CONCEPTUAL
MASTER DRAINAGE REPORT
FOR
SERENO CANYON

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WP# 042054

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1.0 INTRODUCTION

This Conceptual Master Drainage Report has been prepared to meet the master drainage plan requirements, in accordance with the City of Scottsdale development criteria for the proposed Sereno Canyon Project. Sereno Canyon is a planned 330-acre custom lot residential subdivision located in the northeastern portion of Scottsdale, Arizona. This report presents the hydrological and hydraulic modeling and storm water storage requirements.

Sereno Canyon is located in Section 11, Township 4 North, Range 5 East. The site is currently an assemblage of undeveloped parcels bound to the west by the existing Sonoran Crest Development (122^{nd} Street alignment), to the east by the 128^{th} Street alignment, to the north by the Happy Valley Road alignment, and to the south by the McDowell Mountain Sonoran Preserve. Access to the development is planned from the west via the ½ -mile section roadway, Alameda Road. Plate 1 provides a Vicinity Map for the project and surrounding areas.

Sereno Canyon is a proposed custom lot sub-division, nestled at the northern base of the McDowell Mountains. Development of the project is planned to occur in four phases. Please refer to Plate 1A for a *Phasing Map* of the Project. The development includes approximately 122 lots ranging in size from 2 to 3 acres and a Clubhouse with amenities such as jacuzzis, pools, water falls, and restaurant facilities. Interpretive trails and scattered pocket parks with water features will also be incorporated into the site plan.

2.0 GENERAL LOCATION AND DESCRIPTION

2.1 Site Features

The proposed project lies in the northern planning section of the City of Scottsdale. The site drains from the south to the north. Elevations range from 2,830 in the south to 2,675 feet in the northeast. Vegetation is typical Sonoran Desert type with creosote bush, jumping cholla, saguaro cacti, palo verde, ironwood and mesquite trees.

2.2 Flood Insurance Rate Map (FIRM)

The Flood Insurance Rate Maps (FIRM) for Maricopa County, Arizona and incorporated areas, Map Numbers 04013C1255F and 04013C1260E, dated July 19, 2001 indicates the site is within Zone "X" (shaded), and Zone "D".

Zone "X" (shaded) is defined by FEMA as follows:

> *Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.*

Zone "D" is defined by FEMA as follows:

> *Areas in which flood hazards are undetermined.*

The location of the parcel relative to the FIRM panels is illustrated on Plate 2 – *Flood Insurance Rate Map (FIRM)*.

3.0 HYDROLOGY

3.1 Methodology

The U.S. Army Corps of Engineers' HEC-1 hydrologic model was utilized to compute the pre- and post-development 100-year, 6-hour storm runoff discharge rates. The preparation of input data necessary for the computer analysis included definition and measurement of the drainage sub-basins, assignment of soil curve numbers and calculations of the proposed impervious factors. The City of Scottsdale modeling procedures were followed as outlined in Chapter 4 of the *City of Scottsdale Design Standards and Policies Manual (DSPM).*

Provided below is a more detailed explanation of the methods utilized to compute the definition of drainage sub-basins, determination of soil curve numbers, impervious percentages for the study area and the selection of the design rainfall event.

3.2 Drainage Sub-Basins

3.2.1 Off-site Contributing Areas

U.S.G.S. quad maps with 2-foot contour interval topography were utilized to define the drainage sub-basins for the off-site portions of the drainage areas. Please refer to Plate 6 - *Off-Site Watershed Area Map* for the limits of the drainage sub-basins and concentration points.

3.2.2 On-site Contributing Areas

Digital topography with 1-foot contours was used to define the shape of the on-site drainage areas. Please refer to Plate 7 - *Pre-Development Drainage Site Plan* for the limits of the on-site sub-basins and concentration points.

3.3 Soil Curve Numbers

Soil curve numbers for the HEC-1 models were calculated based on published guidelines and engineering experience for the type of soils present within the drainage sub-basins. Plate 3 presents the soils classification (typed) based on the SCS Map for the project area. Figure 4.6 "Runoff Curve Numbers for Arid and Semi-Arid Rangelands" located in the *2004 City of Scottsdale DSPM* was used to determine the soil curve number.

The cover type (less than 30% vegetation cover due to wild fire) and hydrologic condition were estimated as desert shrub areas with poor hydrologic conditions. Runoff curve number of 88 was used for the corresponding soils group D that occurs within the watershed area. Wood/Patel is in agreement with the City's published curve numbers.

3.4 Impervious Area

Impervious percentages were determined for each sub-basin for the developed condition HEC-1 model. Presently no development consists on the site. For the on-site developed conditions, impervious percentages were calculated utilizing the "Percent of Impervious Area vs. Dwelling Units/Acre" (Figure 2.2-16), as contained in Chapter 2 of the old *City of Scottsdale Drainage DSPM*. Based on the lot sizes, an impervious percentage of 10 percent was used for the developed areas.

3.5 Rainfall Event

The precipitation amount for the 100-year, 6-hour return period was obtained from NOAA Atlas 2 Volume VIII maps located in the *City of Scottsdale Manual*. A copy of this map is included in Appendix A. The total calculated 100-year rainfall depth is 3.37 inches for the 100-year, 6-hour rainfall event.

3.6 On-site Detention

According to the City's Drainage Ordinance, all runoff generated from the developed portion of the site must be managed and the peak discharge rate from the site reduced to at least pre-development values. With the development being sparse in nature at approximately 0.37 dwelling units per acre and no mass grading being proposed, post-development flows are only slightly higher than pre-development flows. On-line detention basins, located immediately upstream of culverted roadway crossings and at other strategic locations, are proposed to store the runoff associated with the 100-year, 2-hour storm event from disturbed areas and building envelopes. Please refer to Appendix E for the 100-year 2-hour detention volume calculations for all detention basins.

3.7 Summary of Modeling Results

As previously discussed, the U.S. Army Corps of Engineers' HEC-1 computer analysis program was utilized to compute the peak storm water discharge rates for both existing and proposed conditions. Runoff for each drainage sub-basin was computed and then

routed, if required, through downstream drainage sub-basins where the hydrographs were then combined.

Table 3.1 provides the comparative peak discharge rates for the pre- vs. post-developed conditions at each concentration point. For the location of these concentration points and corresponding flow values, please refer to Plates 7 and 8 for existing conditions, and Plates 9 and 10 for developed conditions. As mentioned previously, the developed conditions HEC-1 model with on-line detention upstream of the culverted road crossings reduced the peak flows at or below the pre-development peak flows at all concentration points. The actual HEC-1 input data and result files for the existing and developed conditions are included in Appendices B and C, respectively.

Table 3.1:
Flow Summary

100-year Flow		
Concentration Point	**Existing Flow cfs**	**Developed Flow cfs**
A1	223	220
A2	102	100
B	181	181
C	83	83
D	87	78
E1	136	123
E2	128	123
COMBE	255	226
E3	26	16
F1	92	88
F2	41	38
F3	38	30
G	41	38
H1	144	144
H2	161	143
I	69	61
J	81	60
K	34	21
L	32	25
M	26	19
N	33	17
O	10	10
P	24	21
Q	12	9
R	482	448

4.0 PROPOSED DRAINAGE SYSTEMS

4.1 Identification of Major Drainage Courses

There are no washes on the site with an anticipated 100-year flow equal to or greater than 750 cfs, therefore no washes are categorized as a Vista Corridor. The major water courses that traverse through the project have been identified as washes with a 100-year flow greater than 50 cfs. These washes will be maintained in their natural location and will not be re-aligned.

4.2 404 Washes

A preliminary investigation has been done on the major washes within the project to identify the washes that may be deemed jurisdictional. A request for 404 Jurisdictional Delineation Verification has been submitted to the Army Corp or Engineers for review and approval. Plate 4 – *404 Washes* provides the preliminary 404 wash locations in reference to the aerial photograph for the site. The preliminary 404 washes are also illustrated on the Pre- and Post-Development Grading and Drainage Plans.

4.3 Drainage System Requirements

The existing drainage patterns will be maintained in their natural location and condition where possible. The site is being developed as large custom lots. Therefore, as lots are developed individual lot engineers will be required to provide drainage documentation to substantiate the development of the lot.

4.4 Easement Requirements

Where flows from the 100-year storm event are greater than 50 cfs, drainage easements have been provided. In addition, drainage easements shall be dedicated to the limits of inundation for the 100-year, 2-hour storm event in each detention basin.

4.5 Roadway Crossing Requirements

In all cases the depth of flow over streets is in accordance with City of Scottsdale Flood Plain and Drainage Ordinance.

4.6 Maintenance

Ongoing maintenance of the designed or recommended drainage systems is required to preserve the design integrity and purpose of the drainage system. Failure to provide maintenance can prevent the drainage system from performing to its intended design purpose and can result in reduced performance. It is the responsibility of private developers, homeowner associations, etc. for facilities on private property, within all drainage easements, private streets, and right-of-ways unless accepted by the City for maintenance. A regular maintenance program is required to have drainage systems perform to the level of protection or service as presented in this report and the project's plans and specifications.

5.0 HYDRAULICS

5.1 100-Year Floodplain Delineation

The U.S. Army Corps of Engineers' HEC-RAS Version 3.1.2 was used to generate the water surface profiles for washes with 100-year flows in excess of 50 cfs. Manning's 'N' values were assigned based on field observation and the review of aerial photography. The majority of the washes contain the 100-year flows within incised channels. Accordingly, an 'N' value of 0.032 was utilized for the incised portion of the wash and 0.045 was used for the over bank condition. The starting water surface elevations were determined using slope area method. A delineation of the 100-year water surface elevation for these washes that experience pre-development peak flows has been drawn based on results from the HEC-RAS analysis. Water surface elevations and top widths during pre-development flows for each cross section are included on Plate 8 - *Pre-Development Grading and Drainage Plan.*

The 100-year floodplain delineation for these washes that experience post-development peak flows has been revised to reflect the limits of ponding that occurs on the upstream side of the culverted road crossings. At this point, the location of the roadways has not been finalized and therefore a post-development HEC-RAS model that includes cross sections representative of the culverts has not been prepared. It is anticipated that the 100-year floodplain delineation for post-development conditions will be approximately the same delineation as the pre-development delineation with the exception of the widened areas at ponding locations. Water surface elevations and top widths for each cross section are included on Plate 10 – *Post-Development Grading and Drainage Plan.*

Cross-sections were placed such that significant variations in the channel cross-sectional geometry are adequately represented. Due to the steep slopes on the project site, it is not feasible to put enough cross-sections such that the difference in energy grade elevations is less than one (1) foot.

5.2 Roadway Crossing Structures

Roadway crossing structures were designed to convey the anticipated 100-year flows. Fourteen (14) culvert crossings have been designed and are identified on Plate 10. The approximate 100-year backwater limits (ponding) have been incorporated with the proposed floodplain delineations shown on the post-development Plates 9 and 10. The supporting hydraulic calculations are included in Appendix D.

These culverts are designed to provide storm water storage on the upstream side of the culvert. The difference between the inflow and outflow rates at the culverts is identified in Table 5.2-1 on the following page. Please refer to Plate 10 for the location of the culverts according to their ID.

Rip rap will be utilized within the channels to dissipate velocities on the upstream and downstream sides of the proposed culverts. The actual design of rip rap sizing will be based on approved practices and will be completed at the time of improvement plan submittal.

Table 5.2-1:

Culvert Inflow vs. Outflow

Basin	Culvert ID	Description	Inflow (cfs)	Outflow (cfs)	Inflow - Outflow (cfs)
M	1	(1) 30" Pipe	27	19	8
F3	2	(1) 30" Pipe	39	30	9
F2	3	(1) 30" Pipe	43	38	5
F1	4	(2) 48" Pipes	96	88	8
E2	5	(2) 42" Pipes	128	123	5
E1	6	(2) 36" Pipes	124	123	1
E1	7	(2) 36" Pipes	144	124	20
E3	8	(1) 24" Pipe	27	16	11
D	9	(2) 36" Pipes	80	78	2
D	10	(2) 36" Pipes	93	80	13
C	11	(2) 30" Pipes	86	84	2
B	12	(2) 42" Pipes	187	181	6
A2	13	(2) 36" Pipes	107	100	7
I	14	(2) 54" Pipes	72	61	11
H2	15	(3) 54" Pipes	165	143	22
H1	16	(2) 54" Pipes	149	144	5
G1	17	(1) 24" Pipe	38	38	0

5.3 Scour Protection

The need for scour protection will be identified as part of the Final Drainage Report. Because of the relatively small flow values and incised nature of the sites washes, development setbacks would be utilized rather than bank protection schemes, if required.

5.4 Annual Sediment Yield

Sediment yield is defined as that portion of eroded material that travels through a drainage system to a downstream measuring or control point (*Bureau of Reclamation 1987*). The units used for this study are acre-feet/square mile/year (AF/sq.mi./yr.). The prediction of sediment yields is not an exact science. Many complex variables influence the erosion process and any sediment yields analysis requires considerable engineering judgment. For this reason, two (2) methods were used to arrive at a conservative estimate of the average annual sediment yield rate. The following sections provided a detailed discussion of each method and its results.

Sediment yield was calculated using the Pacific Southwest Inter-Agency Committee (PSIAC) method. This method was obtained from the following source: Pacific Southwest Inter-Agency Committee, *Report of the Water Management Subcommittee on Factors Affecting Sediment Yield in the Pacific Southwest Area and Selection and Evaluation of Measures for Reduction of Erosion and Sediment Yield*, October, 1968.

Nine (9) factors are evaluated in determining the sediment yield classification. These are geology, soils, climate, runoff, topography, ground cover, land use, upland erosion, and channel erosion and sediment transport. Characteristics of each of the nine factors, which give that factor high, moderate, or low sediment yield, are evaluated and the factor is assigned a numerical value representing its significance in the yield rating. The yield rating is the sum of values for the appropriate characteristics for each of the nine factors. For the purpose of avoiding complexity, the factors are generally described as independently influencing the amount of sediment yield.

Classification	Rating	Sediment Yield acre-ft/sq. mile
1	> 100	3.0
2	75 – 100	1.0 – 3.0
3	50 – 75	0.5 – 1.0
4	25 – 50	0.2 – 0.5
5	0 – 25	< 0.2

Application of the nine sediment yield factors to the watershed discussed in this report generated a total numerical rating of 77 to 85, the actual rating being dependant upon the interpretation of the guidelines that are used to assign rating values to each factor. Regardless of the actual number, i.e. 77 or 85, both values fall within Classification 2 (75 – 100), which indicates a sediment yield range of 1.0 to 3.0 AF/sq.mi./yr.

5.4.1 Bureau of Reclamation Sediment Surveys

The 1987 edition of *Design of Small Dams* (BuRec) publishes data on sediment measurements from 28 reservoirs in semi-arid regions of the United States. A regression line through these data points produces the following equation:

$$Q_s = 1.84\,A^{-0.24}$$

Where:

Q_s = annual sediment yield (AF/sq.mi./yr.)

A = drainage area (sq.mi.)

Using a drainage area size of 1.629 sq.mi. (with Reata Pass improvements), this equation predicts an annual sediment yield of 1.67 AF/sq.mi./yr. or 4,390 cubic yards.

5.4.2 Recommended Annual Sediment Yield

In consideration of the complex processes under investigation, the two (2) methods used exhibit fairly good agreement. Based on comparison of sediment yield calculations to actual sediment yield measurements, Renard & Stone (1981) concluded that "the PSIAC method appears to give the best results for the amount of work required to make the estimate." Based on the results of the sediment yield equations, a design value of 1.7 AF/sq.mi./yr. was selected for use in Planning Units II and IV.

5.4.3 Short-/Long-Term Aggradation, Degradation, Local Scour, and Deposition

Sediment transport analyses need to distinguish between short-term and long-term changes. Short-term changes are event specific and occur to some extent during each flood hydrograph. Examples of short-term changes would be local scour, general scour, bend scour, bedform troughs, and to some extent low-flow channel incisement. With the exception of low-flow channel incisement, any

visual signs of these processes may be difficult to detect after the flow has subsided. Short-term scour processes can usually be quantified with empirical and/or theoretical relationships.

Vertical incisement of the channel bed can occur in response to the following six (6) processes:

1. Long-term degradation,
2. Local scour,
3. General scour,
4. Bend scour,
5. Low-flow channel incisement, and
6. Antidune troughs.

Precise prediction of long-term channel impacts can be much more elusive than their short-term counterparts because of the time span involved and the numerous variables that impact long-term changes. The major drainage corridors within Planning Units II and IV were designed as protected channels.

5.5 Protective Devices

Roadway crossing pipes will incorporate riprap at both inlet and outlet to dissipate energy and provide flow line scour protection. Detention basins upstream of roadways will incorporate a protected overflow area (using native riprap and filter fabric) in the event of overtopping. The bleedoff pipes for other detention basins will also incorporate riprap protection.

6.0 CONCLUSIONS

1. The project site located within FEMA Zone "X" (shaded), and Zone "D" designated flood zones as shown on Plate 2.

2. Drainage corridors have been designated for the identified washes in accordance with the appropriate City of Scottsdale ordinance requirements.

3. The differences of the peak flow rates for the pre- versus post-development conditions for the 100-year, 6-hour storm event is negligible in instances where the post-development flows have increased over the pre-development conditions.

4. It is being proposed that in lieu of providing 100-year, 2-hour detention, online detention on the upstream side of the road culvert crossings be provided to reduce post-development flows to at or below pre-development levels. A storm water storage waiver has been submitted to the City of Scottsdale.

5. The design of hydraulic structures are to be based on generally accepted engineering practices and in accordance with City of Scottsdale requirements.

6. On-going maintenance is required for all drainage systems in order to assure design performance.

7. All finished floor elevations are to be designed to be above the 100-year water surface elevation.

7.0 REFERENCES

1. City of Scottsdale, *Design Standards and Policies Manual Chapter 2 Drainage*, December, 1999.

2. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona: Volume I – Hydrology*, revised January 1995.

3. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona: Volume II – Hydraulics*, January 28, 1996.

4. U.S. Army Corps of Engineers, *HEC-1, Flood Hydrograph Package*, June 1998.

5. U.S. Army Corps of Engineers, *HEC-RAS, Version 3.1.2*, April 2004.

APPENDIX A

HEC-1 Input Parameters

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
					In		In			
58*,59*: Denure	B	None	---	---	>60	---	---	---	High	Low.
60*: Glenbar, Noncalcareous	B	Rare	---	---	>60	---	---	---	High	Low.
Glenbar, Calcareous	B	Rare	---	---	>60	---	---	---	High	Low.
61*, 62*: Gran	D	None	---	---	20-40	Hard	---	---	High	Low.
Wickenburg	D	None	---	---	3-20	Soft	---	---	High	Low.
63*, 64*: Gran	D	None	---	---	20-40	Hard	---	---	High	Low.
Wickenburg	D	None	---	---	3-20	Soft	---	---	High	Low.
Rock outcrop.										
65*: Greyeagle	D	None	---	---	>60	---	4-20	Thick	High	Low.
Continental	C	None	---	---	>60	---	---	---	High	Low.
Nickel	B	None	---	---	>60	---	---	---	High	Low.
66*: Greyeagle	D	None	---	---	>60	---	4-20	Thick	High	Low.
Suncity Variant	D	None	---	---	>60	---	5-20	Thick	High	Low.
67--- Guest	D	Rare	---	---	>60	---	---	---	High	Low.
68*, 69*: Gunsight	B	None	---	---	>60	---	---	---	High	Low.
Cipriano	D	None	---	---	>60	---	5-20	Thick	High	Low.
70*, 71*: Gunsight	B	None	---	---	>60	---	---	---	High	Low.
Rillito	B	None	---	---	>60	---	---	---	High	Low.
72*, 73*: Lehmans	D	None	---	---	6-20	Hard	---	---	High	Low.
Rock outcrop.										
74*: Luke	C	None	---	---	>60	---	20-40	Thick	High	Low.
Cipriano	D	None	---	---	>60	---	4-20	Thick	High	Low.
75, 76, 77, 78, 79--- Mohall	B	None	---	---	>60	---	---	---	High	Low.
80*, 81*: Mohall	B	None	---	---	>60	---	---	---	High	Low.

See footnote at end of table.

Rainfall Data

Primary Zone Number: 7 Latitude: 0.0 Elevation: 0

Short Duration Zone Number: 8 Longitude: 0.0

	Point Values (in)					
Duration	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
5 MIN	0.38	0.46	0.52	0.60	0.66	0.73
10 MIN	0.57	0.70	0.78	0.91	1.01	1.11
15 MIN	0.70	0.87	0.99	1.16	1.29	1.43
30 MIN	0.92	1.16	1.33	1.56	1.75	1.94
1 HOUR	1.12	1.43	1.64	1.95	2.19	2.42
2 HOUR	1.27	1.62	1.87	2.21	2.48	2.74
3 HOUR	1.38	1.75	2.01	2.38	2.67	2.96
6 HOUR	1.57	2.00	2.29	2.71	3.04	3.37
12 HOUR	1.81	2.31	2.66	3.15	3.53	3.91
24 HOUR	2.05	2.62	3.02	3.58	4.02	4.45

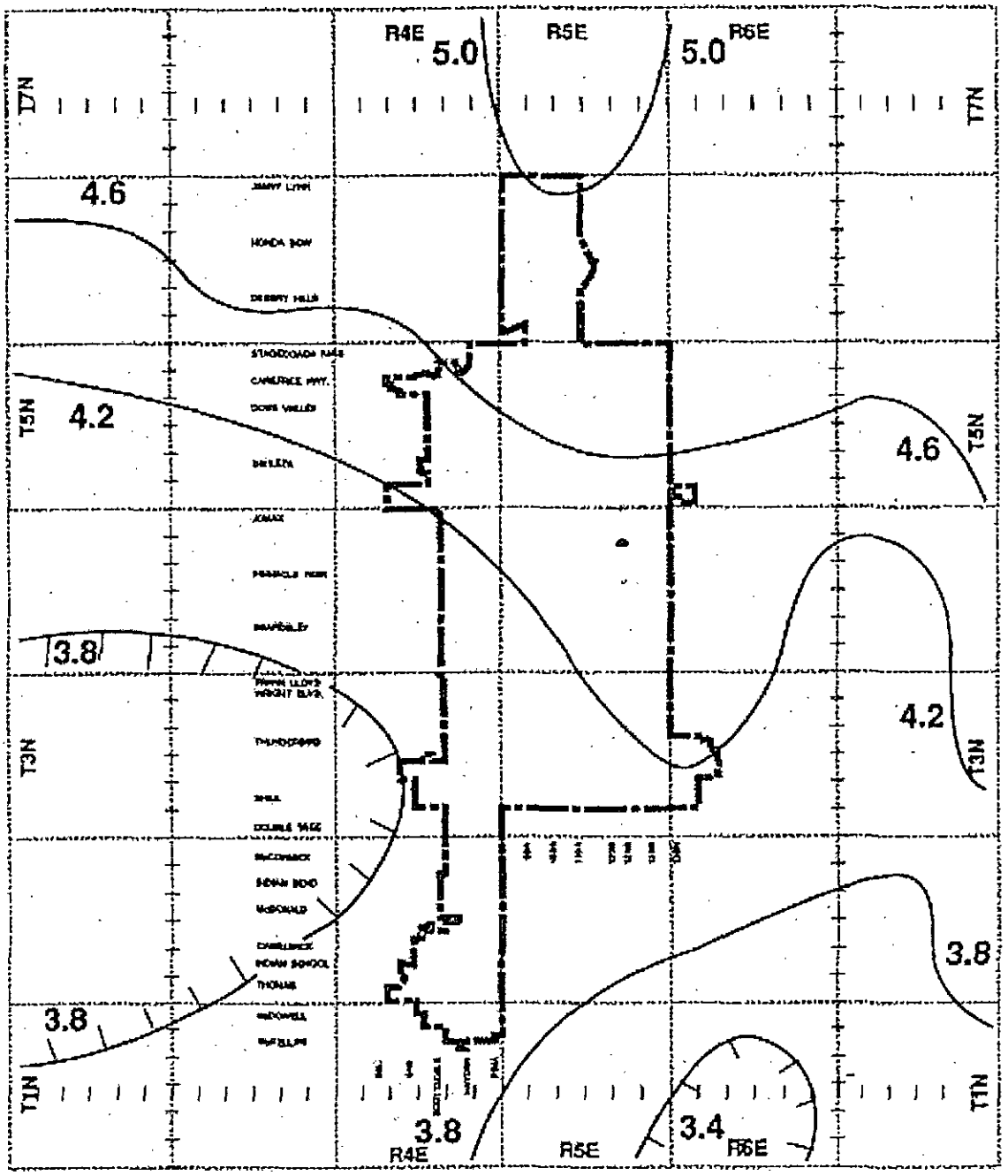


FIGURE 2.2-12

Isopluvials 100 Year 24 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

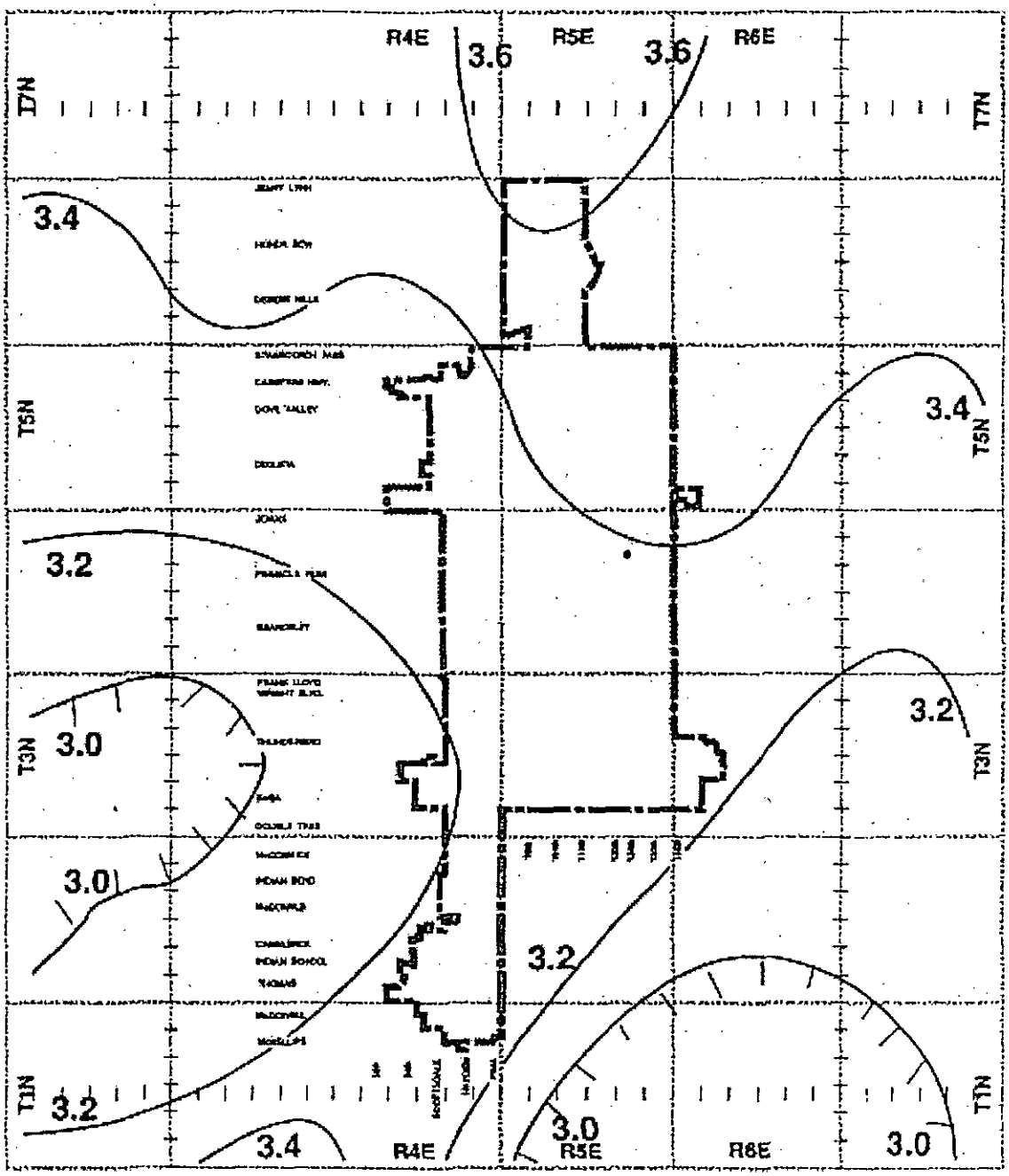


FIGURE 2.2-6

Isopluvials 100 Year 6 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

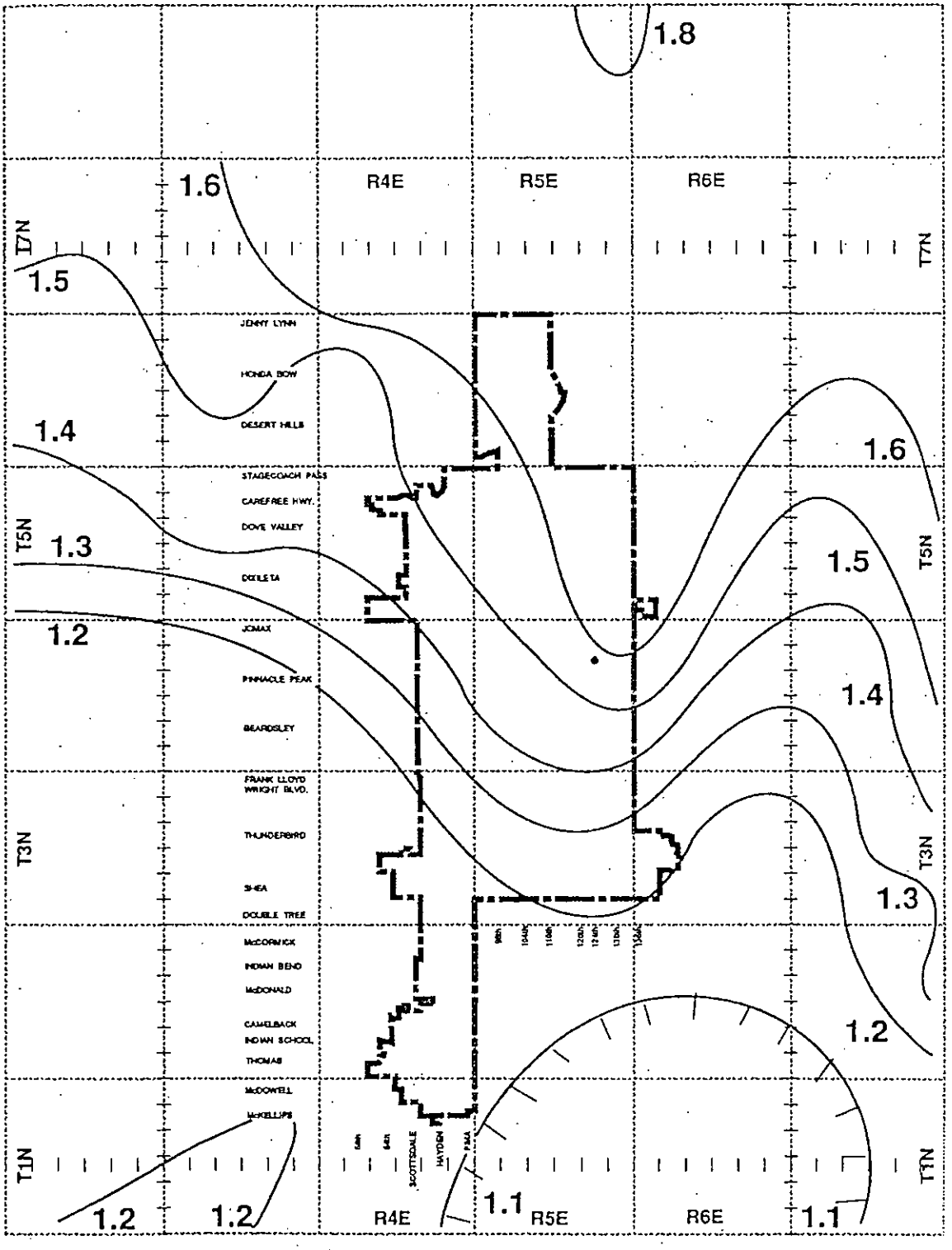


FIGURE 2.2-1

Isopluvials 2 Year 6 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

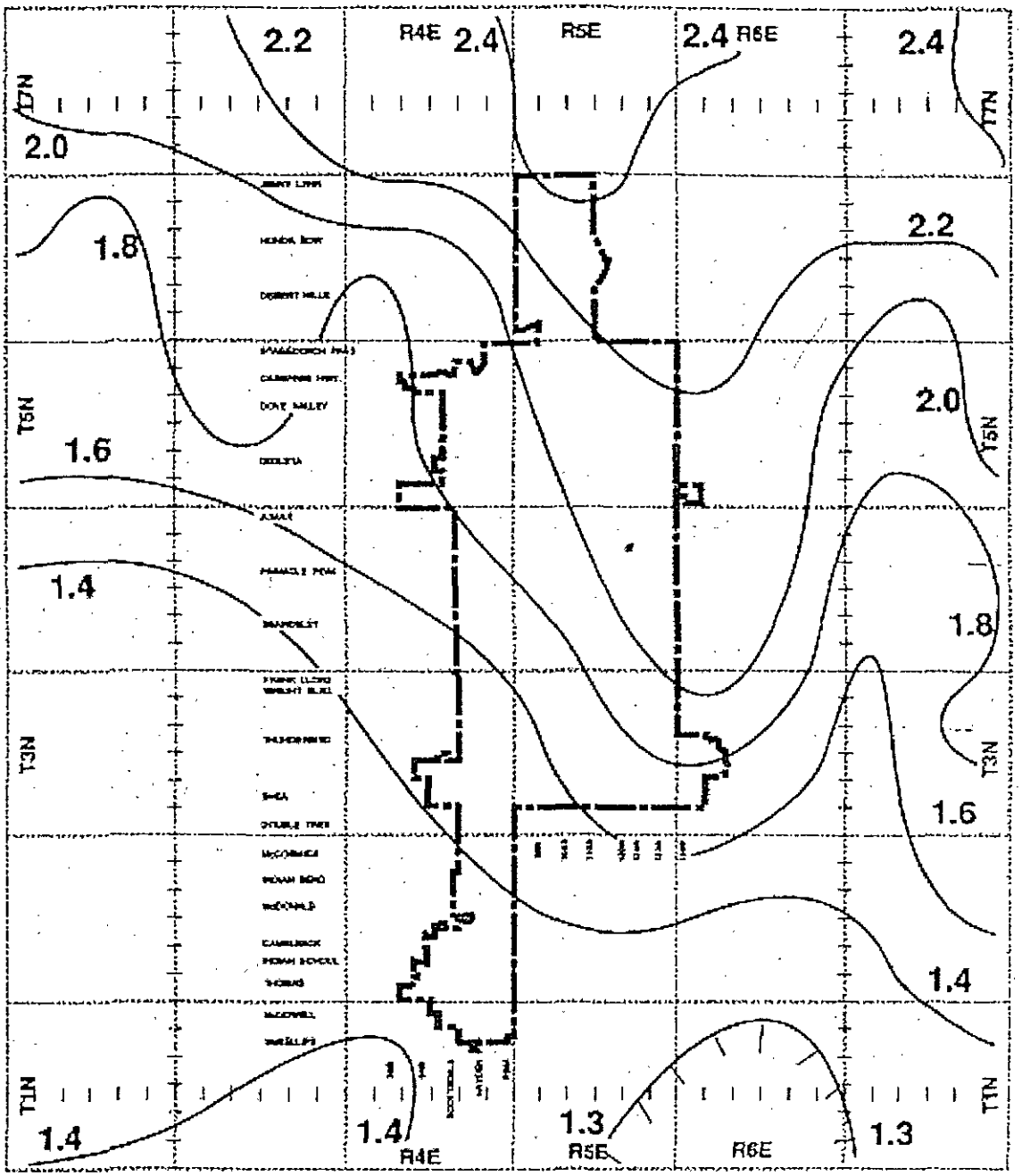


FIGURE 2.2-7

Isopluvials 2 Year 24 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

Runoff Curve Numbers for Urban Areas[1]

Cover type and hydrologic condition	Average % Impervious Area[2]	Curve numbers for hydrologic soil group A	B	C	D
Fully developed urban areas with vegetation established					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover less that 50%)		68	79	86	89
Fair condition (grass cover 50-75%)		49	69	79	84
Good condition (grass cover greater than 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roads, driveways, etc. (excld. right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewer (excld. right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1 to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85				
Industrial	85				
Townhouse, duplexes	65	Not Applicable in Scottsdale			
Multi-Family	85				
Residential districts by average lot size: (See Figure 2.2-16)					
Developing Urban Areas					
Newly graded areas (pervious areas only, no vegetation)[5]:		77	86	91	94

[1]Average runoff condition, and I_a = 0.2S; Table 2-2a, 210-VI-TR55, Second Ed., June 1986.
[2]The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition (not applicable in Scottsdale).
[3]CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
[4]Composite CN's for natural desert landscaping should be computed based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
[5]Composite CN's to use for the design of temporary measures during grading and construction should be computed based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

FIGURE 2.2-19
Runoff Curve Numbers for Urban Areas[1]

Runoff Curve Numbers for Arid and Semiarid Rangelands[1]

Cover type and hydrologic condition	Hydrologic Condition[2]	Curve numbers for hydrologic soil group A	B	C	D
Herbaceous - mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen - mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper - pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub - major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mequite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and $I_a = 0.2S$; Table 2-2d, 210-VI-TR55, Second Ed., June 1986.
[2]Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover (not applicable in Scottsdale)
Good: >70% ground cover (not applicable in Scottsdale).
[3]Curve Numbers for group A have been developed only for desert shrub.

FIGURE 2.2-20
Runoff Curve Numbers for Arid and Semiarid Rangelands[1]

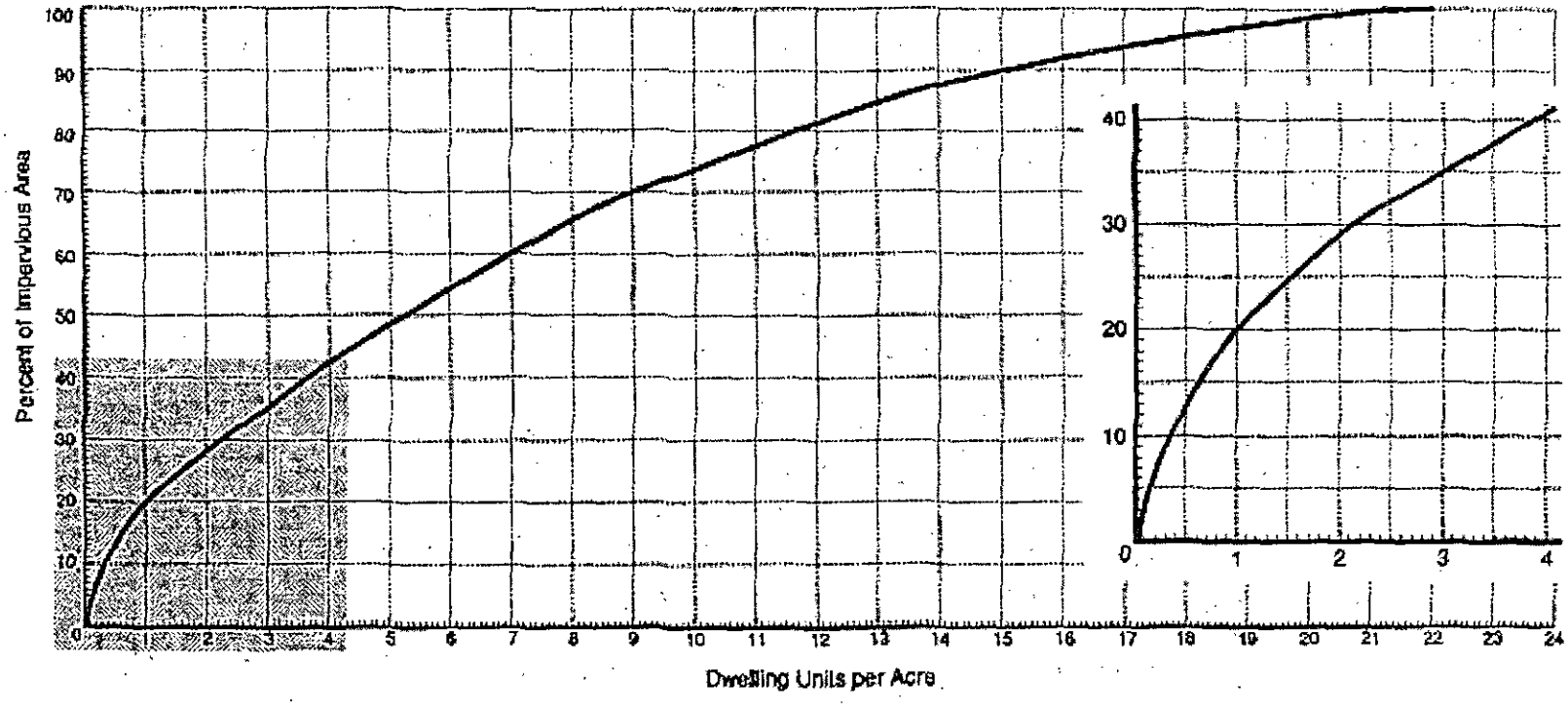


FIGURE 2.2-16

Percent of Impervious Area vs. Dwelling Density

Developed by Water Resources Associates, Inc. *from* data in Table 2.2a of TR-55, Urban Hydrology For Small Watersheds, and from discussions with Scottsdale city staff.

