U.S. Army Corps of Engineers
Los Angeles District

in cooperation with
The City of Tempe

Rio Salado Environmental Restoration Project
Tempe Reach: Indian Bend Wash and Salt River
Tempe, Arizona

FINAL
Hydraulic & Hydrologic Design Analysis Report for the Indian Bend Wash Flood Control Improvements

An Analysis of Various Habitat Restoration Scenarios for Indian Bend Wash Reach of Tempe Rio Salado Environmental Restoration Project

June 2002

Prepared by
McGann & Associates Inc. / Novak Environmental Inc., Joint-Venture

FINAL
HYDRAULIC AND HYDROLOGIC DESIGN ANALYSIS REPORT FOR THE INDIAN BEND WASH FLOOD CONTROL IMPROVEMENTS

AN ANALYSIS OF VARIOUS HABITAT RESTORATION SCENARIOS FOR INDIAN BEND WASH REACH OF TEMPE RIO SALADO ENVIRONMENTAL RESTORATION PROJECT

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

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June, 2002

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ARIZONA, U.S.A.

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I INTRODUCTION

1.1 Purpose

1.1.1 Purpose

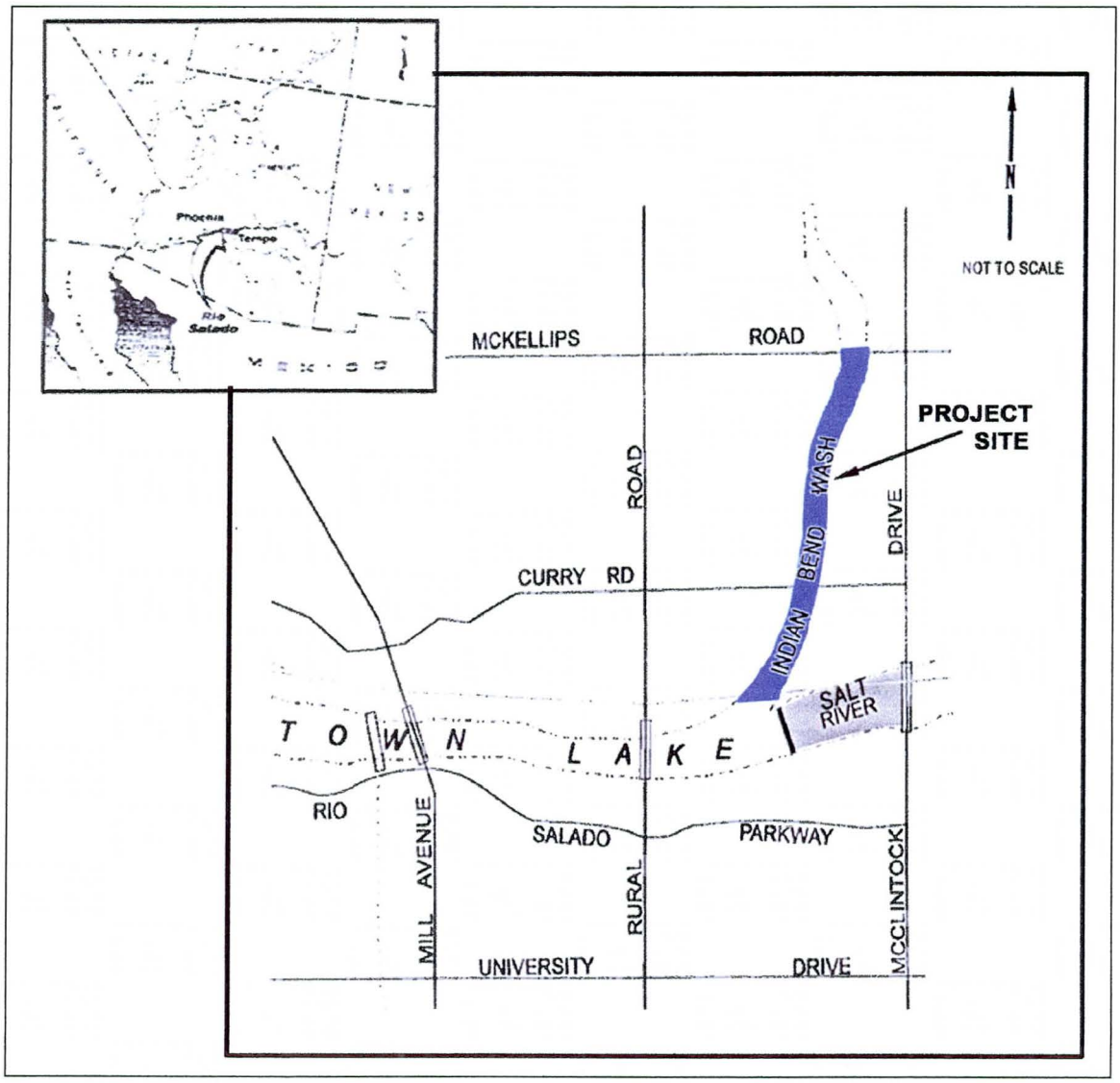
The purpose of this report is to present the results of hydraulic analyses for the final proposed habitat restoration design with updated topographic information. The analyses assessed the impact of the proposed habitat restoration vegetation on flow velocities, water surface elevations and available levee freeboard. Recommendations are provided for levee modifications, which will be required to contain the design storm in IBW after habitat improvements have been installed and to comply with Corps of Engineers and FEMA levee freeboard standards. **The reader is advised that the computed levee freeboard for existing and project conditions has been revised to reflect more accurate levee elevation data obtained since the draft "Hydraulic & Hydrologic Design Analysis Report for the Indian Bend Wash Flood Control Improvements" report was completed by the McGann & Associates, Inc. / Novak Environmental, Inc. Joint-Venture (MA/NE) in November 2001. This new survey information has significantly changed (reduced) the scope of required levee modifications.** This hydraulic analysis uses the more accurate levee elevation data and the final habitat restoration design concept proposed by MA/NE in order to examine projected effects on the required freeboard.

1.1.2 Study Area Description

The Indian Bend Wash reach extends between McKellips Road and the confluence with Salt River (see Figure 1). In the late 1970's, the Corps of Engineers, in

cooperation with the City of Tempe, completed construction of the IBW floodway channel. The project design features included a 120-foot bottom width low-flow channel having a depth of approximately 6 feet and 3:1 sideslopes. The low-flow channel is bounded on both sides by floodway terrace and levee structures, which are designed to contain 30,000 cfs plus freeboard. Today, the terraces are used as a golf course but still convey floodwaters during storms that exceed the 5-year return period event.

Figure 1: Project Location Map.



The design plan for the IBW reach of the Tempe Rio Salado Environmental Restoration Project as depicted in The Feasibility Study (April,1998) proposes development of a riparian habitat area within the low flow channel consisting of cottonwoods, willows, mesquite bosque, aquatic strand, wetland marsh and open space.

1.2 Project Background Information

1.2.1 Study Authorization

The Rio Salado Project, Tempe, Arizona, has been conducted under the authority given in public law 761, 75th Congress, known as Section 6 of the Flood Control Act of 1938 and appropriated under the 1994 Senate Energy and Water Development Bill. The work presented in this report has been conducted by the McGann Associated/Novak Environmental, Inc. Joint Venture under contract #DACW09-00-D-0006, Task Order #0001 – Modification 01.

1.2.2 Previous Studies

A complete list of the previous studies and references used in conjunction with this report is given in Section IV. A brief discussion of previous reports that guide the hydraulic design element of the project is given below.

U.S. Army Corps of Engineers, Los Angeles District Design Memorandum #1

In recognition of the flood problem that exists along IBW in Scottsdale and Tempe, Arizona, Congress authorized a flood control project consisting of a 7-mile long

concrete-lined channel for IBW in 1965. At the request of local interests, the authorized plan was reformulated in the report entitled, Design Memorandum #1, General Design Memorandum B Phase I, Plan Formulation for IBW published in October 1973. The reformulated plan, approved by OCE in April 1974, included recreation as a project purpose and provided a combination of structural and non-structural measures in lieu of the concrete-lined channel along IBW. The Phase II General Design Memorandum and Design Memorandum #2 (Master Plan for Recreation) was prepared concurrently and provides sufficient technical and supporting data to confirm project justification and to establish a reliable cost estimate for the flood control and recreational features of the entire project.

Rio Salado Feasibility Report

The Rio Salado (Salt River), Arizona Feasibility Report was completed by the Corps of Engineers in April 1998. The purpose of the feasibility phase was to conduct the studies necessary to determine the feasibility of restoring riparian habitat along the Salt River at Rio Salado and IBW. During the study, measures were identified that would restore riparian habitat that was lost as a result of federal water control projects. The results of the study support additional federal (Corps) involvement in detailed studies of riparian habitat restoration measures at two locations in the Tempe reach and the Phoenix reach of the Salt River and along IBW. In addition to riparian habitat benefits, water quality and incidental recreational benefits have also been identified.

Federal Flood Insurance Studies

The Federal Emergency Management Agency (FEMA) completed the Flood Insurance Study (FIS) for IBW in 1998. This study identified the regulatory (100-year) floodplain limits and the floodway for IBW channel. The 100-year discharge rate used by FEMA to conduct the FIS for the segment of IBW south of McKellips Road was 20,000 cfs. The Flood Control District of Maricopa County (FCDMC) uses FEMA floodplain and floodway maps to regulate activities within the channel and adjoining floodplain areas. The available freeboard for the levees which form the banks of the IBW channel is presently 3-feet or more for the FEMA discharge of 20,000 cfs.

Previous Hydraulic Design Study

The Draft Hydraulic Design Report for Indian Bend Wash Reach of Tempe Rio Salado Environmental Restoration Project was prepared by McGann & Associates, Inc./Novak Environmental, Inc Joint Venture (MA/NE) and submitted to the Corps of Engineers, Los Angeles District in September 2000. This previous study reported the results of a sensitivity analysis of Manning's n-value for different proposed vegetation densities in IBW and serves as background for data used in the current study. The previous report also provides the basis for Manning's n-values used in the model to represent proposed planting regimes.

Hydraulic & Hydrologic Design Analysis Report for the Indian Bend Wash Flood Control Improvements was prepared by McGann & Associates, Inc / Novak Environmental, Inc. Joint Venture (MA/NE) and submitted to the Corps of Engineers,

Los Angeles District in November 2001. This study reported the results of a hydraulic analysis for two proposed habitat restoration design alternatives along the Indian Bend Wash (IBW) portion of the Tempe, Rio Salado Environmental Restoration Project. The best available topographic information was used for the analysis. This report also provided recommendations for levee modifications required to contain the design storm in IBW after installation of habitat improvements.

1.2.3 Hydraulic Modeling Data

The following information was obtained and used to conduct the hydraulic analyses that were completed as a part of this study. All information is the same as the last report with the addition of item #8.

1. U.S. Army Corps of Engineers Plan #DACW 09-76 S-0007, IBW Between McKellips Road and Salt River Outlet (November 14, 1979)
2. Federal Emergency Management Agency Flood Insurance Study Workmaps dated September 19, 1997
3. Federal Emergency Management Agency Flood Insurance Study HEC-II Model, September 19, 1997
4. Low-Flow Channel Design Analysis for Rio Salado (Salt River), Arizona, Final Report, West Consultants, Inc., January 11, 2000
5. Digital 3-D Topographic Data, Army Corps of Engineers, Datum: 1983 horizontal, 1988 vertical.

6. Corrected Topographic Data, source: (a) Army Corps of Engineers ordered ground survey of southwest portion of Curry Road and IBW, (b) hand digitizing of golf course lake and ancillary culture form aerial photos.

7. Field-corrected Topographic Data, source: October 2001 field verification resulted in correction of topographic data in two locations, the slope of IBW low-flow channel at downstream edge of McKellips bridge and the low flow channel bottom around golf course lake.

8. New ground survey points, source: spot elevations along the tops of levees that were surveyed by Tetra Tech spring of 2002.

II HYDRAULIC ANALYSES

2.1 Background

Two earlier hydraulic analyses have been performed on IBW, results of which are reported in The Army Corps of Engineers Design Memorandum (GDM) #1 and in The FEMA Flood Insurance Study. The GDM states a minimum freeboard of 2.5 feet should be maintained for the IBW reach south of McKellips Road with Q_{100} = 30,000cfs. The FEMA study states a minimum freeboard of 3.0 feet should be maintained with Q_{100} = 20,000cfs. The two previous Hydraulic Design Reports (MA/NE, 2000 and 2001) provide background information on existing conditions at the time of these studies, the final proposed concept plan and other compulsory information as it applies to this study.

Furthermore, the MA/NE 2000 and 2001 studies show deficiencies at current conditions. Because of these deficiencies, the Army Corps of Engineers have requested a new study with updated topographic information be conduced for the IBW reach. This updated analysis responds to that request and confirms freeboard deficiencies still exist at current conditions; however the deficiencies are fewer and are of lower magnitude.

2.2 Methodology

This new study utilizes the 2002 spot elevations in conjunction with the updated, corrected topography and BOSS RiverCAD 2000 to obtain cross-section station data for input into a HEC-RAS model. Original cross-section locations were obtained from the HEC-II model used in the Flood Insurance Study. This study utilized all original locations, with supplemental cross-sections added for increased detail. Appendix A contains an aerial photo of the project site with locations of the cross sections.

Water surface modeling of Indian Bend Wash was performed utilizing the HEC-RAS program. Two models were developed to represent (1) existing conditions and (2) the final proposed planting scheme. Manning's n-values for existing conditions were taken from the FEMA model. Project plan hydraulic modeling was based upon modifications to the existing conditions model including adjustments to Manning's 'n' values for the proposed vegetation types/densities and encroachments such as the overlook south of Curry Road The methodology and basis for selecting post-project Manning's 'n' values is described in the "Draft Hydraulic Design Report for Indian Bend Wash Reach of

Tempe Rio Salado Environmental Restoration Project", McGann and Associates, Inc./Novak Environmental, Inc. Joint Venture, dated September 2000.

The two models were then run using discharges from both the GDM (30,000cfs) and FEMA Study (20,000cfs). Results were analyzed in order to establish water surface elevations, flow velocities, levee freeboard and design features that will occur in conjunction with implementation of the IBW reach of the Tempe Rio Salado Environmental Restoration Project. The pre- and post- project water surface elevations were compared to existing levee elevations to determine available levee freeboard and compliance with FEMA and Corps criteria.

2.3 Existing Conditions

The existing conditions model contains Manning's n-values that reflect the current vegetative conditions at Indian Bend Wash (predominately turf grass). These n-values were obtained from the FEMA HEC-II model. The hydraulic model was run at discharges of 30,000 and 20,000 cfs to determine current conditions water surface elevations for both the U.S. Army Corps of Engineers design discharge rate and the FEMA Study design discharge rate. Existing conditions 100-year water surface elevation and available levee freeboard for both flows are summarized by cross section within the project reach in Table 1 of this report. HEC-RAS output summary tables and water surface profiles for existing conditions at both discharge rates are provided in Appendix B. The HEC-RAS model output also includes cross-section plots showing the pre- and post-project Manning's 'n' values.

FEMA requires a minimum of 3 feet of freeboard for levee structures that contain the regulatory flood within the levees. As previously indicated the design freeboard for the IBW outlet channel is stated in the GDM as 2.5 feet. Table 1 confirms that in some locations the available freeboard at existing conditions complies with the FEMA but not with the U.S. Army Corps of Engineers criteria.

Table 1: Summary of existing conditions water surface elevations and levee freeboard on both banks. Red indicates required freeboard not met.

Cross-Section	Top of Levee (ft)		Existing Conditions					
	Left	Right		Left Freeboard (ft)	Right Freeboard (ft)		Left Freeboard (ft)	Right Freeboard (ft)
			$CWSEL_{20000}$	Q_{20000}	Q_{20000}	$CWSEL_{30000}$	Q_{30000}	Q_{30000}
0.475		n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.532	1174.0	1171.8	1167.0	6.98	4.78	1166.6	7.45	5.25
0.568	1172.0	1172.8	1167.0	4.96	5.76	1167.3	4.69	5.49
0.614	1172.5	1173.5	1166.8	5.67	6.67	1168.4	4.14	5.14
0.663	1173.5	1173.5	1168.9	4.63	5.63	1170.2	3.27	4.27
0.707	1175.5	1175.5	1169.9	5.63	5.63	1171.4	4.15	4.15
0.758	1177.2	1177.2	1171.1	6.08	6.08	1171.9	5.35	5.35
0.776	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.791	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.812	1179.0	1178.5	1173.9	5.09	4.59	1175.2	3.83	3.33
0.852	1179.5	1179.5	1174.8	4.75	4.75	1176.1	3.43	3.43
0.903	1181.0	1180.7	1176.1	4.88	4.58	1177.7	3.28	2.98
0.947	1182.5	1182.2	1177.3	5.21	4.71	1178.6	3.90	3.40
0.987	1183.5	1183.3	1179.0	4.54	4.34	1180.5	3.01	2.81
1.040	1185.0	1184.5	1180.8	4.19	3.69	1182.0	2.99	2.49
1.087	1186.0	1186.5	1182.3	3.74	4.24	1183.6	2.40	2.90
1.136	1187.0	1187.5	1182.7	4.26	4.76	1184.1	2.86	3.36
1.19	1188.0	1188.2	1184.2	3.77	3.97	1185.7	2.26	2.46
1.231	1188.7	1189.0	1184.7	3.98	4.28	1186.2	2.47	2.77
1.283	1189.5	1189.0	1185.4	4.10	3.60	1187.1	2.42	1.92
1.326	1190.2	1190.5	1185.6	4.64	4.94	1187.2	2.97	3.27
1.381	1191.0	1191.0	1185.5	5.52	5.52	1186.9	4.14	4.14
1.42	1192.5	1192.0	1187.4	5.12	4.62	1190.2	2.35	1.85
1.478	1193.7	1193.0	1186.9	6.77	6.07	1189.5	4.24	3.54
1.515	1195.0	1194.0	1188.7	6.34	5.34	1190.2	4.78	3.78
1.554	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = Cross-section at Salt River confluence or roadway dip section

$CWSEL_{20000}$ = Computed water surface elevation at 20,000 cfs

$CWSEL_{30000}$ = Computed water surface elevation at 30,000 cfs

Q_{20000} = 20,000cfs flow

Q_{30000} = 30,000cfs flow

2.4 Final Habitat Restoration Design

A recommended habitat restoration design was described in the 2001 MA/NE Hydraulic & Hydrologic Design Analysis Report for the Indian Bend Wash Flood Control Improvements. It is this design, with a few minor changes, that has formed the Final Habitat Restoration Design. All details on planting densities, planting schemes, Manning's n-values and habitat units are contained in the MA/NE 2001 report. Manning's 'n' value for pre- and post- project conditions are shown on cross-section graphs in Appendices B and C. HEC-RAS output summary tables and water surface profiles for project conditions at both discharge rates are also provided in Appendix C. Table 2 presents a summary of the Final Design-project conditions water surface elevations and available levee freeboard for both the 20,000 and 30,000 cfs discharge rates.

Table 2: Summary of project conditions water surface elevations and levee freeboard for final design concept. Red indicates required freeboard is not met.

Cross-Section	Top of Levee (ft)		Project Conditions					
	Left	Right		Left Freeboard (ft)	Right Freeboard (ft)		Left Freeboard (ft)	Right Freeboard (ft)
			$CWSEL_{20000}$	Q_{20000}	Q_{20000}	$CWSEL_{30000}$	Q_{30000}	Q_{30000}
0.475		n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.532	1174.0	1171.8	1167.4	6.61	4.41	1167.6	6.44	4.24
0.568	1172.0	1172.8	1168.2	3.77	4.57	1169.6	2.45	3.25
0.614	1172.5	1173.5	1168.8	3.68	4.68	1170.2	2.26	3.26
0.663	1173.5	1173.5	1169.9	3.56	4.56	1171.6	1.94	2.94
0.707	1175.5	1175.5	1171.4	4.14	4.14	1172.9	2.61	2.61
0.758	1177.2	1177.2	1172.3	4.85	4.85	1173.9	3.30	3.30
0.776	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.791	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
0.812	1179.0	1178.5	1173.9	5.09	4.59	1175.2	3.81	3.31
0.852	1179.5	1179.5	1176.0	3.52	3.52	1177.7	1.84	1.84
0.903	1181.0	1180.7	1176.8	4.19	3.89	1178.4	2.63	2.33
0.947	1182.5	1182.2	1177.9	4.59	4.09	1179.3	3.18	2.68
0.987	1183.5	1183.3	1179.2	4.34	4.17	1180.5	2.98	2.78
1.040	1185.0	1184.5	1180.7	4.35	3.85	1181.7	3.29	2.79
1.087	1186.0	1186.5	1183.1	2.94	3.44	1184.5	1.54	2.04
1.136	1187.0	1187.5	1183.8	3.25	3.75	1185.2	1.78	2.28
1.19	1188.0	1188.2	1184.9	3.15	3.35	1186.4	1.63	1.83
1.231	1188.7	1189.0	1185.5	3.20	3.50	1187.1	1.64	1.94
1.283	1189.5	1189.0	1186.2	3.32	2.82	1187.9	1.62	1.12
1.326	1190.2	1190.5	1186.6	3.58	3.88	1188.4	1.85	2.15
1.381	1191.0	1191.0	1187.2	2.85	3.85	1188.8	1.18	2.18
1.42	1192.5	1192.0	1188.6	3.88	3.38	1190.4	2.09	1.59
1.478	1193.7	1193.0	1189.1	4.60	3.90	1191.0	2.74	2.04
1.515	1195.0	1194.0	1190.1	4.90	3.90	1191.8	3.23	2.23
1.554	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = Cross-section at Salt River confluence or roadway dip section

$CWSEL_{20000}$ = Computed water surface elevation at 20,000 cfs

$CWSEL_{30000}$ = Computed water surface elevation at 30,000 cfs

Q_{20000} = 20,000cfs flow

Q_{30000} = 30,000cfs flow

Table 3 provides a summary of water surface elevations for the Effective FIS, baseline-existing conditions and Project conditions. Topography datum used in project hydraulic modeling is the same as that used in the FIS, NAVD '88.

Table 3: Summary of FIS, existing and project conditions water surface elevations at 20,000cfs.

Cross-Section	Summary Table				
	$CWSEL_{20000}$ (ft)			Change in CWSEL (ft) relative to FIS	
	FIS	Existing	Project	Existing	Project
0.475	n/a	n/a	n/a	n/a	n/a
0.568	1167.4	1167.0	1168.2	-0.36	0.83
0.663	1169.5	1168.9	1169.9	-0.63	0.44
0.758	1172.4	1171.1	1172.3	-1.28	0.06
0.776	n/a	n/a	n/a	n/a	n/a
0.791	n/a	n/a	n/a	n/a	n/a
0.852	1176.5	1174.8	1176.0	-1.75	-0.52
0.947	1178.3	1177.3	1177.9	-1.01	-0.39
1.040	1182.0	1180.8	1180.7	-1.19	-1.35
1.136	1184.9	1182.7	1183.8	-2.16	-1.15
1.231	1186.3	1184.7	1185.5	-1.58	-0.80
1.326	1186.9	1185.6	1186.6	-1.34	-0.28
1.42	1188.0	1187.4	1188.6	-0.62	0.62
1.515	1189.8	1188.7	1190.1	-0.30	0.30
1.554	n/a	n/a	n/a	n/a	n/a

n/a = Cross-section at Salt River confluence or roadway dip section

$CWSEL_{20000}$ = Computed water surface elevation at 20,000 cfs

2.5 Summary of Results

In order to determine the magnitude and location of available freeboard, modeling of the Indian Bend Wash portion of the Tempe Rio Salado Environmental Restoration Project was performed using the HEC-RAS program and updated topographic data with more accurate levee elevation data. Existing and project conditions were modeled at two different discharge rates; the FCDMC discharge of 20,000 cfs and the USACE design discharge of 30,000 cfs. Project conditions were modeled by adjusting Manning's n-values in the existing conditions model and adding the encroachment associated with the overlook south of Curry Road.

The increase in water surface elevations, caused by the planned vegetation densities (higher Manning's n-values), results in freeboard less than 3.0 feet (for the FEMA discharge) at three cross-section locations. For the Project conditions deficiencies in the USACE 2.5-feet freeboard occur along approximately 5,200 feet of the Indian Bend Wash banks. These deficiencies range from 0.05 to 1.38 feet with the average freeboard deficiency being 0.6-feet. Modeled flow velocities generally ranged from 6.75 fps to 12.54 fps for project conditions at a discharge rate of 30,000. At these velocities, it is believed that project conditions, with 75-150 trees per acre consisting of cottonwood, willow and mesquite bosque habitat, is prone to only minimal loss during high magnitude flows (given that the trees are mature). Some damage and loss however of wetland marsh areas and emergent vegetation will occur.

The post-project water surface elevations given in Tables 2 and 3 are lower than the pre-project FIS water surface elevations at some cross-sections. The topographic mapping used in the effective FIS (dated 1991) was compared to the Corps topographic mapping (dated 1999 with adjustments through 2002). This comparison found the current channel geometry to have a greater cross-section area than the effective FIS which appears to be the reason the post-project water surface elevations are lower than the effective FIS. The flood stages at the Curry Road and McKellips Road crossings are contained within the existing dip sections.

III METHODS TO ACHIEVE SUFFICIENT FREEBOARD

Additional freeboard is required to comply with the USACE criteria. To satisfy

freeboard requirements the Final Project Design proposes a combination of raising the existing levee by building a floodwall, or in limited areas, raising the top of berm elevation through pavement overlays.

In locations where the elevation needs to be raised only a few inches, earthwork, berming or raised bike paths achieve the desired results. Along the west bank, locations where the levee will require being raised more than a foot a floodwall will be constructed on the channel side of the levee with minimal adjustments for existing infrastructure such as bike path, lighting and irrigation. Along the east bank locations where the levee will require being raised more than a foot a floodwall will be constructed on the property line side of the levee. Specifications for a floodwall are subject to structural certification for compliance with FEMA floodwall criteria.

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APPENDIX A

Cross Section Location Map

APPENDIX B

HEC-RAS Output Summary Table for Existing Conditions

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX   XXXX       XXXX      XX     XXXX
X     X  X       X    X     X   X    X  X    X
X     X  X       X          X   X   X    X   X
XXXXXXX  XXXX    X      XXX XXXX    XXXXXX   XXXX
X     X  X       X          X  X    X    X       X
X     X  X       X    X     X   X   X    X       X
X     X  XXXXXX   XXXX      X    X  X    X   XXXXX
```

PROJECT DATA
Project Title: IBW
Project File : IBW.prj
Run Date and Time: 6/28/2002 9:11:01 AM

Project in English units

Project Description:
Indian Bend Wash confluence to McKellips Indian Bend Environmental Restoration Project
  Novak Environmental 8/30/2000 file:ibwh2_~2.dat
  FEMA Baseline
Model for Indian Bend Wash Salt River to McKellips Road
  Q=30000 CFS

PLAN DATA

Plan Title: 30-levee-base
Plan File : r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.p19

Geometry Title: Levee-Adjusted Base Conditions Geometry
Geometry File :
r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.g09

Flow Title : 30 Flow Profiles
Flow File :
r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.f02

Plan Summary Information:

Number of:	Cross Sections	= 26	Mulitple Openings	=	0
	Culverts	= 0	Inline Weirs	=	0
	Bridges	= 1			

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculaton tolerance	= 0.01
Maximum number of interations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: 30 Flow Profiles
Flow File : r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.f02

Flow Data (cfs)

River	Reach	RS	PF 1
Reach #1	Reach #1	1.554	30000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Reach #1	Reach #1	PF 1		

Known WS = 1167.3

GEOMETRY DATA

Geometry Title: Levee-Adjusted Base Conditions Geometry
Geometry File : r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.g09

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.554

INPUT
Description: downstream edge McKellips Rd.
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1193	32.31	1192	80.41	1191	112.43	1190	150.94	1189
274.99	1188	430.39	1187	464.3	1186	470.89	1185	475.88	1184
479.89	1183	484.3	1182	490.08	1181	495.07	1180	500.83	1179
504.19	1178	507.21	1177.29	556.73	1177.29	559.64	1178	563.8	1179
568.04	1180	572.88	1181	579.22	1182	586.77	1183	593.32	1184
600.28	1185	607.04	1186	613.98	1187	667.6	1188	670.8	1188
692.15	1188	792.23	1189	859.8	1190	900.48	1191	934.86	1192

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	464.3	.02	613.98	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
464.3	613.98	192.18	178.77	160.8	.3	.1

Left Levee Station= 0 Elevation= 1193
Right Levee Station= 934.86 Elevation= 1192

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.515

INPUT
Description:
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1194	31.23	1195	40.11	1193	46.9	1192	53.77	1191
62.25	1190	72.37	1189	95.97	1188	240.31	1187	258.16	1187
298.78	1187	305.87	1186	312.21	1185	316.83	1184	320.31	1183
323.73	1182	327.08	1181	330.75	1180	334.47	1179	338.15	1178
341.83	1177	351.93	1176.5	401.93	1176.5	408.99	1177	414.4	1178
420.14	1179	425.13	1180	429.58	1181	433.85	1182	439.18	1183
445.61	1184	459.41	1185	530.07	1186	568.92	1187	634.15	1188
651.66	1189	665.45	1190	672.27	1191	678.61	1192	690.98	1192
703.25	1194								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	298.78	.03	459.41	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
298.78	459.41	207.87	204.9	206.88	.3	.1

Left Levee Station= 31.23 Elevation= 1195
Right Levee Station= 703.25 Elevation= 1194

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.478

INPUT
Description:
Station Elevation Data num= 42

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1193	30.69	1193.7	37.4	1192	43.7	1191	49.61	1190
55.77	1189	68.39	1188	93.63	1187	268.72	1186	273.87	1185
278.18	1184	282.77	1183	286.92	1182	290.63	1181	294.35	1180
298.15	1179	302.59	1178	308.75	1177	315.23	1176	342.98	1176
392.98	1176	410.44	1177	422.1	1178	426.55	1179	430.29	1180
433.88	1181	437.82	1182	442.19	1183	446.99	1184	451.78	1185
459.96	1186	514.15	1187	546.11	1188	566.21	1189	630.93	1189
645.33	1188	654.51	1188	660.66	1189	667.04	1190	674.73	1191
682.53	1193	703.75	1192						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	268.72	.03	459.96	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
268.72	459.96	321.64	296.02	278.93	.3	.1

Left Levee Station= 30.69 Elevation= 1193.7
Right Levee Station= 682.53 Elevation= 1193

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.42

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1191	23.28	1192.5	32.83	1190	42.9	1189	51.68	1188
59.5	1187	70.51	1186	84.1	1185	120.1	1184	140.93	1184
230.34	1185	244.36	1184	251.38	1183	257.9	1182	263.05	1181

267.68	1180	272.02	1179	277.05	1178	286.68	1177	322.75	1176.5
329.55	1176	372.75	1176	408.8	1176	415.13	1177	419.83	1178
424.25	1179	428.45	1180	432.79	1181	437.11	1182	442.39	1183
448.04	1184	454.26	1185	464.18	1186	513.55	1186	540.41	1185
605.15	1185	615.46	1186	623.2	1187	630.22	1188	636.84	1189
643.25	1190	649.58	1192	681.14	1191				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	230.34	.03	464.18	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
230.34	464.18	246.93	234.85	223.94	.3	.1

Left Levee Station= 23.28 Elevation= 1192.5
Right Levee Station= 649.58 Elevation= 1192

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.381

INPUT
Description:
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1190	28.87	1191	42.38	1189	63.22	1188	76.78	1187
91	1186	226.68	1185	237.79	1184	245.36	1183	251.25	1182
257.29	1181	261.02	1180	264.65	1179	268.31	1178	271.91	1177
277.88	1176	286.23	1175	311.91	1175	361.91	1175	401.86	1176
411.6	1177	415.51	1178	419.4	1179	427.84	1181	432.18	1182
436.68	1183	441.21	1184	446.15	1185	451.34	1186	520.8	1186
551.41	1186	581	1187	598.61	1188	621.55	1189	637.53	1190
684.79	1191								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	226.68	.03	451.34	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
226.68	451.34	287.64	287.08	288.27	.3	.01

Left Levee Station= 28.87 Elevation= 1191
Right Levee Station= 684.79 Elevation= 1191

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.326

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1188	29.1	1190.2	40.83	1187	48	1186	56.11	1185
72.91	1184	119.96	1183	146.64	1183	165.83	1184	178.85	1185
217.9	1185	226.37	1184	232.07	1183	237.61	1182	242.8	1181
246.63	1180	250.24	1179	253.64	1178	257.24	1177	263.14	1176
271.43	1175	293.77	1174.5	340.18	1174	343.4	1174	366.79	1174
379.56	1174	389.39	1175	396.24	1176	400.26	1177	404.46	1178
408.58	1179	413.81	1180	420.17	1181	427.37	1182	541.55	1183
585.55	1184	617.3	1185	627.04	1186	633.51	1187	639.04	1188
644.57	1189	653.53	1190.5	670.01	1190				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	217.9	.03	427.37	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

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        217.9  427.37            237.83  239.82  246.85              .3       .1
Left Levee      Station=    29.1      Elevation=  1190.2
Right Levee     Station=  653.53      Elevation=  1190.5

CROSS SECTION           RIVER: Reach #1
REACH: Reach #1            RS: 1.283

INPUT
Description:
Station Elevation Data     num=      45
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1189   16.86  1189.5   27.75    1188   37.88    1187   46.04    1186
   53.13    1185   63.11    1184   75.32    1183   85.62    1182  144.25    1182
  156.05    1183  165.53    1184  183.51    1184  194.79    1183  205.77    1182
  216.03    1181  224.22    1180  229.17    1179  234.28    1178  240.03    1177
  247.83    1176  259.95    1175   277.5  1174.5  332.03    1174  356.99    1174
   374.9    1175  379.75    1176  384.43    1177  389.32    1178  393.76    1179
  398.38    1180  403.14    1181  410.07    1182  417.48    1183  477.84    1183
  502.53    1182  517.85    1181  572.67    1181  587.38    1182  603.51    1183
  613.34    1184  624.92    1185  640.61    1186  659.83    1189  684.59    1187

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035  183.51     .03  417.48    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        183.51  417.48            268.54  277.57  291.11              .3       .1
Left Levee      Station=    16.86     Elevation=  1189.5
Right Levee     Station=  659.83      Elevation=    1189

CROSS SECTION           RIVER: Reach #1
REACH: Reach #1            RS: 1.231

INPUT
Description:
Station Elevation Data     num=      43
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1188.7   24.18    1187   35.28    1187    63.5    1187   71.29    1186
   79.16    1185   88.44    1184   99.95    1183  111.61    1182  134.43    1182
  166.71    1182  211.35    1181  270.66    1180  277.87    1179  284.62    1178
  289.73    1177  293.96    1176  298.95    1175  306.85    1174  328.86    1173
  336.33    1173  386.33    1173  406.05    1174  430.44    1175  433.97    1176
  437.68    1177  441.22    1178  445.08    1179  449.63    1180  454.44    1181
  459.12    1182  467.79    1183  518.64    1183  552.56    1182  577.86    1182
  630.19    1183  646.63    1184  655.18    1185  661.03    1186  667.66    1187
  674.97    1188   689.9    1189  720.49    1189

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035  270.66     .03  467.79    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        270.66  467.79            232.51  246.72  255.62              .3       .1
Left Levee      Station=       0      Elevation=  1188.7
Right Levee     Station=  720.49      Elevation=    1189

CROSS SECTION           RIVER: Reach #1
REACH: Reach #1            RS: 1.19

INPUT
Description:
Station Elevation Data     num=      34
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
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0	1186	11.15	1187	30.38	1188	39.69	1186	45.08	1185
50.53	1184	58.76	1183	72.4	1182	244.49	1181	255.21	1180
261.54	1179	267.46	1178	275.41	1177	282.38	1176	293.36	1175
320.54	1174.5	370.54	1174.5	415.76	1175	423.57	1176	428.77	1177
434.08	1178	442.44	1179	453.82	1180	465.64	1181	486.53	1181
572.53	1181	603.7	1182	619.96	1183	627.93	1184	634.89	1185
641.85	1186	648.72	1187	658.62	1188.2	697.64	1188		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	244.49	.03	465.64	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
244.49	465.64	287.09	289.69	290.94	.3	.1

Left Levee Station= 30.38 Elevation= 1188
Right Levee Station= 658.62 Elevation= 1188.2

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.136

INPUT
Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1186	58.1	1187	64.03	1185	69.72	1184	77.46	1183
87.33	1182	118.43	1181	165.23	1180	203.41	1180	303.51	1180
317	1179	322.36	1178	326.72	1177	330.94	1176	336.23	1175
343.95	1174	355.52	1173	367.42	1173	407.7	1173	417.42	1173
446.95	1174	463.81	1175	472.73	1176	477.38	1177	482.28	1178
487.77	1179	494.62	1180	503.94	1181	526.13	1181	613.82	1181
642.24	1182	650.21	1183	657.23	1184	663.56	1185	669.87	1186
678.48	1187.5	712.15	1187						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	303.51	.03	503.94	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
303.51	503.94	232.8	232.8	232.23	.3	.1

Left Levee Station= 58.1 Elevation= 1187
Right Levee Station= 678.48 Elevation= 1187.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.087

INPUT
Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1186	63.57	1186	88.46	1185	95.71	1184	103.27	1183
110.89	1182	121.5	1181	144.32	1180	208.75	1179	215.75	1179
215.77	1179	246.77	1179	352.31	1179	365.21	1178	370.99	1177
376.99	1176	383.31	1175	389.63	1174	410.73	1173	460	1173
502.7	1173	514.24	1174	519.78	1175	525.55	1176	531.66	1177
538.81	1178	545.39	1179	618.81	1180	631.01	1181	657.78	1181
673.86	1181	683.75	1182	690.63	1183	697.08	1184	704.31	1185
711.59	1186.5	750.29	1186						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	352.31	.03	545.39	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

352.31	545.39	238.56	247.22	255.11		.3	.1

Left Levee Station= 63.57 Elevation= 1186
Right Levee Station= 711.59 Elevation= 1186.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.04

INPUT
Description:
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1184	29.32	1185	37.23	1183	44.94	1182	52.39	1181
61.99	1180	100.23	1179	189.17	1179	295.63	1179	314.78	1178
320.78	1177	326.38	1176	331.13	1175	336.28	1174	341.39	1173
368.18	1173	418.18	1173	449.17	1173	456.33	1174	470.86	1176
482.1	1177	500.3	1177	602.1	1177	617.63	1178	624.79	1179
631.38	1180	636.76	1181	641.84	1182	656	1184.5	665.54	1183
693.53	1182	745.15	1182	824.53	1183	847.11	1182.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	295.63	.03	482.1	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
295.63	482.1	290.01	291.93	296	.3	.1

Left Levee Station= 29.32 Elevation= 1185
Right Levee Station= 656 Elevation= 1184.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.987

INPUT
Description: golf course lake
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1178	12.36	1179	26.23	1180	31.66	1181	37.23	1182
63.51	1183.5	72.2	1181	78.68	1180	85.47	1179	97.35	1178
120.31	1177	170.48	1176	181.9	1175.01	270.26	1175.01	270.45	1175
289.03	1174	341.1	1173	380	1171.5	450.38	1171	481.23	1171
492.5	1172	498.39	1173	504.18	1174	528.5	1175	544.8	1176
640.77	1177	648.76	1178	656.27	1179	663.07	1180	671.43	1181
682.01	1183.3	696.17	1182						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	270.45	.03	504.18	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
270.45	504.18	202	203.97	205.61	.3	.1

Left Levee Station= 63.51 Elevation= 1183.5
Right Levee Station= 682.01 Elevation= 1183.3

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.947

INPUT
Description: golf course lake
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1181	30.31	1182.5	42.48	1179	53.18	1178	69.29	1177
82.25	1176	184.79	1175.01	245.04	1175.01	245.04	1175	245.45	1174
250	1173	260	1172	270	1171	288.77	1170	310.63	1169
327.77	1169	370.97	1169	377.77	1169	400	1170	420	1171

430	1172	442.72	1173	447.79	1174	455.51	1175	495.98	1175
523.25	1175	550	1175	594.22	1176	611.67	1177	619.31	1178
625.56	1179	632.04	1180	637.95	1182				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	245.04	.03	455.51	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
245.04	455.51	248.71	248.64	250.03	.3	.1

Left Levee Station= 30.31 Elevation= 1182.5
Right Levee Station= 637.95 Elevation= 1182

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.903

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1179	38.41	1181	45.68	1178	53.21	1177	60.43	1176
76.19	1175	89.79	1174	100.41	1173	153.46	1173	174.75	1174
215.87	1175	238.74	1175	247.18	1174	254.33	1173	261.49	1172
268.69	1171	276.96	1170	293.25	1169	322.33	1169	377.75	1169
410.67	1170	423.64	1171	439.72	1172	544.79	1173	600.37	1174
616.39	1175	624.05	1176	631.24	1177	637.31	1178	643.62	1179
650.57	1180.7	677.25	1180						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	238.74	.03	439.72	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
238.74	439.72	274.32	268.24	269.22	.3	.1

Left Levee Station= 38.41 Elevation= 1181
Right Levee Station= 650.57 Elevation= 1180.7

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.852

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1175	25.12	1175	60.78	1176	67.39	1177	72.76	1178
106.59	1179.5	113.47	1177	119.6	1176	127.34	1175	137.5	1174
184.52	1173	263.96	1172	300.18	1171	315.3	1170	321.84	1169
326.91	1168	331.9	1167	339.82	1166	351.32	1165	373.86	1165
423.86	1165.5	435.29	1166	445.52	1167	453.46	1168	459.15	1169
465.09	1170	478.61	1171	519.29	1172	652.13	1173	693.75	1174
701.38	1175	709.32	1179.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	315.3	.03	465.09	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
315.3	465.09	179.08	179.06	181.91	.3	.1

Left Levee Station= 106.59 Elevation= 1179.5
Right Levee Station= 709.32 Elevation= 1179.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.812

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1179	4.72	1175	9.42	1174	15.61	1173	25.51	1172
100.06	1172	171.55	1172	182.79	1171	188.36	1170	194.47	1169
199.72	1168	204.81	1167	210.34	1166	220.54	1165	308.37	1165
331.63	1166	337.48	1167	343.51	1168	350.51	1169	357.09	1170
367.95	1171	492.65	1172	504.57	1172	526.21	1172	555.6	1173
566.37	1174	576.7	1175	600.82	1176	607.81	1177	615.58	1178.5
640.6	1178								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	171.55	.03	367.95	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
171.55	367.95	108.3	112.43	114.94	.3	.1

Left Levee Station= 0 Elevation= 1179
Right Levee Station= 615.58 Elevation= 1178.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.791

INPUT
Description: upstream edge Curry Road
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1172.5	48.86	1173	85.99	1172	123.04	1171	176.67	1171
219.03	1171	252.92	1170	263.27	1169	274.76	1168	281.96	1167
282.5	1165	299.85	1165	411.76	1165	435.4	1165	566.35	1171
646.51	1172	686.03	1173	715.6	1174	742.19	1175	757.27	1176
806.98	1177	894.58	1174						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	252.92	.02	566.35	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
252.92	566.35	66.51	66.51	69.25	.3	.1

BRIDGE RIVER: Reach #1
REACH: Reach #1 RS: 0.790

INPUT
Description:
Distance from Upstream XS = 1
Deck/Roadway Width = 64.5
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 20

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1174.5	0	48.86	1173	0	85.99	1172	0
123.04	1171	0	176.67	1171	0	219.03	1171	0
252.92	1170	0	282.4	1169.68	0	282.5	1169.68	1167.68
435.4	1169.68	1167.68	435.5	1169.68	0	471	1169.6	0
566.35	1171	0	646.51	1172	0	686.03	1173	0
715.6	1174	0	742.19	1175	0	757.27	1176	0
806.98	1177	0	894.58	1178.5	0			

Upstream Bridge Cross Section Data
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1172.5	48.86	1173	85.99	1172	123.04	1171	176.67	1171
219.03	1171	252.92	1170	263.27	1169	274.76	1168	281.96	1167
282.5	1165	299.85	1165	411.76	1165	435.4	1165	566.35	1171
646.51	1172	686.03	1173	715.6	1174	742.19	1175	757.27	1176
806.98	1177	894.58	1174						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	252.92	.02	566.35	.02

Bank Sta: Left	Right	Coeff Contr.	Expan.
252.92	566.35	.3	.1

Downstream Deck/Roadway Coordinates
num= 5

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
267.39	1170	0	288.2	1169.68	0	288.3	1169.68	1166.68
440.9	1169.68	1166.68	441	1169.68	0			

Downstream Bridge Cross Section Data
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1172.5	30.87	1174	67.71	1173	110.38	1172	142.22	1171.5
183.51	1171	267.39	1170	274.69	1169	283.48	1168	288.2	1164
300.93	1164	309.39	1164	325.67	1164	352	1164	403.77	1164
416.92	1164	441	1164	441.1	1170	578.43	1171	665.25	1172
713.41	1173	746.87	1174	777.33	1175	810.58	1176	843.59	1177
883.33	1178	935.87	1174.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	267.39	.02	578.43	.02

Bank Sta: Left	Right	Coeff Contr.	Expan.
267.39	578.43	.3	.1

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 2

Pier Data
Pier Station Upstream= 333.25 Downstream= 338.97
Upstream num= 2

Width	Elev	Width	Elev
1.5	1165	1.5	1168

Downstream num= 2

Width	Elev	Width	Elev
1.5	1164	1.5	1167

Pier Data
Pier Station Upstream= 384.75 Downstream= 390.7
Upstream num= 2

Width	Elev	Width	Elev
1.5	1165	1.5	1168

Downstream num= 2

Width	Elev	Width	Elev