APPENDIX B

Existing HEC-1 Model

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   16DEC05  TIME  09:24:56   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

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

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
   1          ID      HEC-1 MODEL FOR MCDOWELL MOUNTAIN BACKBOWL
   2          ID      100-YEAR, 6-HOUR STORM
   3          ID      RAINFALL FROM NOAA ATLAS
   4          ID      SCS CURVE NUMBER SOIL LOSS PARAMETERS
   5          ID      KINEMATIC WAVE HYDROGRAPH ROUTING
   6          ID      EXISTING CONDITIONS
   7          ID
   8          ID      PREPARED BY WOOD/PATEL, 8.4.2004
   9          ID      FILE NAME:  EX-100.DAT
  10          ID
              *DIAGRAM
  11          IT    2                 2000
  12          IO    5
  13          JD          .01
  14          PH                .73   1.43   2.42   2.74   2.96   3.37

  15          KK    A1
  16          KM     RUNOFF FROM SUB-BASIN A1
              *     1
  17          BA   .084
  18          LS          88
  19          UK    260   .025    .15    100
  20          RK   3520   .023    .032           TRAP    15     5

  21          KK    A2
  22          KM     RUNOFF FROM SUB-BASIN A2
  23          BA   .036
  24          LS          88
  25          UK    235   .025    .15    100
  26          RK   2000    .02    .032           TRAP    15     5

  27          KK     B
  28          KM     RUNOFF FROM SUB-BASIN B
  29          BA   .077
  30          LS          88
  31          UK    400   .025    .15    100
  32          RK   2420   .024    .032           TRAP    15     5

  33          KK     C
  34          KM     RUNOFF FROM SUB-BASIN C
  35          BA    .03
  36          LS          88
  37          UK    250   .023    .15    100
  38          RK   1570   .017    .032           TRAP    15     5

  39          KK     D
  40          KM     RUNOFF FROM SUB-BASIN D
  41          BA   .034
  42          LS          88
  43          UK    300    .02    .15    100
  44          RK   1425   .014    .032           TRAP    15     5
```

1 HEC-1 INPUT PAGE 2

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
  45          KK    E1
  46          KM     RUNOFF FROM SUB-BASIN E1
  47          BA   .061
  48          LS          88
  49          UK    400    .02    .15    100
  50          RK   2050   .013    .032           TRAP    15     5

  51          KK    E2
  52          KM     RUNOFF FROM SUB-BASIN E2
  53          BA   .046
  54          LS          88
  55          UK    200    .02    .15    100
```

```
 56          RK    2370    .013    .032            TRAP      15        5

 57          KK   COMBE
 58          KM        COMBINE SECTIONS E1 AND E2
 59          HC        2
             *

 60          KK   CLEAR
 61          KM        CLEAR HYDROGRAPH STACK
 62          HC        6
             *

 63          KK      E3
 64          KM        RUNOFF FROM SUB-BASIN E3
 65          BA    .008
 66          LS                88
 67          UK     175    .025     .15     100
 68          RK     750    .032    .032             TRAP      15        5

 69          KK      F1
 70          KM        RUNOFF FROM SUB-BASIN F1
 71          BA    .036
 72          LS                88
 73          UK     225    .018     .15     100
 74          RK    2500    .012    .032             TRAP      15        5
             *

 75          KK      F2
 76          KM        RUNOFF FROM SUB-BASIN F2
 77          BA    .014
 78          LS                88
 79          UK     200    .018     .15     100
 80          RK    1440    .028    .032             TRAP      15        5
             *

 81          KK      F3
 82          KM        RUNOFF FROM SUB-BASIN F3
 83          BA    .013
 84          LS                88
 85          UK     225    .018     .15     100
 86          RK     850    .026    .032             TRAP      15        5
             *
1                                    HEC-1 INPUT                                    PAGE  3

 LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 87          KK      G
 88          KM        RUNOFF FROM SUB-BASIN G
 89          BA    .017
 90          LS                88
 91          UK     400    .025     .15     100
 92          RK     720    .022    .032             TRAP      15        5

 93          KK      H1
 94          KM        RUNOFF FROM SUB-BASIN H1
 95          BA    .059
 96          LS                88
 97          UK     375    .025     .15     100
 98          RK    2210    .019    .032             TRAP      15        5

 99          KK      H2
100          KM        RUNOFF FROM SUB-BASIN H2
101          BA    .072
102          LS                88
103          UK     400    .025     .15     100
104          RK    3480    .019    .032             TRAP      15        5

105          KK      I
106          KM        RUNOFF FROM SUB-BASIN I
107          BA    .025
108          LS                88
109          UK     225     .02     .15     100
110          RK    2100    .026    .032             TRAP      15        5

111          KK   CLEAR
112          KM        CLEAR HYDROGRAPH STACK
113          HC        8

114          KK      J
115          KM        RUNOFF FROM SUB-BASIN J
116          BA    .024
117          LS                88        0
118          UK     145     .02     .15     100
119          RK     965    .026    .032             TRAP      15        5

120          KK      K
121          KM        RUNOFF FROM SUB-BASIN K
122          BA    .009
123          LS                88        0
124          UK      81    .025     .15     100
125          RK     715    .022    .032             TRAP      15        5

126          KK      L
127          KM        RUNOFF FROM SUB-BASIN L
128          BA    .009
129          LS                88        0
130          UK     113    .018     .15     100
131          RK     450    .012    .032             TRAP      15        5
1                                    HEC-1 INPUT                                    PAGE  4

 LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

132          KK      M
133          KM        RUNOFF FROM SUB-BASIN M
```

```
134          BA    .008
135          LS              88       0
136          UK     137    .018     .15     100
137          RK     750    .012    .032             TRAP      15       5

138          KK       N
139          KM       RUNOFF FROM SUB-BASIN N
140          BA     .01
141          LS              88       0
142          UK     117    .018     .15     100
143          RK    1036    .012    .032             TRAP      15       5

144          KK       O
145          KM       RUNOFF FROM SUB-BASIN O
146          BA    .0029
147          LS              88       0
148          UK     108     .02     .15     100
149          RK     174    .014    .032             TRAP      15       5

150          KK       P
151          KM       RUNOFF FROM SUB-BASIN P
152          BA    .0069
153          LS              88       0
154          UK     135     .02     .15     100
155          RK     354    .014    .032             TRAP      15       5

156          KK   CLEAR
157          KM       CLEAR HYDROGRAPH STACK
158          HC       8

159          KK       Q
160          KM       RUNOFF FROM SUB-BASIN Q
161          BA    .0032
162          LS              88       0
163          UK      86     .02     .15     100
164          RK     160    .014    .032             TRAP      15       5

165          KK       R
166          KM       RUNOFF FROM SUB-BASIN R
167          BA     .15
168          LS              88
169          UK     180    .025     .15     100
170          RK    1840    .023    .032             TRAP      15       5
171          ZZ
```

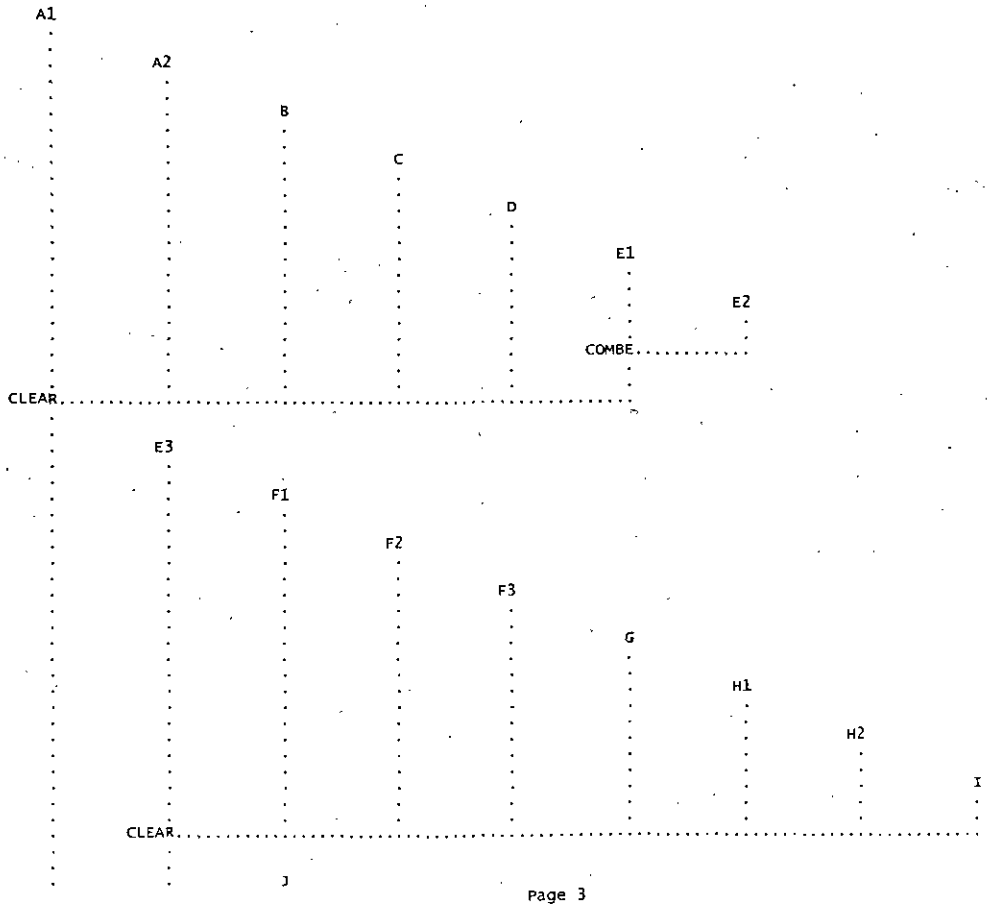
1

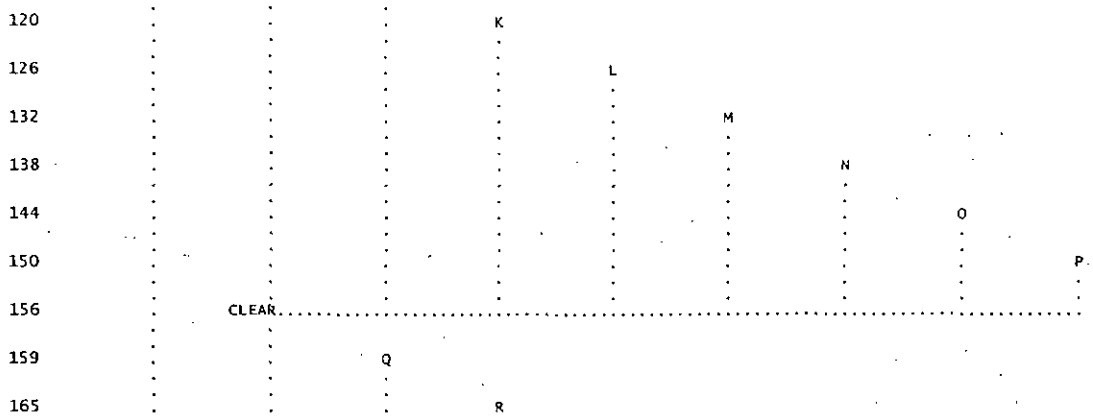
SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW





(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1**********************************************
*                                            *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)        *
*             JUN  1998                      *
*          VERSION 4.1                       *
*                                            *
*  RUN DATE   16DEC05  TIME  09:24:56        *
*                                            *
**********************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*           (916) 756-1104             *
*                                      *
****************************************
```

HEC-1 MODEL FOR MCDOWELL MOUNTAIN BACKBOWL
100-YEAR, 6-HOUR STORM
RAINFALL FROM NOAA ATLAS
SCS CURVE NUMBER SOIL LOSS PARAMETERS
KINEMATIC WAVE HYDROGRAPH ROUTING
EXISTING CONDITIONS

PREPARED BY WOOD/PATEL, 8.4.2004
FILE NAME: EX-100.DAT

12 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN		2	MINUTES IN COMPUTATION INTERVAL
IDATE	1	0	STARTING DATE
ITIME		0000	STARTING TIME
NQ		2000	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	3	0	ENDING DATE
NDTIME		1838	ENDING TIME
ICENT		19	CENTURY MARK

COMPUTATION INTERVAL .03 HOURS
TOTAL TIME BASE 66.63 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

13 JD INDEX STORM NO. 1

STRM	3.37	PRECIPITATION DEPTH
TRDA	.01	TRANSPOSITION DRAINAGE AREA

14 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.04	.04	.04	.06	.06	.07	.09	.12	.17	.29
.29	.24	.15	.11	.07	.07	.06	.05	.04	.04
.04	.03	.03	.03	.03	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

*** FOKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 1

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 1

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 1

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 1

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	A1	223.	3.17	19.	5.	2.	.08		
+	HYDROGRAPH AT	A2	102.	3.17	8.	2.	1.	.04		
+	HYDROGRAPH AT	B	181.	3.20	18.	4.	2.	.08		
+	HYDROGRAPH AT	C	83.	3.17	7.	2.	1.	.03		
+	HYDROGRAPH AT	D	87.	3.17	8.	2.	1.	.03		
+	HYDROGRAPH AT	E1	136.	3.20	14.	4.	1.	.06		
+	HYDROGRAPH AT	E2	128.	3.17	11.	3.	1.	.05		
+	2 COMBINED AT	COMBE	255.	3.17	24.	6.	2.	.11		
+	6 COMBINED AT	CLEAR	929.	3.17	84.	21.	8.	.37		
+	HYDROGRAPH AT	E3	26.	3.10	2.	0.	0.	.01		
+	HYDROGRAPH AT	F1	92.	3.20	8.	2.	1.	.04		
+	HYDROGRAPH AT	F2	41.	3.13	3.	1.	0.	.01		
+	HYDROGRAPH AT	F3	38.	3.13	3.	1.	0.	.01		
+	HYDROGRAPH AT	G	41.	3.17	4.	1.	0.	.02		
+	HYDROGRAPH AT	H1	144.	3.20	14.	3.	1.	.06		
+	HYDROGRAPH AT	H2	161.	3.23	16.	4.	1.	.07		
+	HYDROGRAPH AT	I	69.	3.17	6.	1.	1.	.03		
+	8 COMBINED AT	CLEAR	581.	3.17	56.	14.	5.	.24		
+	HYDROGRAPH AT	J	81.	3.10	6.	1.	0.	.02		
+	HYDROGRAPH AT	K	34.	3.07	2.	1.	0.	.01		
+	HYDROGRAPH AT	L	32.	3.10	2.	1.	0.	.01		
+	HYDROGRAPH AT	M	26.	3.10	2.	0.	0.	.01		
+	HYDROGRAPH AT	N	33.	3.10	2.	1.	0.	.01		
+	HYDROGRAPH AT	O	10.	3.07	1.	0.	0.	.00		
+	HYDROGRAPH AT	P	24.	3.10	2.	0.	0.	.01		
+	8 COMBINED AT	CLEAR	758.	3.17	72.	18.	7.	.31		
+	HYDROGRAPH AT	Q	12.	3.07	1.	0.	0.	.00		

HYDROGRAPH AT

\+ R 482. 3.10 35. 9. 3. .15
1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
FOR STORM = 1 STORM AREA (SQ MI) = .01									
A1	MANE	1.92	225.80	190.40	2.14	2.00	223.31	190.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9633E+01 OUTFLOW= .9599E+01 BASIN STORAGE= .3600E-03 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01									
A2	MANE	1.43	104.13	188.54	2.15	2.00	102.13	190.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4129E+01 OUTFLOW= .4119E+01 BASIN STORAGE= .1150E-03 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01									
B	MANE	1.39	182.80	191.08	2.14	2.00	180.83	192.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8830E+01 OUTFLOW= .8782E+01 BASIN STORAGE= .5870E-03 PERCENT ERROR= .5

FOR STORM = 1 STORM AREA (SQ MI) = .01									
C	MANE	1.28	84.68	188.46	2.15	2.00	83.44	190.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3440E+01 OUTFLOW= .3432E+01 BASIN STORAGE= .1204E-03 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01									
D	MANE	1.30	87.59	190.71	2.14	2.00	87.45	190.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3899E+01 OUTFLOW= .3885E+01 BASIN STORAGE= .1913E-03 PERCENT ERROR= .4

FOR STORM = 1 STORM AREA (SQ MI) = .01									
E1	MANE	1.60	136.49	193.57	2.14	2.00	135.65	192.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6996E+01 OUTFLOW= .6955E+01 BASIN STORAGE= .5465E-03 PERCENT ERROR= .6

FOR STORM = 1 STORM AREA (SQ MI) = .01									
E2	MANE	1.80	129.68	189.33	2.14	2.00	127.91	190.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5275E+01 OUTFLOW= .5262E+01 BASIN STORAGE= .1409E-03 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01									
E3	MANE	.76	26.38	186.17	2.15	2.00	26.25	186.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9174E+00 OUTFLOW= .9157E+00 BASIN STORAGE= .1670E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F1	MANE	2.00	93.25	191.67	2.14	2.00	92.18	192.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4129E+01 OUTFLOW= .4112E+01 BASIN STORAGE= .1467E-03 PERCENT ERROR= .4

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F2	MANE	1.28	41.26	188.54	2.14	2.00	40.94	188.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1606E+01 OUTFLOW= .1601E+01 BASIN STORAGE= .4319E-04 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01									
F3	MANE	.76	37.65	188.33	2.15	2.00	37.59	188.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1491E+01 OUTFLOW= .1488E+01 BASIN STORAGE= .4644E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01									
G	MANE	.70	40.99	191.07	2.14	2.00	40.92	190.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1950E+01 OUTFLOW= .1939E+01 BASIN STORAGE= .1238E-03 PERCENT ERROR= .5

FOR STORM = 1 STORM AREA (SQ MI) = .01									
H1	MANE	1.43	144.55	191.09	2.14	2.00	143.52	192.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .6766E+01 OUTFLOW= .6737E+01 BASIN STORAGE= .3777E-03 PERCENT ERROR= .4

FOR STORM = 1 STORM AREA (SQ MI) = .01									
H2	MANE	2.00	161.86	192.60	2.14	2.00	160.64	194.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8257E+01 OUTFLOW= .8201E+01 BASIN STORAGE= .5785E-03 PERCENT ERROR= .7

FOR STORM = 1 STORM AREA (SQ MI) = .01

I	MANE	1.50	69.38	188.68	2.14	2.00	69.26	190.00	2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2867E+01 OUTFLOW= .2859E+01 BASIN STORAGE= .1014E-03 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01

J	MANE	.69	80.91	185.91	2.15	2.00	80.83	186.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2752E+01 OUTFLOW= .2749E+01 BASIN STORAGE= .4778E-04 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

K	MANE	.73	34.32	184.84	2.15	2.00	33.78	184.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1032E+01 OUTFLOW= .1032E+01 BASIN STORAGE= .6088E-05 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .01

L	MANE	.67	31.90	185.18	2.15	2.00	31.51	186.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1032E+01 OUTFLOW= .1031E+01 BASIN STORAGE= .1334E-04 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

M	MANE	1.00	26.37	186.99	2.15	2.00	26.23	186.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9174E+00 OUTFLOW= .9164E+00 BASIN STORAGE= .1694E-04 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

N	MANE	1.27	33.61	186.96	2.15	2.00	32.90	186.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1147E+01 OUTFLOW= .1146E+01 BASIN STORAGE= .1533E-04 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

O	MANE	.40	10.64	184.55	2.15	2.00	10.48	184.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3326E+00 OUTFLOW= .3322E+00 BASIN STORAGE= .3447E-05 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

P	MANE	.43	24.11	185.50	2.15	2.00	23.85	186.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7913E+00 OUTFLOW= .7899E+00 BASIN STORAGE= .1181E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01

Q	MANE	.39	12.21	184.17	2.15	2.00	12.19	184.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3670E+00 OUTFLOW= .3667E+00 BASIN STORAGE= .2684E-05 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

R	MANE	.91	488.31	186.83	2.15	2.00	481.77	186.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1720E+02 OUTFLOW= .1717E+02 BASIN STORAGE= .3282E-03 PERCENT ERROR= .2

*** NORMAL END OF HEC-1 ***

APPENDIX C

Proposed HEC-1 Model

```
1*************************************
*                                   *
*   FLOOD HYDROGRAPH PACKAGE (HEC-1)*
*             JUN  1998             *
*           VERSION 4.1             *
*                                   *
*  RUN DATE   16DEC05  TIME 09:14:58*
*                                   *
*************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*         609 SECOND STREET         *
*       DAVIS, CALIFORNIA 95616     *
*         (916) 756-1104            *
*                                   *
*************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X              X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X              X
X     X  X        X     X        X
X     X  XXXXXXX   XXXXX         XXX .
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
   1      ID        HEC-1 MODEL FOR MCDOWELL MOUNTAIN BACKBOWL
   2      ID        100-YEAR, 6-HOUR STORM
   3      ID        RAINFALL FROM NOAA ATLAS
   4      ID        SCS CURVE NUMBER SOIL LOSS PARAMETERS
   5      ID        KINEMATIC WAVE HYDROGRAPH ROUTING
   6      ID        DEVELOPED CONDITIONS
   7      ID        10% IMPERVIOUS AREA USED FOR SITE
   8      ID
   9      ID        PREPARED BY WOOD/PATEL, 1.10.2005
  10      ID        FILE NAME:  DEV-100.DAT
  11      ID
          *DIAGRAM
  12      IT       2                  2000
  13      IO       5
  14      JD                .01
  15      PH                        .73    1.43    2.42    2.74    2.96    3.37

  16      KK      A1
  17      KM       RUNOFF FROM SUB-BASIN A1
  18      BA     .083
  19      LS                 88     1.1
  20      UK      260    .025     .15     100
  21      RK     3520    .023    .032             TRAP      15       5
          *
  22      KK    BASA1
  23      KM         1-12" PIPE AND 28' WIER  AT HEADWALL
  24      RS        1    STOR       0
  25      SV        0    .151    .342    .575
  26      SE        0       1       2       3
  27      SQ        0       2      83     228

  28      KK      A2
  29      KM       RUNOFF FROM SUB-BASIN A2
  30      BA     .036
  31      LS                 88     7.4
  32      UK      235    .025     .15     100
  33      RK     2000     .02    .032             TRAP      15       5

  34      KK    BASA2-1
  35      KM         2-36" PIPES
  36      KM         1-12' PIPE AND 15' WEIR AT HEADWALL
  37      RS        1    STOR       0
  38      SV        0    .127    .292    .504
  39      SE     2772    2773    2774    2775
  40      SQ        0     2.2    46.5   124.8

  41      KK    BASA2-2
  42      KM         2-36" PIPES
  43      KM         1-12' PIPE AND 15' WEIR AT HEADWALL
  44      RS        1    STOR       0
  45      SV        0     .07     .16    .272    .407
  46      SE     2733    2734    2735    2736    2737
  47      SQ        0     2.2    46.5   124.8   225.3
```

1 HEC-1 INPUT PAGE 2

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  48      KK       B
  49      KM       RUNOFF FROM SUB-BASIN B
  50      BA     .077
  51      LS                 88     5.7
  52      UK      400    .025     .15     100
  53      RK     2420    .024    .032             TRAP      15       5

  54      KK     BASB-1
  55      KM         3-42" PIPES
```

```
 56          KM        1-12" PIPE AND 24' WEIR AT HEADWALL
 57          RS      1    STOR       0
 58          SV      0    .148    .339    .579
 59          SE   2767    2768    2769    2770
 60          SQ      0       2      72     196

 61          KK    BASB-2
 62          KM        3-42" PIPES
 63          KM        1-12" PIPE AND 28' WEIR AT HEADWALL
 64          RS      1    STOR       0
 65          SV      0     .21    .459    .750
 66          SE   2746    2747    2748    2749
 67          SQ      0       2      83     228

 68          KK        C
 69          KM        RUNOFF FROM SUB-BASIN C
 70          BA     .03
 71          LS                88     5.9
 72          UK     250    .023     .15     100
 73          RK    1570    .017    .032            TRAP      15       5
             *

 74          KK    BASC-1
 75          KM        2-30" PIPES
 76          KM        1-12" PIPE AND 15' WEIR AT HEADWALL
 77          RS      1    STOR       0
 78          SV      0    .107    .236    .388
 79          SE   2779    2780    2781    2782
 80          SQ      0     2.2    46.5   124.8

 81          KK    BASC-2
 82          KM        2-30" PIPES
 83          KM        1-12" PIPE AND 15' WEIR AT HEADWALL
 84          RS      1    STOR       0
 85          SV      0    .054    .127    .225
 86          SE   2754    2755    2756    2757
 87          SQ      0     2.2    46.5   124.8
             *

 88          KK        D
 89          KM        RUNOFF FROM SUB-BASIN D
 90          BA    .034
 91          LS                88      12
 92          UK     300     .02     .15     100
 93          RK    1425    .014    .032            TRAP      15       5
             *
```



```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 94          KK    BASD-1
 95          KM        2-36" PIPES
 96          KM        1-12" PIPE AND 10' WEIR AT HEADWALL
 97          RS      1    STOR       0
 98          SV      0    .134    .300    .500
 99          SE   2736    2737    2738    2739
100          SQ      0       3      54      82

101          KK    BASD-2
102          KM        2-36" PIPES
103          KM        1-12" PIPE AND 10' WEIR AT HEADWALL
104          RS      1    STOR       0
105          SV      0    .097    .218    .364
106          SE   2724    2725    2726    2727
107          SQ      0       1      31      82
             *

108          KK       E1                5
109          KM        RUNOFF FROM SUB-BASIN E1
110          BA    .061
111          LS                88      10
112          UK     400     .02     .15     100
113          RK    2050    .013    .032            TRAP      15       5
             *

114          KK   BASE1-1
115          KM        2-36" PIPES
116          KM        1-12" PIPE AND 15' WEIR AT HEADWALL
117          RS      1    STOR       0
118          SV      0    .319    .712    1.18
119          SE   2716    2717    2718    2719
120          SQ      0     2.2    46.5   124.8

121          KK   BASE1-2
122          KM        2-36" PIPES
123          KM        1-12" PIPE AND 15' WEIR AT HEADWALL
124          RS      1    STOR       0
125          SV      0    .108    .238    .391
126          SE   2689    2690    2691    2692
127          SQ      0     2.2    46.5   124.8

128          KK       E2
129          KM        RUNOFF FROM SUB-BASIN E2
130          BA    .046
131          LS                88      10
132          UK     200     .02     .15     100
133          RK    2370    .013    .032            TRAP      15       5
             *
```



```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

134          KK   BASE2
135          KM        2-42" PIPES
```

```
136          KM       1-12" PIPE AND 13' WEIR AT HEADWALL
137          RS     I    STOR       0
138          SV     0    .176     .385     .632     .919
139          SE  2694    2695     2696     2697     2698
140          SQ     0     2.2     40.9   108.95   196.24
             *

141          KK   COMBE
142          KM       COMBINE SECTIONS E1 AND E2
143          HC     2
             *

144          KK   CLEAR
145          KM       CLEAR HYDROGRAPH STACK
146          HC     6
             *

147          KK     E3
148          KM       RUNOFF FROM SUB-BASIN E3
149          BA   .008
150          LS              88       10
151          UK    175    .025      .15      100
152          RK    750    .032     .032             TRAP      15       5
             *

153          KK   BASE3
154          KM       1-24" PIPE
155          RS     1    STOR       0
156          SV     0    .082     .188     .322
157          SE  2711    2712     2713     2714
158          SQ     0     4.2     12.5     20.2
             *

159          KK     F1
160          KM       RUNOFF FROM SUB-BASIN F1
161          BA   .036
162          LS              88       10
163          UK    225    .018      .15      100
164          RK   2500    .012     .032             TRAP      15       5
             *

165          KK   BASF1
166          KM       2-48" PIPES
167          RS     1    STOR       0
168          SV     0    .132     .293     .483
169          SE  2696    2697     2698     2699
170          SQ     0      16       46       92
             *
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

171          KK     F2
172          KM       RUNOFF FROM SUB-BASIN F2
173          BA   .014
174          LS              88       10
175          UK    200    .018      .15      100
176          RK   1440    .028     .032             TRAP      15       5
             *

177          KK   BASF2
178          KM       1-30" PIPE
179          KM       V-NOTCH WEIR WITH 95 DEGREE ANGLE AT HEADWALL
180          RS     1    STOR       0
181          SV     0    .055     .135     .240
182          SE  2701    2702     2703     2704
183          SQ     0     2.7     15.4     42.4
             *

184          KK     F3
185          KM       RUNOFF FROM SUB-BASIN F3
186          BA   .013
187          LS              88       10
188          UK    225    .018      .15      100
189          RK    850    .026     .032             TRAP      15       5
             *

190          KK   BASF3
191          KM       1-30" PIPE
192          KM       V-NOTCH WEIR WITH 50 DEGREE ANGLE AT HEADWALL
193          RS     1    STOR       0
194          SV     0    .055     .133     .239     .378
195          SE  2706    2707     2708     2709     2710
196          SQ     0     1.2      6.6       18     37.2
             *

197          KK       G
198          KM       RUNOFF FROM SUB-BASIN G
199          BA   .015
200          LS              88       10
201          UK    400    .025      .15      100
202          RK    720    .022     .032             TRAP      15       5
             *

203          KK     G-1
204          KM       RUNOFF FROM SUB-BASIN G-1
205          BA   .0014
206          LS              88       10
             *

207          KK   BASIN G-1
208          KM       1-24" PIPE
209          RS     1    STOR       0
210          SV     0    .159     .356     .592
211          SE  2723    2724     2725     2726
```

```
212          SQ       0     4.2    12.5    20.2
             *
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

213          KK    RG-1
214          KM       ROUTE BASIN G-1 THROUGH G
215          RS       1    FLOW       0
216          RC     .45     .35     .45     610    .048    2744
217          RX     100     110     120     138     148     166     176     186
218          RY      10      99      98      95      95      98      99     100
             *

219          KK     CPG
220          KM    CONCENTRATION POINT G
221          HC       2
             *

222          KK      H1
223          KM       RUNOFF FROM SUB-BASIN H1
224          BA    .059
225          LS               88     9.4
226          UK     375    .025     .15     100
227          RK    2210    .019    .032             TRAP      15       5
             *

228          KK    BASH1
229          KM          2-54"PIPE
230          RS       1    STOR       0
231          SV       0    .086    .192    .321    .474
232          SE    2736    2737    2738    2739    2740
233          SQ       0      20      52     104     162
             *

234          KK      H2
235          KM       RUNOFF FROM SUB-BASIN H2
236          BA    .072
237          LS               88    4.78
238          UK     400    .025     .15     100
239          RK    3480    .019    .032             TRAP      15       5
             *

240          KK   BASH2-1
241          KM         3-54" PIPES
242          RS       1    STOR       0
243          SV       0     .34    .743   1.214
244          SE       0       1       2       3
245          SQ       0      30      78     156
             *

246          KK       I
247          KM       RUNOFF FROM SUB-BASIN I
248          BA    .025
249          LS               88     7.4
250          UK     225     .02     .15     100
251          RK    2100    .026    .032             TRAP      15       5
             *
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

252          KK    BASI
253          KM         2-30" PIPE
254          KM        1-12" PIPE AND 9' WEIR AT HEADWALL
255          RS       1    STOR       0
256          SV       0    .186    .399    .640
257          SE    2755    2756    2757    2758
258          SQ       0       2    35.1    87.4
             *

259          KK   CLEAR
260          KM        CLEAR HYDROGRAPH STACK
261          HC       6
             *

262          KK       J
263          KM       RUNOFF FROM SUB-BASIN J
264          BA    .024
265          LS               88     7.9
266          UK     145     .02     .15     100
267          RK     965    .026    .032             TRAP      15       5
             *

268          KK    BASJ
269          KM         1-42" PIPE
270          RS       1    STOR       0
271          SV       0    .098    .217    .359    .528
272          SE    2769    2770    2771    2772    2773
273          SQ       0       8      20      41      60
             *

274          KK       K
275          KM       RUNOFF FROM SUB-BASIN K
276          BA    .009
277          LS               88      10
278          UK      81    .025     .15     100
279          RK     715    .022    .032             TRAP      15       5
             *

280          KK    BASK
281          KM         1-30" PIPE
282          RS       1    STOR       0
283          SV       0    .106    .232    .378
```

```
 284          SE    2737    2738    2739    2740
 285          SQ       0     5.0      16      28
              *

 286          KK       L
 287          KM       RUNOFF FROM SUB-BASIN L
 288          BA    .009
 289          LS              88      10
 290          UK     113    .018     .15     100
 291          RK     450    .012    .032            TRAP      15       5
              *
```



```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 292          KK    BASL
 293          KM          1-30"PIPE
 294          RS       1    STOR       0
 295          SV       0    .035    .096    .188
 296          SE    2722    2723    2724    2725
 297          SQ       0       5      16      28
              *

 298          KK       M
 299          KM       RUNOFF FROM SUB-BASIN M
 300          BA    .008
 301          LS              88      10
 302          UK     137    .018     .15     100
 303          RK     750    .012    .032            TRAP      15       5
              *

 304          KK    BASM
 305          KM          1-30"PIPE
 306          RS       1    STOR       0
 307          SV       0    .069    .160    .278
 308          SE    2721    2722    2723    2724
 309          SQ       0       5      16      28
              *

 310          KK       N
 311          KM       RUNOFF FROM SUB-BASIN N
 312          BA     .01
 313          LS              88      10
 314          UK     117    .018     .15     100
 315          RK    1036    .012    .032            TRAP      15       5
              *

 316          KK    BASN
 317          KM         1-24" PIPE
 318          RS       1    STOR       0
 319          SV       0     .11     .25     .422
 320          SE    2691    2692    2693    2694
 321          SQ       1     4.2    12.5    20.2
              *

 322          KK    BASO
 323          KM       RUNOFF FROM SUB-BASIN O
 324          KM        Area of Basin subtrating the area to be retained for 100 year event
 325          BA  .00265
 326          LS              88      10
 327          UK     108    .02     .15     100
 328          RK     174    .014    .032            TRAP      15       5

 329          KK       P
 330          KM       RUNOFF FROM SUB-BASIN P
 331          KM        Area of Basin subtrating the area to be retained for 100 year event
 332          BA   .0058
 333          LS              88      10
 334          UK     135    .02     .15     100
```



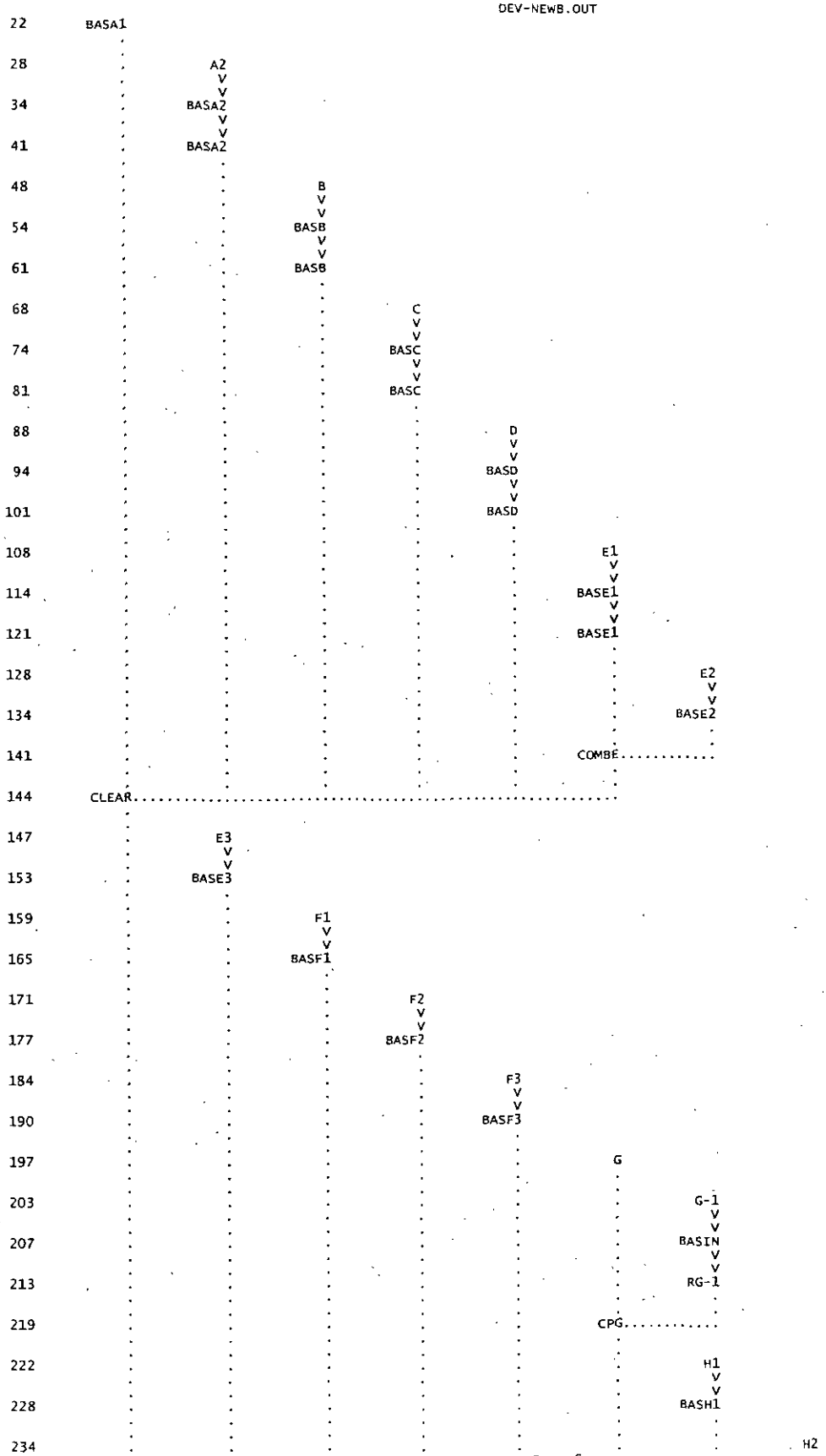
```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 335          RK     354    .014    .032            TRAP      15       5

 336          KK   CLEAR
 337          KM        CLEAR HYDROGRAPH STACK
 338          HC       8

 339          KK       Q
 340          KM       RUNOFF FROM SUB-BASIN Q
 341          KM        Area of Basin subtrating the area to be retained for 100 year event
 342          BA   .0024
 343          LS              88      10
 344          UK      86    .02     .15     100
 345          RK     160    .014    .032            TRAP      15       5

 346          KK       R
 347          KM       RUNOFF FROM SUB-BASIN R
 348          KM        Area of Basin subtrating the area to be retained for 100 year event
 349          BA    .148
 350          LS              88     .14
 351          UK     180    .025     .15     100
 352          RK    1840    .023    .032            TRAP      15       5
 353          ZZ
```

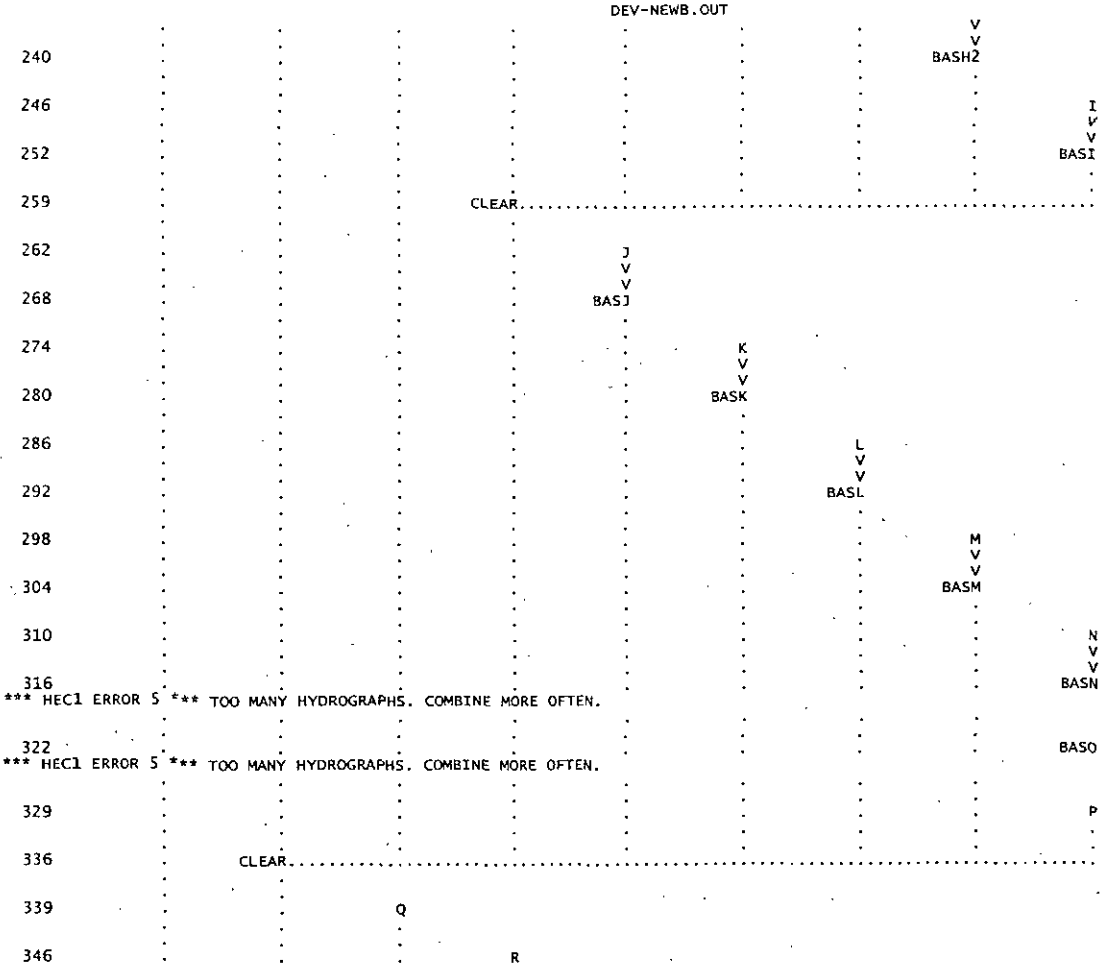
1 SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING
(.) CONNECTOR
(---->) DIVERSION OR PUMP FLOW
(<----) RETURN OF DIVERTED OR PUMPED FLOW

```
  16        A1
             V
             V
```


22
BASA1
28
A2
34
BASA2
41
BASA2
48
B
54
BASB
61
BASB
68
C
74
BASC
81
BASC
88
D
94
BASD
101
BASD
108
E1
114
BASE1
121
BASE1
128
E2
134
BASE2
141
COMBE
144
CLEAR
147
E3
153
BASE3
159
F1
165
BASF1
171
F2
177
BASF2
184
F3
190
BASF3
197
G
203
G-1
207
BASIN
213
RG-1
219
CPG
222
H1
228
BASH1
234
H2



*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.