```
     1.5    1164     1.5    1167

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION           RIVER: Reach #1
REACH: Reach #1            RS: 0.776

INPUT
Description: downstream edge Curry Road
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1172.5   30.87    1174   67.71    1173  110.38    1172  142.22  1171.5
  183.51    1171  267.39    1170  274.69    1169  283.48    1168   288.2    1164
  300.93    1164  309.39    1164  325.67    1164     352    1164  403.77    1164
  416.92    1164     441    1164   441.1    1170  578.43    1171  665.25    1172
  713.41    1173  746.87    1174  777.33    1175  810.58    1176  843.59    1177
  883.33    1178  935.87  1174.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .02  267.39     .02  578.43     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        267.39  578.43           113.71  106.75  105.35              .3       .1

CROSS SECTION           RIVER: Reach #1
REACH: Reach #1            RS: 0.758

INPUT
Description:
Station Elevation Data    num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1177.2   29.68    1177   36.67    1176   43.32    1175   49.36    1174
   55.53    1173   63.28    1172    73.9    1171  165.05    1170  175.43    1169
  181.37    1168  187.29    1167  190.97    1166   194.7    1165  198.89    1164
  204.06    1163  211.44    1162  216.92    1161  249.27    1160  276.62    1160
  313.81    1160  326.62    1160  340.55    1160  344.21    1161  347.28    1162
  350.31    1163  353.35    1164  356.44    1165  359.79    1166   363.3    1167
  366.87    1168  371.72    1169  608.61    1170   621.6    1171  630.56    1172
  641.11    1173  649.81    1174  658.38    1175  667.03    1176  675.08  1177.2
  689.29    1177