*** HEC1 ERROR 5 *** TOO MANY HYDROGRAPHS. COMBINE MORE OFTEN.

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

2 ERRORS IN STREAM SYSTEM

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*             JUN  1998                 *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   16DEC05  TIME  09:14:58   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

HEC-1 MODEL FOR MCDOWELL MOUNTAIN BACKBOWL
100-YEAR, 6-HOUR STORM
RAINFALL FROM NOAA ATLAS
SCS CURVE NUMBER SOIL LOSS PARAMETERS
KINEMATIC WAVE HYDROGRAPH ROUTING
DEVELOPED CONDITIONS
10% IMPERVIOUS AREA USED FOR SITE

PREPARED BY WOOD/PATEL, 1.10.2005
FILE NAME: DEV-100.DAT

13 IO — OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT — HYDROGRAPH TIME DATA

NMIN	2	MINUTES IN COMPUTATION INTERVAL
IDATE	1 0	STARTING DATE
ITIME	0000	STARTING TIME
NQ	2000	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	3 0	ENDING DATE
NDTIME	1838	ENDING TIME
ICENT	19	CENTURY MARK

COMPUTATION INTERVAL .03 HOURS
TOTAL TIME BASE 66.63 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

14 JD INDEX STORM NO. 1

STRM	3.37	PRECIPITATION DEPTH
TRDA	.01	TRANSPOSITION DRAINAGE AREA

15 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.03	.03	.03	.03	.03
.04	.04	.04	.06	.06	.07	.09	.12	.17	.29
.29	.24	.15	.11	.07	.07	.06	.05	.04	.04
.04	.03	.03	.03	.03	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 1

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 1

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION= 1

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	A1	224.	3.17	19.	5.	2.	.08		
+	ROUTED TO	BASA1	220.	3.20	19.	5.	2.	.08		
+									2.94	3.20
+	HYDROGRAPH AT	A2	107.	3.13	9.	2.	1.	.04		
+	ROUTED TO	BASA2	100.	3.17	9.	2.	1.	.04		
+									2774.69	3.17
+	ROUTED TO	BASA2	100.	3.20	9.	2.	1.	.04		
+									2735.68	3.20
+	HYDROGRAPH AT	B	187.	3.20	18.	5.	2.	.08		
+	ROUTED TO	BASB	183.	3.20	18.	5.	2.	.08		
+									2769.90	3.20
+	ROUTED TO	BASB	181.	3.23	18.	5.	2.	.08		
+									2748.67	3.23
+	HYDROGRAPH AT	C	86.	3.13	7.	2.	1.	.03		
+	ROUTED TO	BASC	84.	3.17	7.	2.	1.	.03		
+									2781.48	3.17
+	ROUTED TO	BASC	83.	3.20	7.	2.	1.	.03		
+									2756.46	3.20
+	HYDROGRAPH AT	D	93.	3.17	8.	2.	1.	.03		
+	ROUTED TO	BASD	80.	3.23	8.	2.	1.	.03		
+									2738.92	3.23
+	ROUTED TO	BASD	78.	3.27	8.	2.	1.	.03		
+									2726.92	3.27

+	HYDROGRAPH AT	E1	144.	3.20	15.	4.	1.	.06	
+ +	ROUTED TO	BASE1	124.	3.27	14.	4.	1.	.06	2719.00 3.27
+ +	ROUTED TO	BASE1	123.	3.30	14.	4.	1.	.06	2691.98 3.30
+	HYDROGRAPH AT	E2	133.	3.17	11.	3.	1.	.05	
+ +	ROUTED TO	BASE2	123.	3.20	11.	3.	1.	.05	2697.16 3.20
+	2 COMBINED AT	COMBE	226.	3.27	25.	7.	2.	.11	
+	6 COMBINED AT	CLEAR	861.	3.23	86.	22.	8.	.37	
+	HYDROGRAPH AT	E3	27.	3.10	2.	0.	0.	.01	
+ +	ROUTED TO	BASE3	16.	3.23	2.	0.	0.	.01	2713.42 3.23
+	HYDROGRAPH AT	F1	96.	3.17	9.	2.	1.	.04	
+ +	ROUTED TO	BASF1	88.	3.23	9.	2.	1.	.04	2698.91 3.23
+	HYDROGRAPH AT	F2	43.	3.13	3.	1.	0.	.01	
+ +	ROUTED TO	BASF2	38.	3.20	3.	1.	0.	.01	2703.83 3.20
+	HYDROGRAPH AT	F3	39.	3.13	3.	1.	0.	.01	
+ +	ROUTED TO	BASF3	30.	3.20	3.	1.	0.	.01	2709.60 3.20
+	HYDROGRAPH AT	G	38.	3.17	4.	1.	0.	.01	
+	HYDROGRAPH AT	G-1	0.	.00	0.	0.	0.	.00	
+ +	ROUTED TO	BASIN	0.	.00	0.	0.	0.	.00	2723.00 .00
+ +	ROUTED TO	RG-1	0.	.00	0.	0.	0.	.00	10.00 .00
+	2 COMBINED AT	CPG	38.	3.17	4.	1.	0.	.02	
+	HYDROGRAPH AT	H1	149.	3.17	14.	4.	1.	.06	
+ +	ROUTED TO	BASH1	144.	3.20	14.	4.	1.	.06	2739.69 3.20
+	HYDROGRAPH AT	H2	165.	3.23	17.	4.	2.	.07	
+ +	ROUTED TO	BASH2	143.	3.30	17.	4.	2.	.07	2.84 3.30
+	HYDROGRAPH AT	I	72.	3.17	6.	2.	1.	.03	
+ +	ROUTED TO	BASI	61.	3.20	6.	2.	1.	.03	2757.50 3.20
+	6 COMBINED AT	CLEAR	430.	3.23	47.	12.	4.	.20	
+	HYDROGRAPH AT	J	83.	3.10	6.	1.	1.	.02	
+ +	ROUTED TO	BASJ	60.	3.17	6.	1.	1.	.02	2772.99 3.17
+	HYDROGRAPH AT	K	36.	3.07	2.	1.	0.	.01	
+	ROUTED TO	BASK	21.	3.17	2.	1.	0.	.01	

+								2739.39	3.17
	HYDROGRAPH AT								
+		L	33.	3.10	2.	1.	0.	.01	
	ROUTED TO								
+		BASL	25.	3.17	2.	1.	0.	.01	
+								2724.73	3.17
	HYDROGRAPH AT								
+		M	27.	3.10	2.	0.	0.	.01	
	ROUTED TO								
+		BASM	19.	3.20	2.	0.	0.	.01	
+								2723.27	3.20
	HYDROGRAPH AT								
+		N	34.	3.10	2.	1.	0.	.01	
	ROUTED TO								
+		BASN	17.	3.27	3.	1.	1.	.01	
+								2693.57	3.27
	HYDROGRAPH AT								
+		BASO	10.	3.07	1.	0.	0.	.00	
	HYDROGRAPH AT								
+		P	21.	3.10	1.	0.	0.	.01	
	8 COMBINED AT								
+		CLEAR	574.	3.23	64.	17.	7.	.27	
	HYDROGRAPH AT								
+		Q	9.	3.07	1.	0.	0.	.00	
	HYDROGRAPH AT								
+		R	448.	3.10	32.	8.	3.	.14	

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
FOR STORM = 1 STORM AREA (SQ MI) = .01									
A1	MANE	1.97	224.38	189.72	2.16	2.00	223.88	190.00	2.16
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9578E+01 OUTFLOW= .9540E+01 BASIN STORAGE= .3266E-03 PERCENT ERROR= .4									
FOR STORM = 1 STORM AREA (SQ MI) = .01									
A2	MANE	1.47	108.11	188.73	2.24	2.00	106.51	188.00	2.24
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4302E+01 OUTFLOW= .4296E+01 BASIN STORAGE= .1214E-03 PERCENT ERROR= .1									
FOR STORM = 1 STORM AREA (SQ MI) = .01									
B	MANE	1.38	188.28	190.79	2.21	2.00	187.40	192.00	2.21
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9116E+01 OUTFLOW= .9090E+01 BASIN STORAGE= .5599E-03 PERCENT ERROR= .3									
FOR STORM = 1 STORM AREA (SQ MI) = .01									
C	MANE	1.33	87.41	188.69	2.22	2.00	86.27	188.00	2.22
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3556E+01 OUTFLOW= .3548E+01 BASIN STORAGE= .1096E-03 PERCENT ERROR= .2									
FOR STORM = 1 STORM AREA (SQ MI) = .01									
D	MANE	1.27	92.75	189.26	2.29	2.00	92.69	190.00	2.29
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4165E+01 OUTFLOW= .4152E+01 BASIN STORAGE= .1802E-03 PERCENT ERROR= .3									
FOR STORM = 1 STORM AREA (SQ MI) = .01									
E1	MANE	1.50	144.09	192.20	2.26	2.00	143.65	192.00	2.26
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7392E+01 OUTFLOW= .7359E+01 BASIN STORAGE= .5820E-03 PERCENT ERROR= .4									
FOR STORM = 1 STORM AREA (SQ MI) = .01									
E2	MANE	1.90	134.16	188.57	2.27	2.00	133.10	190.00	2.27
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5574E+01 OUTFLOW= .5561E+01 BASIN STORAGE= .1525E-03 PERCENT ERROR= .2									
FOR STORM = 1 STORM AREA (SQ MI) = .01									
E3	MANE	.78	27.54	186.24	2.27	2.00	27.41	186.00	2.27
CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9695E+00 OUTFLOW= .9684E+00 BASIN STORAGE= .1817E-04 PERCENT ERROR= .1									
FOR STORM = 1 STORM AREA (SQ MI) = .01									
F1	MANE	2.00	98.02	190.68	2.27	2.00	95.80	190.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4363E+01 OUTFLOW= .4350E+01 BASIN STORAGE= .1591E-03 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01

F2	MANE	1.22	42.84	188.53	2.27	2.00	42.60	188.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1697E+01 OUTFLOW= .1693E+01 BASIN STORAGE= .4564E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01

F3	MANE	.75	39.32	187.69	2.27	2.00	39.09	188.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1575E+01 OUTFLOW= .1573E+01 BASIN STORAGE= .5118E-04 PERCENT ERROR= .2

FOR STORM = 1 STORM AREA (SQ MI) = .01

G	MANE	.77	38.40	190.65	2.27	2.00	38.38	190.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1818E+01 OUTFLOW= .1813E+01 BASIN STORAGE= .1139E-03 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01

H1	MANE	1.43	150.60	191.55	2.26	2.00	149.35	190.00	2.26

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7127E+01 OUTFLOW= .7105E+01 BASIN STORAGE= .4181E-03 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01

H2	MANE	2.00	167.87	193.01	2.20	2.00	165.00	194.00	2.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8481E+01 OUTFLOW= .8441E+01 BASIN STORAGE= .5510E-03 PERCENT ERROR= .5

FOR STORM = 1 STORM AREA (SQ MI) = .01

I	MANE	1.48	72.37	188.53	2.23	2.00	71.73	190.00	2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2987E+01 OUTFLOW= .2980E+01 BASIN STORAGE= .1012E-03 PERCENT ERROR= .3

FOR STORM = 1 STORM AREA (SQ MI) = .01

J	MANE	.75	83.27	185.90	2.25	2.00	83.14	186.00	2.25

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2876E+01 OUTFLOW= .2874E+01 BASIN STORAGE= .4203E-04 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

K	MANE	.77	35.81	184.12	2.27	2.00	35.58	184.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1091E+01 OUTFLOW= .1090E+01 BASIN STORAGE= .5989E-05 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .01

L	MANE	.66	33.19	184.98	2.27	2.00	32.61	186.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1091E+01 OUTFLOW= .1090E+01 BASIN STORAGE= .1377E-04 PERCENT ERROR= .0

FOR STORM = 1 STORM AREA (SQ MI) = .01

M	MANE	1.04	27.69	186.68	2.27	2.00	27.29	186.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9695E+00 OUTFLOW= .9685E+00 BASIN STORAGE= .1590E-04 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

N	MANE	1.26	34.49	187.00	2.27	2.00	34.09	186.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1212E+01 OUTFLOW= .1211E+01 BASIN STORAGE= .1508E-04 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

BASO	MANE	.31	10.07	184.74	2.27	2.00	9.97	184.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3211E+00 OUTFLOW= .3207E+00 BASIN STORAGE= .3235E-05 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

P	MANE	.50	21.02	185.36	2.27	2.00	20.67	186.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7029E+00 OUTFLOW= .7020E+00 BASIN STORAGE= .8658E-05 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

Q	MANE	.41	9.50	183.99	2.27	2.00	9.49	184.00	2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2908E+00 OUTFLOW= .2906E+00 BASIN STORAGE= .2034E-05 PERCENT ERROR= .1

FOR STORM = 1 STORM AREA (SQ MI) = .01

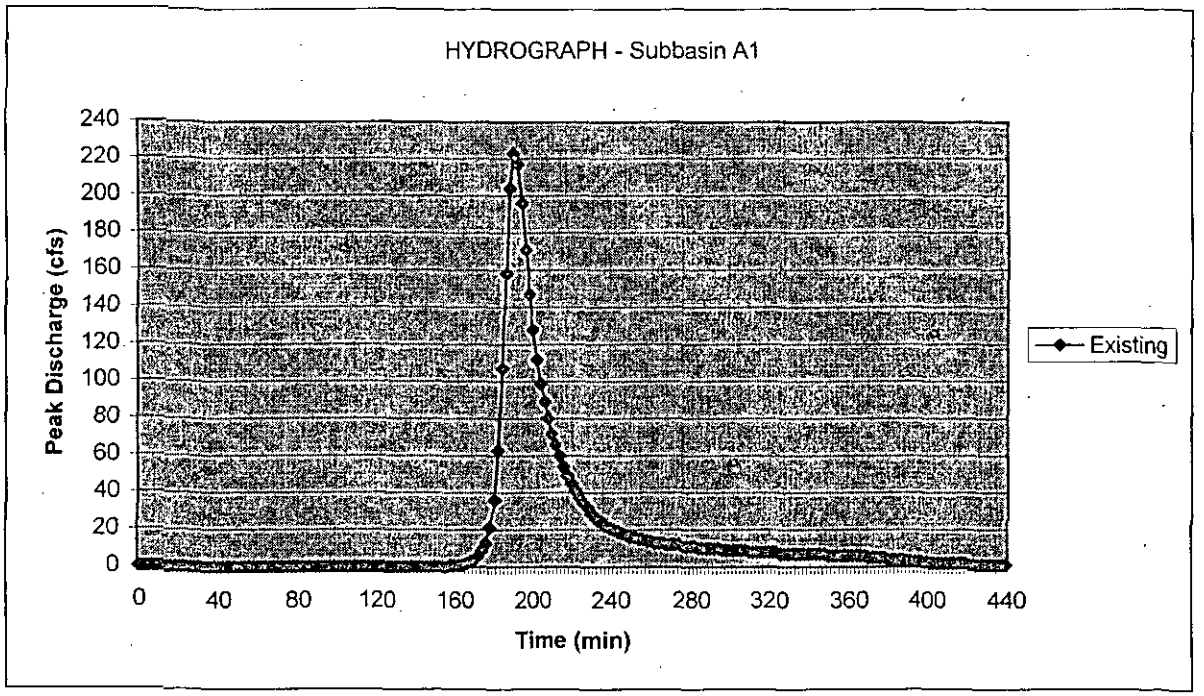
R	MANE	.82	453.82	187.00	2.15	2.00	447.75	186.00	2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1607E+02 OUTFLOW= .1605E+02 BASIN STORAGE= .2979E-03 PERCENT ERROR= .1

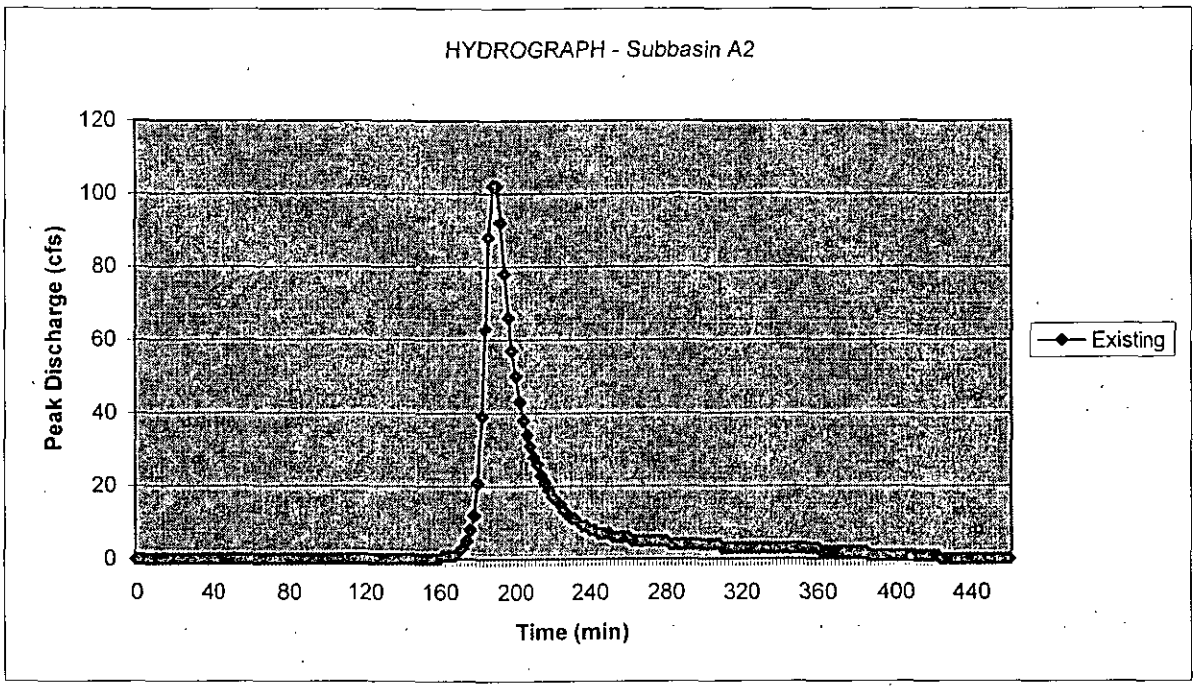
*** NORMAL END OF HEC-1 ***

Project: *Sereno Canyon*
Location: *City of Scottsdale*

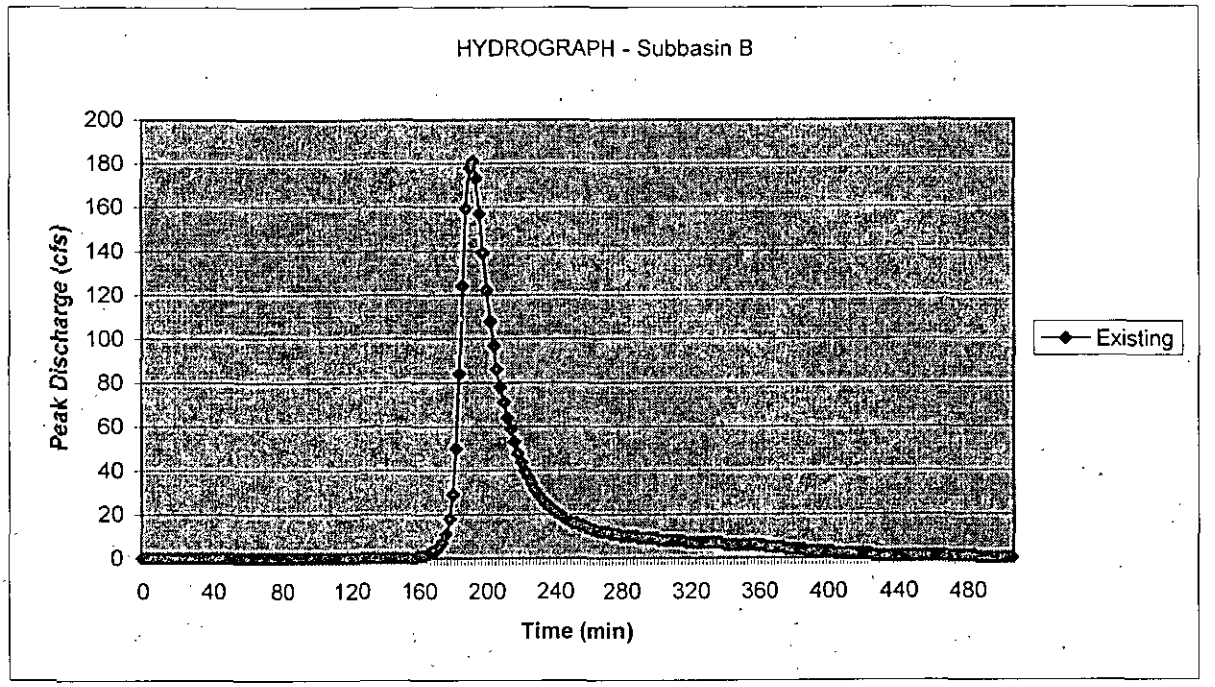
W/P#: *042054*
Date: *12/16/2005*



Project: *Sereno Canyon* **W/P#:** *042054*
Location: *City of Scottsdale* **Date:** *12/16/2005*

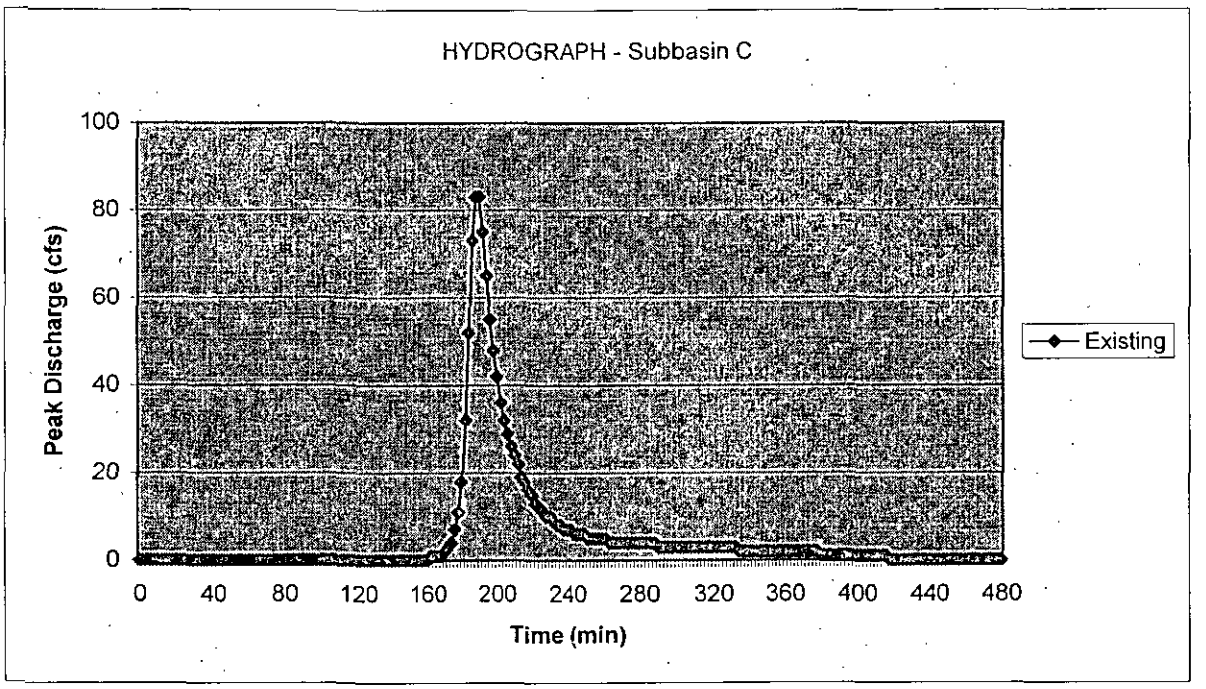


Project: *Sereno Canyon* **W/P#:** *042054*
Location: *City of Scottsdale* **Date:** *12/16/2005*



Project: *Sereno Canyon*
Location: *City of Scottsdale*

W/P#: *042054*
Date: *12/16/2005*



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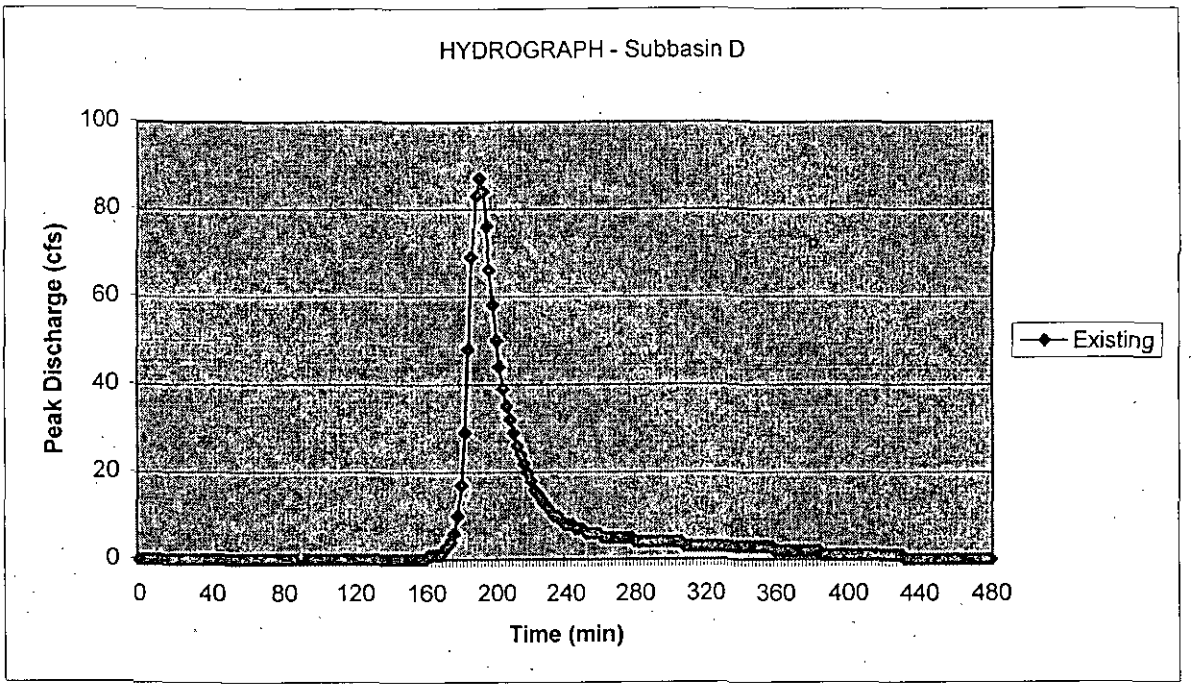
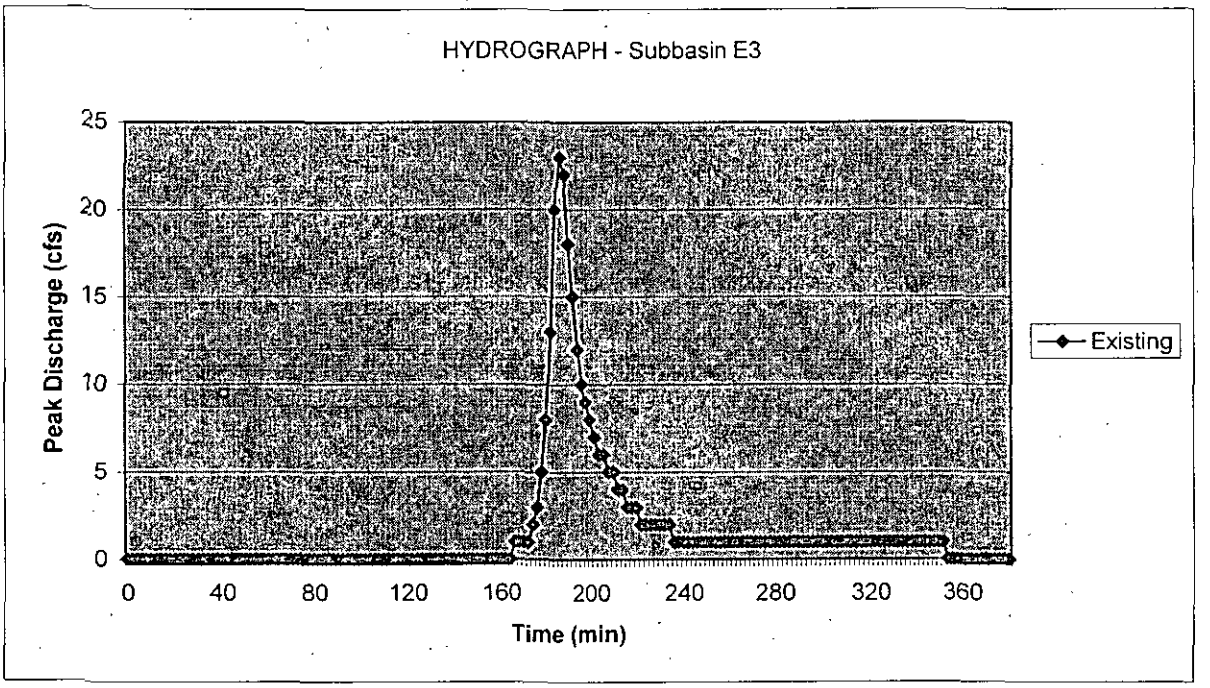
Location: *City of Scottsdale* **Date:** *12/16/2005*

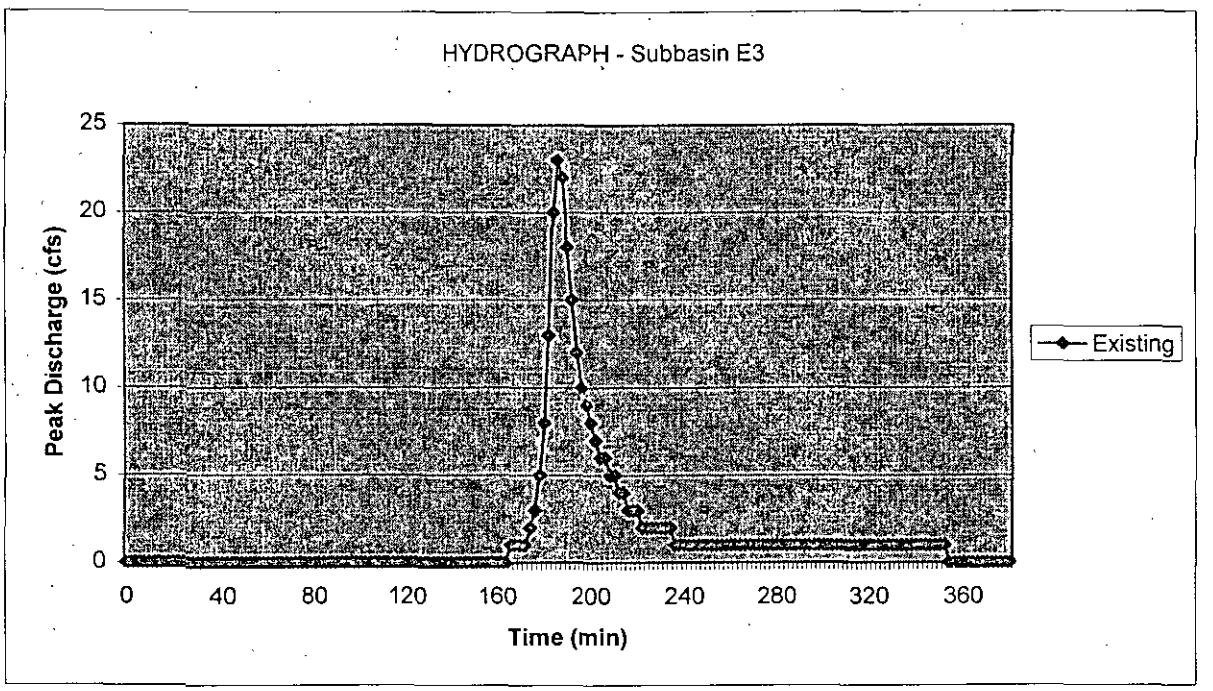


Project: *Sereno Canyon* **W/P#:** *042054*
Location: *City of Scottsdale* **Date:** *12/16/2005*

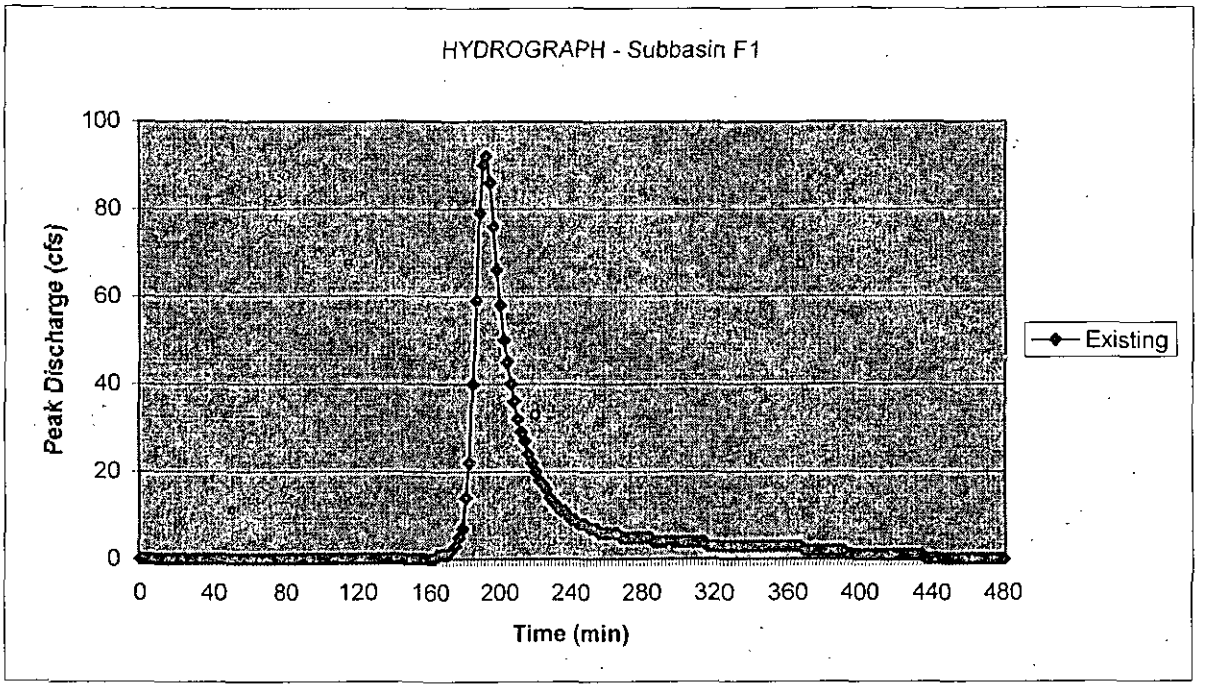


Project: *Sereno Canyon*
Location: *City of Scottsdale*

W/P#: *042054*
Date: *12/16/2005*



Project: *Sereno Canyon* **W/P#:** *042054*
Location: *City of Scottsdale* **Date:** *12/16/2005*



APPENDIX D

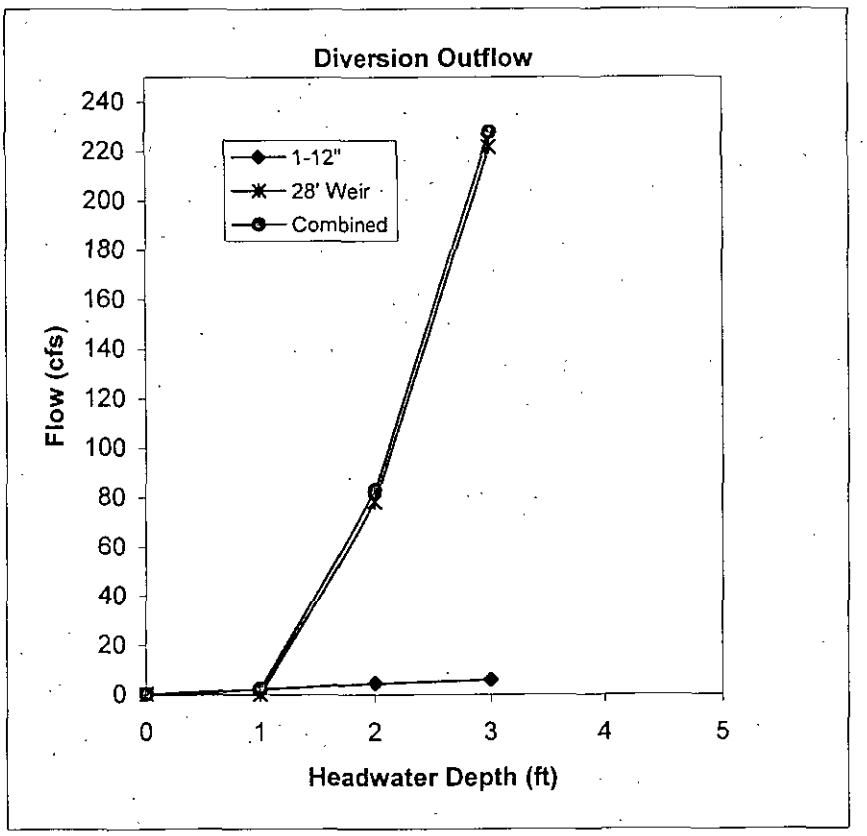
Hydraulics:
Culvert Rating Curves for Stage-Storage Intervals

Project: *Sereno Canyon* **W/P#:** *042054*

Location: *City of Scottsdale* **Date:** *12/16/2005*

Rating Curve for Diversion BASA1

1-12"		28' Weir		Combined Flows	
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs
0	0	0	0	0	0
1	2.2	1	0	1	2
2	4.5	2	78	2	83
3	6	3	222	3	228

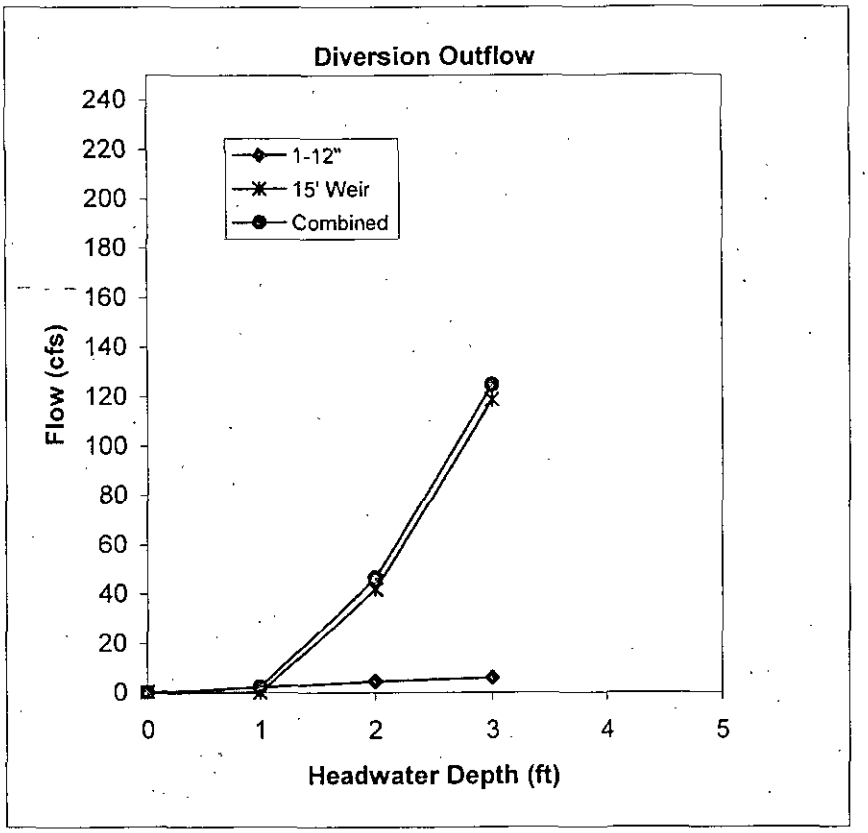


Project: *Sereno Canyon*
Location: *City of Scottsdale*

W/P#: *042054*
Date: *12/16/2005*

Rating Curve for Diversion BASA2

1-12"		15' Weir		Combined Flows	
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs
0	0	0	0	0	0
1	2.2	1	0	1	2
2	4.5	2	42	2	47
3	6	3	119	3	125

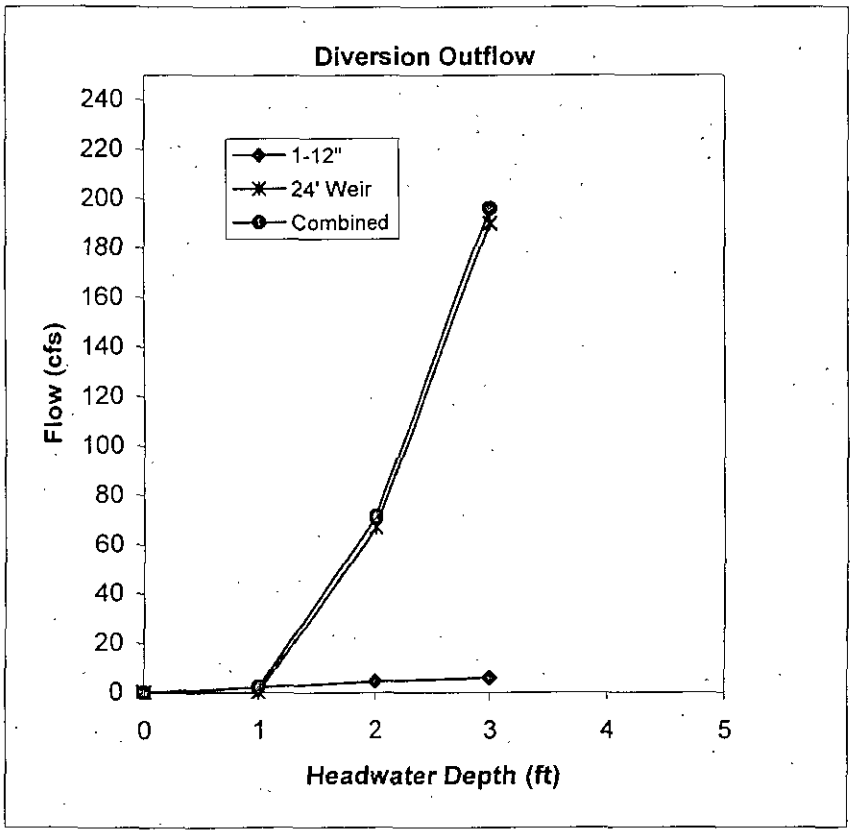


Project: *Sereno Canyon* **W/P#:** *042054*

Location: *City of Scottsdale* **Date:** *12/16/2005*

Rating Curve for Diversion BASB

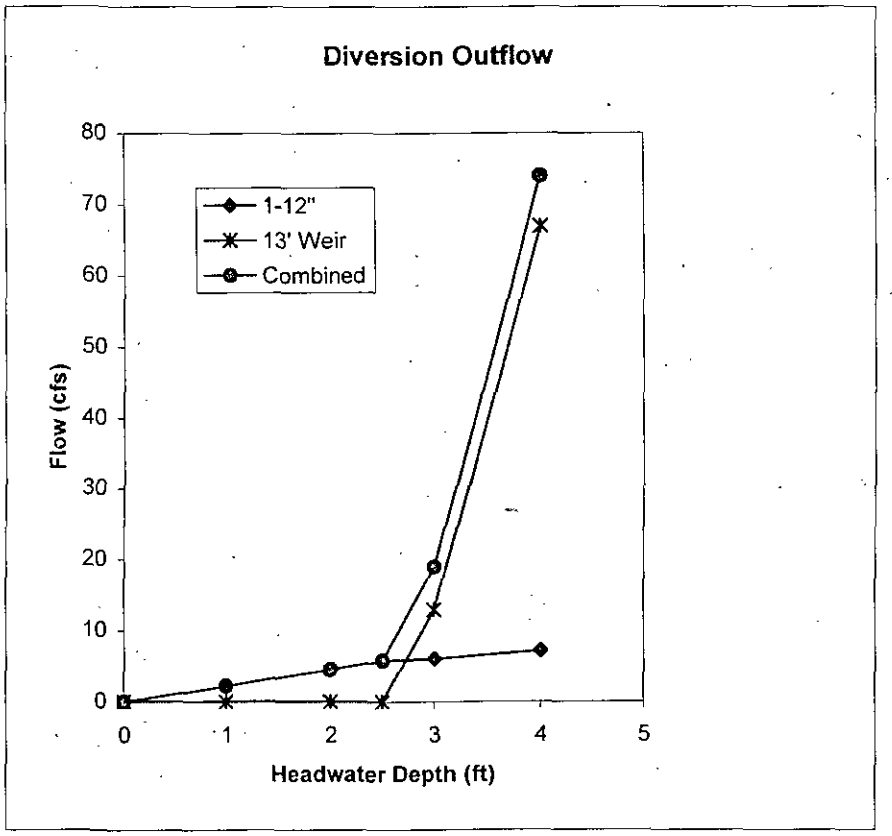
1-12"		24' Weir		Combined Flows	
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs
0	0	0	0	0	0
1	2.2	1	0	1	2
2	4.5	2	67	2	72
3	6	3	190	3	196