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035  165.05    .025  371.72    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        165.05  371.72           267.42  252.47  239.42              .3       .1
Left Levee      Station=       0      Elevation=  1177.2
```

Right Levee Station= 675.08 Elevation= 1177.2

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.707

INPUT
Description:
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1175.5	7.97	1174	15.35	1173	21.49	1172	27.66	1171
36.41	1170	52.55	1169	123.02	1168	134.2	1167	140.12	1166
144.75	1165	149.29	1164	154.79	1163	160.49	1162	166.18	1161
206.57	1161	245.47	1161	279.38	1161	281.78	1161	285.85	1161
290.94	1162	296.05	1163	301.21	1164	306.42	1165	311.7	1166
317.06	1167	441.81	1167.7	464.3	1168	498.51	1168.5	577.56	1169
598.49	1171	608.55	1172	618.72	1173	628.8	1174	638.69	1175.5
655.18	1175								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	123.02	.025	317.06	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
123.02	317.06	247.85	235.96	224.89	.3	.1

Left Levee Station= 0 Elevation= 1175.5
Right Levee Station= 638.69 Elevation= 1175.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.663

INPUT
Description:
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1174	38.28	1173.5	52.11	1173	58.27	1172	64.58	1171
71.82	1170	79.3	1169	93.21	1168	149.7	1167	162.28	1166
172.18	1165	179.01	1164	184.54	1163	189.93	1162	209.37	1161
222.92	1160	262.46	1160	278.1	1160.5	291	1160.3	330.53	1161
334.71	1162	339.09	1163	343.45	1164	347.45	1164.5	350.52	1165
357.69	1166	503.04	1166.8	520.02	1167	550.01	1167.5	632.53	1168
645.97	1169	653.69	1170	659.89	1171	666.22	1172	681.44	1174.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	149.7	.025	357.69	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
149.7	357.69	287.76	272.3	268.37	.03	.01

Left Levee Station= 38.28 Elevation= 1173.5
Right Levee Station= 681.44 Elevation= 1174.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.614

INPUT
Description:
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1173	18.96	1172.5	29.99	1172	38.47	1171	45.06	1170
51.52	1169	60.05	1168	70.63	1167	149.96	1166	162.34	1165
170.36	1164	176.37	1163	182.96	1162	191.59	1161	204.08	1160
223.08	1159.5	247.97	1159	297.97	1159	349.64	1159	361.49	1160
367.95	1161	372.95	1162	377.59	1163	384.34	1164	398.46	1165

459.96	1165	498.06	1165	597.4	1166	603.61	1166.5	619.89	1167
631.22	1168	638.48	1169	645.22	1170	651.94	1171	659.69	1172
681.04	1173.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	149.96	.025	398.46	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
149.96	398.46	204.8	184.21	167.27	.3	.1

Left Levee Station= 18.96 Elevation= 1172.5
Right Levee Station= 681.04 Elevation= 1173.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.568

INPUT
Description:
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1172	56.4	1171	63.78	1170	69.94	1169	76.11	1168
83.12	1167	92.26	1166	141.49	1165	198.25	1164	215.54	1163
226.42	1162	235.88	1161	246.56	1160	263.47	1159	288.47	1159
338.47	1159	371.5	1159	424.24	1159	432.81	1160	440.84	1161
447.72	1162	455.62	1163	478.26	1164	488.26	1164	528.26	1164
617.68	1165	645.37	1166	658.11	1167	666.14	1168	673.14	1169
680.13	1170	687.13	1171	699.19	1171.5	712.64	1172.8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	198.25	.025	478.26	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
198.25	478.26	212.06	200.8	191.1	.3	.1

Left Levee Station= 0 Elevation= 1172
Right Levee Station= 712.64 Elevation= 1172.8

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.532

INPUT
Description:
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1174	8.21	1174	16.15	1173	27.02	1172	39.91	1171
59.34	1170	98.09	1169	121.97	1168	134.57	1167	148.33	1166
158.33	1165.5	165.54	1165	183.95	1164	227.25	1163	313.26	1162
330.23	1161	341.2	1160	352.65	1159	402.65	1159	447.17	1159
480	1159	546.68	1160	556.24	1161	565.4	1162	575.81	1163
621.81	1163.5	654.14	1163.5	694.4	1164	708.37	1165	718.81	1166
728.87	1167	738.75	1168	748.05	1169	756.21	1170	775.78	1171.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	313.26	.025	575.81	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
313.26	575.81	311.48	309.07	304.28	.3	.1

Left Levee Station= 0 Elevation= 1174
Right Levee Station= 775.78 Elevation= 1171.8

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.475

INPUT
Description:
Station Elevation Data num= 55

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1179	9.2	1179.5	16.4	1179	20.07	1178	25.54	1177
27.25	1176	29.62	1175	32	1174	34.73	1173	37.43	1172
40.15	1171	43.08	1170	45.7	1169	48.31	1168	50.9	1167
53.24	1166	56.15	1165	58.93	1164	61.58	1163	64.34	1162
67.48	1161	70.85	1160	75.24	1159	85.34	1158	99.73	1158
108.14	1159	263.68	1159	269.45	1159	296.5	1158.5	306.7	1158
314.94	1157	348.36	1157	357.84	1158	375	1158	376.73	1158
430.32	1157	442.77	1156	459.35	1156	470.77	1157	498.49	1158
511.48	1159	522.74	1159	588.64	1159	655.92	1160	665.66	1161
671.22	1162	674.75	1163	677.94	1164	681.05	1165	684.1	1166
686.89	1167	689.97	1168	693.45	1169	700.43	1171.5	742.96	1170

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	263.68	.045	511.48	.045

Bank Sta: Left	Right	Coeff Contr.	Expan.
263.68	511.48	.3	.1

Left Levee Station= 9.2 Elevation= 1179.5
Right Levee Station= 700.43 Elevation= 1171.5

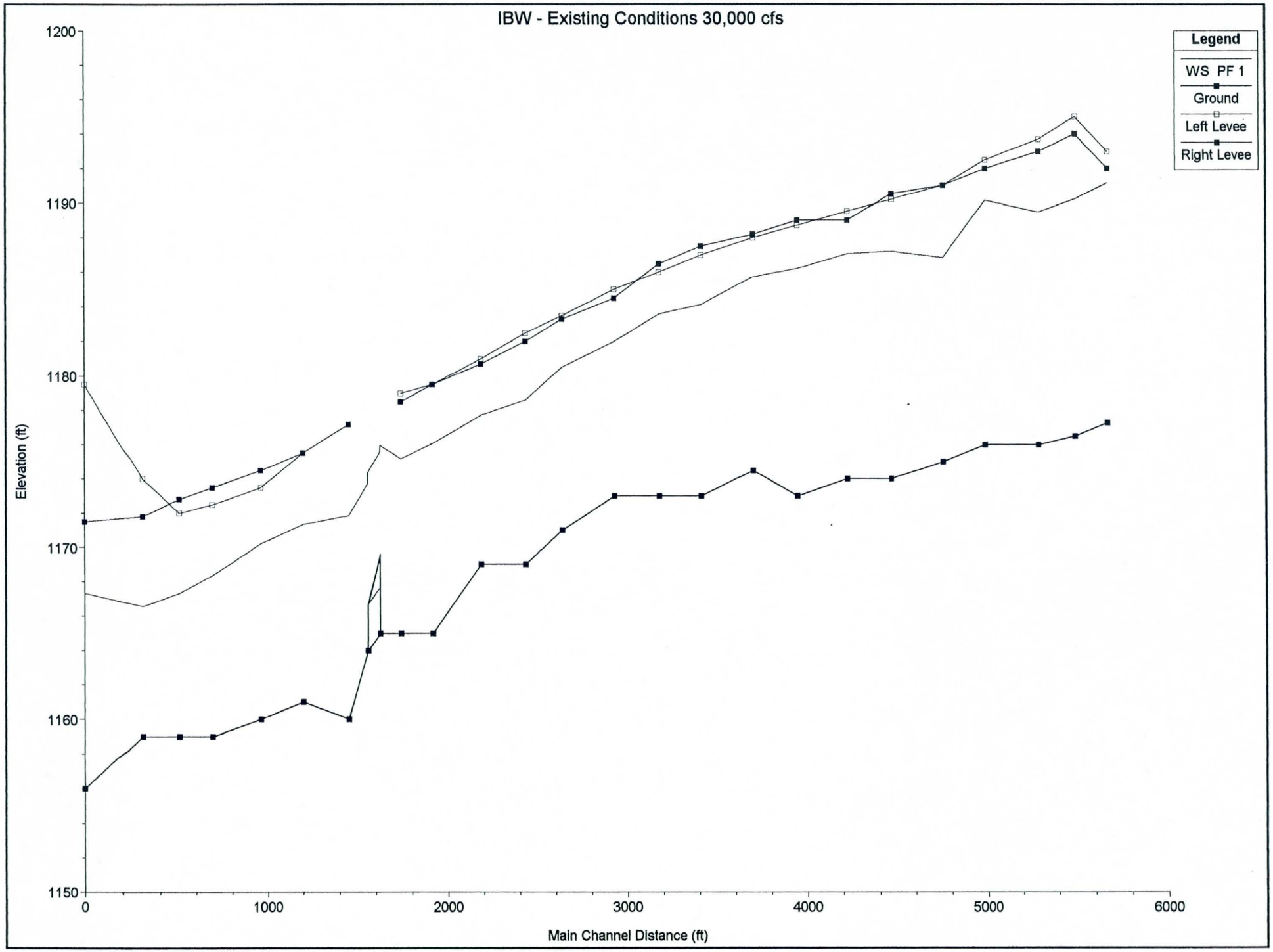
SUMMARY OF MANNING'S N VALUES

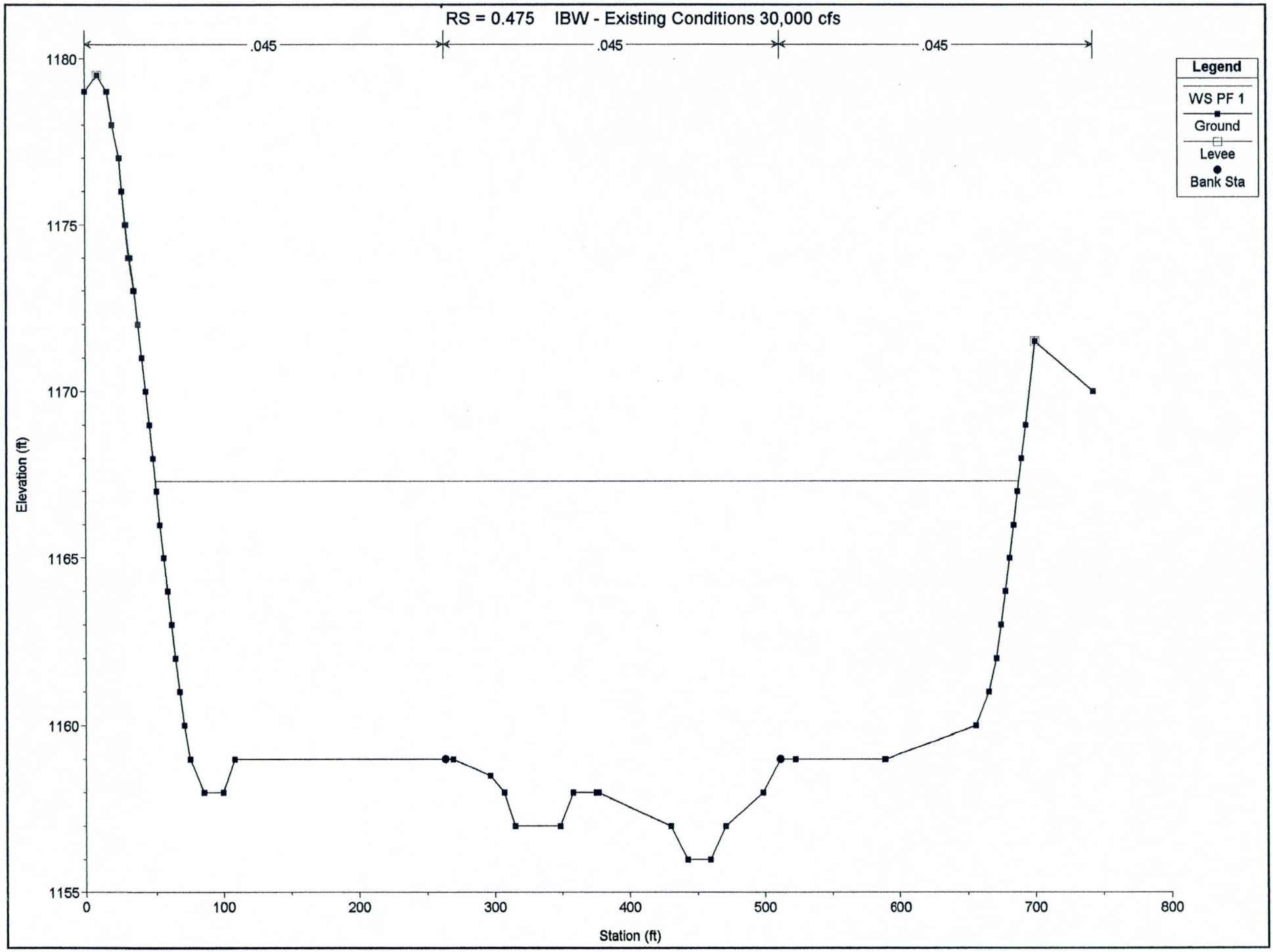
River:Reach #1

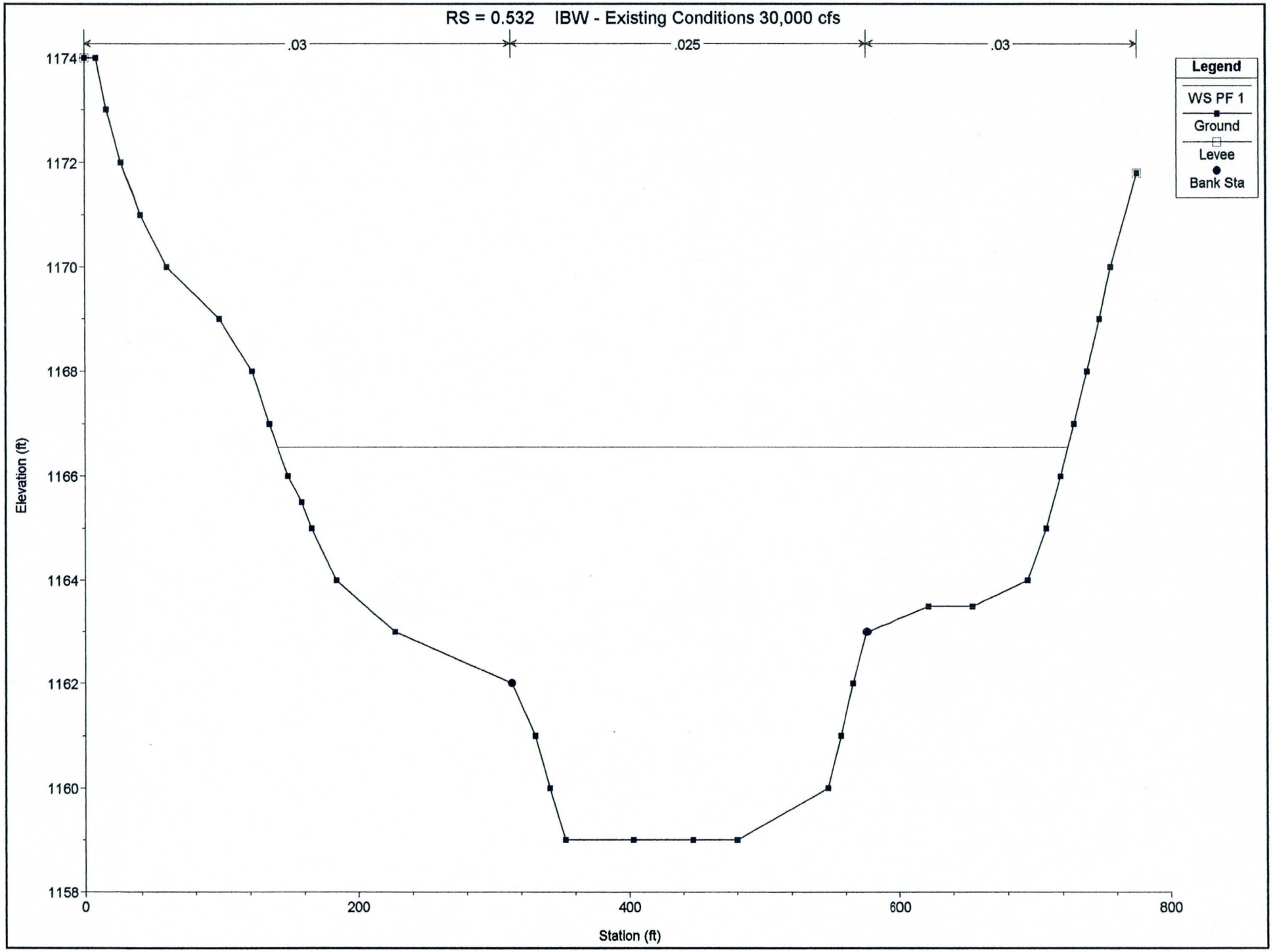
Reach	River Sta.	n1	n2	n3
Reach #1	1.554	.02	.02	.02
Reach #1	1.515	.035	.03	.035
Reach #1	1.478	.035	.03	.035
Reach #1	1.42	.035	.03	.035
Reach #1	1.381	.035	.03	.035
Reach #1	1.326	.035	.03	.035
Reach #1	1.283	.035	.03	.035
Reach #1	1.231	.035	.03	.035
Reach #1	1.19	.035	.03	.035
Reach #1	1.136	.035	.03	.035
Reach #1	1.087	.035	.03	.035
Reach #1	1.04	.035	.03	.035
Reach #1	0.987	.035	.03	.035
Reach #1	0.947	.035	.03	.035
Reach #1	0.903	.035	.03	.035
Reach #1	0.852	.035	.03	.035
Reach #1	0.812	.035	.03	.035
Reach #1	0.791	.02	.02	.02
Reach #1	0.790	Bridge		
Reach #1	0.776	.02	.02	.02
Reach #1	0.758	.035	.025	.035
Reach #1	0.707	.035	.025	.035
Reach #1	0.663	.03	.025	.03
Reach #1	0.614	.03	.025	.03
Reach #1	0.568	.03	.025	.03
Reach #1	0.532	.03	.025	.03
Reach #1	0.475	.045	.045	.045

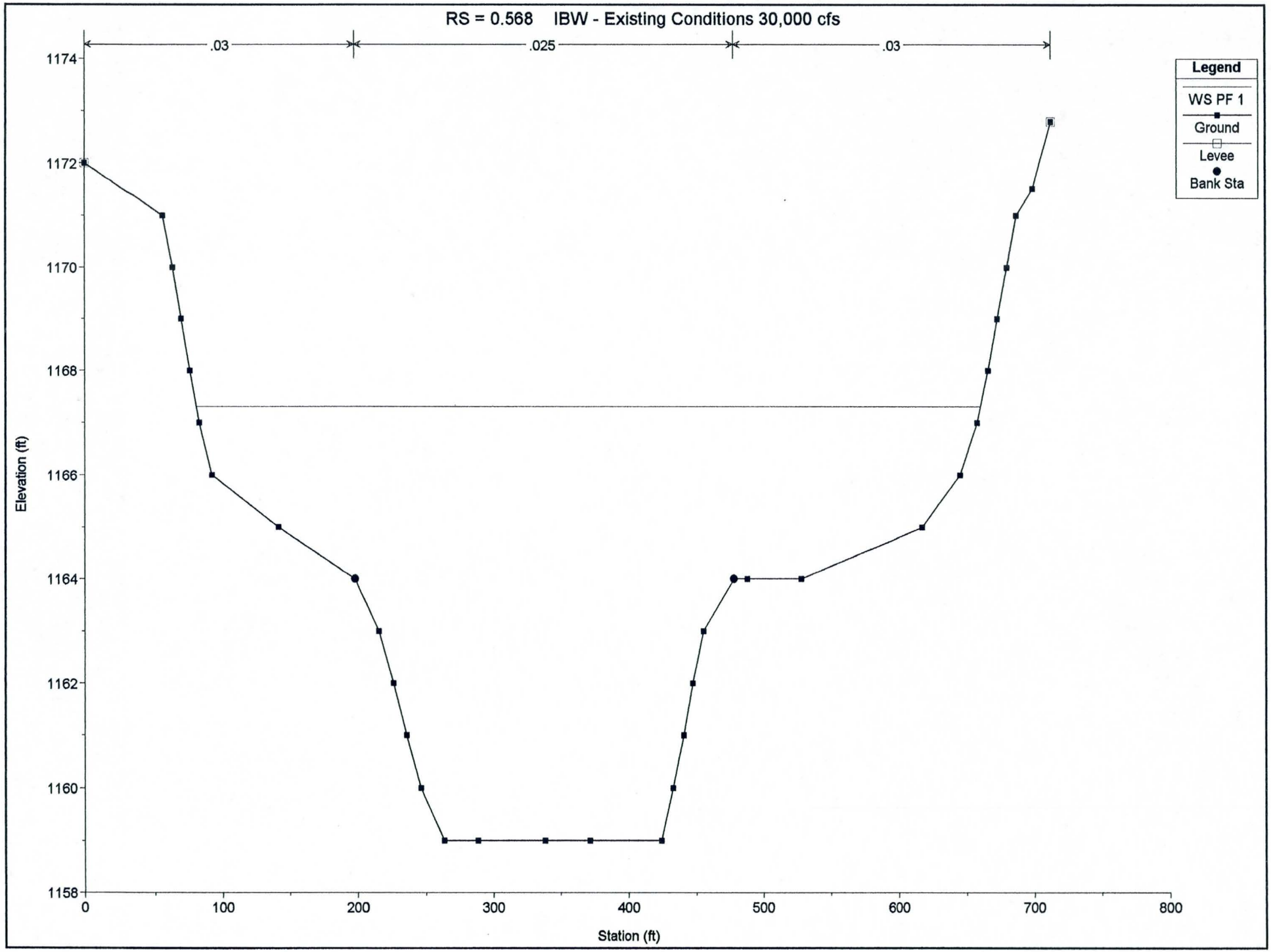
HEC-RAS Plan: levee-base River: Reach #1 Reach: Reach #1 Profile: PF 1

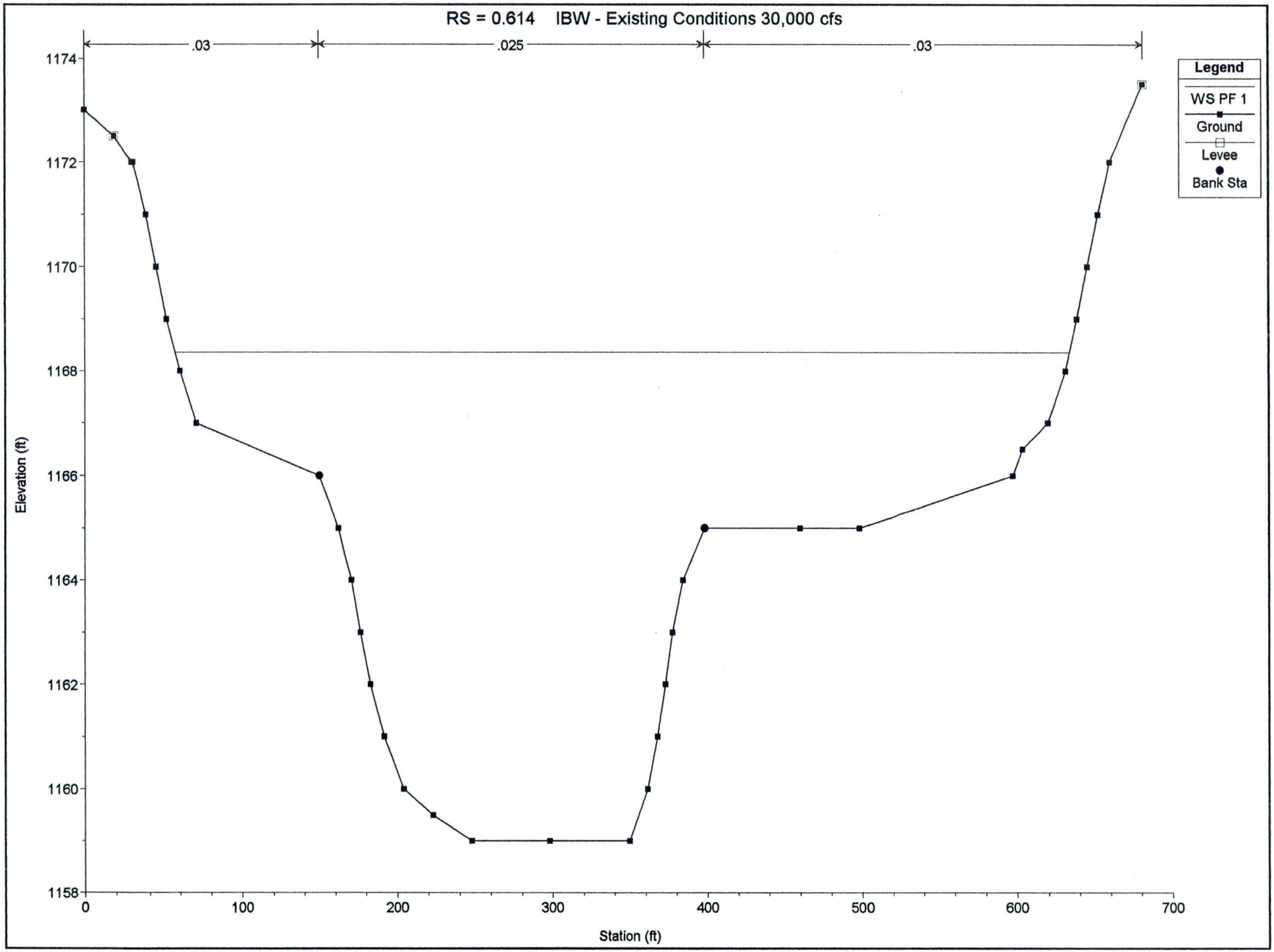
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Levee El Left	Levee El Right	L. Levee Frbrd	R. Levee Frbrd
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(ft)	(ft)	(ft)
Reach #1	1.554	30000.00	1177.29	1191.14	1191.14	1193.08	0.001363	13.04	3374.75	831.31	0.71	1193.00	1192.00	1.86	0.86
Reach #1	1.515	30000.00	1176.50	1190.22	1190.22	1192.59	0.003447	13.78	3002.34	606.57	0.75	1195.00	1194.00	4.78	3.78
Reach #1	1.478	30000.00	1176.00	1189.46	1188.72	1191.73	0.002788	12.76	2971.17	610.71	0.68	1193.70	1193.00	4.24	3.54
Reach #1	1.42	30000.00	1176.00	1190.15	1187.21	1191.08	0.001174	8.57	4425.54	611.46	0.45	1192.50	1192.00	2.35	1.85
Reach #1	1.381	30000.00	1175.00	1186.86	1186.86	1189.95	0.004464	14.30	2323.34	498.02	0.84	1191.00	1191.00	4.14	4.14
Reach #1	1.326	30000.00	1174.00	1187.23	1185.77	1188.72	0.002022	10.72	3592.50	594.81	0.58	1190.20	1190.50	2.97	3.27
Reach #1	1.283	30000.00	1174.00	1187.08	1185.05	1188.24	0.001725	9.56	3962.65	610.53	0.53	1189.50	1189.00	2.42	1.92
Reach #1	1.231	30000.00	1173.00	1186.23	1184.62	1187.64	0.001908	10.61	3694.90	593.04	0.57	1188.70	1189.00	2.47	2.77
Reach #1	1.19	30000.00	1174.50	1185.74	1184.38	1187.13	0.002266	10.56	3625.09	598.97	0.60	1188.00	1188.20	2.26	2.46
Reach #1	1.136	30000.00	1173.00	1184.14	1183.74	1186.14	0.003496	12.63	3089.24	589.19	0.74	1187.00	1187.50	2.86	3.36
Reach #1	1.087	30000.00	1173.00	1183.60	1182.90	1185.36	0.003084	12.04	3283.97	595.82	0.70	1186.00	1186.50	2.40	2.90
Reach #1	1.04	30000.00	1173.00	1182.01	1182.01	1184.24	0.005119	13.77	2860.54	597.04	0.88	1185.00	1184.50	2.99	2.49
Reach #1	0.987	30000.00	1171.00	1180.49	1179.37	1181.96	0.002925	10.93	3426.52	591.66	0.67	1183.50	1183.30	3.01	2.81
Reach #1	0.947	30000.00	1169.00	1178.60	1178.60	1180.95	0.004584	13.57	2826.71	576.30	0.84	1182.50	1182.00	3.90	3.40
Reach #1	0.903	30000.00	1169.00	1177.72	1177.25	1179.57	0.004294	12.56	3065.29	587.82	0.80	1181.00	1180.70	3.28	2.98
Reach #1	0.852	30000.00	1165.00	1176.07	1176.07	1178.36	0.003815	14.03	3006.28	584.07	0.79	1179.50	1179.50	3.43	3.43
Reach #1	0.812	30000.00	1165.00	1175.17	1175.17	1177.55	0.004462	13.75	2841.01	576.19	0.83	1179.00	1178.50	3.83	3.33
Reach #1	0.791	30000.00	1165.00	1175.96	1173.52	1176.72	0.000540	7.65	4721.71	814.12	0.44				
Reach #1	0.790	Bridge													
Reach #1	0.776	30000.00	1164.00	1173.76	1173.76	1175.88	0.002326	12.42	2845.42	725.48	0.85				
Reach #1	0.758	30000.00	1160.00	1171.85	1171.78	1174.60	0.002700	13.85	2689.23	564.39	0.79	1177.20	1177.20	5.35	5.35
Reach #1	0.707	30000.00	1161.00	1171.36	1171.36	1173.88	0.002960	13.94	2905.97	576.59	0.82	1175.50	1175.50	4.15	4.15
Reach #1	0.663	30000.00	1160.00	1170.23	1170.23	1172.56	0.003023	13.50	2872.26	584.92	0.82	1173.50	1174.50	3.27	4.27
Reach #1	0.614	30000.00	1159.00	1168.36	1168.36	1170.74	0.003219	13.23	2760.78	576.78	0.84	1172.50	1173.50	4.14	5.14
Reach #1	0.568	30000.00	1159.00	1167.31	1167.31	1169.66	0.003503	13.03	2734.77	579.68	0.86	1172.00	1172.80	4.69	5.49
Reach #1	0.532	30000.00	1159.00	1166.56	1166.56	1168.88	0.003809	13.29	2755.15	583.69	0.89	1174.00	1171.80	7.45	5.25
Reach #1	0.475	30000.00	1156.00	1167.30	1162.84	1167.78	0.001591	6.01	5432.09	637.69	0.34	1179.50	1171.50	12.20	4.20

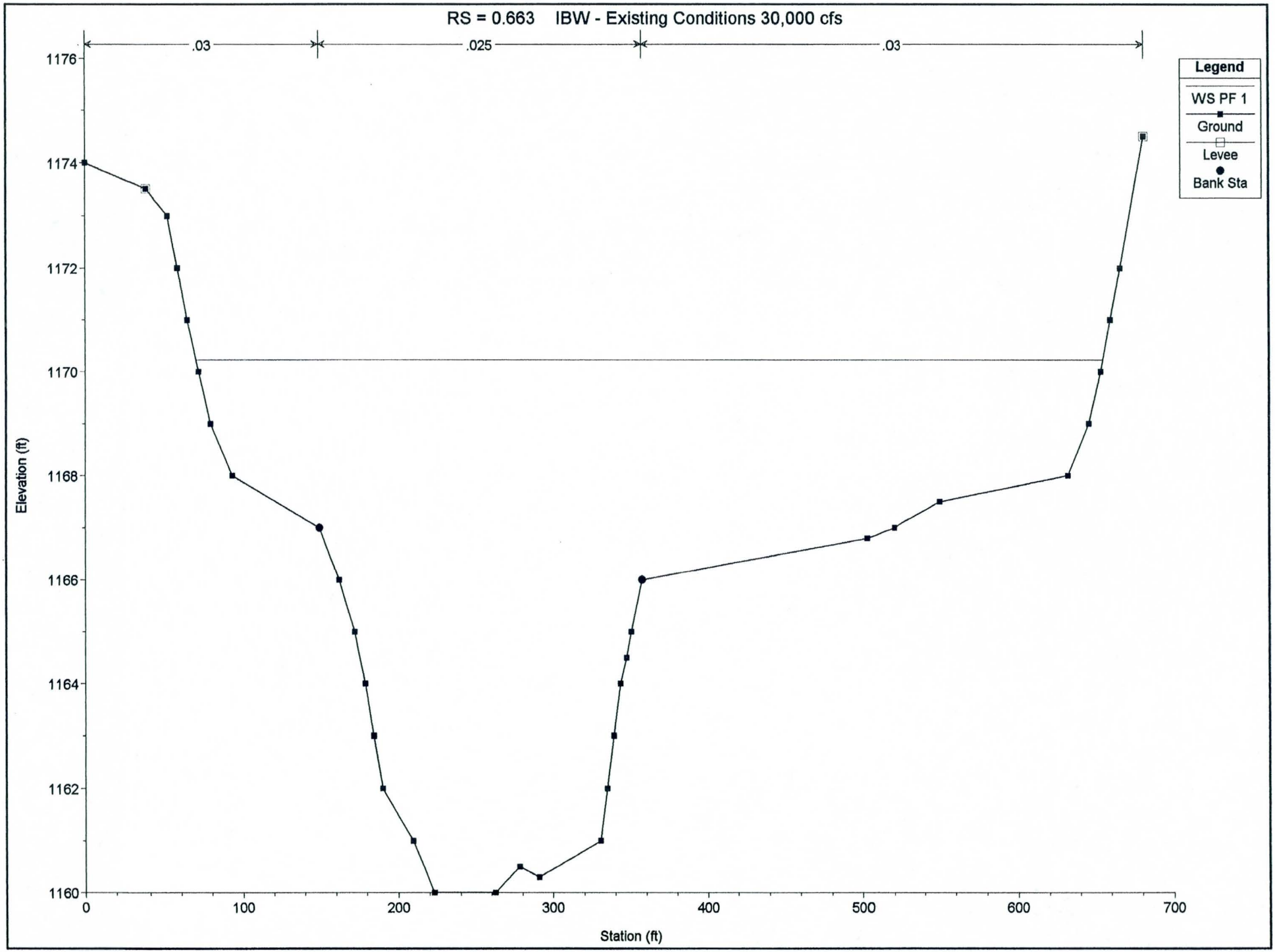

IBW - Existing Conditions 30,000 cfs
Legend
WS PF 1
Ground
Left Levee
Right Levee
Elevation (ft)
1200
1190
1180
1170
1160
1150
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)

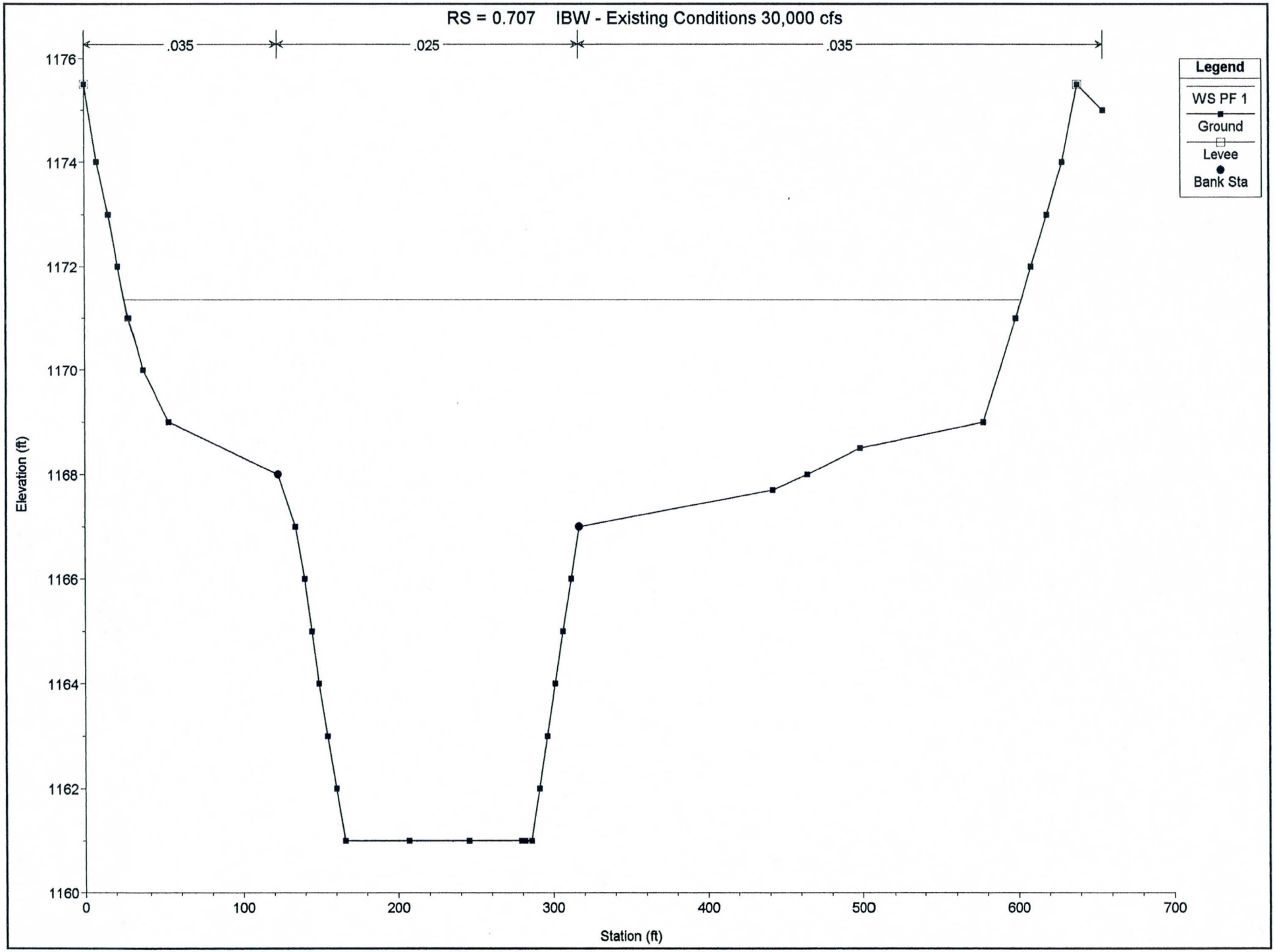

RS = 0.475 IBW - Existing Conditions 30,000 cfs
.045
.045
.045
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1180
1175
1170
1165
1160
1155
Station (ft)
0
100
200
300
400
500
600
700
800

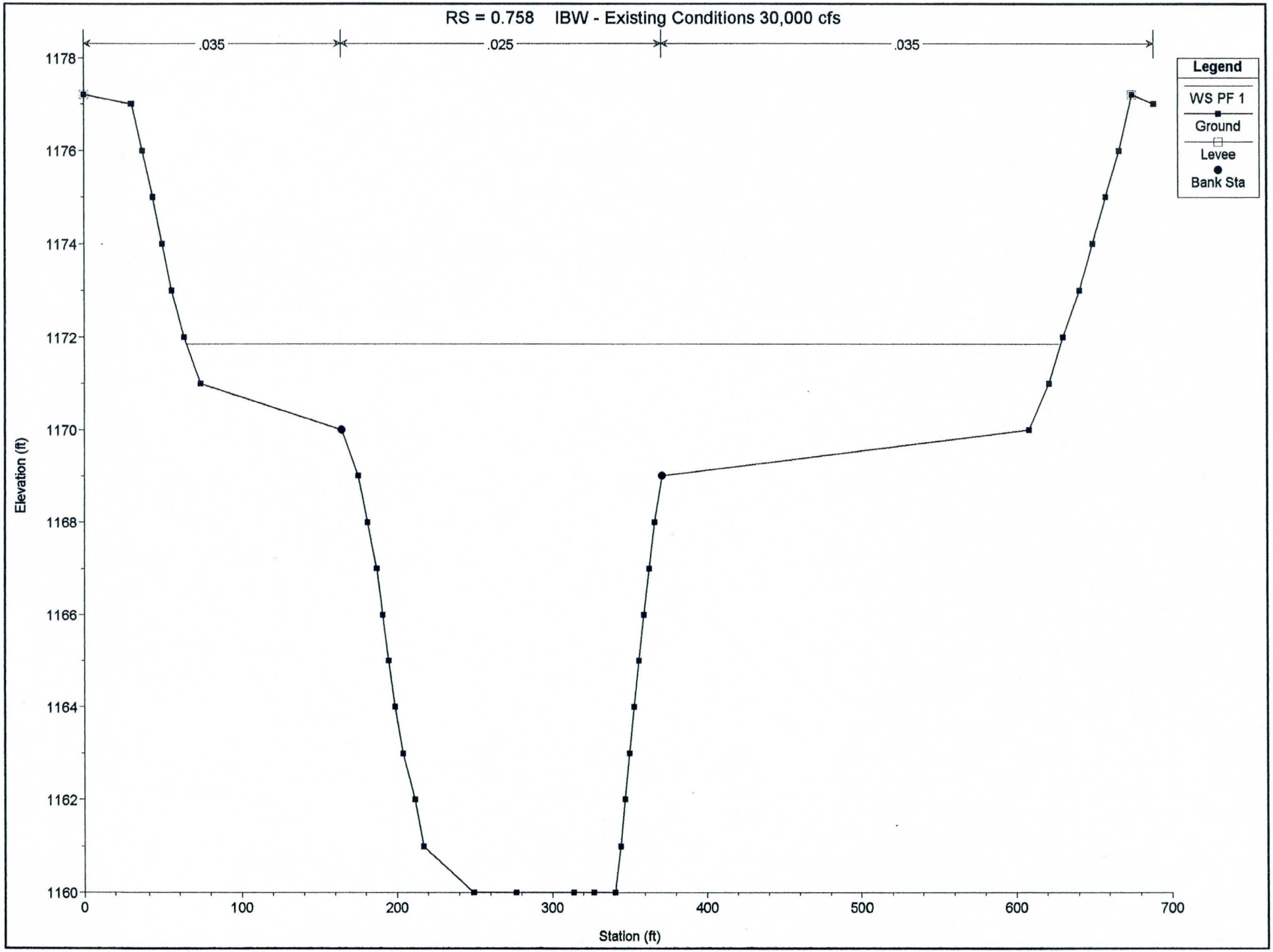

RS = 0.532 IBW - Existing Conditions 30,000 cfs
.03
.025
.03
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1174
1172
1170
1168
1166
1164
1162
1160
1158
0
200
400
600
800
Station (ft)

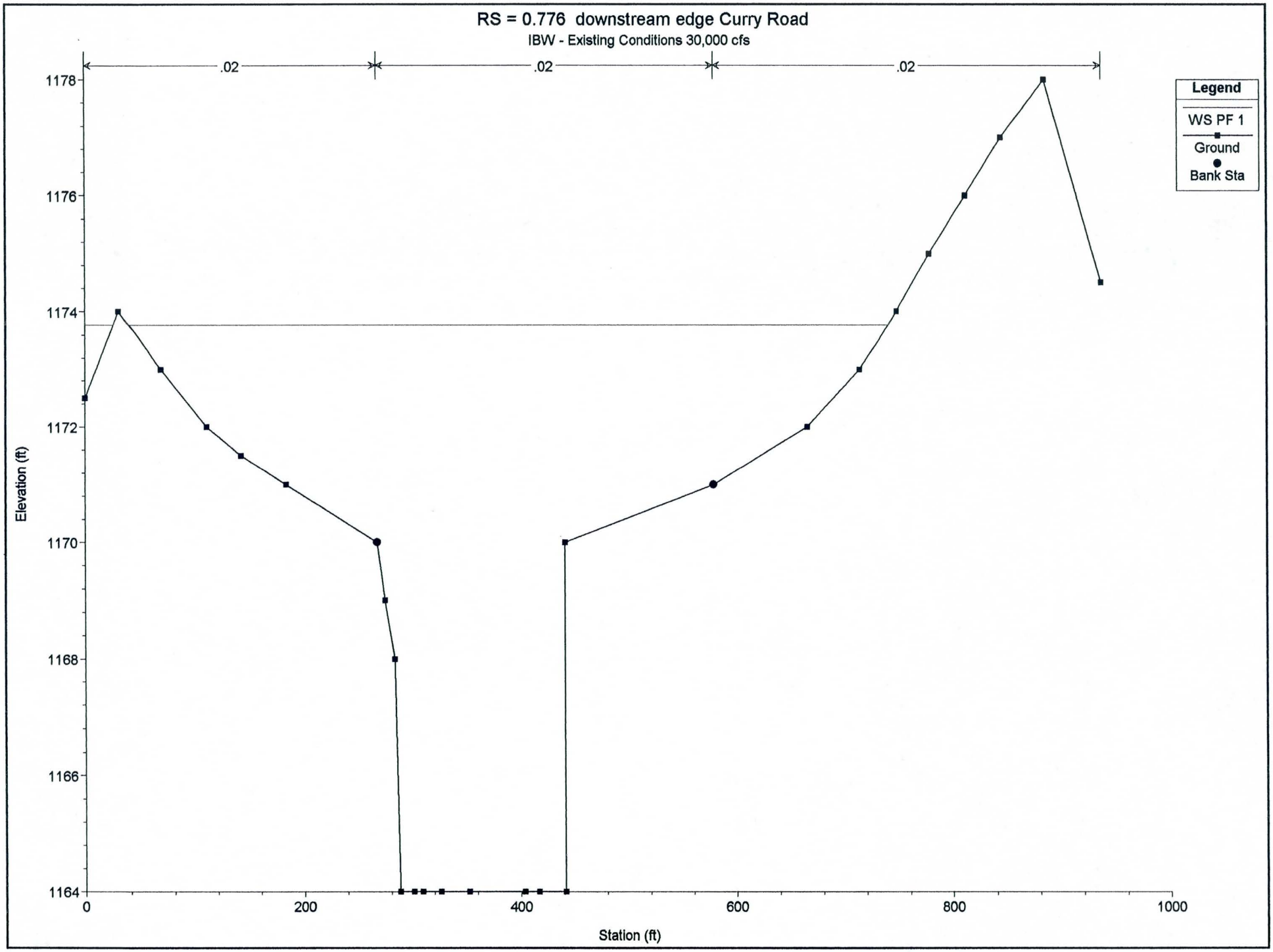

RS = 0.568 IBW - Existing Conditions 30,000 cfs
.03
.025
.03
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1174
1172
1170
1168
1166
1164
1162
1160
1158
0
100
200
300
400
500
600
700
800
Station (ft)

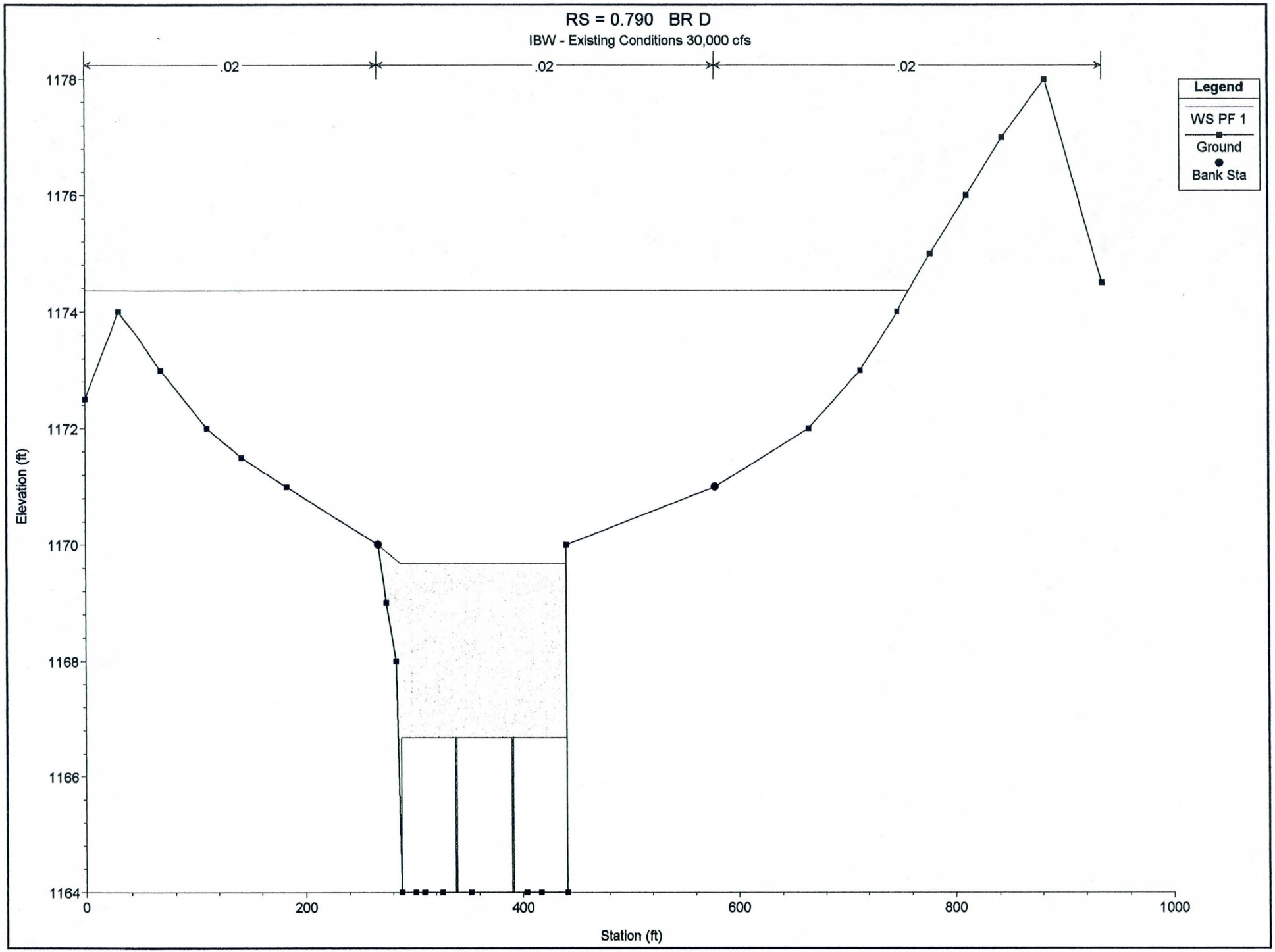

RS = 0.614 IBW - Existing Conditions 30,000 cfs
.03
.025
.03
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1174
1172
1170
1168
1166
1164
1162
1160
1158
0
100
200
300
400
500
600
700
Station (ft)

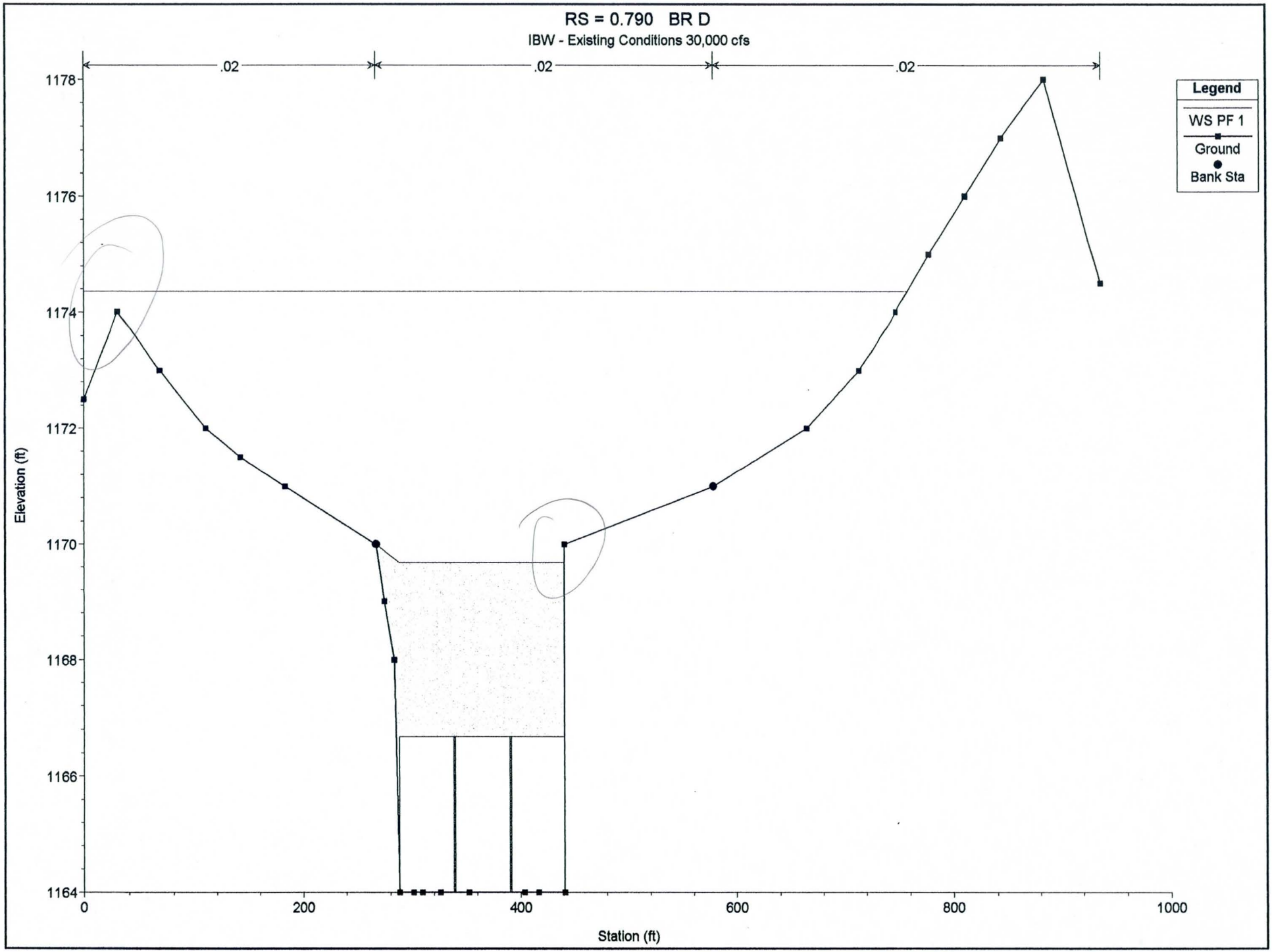

RS = 0.663 IBW - Existing Conditions 30,000 cfs
.03
.025
.03
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1176
1174
1172
1170
1168
1166
1164
1162
1160
0
100
200
300
400
500
600
700
Station (ft)

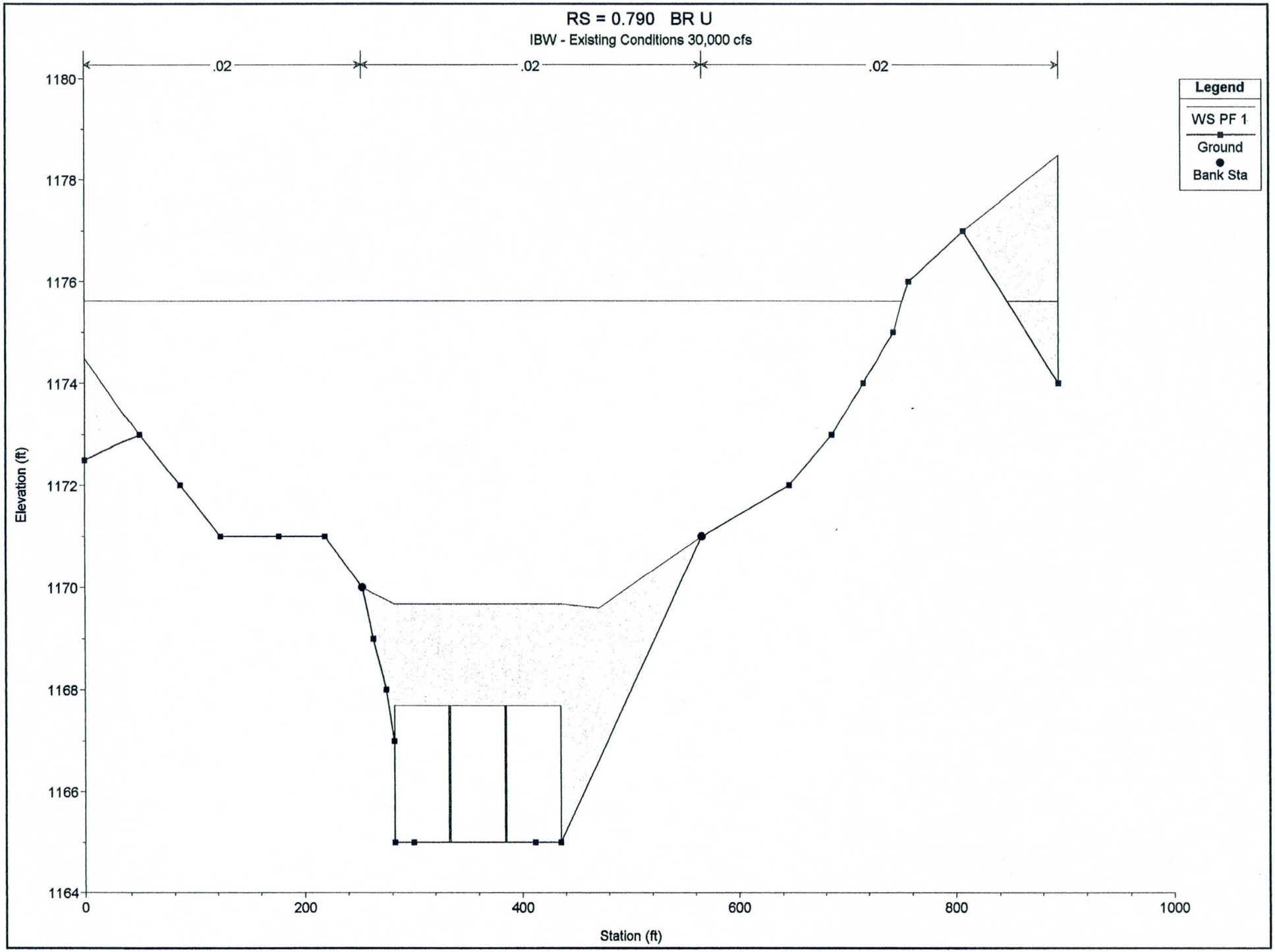

RS = 0.707 IBW - Existing Conditions 30,000 cfs
.035
.025
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1176
1174
1172
1170
1168
1166
1164
1162
1160
0
100
200
300
400
500
600
700
Station (ft)

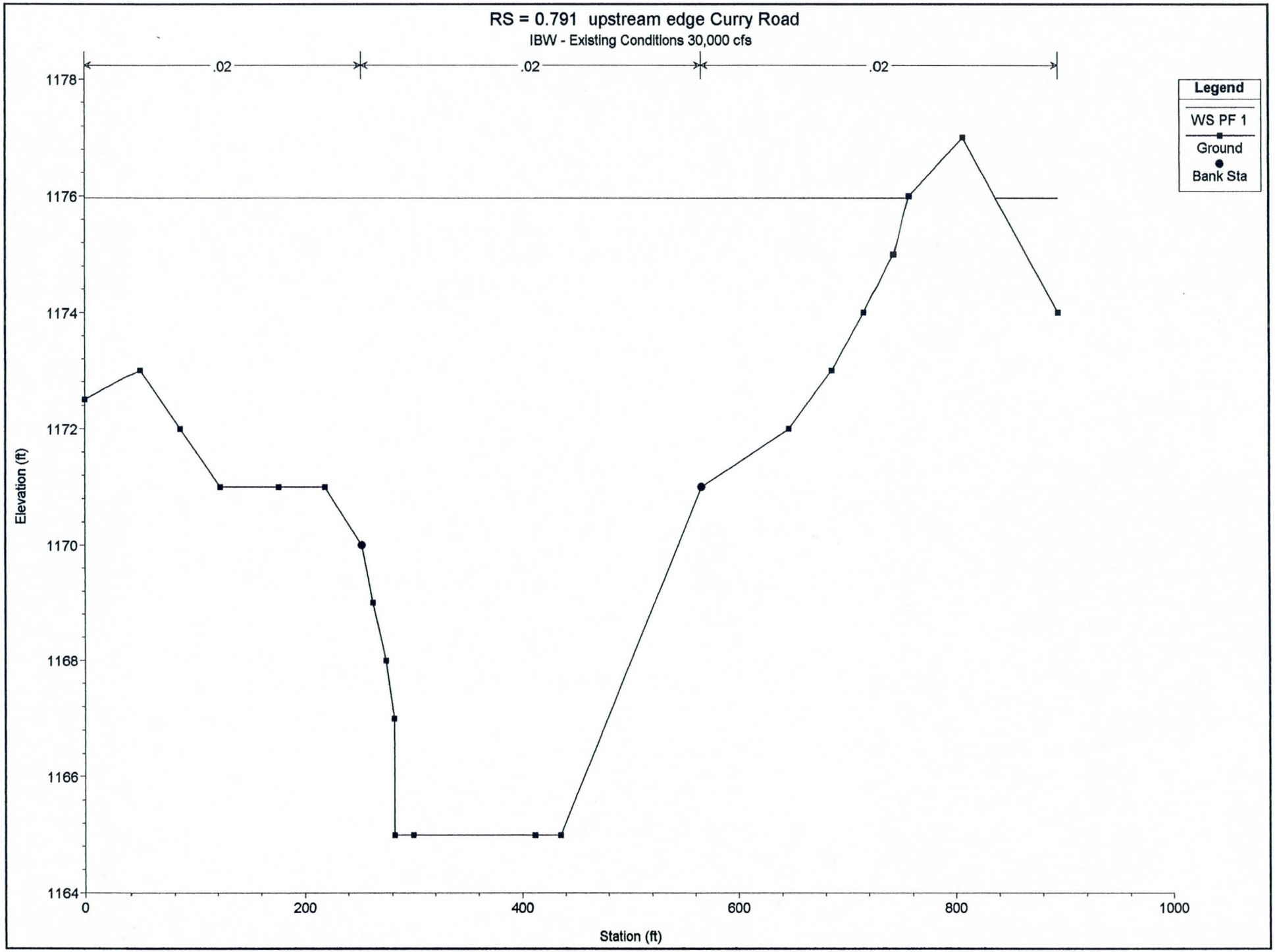

RS = 0.758 IBW - Existing Conditions 30,000 cfs
.035
.025
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1178
1176
1174
1172
1170
1168
1166
1164
1162
1160
0
100
200
300
400
500
600
700
Station (ft)

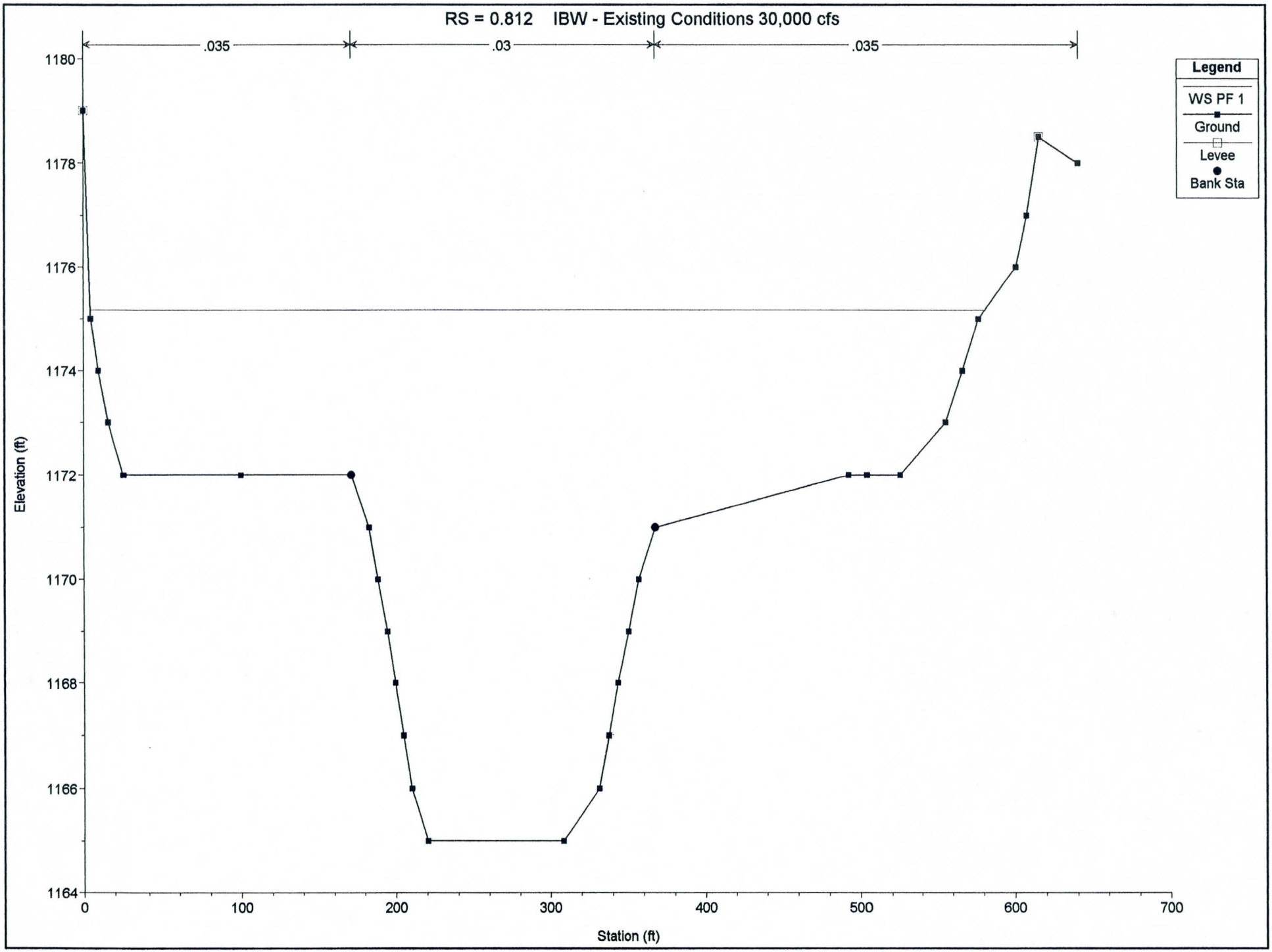

RS = 0.776 downstream edge Curry Road
IBW - Existing Conditions 30,000 cfs
.02
.02
.02
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1178
1176
1174
1172
1170
1168
1166
1164
0
200
400
600
800
1000
Station (ft)

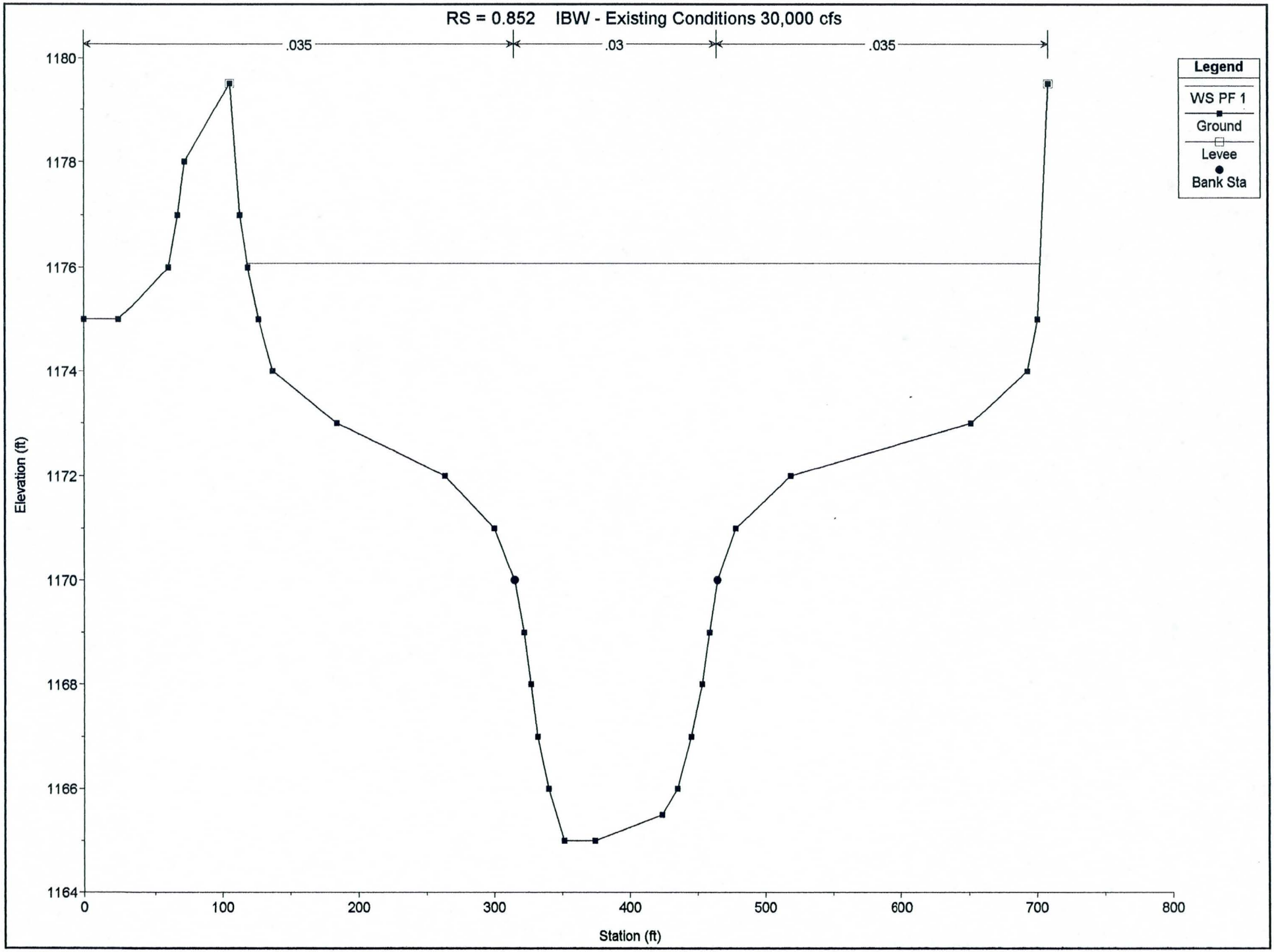

RS = 0.790 BR D
IBW - Existing Conditions 30,000 cfs
.02
.02
.02
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1178
1176
1174
1172
1170
1168
1166
1164
0
200
400
600
800
1000
Station (ft)

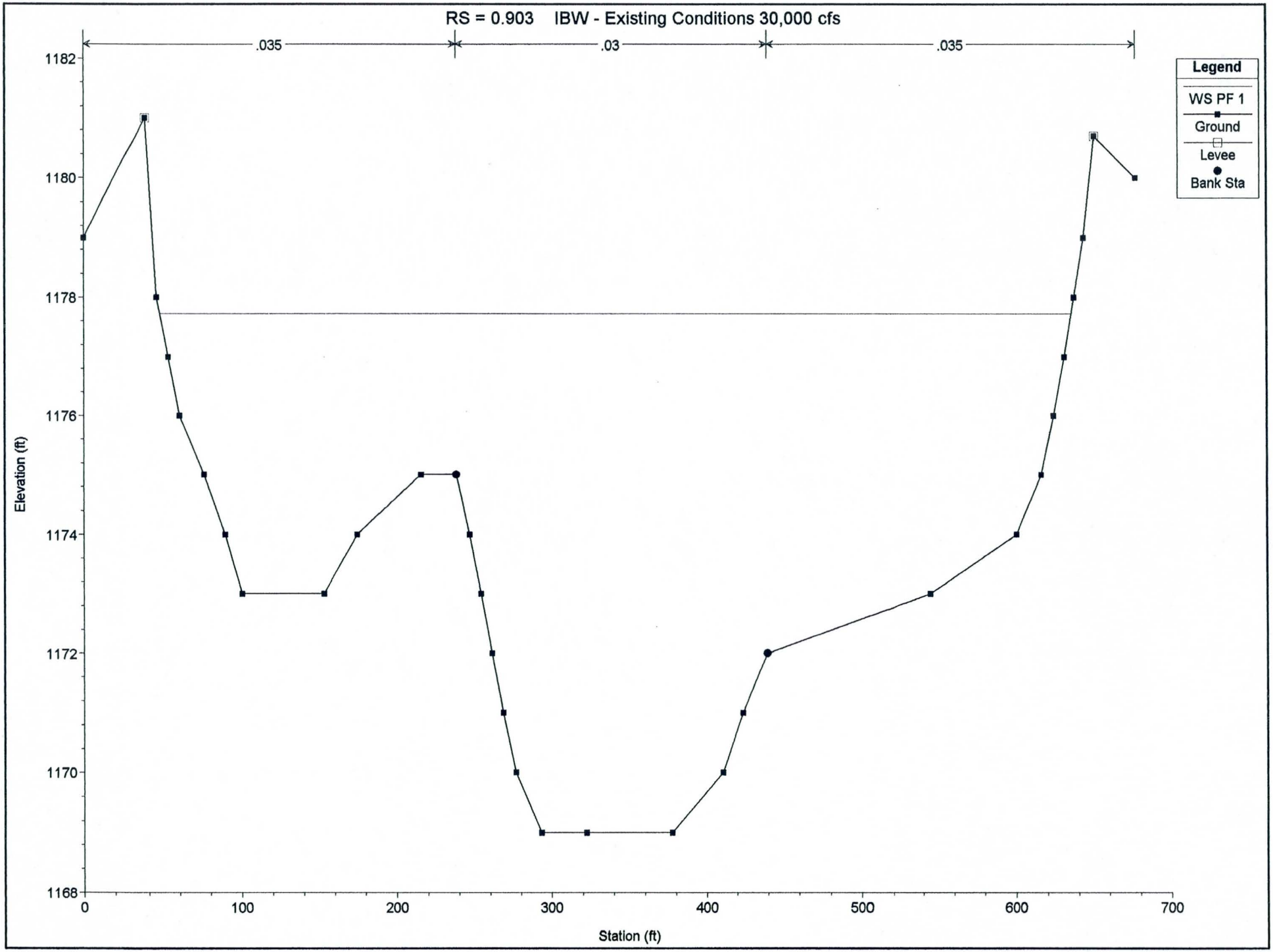

RS = 0.790 BR D
IBW - Existing Conditions 30,000 cfs
.02
.02
.02
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1178
1176
1174
1172
1170
1168
1166
1164
0
200
400
600
800
1000
Station (ft)

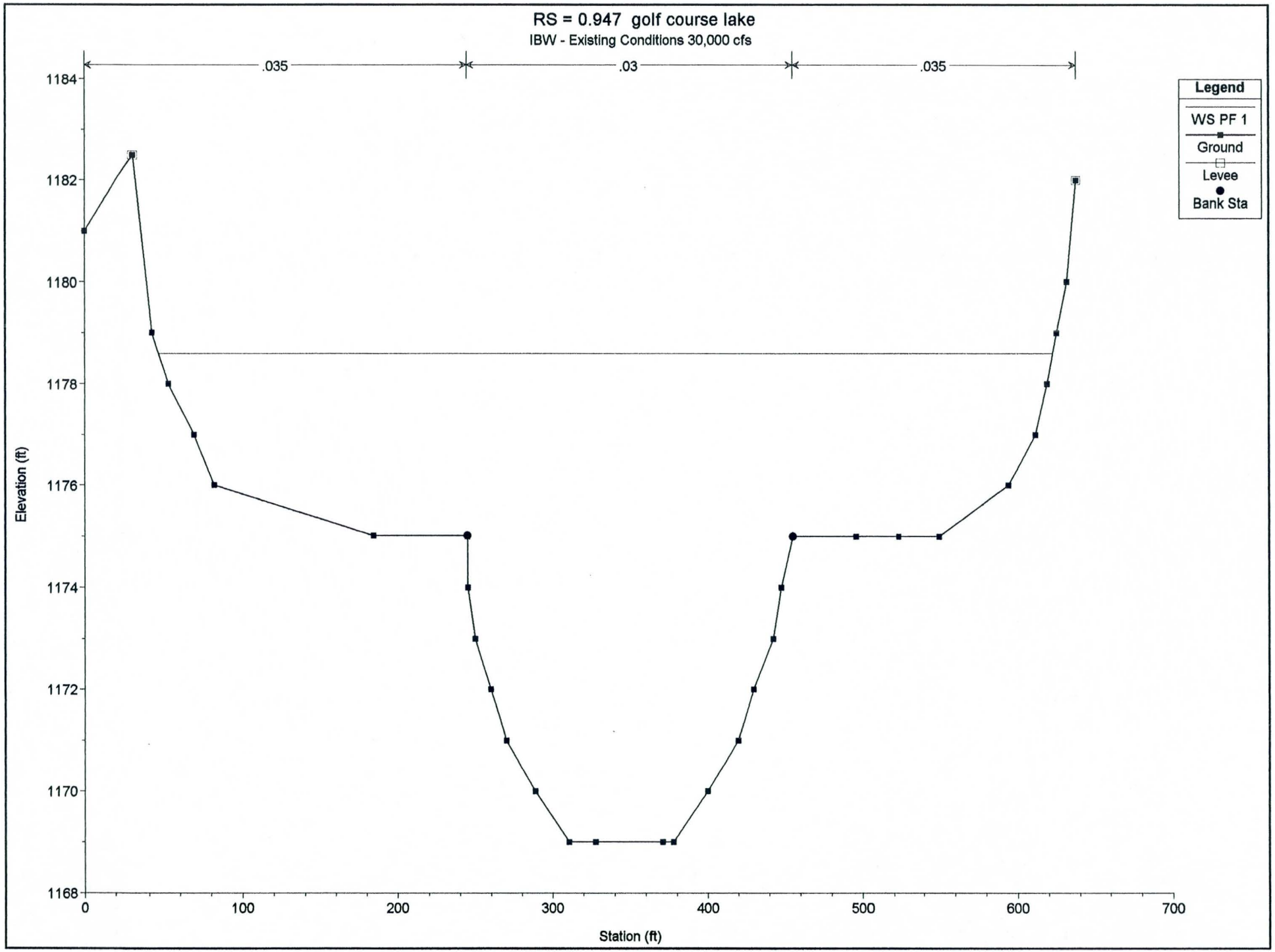

RS = 0.790 BR U
IBW - Existing Conditions 30,000 cfs
.02
.02
.02
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1180
1178
1176
1174
1172
1170
1168
1166
1164
0
200
400
600
800
1000
Station (ft)

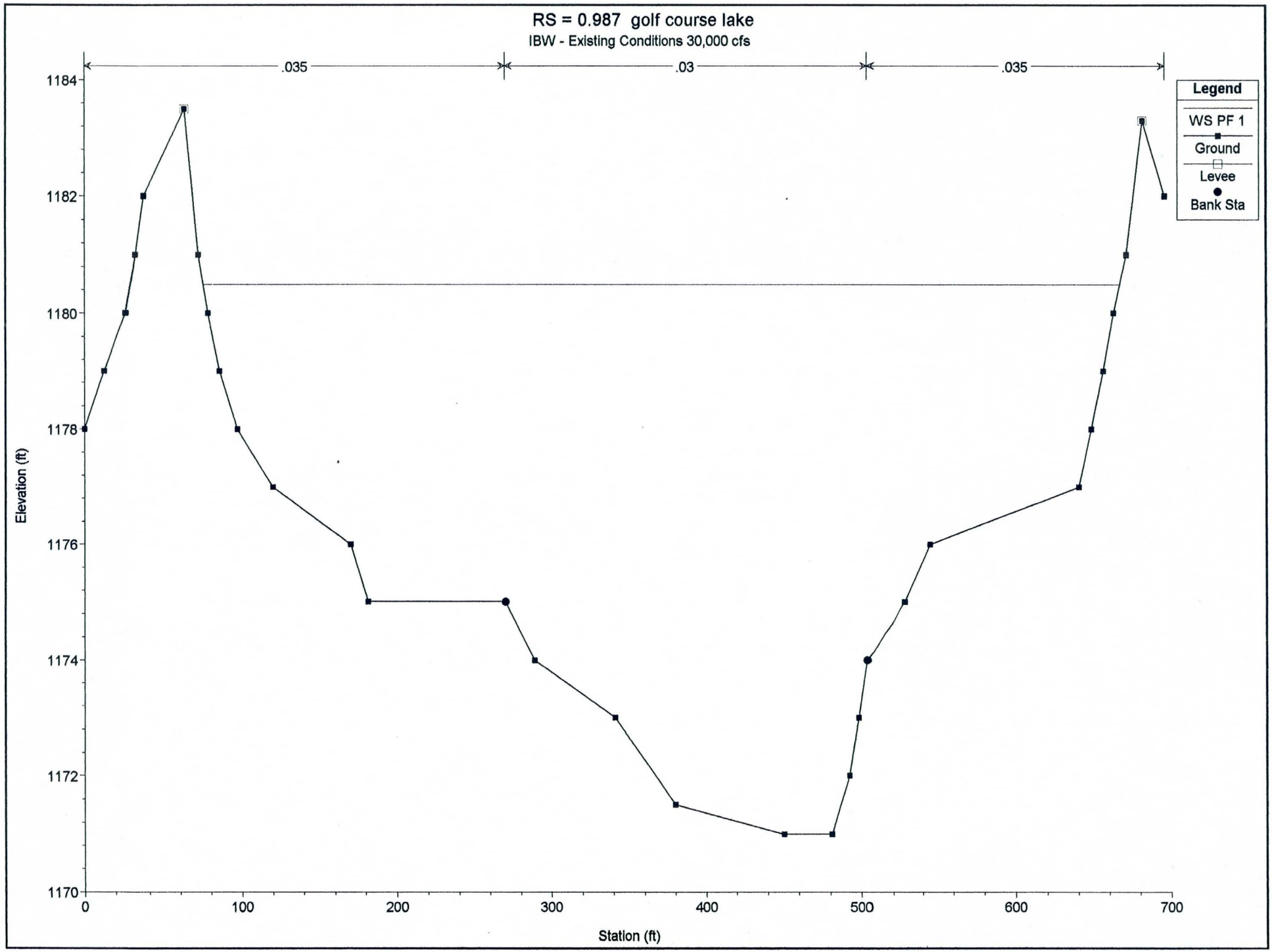

RS = 0.791 upstream edge Curry Road
IBW - Existing Conditions 30,000 cfs
.02
.02
.02
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1178
1176
1174
1172
1170
1168
1166
1164
0
200
400
600
800
1000
Station (ft)

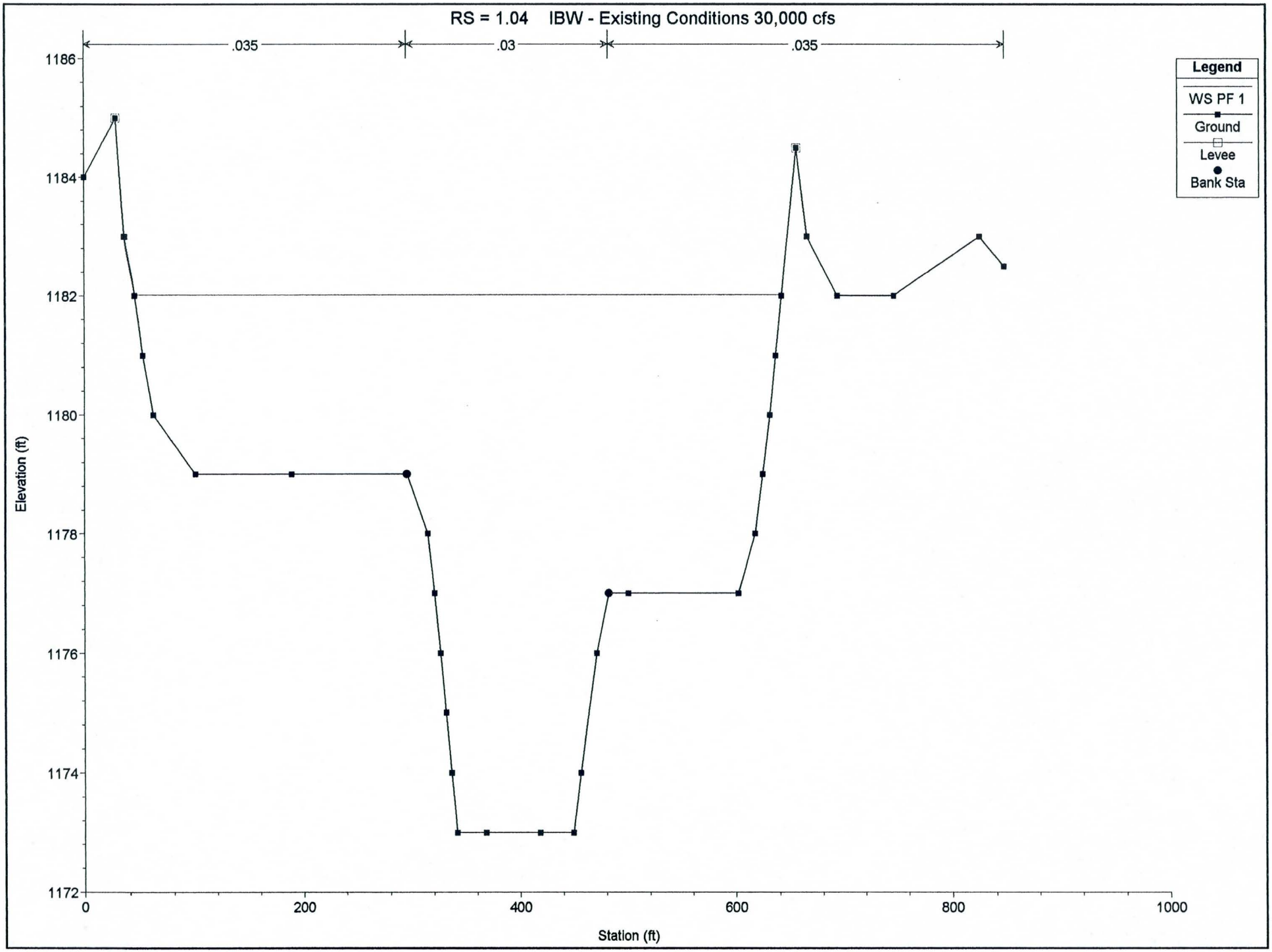

RS = 0.812 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1180
1178
1176
1174
1172
1170
1168
1166
1164
0
100
200
300
400
500
600
700
Station (ft)

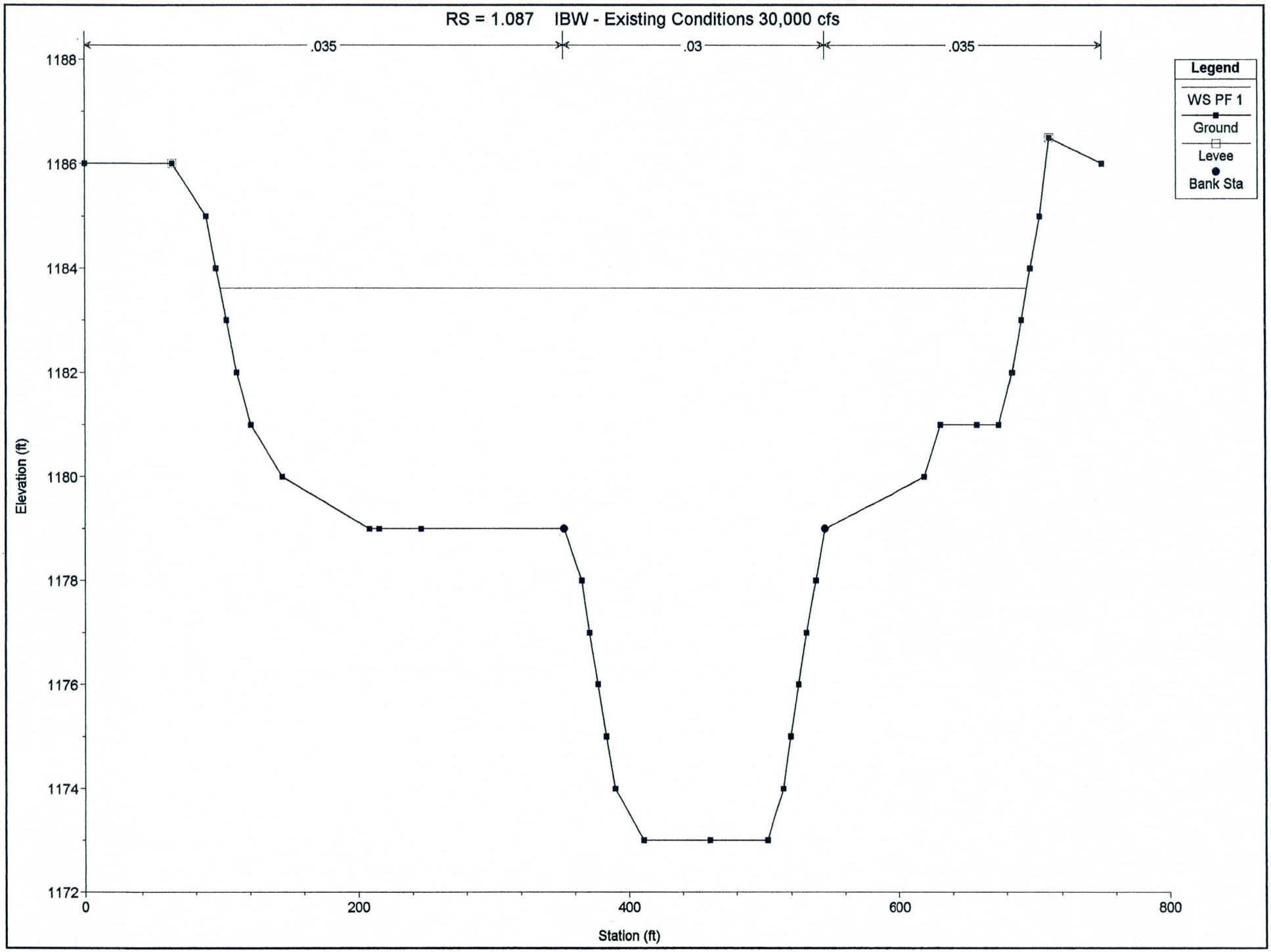

RS = 0.852 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1180
1178
1176
1174
1172
1170
1168
1166
1164
0
100
200
300
400
500
600
700
800
Station (ft)

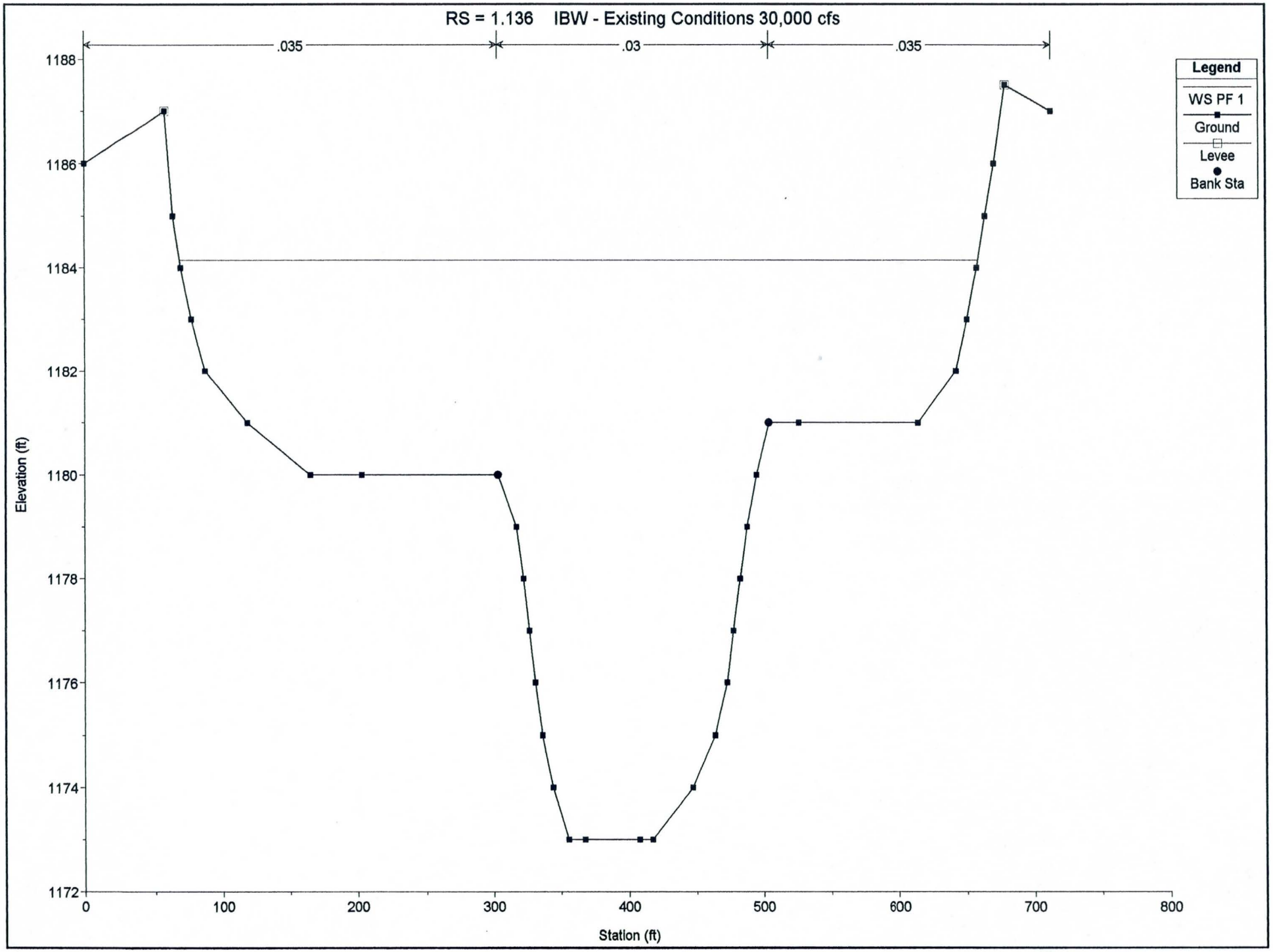

RS = 0.903 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1182
1180
1178
1176
1174
1172
1170
1168
0
100
200
300
400
500
600
700
Station (ft)

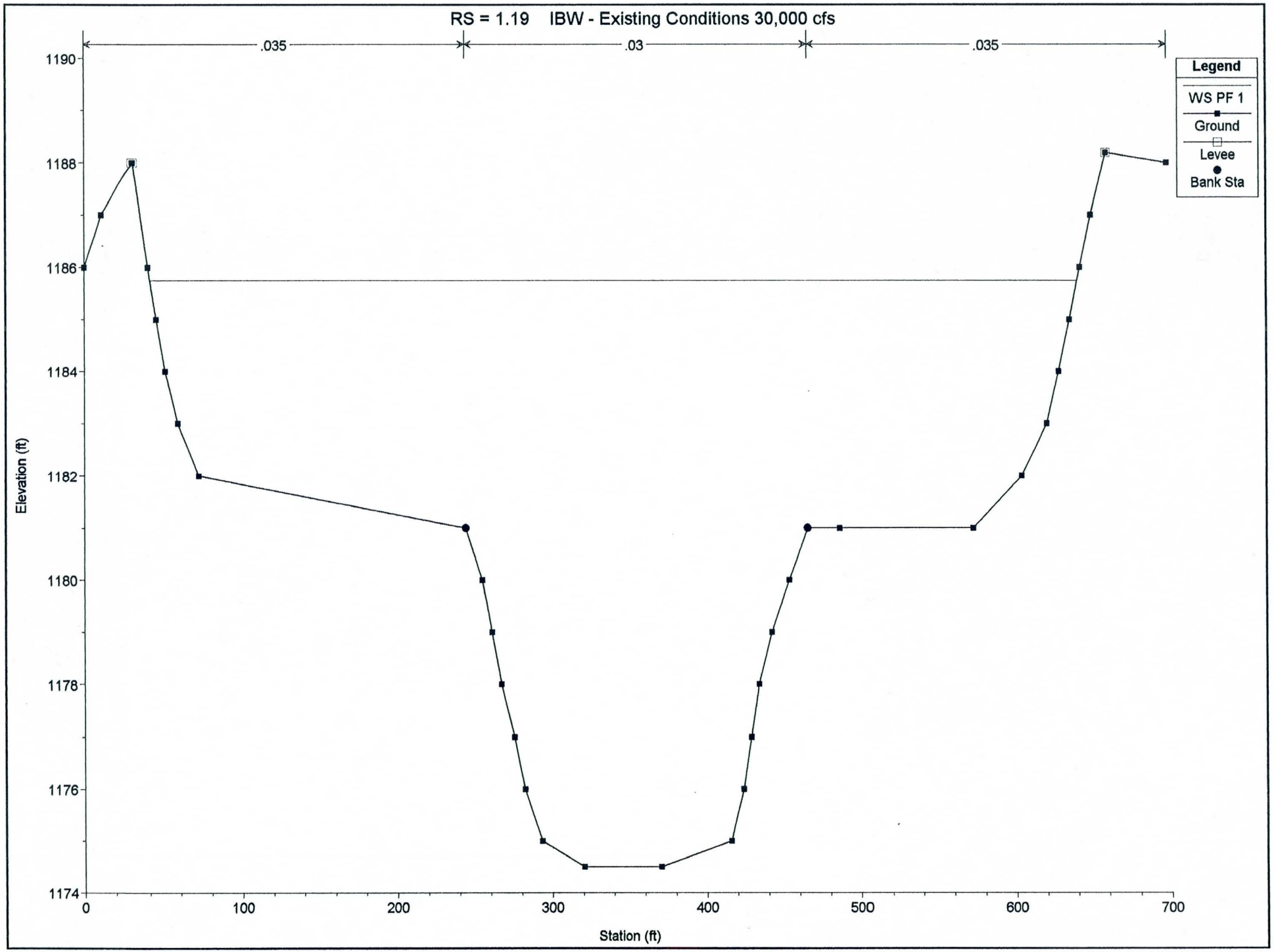

RS = 0.947 golf course lake
IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1184
1182
1180
1178
1176
1174
1172
1170
1168
0
100
200
300
400
500
600
700
Station (ft)

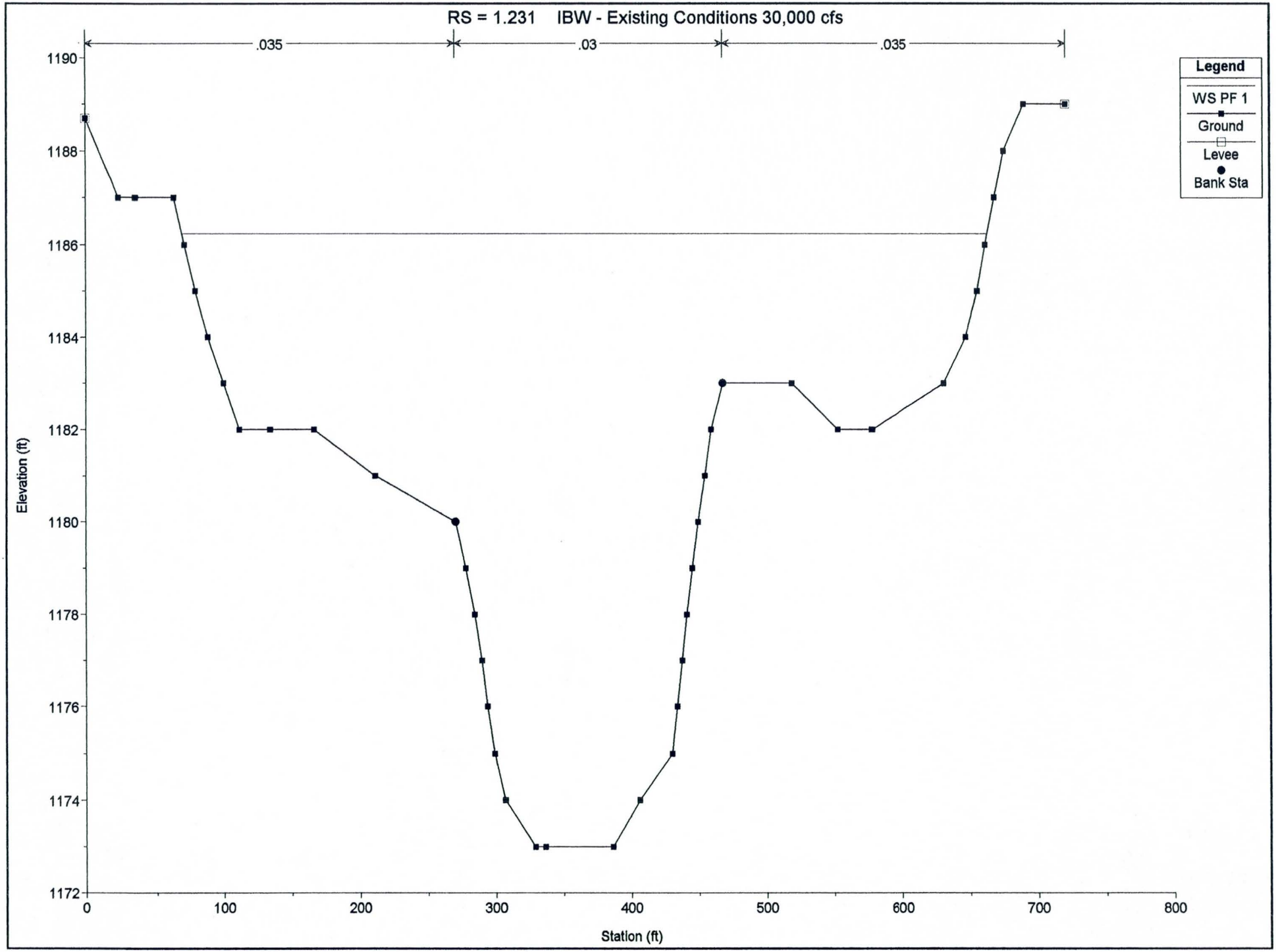

RS = 0.987 golf course lake
IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1184
1182
1180
1178
1176
1174
1172
1170
0
100
200
300
400
500
600
700
Station (ft)

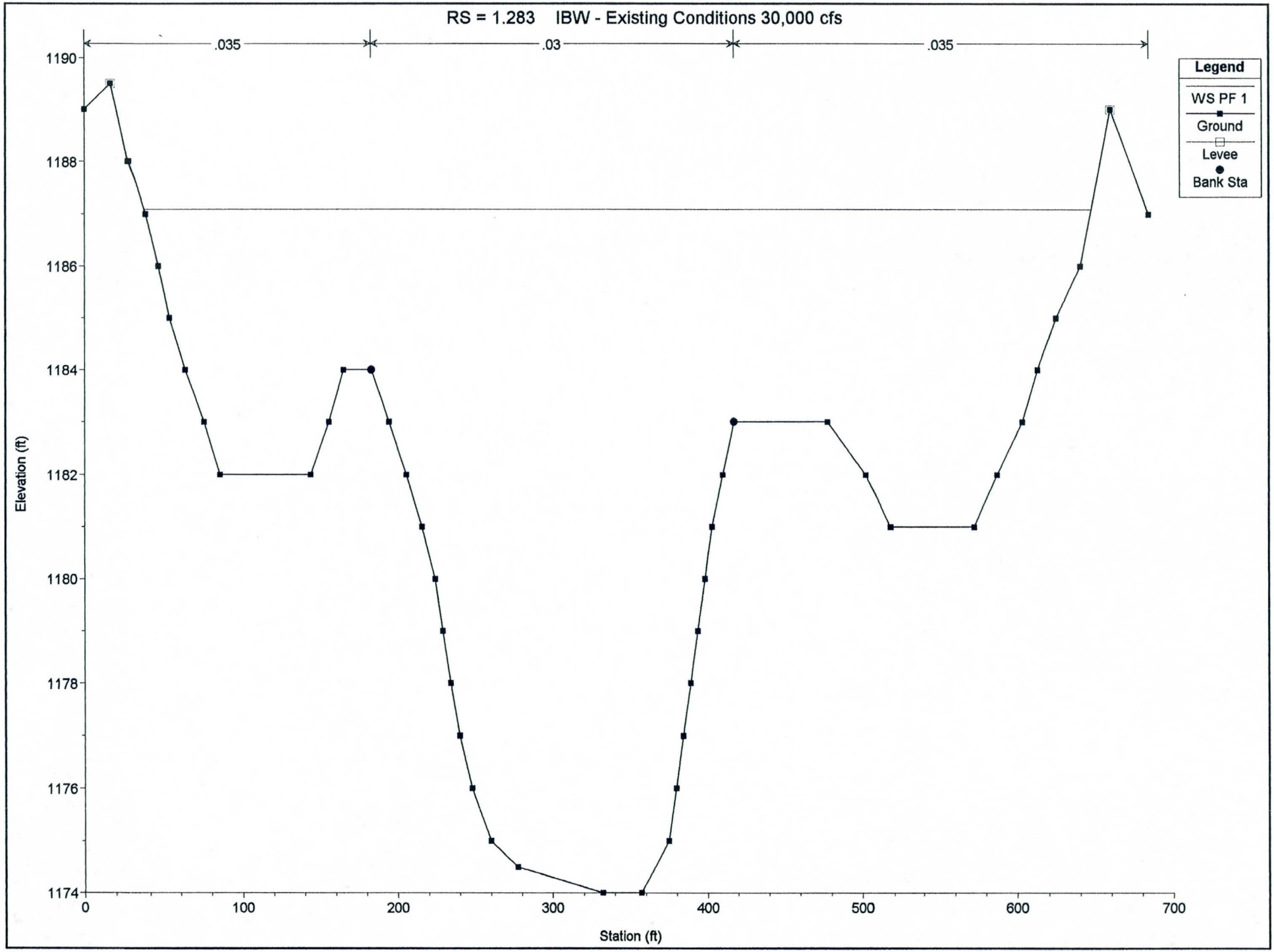

RS = 1.04 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1186
1184
1182
1180
1178
1176
1174
1172
0
200
400
600
800
1000
Station (ft)

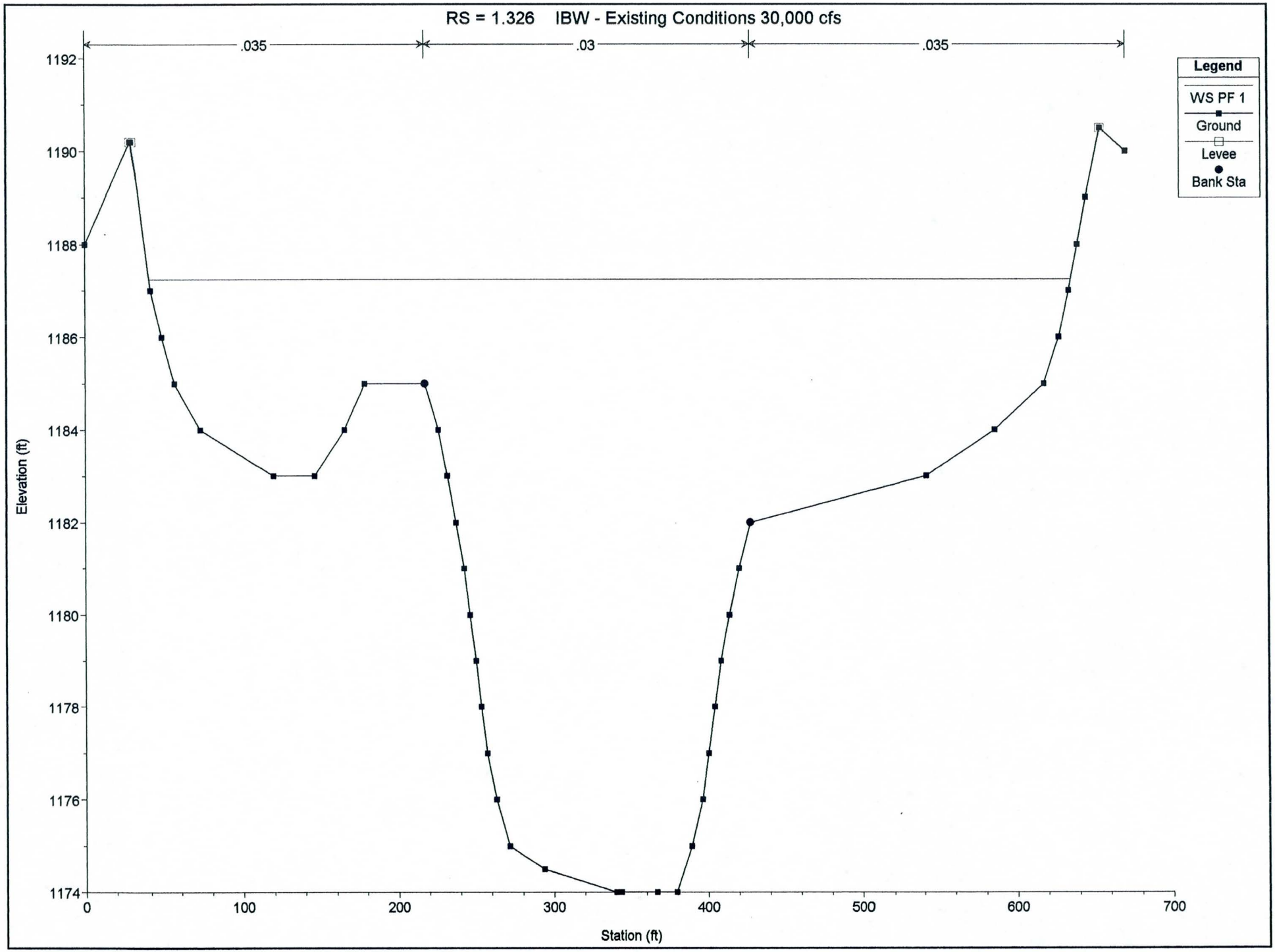

RS = 1.087 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1188
1186
1184
1182
1180
1178
1176
1174
1172
0
200
400
600
800
Station (ft)

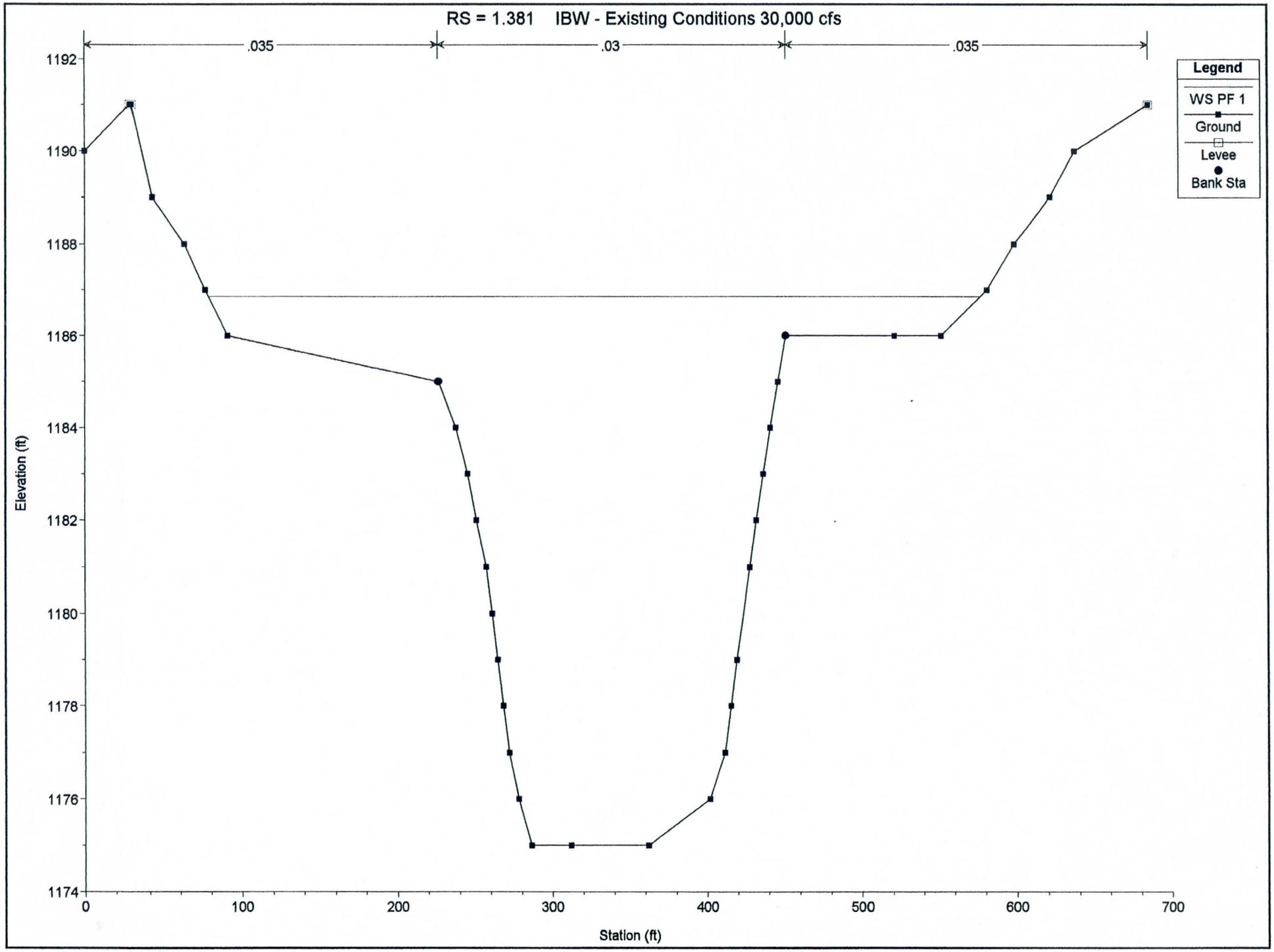

RS = 1.136 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1188
1186
1184
1182
1180
1178
1176
1174
1172
0
100
200
300
400
500
600
700
800
Station (ft)

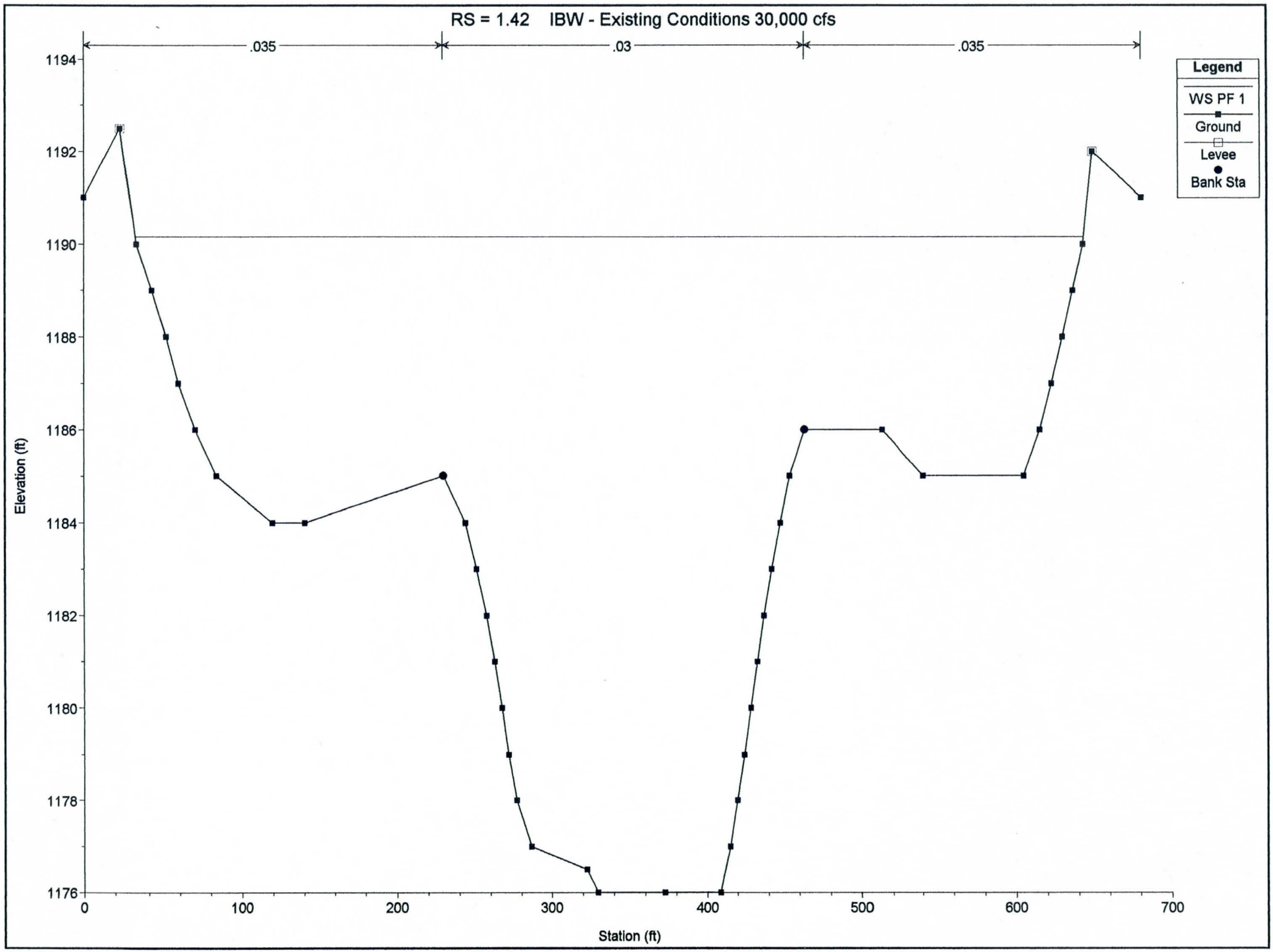

RS = 1.19 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1190
1188
1186
1184
1182
1180
1178
1176
1174
0
100
200
300
400
500
600
700
Station (ft)

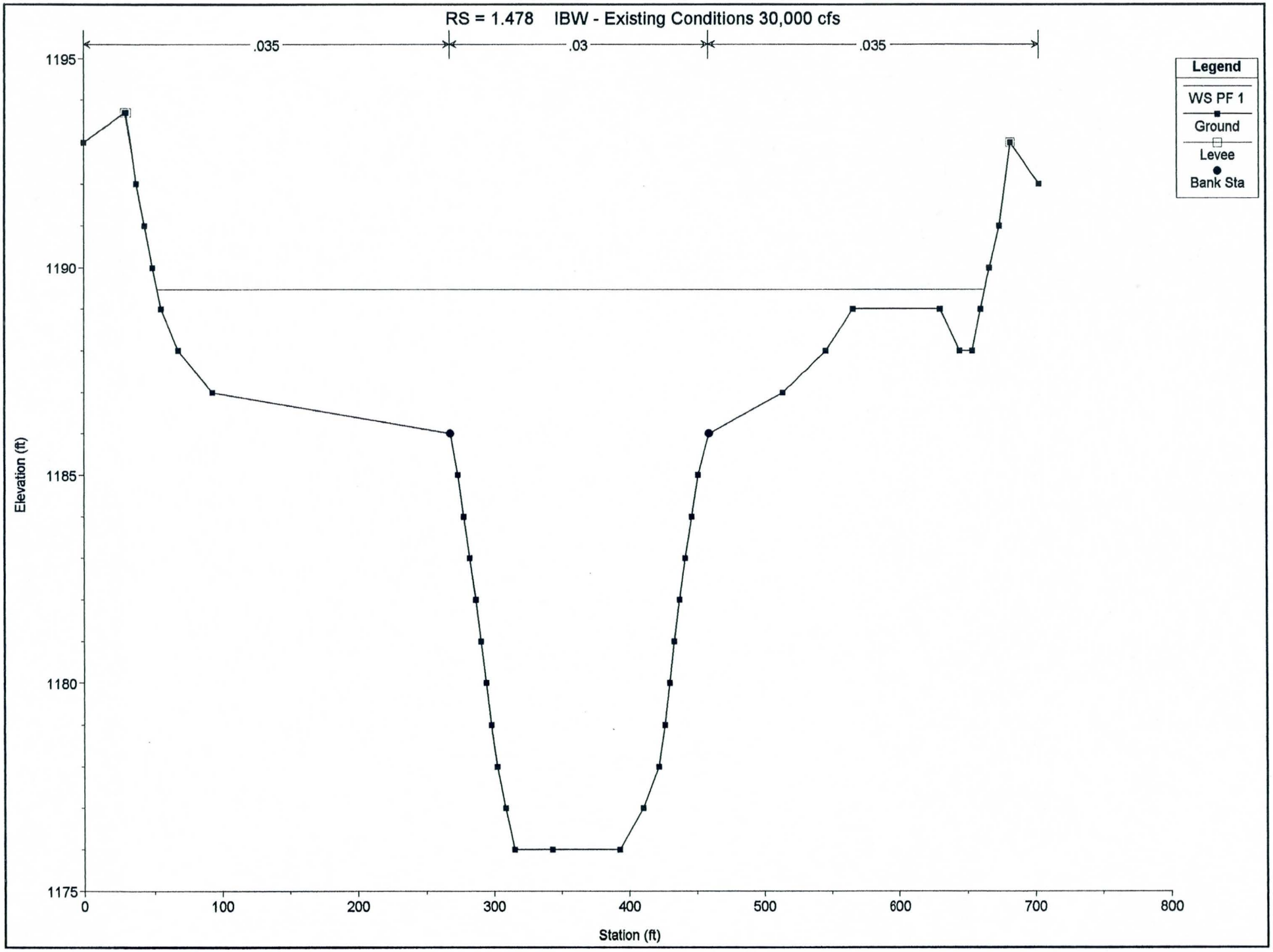

RS = 1.231 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1190
1188
1186
1184
1182
1180
1178
1176
1174
1172
0
100
200
300
400
500
600
700
800
Station (ft)

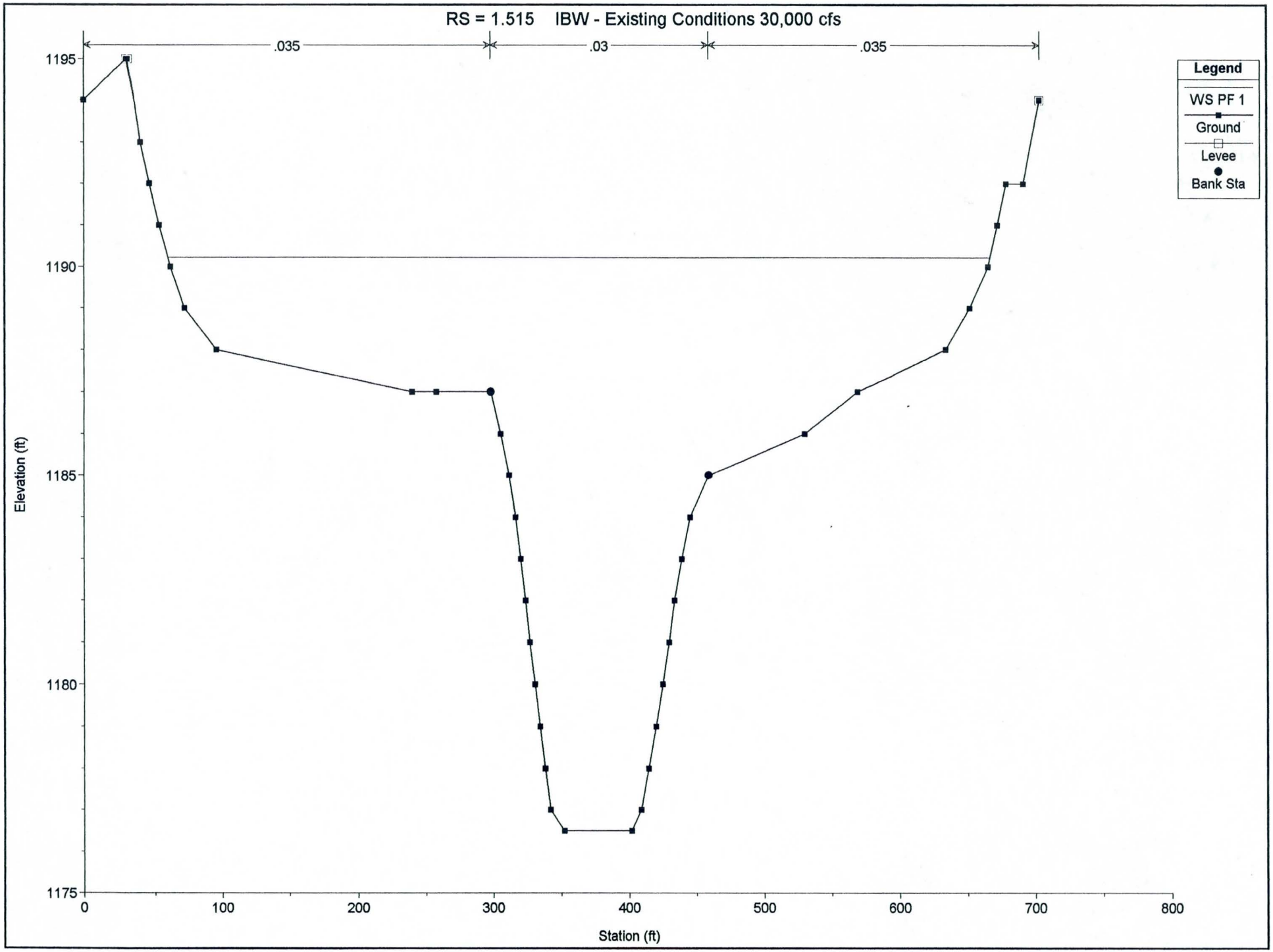

RS = 1.283 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1190
1188
1186
1184
1182
1180
1178
1176
1174
0
100
200
300
400
500
600
700
Station (ft)

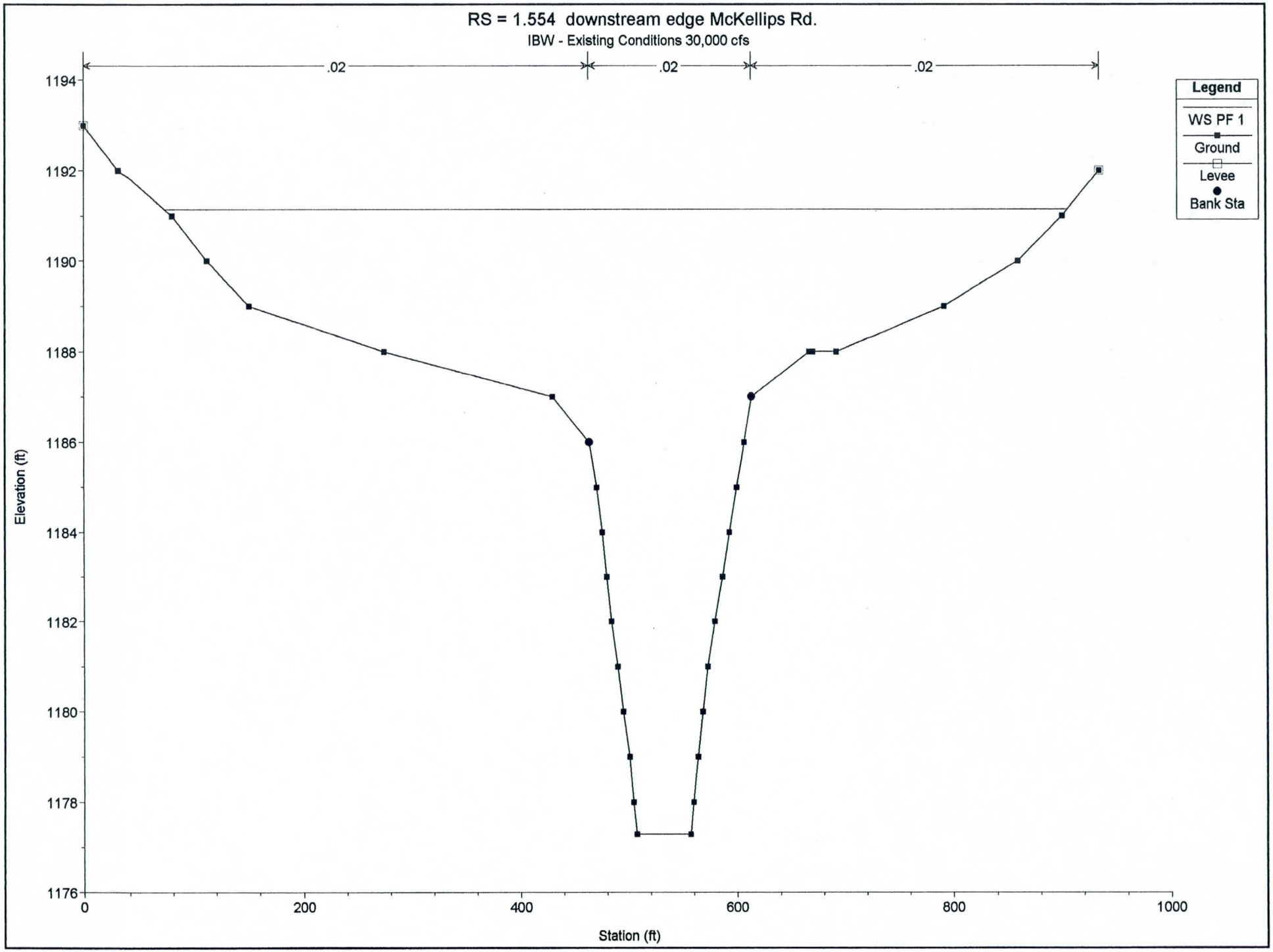

RS = 1.326 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1192
1190
1188
1186
1184
1182
1180
1178
1176
1174
0
100
200
300
400
500
600
700
Station (ft)


RS = 1.381 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1192
1190
1188
1186
1184
1182
1180
1178
1176
1174
0
100
200
300
400
500
600
700
Station (ft)


RS = 1.42 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1194
1192
1190
1188
1186
1184
1182
1180
1178
1176
0
100
200
300
400
500
600
700
Station (ft)

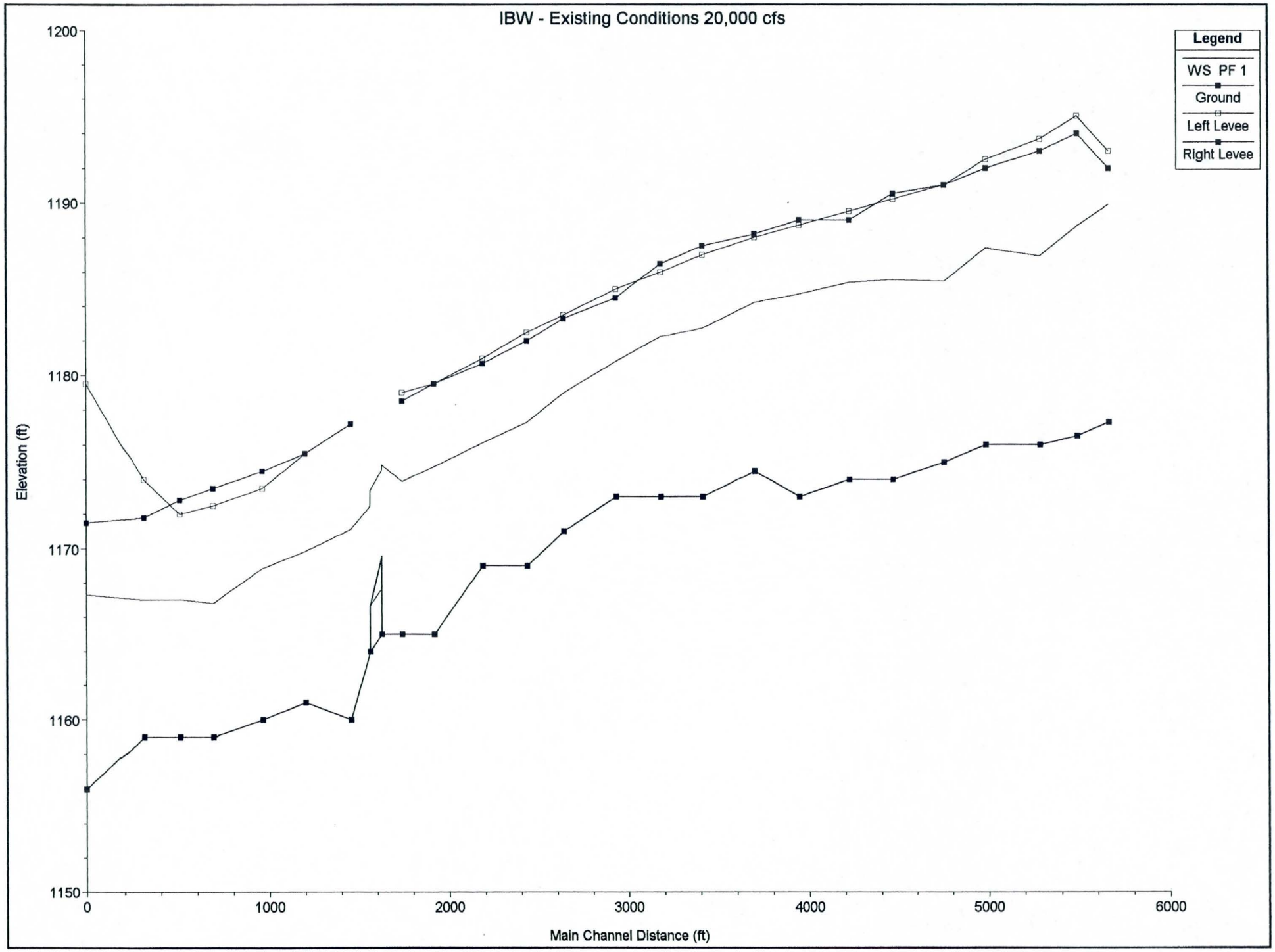

RS = 1.478 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1195
1190
1185
1180
1175
0
100
200
300
400
500
600
700
800
Station (ft)


RS = 1.515 IBW - Existing Conditions 30,000 cfs
.035
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1195
1190
1185
1180
1175
0
100
200
300
400
500
600
700
800
Station (ft)


RS = 1.554 downstream edge McKellips Rd.
IBW - Existing Conditions 30,000 cfs
.02
.02
.02
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1194
1192
1190
1188
1186
1184
1182
1180
1178
1176
0
200
400
600
800
1000
Station (ft)

HEC-RAS Plan: levee-base River: Reach #1 Reach: Reach #1 Profile: PF 1

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	Levee El Left	Levee El Right	L. Levee Frbrd	R. Levee Frbrd
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(ft)	(ft)	(ft)
Reach #1	1.554	20000.00	1177.29	1189.89	1189.89	1191.62	0.001284	11.62	2395.46	735.48	0.67	1193.00	1192.00	3.11	2.11
Reach #1	1.515	20000.00	1176.50	1188.66	1188.66	1190.78	0.003451	12.38	2082.17	565.22	0.73	1195.00	1194.00	6.34	5.34
Reach #1	1.478	20000.00	1176.00	1186.93	1185.44	1189.31	0.003762	12.42	1696.66	404.09	0.76	1193.70	1193.00	6.77	6.07
Reach #1	1.42	20000.00	1176.00	1187.38	1185.29	1188.43	0.001748	8.69	2791.56	569.37	0.52	1192.50	1192.00	5.12	4.62
Reach #1	1.381	20000.00	1175.00	1185.48	1183.70	1187.56	0.003578	11.57	1743.27	286.93	0.73	1191.00	1191.00	5.52	5.52
Reach #1	1.326	20000.00	1174.00	1185.56	1183.47	1186.80	0.001955	9.41	2619.07	571.27	0.55	1190.20	1190.50	4.64	4.94
Reach #1	1.283	20000.00	1174.00	1185.40	1183.59	1186.33	0.001699	8.40	2954.32	580.81	0.51	1189.50	1189.00	4.10	3.60
Reach #1	1.231	20000.00	1173.00	1184.72	1182.78	1185.82	0.001682	9.03	2818.37	571.09	0.52	1188.70	1189.00	3.98	4.28
Reach #1	1.19	20000.00	1174.50	1184.22	1183.05	1185.34	0.002179	9.22	2731.13	580.19	0.57	1188.00	1188.20	3.77	3.97
Reach #1	1.136	20000.00	1173.00	1182.74	1182.39	1184.40	0.003397	11.12	2275.63	568.03	0.71	1187.00	1187.50	4.26	4.76
Reach #1	1.087	20000.00	1173.00	1182.26	1181.62	1183.65	0.002845	10.41	2498.44	576.69	0.65	1186.00	1186.50	3.74	4.24
Reach #1	1.04	20000.00	1173.00	1180.81	1180.81	1182.62	0.004930	12.07	2153.62	581.55	0.83	1185.00	1184.50	4.19	3.69
Reach #1	0.987	20000.00	1171.00	1178.96	1178.14	1180.19	0.003098	9.80	2535.45	569.94	0.67	1183.50	1183.30	4.54	4.34
Reach #1	0.947	20000.00	1169.00	1177.29	1177.29	1179.22	0.004440	11.89	2090.07	549.36	0.80	1182.50	1182.00	5.21	4.71
Reach #1	0.903	20000.00	1169.00	1176.12	1176.12	1177.89	0.005342	11.98	2141.62	565.32	0.86	1181.00	1180.70	4.88	4.58
Reach #1	0.852	20000.00	1165.00	1174.75	1174.75	1176.66	0.003545	12.29	2247.01	569.64	0.74	1179.50	1179.50	4.75	4.75
Reach #1	0.812	20000.00	1165.00	1173.91	1173.91	1175.82	0.004151	11.92	2128.82	555.36	0.78	1179.00	1178.50	5.09	4.59
Reach #1	0.791	20000.00	1165.00	1174.86	1171.97	1175.37	0.000419	6.20	3851.59	763.76	0.38				
Reach #1	0.790	Bridge													
Reach #1	0.776	20000.00	1164.00	1172.47	1172.47	1174.32	0.002545	11.24	1986.80	597.80	0.86				
Reach #1	0.758	20000.00	1160.00	1171.12	1168.68	1172.71	0.001681	10.37	2282.52	550.10	0.61	1177.20	1177.20	6.08	6.08
Reach #1	0.707	20000.00	1161.00	1169.86	1169.86	1172.00	0.002938	12.31	2067.34	548.04	0.79	1175.50	1175.50	5.63	5.63
Reach #1	0.663	20000.00	1160.00	1168.87	1168.87	1170.83	0.002980	11.92	2091.82	563.10	0.79	1173.50	1174.50	4.63	5.63
Reach #1	0.614	20000.00	1159.00	1166.83	1166.83	1168.94	0.003561	12.03	1903.34	529.89	0.85	1172.50	1173.50	5.67	6.67
Reach #1	0.568	20000.00	1159.00	1167.04	1165.92	1168.22	0.001822	9.16	2579.78	575.64	0.62	1172.00	1172.80	4.96	5.76
Reach #1	0.532	20000.00	1159.00	1167.02	1165.27	1167.87	0.001298	8.10	3028.76	594.73	0.53	1174.00	1171.80	6.98	4.78
Reach #1	0.475	20000.00	1156.00	1167.30	1161.84	1167.52	0.000707	4.01	5432.09	637.69	0.23	1179.50	1171.50	12.20	4.20


IBW - Existing Conditions 20,000 cfs
Legend
WS PF 1
Ground
Left Levee
Right Levee
Elevation (ft)
1200
1190
1180
1170
1160
1150
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)

APPENDIX C

HEC-RAS Output Summary Table for Final Project Conditions

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X       X    X       X   X     X  X    X
X     X  X       X            X   X    X    X   X
XXXXXXX  XXXX    X       XXX  XXXX    XXXXXX    XXXX
X     X  X       X            X  X     X    X       X
X     X  X       X    X       X   X    X    X       X
X     X  XXXXXX    XXXX        X    X  X    X   XXXXX
```