Project: *Sereno Canyon* **W/P#:** *042054*
Location: *City of Scottsdale* **Date:** *12/16/2005*

Rating Curve for Diversion BASH2

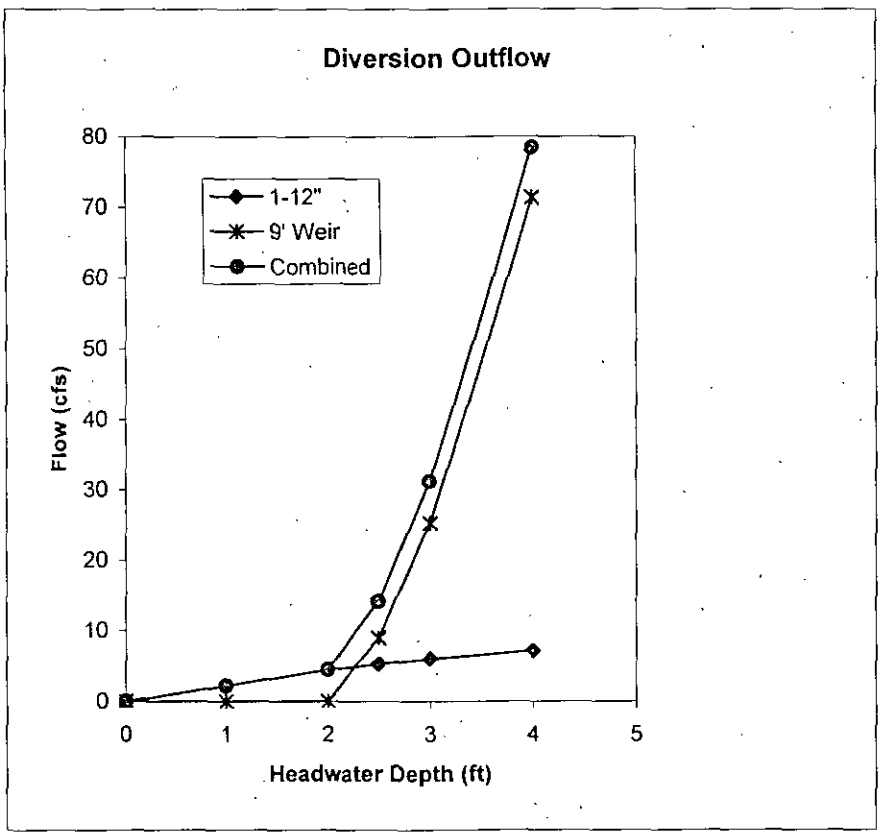
1-12"		13' Weir		Combined Flows	
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs
0	0	0	0	0	0.0
1	2.2	1	0	1	2.2
2	4.5	2	0	2	4.5
2.5	5.75	2.5	0	2.5	5.8
3	6	3	13	3	18.9
4	7.1	4	67	4	74.0
5	8.2	5	144	5	152.1



Project: *Sereno Canyon* **W/P#:** *042054*
Location: *City of Scottsdale* **Date:** *12/16/2005*

Rating Curve for Diversion BASI

1-12"		9' Weir		Combined Flows	
Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs	Headwater Depth ft	Flow cfs
0	0	0	0	0	0
1	2.2	1	0	1	2
2	4.5	2	0	2	5
2.5	5.25	2.5	9	2.5	14
3	6	3	25	3	31
4	7.1	4	71	4	78



HEC-RAS Output Files

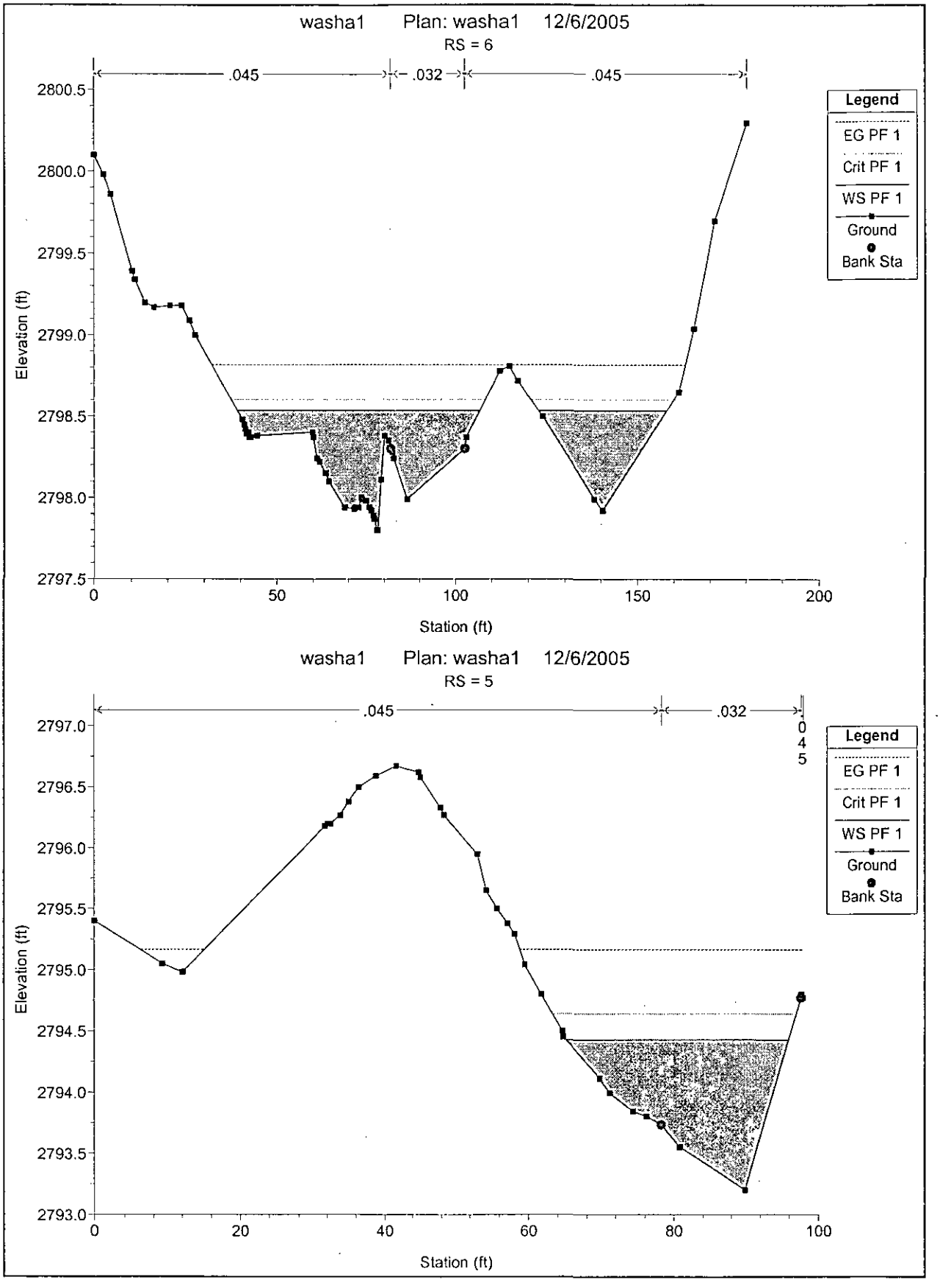
WASH A1

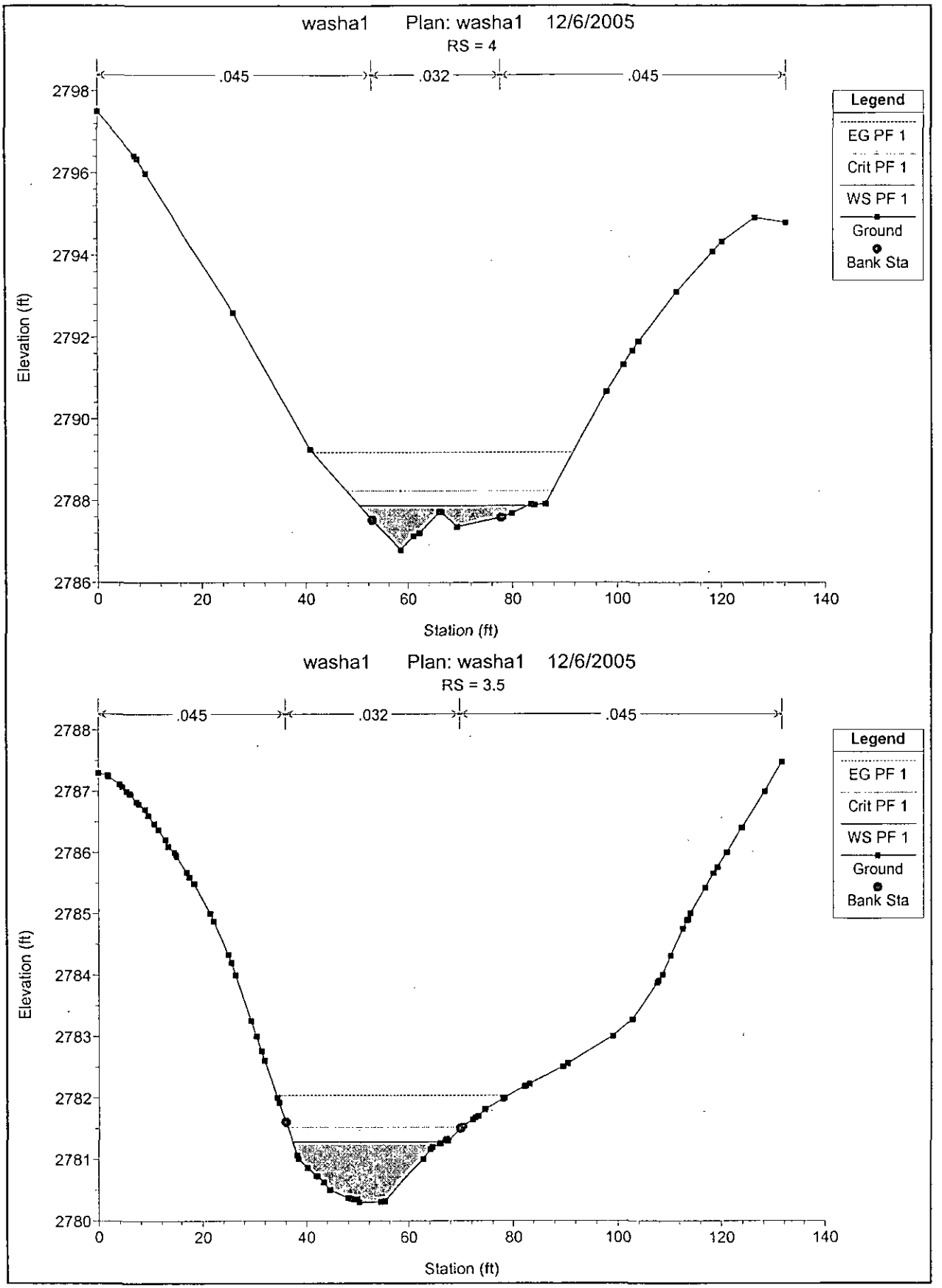
HEC-RAS Plan: wasa1 River: RIVER-1 Reach: Reach-1 Profile: PF 1

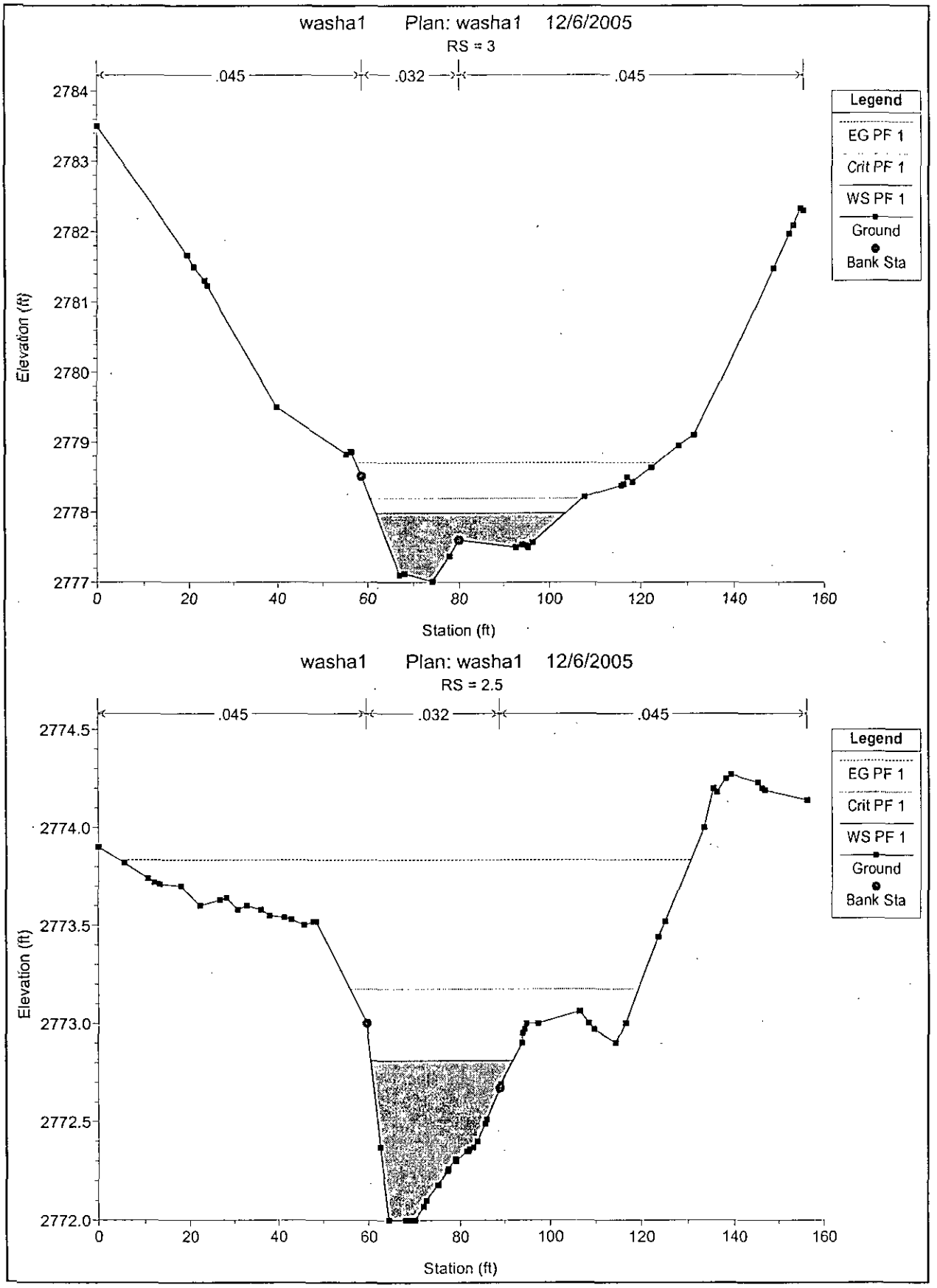
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	6	PF 1	128.00	2797.99	2798.54	2798.60	2798.82	0.050032	5.55	32.78	102.82	1.56
Reach-1	5	PF 1	128.00	2793.20	2794.43	2794.64	2795.16	0.030199	7.29	20.61	30.80	1.38
Reach-1	4	PF 1	128.00	2786.79	2787.88	2788.24	2789.18	0.092876	9.28	14.63	32.77	2.24
Reach-1	3.5	PF 1	128.00	2780.30	2781.28	2781.51	2782.04	0.041984	6.96	18.39	29.28	1.55
Reach-1	3	PF 1	128.00	2777.01	2777.99	2778.19	2778.70	0.041823	7.52	21.73	41.91	1.57
Reach-1	2.5	PF 1	128.00	2772.00	2772.81	2773.17	2773.83	0.068010	8.13	15.91	31.40	1.93
Reach-1	2	PF 1	213.00	2761.68	2763.46	2764.06	2765.28	0.053087	11.76	23.67	34.94	1.91
Reach-1	1.5	PF 1	213.00	2759.00	2760.11	2760.23	2760.58	0.032801	5.46	39.01	74.45	1.33
Reach-1	1	PF 1	213.00	2753.00	2754.25	2754.61	2755.43	0.048899	9.70	30.35	57.61	1.78

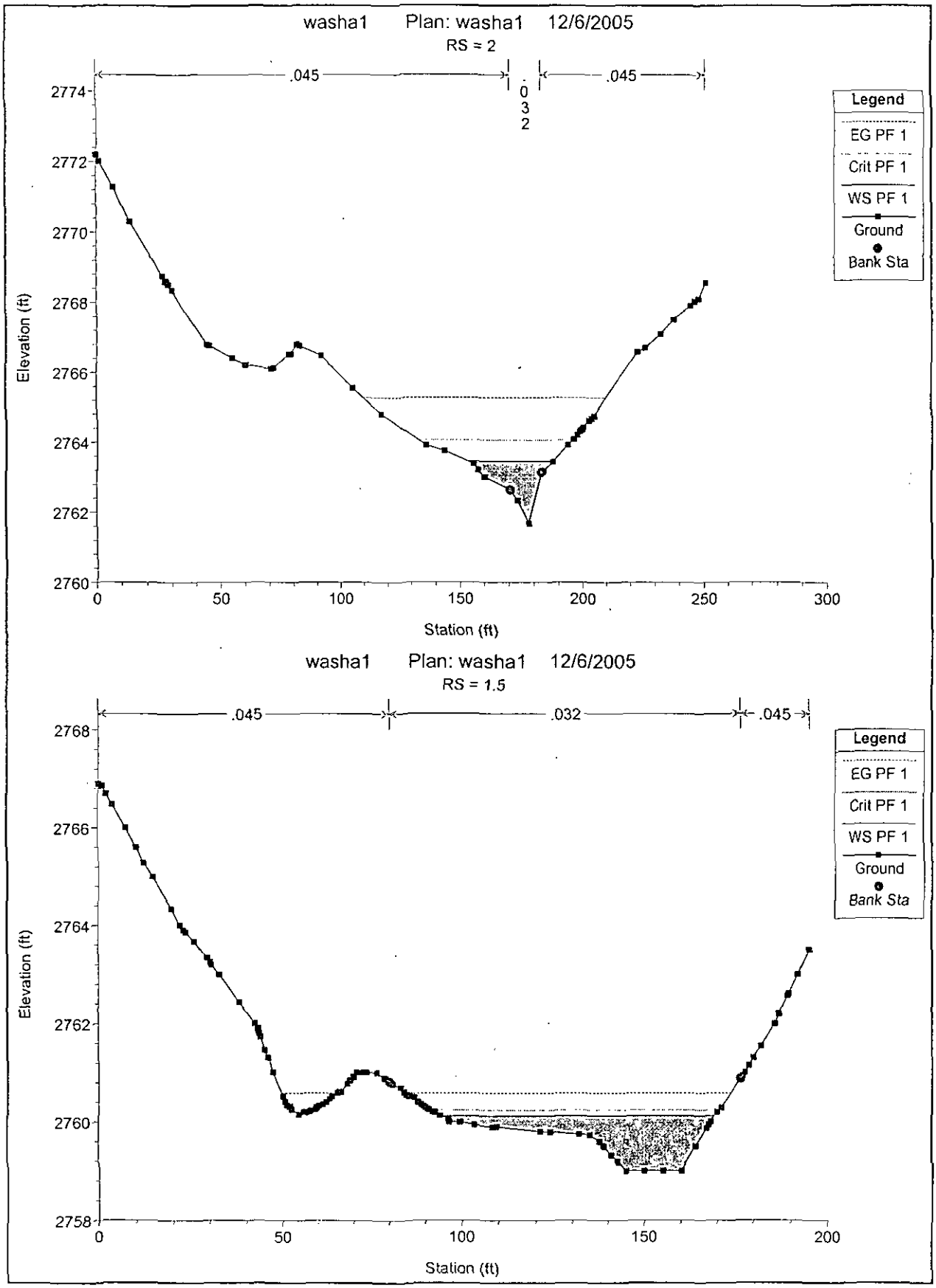
Errors Warnings and Notes for Plan : wasa1

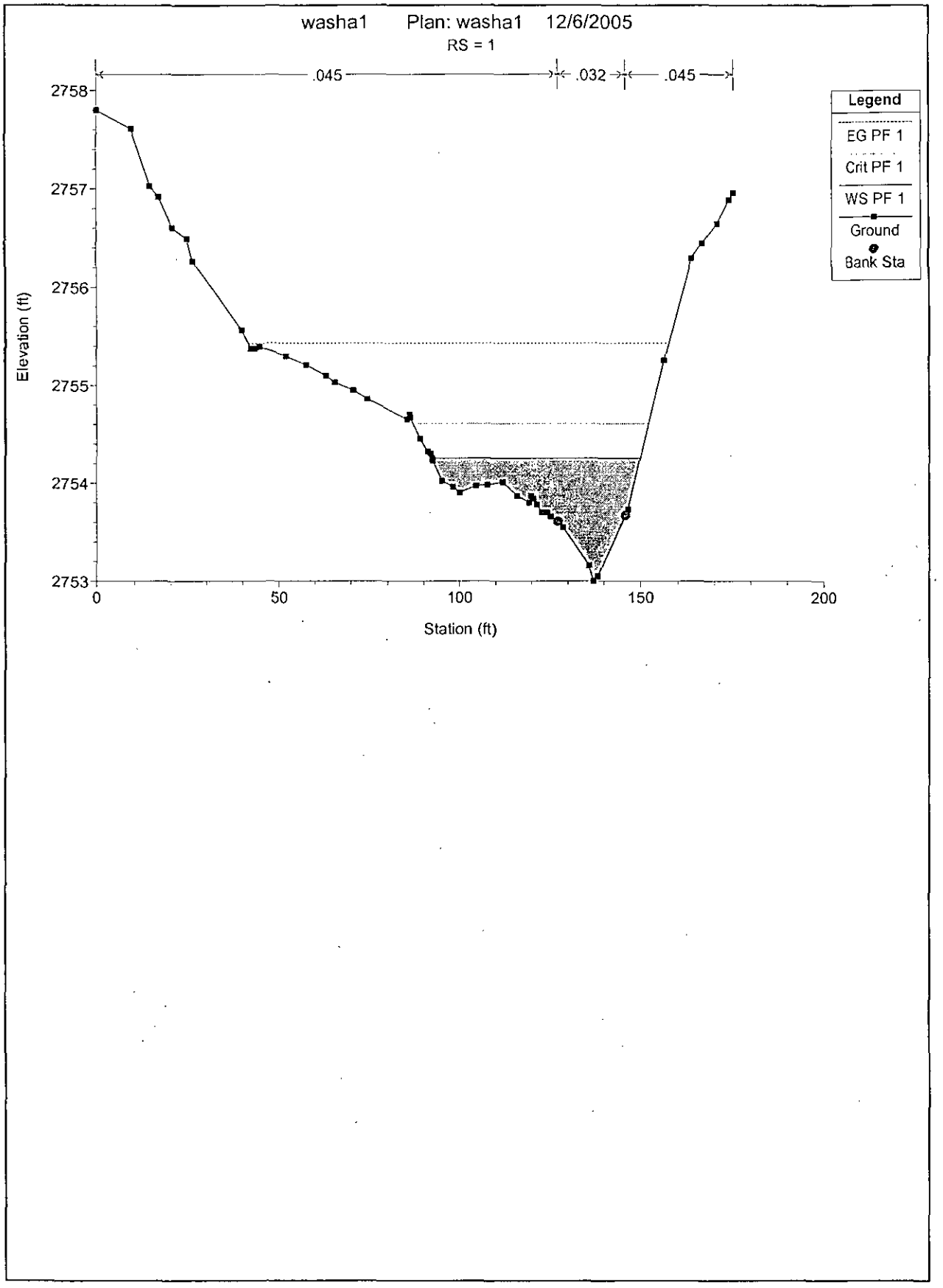
Location:	River: RIVER-1 Reach: Reach-1 RS: 6 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3.5 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1.5 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.


washa1 Plan: washa1 12/6/2005
RS = 6
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2800.5
2800.0
2799.5
2799.0
2798.5
2798.0
2797.5
0
50
100
150
200
Station (ft)
washa1 Plan: washa1 12/6/2005
RS = 5
.045
.032
0
4
5
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2797.0
2796.5
2796.0
2795.5
2795.0
2794.5
2794.0
2793.5
2793.0
0
20
40
60
80
100
Station (ft)


washa1 Plan: washa1 12/6/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washa1 Plan: washa1 12/6/2005
RS = 3.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washa1 Plan: washa1 12/6/2005
RS = 3
.045
.032
.045
2784
2783
2782
2781
2780
2779
2778
2777
Elevation (ft)
0
20
40
60
80
100
120
140
160
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
washa1 Plan: washa1 12/6/2005
RS = 2.5
.045
.032
.045
2774.5
2774.0
2773.5
2773.0
2772.5
2772.0
Elevation (ft)
0
20
40
60
80
100
120
140
160
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta


washa1 Plan: washa1 12/6/2005
RS = 2
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washa1 Plan: washa1 12/6/2005
RS = 1.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washa1 Plan: washa1 12/6/2005
RS = 1
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2758
2757
2756
2755
2754
2753
0
50
100
150
200
Station (ft)

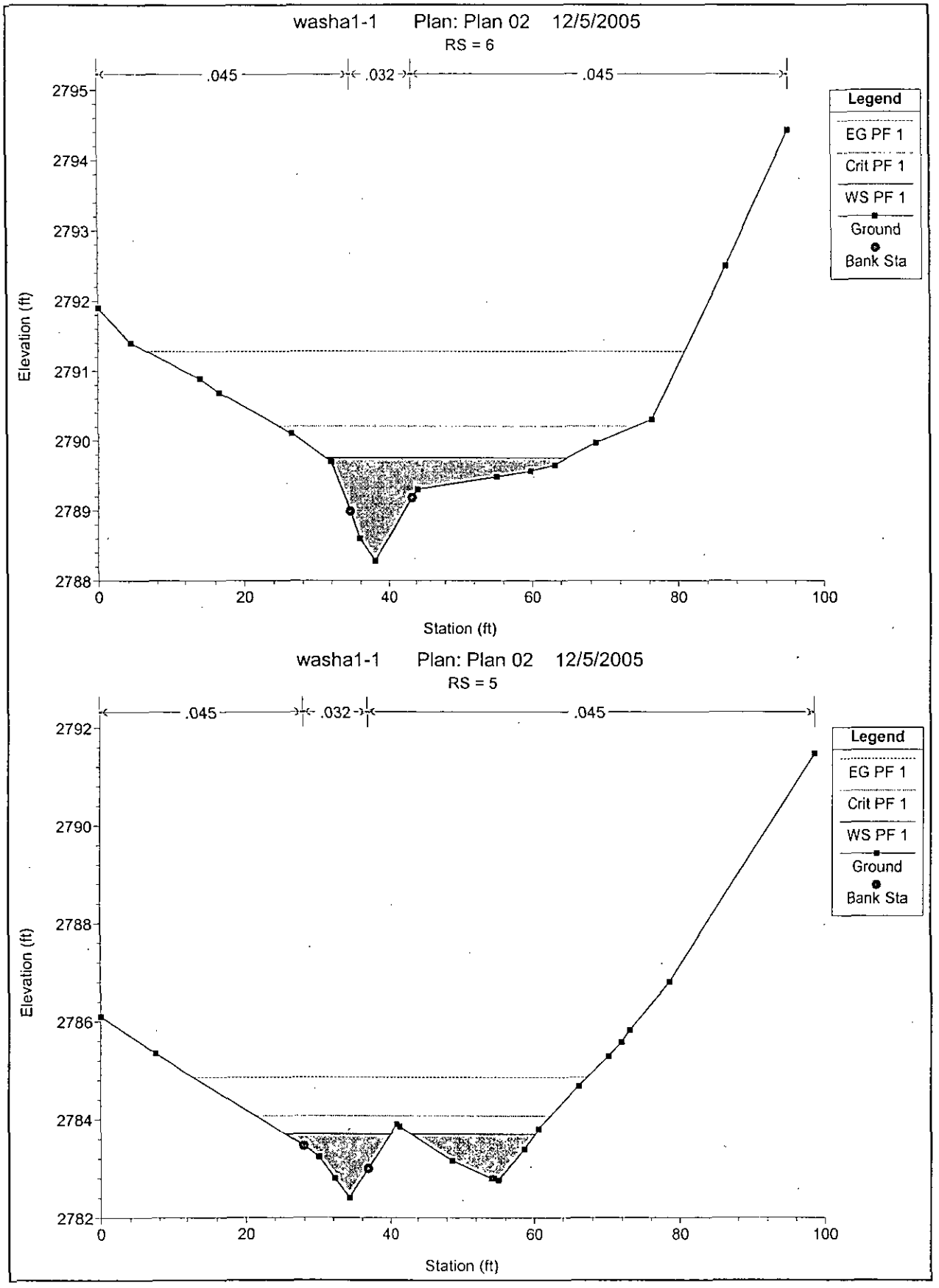
WASHOA1-1

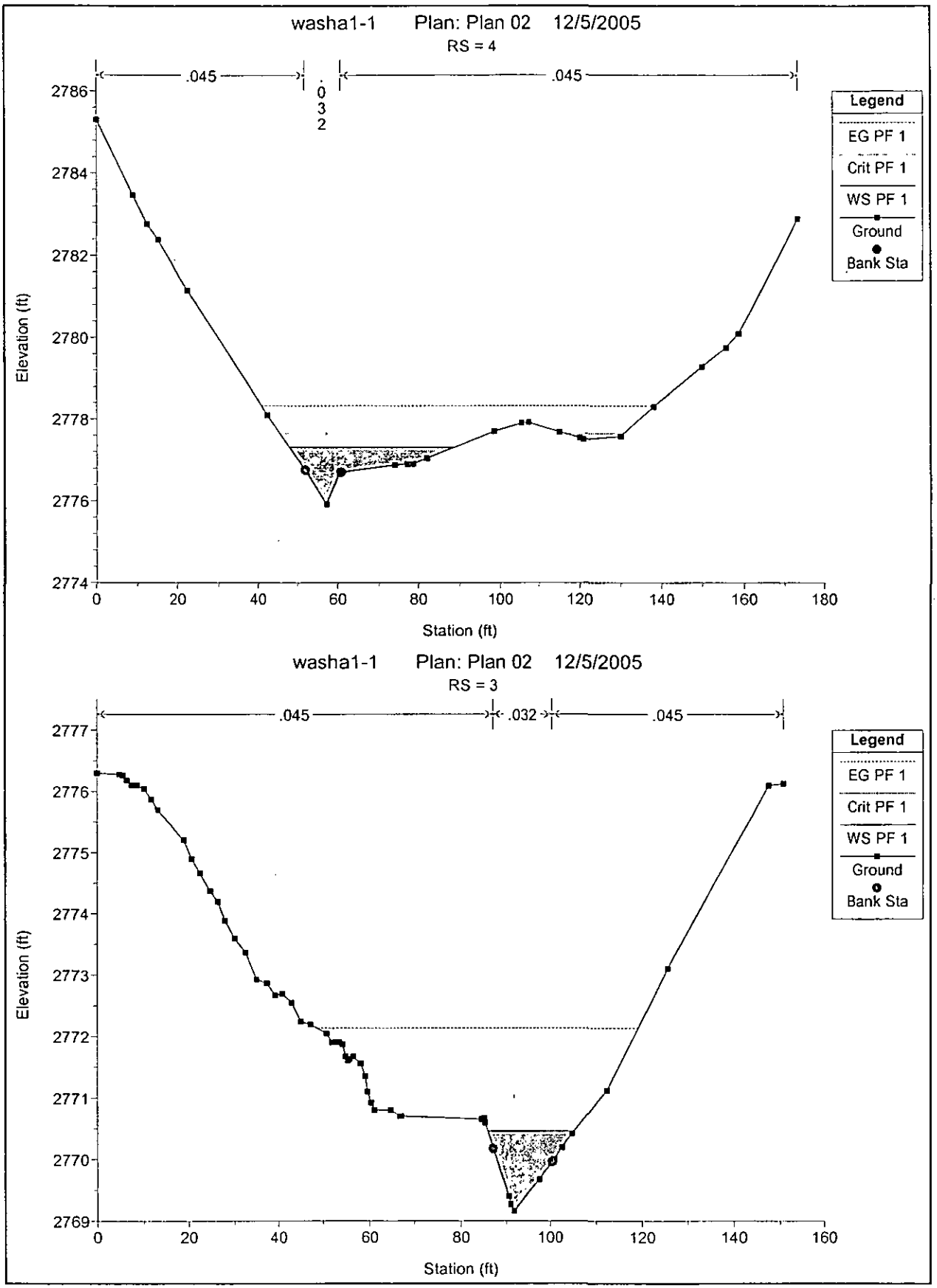
HEC-RAS Plan: Plan 02 River: RIVER-1 Reach: Reach-1 Profile: PF 1

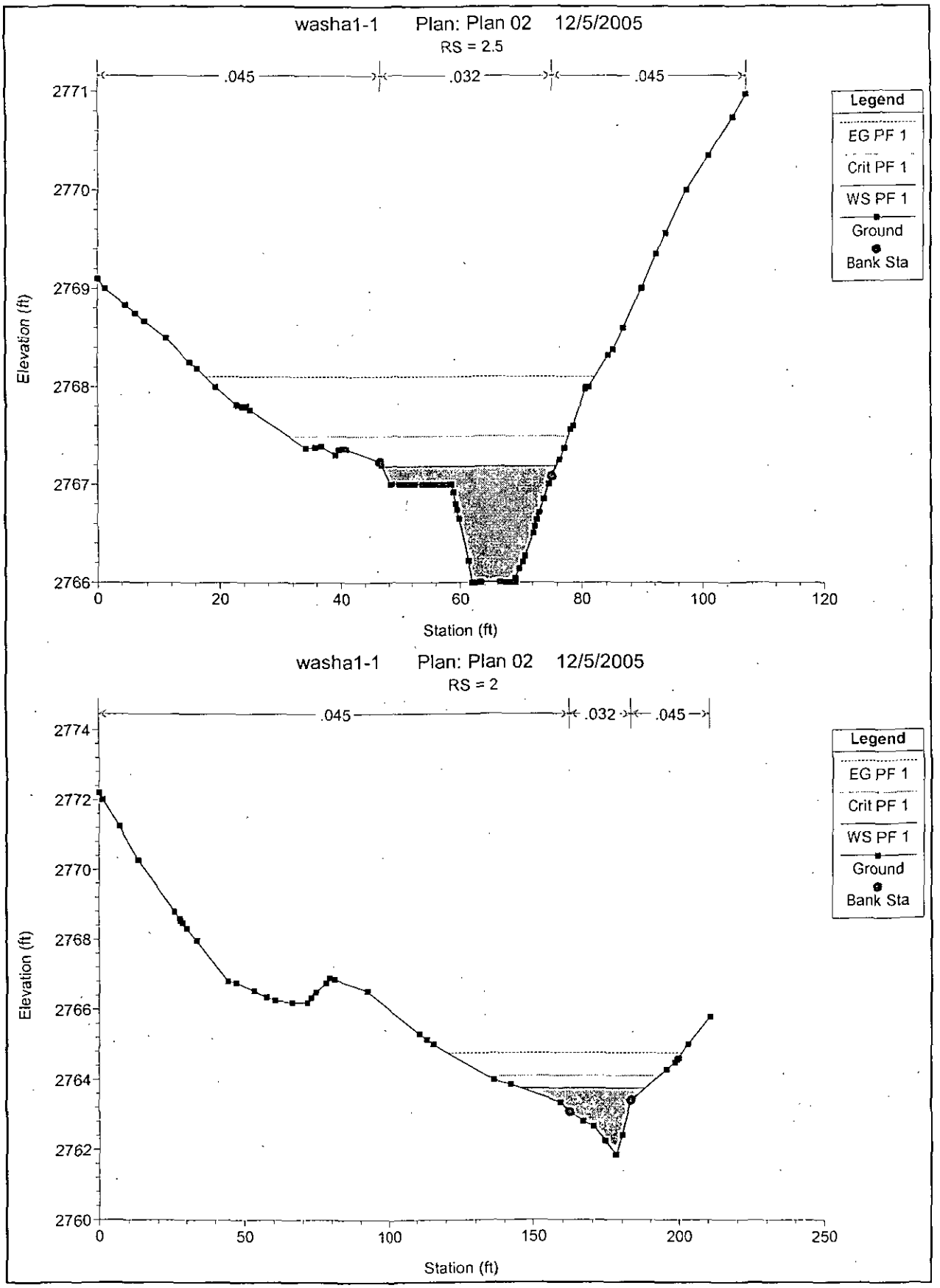
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	6	PF 1	128.00	2788.28	2789.75	2790.21	2791.28	0.050053	10.84	16.83	33.79	1.83
Reach-1	5	PF 1	128.00	2782.40	2783.71	2784.06	2784.85	0.068334	10.34	17.44	32.03	2.04
Reach-1	4	PF 1	128.00	2775.92	2777.31	2777.64	2778.33	0.045358	9.63	20.71	40.76	1.72
Reach-1	3	PF 1	128.00	2769.16	2770.46	2771.03	2772.13	0.062347	10.54	13.08	19.34	1.98
Reach-1	2.5	PF 1	128.00	2766.00	2767.18	2767.49	2768.10	0.056771	7.70	16.65	28.99	1.77
Reach-1	2	PF 1	213.00	2761.84	2763.74	2764.10	2764.75	0.025862	8.25	29.71	42.13	1.34
Reach-1	1.5	PF 1	213.00	2759.00	2760.02	2760.24	2760.71	0.061570	6.69	31.84	71.84	1.77
Reach-1	1	PF 1	213.00	2753.00	2754.35	2754.61	2755.20	0.031929	8.48	36.11	59.96	1.47

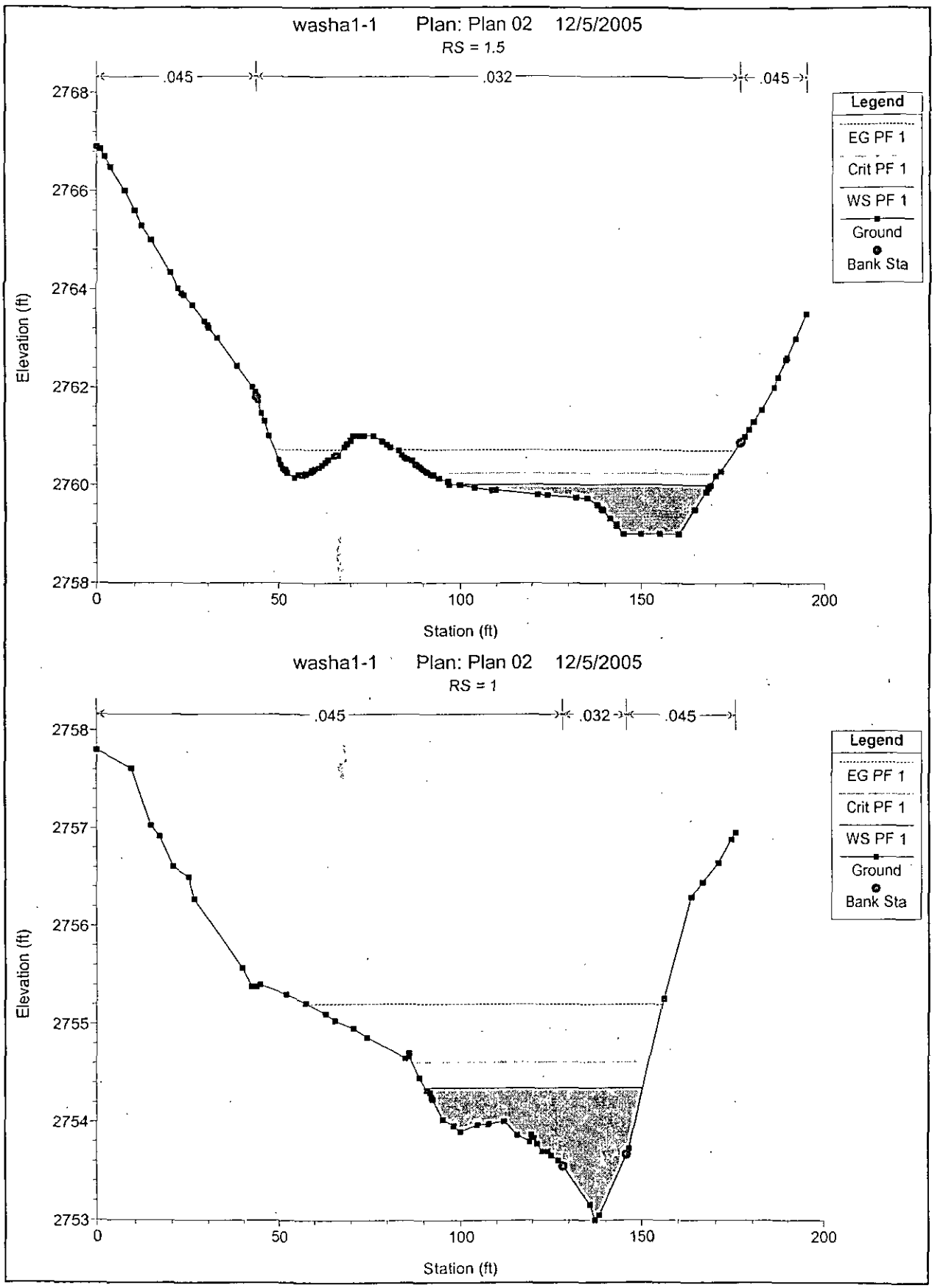
Errors Warnings and Notes for Plan : Plan 02

Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2.5 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1.5 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.


washa1-1 Plan: Plan 02 12/5/2005
RS = 6
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washa1-1 Plan: Plan 02 12/5/2005
RS = 5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washa1-1 Plan: Plan 02 12/5/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washa1-1 Plan: Plan 02 12/5/2005
RS = 3
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washa1-1 Plan: Plan 02 12/5/2005
RS = 2.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washa1-1 Plan: Plan 02 12/5/2005
RS = 2
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washa1-1 Plan: Plan 02 12/5/2005
RS = 1.5
.045
.032
.045
2768
2766
2764
2762
2760
2758
Elevation (ft)
0
50
100
150
200
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
washa1-1 Plan: Plan 02 12/5/2005
RS = 1
.045
.032
.045
2758
2757
2756
2755
2754
2753
Elevation (ft)
0
50
100
150
200
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