PROJECT DATA
Project Title: IBW
Project File : IBW.prj
Run Date and Time: 6/27/2002 2:01:55 PM

Project in English units

Project Description:
Indian Bend Wash confluence to McKellips Indian Bend Environmental Restoration Project
Novak Environmental 8/30/2000 file:ibwh2_~2.dat
FEMA Baseline
Model for Indian Bend Wash Salt River to McKellips Road
Q=30000 CFS

PLAN DATA

Plan Title: 30-adjusted-proposed-cond-3
Plan File : r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.p16

Geometry Title: Adjusted Proposed Conditions 3 Geometry
Geometry File :
r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.g08

Flow Title : 30 Flow Profiles
Flow File :
r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.f02

Plan Summary Information:

Number of:	Cross Sections	= 26	Mulitple Openings	=	0
	Culverts	= 0	Inline Weirs	=	0
	Bridges	= 1			

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculaton tolerance	= 0.01
Maximum number of interations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: 30 Flow Profiles
Flow File : r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.f02

Flow Data (cfs)

River	Reach	RS	PF 1
Reach #1	Reach #1	1.554	30000

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Reach #1	Reach #1	PF 1	

Known WS = 1167.3

GEOMETRY DATA

Geometry Title: Adjusted Proposed Conditions 3 Geometry
Geometry File : r:\Projects\0011RSTempe\hydrology\hecras_files\2001-work\IBW.g08

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.554

INPUT
Description: downstream edge McKellips Rd.
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1193	32.31	1192	80.41	1191	112.43	1190	150.94	1189
274.99	1188	430.39	1187	464.3	1186	470.89	1185	475.88	1184
479.89	1183	484.3	1182	490.08	1181	495.07	1180	500.83	1179
504.19	1178	507.21	1177.29	556.73	1177.29	559.64	1178	563.8	1179
568.04	1180	572.88	1181	579.22	1182	586.77	1183	593.32	1184
600.28	1185	607.04	1186	613.98	1187	667.6	1188	670.8	1188
692.15	1188	792.23	1189	859.8	1190	900.48	1191	934.86	1192

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	464.3	.02	613.98	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
464.3	613.98	192.18	178.77	160.8	.3	.1

Left Levee Station= 0 Elevation= 1193
Right Levee Station= 934.86 Elevation= 1192

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.515

INPUT
Description:
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1194	31.23	1195	40.11	1193	46.9	1192	53.77	1191
62.25	1190	72.37	1189	95.97	1188	240.31	1187	258.16	1187
298.78	1187	305.87	1186	312.21	1185	316.83	1184	320.31	1183
323.73	1182	327.08	1181	330.75	1180	334.47	1179	338.15	1178
341.83	1177	351.93	1176.5	401.93	1176.5	408.99	1177	414.4	1178
420.14	1179	425.13	1180	429.58	1181	433.85	1182	439.18	1183
445.61	1184	459.41	1185	530.07	1186	568.92	1187	634.15	1188
651.66	1189	665.45	1190	672.27	1191	678.61	1192	690.98	1192
703.25	1194								

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	298.78	.03	316.83	.07	351.93	.03	401.93	.07
445.61	.03	459.41	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
298.78	459.41	207.87	204.9	206.88	.3	.1

Left Levee Station= 31.23 Elevation= 1195
Right Levee Station= 703.25 Elevation= 1194

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.478

INPUT
Description:
Station Elevation Data num= 42

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1193	30.69	1193.7	37.4	1192	43.7	1191	49.61	1190
55.77	1189	68.39	1188	93.63	1187	268.72	1186	273.87	1185
278.18	1184	282.77	1183	286.92	1182	290.63	1181	294.35	1180
298.15	1179	302.59	1178	308.75	1177	315.23	1176	342.98	1176
392.98	1176	410.44	1177	422.1	1178	426.55	1179	430.29	1180
433.88	1181	437.82	1182	442.19	1183	446.99	1184	451.78	1185
459.96	1186	514.15	1187	546.11	1188	566.21	1189	630.93	1189
645.33	1188	654.51	1188	660.66	1189	667.04	1190	674.73	1191
682.53	1193	703.75	1192						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	268.72	.03	286.92	.07	342.98	.03	392.98	.07
459.96	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
268.72	459.96	321.64	296.02	278.93	.3	.1

Left Levee Station= 30.69 Elevation= 1193.7
Right Levee Station= 682.53 Elevation= 1193

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.42

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1191	23.28	1192.5	32.83	1190	42.9	1189	51.68	1188

59.5	1187	70.51	1186	84.1	1185	120.1	1184	140.93	1184
230.34	1185	244.36	1184	251.38	1183	257.9	1182	263.05	1181
267.68	1180	272.02	1179	277.05	1178	286.68	1177	322.75	1176.5
329.55	1176	372.75	1176	408.8	1176	415.13	1177	419.83	1178
424.25	1179	428.45	1180	432.79	1181	437.11	1182	442.39	1183
448.04	1184	454.26	1185	464.18	1186	513.55	1186	540.41	1185
605.15	1185	615.46	1186	623.2	1187	630.22	1188	636.84	1189
643.25	1190	649.58	1192	681.14	1191				

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	230.34	.03	251.38	.07	322.75	.03	372.75	.07
442.39	.03	464.18	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
230.34	464.18	246.93	234.85	223.94	.3	.1

Left Levee Station= 23.28 Elevation= 1192.5
Right Levee Station= 649.58 Elevation= 1192

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.381

INPUT
Description:
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1190	28.87	1190	42.38	1189	63.22	1188	76.78	1187
91	1186	226.68	1185	237.79	1184	245.36	1183	251.25	1182
257.29	1181	261.02	1180	264.65	1179	268.31	1178	271.91	1177
277.88	1176	286.23	1175	311.91	1175	361.91	1175	401.86	1176
411.6	1177	415.51	1178	419.4	1179	427.84	1181	432.18	1182
436.68	1183	441.21	1184	446.15	1185	451.34	1186	520.8	1186
551.41	1186	581	1187	598.61	1188	621.55	1189	637.53	1190
684.79	1191								

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	226.68	.03	251.25	.07	311.91	.03	361.91	.07
432.18	.03	451.34	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
226.68	451.34	287.64	287.08	288.27	.3	.01

Left Levee Station= 28.87 Elevation= 1190
Right Levee Station= 684.79 Elevation= 1191

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.326

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1188	29.1	1190.2	40.83	1187	48	1186	56.11	1185
72.91	1184	119.96	1183	146.64	1183	165.83	1184	178.85	1185
217.9	1185	226.37	1184	232.07	1183	237.61	1182	242.8	1181
246.63	1180	250.24	1179	253.64	1178	257.24	1177	263.14	1176
271.43	1175	293.77	1174.5	340.18	1174	343.4	1174	366.79	1174
379.56	1174	389.39	1175	396.24	1176	400.26	1177	404.46	1178
408.58	1179	413.81	1180	420.17	1181	427.37	1182	541.55	1183
585.55	1184	617.3	1185	627.04	1186	633.51	1187	639.04	1188
644.57	1189	653.53	1190.5	670.01	1190				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	217.9	.03	242.8	.07	293.77	.03	343.4	.07
427.37	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
217.9	427.37	237.83	239.82	246.85	.3	.1

Left Levee Station= 29.1 Elevation= 1190.2
Right Levee Station= 653.53 Elevation= 1190.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.283

INPUT
Description:
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1189	16.86	1189.5	27.75	1188	37.88	1187	46.04	1186
53.13	1185	63.11	1184	75.32	1183	85.62	1182	144.25	1182
156.05	1183	165.53	1184	183.51	1184	194.79	1183	205.77	1182
216.03	1181	224.22	1180	229.17	1179	234.28	1178	240.03	1177
247.83	1176	259.95	1175	277.5	1174.5	332.03	1174	356.99	1174
374.9	1175	379.75	1176	384.43	1177	389.32	1178	393.76	1179
398.38	1180	403.14	1181	410.07	1182	417.48	1183	477.84	1183
502.53	1182	517.85	1181	572.67	1181	587.38	1182	603.51	1183
613.34	1184	624.92	1185	640.61	1186	659.83	1189	684.59	1187

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	183.51	.03	224.22	.07	277.5	.03	332.03	.07
403.14	.03	417.48	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
183.51	417.48	268.54	277.57	291.11	.3	.1

Left Levee Station= 16.86 Elevation= 1189.5
Right Levee Station= 659.83 Elevation= 1189

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.231

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1188.7	24.18	1187	35.28	1187	63.5	1187	71.29	1186
79.16	1185	88.44	1184	99.95	1183	111.61	1182	134.43	1182
166.71	1182	211.35	1181	270.66	1180	277.87	1179	284.62	1178
289.73	1177	293.96	1176	298.95	1175	306.85	1174	328.86	1173
336.33	1173	386.33	1173	406.05	1174	430.44	1175	433.97	1176
437.68	1177	441.22	1178	445.08	1179	449.63	1180	454.44	1181
459.12	1182	467.79	1183	518.64	1183	552.56	1182	577.86	1182
630.19	1183	646.63	1184	655.18	1185	661.03	1186	667.66	1187
674.97	1188	689.9	1189	720.49	1189				

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	270.66	.03	289.73	.07	336.33	.03	386.33	.07
459.12	.03	467.79	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
270.66	467.79	232.51	246.72	255.62	.3	.1

Left Levee Station= 0 Elevation= 1188.7
Right Levee Station= 720.49 Elevation= 1189

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.19

INPUT
Description:
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1186	11.15	1187	30.38	1188	39.69	1186	45.08	1185
50.53	1184	58.76	1183	72.4	1182	244.49	1181	255.21	1180
261.54	1179	267.46	1178	275.41	1177	282.38	1176	293.36	1175
320.54	1174.5	370.54	1174.5	415.76	1175	423.57	1176	428.77	1177
434.08	1178	442.44	1179	453.82	1180	465.64	1181	486.53	1181
572.53	1181	603.7	1182	619.96	1183	627.93	1184	634.89	1185
641.85	1186	648.72	1187	658.62	1188.2	697.64	1188		

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	244.49	.03	261.54	.07	320.54	.03	370.54	.07
434.08	.03	465.64	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
244.49	465.64	287.09	289.69	290.94	.3	.1

Left Levee Station= 30.38 Elevation= 1188
Right Levee Station= 658.62 Elevation= 1188.2

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.136

INPUT
Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1186	58.1	1187	64.03	1185	69.72	1184	77.46	1183
87.33	1182	118.43	1181	165.23	1180	203.41	1180	303.51	1180
317	1179	322.36	1178	326.72	1177	330.94	1176	336.23	1175
343.95	1174	355.52	1173	367.42	1173	407.7	1173	417.42	1173
446.95	1174	463.81	1175	472.73	1176	477.38	1177	482.28	1178
487.77	1179	494.62	1180	503.94	1181	526.13	1181	613.82	1181
642.24	1182	650.21	1183	657.23	1184	663.56	1185	669.87	1186
678.48	1187.5	712.15	1187						

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	303.51	.03	322.36	.07	367.42	.03	417.42	.07
487.77	.03	503.94	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
303.51	503.94	232.8	232.8	232.23	.3	.1

Left Levee Station= 58.1 Elevation= 1187
Right Levee Station= 678.48 Elevation= 1187.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.087

INPUT
Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1186	63.57	1186	88.46	1185	95.71	1184	103.27	1183
110.89	1182	121.5	1181	144.32	1180	208.75	1179	215.75	1179
215.77	1179	246.77	1179	352.31	1179	365.21	1178	370.99	1177
376.99	1176	383.31	1175	389.63	1174	410.73	1173	460	1173
502.7	1173	514.24	1174	519.78	1175	525.55	1176	531.66	1177

538.81	1178	545.39	1179	618.81	1180	631.01	1181	657.78	1181
673.86	1181	683.75	1182	690.63	1183	697.08	1184	704.31	1185
711.59	1186.5	750.29	1186						

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	352.31	.03	376.99	.07	410.73	.03	460	.07
538.81	.03	545.39	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
352.31	545.39	238.56	247.22	255.11	.3	.1

Left Levee Station= 63.57 Elevation= 1186
Right Levee Station= 711.59 Elevation= 1186.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 1.04

INPUT
Description:
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1184	29.32	1185	37.23	1183	44.94	1182	52.39	1181
61.99	1180	100.23	1179	189.17	1179	295.63	1179	314.78	1178
320.78	1177	326.38	1176	331.13	1175	336.28	1174	341.39	1173
368.18	1173	418.18	1173	449.17	1173	456.33	1174	470.86	1176
482.1	1177	500.3	1177	602.1	1177	617.63	1178	624.79	1179
631.38	1180	636.76	1181	641.84	1182	656	1184.5	665.54	1183
693.53	1182	745.15	1182	824.53	1183	847.11	1182.5		

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	295.63	.03	314.78	.07	368.18	.03	418.18	.07
482.1	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
295.63	482.1	290.01	291.93	296	.3	.1

Left Levee Station= 29.32 Elevation= 1185
Right Levee Station= 656 Elevation= 1184.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.987

INPUT
Description: golf course lake
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1178	12.36	1179	26.23	1180	31.66	1181	37.23	1182
63.51	1183.5	72.2	1181	78.68	1180	85.47	1179	97.35	1178
120.31	1177	170.48	1176	181.9	1175.01	270.26	1175.01	270.45	1175
289.03	1174	341.1	1173	380	1171.5	450.38	1171	481.23	1171
492.5	1172	498.39	1173	504.18	1174	528.5	1175	544.8	1176
640.77	1177	648.76	1178	656.27	1179	663.07	1180	671.43	1181
682.01	1183.3	696.17	1182						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	270.45	.03	341.1	.07	380	.03	450.38	.07
504.18	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
270.45	504.18	202	203.97	205.61	.3	.1

Left Levee Station= 63.51 Elevation= 1183.5
Right Levee Station= 682.01 Elevation= 1183.3

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.947

INPUT
Description: golf course lake
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1181	30.31	1182.5	42.48	1179	53.18	1178	69.29	1177
82.25	1176	184.79	1175.01	245.04	1175.01	245.04	1175	245.45	1174
250	1173	260	1172	270	1171	288.77	1170	310.63	1169
327.77	1169	370.97	1169	377.77	1169	400	1170	420	1171
430	1172	442.72	1173	447.79	1174	455.51	1175	495.98	1175
523.25	1175	550	1175	594.22	1176	611.67	1177	619.31	1178
625.56	1179	632.04	1180	637.95	1182				

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	245.04	.03	288.77	.07	327.77	.03	377.77	.07
442.72	.03	455.51	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
245.04	455.51	248.71	248.64	250.03	.3	.1

Left Levee Station= 30.31 Elevation= 1182.5
Right Levee Station= 637.95 Elevation= 1182

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.903

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1179	38.41	1181	45.68	1178	53.21	1177	60.43	1176
76.19	1175	89.79	1174	100.41	1173	153.46	1173	174.75	1174
215.87	1175	238.74	1175	247.18	1174	254.33	1173	261.49	1172
268.69	1171	276.96	1170	293.25	1169	322.33	1169	377.75	1169
410.67	1170	423.64	1171	439.72	1172	544.79	1173	600.37	1174
616.39	1175	624.05	1176	631.24	1177	637.31	1178	643.62	1179
650.57	1181.7	677.25	1180						

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	238.74	.03	276.96	.07	322.33	.03	377.75	.07
423.64	.03	439.72	.035						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
238.74	439.72	274.32	268.24	269.22	.3	.1

Left Levee Station= 38.41 Elevation= 1181
Right Levee Station= 650.57 Elevation= 1180.7

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.852

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1175	25.12	1175	60.78	1176	67.39	1177	72.76	1178
106.59	1179.5	113.47	1177	119.6	1176	127.34	1175	137.5	1174
184.52	1173	263.96	1172	300.18	1171	315.3	1170	321.84	1169
326.91	1168	331.9	1167	339.82	1166	351.32	1165	373.86	1165
423.86	1165.5	435.29	1166	445.52	1167	453.46	1168	459.15	1169

465.09	1170	478.61	1171	519.29	1172	652.13	1173	693.75	1174
701.38	1175	709.32	1179.5						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	315.3	.03	321.84	.07	373.86	.03	423.86	.07
465.09	.035								

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
315.3	465.09	179.08	179.06	181.91	.3	.1

Left Levee Station= 106.59 Elevation= 1179.5
Right Levee Station= 709.32 Elevation= 1179.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.812

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1179	4.72	1175	9.42	1174	15.61	1173	25.51	1172
100.06	1172	171.55	1172	182.79	1171	188.36	1170	194.47	1169
199.72	1168	204.81	1167	210.34	1166	220.54	1165	308.37	1165
331.63	1166	337.48	1167	343.51	1168	350.51	1169	357.09	1170
367.95	1171	492.65	1172	504.57	1172	526.21	1172	555.6	1173
566.37	1174	576.7	1175	600.82	1176	607.81	1177	615.58	1178.5
640.6	1178								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	171.55	.03	194.47	.03	367.95	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
171.55	367.95	108.3	112.43	114.94	.3	.1

Left Levee Station= 0 Elevation= 1179
Right Levee Station= 615.58 Elevation= 1178.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.791

INPUT
Description: upstream edge Curry Road
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1172.5	48.86	1173	85.99	1172	123.04	1171	176.67	1171
219.03	1171	252.92	1170	263.27	1169	274.76	1168	281.96	1167
282.5	1165	299.85	1165	411.76	1165	435.4	1165	566.35	1171
646.51	1172	686.03	1173	715.6	1174	742.19	1175	757.27	1176
806.98	1177	894.58	1174						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	252.92	.02	566.35	.02

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
252.92	566.35	66.51	66.51	69.25	.3	.1

BRIDGE RIVER: Reach #1
REACH: Reach #1 RS: 0.790

INPUT
Description:
Distance from Upstream XS = 1

Deck/Roadway Width = 64.5
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 20

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1174.5	0	48.86	1173	0	85.99	1172	0
123.04	1171	0	176.67	1171	0	219.03	1171	0
252.92	1170	0	282.4	1169.68	0	282.5	1169.68	1167.68
435.4	1169.68	1167.68	435.5	1169.68	0	471	1169.6	0
566.35	1171	0	646.51	1172	0	686.03	1173	0
715.6	1174	0	742.19	1175	0	757.27	1176	0
806.98	1177	0	894.58	1178.5	0			

Upstream Bridge Cross Section Data
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1172.5	48.86	1173	85.99	1172	123.04	1171	176.67	1171
219.03	1171	252.92	1170	263.27	1169	274.76	1168	281.96	1167
282.5	1165	299.85	1165	411.76	1165	435.4	1165	566.35	1171
646.51	1172	686.03	1173	715.6	1174	742.19	1175	757.27	1176
806.98	1177	894.58	1174						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.02	252.92	.02	566.35	.02

Bank Sta: Left	Right	Coeff Contr.	Expan.
252.92	566.35	.3	.1

Downstream Deck/Roadway Coordinates
num= 5

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
267.39	1170	0	288.2	1169.68	0	288.3	1169.68	1166.68
440.9	1169.68	1166.68	441	1169.68	0			

Downstream Bridge Cross Section Data
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1172.5	30.87	1174	67.71	1173	110.38	1172	142.22	1171.5
183.51	1171	267.39	1170	274.69	1169	283.48	1168	288.2	1164
300.93	1164	309.39	1164	325.67	1164	352	1164	403.77	1164
416.92	1164	441	1164	441.1	1170	578.43	1171	665.25	1172
713.41	1173	746.87	1174	777.33	1175	810.58	1176	843.59	1177
883.33	1178	935.87	1174.5						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	142.22	.07	352	.03	403.77	.07

Bank Sta: Left	Right	Coeff Contr.	Expan.
267.39	578.43	.3	.1

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Piers = 2

Pier Data

```
Pier Station      Upstream=  333.25    Downstream=  338.97
Upstream      num=        2
    Width   Elev    Width   Elev
     1.5    1165     1.5    1168
Downstream      num=        2
    Width   Elev    Width   Elev
     1.5    1164     1.5    1167

Pier Data
Pier Station      Upstream=  384.75    Downstream=   390.7
Upstream      num=        2
    Width   Elev    Width   Elev
     1.5    1165     1.5    1168
Downstream      num=        2
    Width   Elev    Width   Elev
     1.5    1164     1.5    1167

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION           RIVER: Reach #1
REACH: Reach #1            RS: 0.776

INPUT
Description: downstream edge Curry Road
Station Elevation Data     num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1172.5   30.87    1174   67.71    1173  110.38    1172  142.22  1171.5
  183.51    1171  267.39    1170  274.69    1169  283.48    1168   288.2    1164
  300.93    1164  309.39    1164  325.67    1164     352    1164  403.77    1164
  416.92    1164     441    1164   441.1    1170  578.43    1171  665.25    1172
  713.41    1173  746.87    1174  777.33    1175  810.58    1176  843.59    1177
  883.33    1178  935.87  1174.5

Manning's n Values         num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .02  142.22     .07     352     .03  403.77     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        267.39  578.43            113.71  106.75  105.35             .3       .1

CROSS SECTION           RIVER: Reach #1
REACH: Reach #1            RS: 0.758

INPUT
Description:
Station Elevation Data     num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1177.2   29.68    1177   36.67    1176   43.32    1175   49.36    1174
   55.53    1173   63.28    1172    73.9    1171  165.05    1170  175.43    1169
```

181.37	1168	187.29	1167	190.97	1166	194.7	1165	198.89	1164
204.06	1163	211.44	1162	216.92	1161	249.27	1160	276.62	1160
313.81	1160	326.62	1160	340.55	1160	344.21	1161	347.28	1162
350.31	1163	353.35	1164	356.44	1165	359.79	1166	363.3	1167
366.87	1168	371.72	1169	608.61	1170	621.6	1171	630.56	1172
641.11	1173	649.81	1174	658.38	1175	667.03	1176	675.08	1177.2
689.29	1177								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	73.9	.07	276.62	.03	326.62	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
165.05	371.72	267.42	252.47	239.42	.3	.1

Left Levee Station= 0 Elevation= 1177.2
Right Levee Station= 675.08 Elevation= 1177.2

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.707

INPUT
Description:
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1175.5	7.97	1174	15.35	1173	21.49	1172	27.66	1171
36.41	1170	52.55	1169	123.02	1168	134.2	1167	140.12	1166
144.75	1165	149.29	1164	154.79	1163	160.49	1162	166.18	1161
206.57	1161	245.47	1161	279.38	1161	281.78	1161	285.85	1161
290.94	1162	296.05	1163	301.21	1164	306.42	1165	311.7	1166
317.06	1167	441.81	1167.7	464.3	1168	498.51	1168.5	577.56	1169
598.49	1171	608.55	1172	618.72	1173	628.8	1174	638.69	1175.5
655.18	1175								

Manning's n Values num= 8

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	52.55	.07	245.47	.03	296.05	.07	441.81	.08
498.51	.03	598.49	.08	638.69	.07				

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
123.02	317.06	247.85	235.96	224.89	.3	.1

Left Levee Station= 0 Elevation= 1175.5
Right Levee Station= 638.69 Elevation= 1175.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.663

INPUT
Description:
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1174	38.28	1173.5	52.11	1173	58.27	1172	64.58	1171
71.82	1170	79.3	1169	93.21	1168	149.7	1167	162.28	1166
172.18	1165	179.01	1164	184.54	1163	189.93	1162	209.37	1161
222.92	1160	262.46	1160	278.1	1160.5	291	1160.3	330.53	1161
334.71	1162	339.09	1163	343.45	1164	347.45	1164.5	350.52	1165
357.69	1166	503.04	1166.8	520.02	1167	550.01	1167.5	632.53	1168
645.97	1169	653.69	1170	659.89	1171	666.22	1172	681.44	1174.5

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	93.21	.07	291	.03	330.53	.07	503.04	.08
550.01	.03	659.89	.08						

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
149.7	357.69	287.76	272.3	268.37	.03	.01

Left Levee Station= 38.28 Elevation= 1173.5
Right Levee Station= 681.44 Elevation= 1174.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.614

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1173	18.96	1172.5	29.99	1172	38.47	1171	45.06	1170
51.52	1169	60.05	1168	70.63	1167	149.96	1166	162.34	1165
170.36	1164	176.37	1163	182.96	1162	191.59	1161	204.08	1160
223.08	1159.5	247.97	1159	297.97	1159	349.64	1159	361.49	1160
367.95	1161	372.95	1162	377.59	1163	384.34	1164	398.46	1165
459.96	1165	498.06	1165	597.4	1166	603.61	1166.5	611.89	1167
614.89	1170	615	1173	681.04	1173.5				

Manning's n Values num= 8

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	70.63	.07	247.97	.03	297.97	.07	459.96	.08
498.06	.03	603.61	.08	611.89	.07				

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
149.96	398.46	204.8	184.21	167.27	.3	.1

Left Levee Station= 18.96 Elevation= 1172.5
Right Levee Station= 681.04 Elevation= 1173.5

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.568

INPUT
Description:
Station Elevation Data num= 34

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1172	56.4	1171	63.78	1170	69.94	1169	76.11	1168
83.12	1167	92.26	1166	141.49	1165	198.25	1164	215.54	1163
226.42	1162	235.88	1161	246.56	1160	263.47	1159	288.47	1159
338.47	1159	371.5	1159	424.24	1159	432.81	1160	440.84	1161
447.72	1162	455.62	1163	478.26	1164	488.26	1164	528.26	1164
617.68	1165	645.37	1166	658.11	1167	666.14	1168	673.14	1169
680.13	1170	687.13	1171	699.19	1171.5	712.64	1172.8		

Manning's n Values num= 8

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	92.26	.07	288.47	.03	338.47	.07	488.26	.08
528.26	.03	645.37	.08	687.13	.07				

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
198.25	478.26	212.06	200.8	191.1	.3	.1

Left Levee Station= 0 Elevation= 1172
Right Levee Station= 712.64 Elevation= 1172.8

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.532

INPUT
Description:
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1174	8.21	1174	16.15	1173	27.02	1172	39.91	1171

59.34	1170	98.09	1169	121.97	1168	134.57	1167	148.33	1166
158.33	1165.5	165.54	1165	183.95	1164	227.25	1163	313.26	1162
330.23	1161	341.2	1160	352.65	1159	402.65	1159	447.17	1159
480	1159	546.68	1160	556.24	1161	565.4	1162	575.81	1163
621.81	1163.5	654.14	1163.5	694.4	1164	708.37	1165	718.81	1166
728.87	1167	738.75	1168	748.05	1169	756.21	1170	775.78	1171.8

Manning's n Values num= 8

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	158.33	.07	352.65	.03	402.65	.07	447.17	.08
480	.03	621.81	.08	654.14	.07				

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
313.26	575.81	311.48	309.07	304.28	.3	.1

Left Levee Station= 0 Elevation= 1174
Right Levee Station= 775.78 Elevation= 1171.8

CROSS SECTION RIVER: Reach #1
REACH: Reach #1 RS: 0.475

INPUT
Description:
Station Elevation Data num= 55

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1179	9.2	1179.5	16.4	1179	20.07	1178	25.54	1177
27.25	1176	29.62	1175	32	1174	34.73	1173	37.43	1172
40.15	1171	43.08	1170	45.7	1169	48.31	1168	50.9	1167
53.24	1166	56.15	1165	58.93	1164	61.58	1163	64.34	1162
67.48	1161	70.85	1160	75.24	1159	85.34	1158	99.73	1158
108.14	1159	263.68	1159	269.45	1159	296.5	1158.5	306.7	1158
314.94	1157	348.36	1157	357.84	1158	375	1158	376.73	1158
430.32	1157	442.77	1156	459.35	1156	470.77	1157	498.49	1158
511.48	1159	522.74	1159	588.64	1159	655.92	1160	665.66	1161
671.22	1162	674.75	1163	677.94	1164	681.05	1165	684.1	1166
686.89	1167	689.97	1168	693.45	1169	700.43	1171.5	742.96	1170

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	67.48	.07	296.5	.03	348.36	.07

Bank Sta: Left	Right	Coeff Contr.	Expan.
263.68	511.48	.3	.1

Left Levee Station= 9.2 Elevation= 1179.5
Right Levee Station= 700.43 Elevation= 1171.5