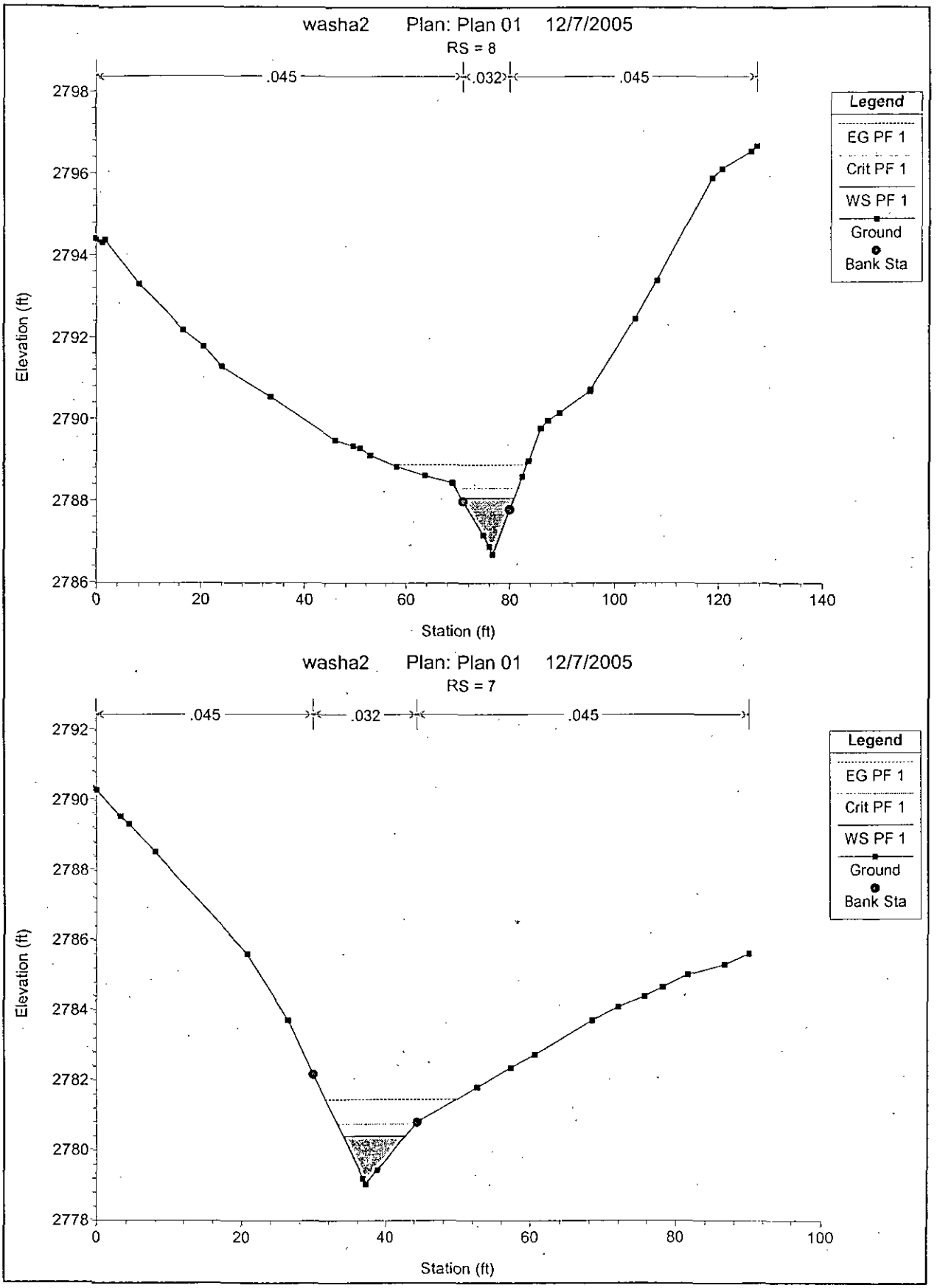
WASH A2

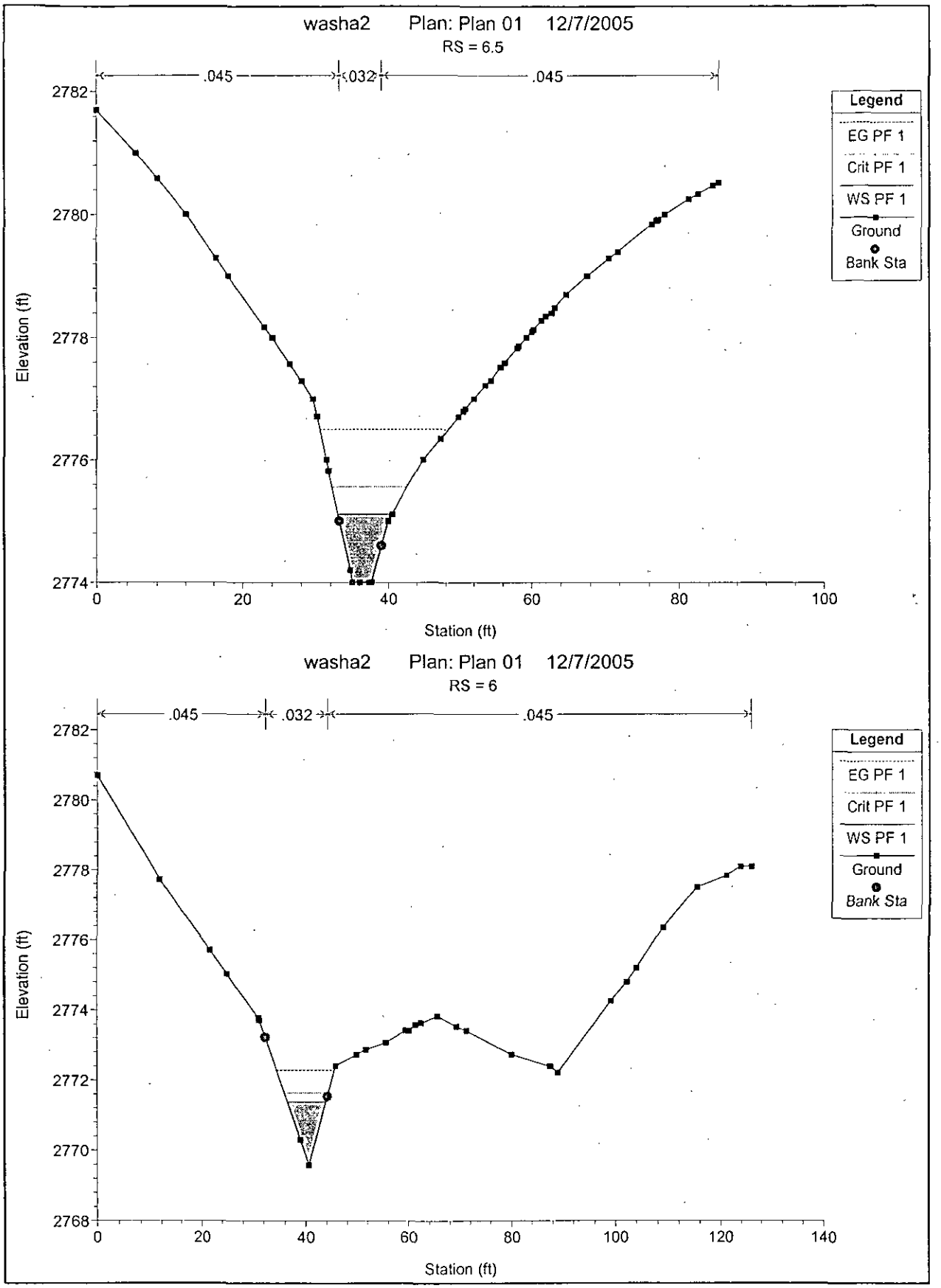
HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-1 Profile: PF 1

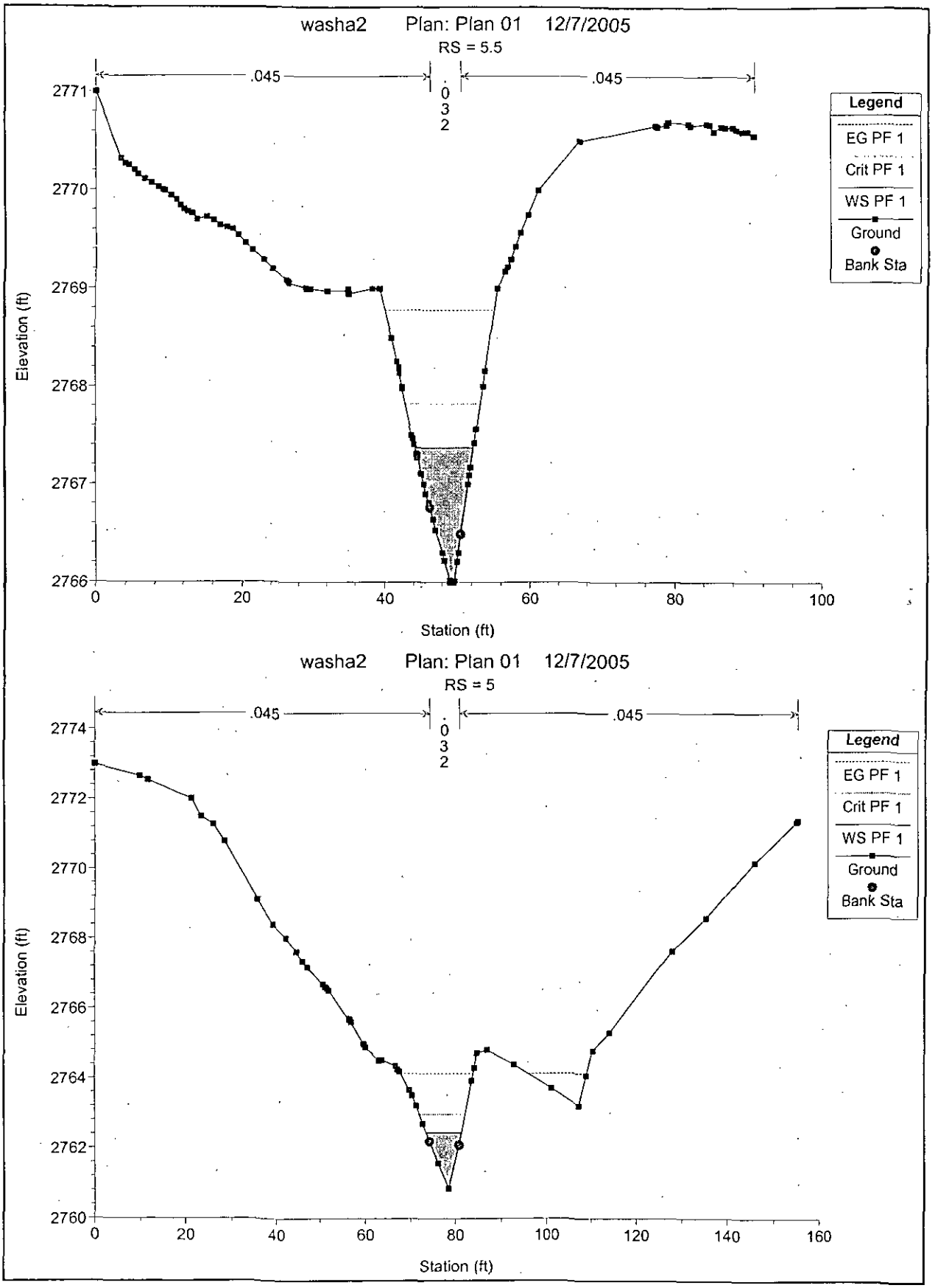
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	8	PF 1	50.00	2786.70	2788.08	2788.32	2788.89	0.037052	7.25	7.00	10.29	1.47
Reach-1	7	PF 1	50.00	2779.03	2780.41	2780.75	2781.45	0.054930	8.20	6.09	8.86	1.74
Reach-1	6.5	PF 1	50.00	2774.00	2775.12	2775.56	2776.49	0.053771	9.50	5.51	7.56	1.78
Reach-1	6	PF 1	50.00	2769.58	2771.38	2771.63	2772.27	0.035829	7.60	6.58	7.35	1.41
Reach-1	5.5	PF 1	50.00	2766.00	2767.37	2767.82	2768.78	0.045155	9.98	5.95	8.05	1.70
Reach-1	5	PF 1	65.00	2760.85	2762.45	2762.98	2764.14	0.060416	10.47	6.36	7.80	1.89
Reach-1	4	PF 1	65.00	2754.30	2756.01	2756.26	2756.93	0.034820	7.73	8.44	9.82	1.44
Reach-1	3	PF 1	65.00	2749.02	2750.53	2750.80	2751.42	0.041151	7.55	8.61	11.61	1.55
Reach-1	2	PF 1	100.00	2742.10	2743.47	2743.82	2744.48	0.040885	8.14	12.82	19.90	1.59
Reach-1	1.5	PF 1	100.00	2739.00	2740.23	2740.46	2740.93	0.023444	6.85	16.97	32.42	1.24
Reach-1	1	PF 1	100.00	2733.30	2734.56	2734.98	2735.97	0.081796	9.53	10.68	20.42	2.14

Errors Warnings and Notes for Plan : Plan 01

Location:	River: RIVER-1 Reach: Reach-1 RS: 7 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 6.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 6 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 5.5 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.


washa2 Plan: Plan 01 12/7/2005
RS = 8
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washa2 Plan: Plan 01 12/7/2005
RS = 7
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washa2 Plan: Plan 01 12/7/2005
RS = 6.5
.045
.032
.045
2782
2780
2778
2776
2774
Elevation (ft)
0
20
40
60
80
100
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
washa2 Plan: Plan 01 12/7/2005
RS = 6
.045
.032
.045
2782
2780
2778
2776
2774
2772
2770
2768
Elevation (ft)
0
20
40
60
80
100
120
140
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta


washa2 Plan: Plan 01 12/7/2005
RS = 5.5
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.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washa2 Plan: Plan 01 12/7/2005
RS = 5
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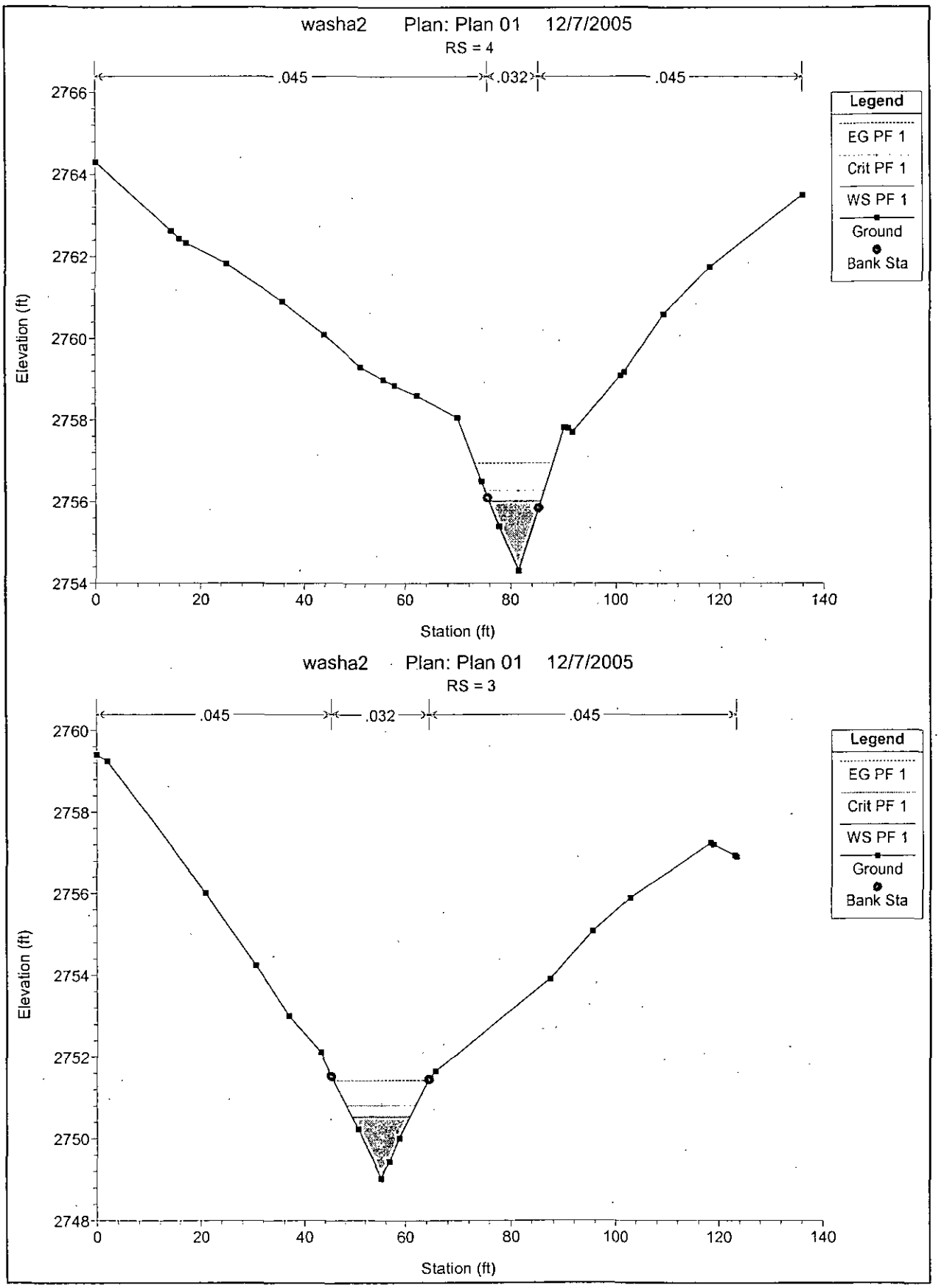
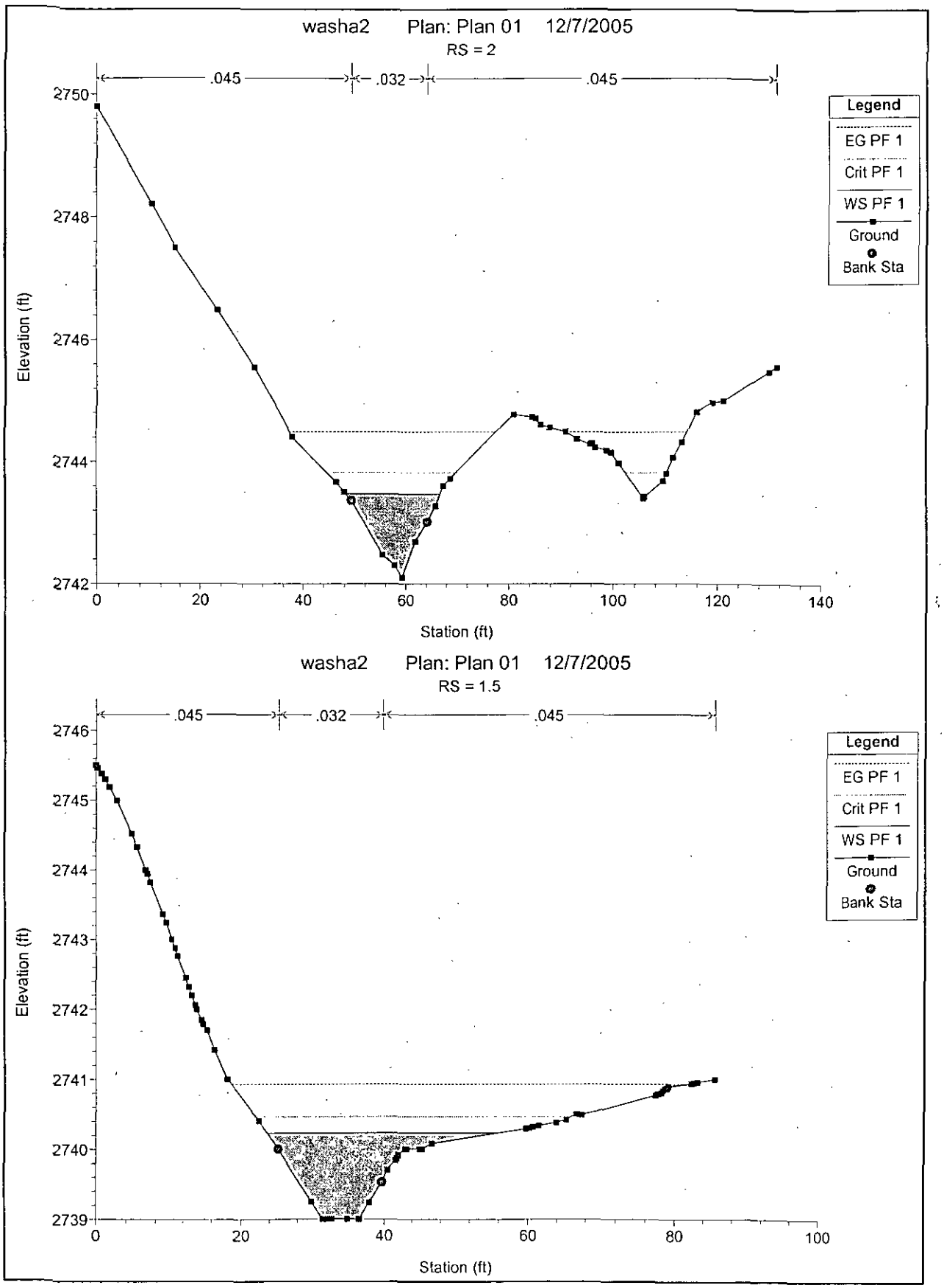
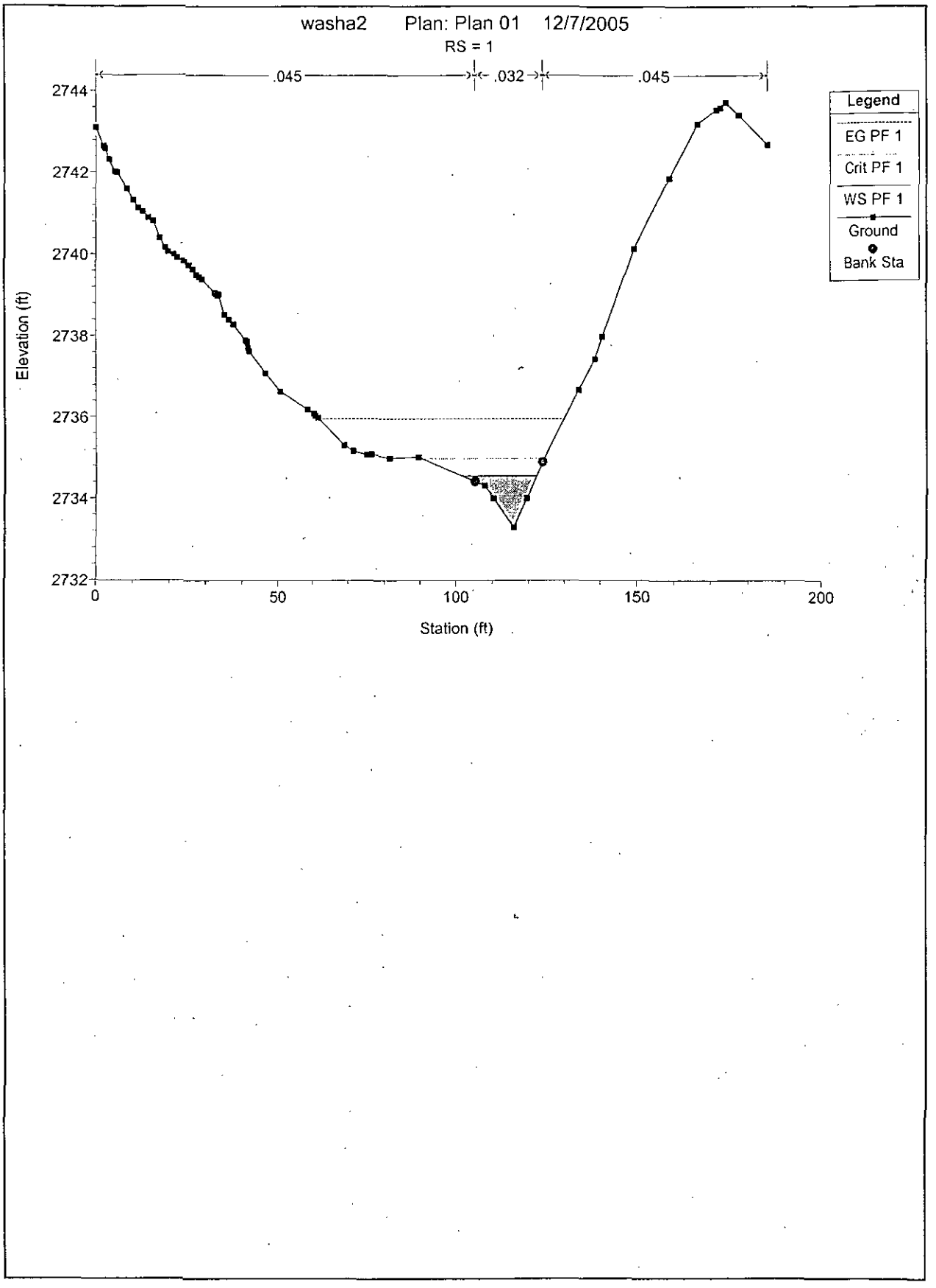
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washa2 Plan: Plan 01 12/7/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washa2 Plan: Plan 01 12/7/2005
RS = 3
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washa2 Plan: Plan 01 12/7/2005
RS = 2
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2750
2748
2746
2744
2742
0
20
40
60
80
100
120
140
Station (ft)
washa2 Plan: Plan 01 12/7/2005
RS = 1.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2746
2745
2744
2743
2742
2741
2740
2739
0
20
40
60
80
100
Station (ft)


washa2 Plan: Plan 01 12/7/2005
RS = 1
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2744
2742
2740
2738
2736
2734
2732
0
50
100
150
200
Station (ft)

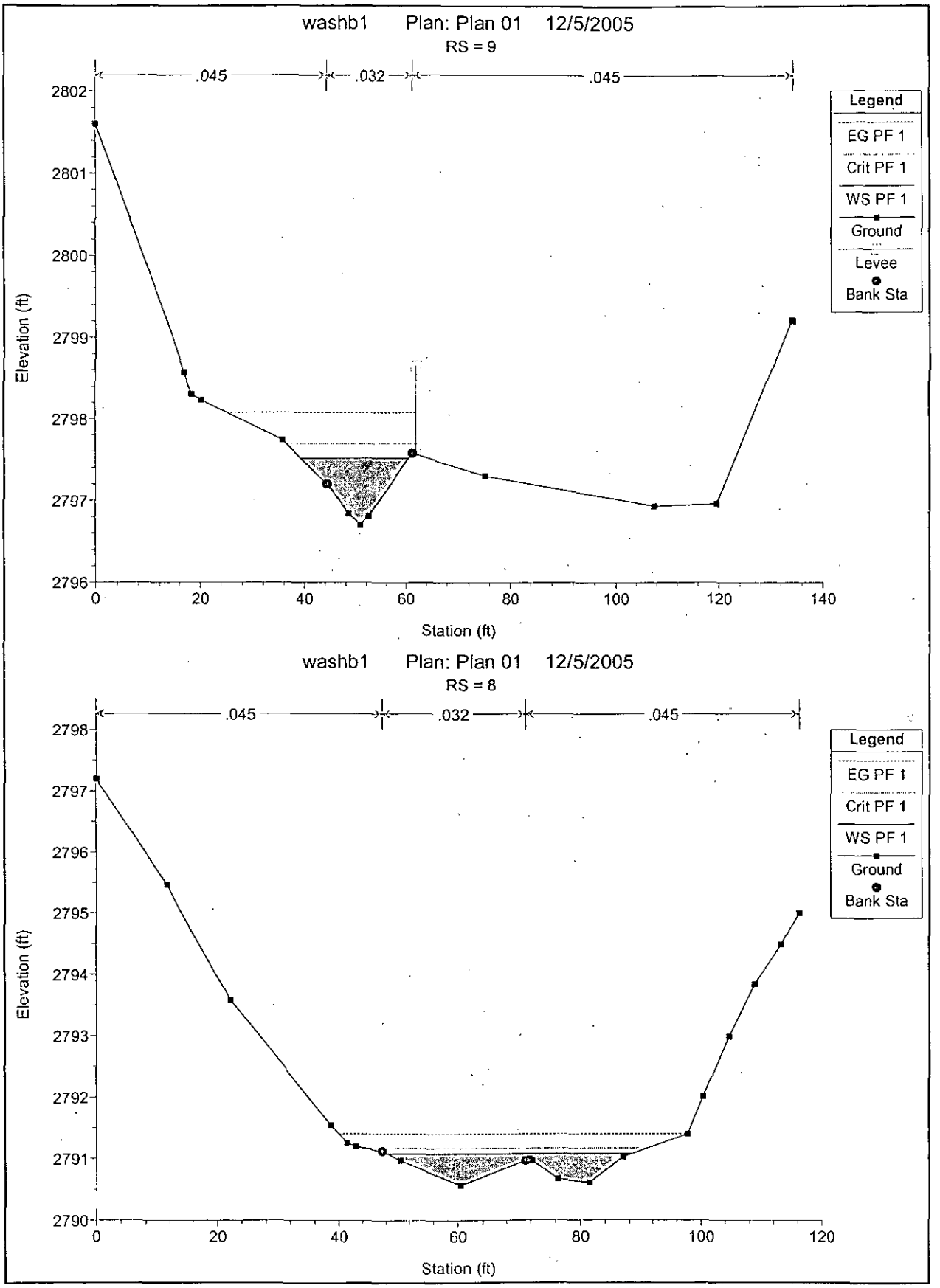
WASHB1

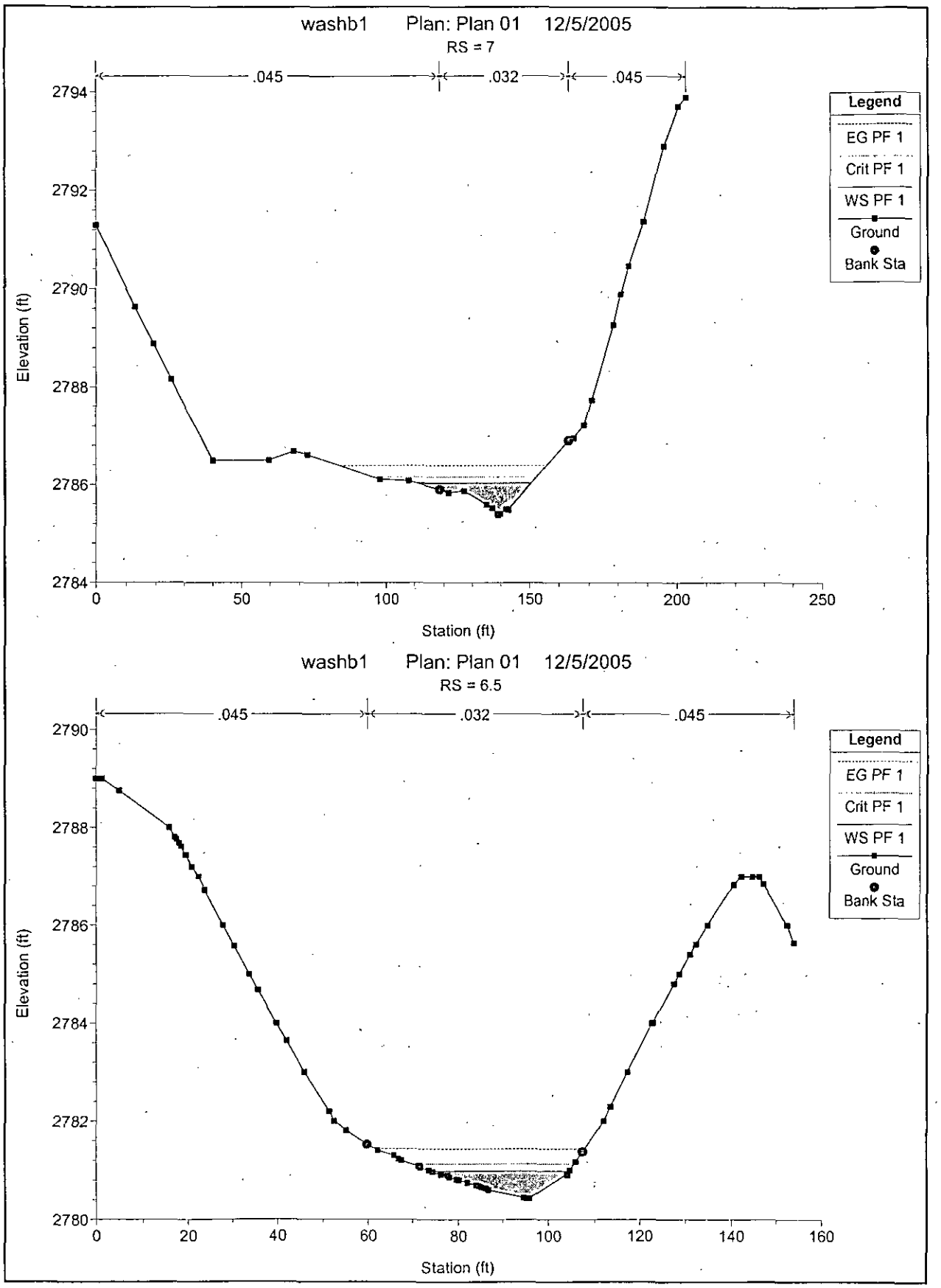
HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-1 *Profile: PF 1*

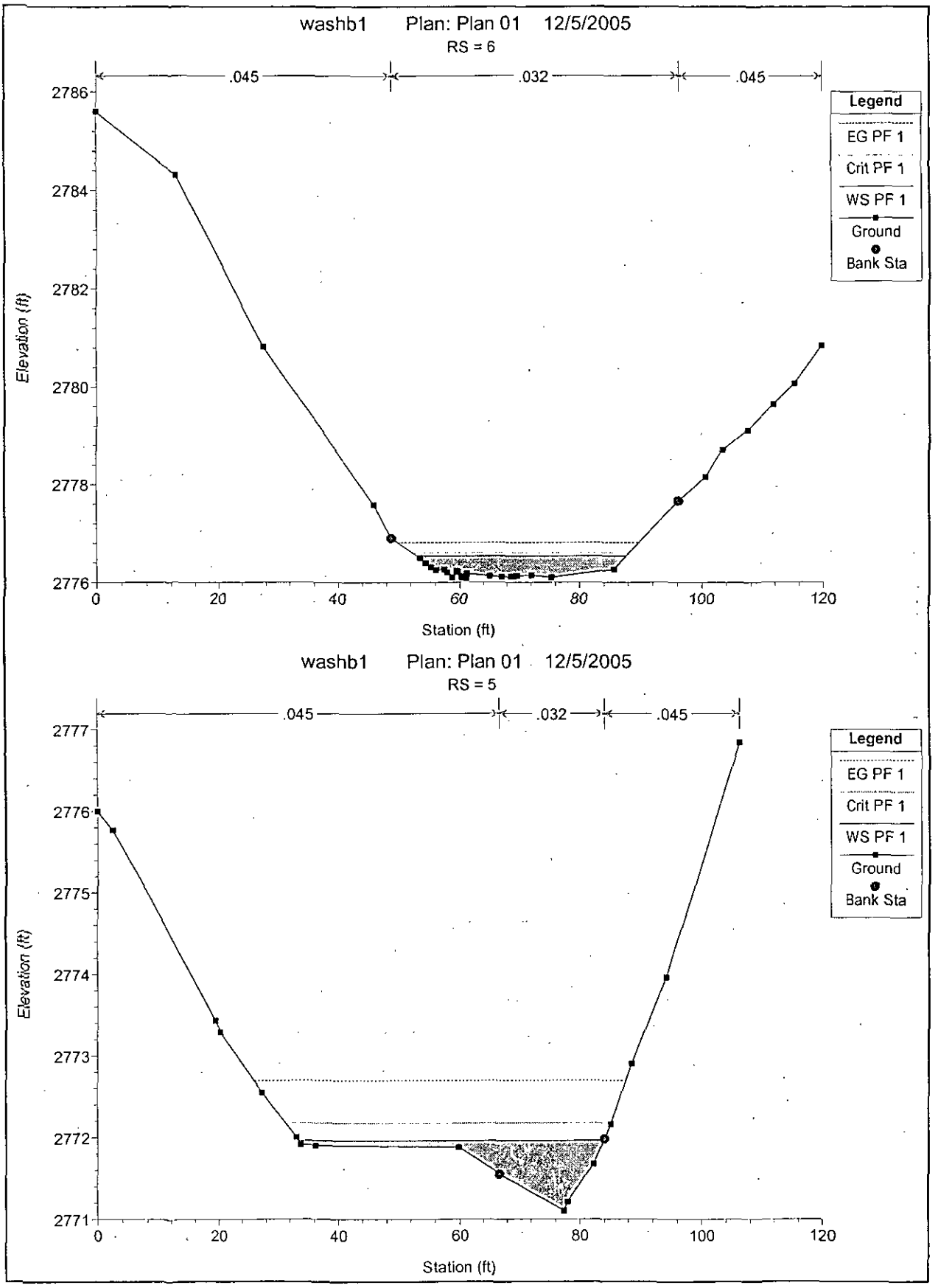
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	*Froude # Chl*
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	9	PF 1	50.00	2796.70	2797.52	2797.69	2798.08	0.045030	6.09	8.74	21.32	1.54
Reach-1	8	PF 1	50.00	2790.57	2791.08	2791.17	2791.40	0.059767	4.94	11.57	40.41	1.62
Reach-1	7	PF 1	50.00	2785.37	2786.03	2786.15	2786.38	0.048169	4.80	10.80	39.56	1.49
Reach-1	6.5	PF 1	50.00	2780.43	2780.99	2781.13	2781.43	0.065773	5.37	9.31	30.67	1.72
Reach-1	6	PF 1	50.00	2776.08	2776.54	2776.59	2776.81	0.033697	4.19	11.94	34.58	1.26
Reach-1	5	PF 1	75.00	2771.10	2771.96	2772.17	2772.70	0.051225	7.15	13.13	50.55	1.68
Reach-1	4.5	PF 1	75.00	2768.38	2768.93	2769.06	2769.40	0.048075	5.47	13.70	34.74	1.54
Reach-1	4	PF 1	75.00	2764.68	2765.48	2765.67	2766.11	0.041720	7.30	13.92	30.42	1.56
Reach-1	3	PF 1	75.00	2759.60	2760.56	2760.78	2761.28	0.041947	6.93	11.63	23.08	1.55
Reach-1	2	PF 1	75.00	2754.10	2754.83	2755.00	2755.40	0.049622	6.14	12.78	32.98	1.60
Reach-1	1	PF 1	177.00	2745.67	2746.96	2747.10	2747.45	0.047552	7.55	36.95	83.82	1.64

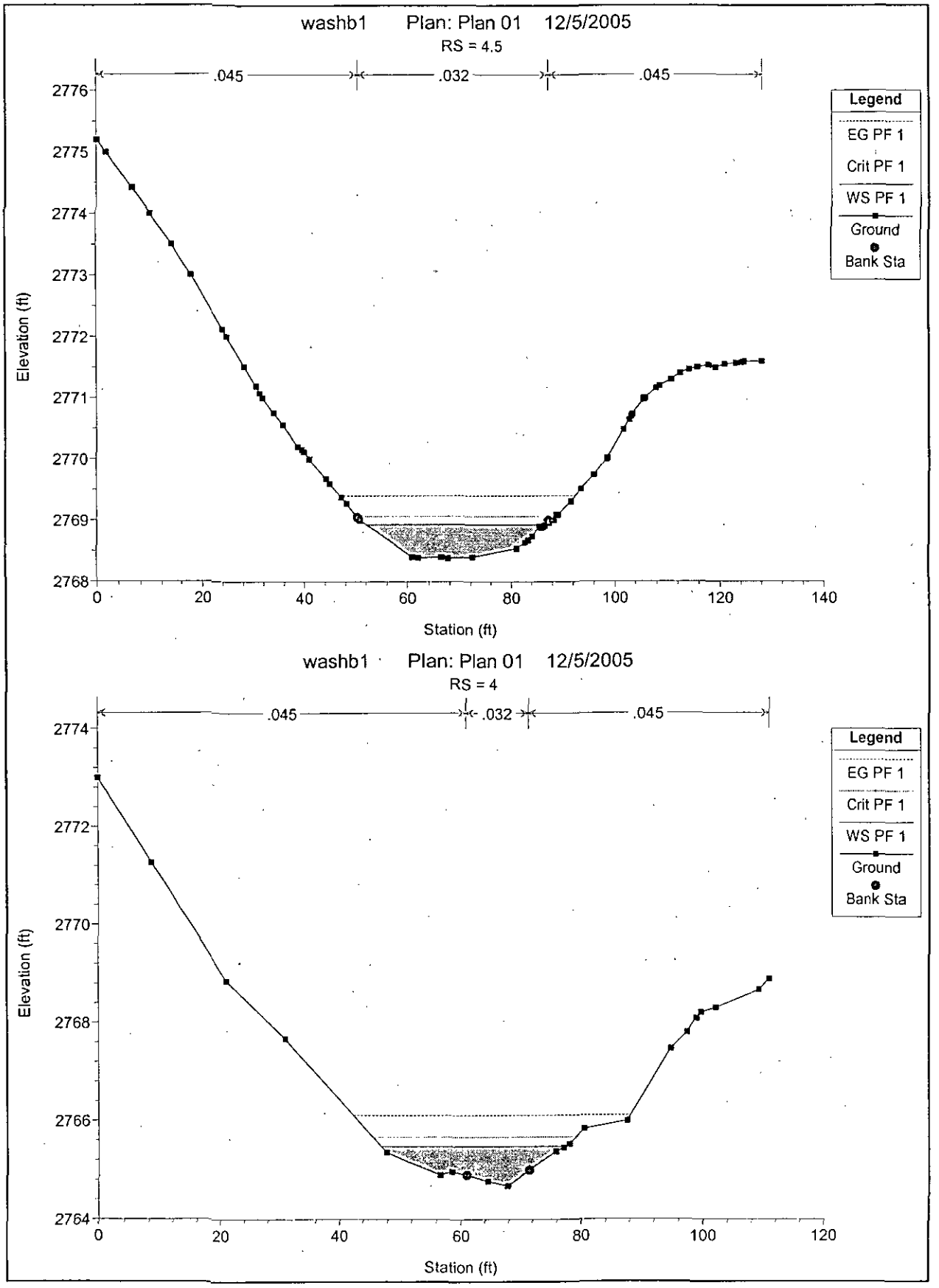
Errors Warnings and Notes for Plan : Plan 01

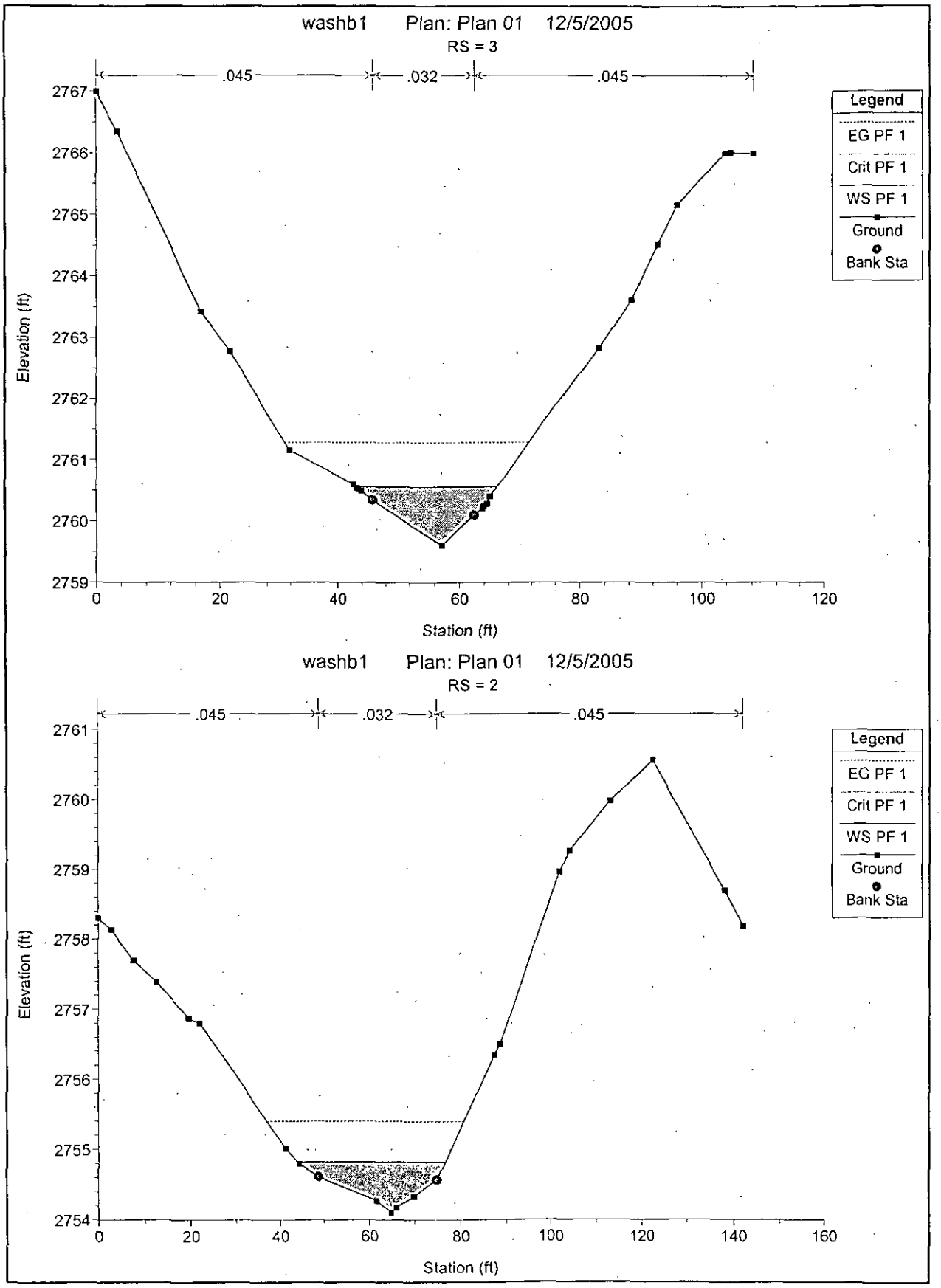
Location:	River: RIVER-1 Reach: Reach-1 RS: 9 Profile: PF 1
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, water
	surface was used.
Location:	River: RIVER-1 Reach: Reach-1 RS: 8 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 7 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 6.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 6 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.