SUMMARY OF MANNING'S N VALUES

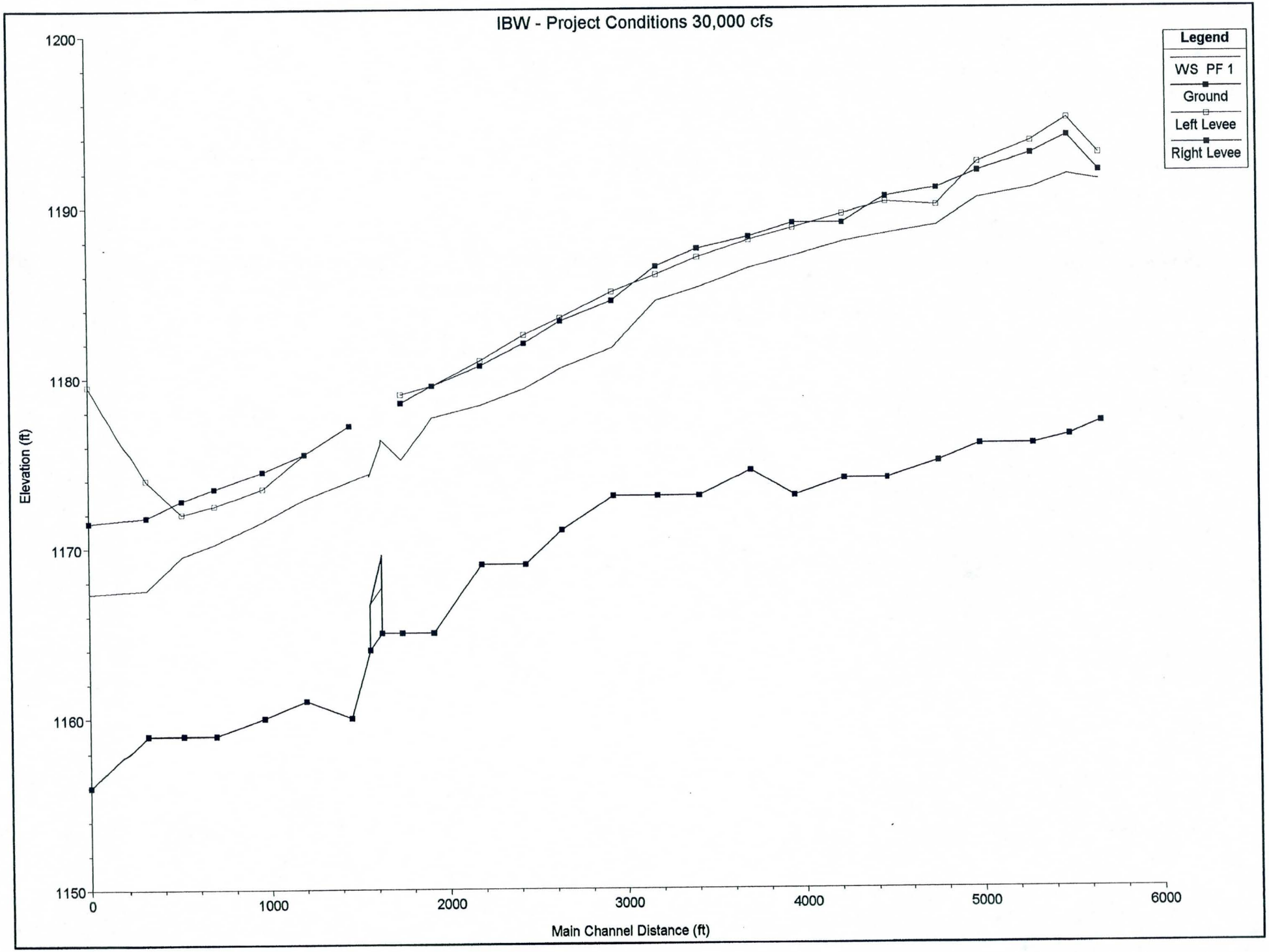
River:Reach #1

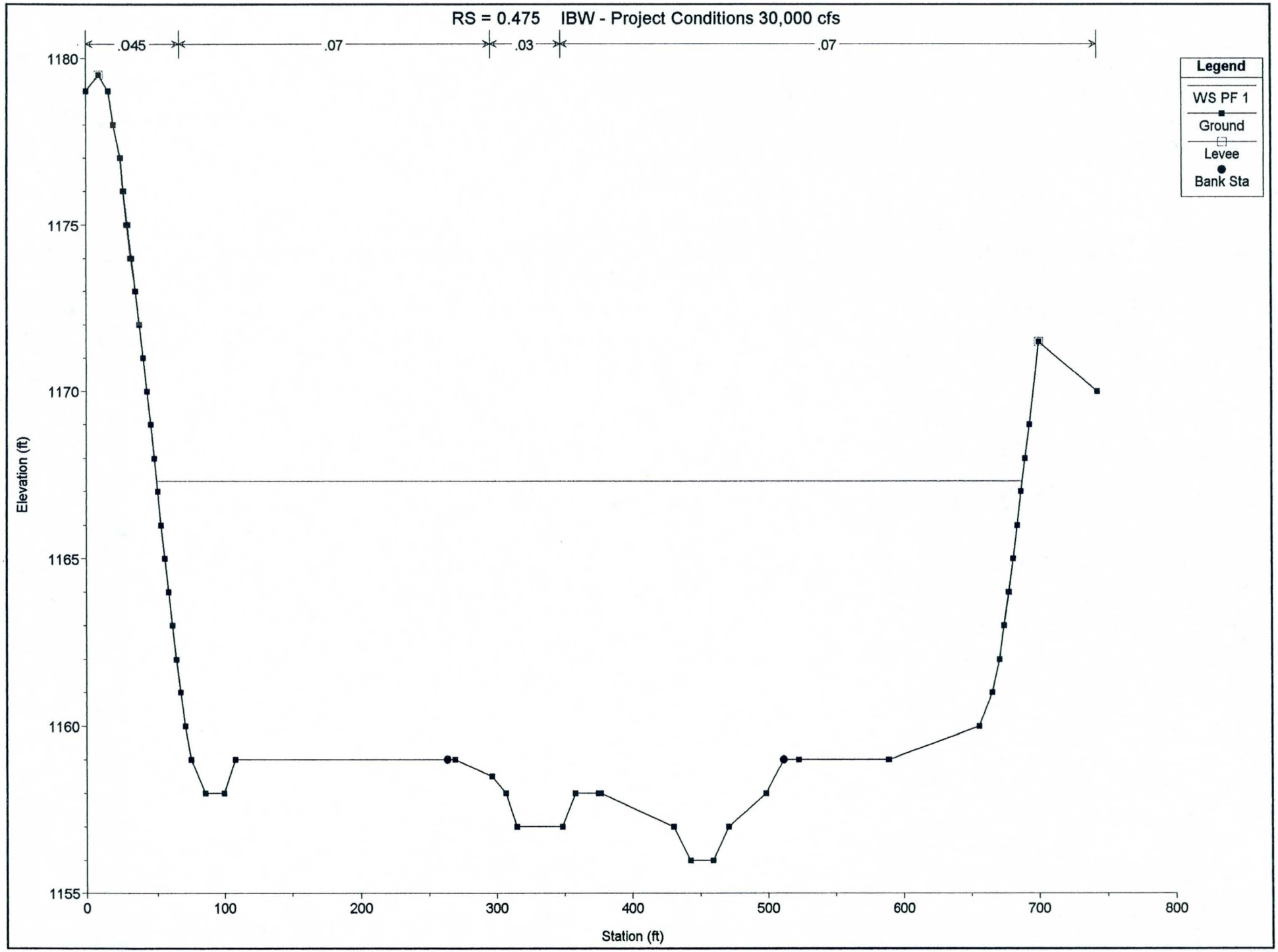
Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7	n8
Reach #1	1.554	.02	.02	.02					
Reach #1	1.515	.035	.03	.07	.03	.07	.03	.035	
Reach #1	1.478	.035	.03	.07	.03	.07	.035		
Reach #1	1.42	.035	.03	.07	.03	.07			

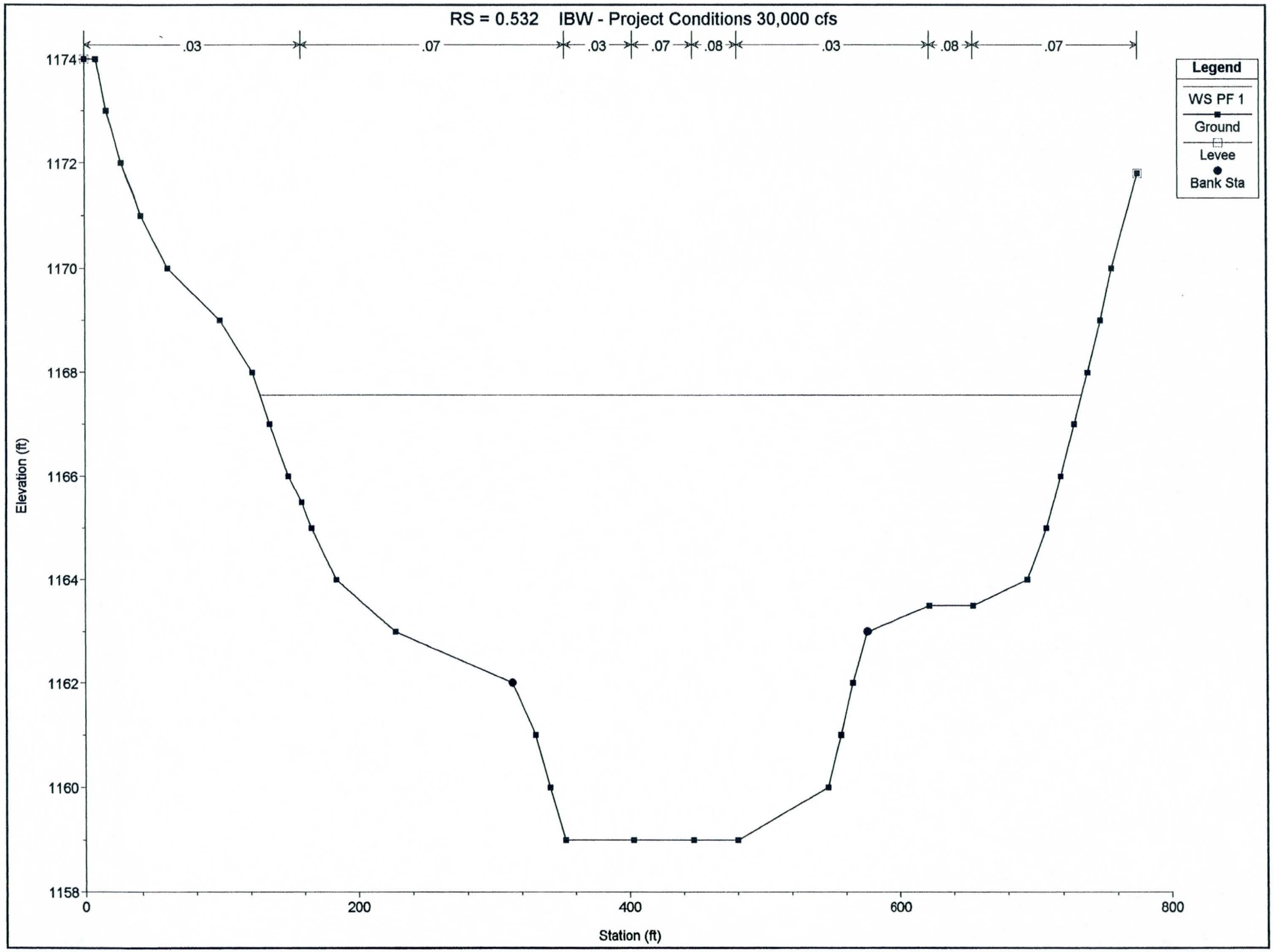
.03	.035						
Reach #1		1.381	.035	.03	.07	.03	.07
.03	.035						
Reach #1		1.326	.035	.03	.07	.03	.07
.035							
Reach #1		1.283	.035	.03	.07	.03	.07
.03	.035						
Reach #1		1.231	.035	.03	.07	.03	.07
.03	.035						
Reach #1		1.19	.035	.03	.07	.03	.07
.03	.035						
Reach #1		1.136	.035	.03	.07	.03	.07
.03	.035						
Reach #1		1.087	.035	.03	.07	.03	.07
.03	.035						
Reach #1		1.04	.035	.03	.07	.03	.07
.035							
Reach #1		0.987	.035	.03	.07	.03	.07
.035							
Reach #1		0.947	.035	.03	.07	.03	.07
.03	.035						
Reach #1		0.903	.035	.03	.07	.03	.07
.03	.035						
Reach #1		0.852	.035	.03	.07	.03	.07
.035							
Reach #1		0.812	.035	.03	.03	.035	
Reach #1		0.791	.02	.02	.02		
Reach #1		0.790	Bridge				
Reach #1		0.776	.02	.07	.03	.07	
Reach #1		0.758	.035	.07	.03	.07	
Reach #1		0.707	.035	.07	.03	.07	.08
.03	.08	.07					
Reach #1		0.663	.03	.07	.03	.07	.08
.03	.08						
Reach #1		0.614	.03	.07	.03	.07	.08
.03	.08	.07					
Reach #1		0.568	.03	.07	.03	.07	.08
.03	.08	.07					
Reach #1		0.532	.03	.07	.03	.07	.08
.03	.08	.07					
Reach #1		0.475	.045	.07	.03	.07	

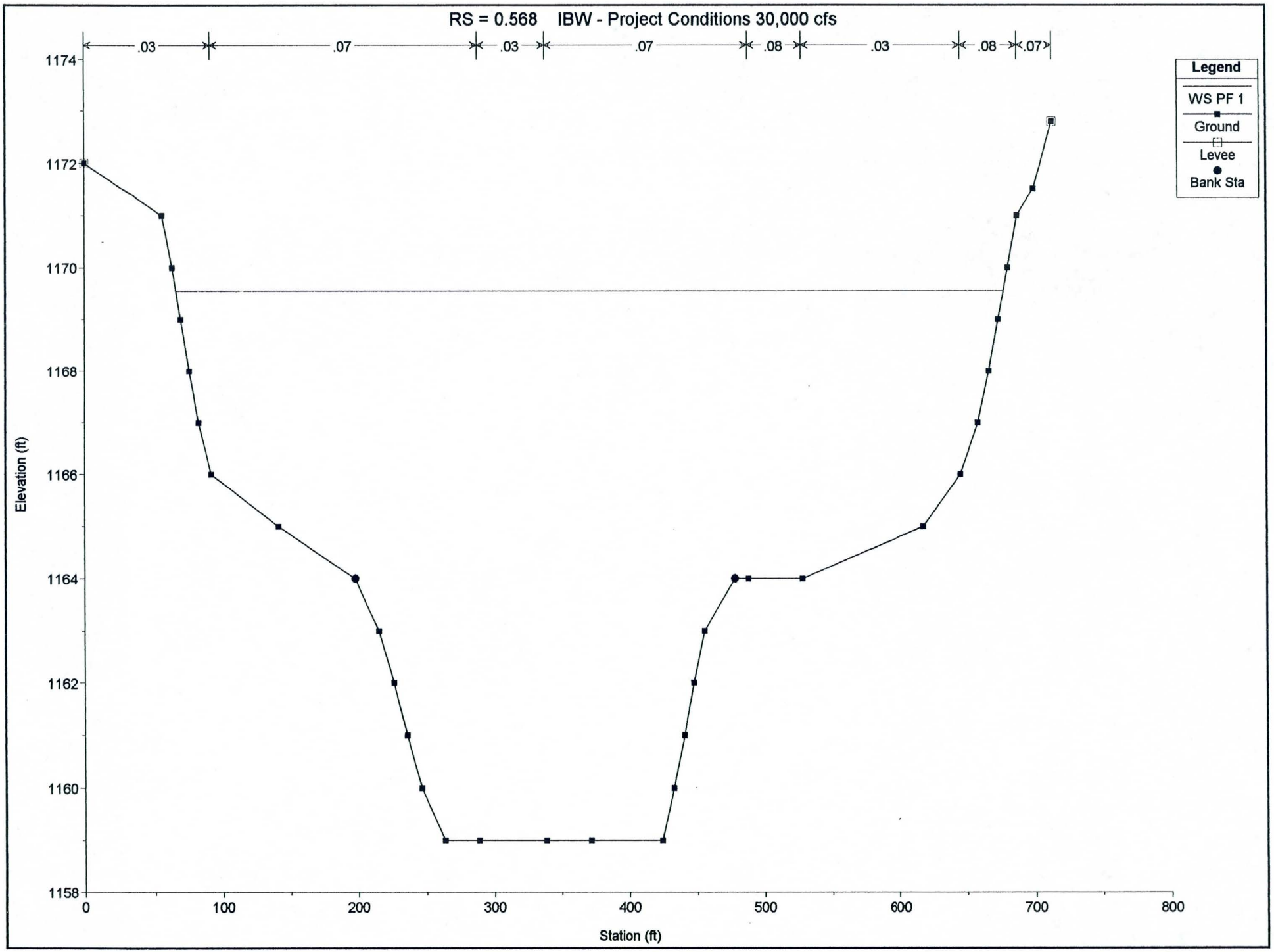
HEC-RAS Plan: 30-prop-3 River: Reach #1 Reach: Reach #1 Profile: PF 1

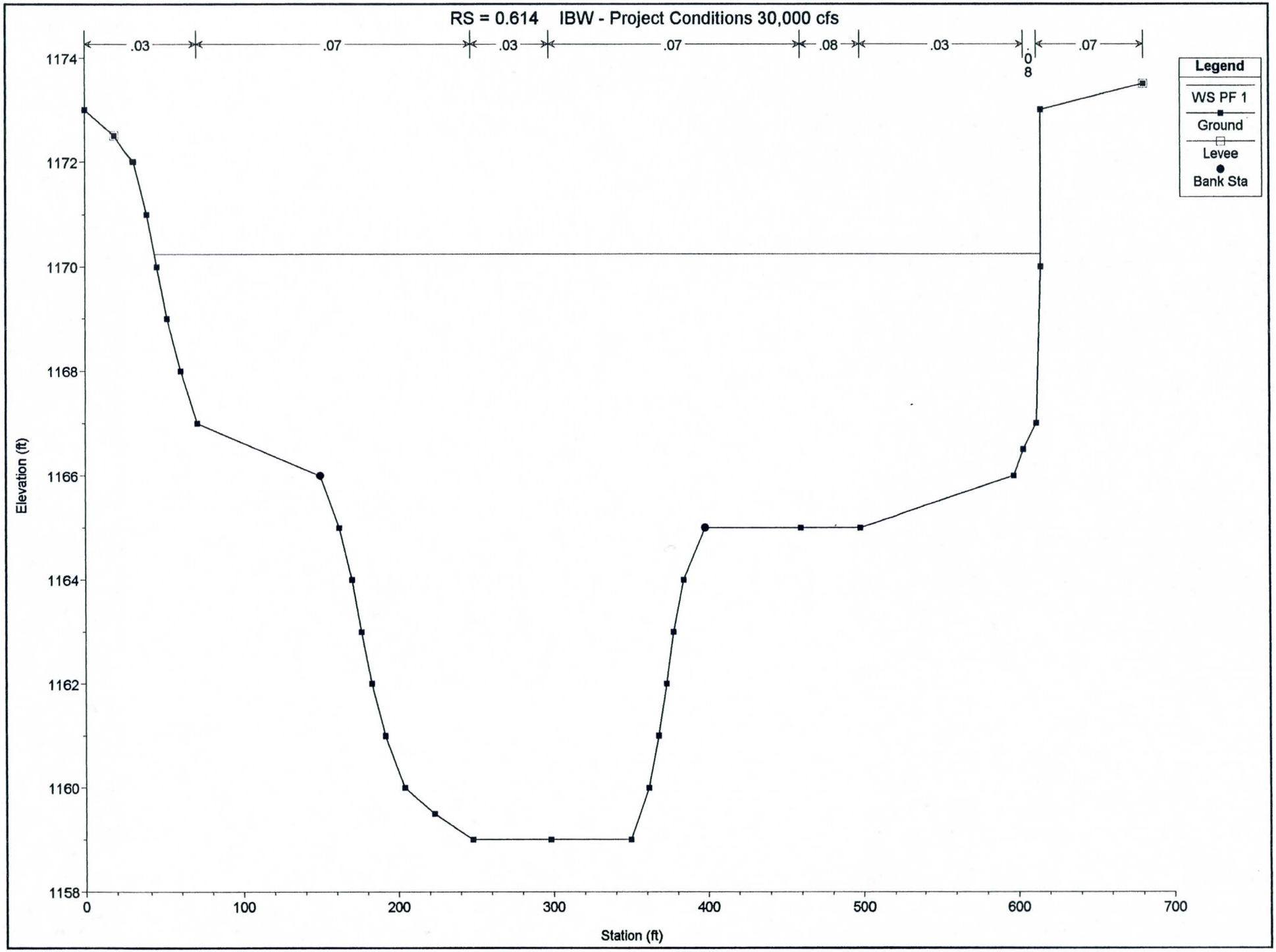
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Levee El Left	Levee El Right	L. Levee Frbrd	R. Levee Frbrd
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(ft)	(ft)	(ft)
Reach #1	1.554	30000.00	1177.29	1191.46	1191.14	1193.11	0.001136	12.15	3652.49	858.42	0.65	1193.00	1192.00	1.54	0.54
Reach #1	1.515	30000.00	1176.50	1191.77	1189.86	1192.71	0.003361	8.64	3958.54	628.63	0.44	1195.00	1194.00	3.23	2.23
Reach #1	1.478	30000.00	1176.00	1190.96	1188.80	1191.95	0.003961	8.64	3897.92	630.46	0.43	1193.70	1193.00	2.74	2.04
Reach #1	1.42	30000.00	1176.00	1190.41	1187.19	1191.11	0.001960	7.31	4583.41	613.26	0.38	1192.50	1192.00	2.09	1.59
Reach #1	1.381	30000.00	1175.00	1188.82	1187.21	1190.18	0.005636	9.95	3367.89	571.30	0.53	1190.00	1191.00	1.18	2.18
Reach #1	1.326	30000.00	1174.00	1188.35	1185.77	1189.18	0.002393	8.01	4261.42	605.06	0.41	1190.20	1190.50	1.85	2.15
Reach #1	1.283	30000.00	1174.00	1187.88	1184.96	1188.63	0.002078	7.60	4453.50	623.68	0.41	1189.50	1189.00	1.62	1.12
Reach #1	1.231	30000.00	1173.00	1187.06	1184.55	1187.96	0.002473	8.51	4193.03	644.69	0.44	1188.70	1189.00	1.64	1.94
Reach #1	1.19	30000.00	1174.50	1186.36	1184.18	1187.29	0.002959	8.40	4000.99	606.37	0.46	1188.00	1188.20	1.63	1.83
Reach #1	1.136	30000.00	1173.00	1185.22	1183.54	1186.30	0.003514	9.22	3731.75	601.56	0.51	1187.00	1187.50	1.78	2.28
Reach #1	1.087	30000.00	1173.00	1184.46	1182.62	1185.49	0.003445	8.94	3800.78	608.07	0.50	1186.00	1186.50	1.54	2.04
Reach #1	1.04	30000.00	1173.00	1181.71	1181.71	1183.80	0.010409	12.54	2680.66	593.25	0.81	1185.00	1184.50	3.29	2.79
Reach #1	0.987	30000.00	1171.00	1180.52	1179.18	1181.79	0.004138	9.95	3444.52	592.12	0.61	1183.50	1183.30	2.98	2.78
Reach #1	0.947	30000.00	1169.00	1179.32	1178.38	1180.79	0.005041	10.79	3244.31	586.24	0.64	1182.50	1182.00	3.18	2.68
Reach #1	0.903	30000.00	1169.00	1178.36	1176.96	1179.59	0.004413	9.72	3447.10	594.82	0.60	1181.00	1180.70	2.63	2.33
Reach #1	0.852	30000.00	1165.00	1177.66	1175.68	1178.62	0.002837	8.87	3948.62	594.44	0.46	1179.50	1179.50	1.84	1.84
Reach #1	0.812	30000.00	1165.00	1175.19	1175.19	1177.57	0.004295	13.75	2852.98	576.72	0.83	1179.00	1178.50	3.81	3.31
Reach #1	0.791	30000.00	1165.00	1176.39	1173.52	1177.04	0.000447	7.16	5071.80	846.21	0.40				
Reach #1	0.790	Bridge													
Reach #1	0.776	30000.00	1164.00	1174.38		1175.97	0.008974	10.87	3302.56	758.36	0.71				
Reach #1	0.758	30000.00	1160.00	1173.90	1171.78	1175.30	0.004360	10.33	3881.42	598.94	0.53	1177.20	1177.20	3.30	3.30
Reach #1	0.707	30000.00	1161.00	1172.88	1171.33	1174.12	0.004941	10.14	3807.64	601.50	0.55	1175.50	1175.50	2.61	2.61
Reach #1	0.663	30000.00	1160.00	1171.56	1170.18	1172.82	0.006366	10.11	3665.77	602.43	0.57	1173.50	1174.50	1.94	2.94
Reach #1	0.614	30000.00	1159.00	1170.24	1168.23	1171.32	0.004797	8.99	3803.14	571.43	0.51	1172.50	1173.50	2.26	3.26
Reach #1	0.568	30000.00	1159.00	1169.55	1167.19	1170.47	0.004441	8.12	4065.52	610.39	0.47	1172.00	1172.80	2.45	3.25
Reach #1	0.532	30000.00	1159.00	1167.56	1166.63	1169.21	0.006151	11.33	3351.88	606.82	0.71	1174.00	1171.80	6.44	4.24
Reach #1	0.475	30000.00	1156.00	1167.30	1163.05	1167.83	0.002910	6.75	5432.09	637.69	0.38	1179.50	1171.50	12.20	4.20

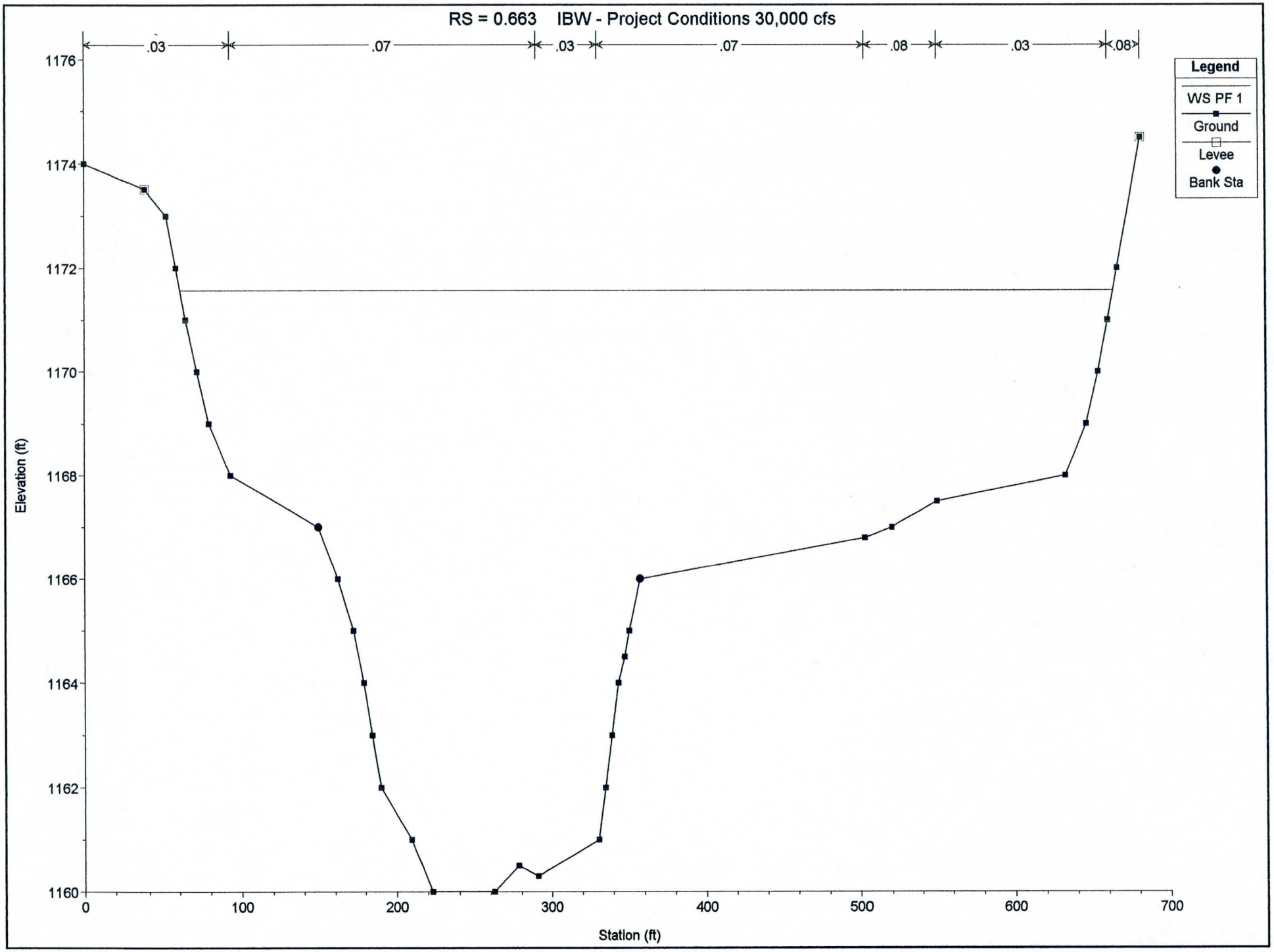

IBW - Project Conditions 30,000 cfs
Legend
WS PF 1
Ground
Left Levee
Right Levee
Elevation (ft)
1200
1190
1180
1170
1160
1150
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)

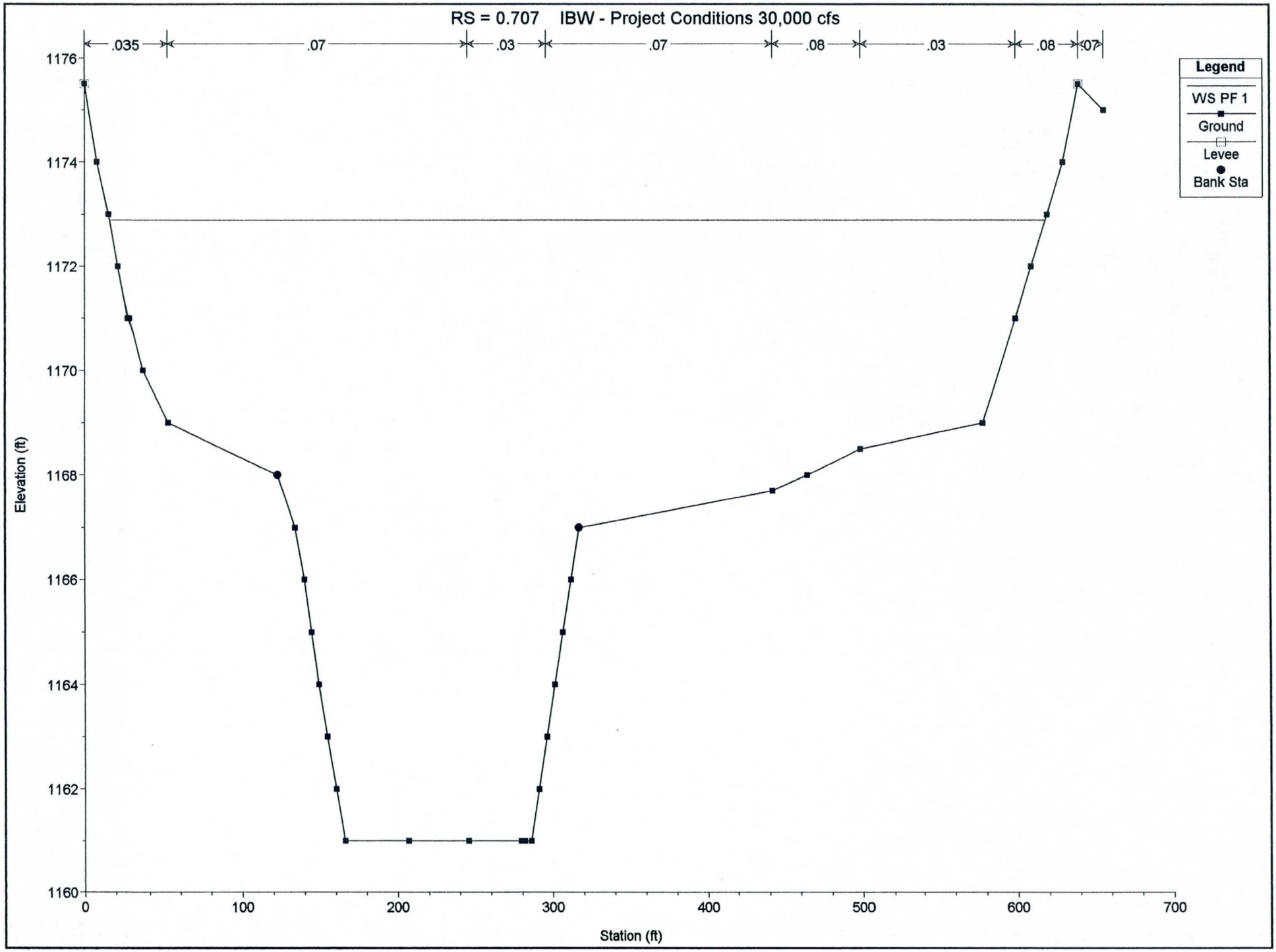

RS = 0.475 IBW - Project Conditions 30,000 cfs
.045
.07
.03
.07
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1180
1175
1170
1165
1160
1155
0
100
200
300
400
500
600
700
800
Station (ft)

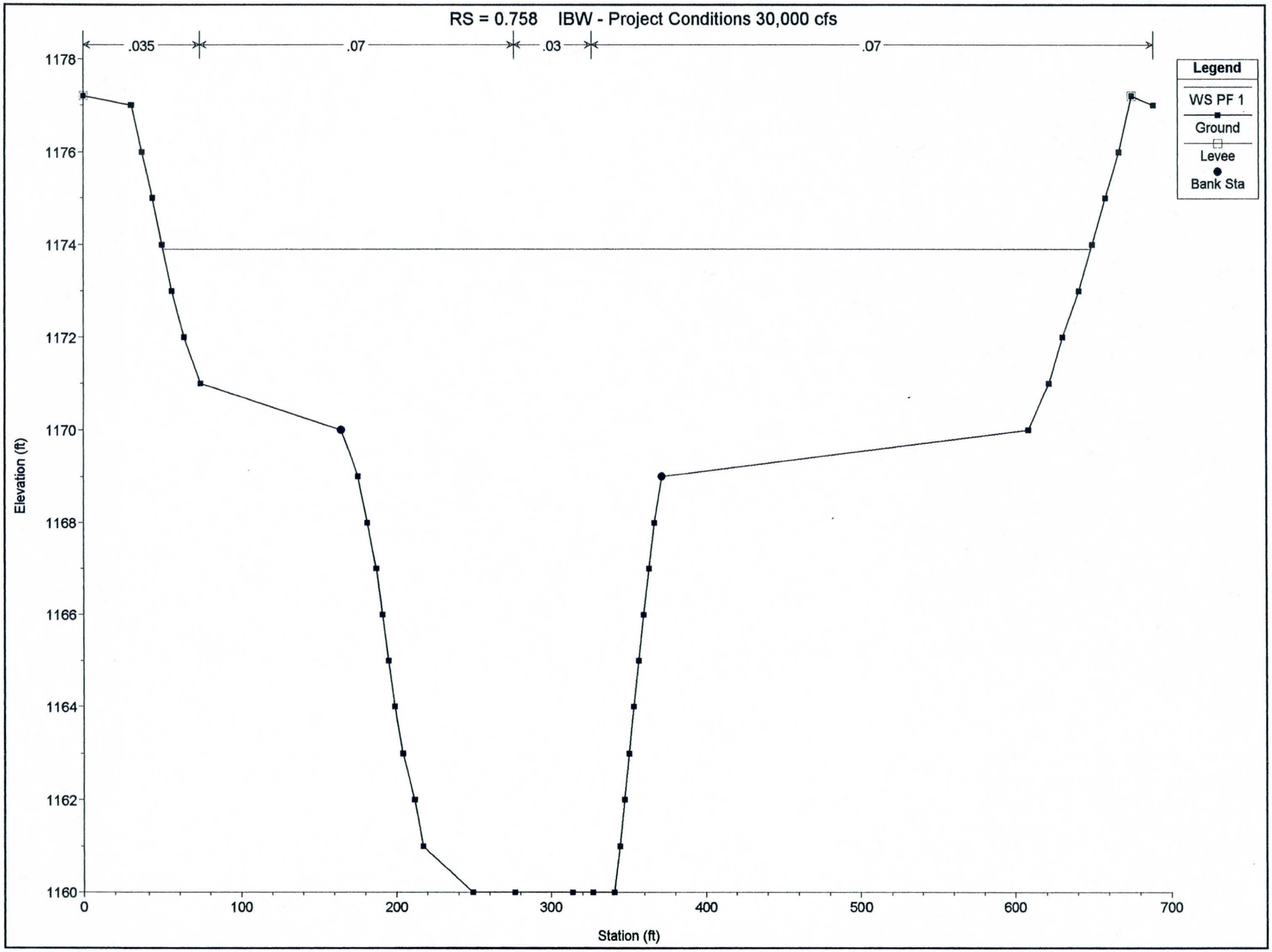

RS = 0.532 IBW - Project Conditions 30,000 cfs
.03
.07
.03
.07
.08
.03
.08
.07
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1174
1172
1170
1168
1166
1164
1162
1160
1158
0
200
400
600
800
Station (ft)

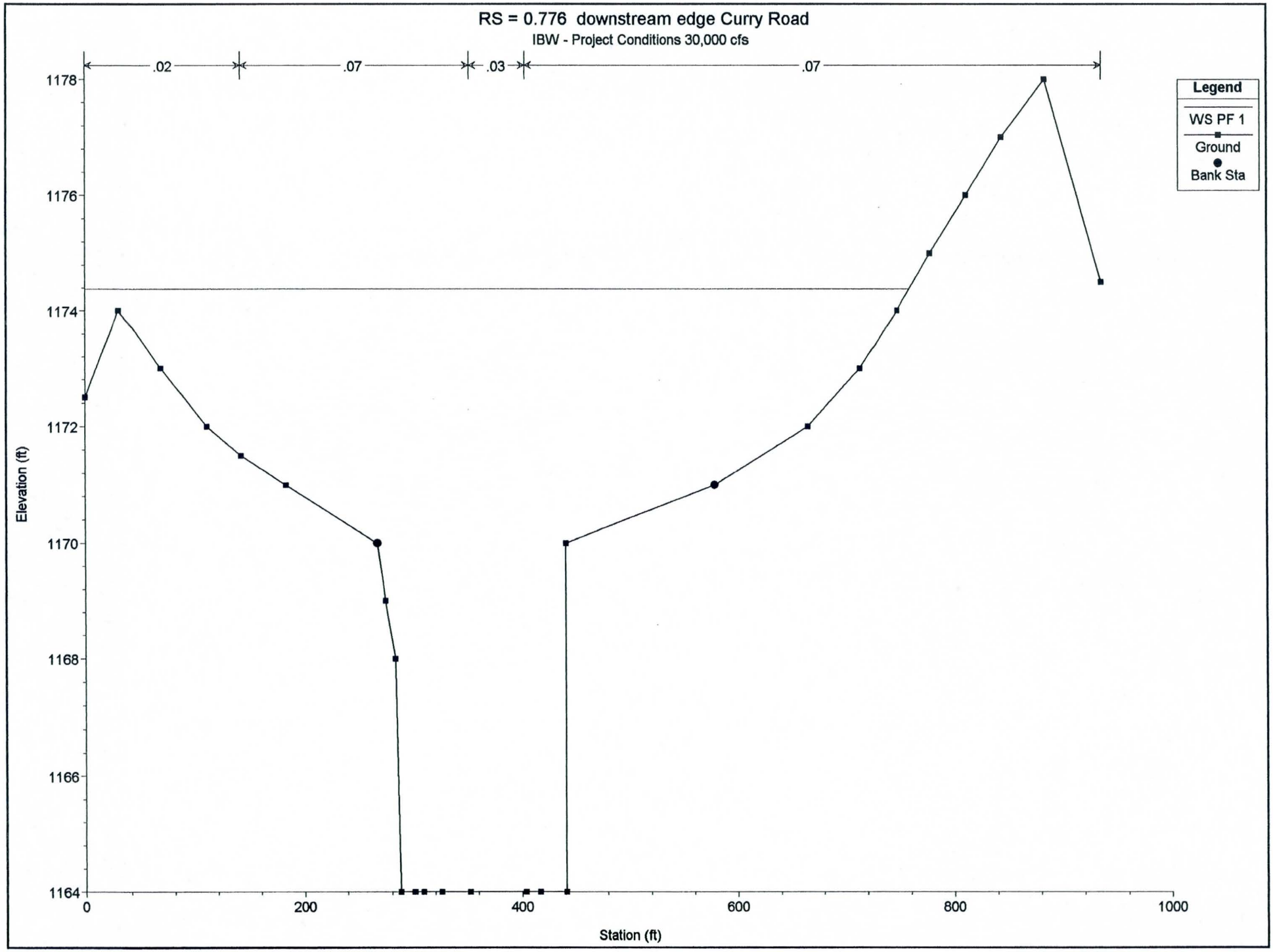

RS = 0.568 IBW - Project Conditions 30,000 cfs
.03
.07
.03
.07
.08
.03
.08
.07
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1174
1172
1170
1168
1166
1164
1162
1160
1158
0
100
200
300
400
500
600
700
800
Station (ft)

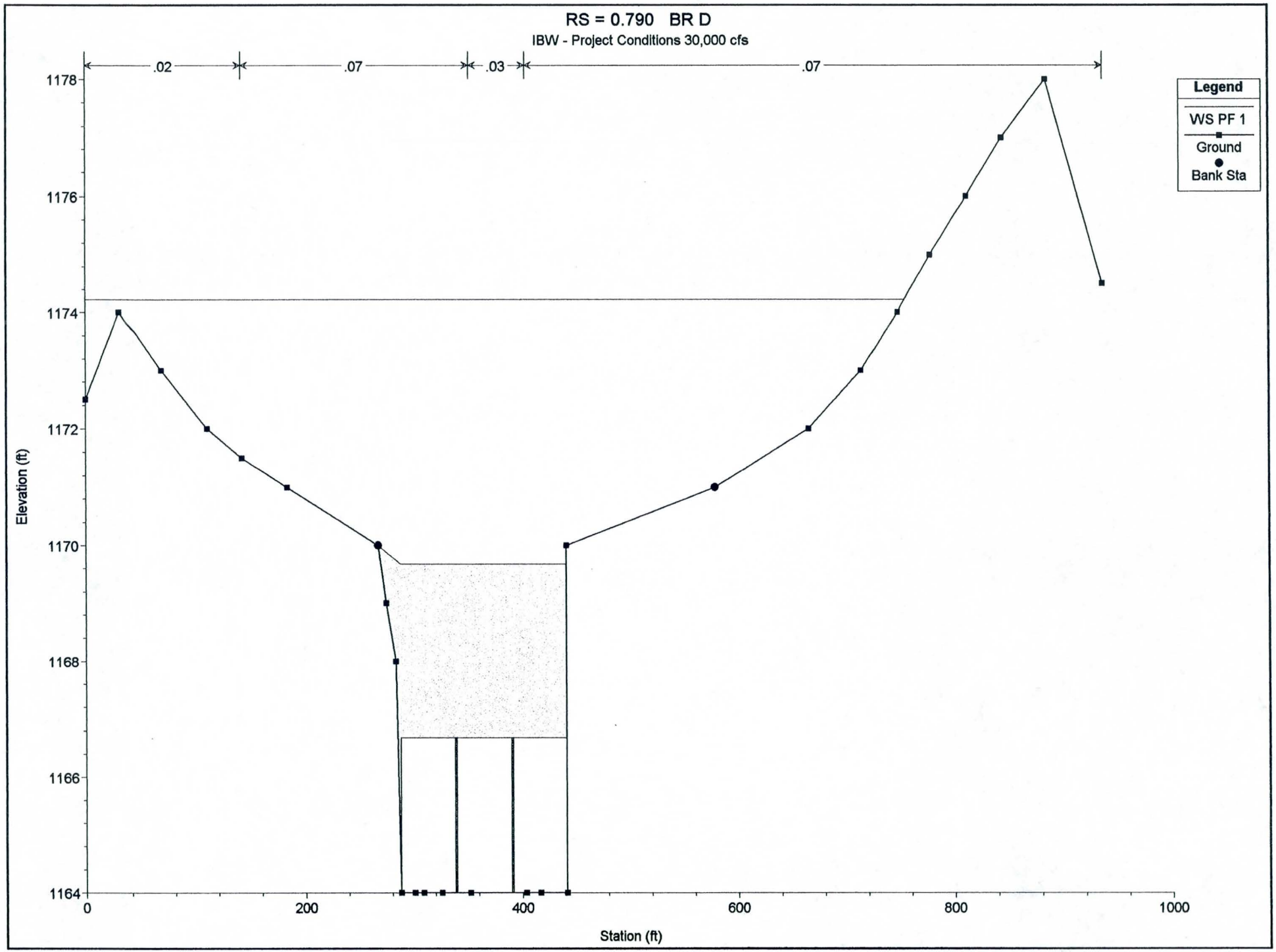

RS = 0.614 IBW - Project Conditions 30,000 cfs
.03
.07
.03
.07
.08
.03
.08
.07
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1174
1172
1170
1168
1166
1164
1162
1160
1158
0
100
200
300
400
500
600
700
Station (ft)