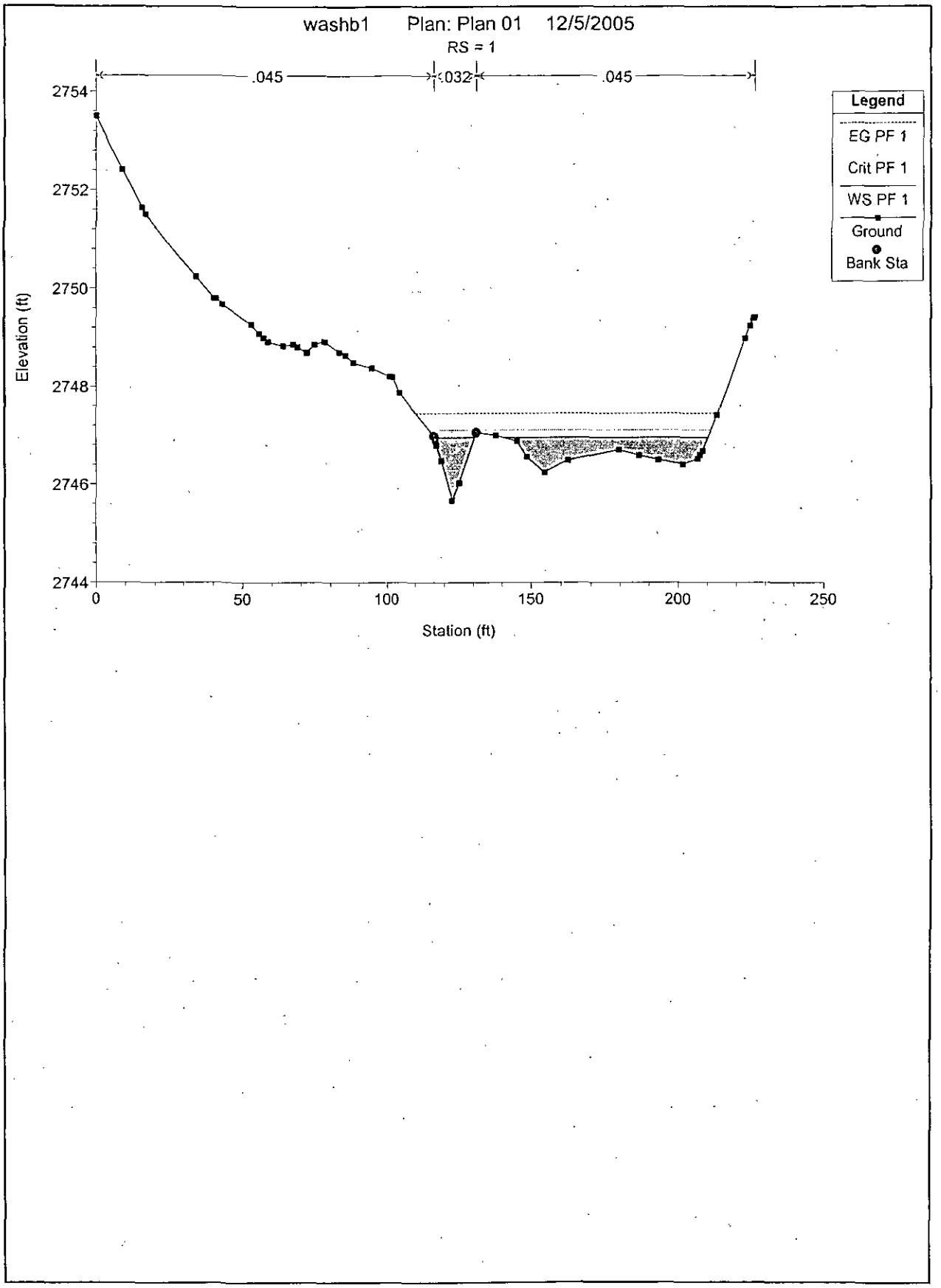

washb1 Plan: Plan 01 12/5/2005
RS = 9
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
washb1 Plan: Plan 01 12/5/2005
RS = 8
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washb1 Plan: Plan 01 12/5/2005
RS = 7
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2794
2792
2790
2788
2786
2784
0
50
100
150
200
250
washb1 Plan: Plan 01 12/5/2005
RS = 6.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2790
2788
2786
2784
2782
2780
0
20
40
60
80
100
120
140
160


washb1 Plan: Plan 01 12/5/2005
RS = 6
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2786
2784
2782
2780
2778
2776
0
20
40
60
80
100
120
Station (ft)
washb1 Plan: Plan 01 12/5/2005
RS = 5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2777
2776
2775
2774
2773
2772
2771
0
20
40
60
80
100
120
Station (ft)


washb1 Plan: Plan 01 12/5/2005
RS = 4.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washb1 Plan: Plan 01 12/5/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washb1 Plan: Plan 01 12/5/2005
RS = 3
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washb1 Plan: Plan 01 12/5/2005
RS = 2
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washb1 Plan: Plan 01 12/5/2005
RS = 1
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2754
2752
2750
2748
2746
2744
0
50
100
150
200
250
Station (ft)

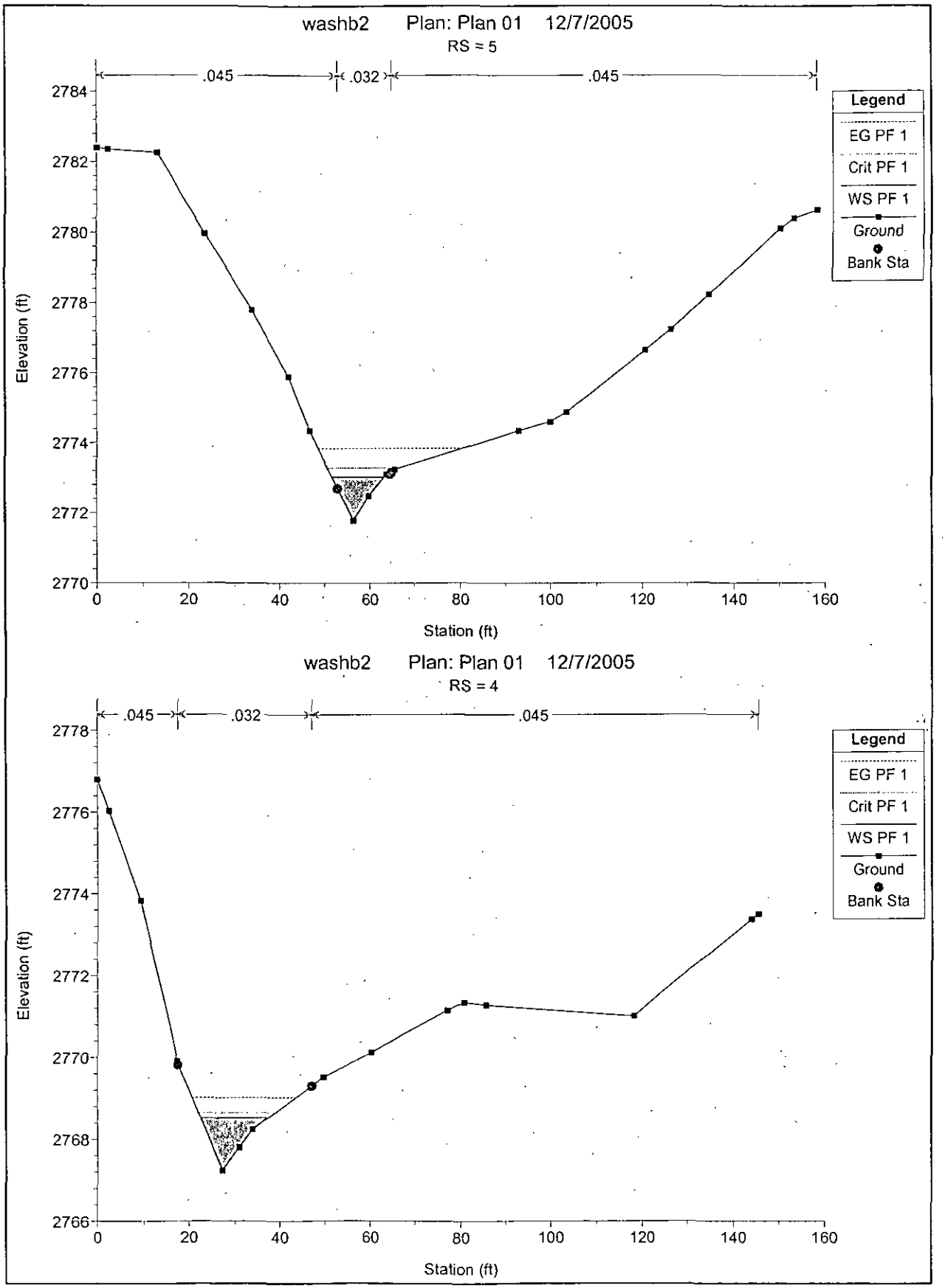
WASH B2

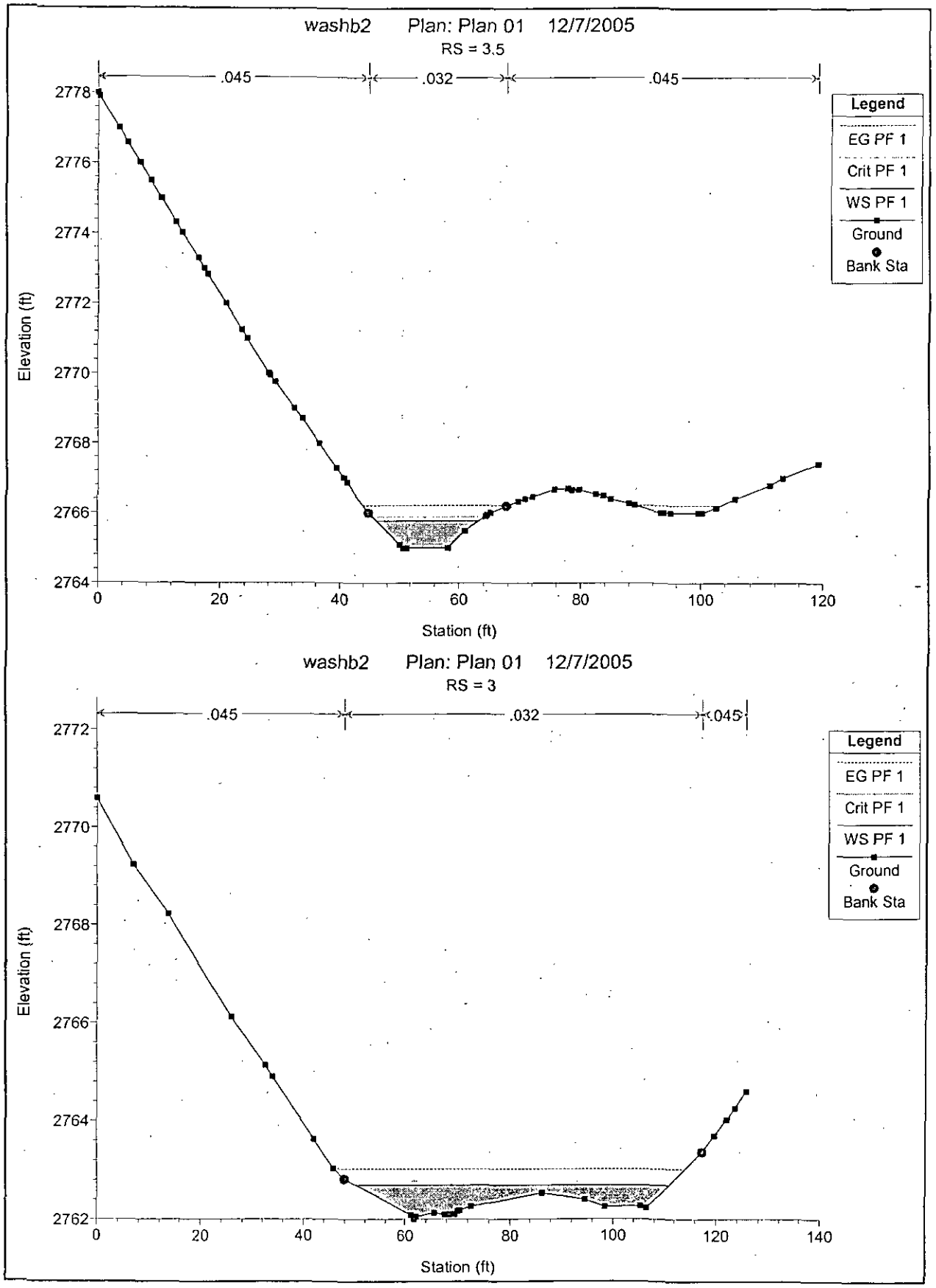
HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-1 Profile: PF 1

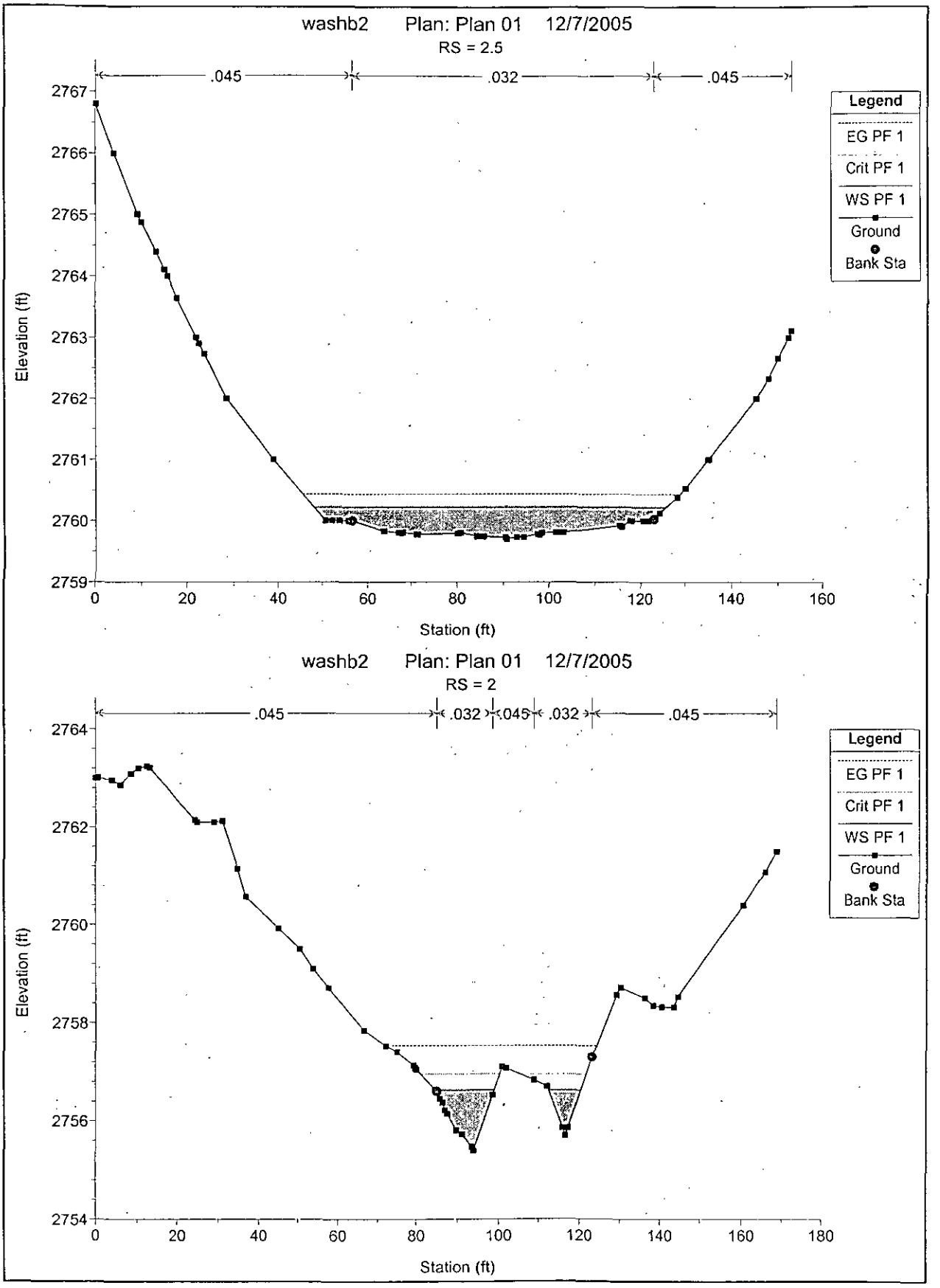
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	5	PF 1	50.00	2771.78	2773.02	2773.28	2773.84	0.045021	7.27	7.03	11.78	1.59
Reach-1	4	PF 1	50.00	2767.23	2768.51	2768.64	2769.01	0.030968	5.67	8.82	15.02	1.30
Reach-1	3.5	PF 1	50.00	2765.00	2765.78	2765.88	2766.22	0.029393	5.31	9.41	17.14	1.26
Reach-1	3	PF 1	100.00	2762.00	2762.69	2762.78	2763.02	0.037825	4.56	21.91	60.90	1.34
Reach-1	2.5	PF 1	100.00	2759.70	2760.22	2760.24	2760.43	0.022853	3.74	27.78	77.79	1.06
Reach-1	2	PF 1	100.00	2755.39	2756.63	2756.95	2757.52	0.051075	7.59	13.19	22.30	1.73
Reach-1	1.5	PF 1	100.00	2753.00	2754.46	2754.68	2755.16	0.021251	7.80	20.25	34.63	1.22
Reach-1	1	PF 1	177.00	2745.67	2746.97	2747.11	2747.43	0.044086	7.32	38.04	84.83	1.59

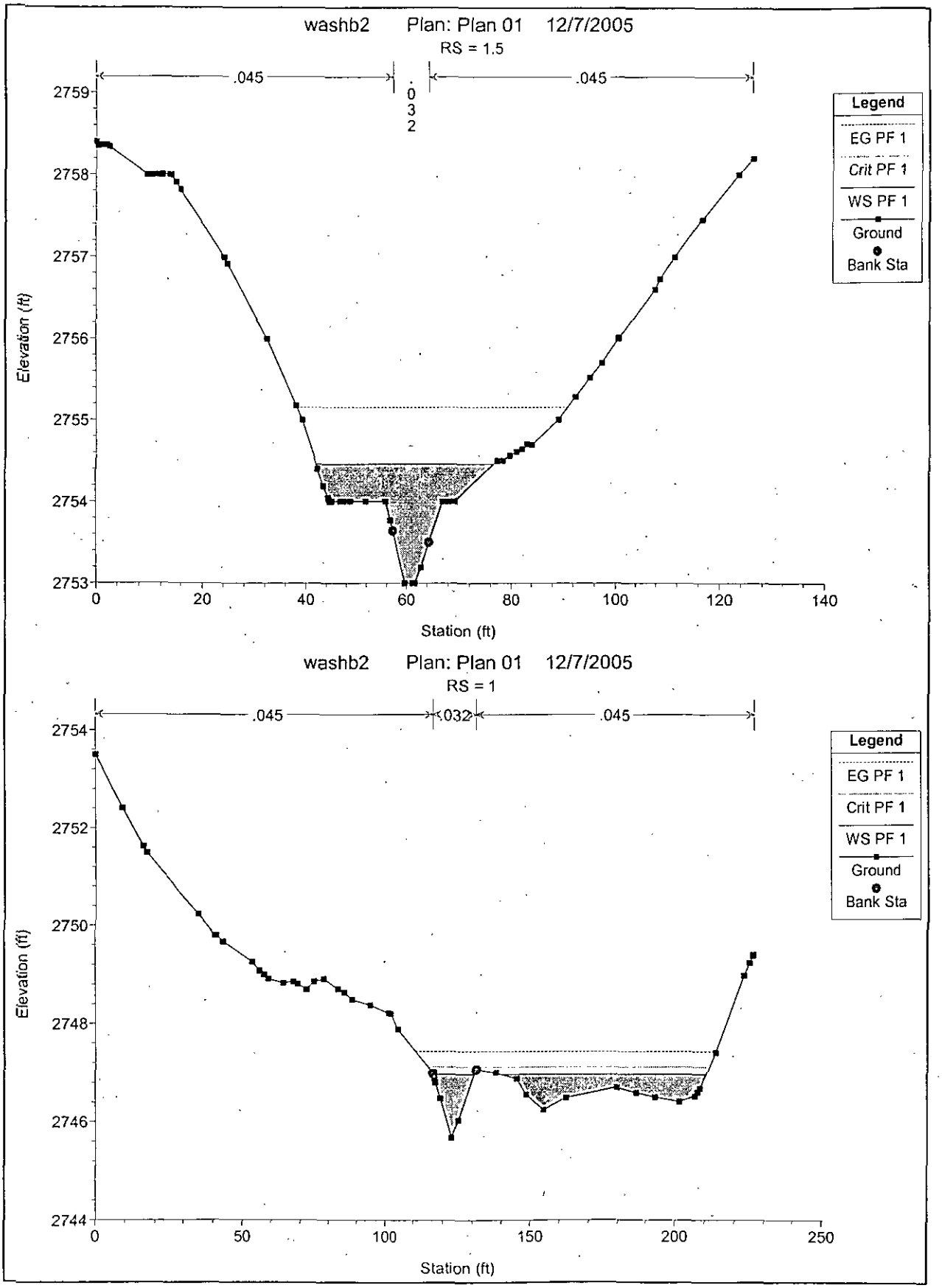
Errors Warnings and Notes for Plan : Plan 01

Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1.5 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.


washb2 Plan: Plan 01 12/7/2005
RS = 5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washb2 Plan: Plan 01 12/7/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washb2 Plan: Plan 01 12/7/2005
RS = 3.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washb2 Plan: Plan 01 12/7/2005
RS = 3
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washb2 Plan: Plan 01 12/7/2005
RS = 2.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2767
2766
2765
2764
2763
2762
2761
2760
2759
0
20
40
60
80
100
120
140
160
Station (ft)
washb2 Plan: Plan 01 12/7/2005
RS = 2
.045
.032
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2764
2762
2760
2758
2756
2754
0
20
40
60
80
100
120
140
160
180
Station (ft)


washb2 Plan: Plan 01 12/7/2005
RS = 1.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washb2 Plan: Plan 01 12/7/2005
RS = 1
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

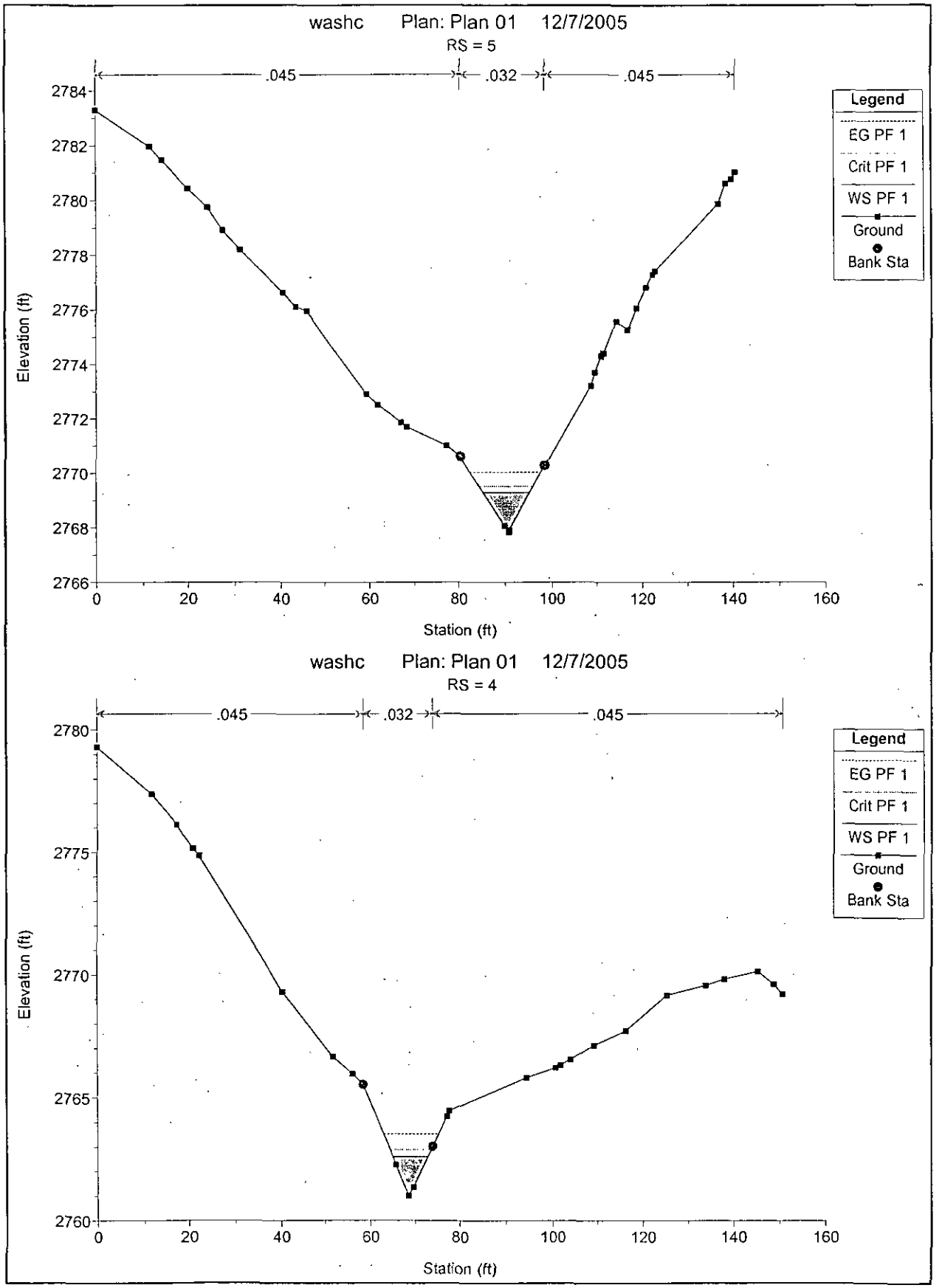
WASHC

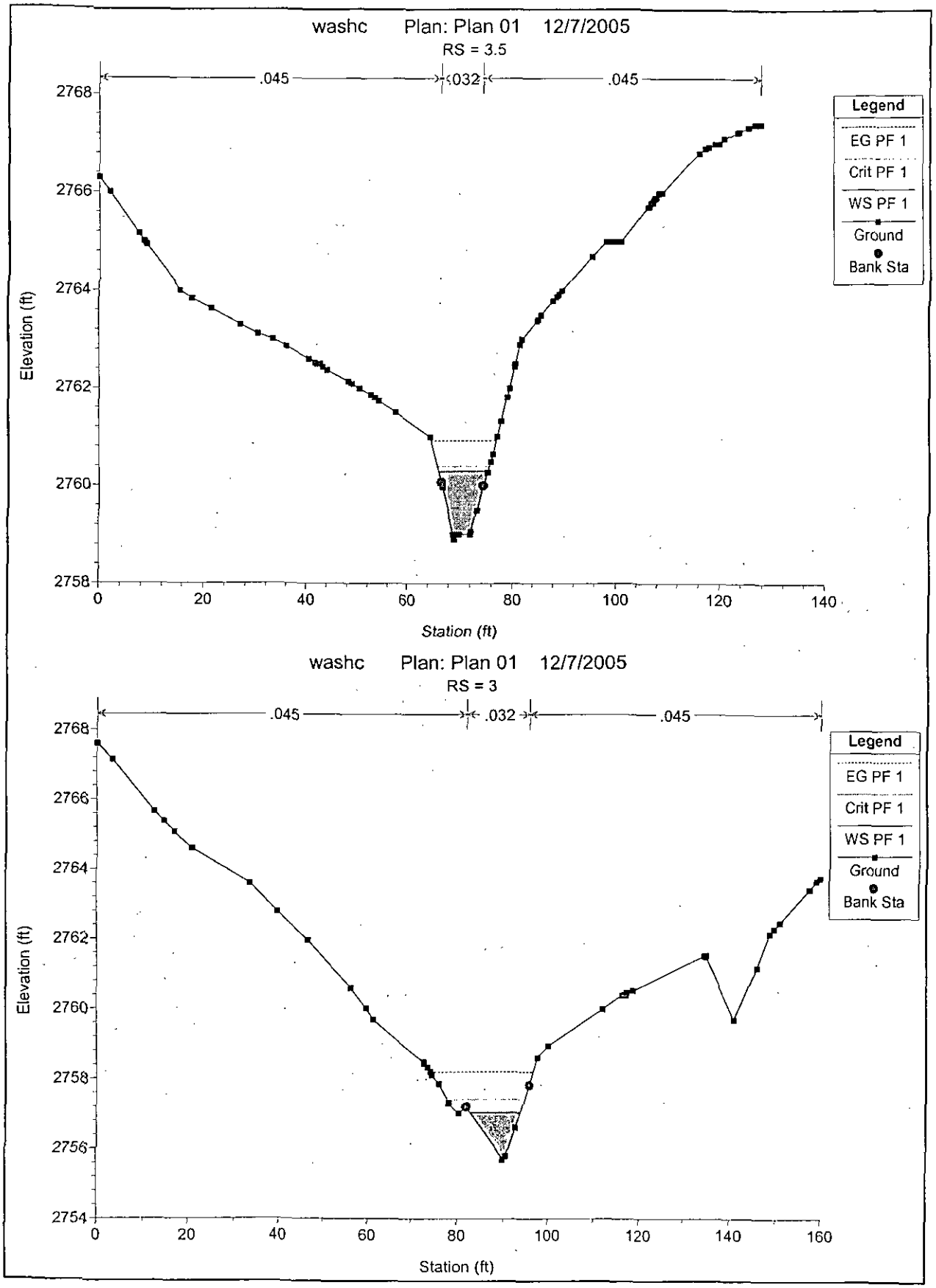
HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-1 Profile PF 1

Reach	River Sta	Profile	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
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	5	PF 1	50.00	2767.82	2769.29	2769.50	2770.03	0.036028	6.90	7.25	10.04	1.43
Reach-1	4	PF 1	50.00	2761.00	2762.59	2762.87	2763.50	0.039393	7.65	6.54	8.03	1.49
Reach-1	3.5	PF 1	50.00	2758.90	2760.30	2760.39	2760.92	0.019976	6.32	8.08	9.29	1.11
Reach-1	3	PF 1	65.00	2755.68	2757.04	2757.41	2758.20	0.059581	8.65	7.52	11.30	1.84
Reach-1	2	PF 1	65.00	2749.90	2751.82	2751.88	2752.40	0.019726	6.09	10.67	11.11	1.10
Reach-1	1.5	PF 1	65.00	2746.00	2748.96	2749.27	2749.92	0.058207	7.87	8.26	13.81	1.79
Reach-1	1	PF 1	83.00	2743.99	2745.61	2745.77	2746.31	0.026195	6.71	12.44	15.76	1.27

Errors Warnings and Notes for Plan : Plan 01

Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1.5 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.


washc Plan: Plan 01 12/7/2005
RS = 5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washc Plan: Plan 01 12/7/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washc Plan: Plan 01 12/7/2005
RS = 3.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washc Plan: Plan 01 12/7/2005
RS = 3
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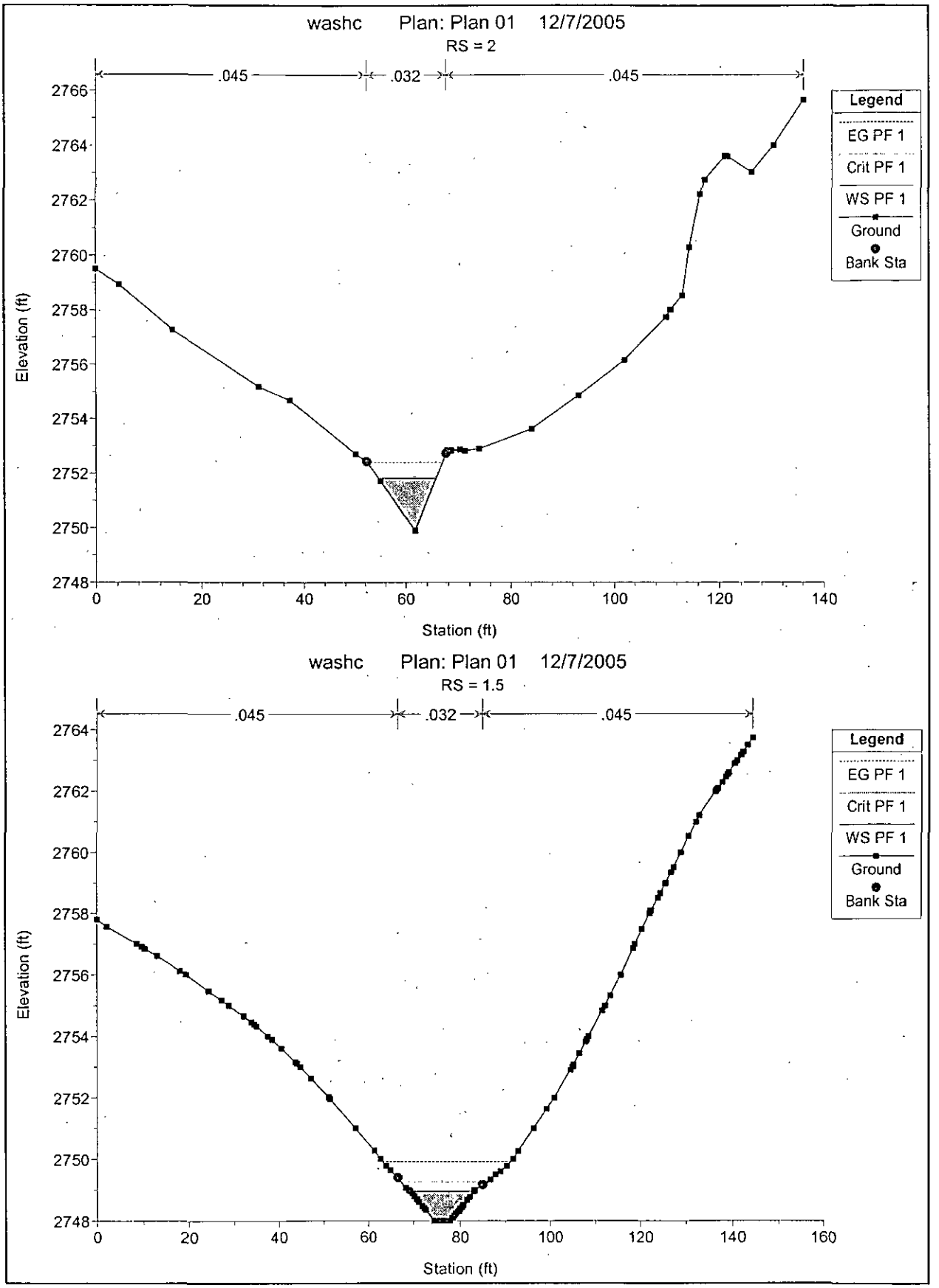
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washc Plan: Plan 01 12/7/2005
RS = 2
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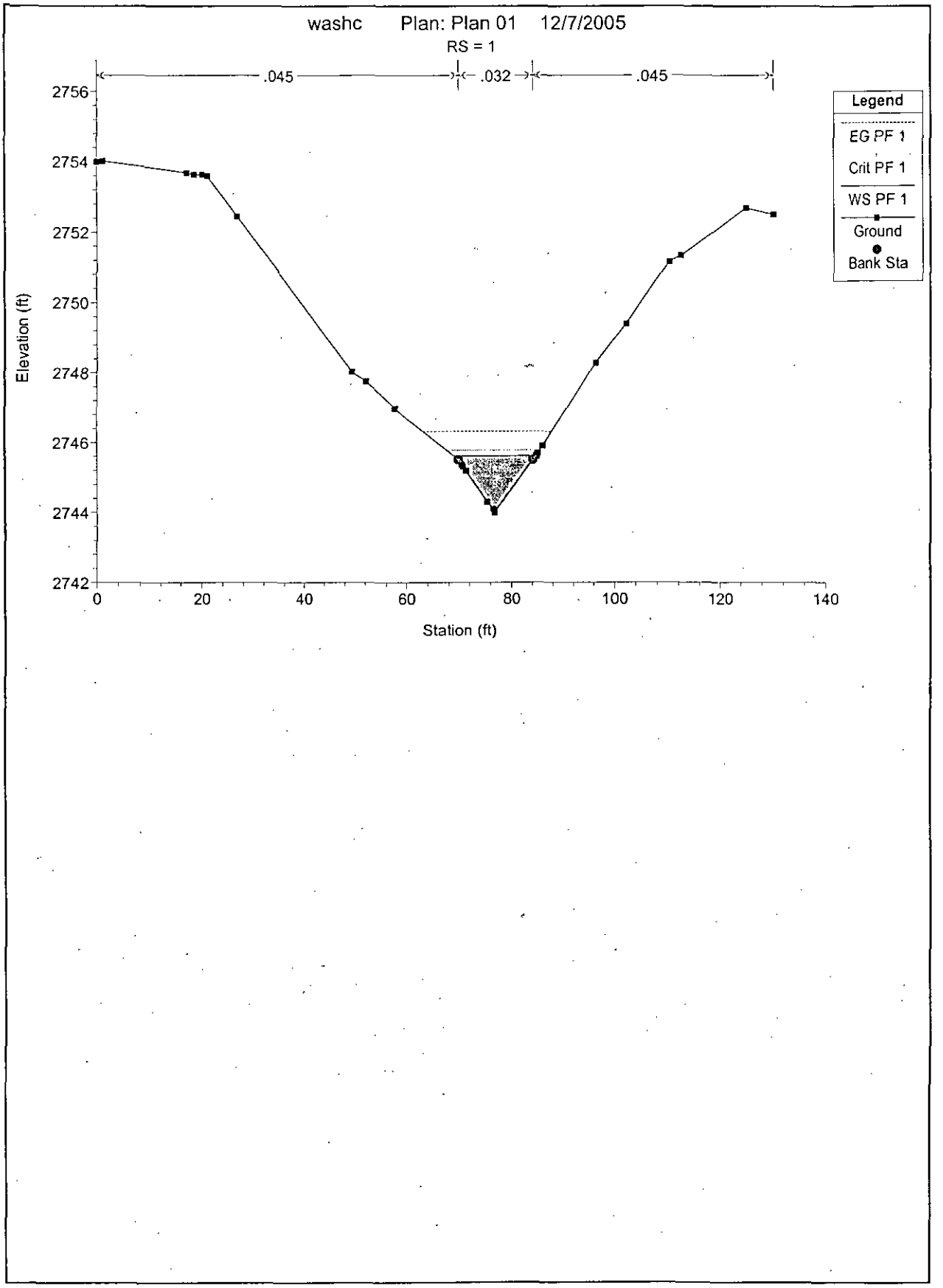
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washc Plan: Plan 01 12/7/2005
RS = 1.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washc Plan: Plan 01 12/7/2005
RS = 1
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
2756
2754
2752
2750
2748
2746
2744
2742
0
20
40
60
80
100
120
140
Station (ft)