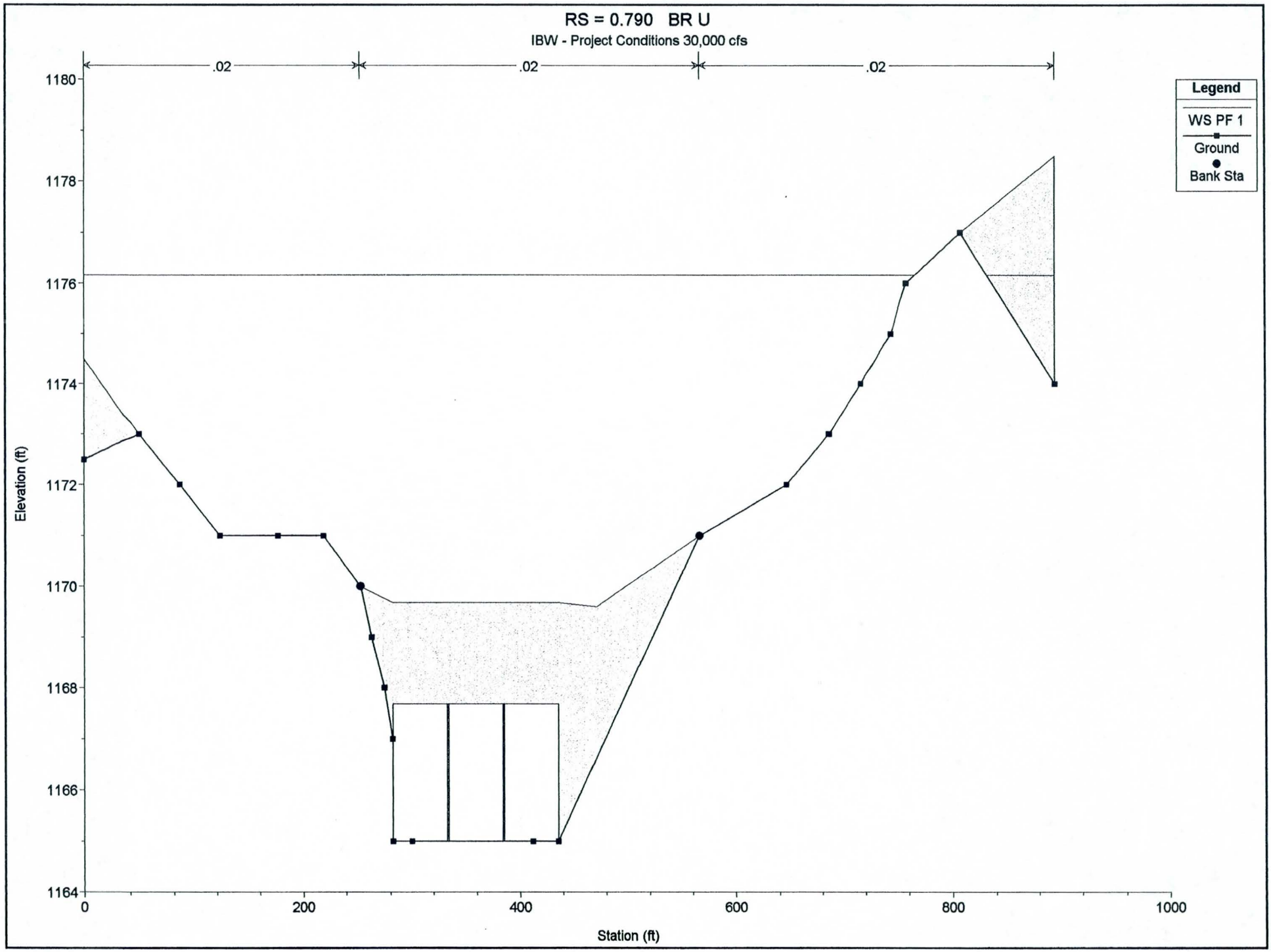

RS = 0.663 IBW - Project Conditions 30,000 cfs
.03
.07
.03
.07
.08
.03
.08
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1176
1174
1172
1170
1168
1166
1164
1162
1160
0
100
200
300
400
500
600
700
Station (ft)

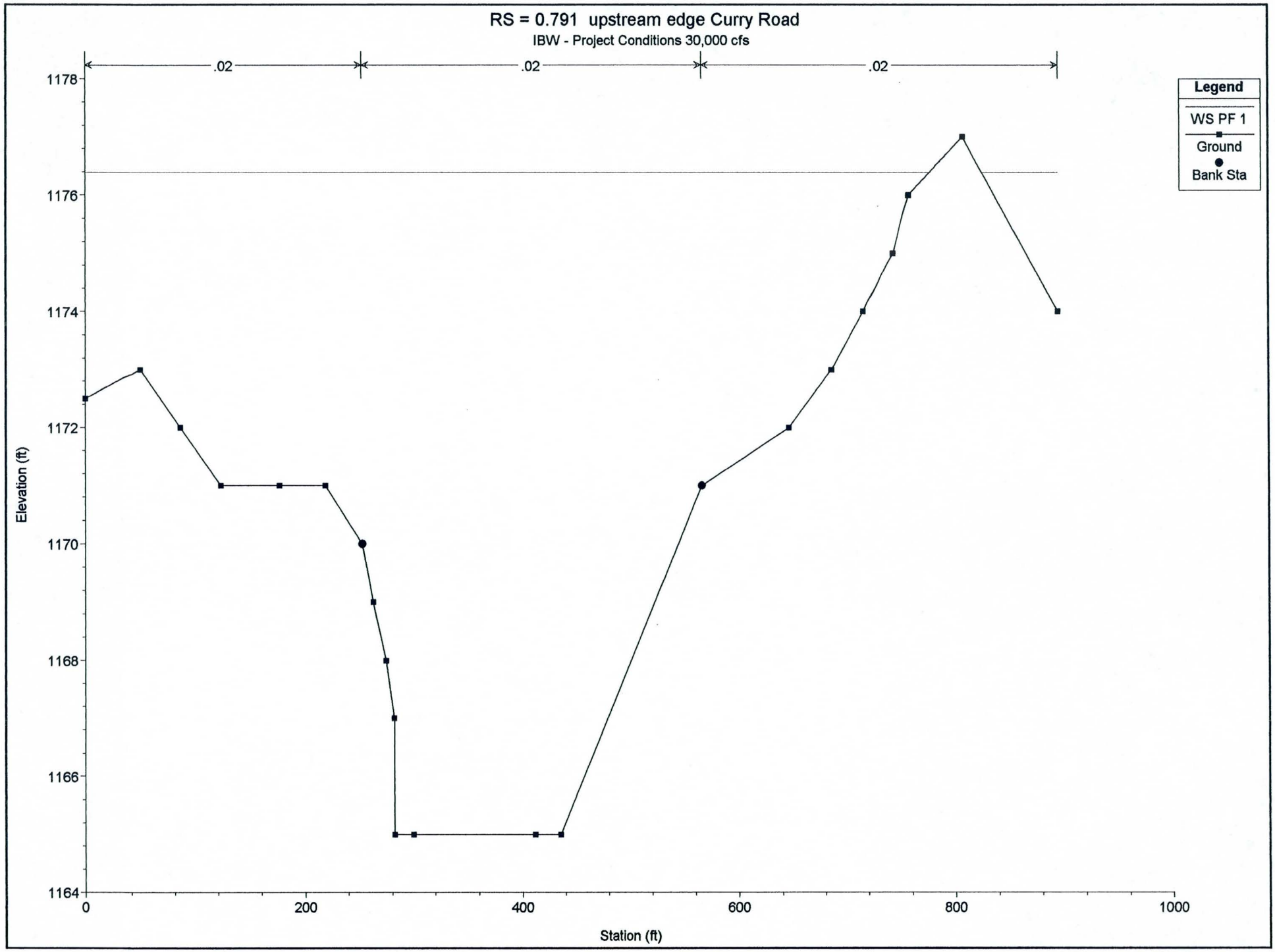

RS = 0.707 IBW - Project Conditions 30,000 cfs
.035
.07
.03
.07
.08
.03
.08
.07
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1176
1174
1172
1170
1168
1166
1164
1162
1160
0
100
200
300
400
500
600
700
Station (ft)

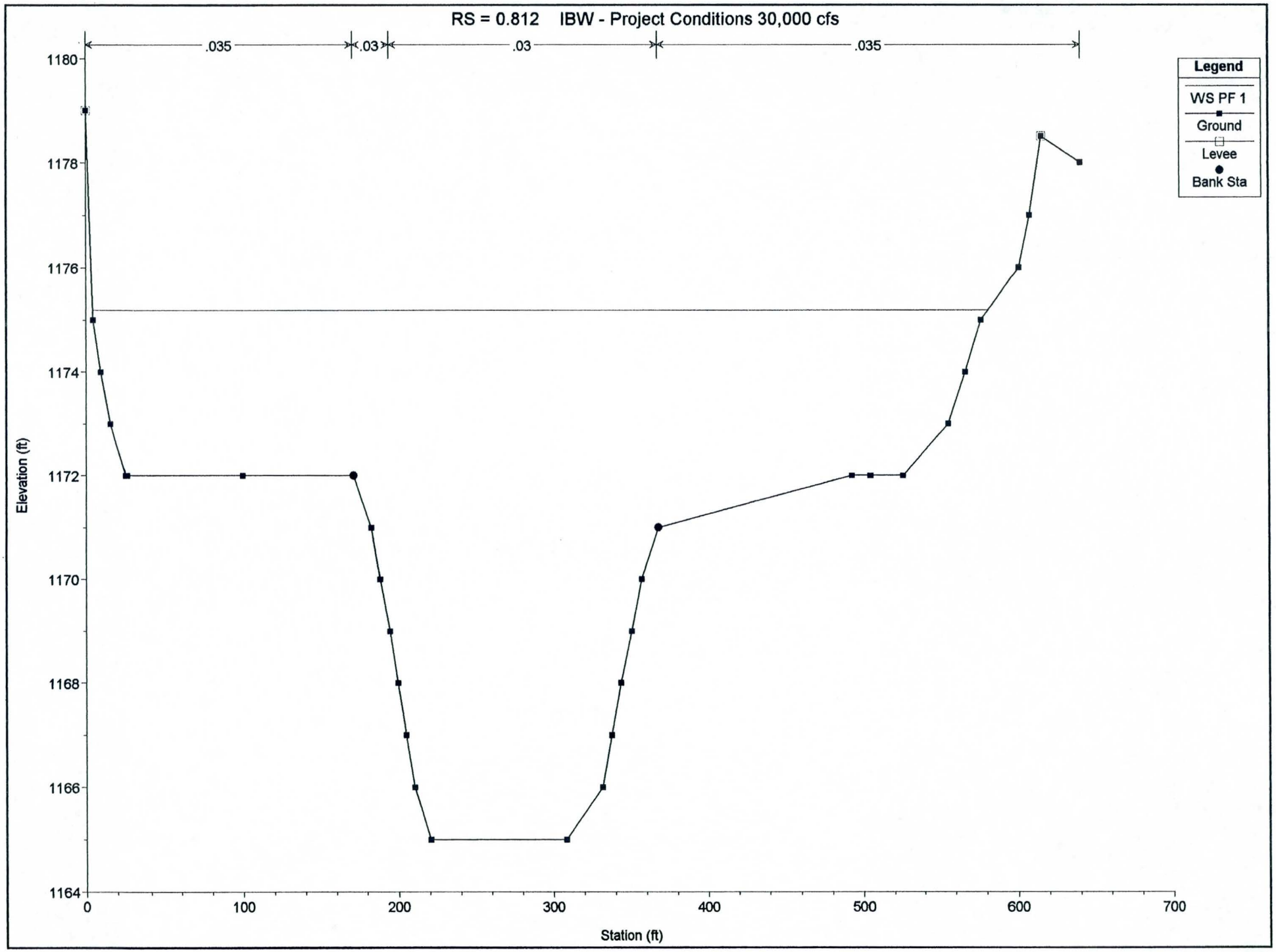

RS = 0.758 IBW - Project Conditions 30,000 cfs
.035
.07
.03
.07
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1178
1176
1174
1172
1170
1168
1166
1164
1162
1160
0
100
200
300
400
500
600
700
Station (ft)

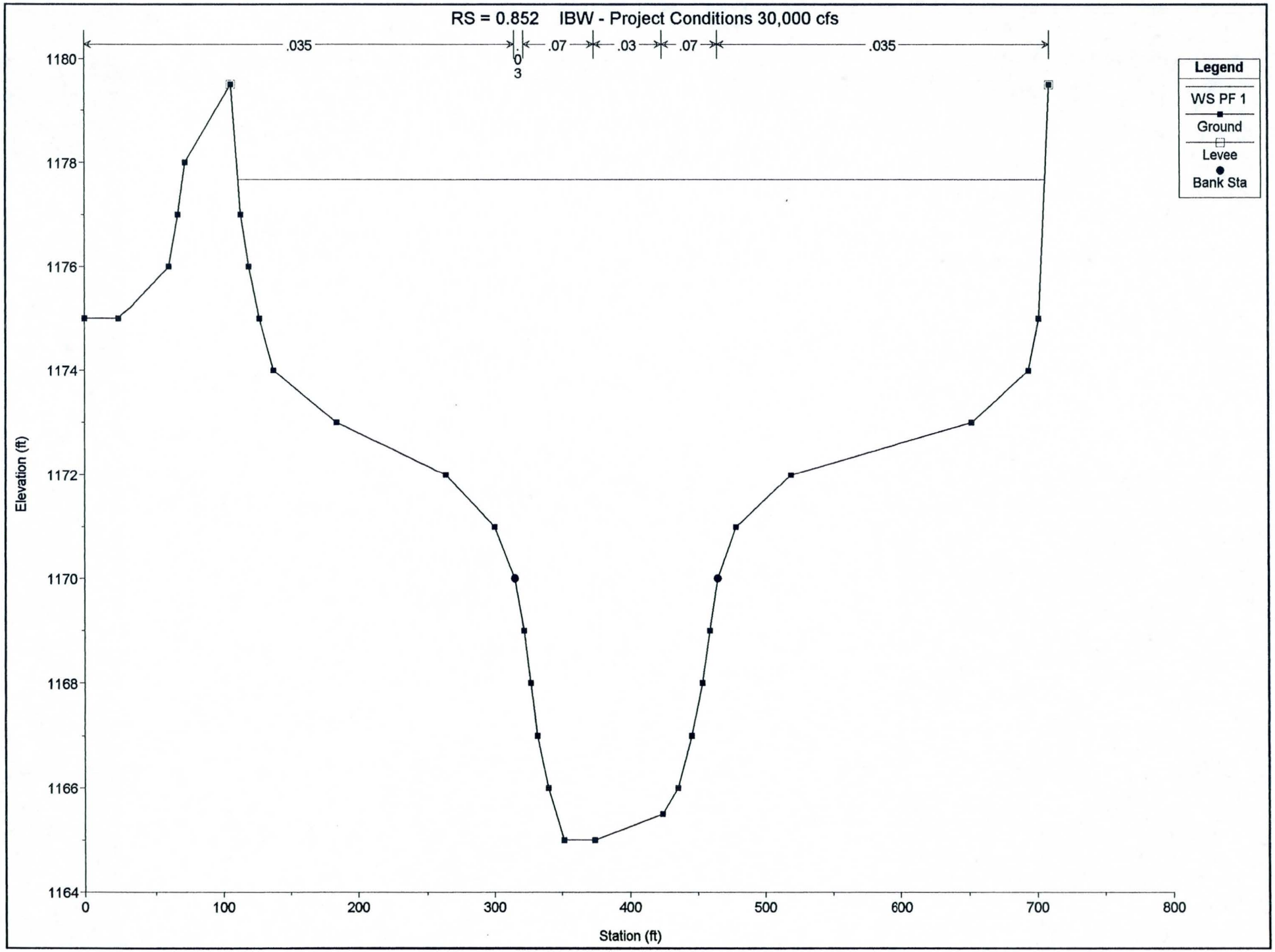

RS = 0.776 downstream edge Curry Road
IBW - Project Conditions 30,000 cfs
.02
.07
.03
.07
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1178
1176
1174
1172
1170
1168
1166
1164
0
200
400
600
800
1000
Station (ft)

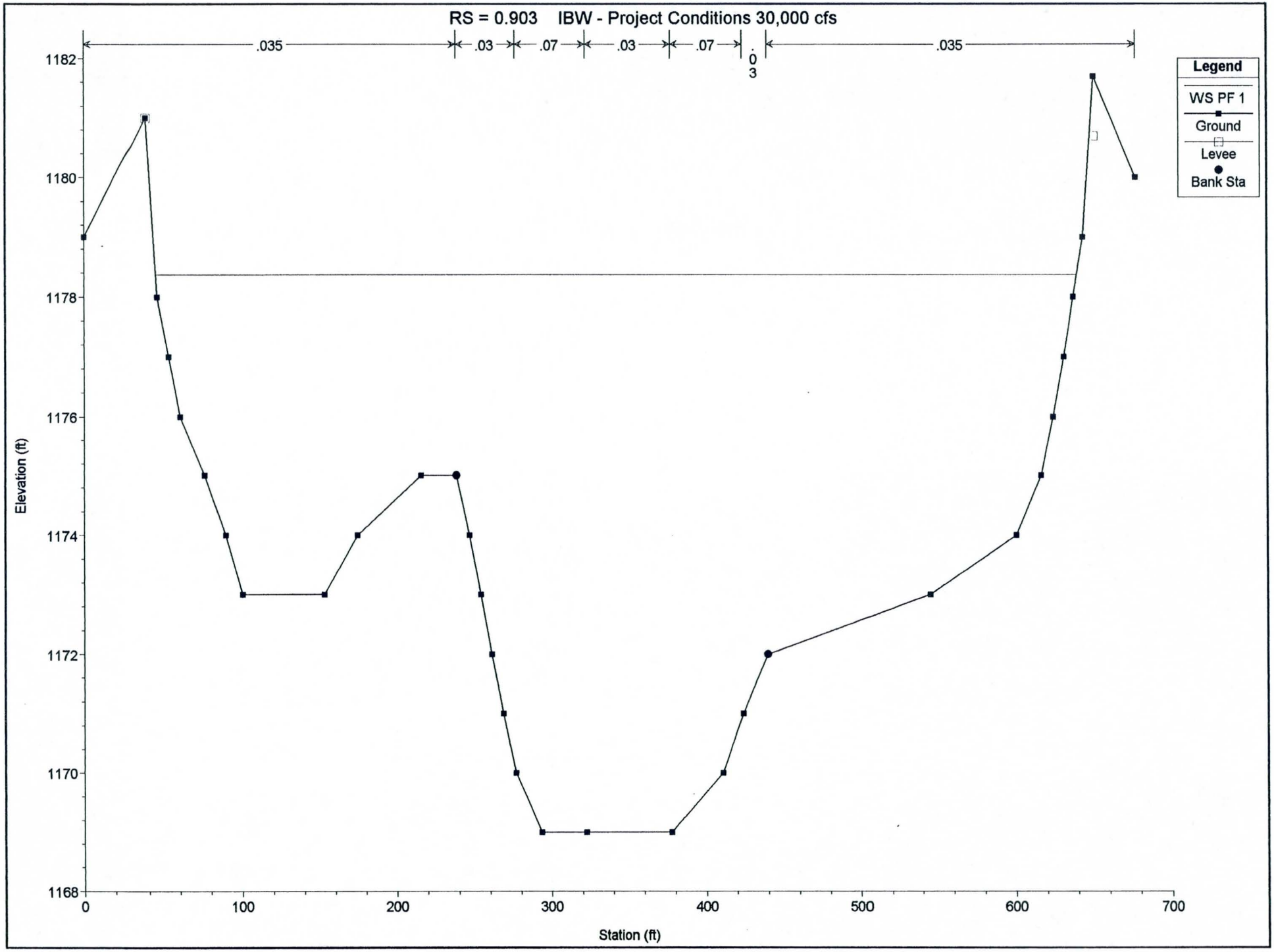

RS = 0.790 BR D
IBW - Project Conditions 30,000 cfs
.02
.07
.03
.07
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1178
1176
1174
1172
1170
1168
1166
1164
0
200
400
600
800
1000
Station (ft)

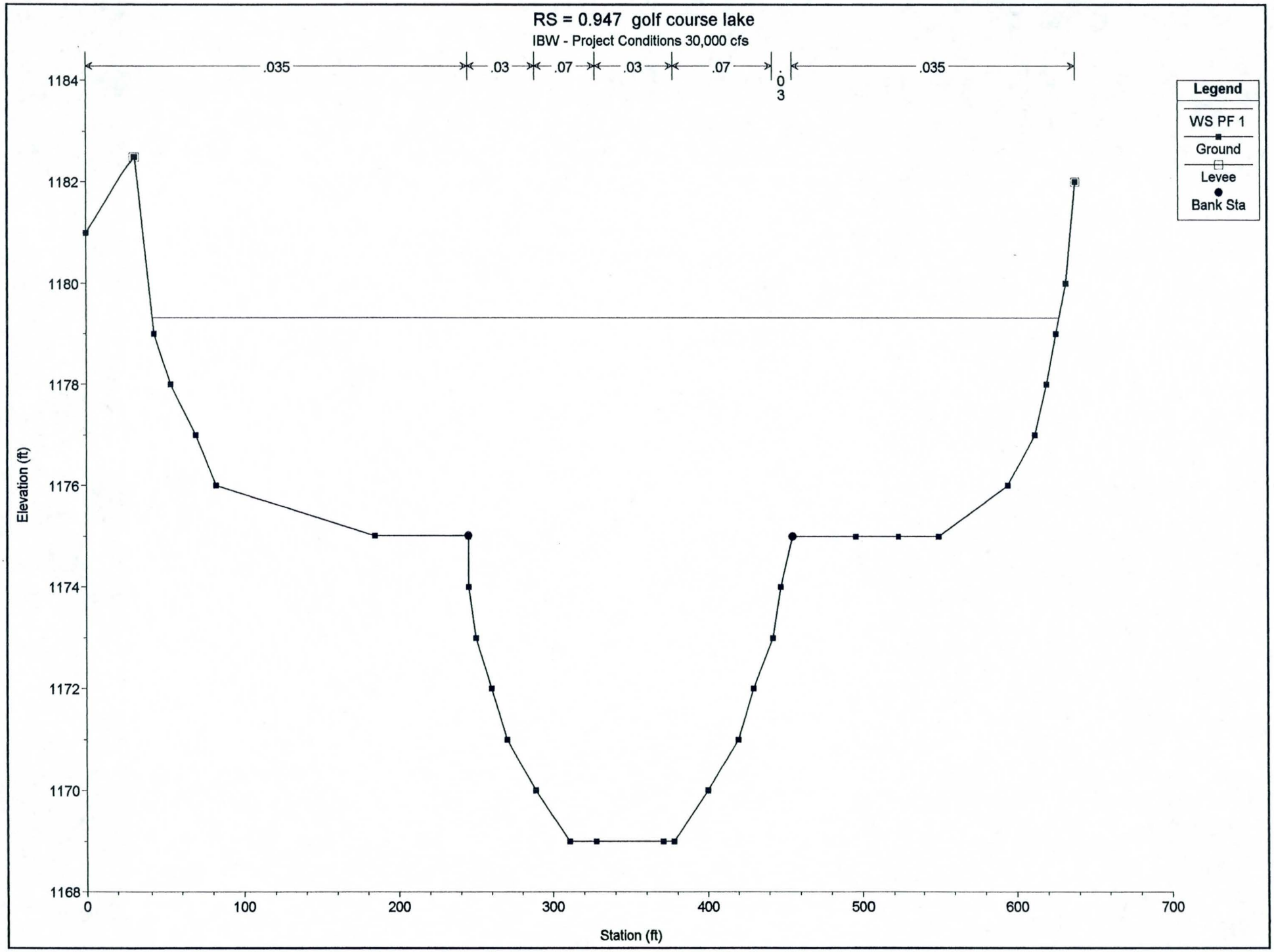

RS = 0.790 BR U
IBW - Project Conditions 30,000 cfs
.02
.02
.02
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1180
1178
1176
1174
1172
1170
1168
1166
1164
0
200
400
600
800
1000
Station (ft)

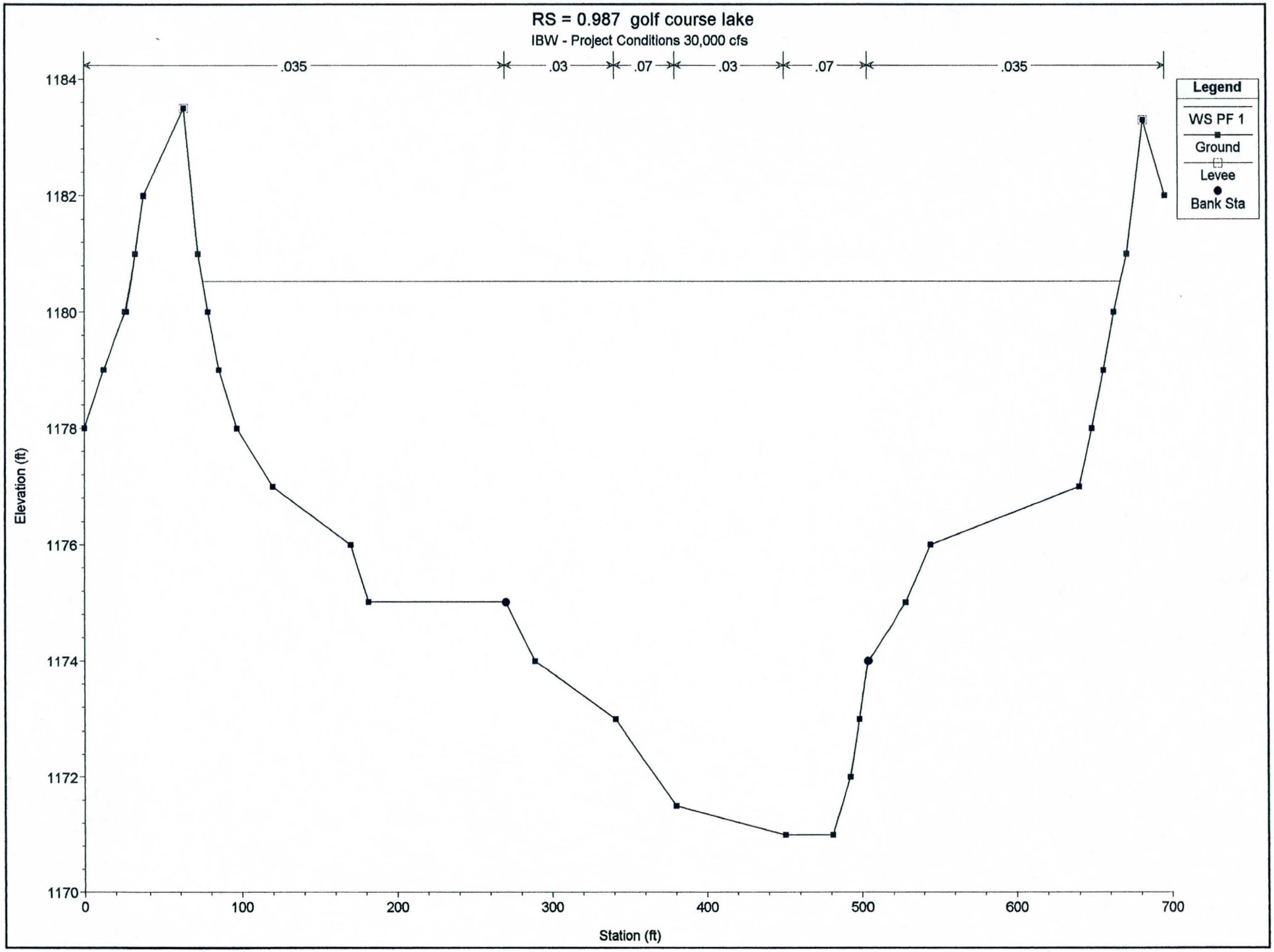

RS = 0.791 upstream edge Curry Road
IBW - Project Conditions 30,000 cfs
.02
.02
.02
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1178
1176
1174
1172
1170
1168
1166
1164
0
200
400
600
800
1000
Station (ft)

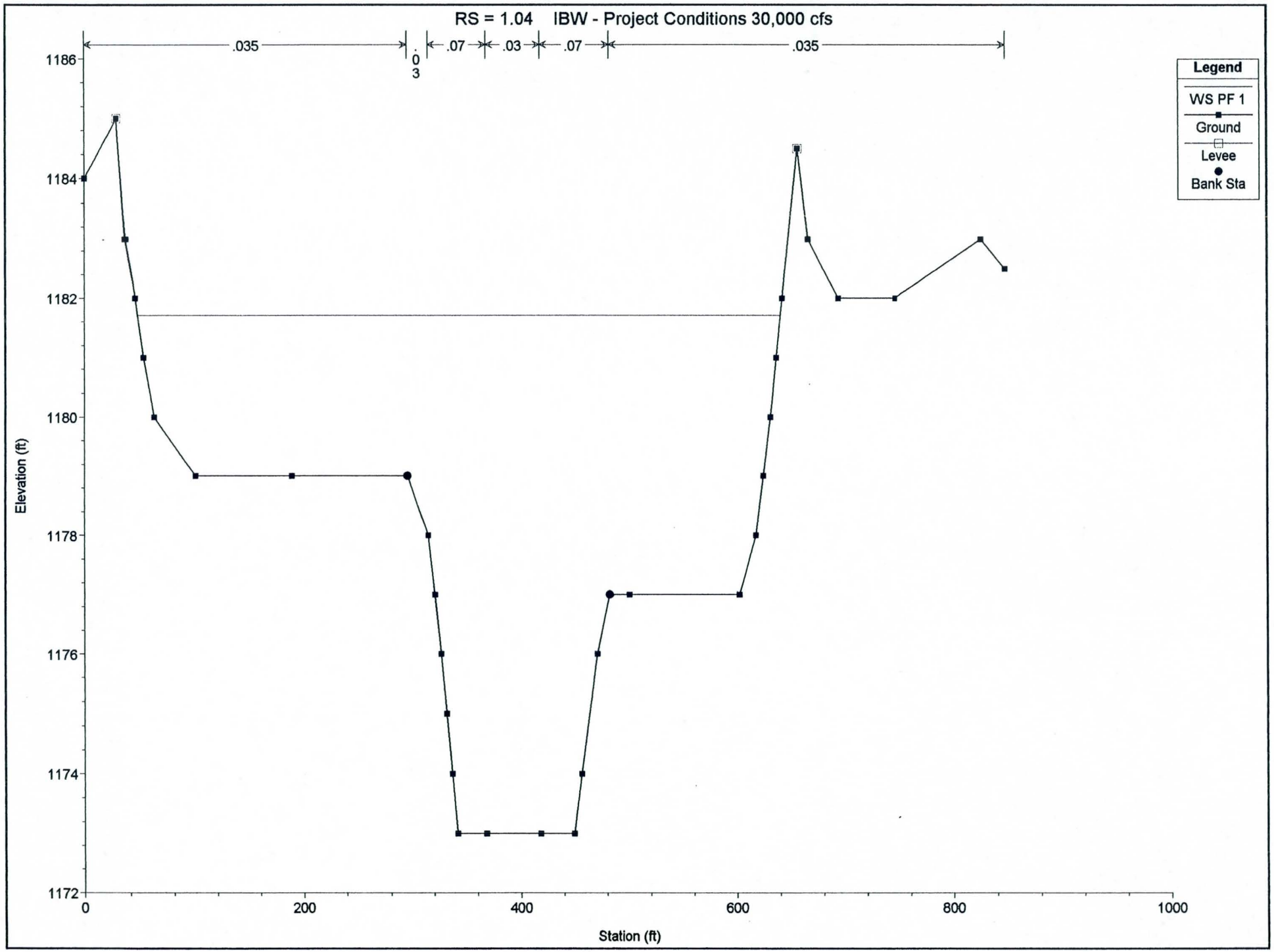

RS = 0.812 IBW - Project Conditions 30,000 cfs
.035
.03
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1180
1178
1176
1174
1172
1170
1168
1166
1164
0
100
200
300
400
500
600
700
Station (ft)

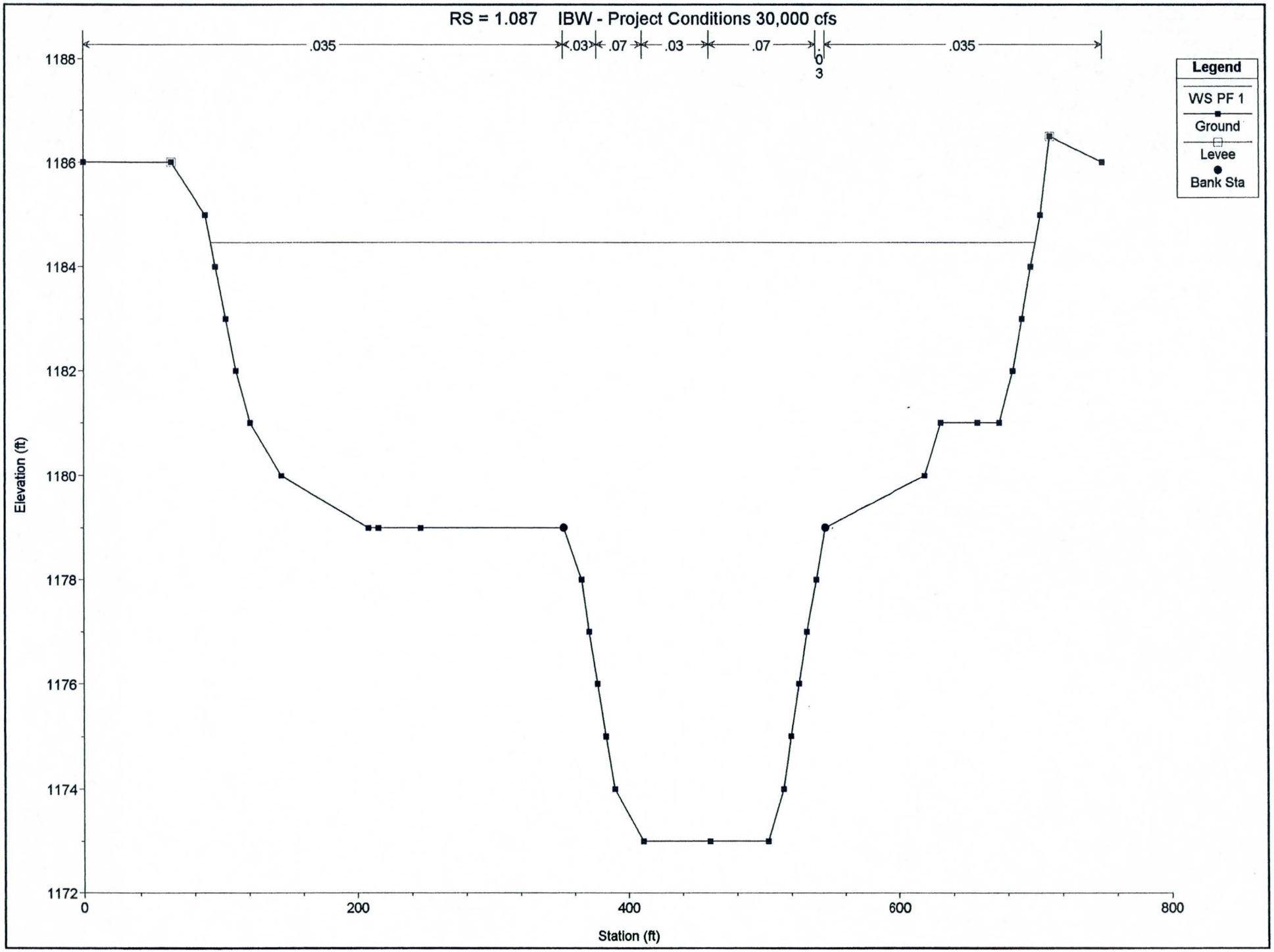

RS = 0.852 IBW - Project Conditions 30,000 cfs
.035
.07
.03
.07
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
1180
1178
1176
1174
1172
1170
1168
1166
1164
0
100
200
300
400
500
600
700
800

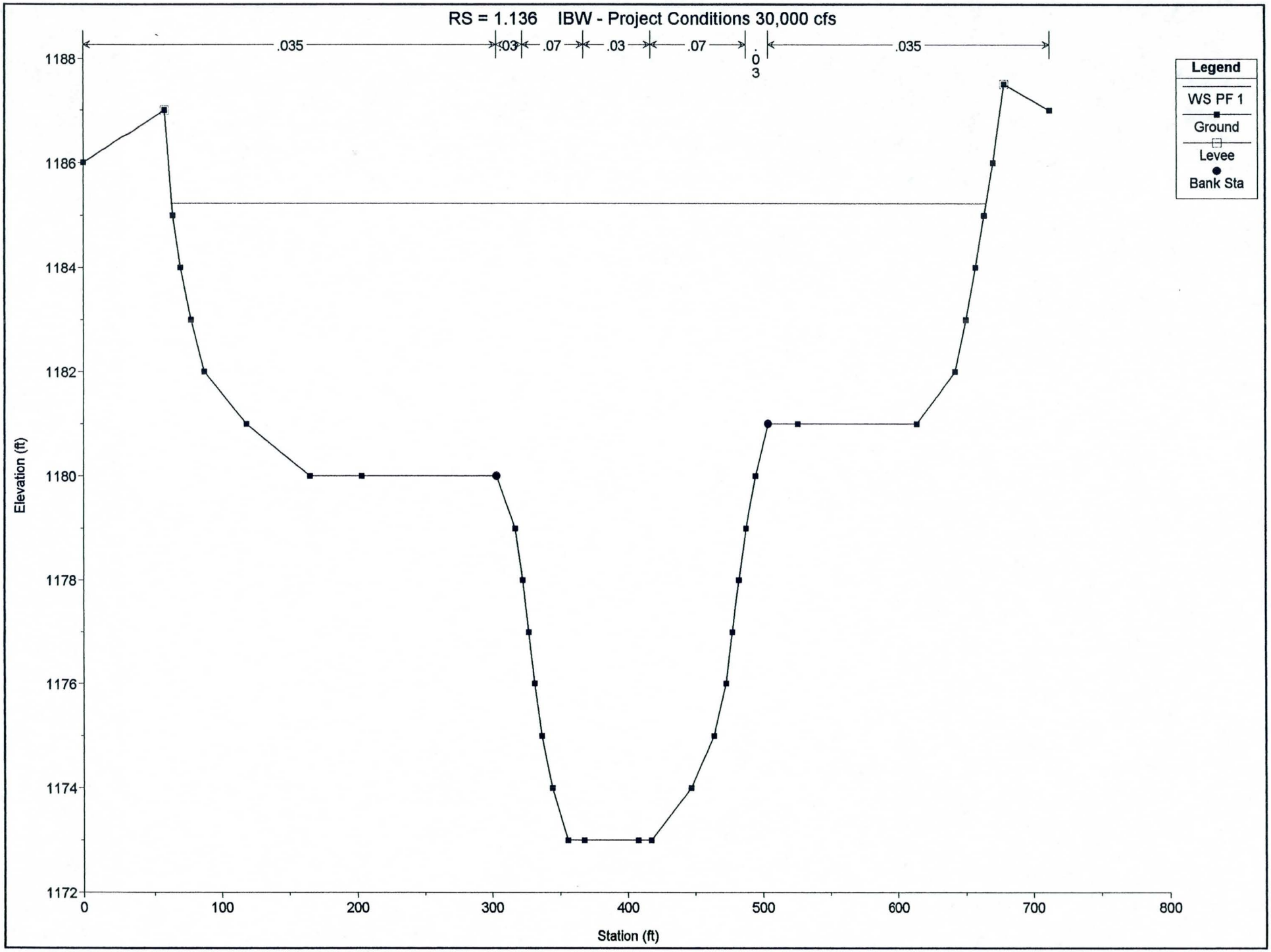

RS = 0.903 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1182
1180
1178
1176
1174
1172
1170
1168
0
100
200
300
400
500
600
700
Station (ft)