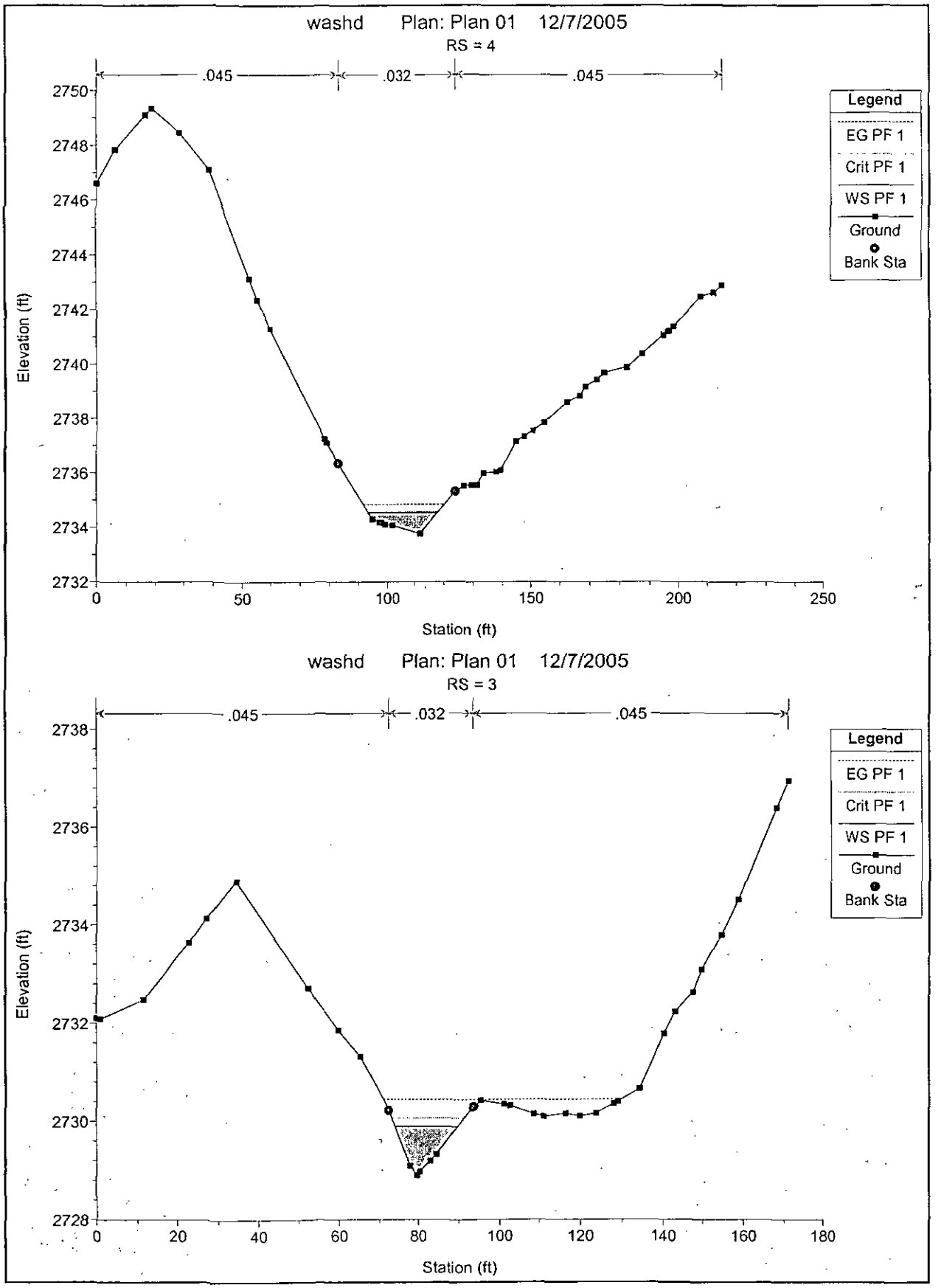
WASH D

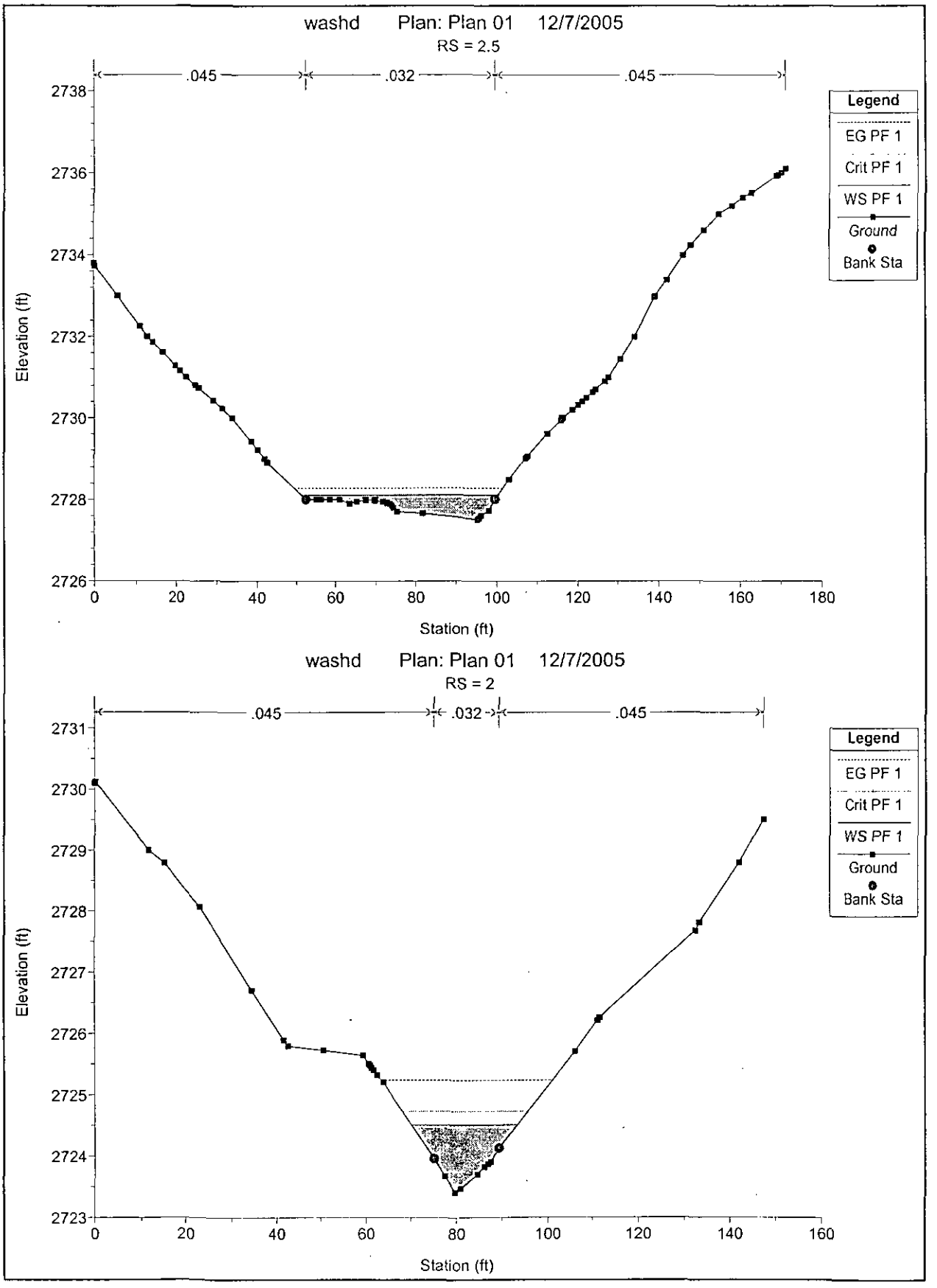
HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-1 Profile: PF 1

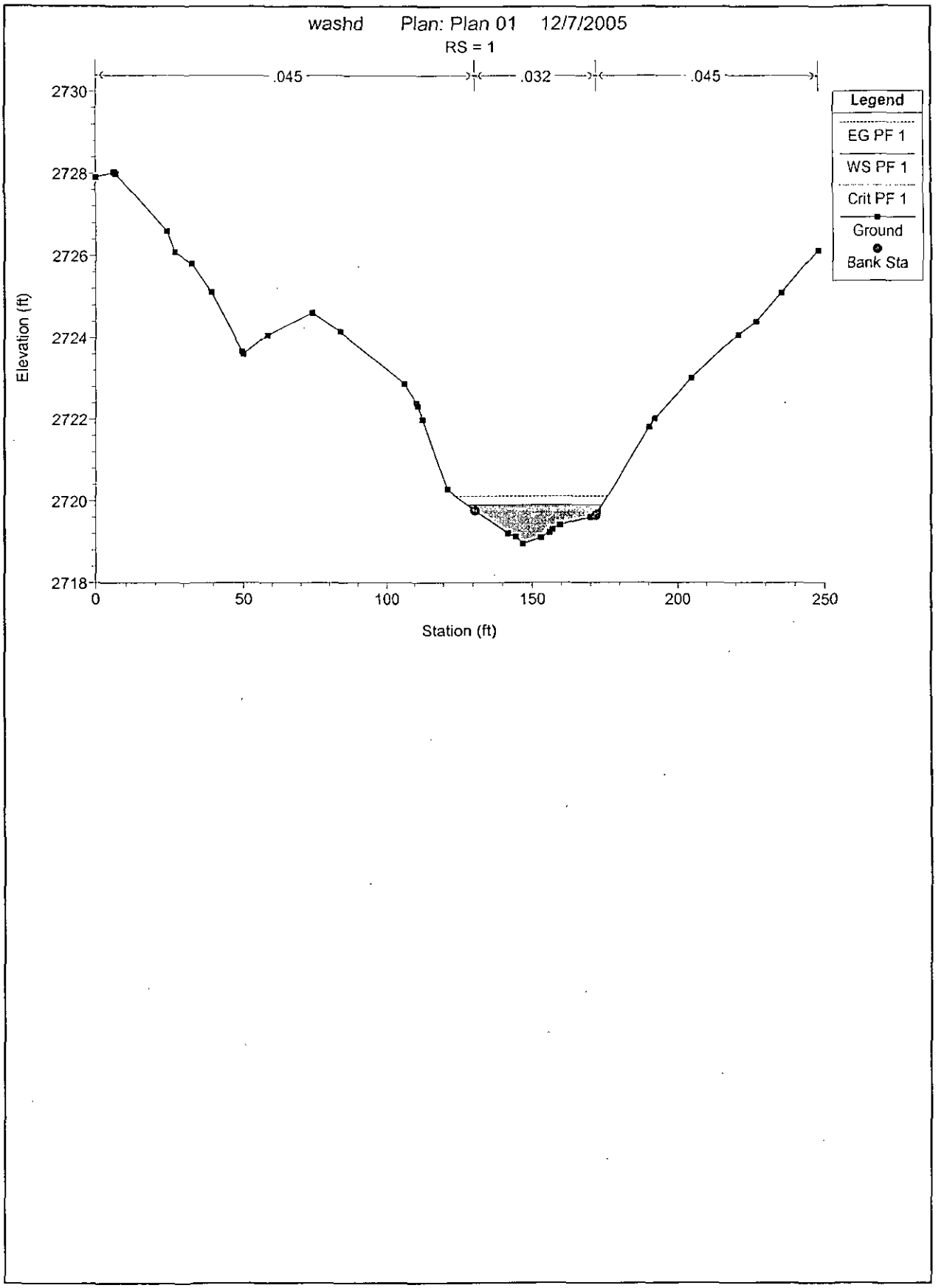
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4	PF 1	50.00	2733.77	2734.54	2734.58	2734.84	0.025006	4.39	11.38	24.53	1.14
Reach-1	3	PF 1	50.00	2728.90	2729.90	2730.06	2730.45	0.038474	5.94	8.42	15.86	1.44
Reach-1	2.5	PF 1	50.00	2727.51	2728.11	2728.12	2728.28	0.023407	3.32	15.16	49.07	1.03
Reach-1	2	PF 1	85.00	2723.41	2724.51	2724.73	2725.24	0.030841	7.02	13.55	23.22	1.38
Reach-1	1	PF 1	85.00	2718.95	2719.90	2719.85	2720.11	0.014008	3.70	23.30	45.93	0.88

Errors Warnings and Notes for Plan : Plan 01

Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Note:	Hydraulic jump has occurred between this cross section and the previous upstream section.


washd Plan: Plan 01 12/7/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washd Plan: Plan 01 12/7/2005
RS = 3
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washd Plan: Plan 01 12/7/2005
RS = 2.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washd Plan: Plan 01 12/7/2005
RS = 2
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washd Plan: Plan 01 12/7/2005
RS = 1
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2730
2728
2726
2724
2722
2720
2718
0
50
100
150
200
250
Station (ft)

WASH E1

HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-1 Profile: PF 1

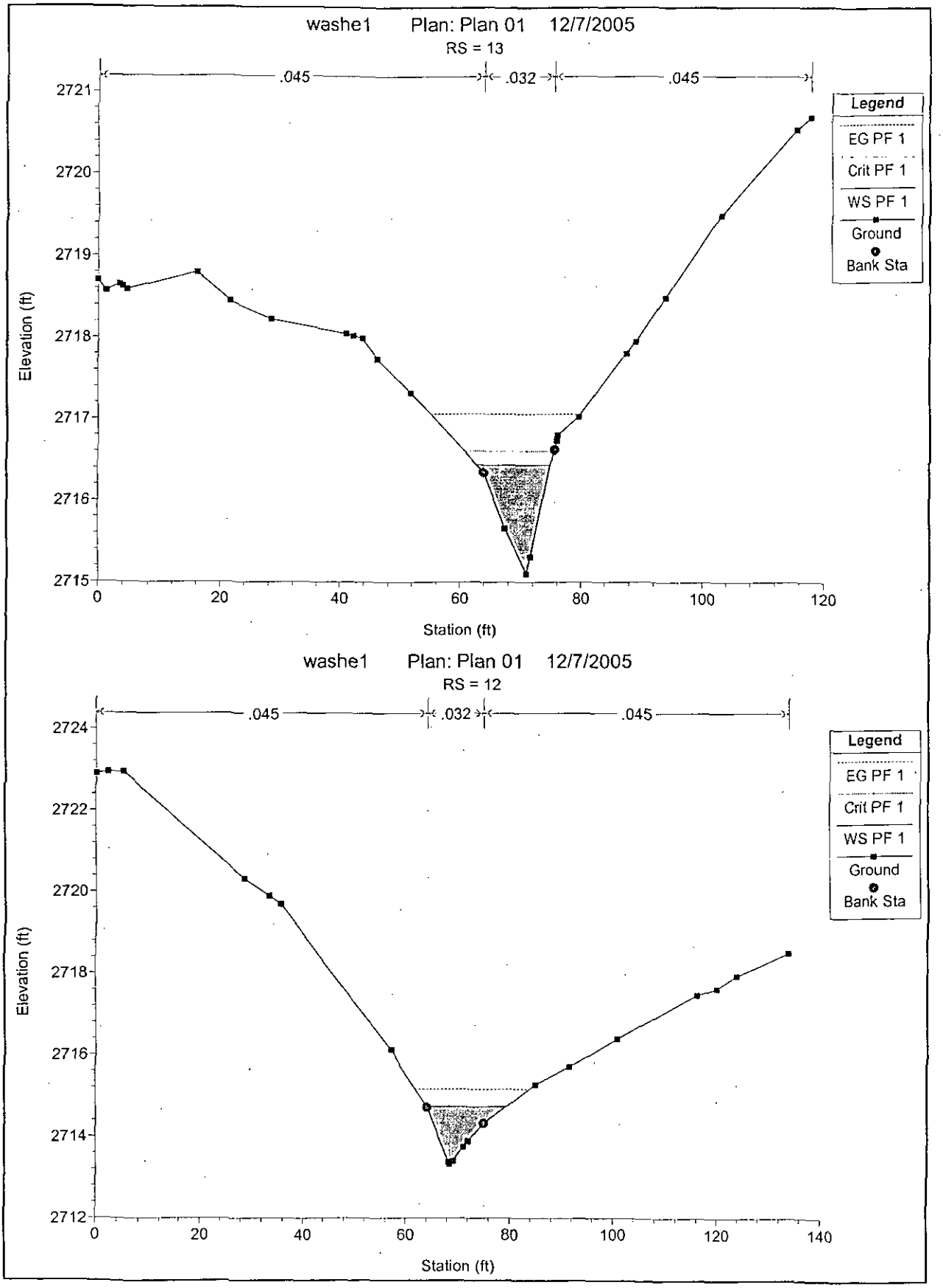
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	13	PF 1	50.00	2715.10	2716.43	2716.60	2717.06	0.030018	6.34	7.93	12.10	1.32
Reach-1	12	PF 1	50.00	2713.32	2714.73	2714.77	2715.18	0.017142	5.31	10.05	15.35	1.02
Reach-1	11	PF 1	50.00	2711.10	2712.13	2712.36	2712.87	0.045013	6.89	7.38	13.63	1.58
Reach-1	10	PF 1	50.00	2708.30	2709.94	2710.07	2710.51	0.018336	6.16	9.08	14.42	1.07
Reach-1	9	PF 1	50.00	2706.40	2707.58	2707.84	2708.40	0.040012	7.29	7.00	11.58	1.52
Reach-1	8	PF 1	50.00	2703.40	2704.77	2705.10	2705.82	0.046780	8.23	6.21	9.25	1.65
Reach-1	7	PF 1	50.00	2701.44	2702.70	2702.85	2703.29	0.030785	6.17	8.11	12.04	1.32
Reach-1	6	PF 1	50.00	2700.00	2701.17	2701.35	2701.79	0.036001	6.31	7.92	13.05	1.42
Reach-1	5	PF 1	110.00	2696.59	2698.30	2698.33	2698.80	0.017684	5.71	19.43	23.16	1.06
Reach-1	4	PF 1	110.00	2692.81	2694.46	2694.74	2695.37	0.030727	7.70	14.71	19.32	1.40
Reach-1	3.5	PF 1	110.00	2692.00	2692.95	2692.96	2693.32	0.014354	5.00	24.98	39.27	0.95
Reach-1	3	PF 1	133.00	2689.21	2690.87	2691.19	2691.67	0.023564	7.41	21.04	33.22	1.26
Reach-1	2	PF 1	251.00	2679.83	2681.78	2682.26	2683.26	0.033851	9.83	26.57	26.60	1.54
Reach-1	1	PF 1	251.00	2677.00	2679.28	2679.50	2680.16	0.016076	8.21	40.37	39.91	1.10

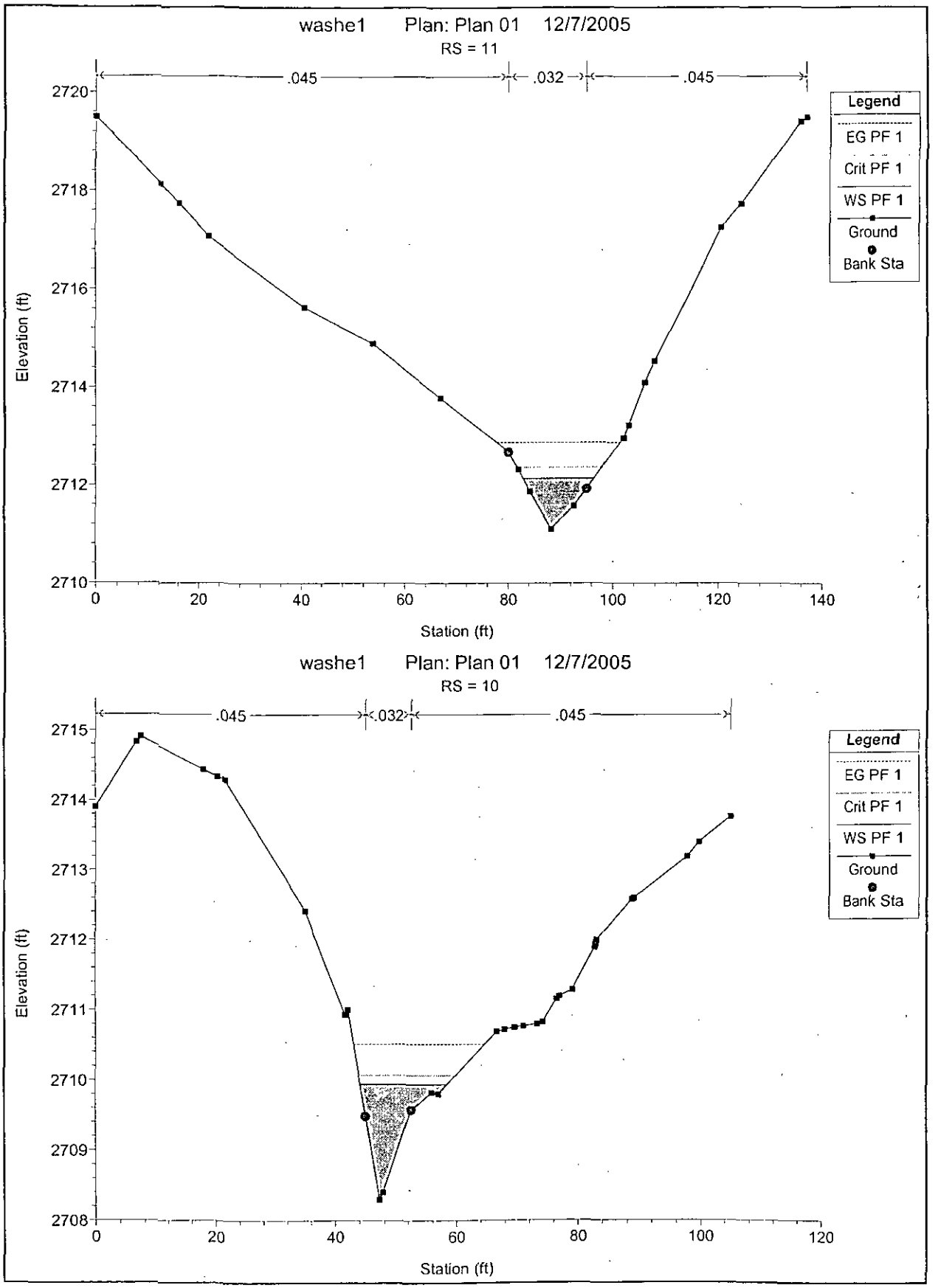
Errors Warnings and Notes for Plan : Plan 01

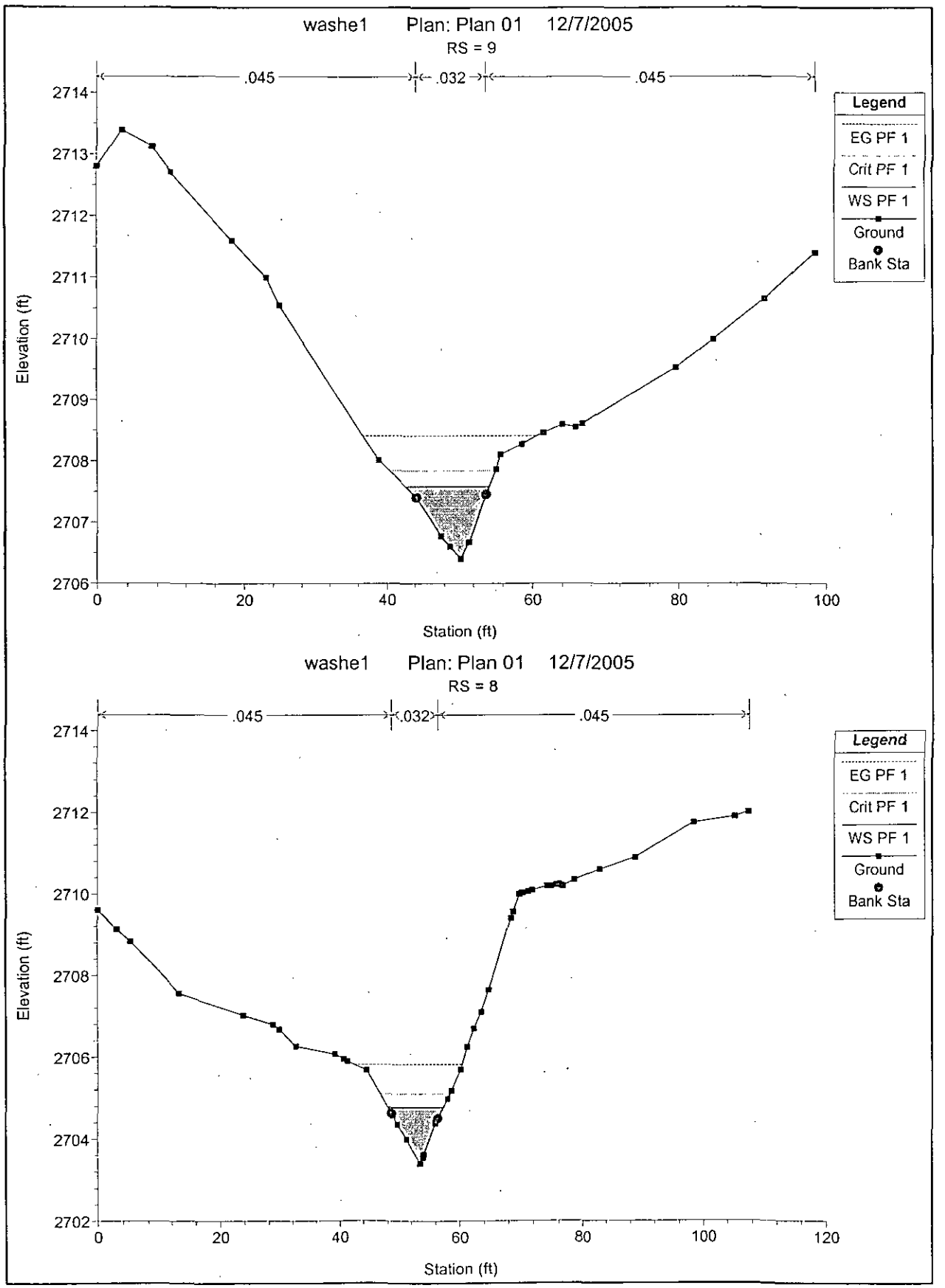
Location:	River: RIVER-1 Reach: Reach-1 RS: 12 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 11 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 10 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 9 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 8 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 7 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 6 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	selected the water surface that had the least amount of error between computed and assumed
	values.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3.5 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7

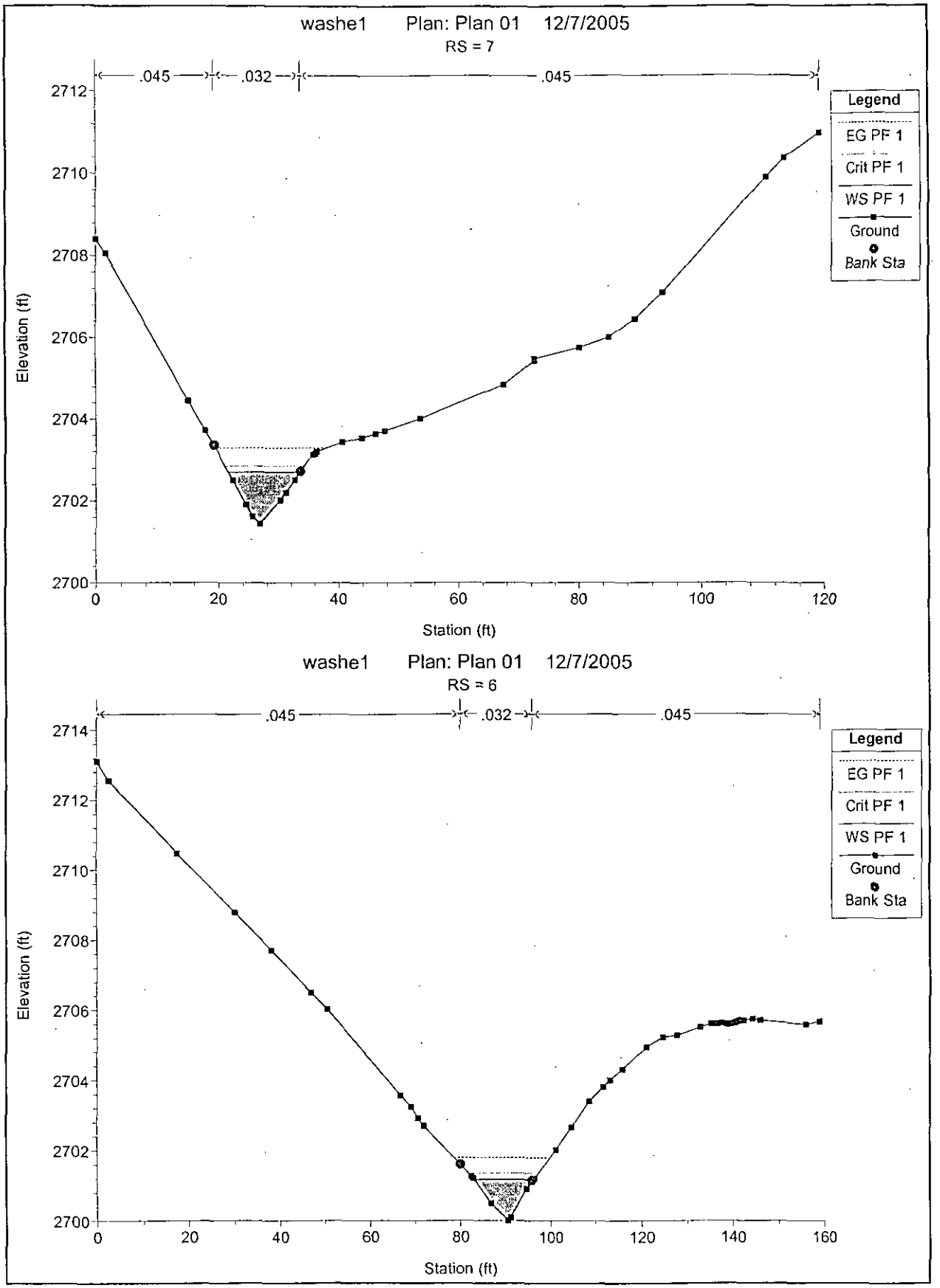
Errors Warnings and Notes for Plan : Plan 01 (Continued)

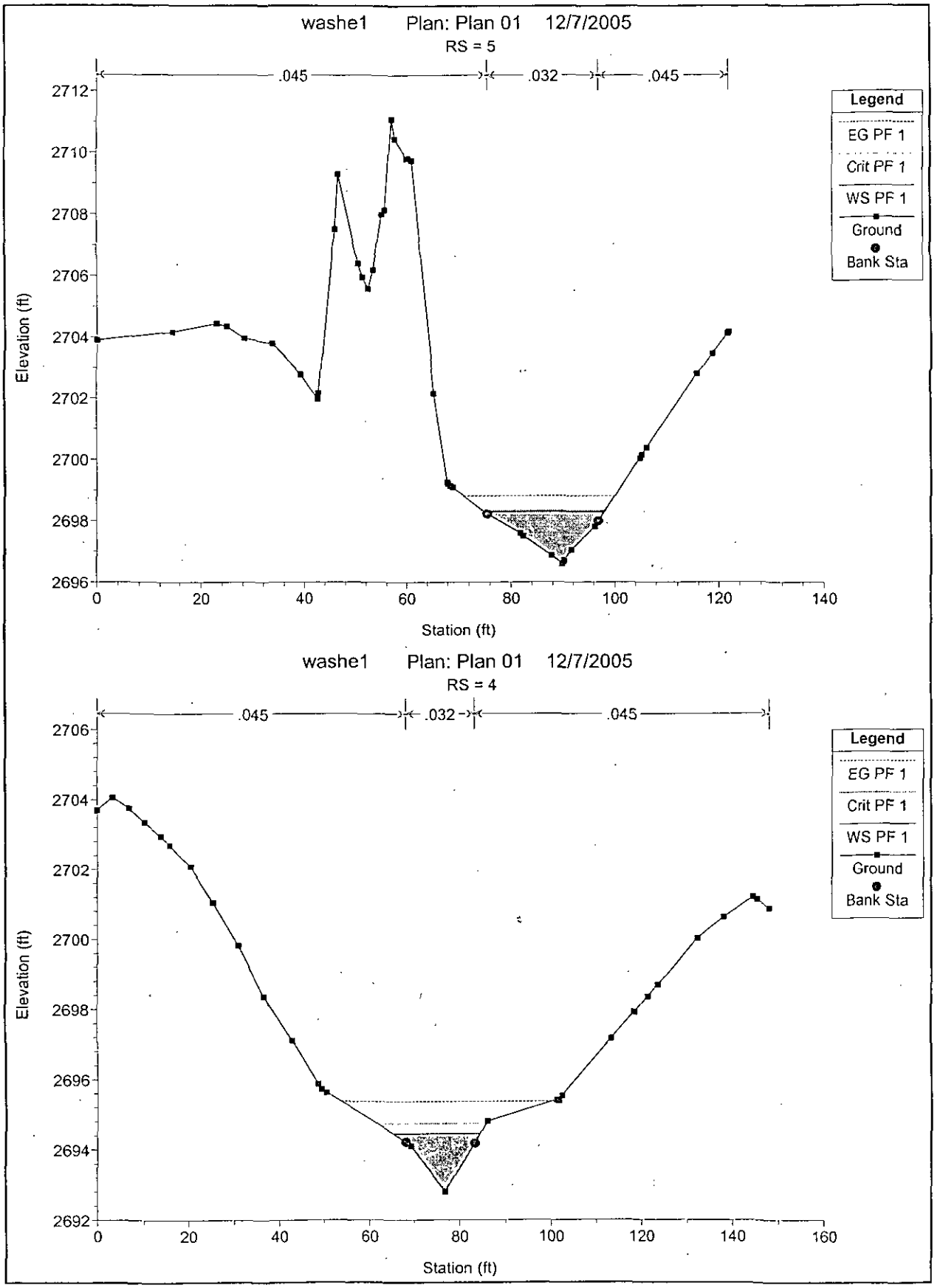
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.

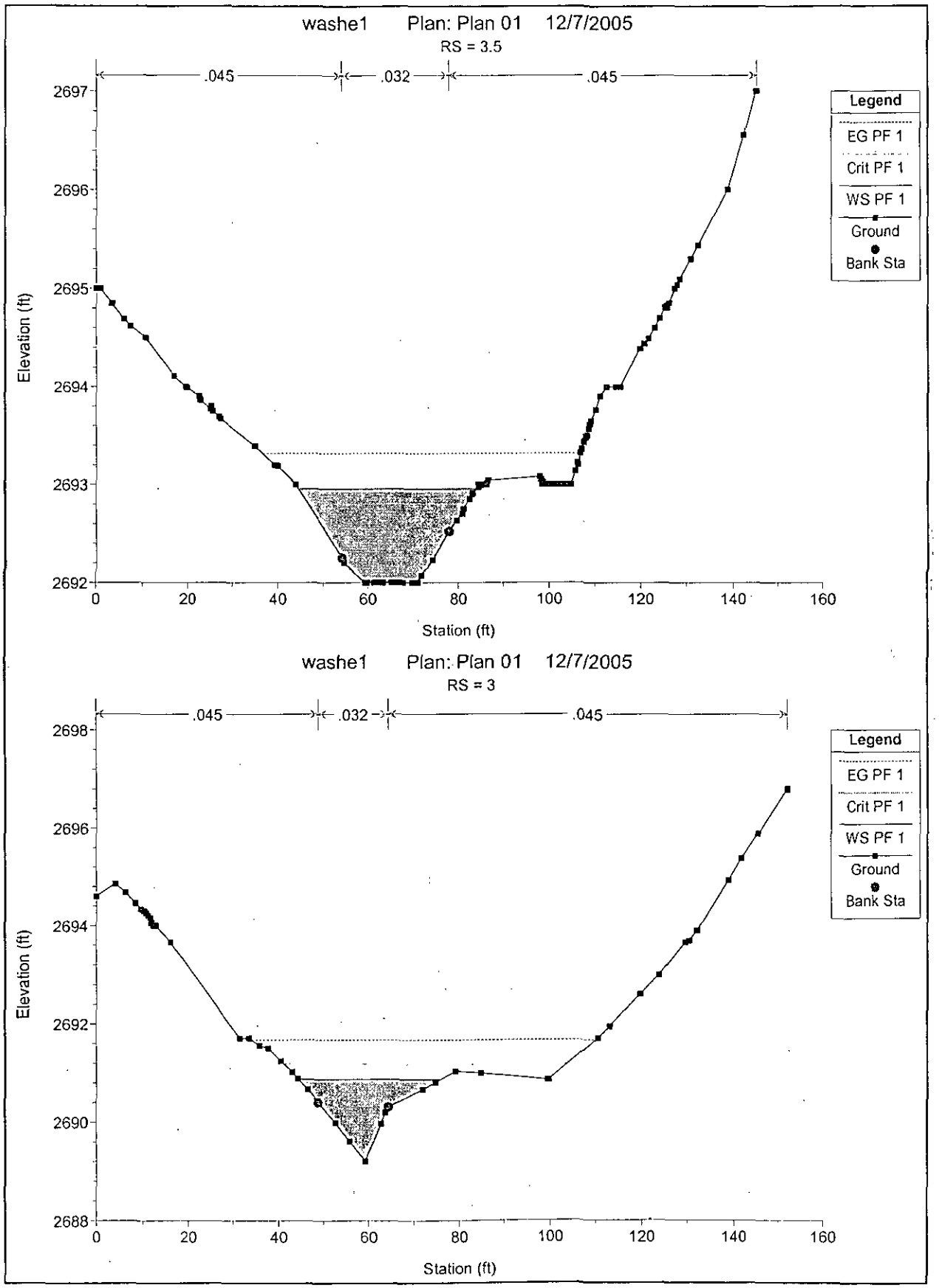

washe1 Plan: Plan 01 12/7/2005
RS = 13
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washe1 Plan: Plan 01 12/7/2005
RS = 12
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washe1 Plan: Plan 01 12/7/2005
RS = 11
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washe1 Plan: Plan 01 12/7/2005
RS = 10
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washe1 Plan: Plan 01 12/7/2005
RS = 9
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washe1 Plan: Plan 01 12/7/2005
RS = 8
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washe1 Plan: Plan 01 12/7/2005
RS = 7
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washe1 Plan: Plan 01 12/7/2005
RS = 6
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washe1 Plan: Plan 01 12/7/2005
RS = 5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washe1 Plan: Plan 01 12/7/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washe1 Plan: Plan 01 12/7/2005
RS = 3.5
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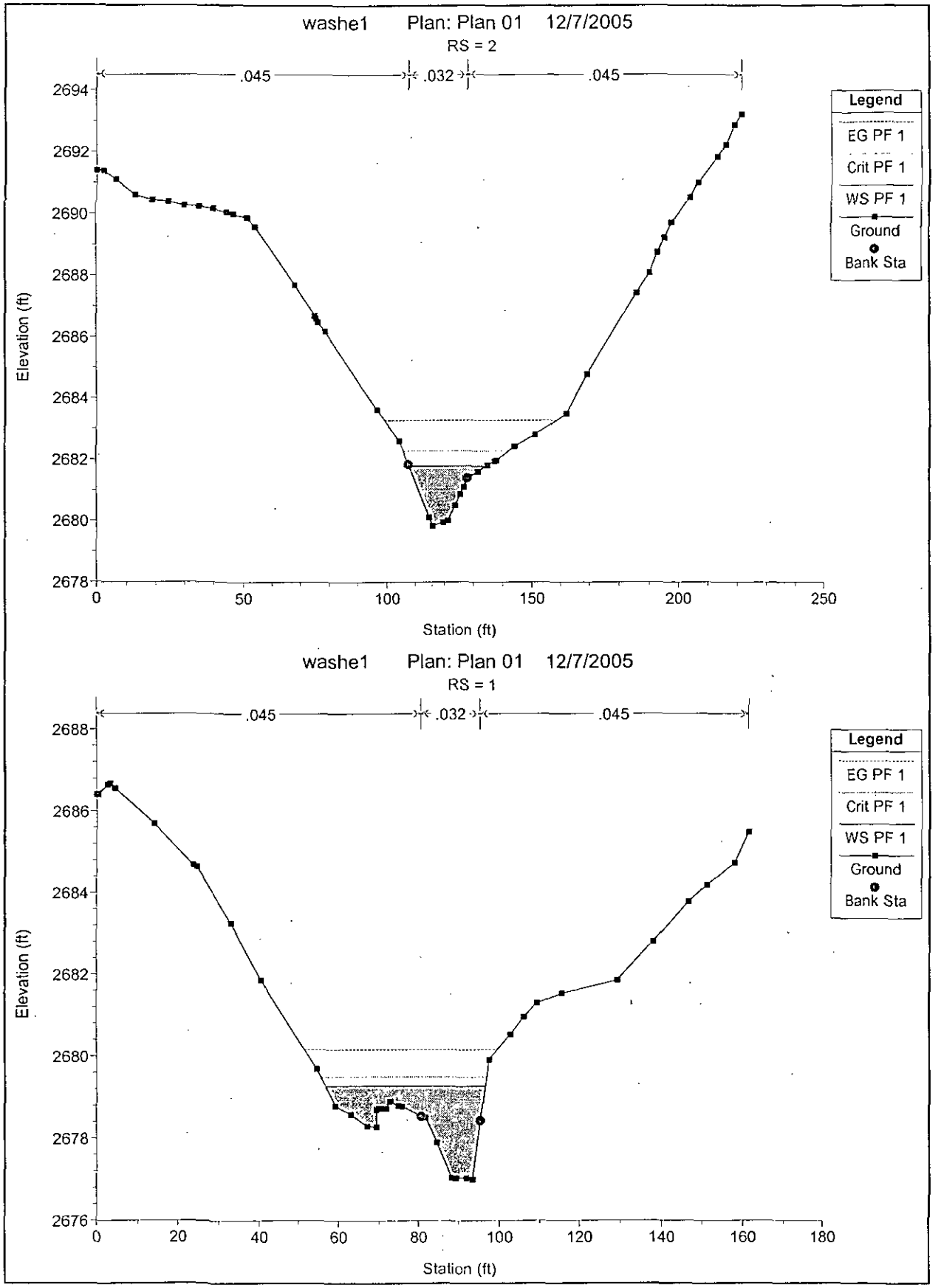
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washe1 Plan: Plan 01 12/7/2005
RS = 3
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washe1 Plan: Plan 01 12/7/2005
RS = 2
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washe1 Plan: Plan 01 12/7/2005
RS = 1
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