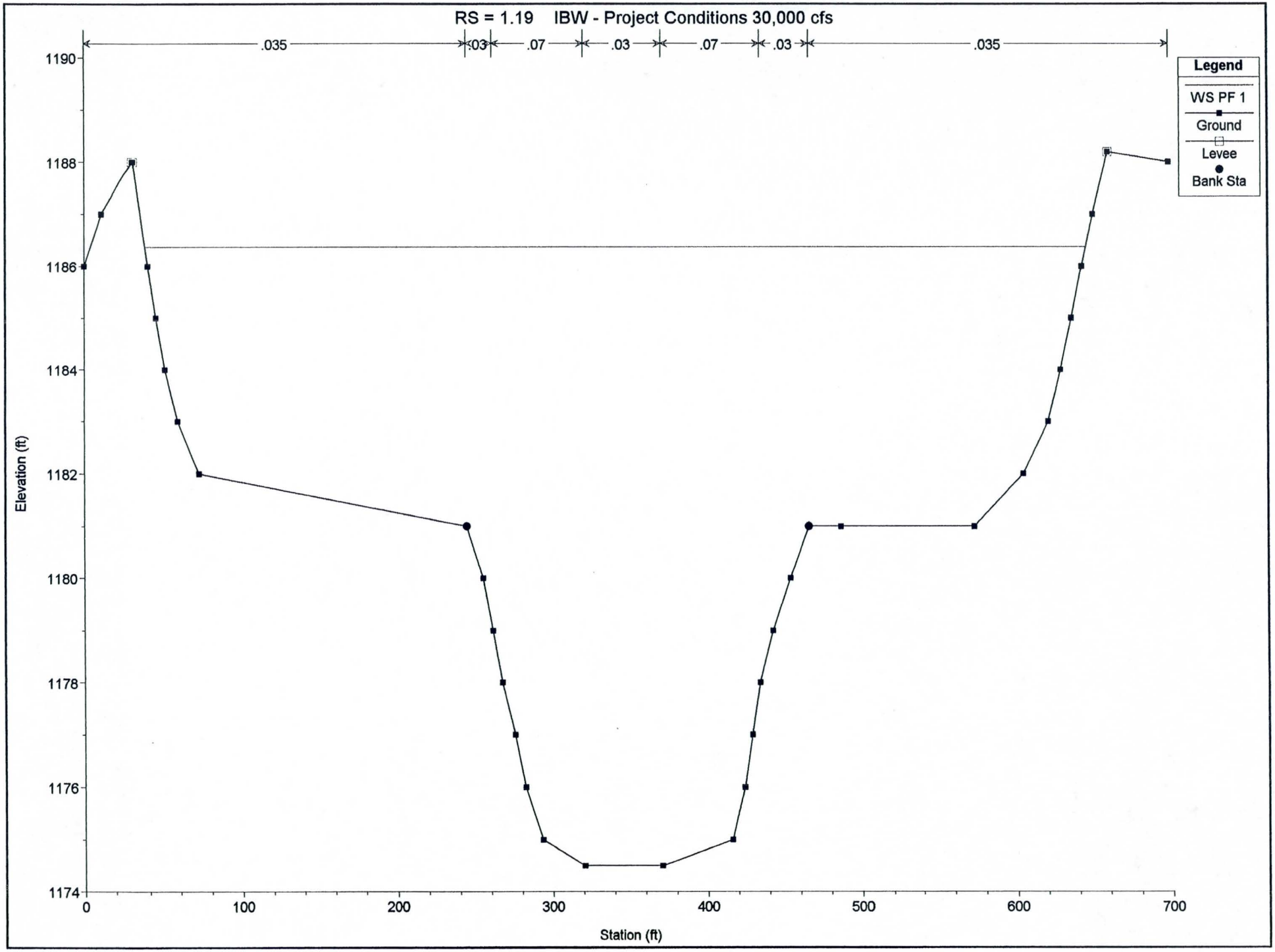

RS = 0.947 golf course lake
IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1184
1182
1180
1178
1176
1174
1172
1170
1168
0
100
200
300
400
500
600
700
Station (ft)

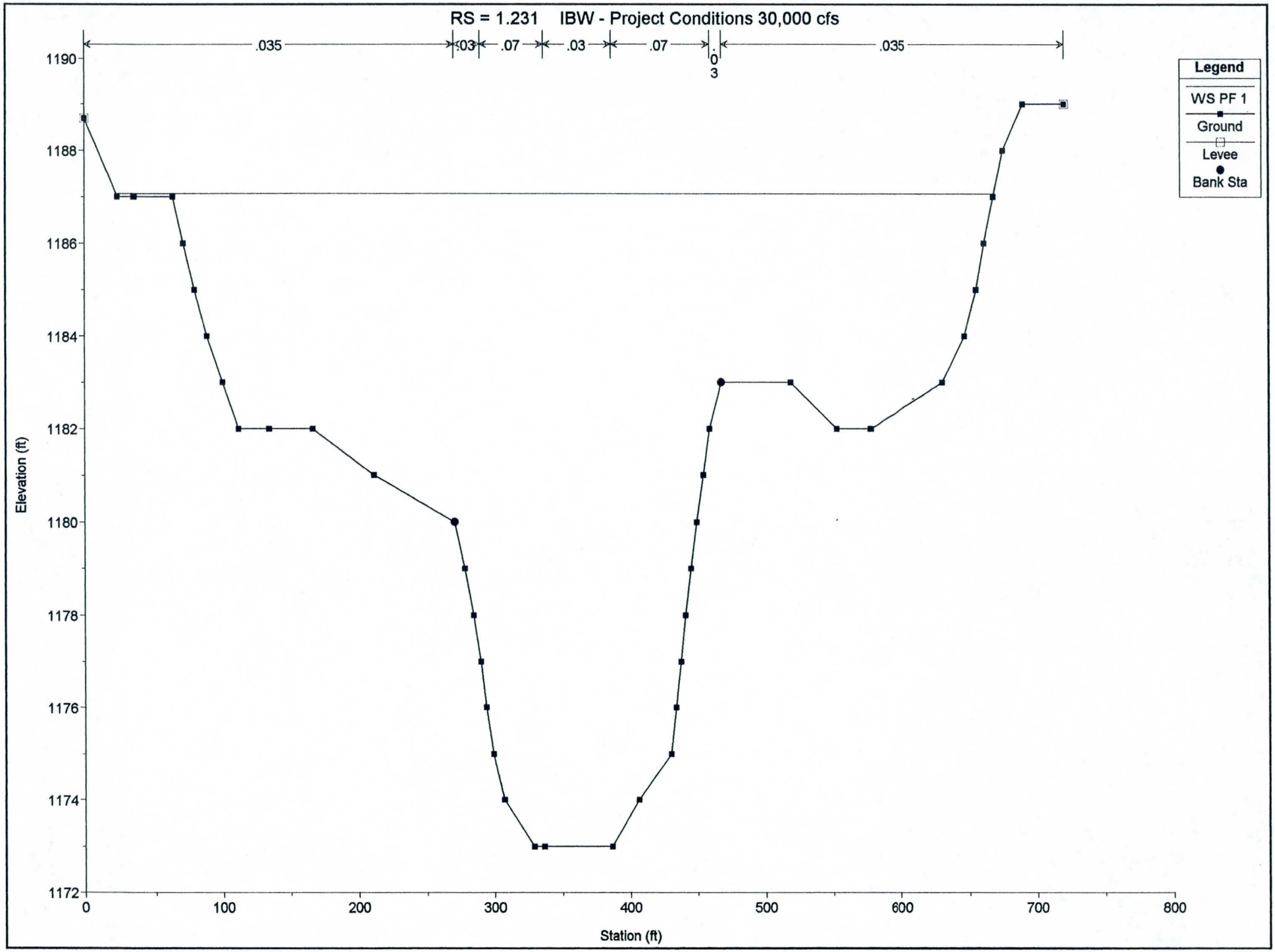

RS = 0.987 golf course lake
IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1184
1182
1180
1178
1176
1174
1172
1170
0
100
200
300
400
500
600
700
Station (ft)

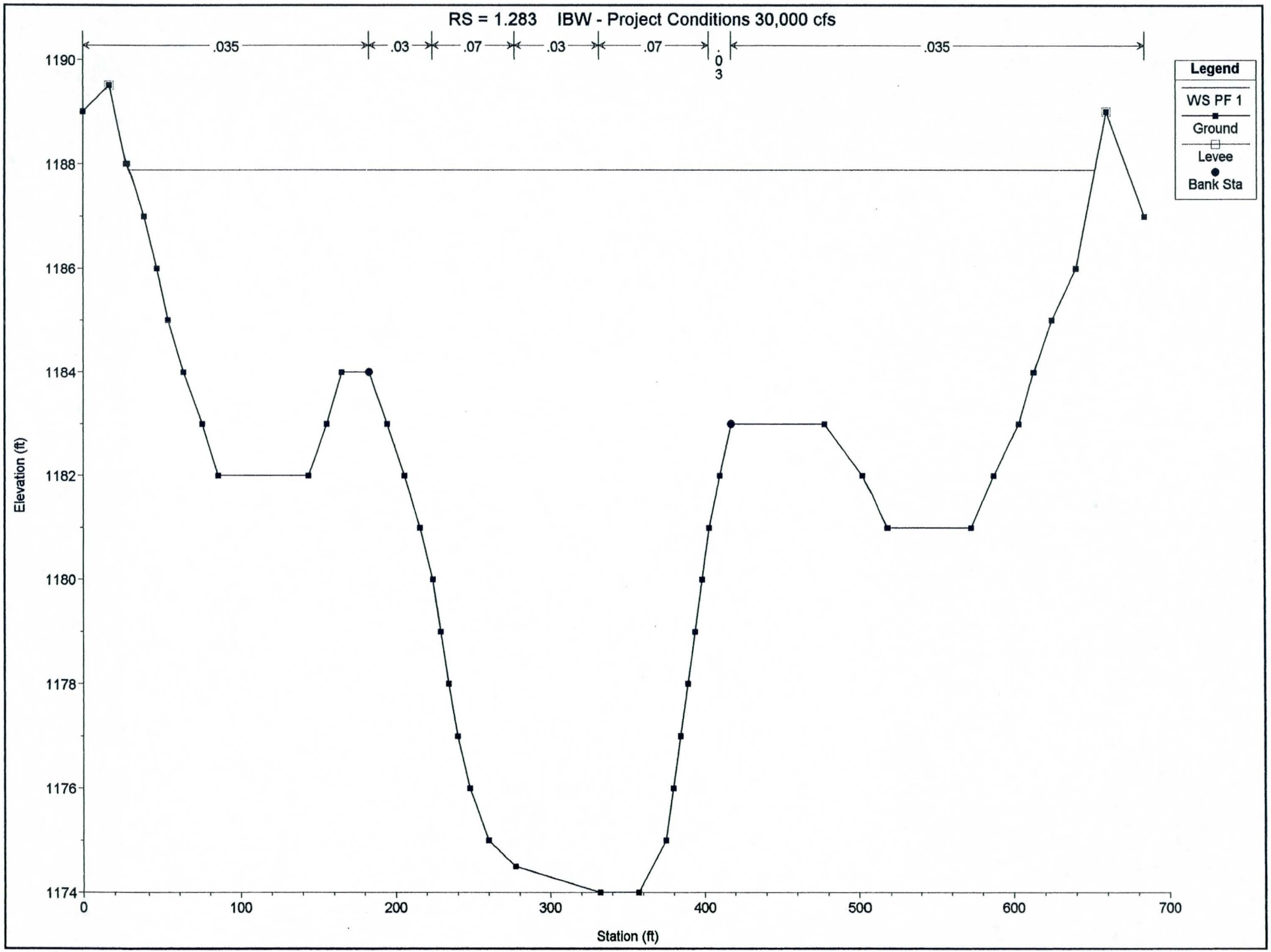

RS = 1.04 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1186
1184
1182
1180
1178
1176
1174
1172
0
200
400
600
800
1000
Station (ft)

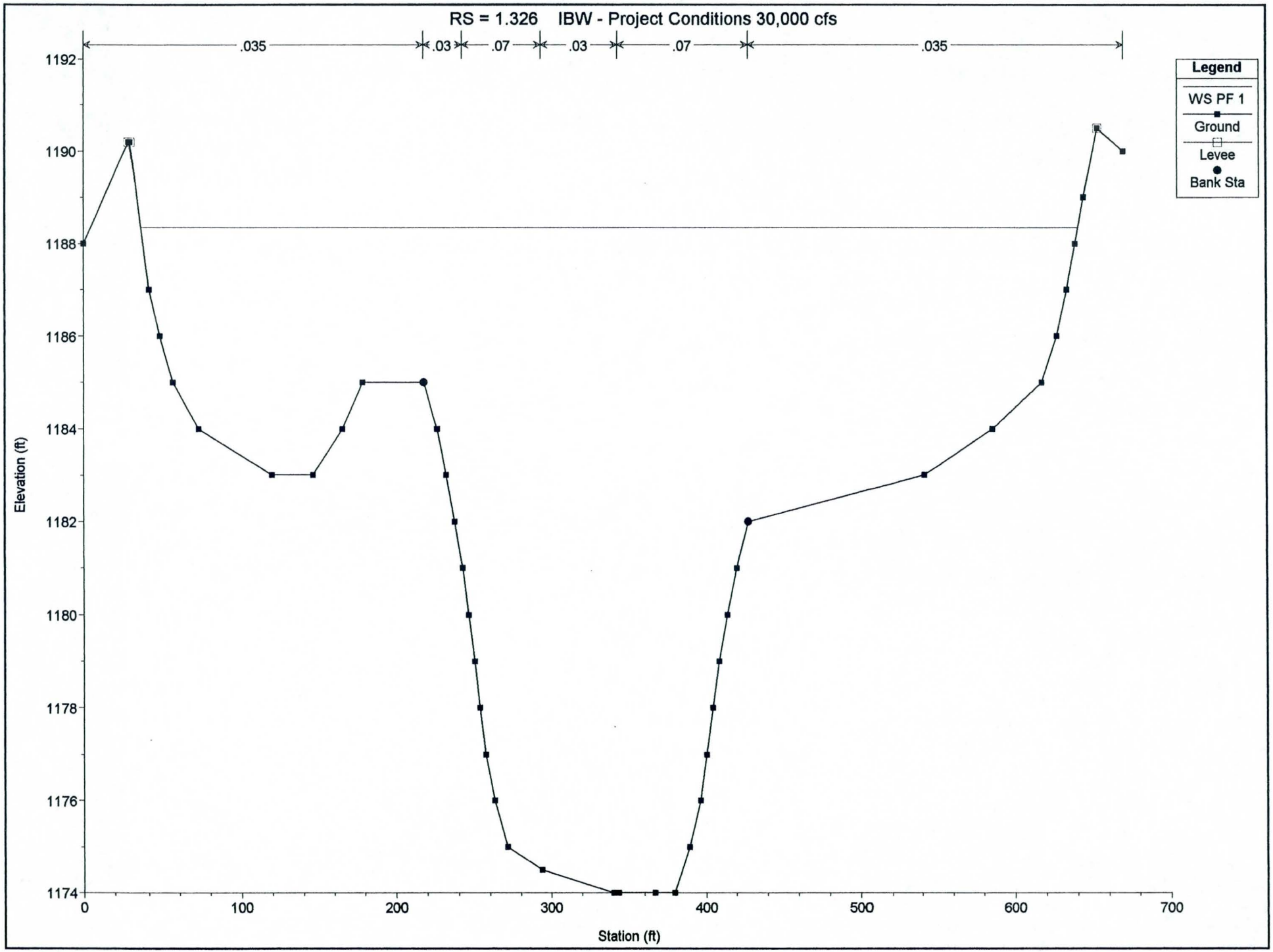

RS = 1.087 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1188
1186
1184
1182
1180
1178
1176
1174
1172
0
200
400
600
800
Station (ft)

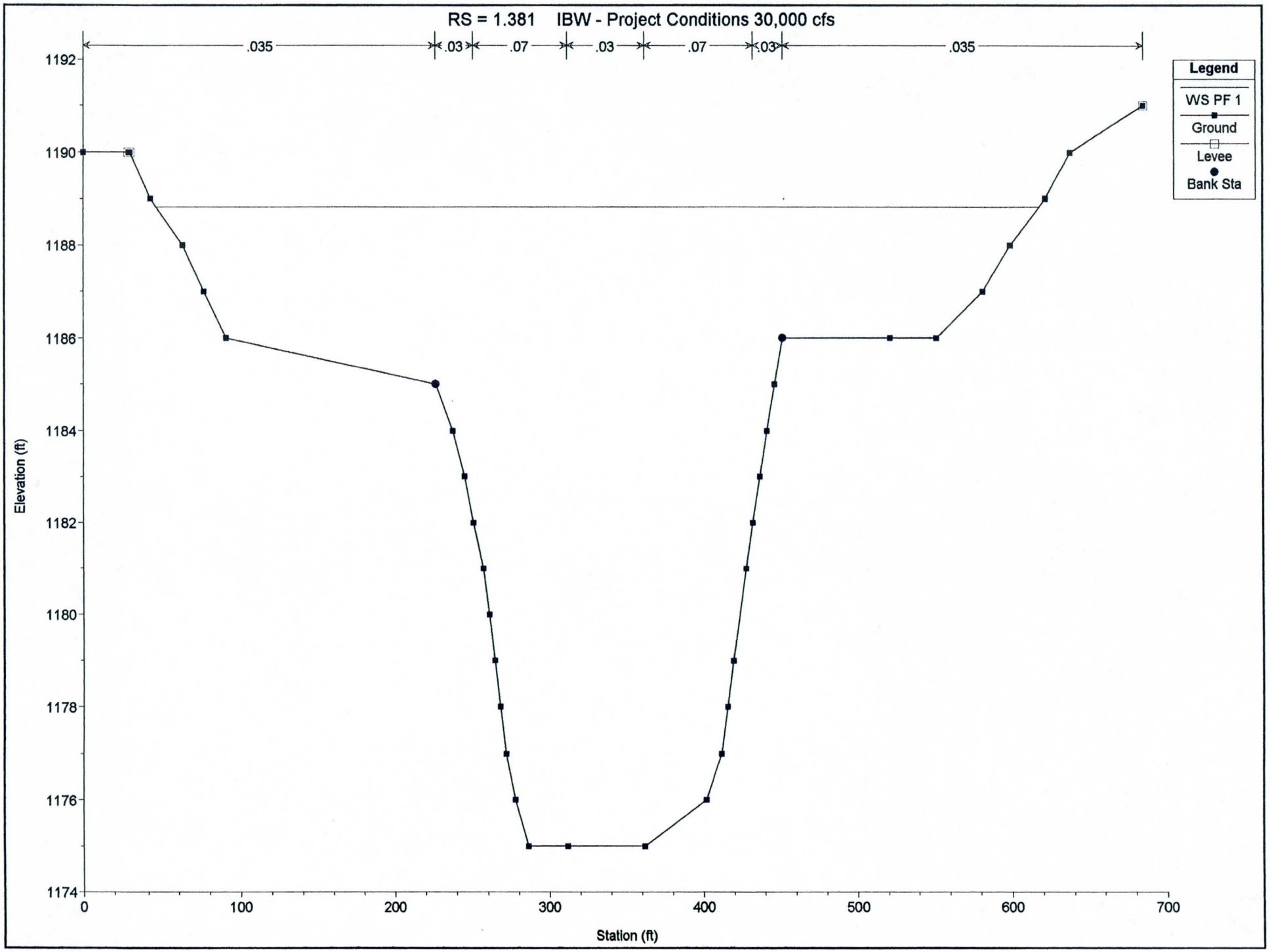

RS = 1.136 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1188
1186
1184
1182
1180
1178
1176
1174
1172
0
100
200
300
400
500
600
700
800
Station (ft)

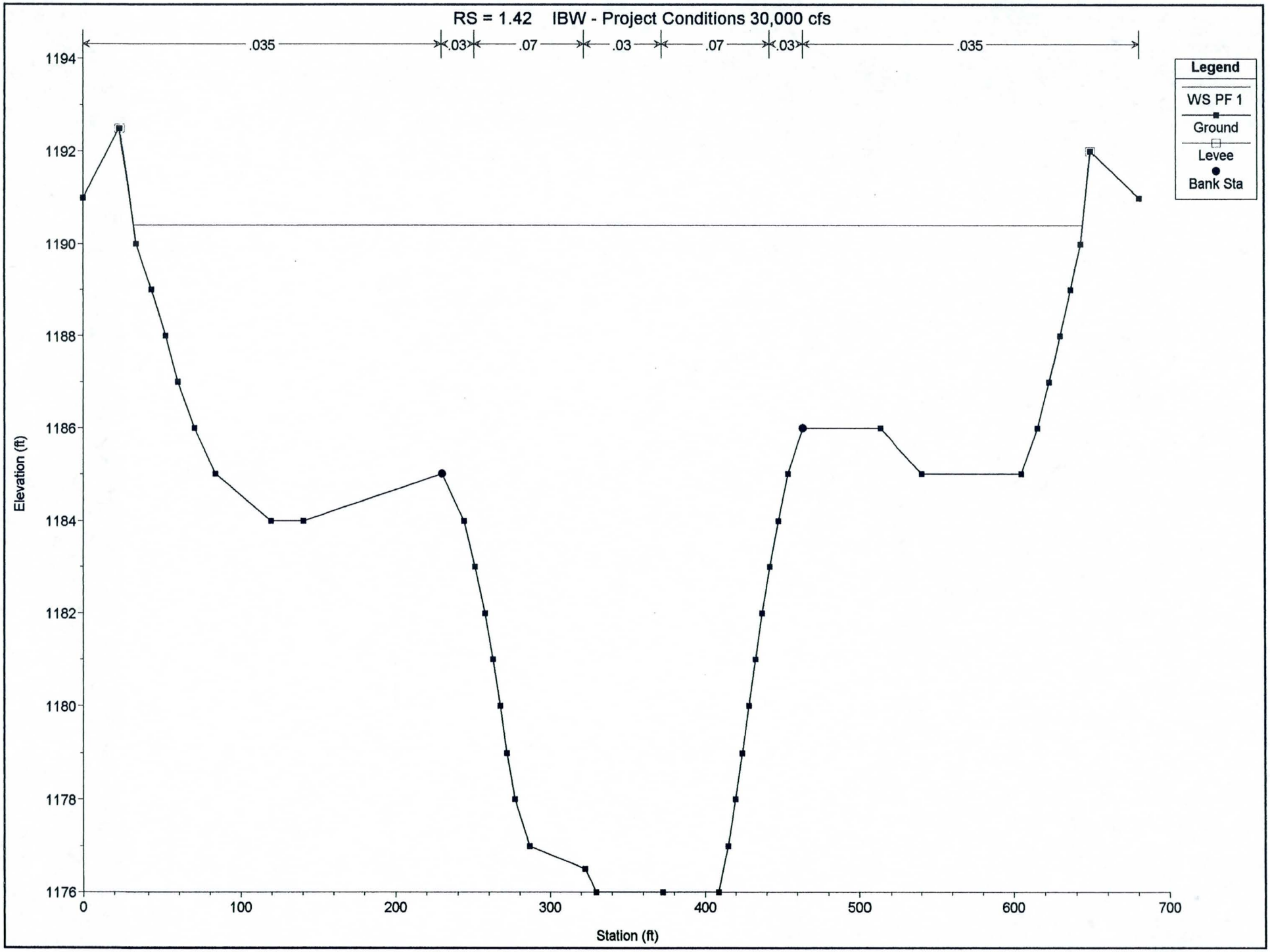

RS = 1.19 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1190
1188
1186
1184
1182
1180
1178
1176
1174
0
100
200
300
400
500
600
700
Station (ft)

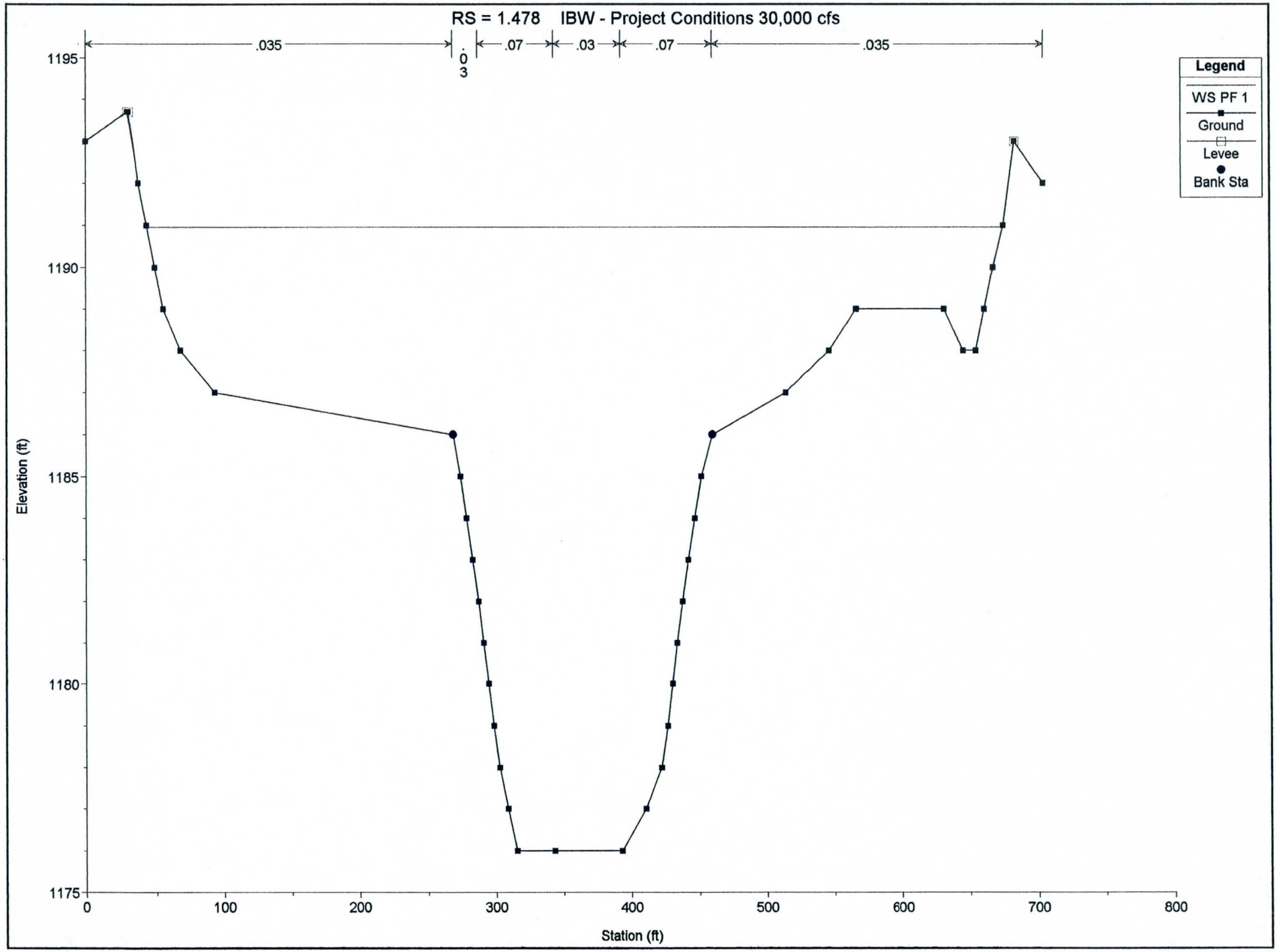

RS = 1.231 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1190
1188
1186
1184
1182
1180
1178
1176
1174
1172
0
100
200
300
400
500
600
700
800
Station (ft)

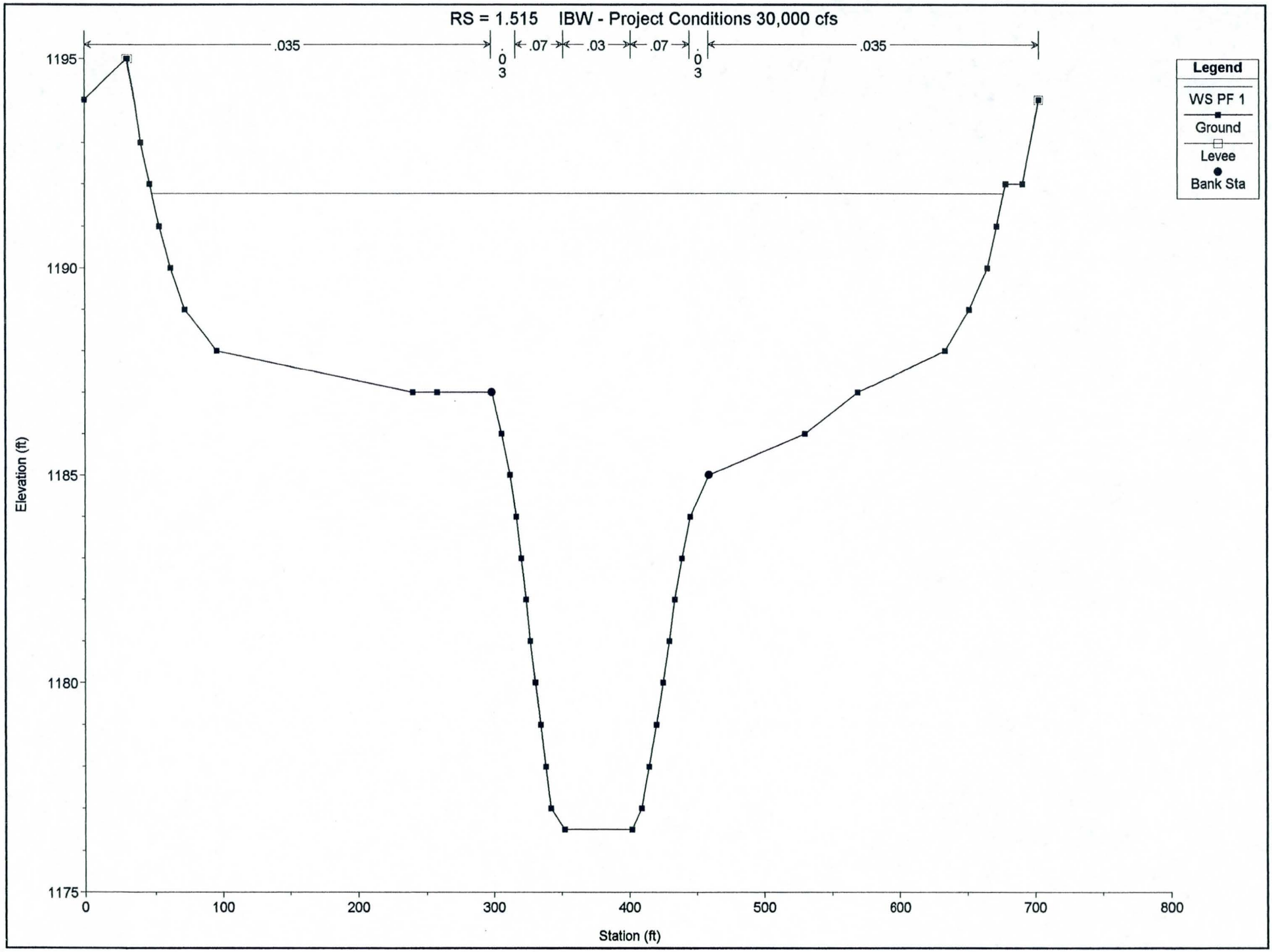

RS = 1.283 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1190
1188
1186
1184
1182
1180
1178
1176
1174
0
100
200
300
400
500
600
700
Station (ft)

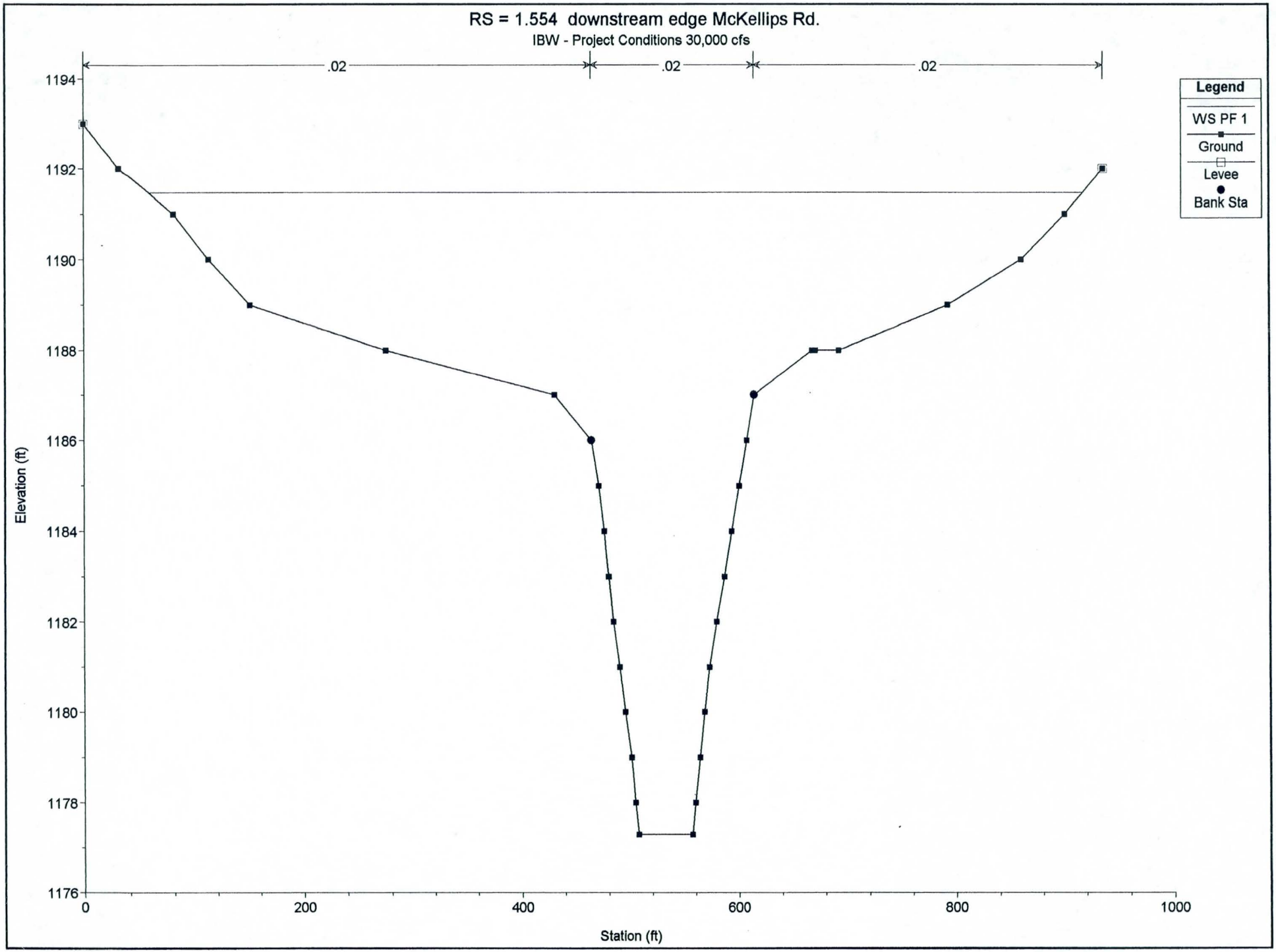

RS = 1.326 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1192
1190
1188
1186
1184
1182
1180
1178
1176
1174
0
100
200
300
400
500
600
700
Station (ft)


RS = 1.381 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1192
1190
1188
1186
1184
1182
1180
1178
1176
1174
0
100
200
300
400
500
600
700
Station (ft)


RS = 1.42 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1194
1192
1190
1188
1186
1184
1182
1180
1178
1176
0
100
200
300
400
500
600
700
Station (ft)

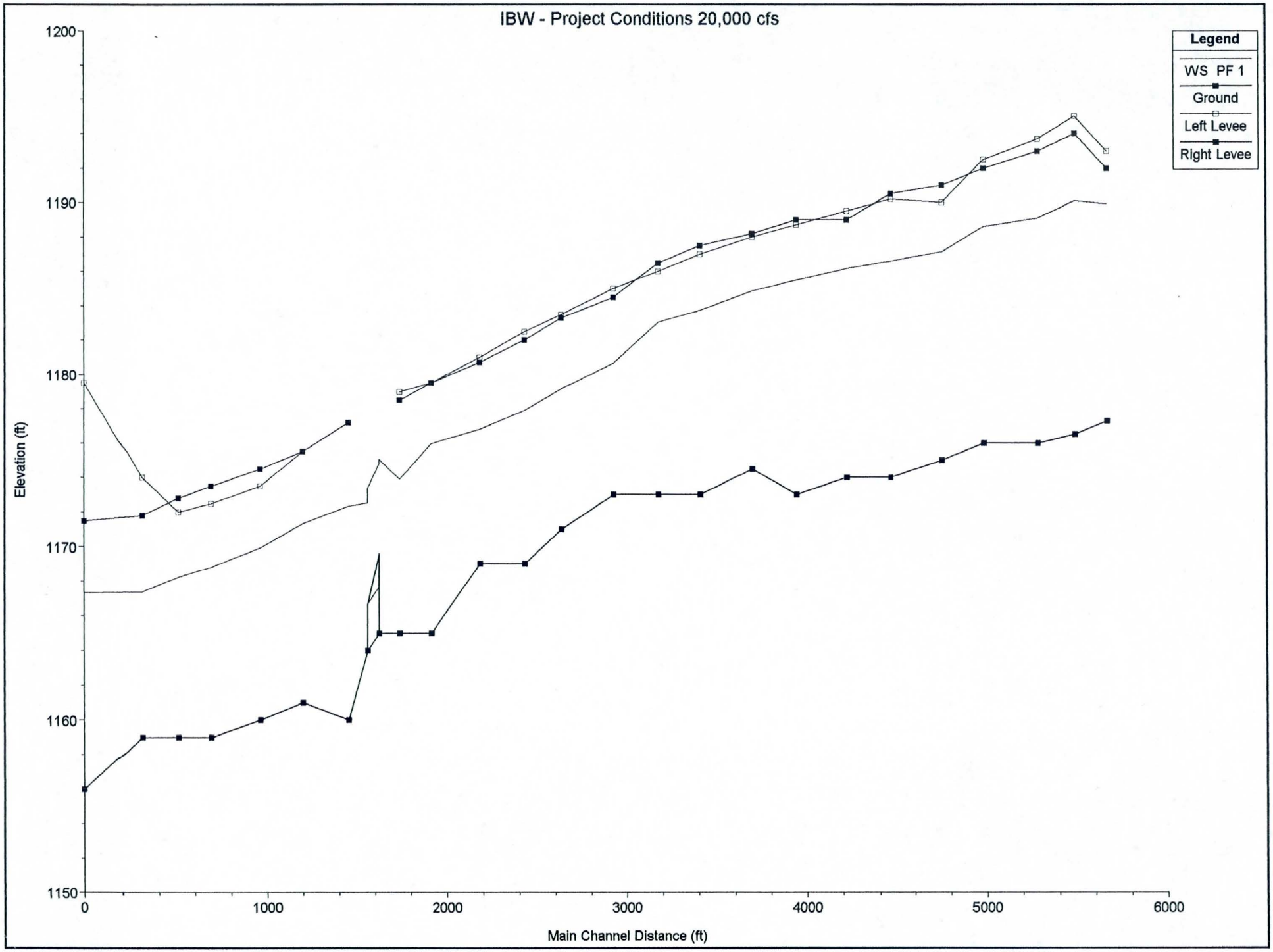

RS = 1.478 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1195
1190
1185
1180
1175
Station (ft)
0
100
200
300
400
500
600
700
800


RS = 1.515 IBW - Project Conditions 30,000 cfs
.035
.03
.07
.03
.07
.03
.035
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1195
1190
1185
1180
1175
0
100
200
300
400
500
600
700
800
Station (ft)


RS = 1.554 downstream edge McKellips Rd.
IBW - Project Conditions 30,000 cfs
.02
.02
.02
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
1194
1192
1190
1188
1186
1184
1182
1180
1178
1176
0
200
400
600
800
1000
Station (ft)

HEC-RAS Plan: 20-prop-3 River: Reach #1 Reach: Reach #1 Profile: PF 1

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	Levee El Left	Levee El Right	L. Levee Frbrd	R. Levee Frbrd
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(ft)	(ft)	(ft)	(ft)
Reach #1	1.554	20000.00	1177.29	1189.89	1189.89	1191.62	0.001284	11.62	2395.46	735.48	0.67	1193.00	1192.00	3.11	2.11
Reach #1	1.515	20000.00	1176.50	1190.10	1188.64	1190.92	0.003605	8.10	2927.38	604.67	0.44	1195.00	1194.00	4.90	3.90
Reach #1	1.478	20000.00	1176.00	1189.10	1185.42	1190.05	0.004536	8.30	2750.51	606.17	0.45	1193.70	1193.00	4.60	3.90
Reach #1	1.42	20000.00	1176.00	1188.62	1185.52	1189.18	0.001888	6.49	3507.22	588.07	0.36	1192.50	1192.00	3.88	3.38
Reach #1	1.381	20000.00	1175.00	1187.15	1183.70	1188.29	0.005551	8.85	2468.37	508.78	0.51	1190.00	1191.00	2.85	3.85
Reach #1	1.326	20000.00	1174.00	1186.62	1183.86	1187.30	0.002340	7.21	3229.41	587.46	0.40	1190.20	1190.50	3.58	3.88
Reach #1	1.283	20000.00	1174.00	1186.18	1183.63	1186.77	0.002000	6.73	3415.62	597.17	0.39	1189.50	1189.00	3.32	2.82
Reach #1	1.231	20000.00	1173.00	1185.50	1182.97	1186.17	0.002119	7.23	3265.68	582.86	0.40	1188.70	1189.00	3.20	3.50
Reach #1	1.19	20000.00	1174.50	1184.85	1183.03	1185.56	0.002839	7.40	3095.39	587.93	0.44	1188.00	1188.20	3.15	3.35
Reach #1	1.136	20000.00	1173.00	1183.75	1182.35	1184.61	0.003382	8.22	2859.80	583.81	0.49	1187.00	1187.50	3.25	3.75
Reach #1	1.087	20000.00	1173.00	1183.06	1181.52	1183.84	0.003225	7.85	2959.58	588.14	0.47	1186.00	1186.50	2.94	3.44
Reach #1	1.04	20000.00	1173.00	1180.65	1180.65	1182.29	0.009845	11.13	2058.97	579.10	0.78	1185.00	1184.50	4.35	3.85
Reach #1	0.987	20000.00	1171.00	1179.16	1178.04	1180.14	0.004059	8.74	2649.66	572.92	0.59	1183.50	1183.30	4.34	4.14
Reach #1	0.947	20000.00	1169.00	1177.91	1177.22	1179.14	0.005110	9.72	2431.44	563.92	0.63	1182.50	1182.00	4.59	4.09
Reach #1	0.903	20000.00	1169.00	1176.81	1175.93	1177.85	0.005048	9.05	2534.25	575.25	0.62	1181.00	1180.70	4.19	3.89
Reach #1	0.852	20000.00	1165.00	1175.98	1174.60	1176.80	0.003000	8.25	2957.47	583.39	0.47	1179.50	1179.50	3.52	3.52
Reach #1	0.812	20000.00	1165.00	1173.91	1173.91	1175.84	0.003974	11.96	2130.04	555.40	0.78	1179.00	1178.50	5.09	4.59
Reach #1	0.791	20000.00	1165.00	1175.04	1171.97	1175.52	0.000381	5.99	3990.76	773.35	0.36				
Reach #1	0.790	Bridge													
Reach #1	0.776	20000.00	1164.00	1172.55	1172.55	1174.40	0.012137	11.23	2032.25	605.66	0.85				
Reach #1	0.758	20000.00	1160.00	1172.34	1168.68	1173.38	0.003556	8.60	2969.59	573.60	0.48	1177.20	1177.20	4.85	4.85
Reach #1	0.707	20000.00	1161.00	1171.36	1169.93	1172.37	0.004601	8.90	2908.02	576.64	0.52	1175.50	1175.50	4.14	4.14
Reach #1	0.663	20000.00	1160.00	1169.94	1168.93	1171.05	0.006678	9.27	2705.38	580.97	0.57	1173.50	1174.50	3.56	4.56
Reach #1	0.614	20000.00	1159.00	1168.82	1166.90	1169.62	0.004235	7.69	2998.77	560.66	0.47	1172.50	1173.50	3.68	4.68
Reach #1	0.568	20000.00	1159.00	1168.23	1165.95	1168.88	0.003762	6.81	3275.72	593.11	0.42	1172.00	1172.80	3.77	4.57
Reach #1	0.532	20000.00	1159.00	1167.39	1165.30	1168.17	0.002980	7.77	3250.79	603.06	0.49	1174.00	1171.80	6.61	4.41
Reach #1	0.475	20000.00	1156.00	1167.30	1162.00	1167.54	0.001293	4.50	5432.09	637.69	0.25	1179.50	1171.50	12.20	4.20


IBW - Project Conditions 20,000 cfs
Legend
WS PF 1
Ground
Left Levee
Right Levee
Elevation (ft)
1200
1190
1180
1170
1160
1150
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)