WASH E2

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1

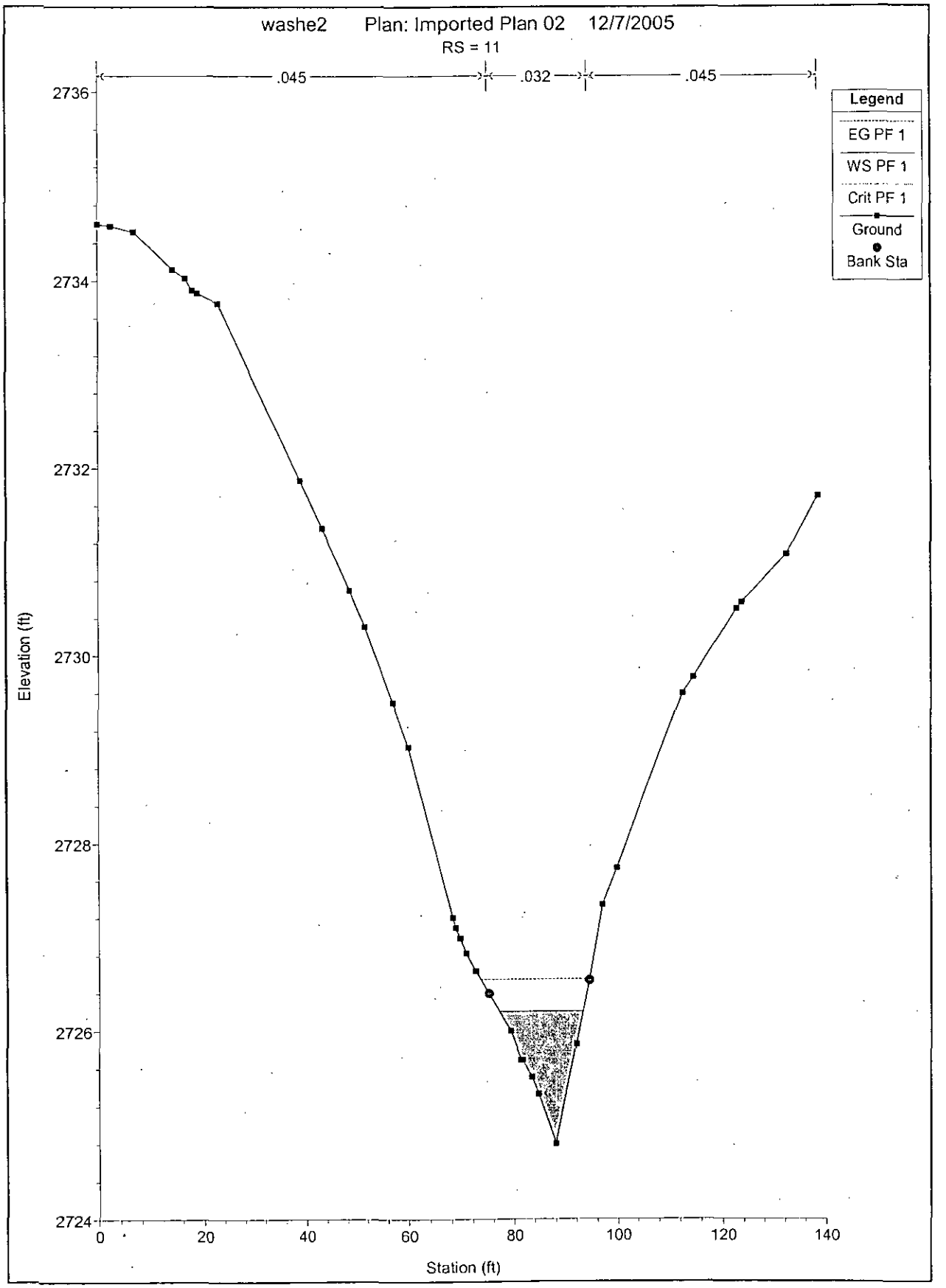
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	11	PF 1	50 00	2724 80	2726.21	2726.21	2726 55	0.018084	4.69	10 67	16.13	1.02
Reach-1	10	PF 1	50 00	2719 82	2721.45	2721.45	2721 87	0.015739	5 17	9.85	14 80	0 98
Reach-1	9	PF 1	50 00	2715.71	2717.28	2717.28	2717.71	0.013081	5.64	10.87	14.46	0.94
Reach-1	8	PF 1	50.00	2709.10	2710.75	2710.73	2711.18	0.013703	5.29	9.88	13.61	0 93
Reach-1	7.5	PF 1	50.00	2708.00	2708.95	2708.95	2709.30	0.014860	4.88	11.16	16 95	0.95
Reach-1	7	PF 1	50.00	2705.46	2706.72	2706.72	2707.06	0.018115	4.66	10.75	17.20	1.02
Reach-1	*6*	*PF 1*	*50 00*	*2701.53*	*2703.27*	*2703.27*	*2703.72*	*0.017169*	*5 37*	*9.32*	*10.70*	*1.01*
Reach-1	5	PF 1	50.00	2697.79	2699.50	2699.50	2700.00	0.012670	5 97	10.10	11.77	0.93
Reach-1	4.5	PF 1	50.00	2697.00	2698.23	2698 23	2698.64	0.014274	5 21	10.31	14.42	0.95
Reach-1	4	PF 1	50.00	2694.91	2696.16	2696.16	2696.49	0.018131	4.61	10.84	16.93	1.02
Reach-1	3	PF 1	50.00	2687.45	2689.05	2689.05	2689 47	0.017317	5.17	9.67	12.00	1.01
Reach-1	2	PF 1	50.00	2679.83	2680.97	2680.94	2681 31	0.015193	4 66	10.76	14.98	0.95
Reach-1	1	PF 1	50 00	2677.00	2678.17	2678.17	2678 60	0.031321	5.29	9.56	11.63	0 98

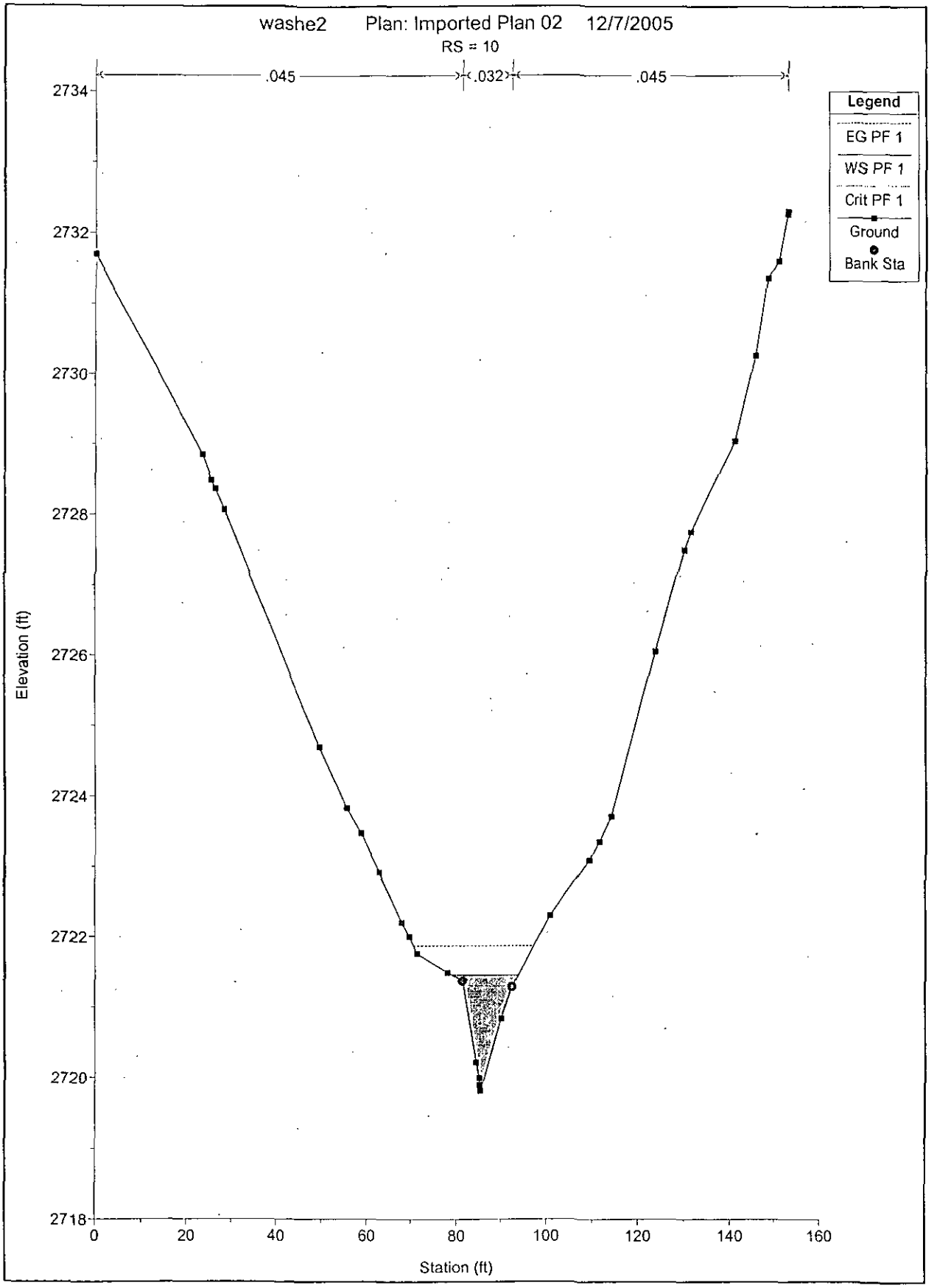
Errors Warnings and Notes for Plan : Imported Pla

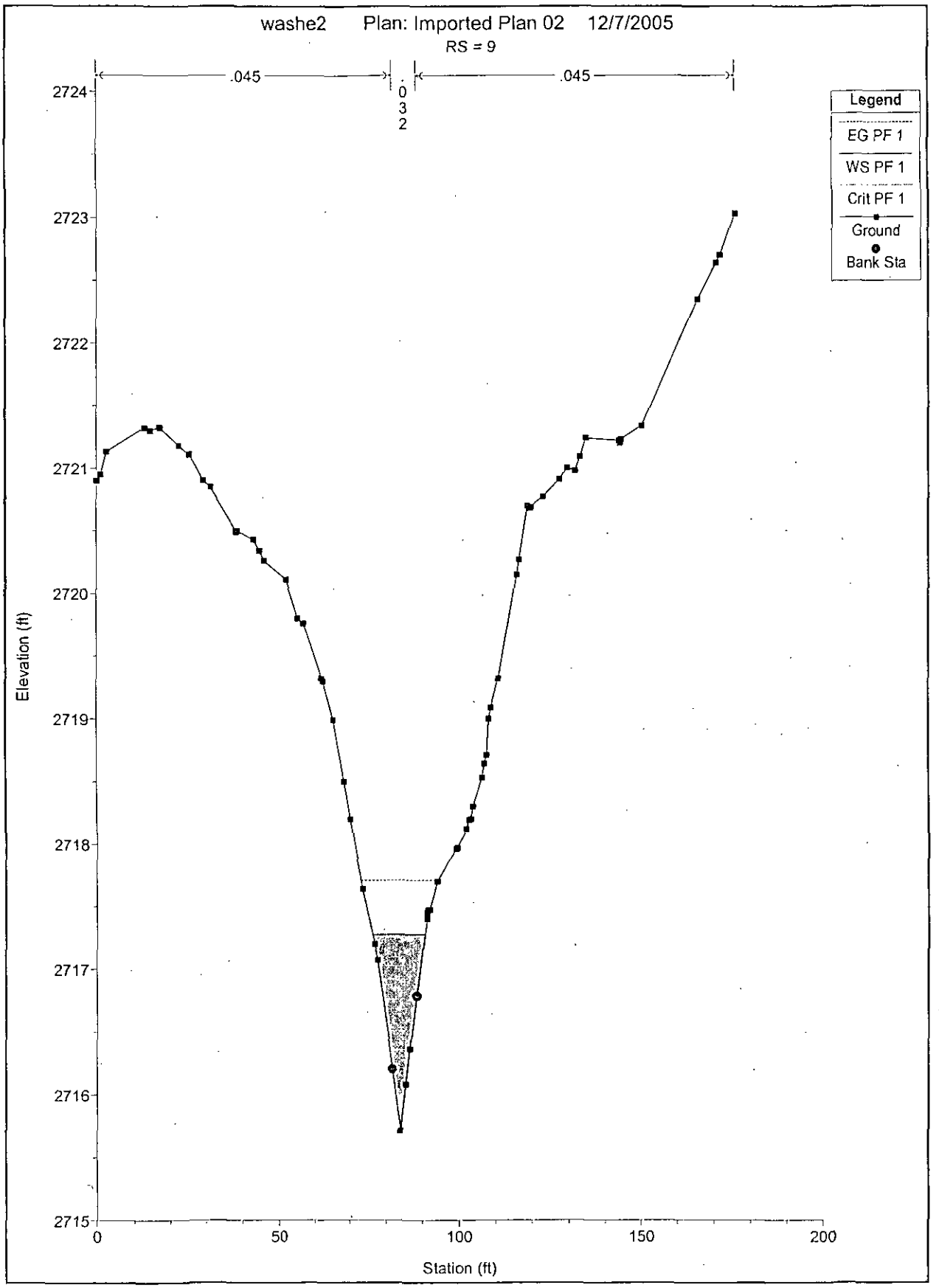
Location:	River: RIVER-1 Reach: Reach-1 RS: 11 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 10 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 9 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 8 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 7.5 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 7 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 6 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program

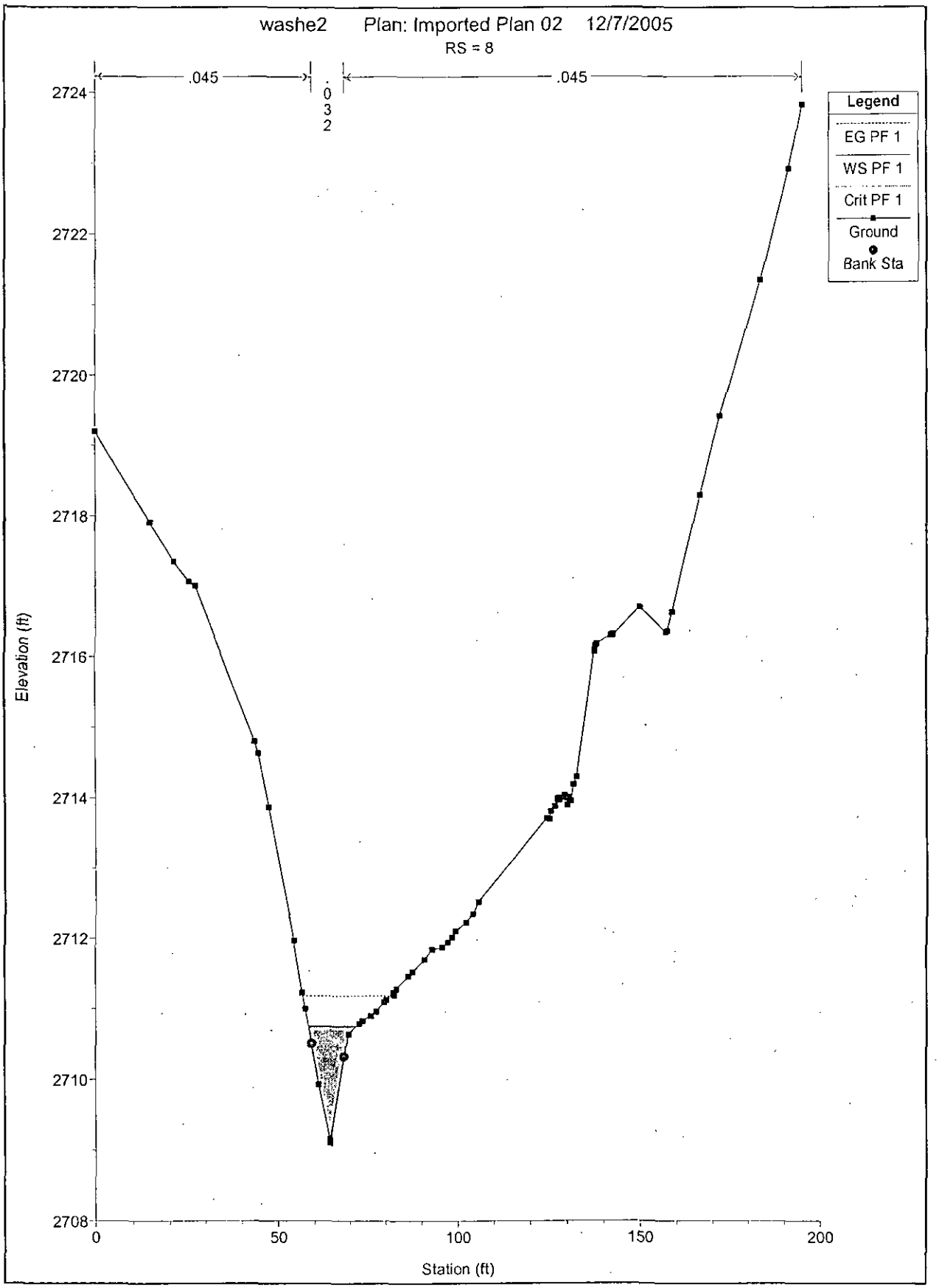
Errors Warnings and Notes for Plan : Imported Pla (Continued)

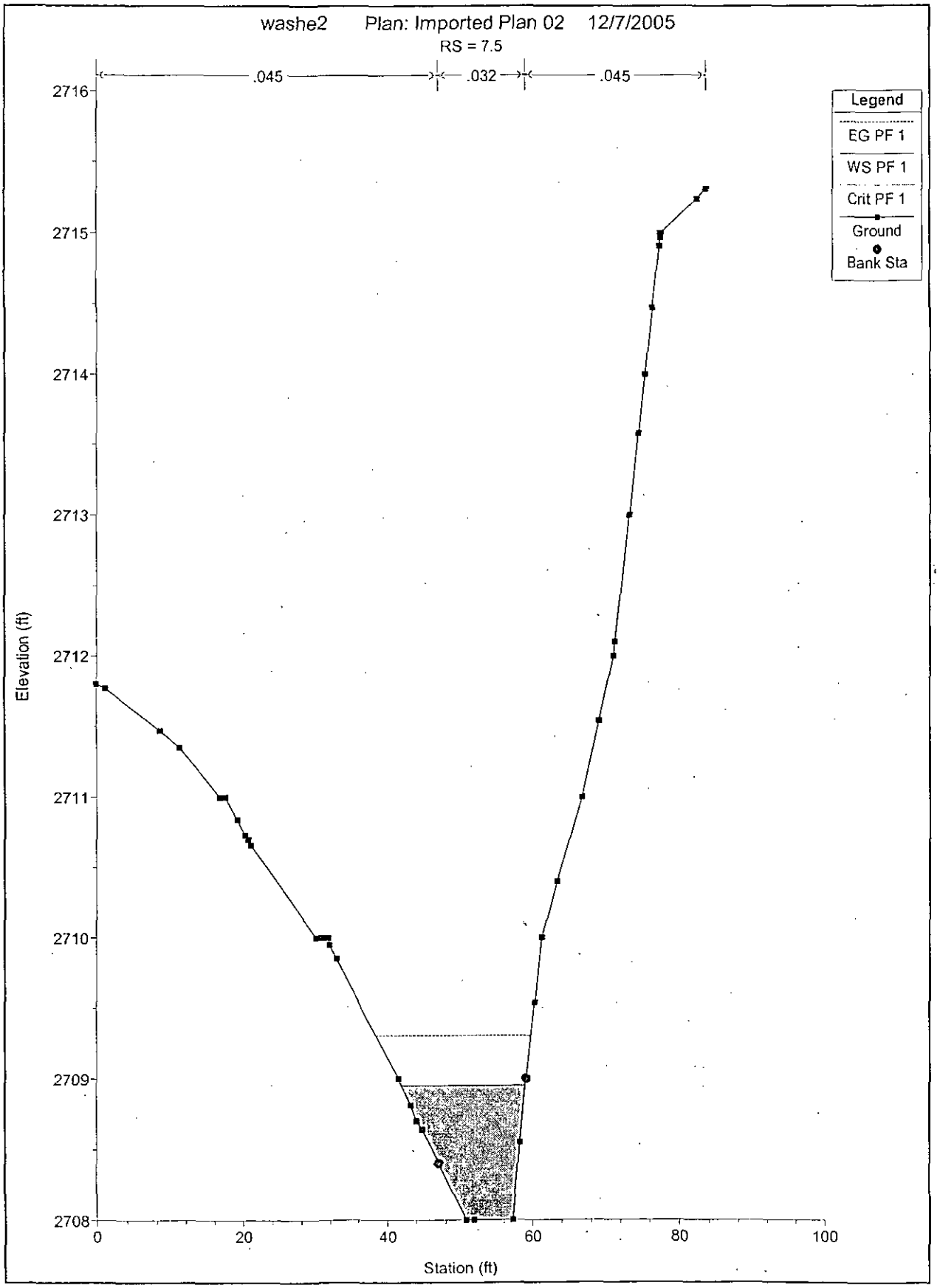
	selected the water surface that had the least amount of error between computed and assumed
	values.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4.5 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.

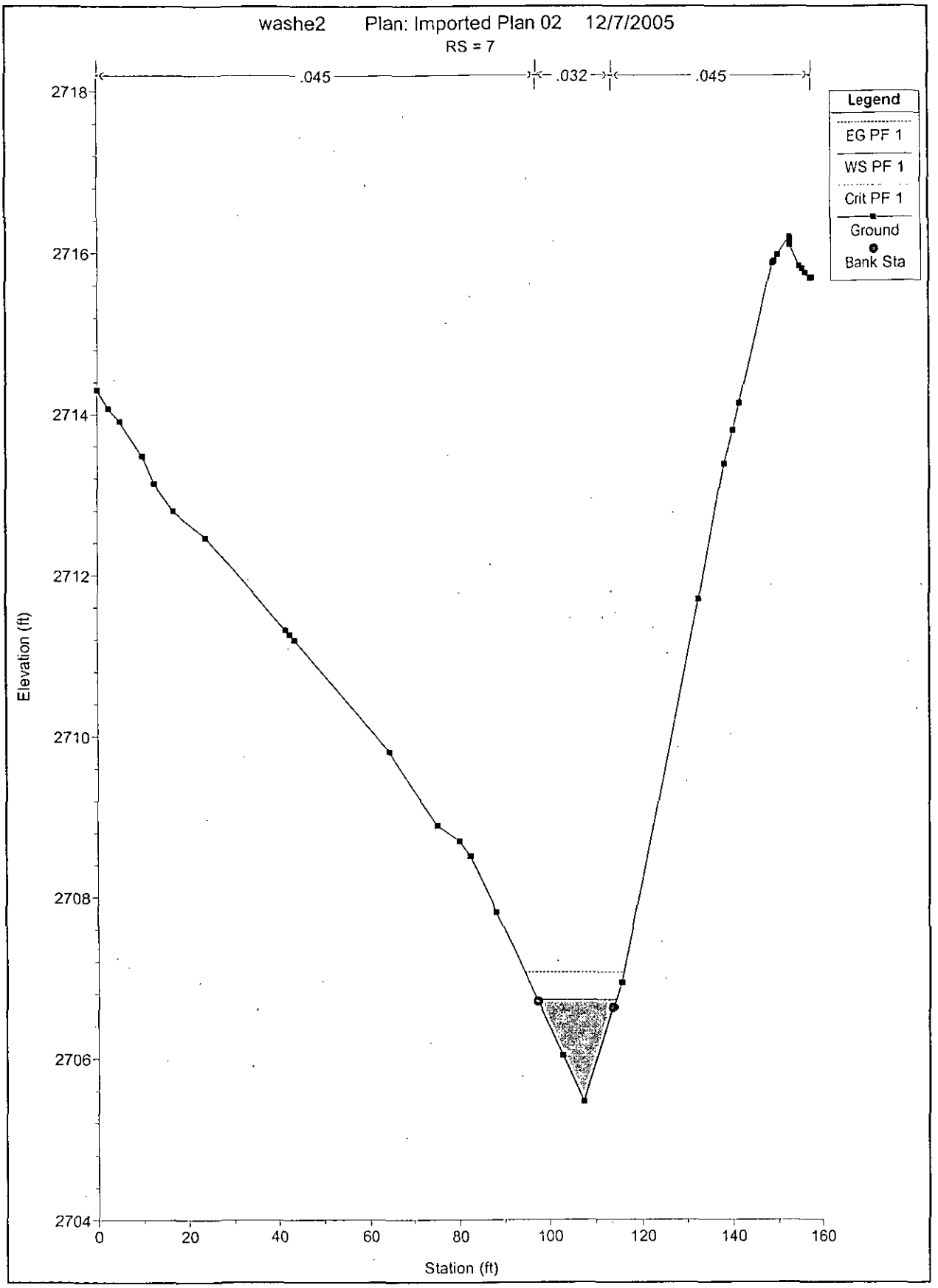

washe2 Plan: Imported Plan 02 12/7/2005
RS = 11
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2736
2734
2732
2730
2728
2726
2724
0
20
40
60
80
100
120
140
Station (ft)

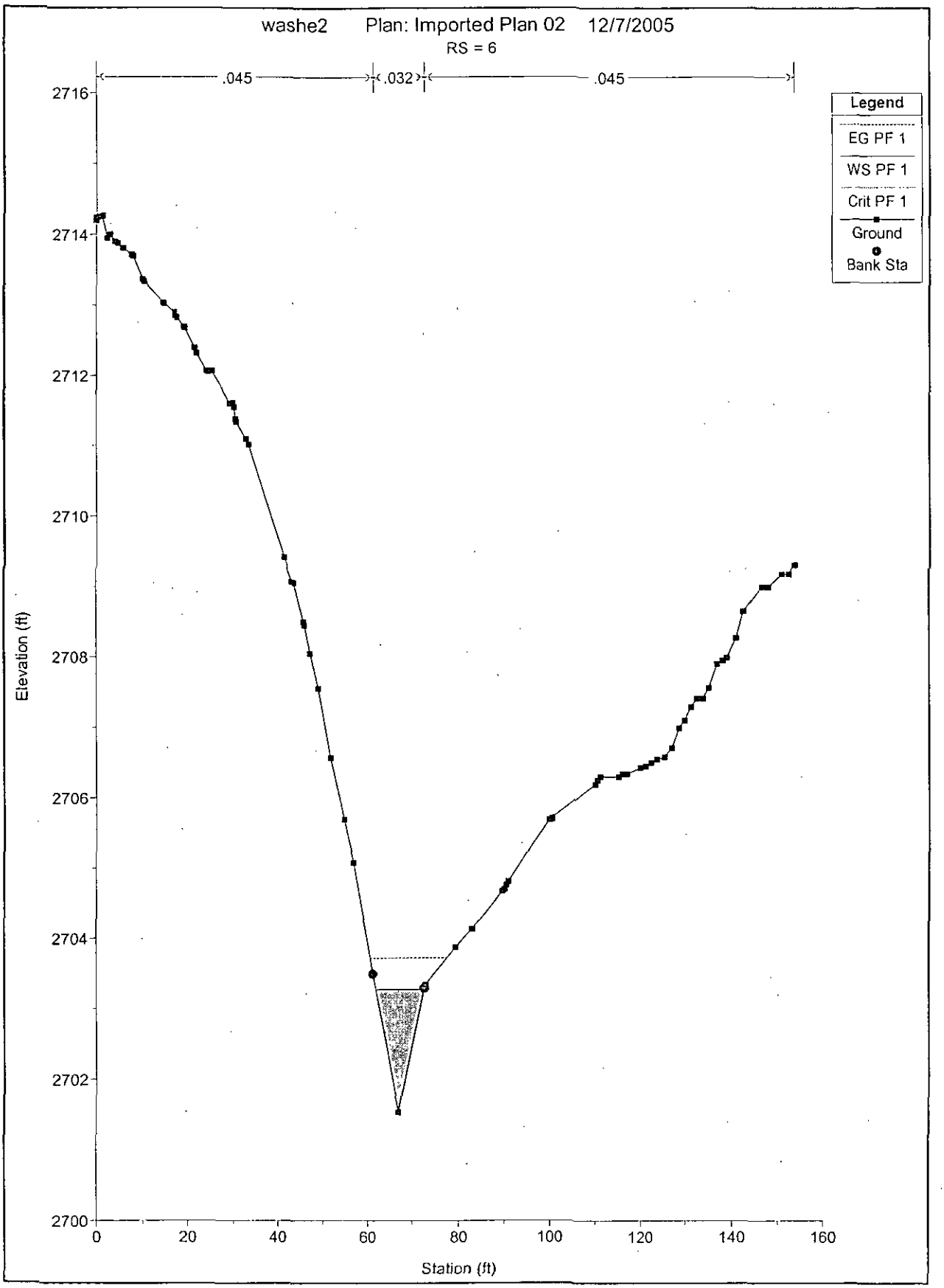

washe2 Plan: Imported Plan 02 12/7/2005
RS = 10
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2734
2732
2730
2728
2726
2724
2722
2720
2718
0
20
40
60
80
100
120
140
160
Station (ft)

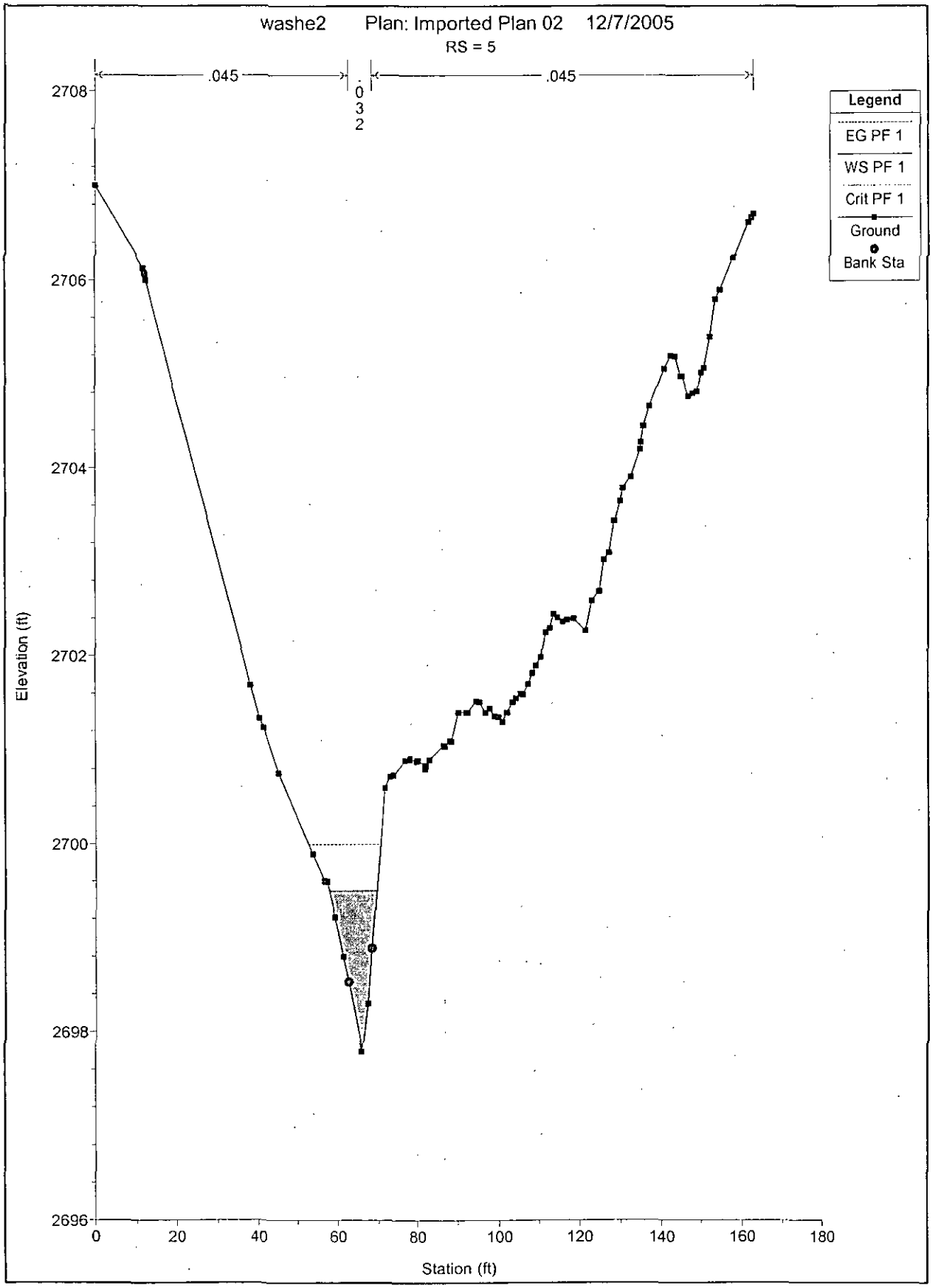

washe2 Plan: Imported Plan 02 12/7/2005
RS = 9
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2724
2723
2722
2721
2720
2719
2718
2717
2716
2715
0
50
100
150
200

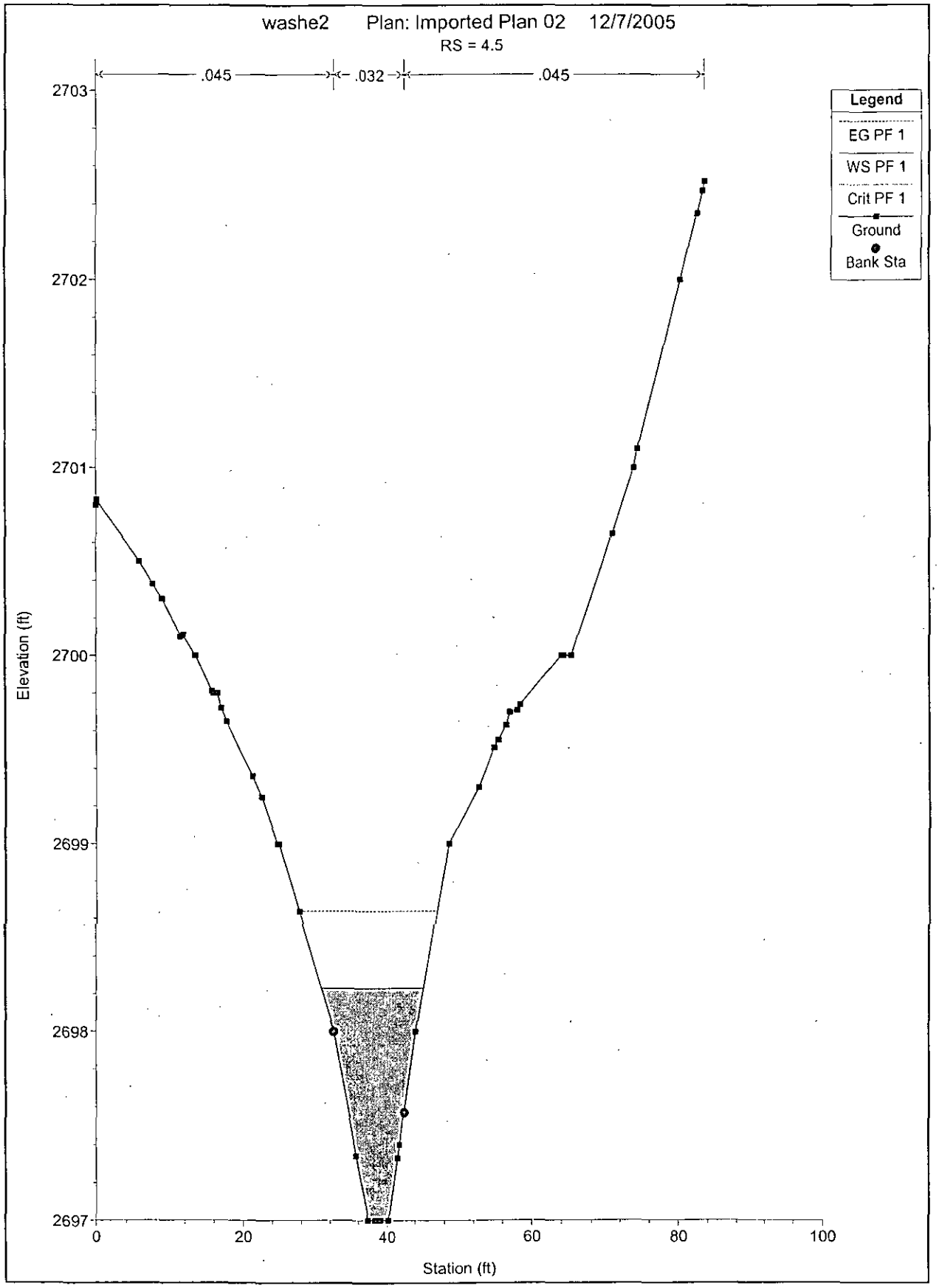

washe2 Plan: Imported Plan 02 12/7/2005
RS = 8
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2724
2722
2720
2718
2716
2714
2712
2710
2708
0
50
100
150
200

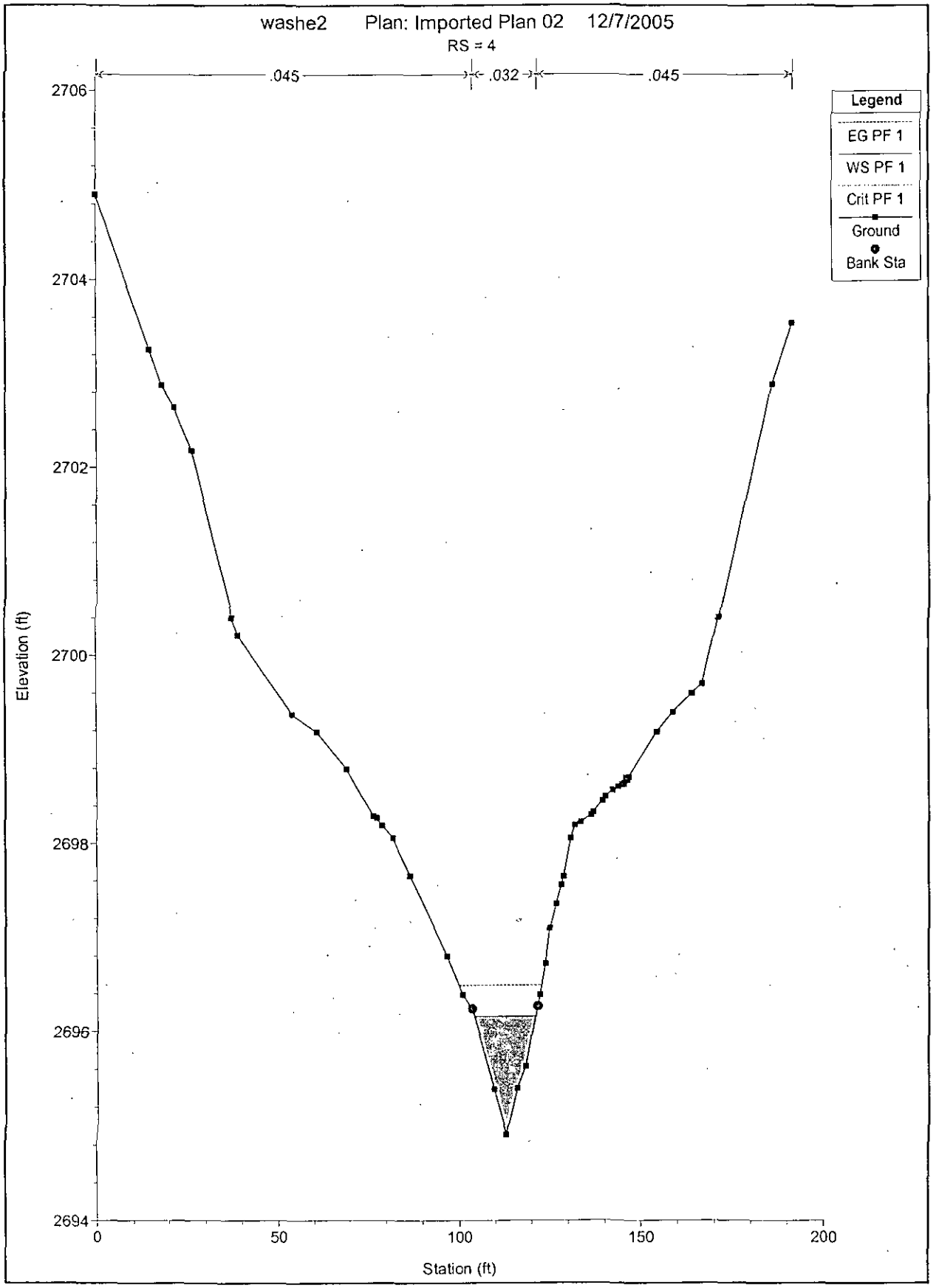

washe2 Plan: Imported Plan 02 12/7/2005
RS = 7.5
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2716
2715
2714
2713
2712
2711
2710
2709
2708
0
20
40
60
80
100
Station (ft)

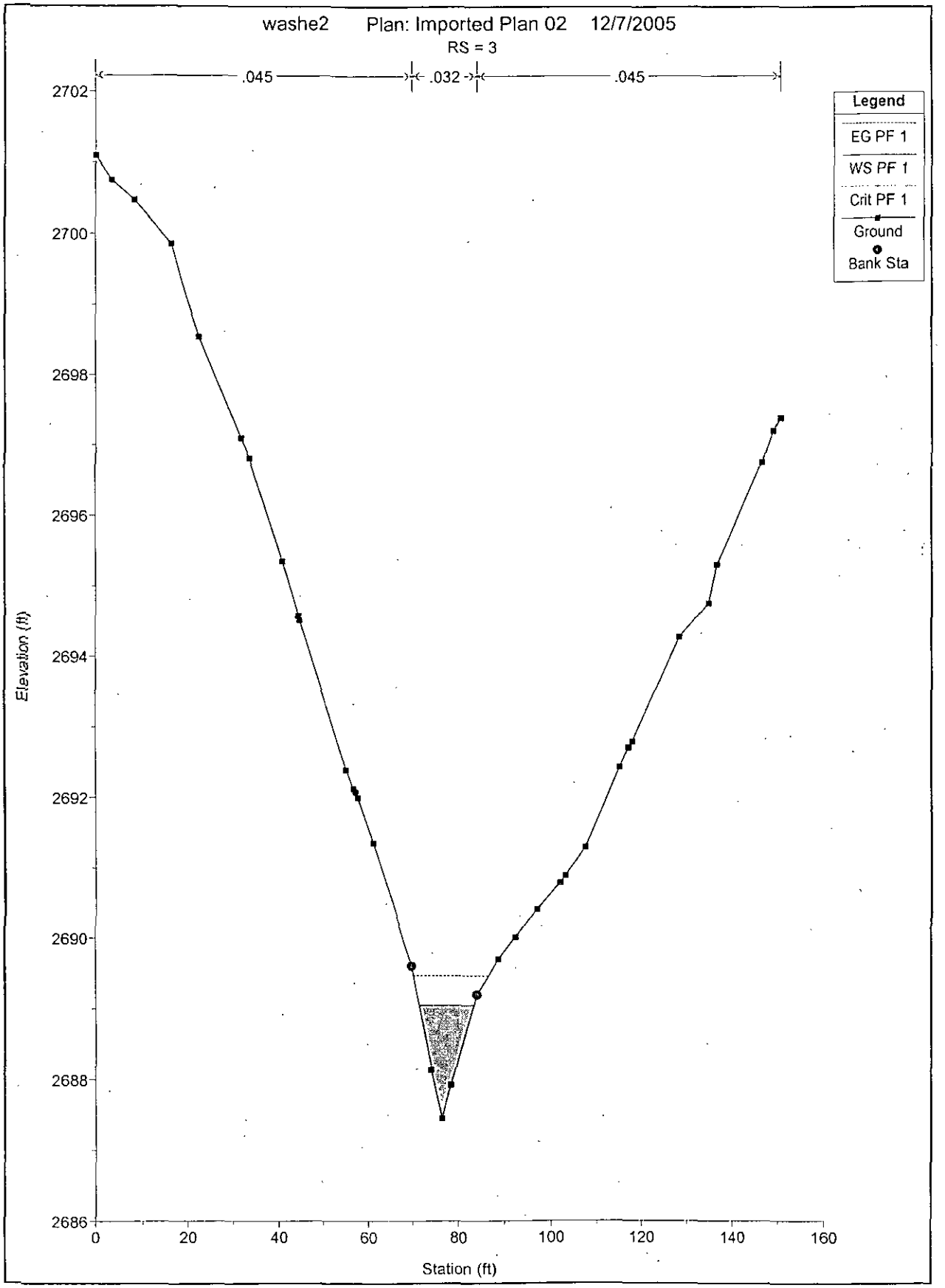

washe2 Plan: Imported Plan 02 12/7/2005
RS = 7
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2718
2716
2714
2712
2710
2708
2706
2704
0
20
40
60
80
100
120
140
160

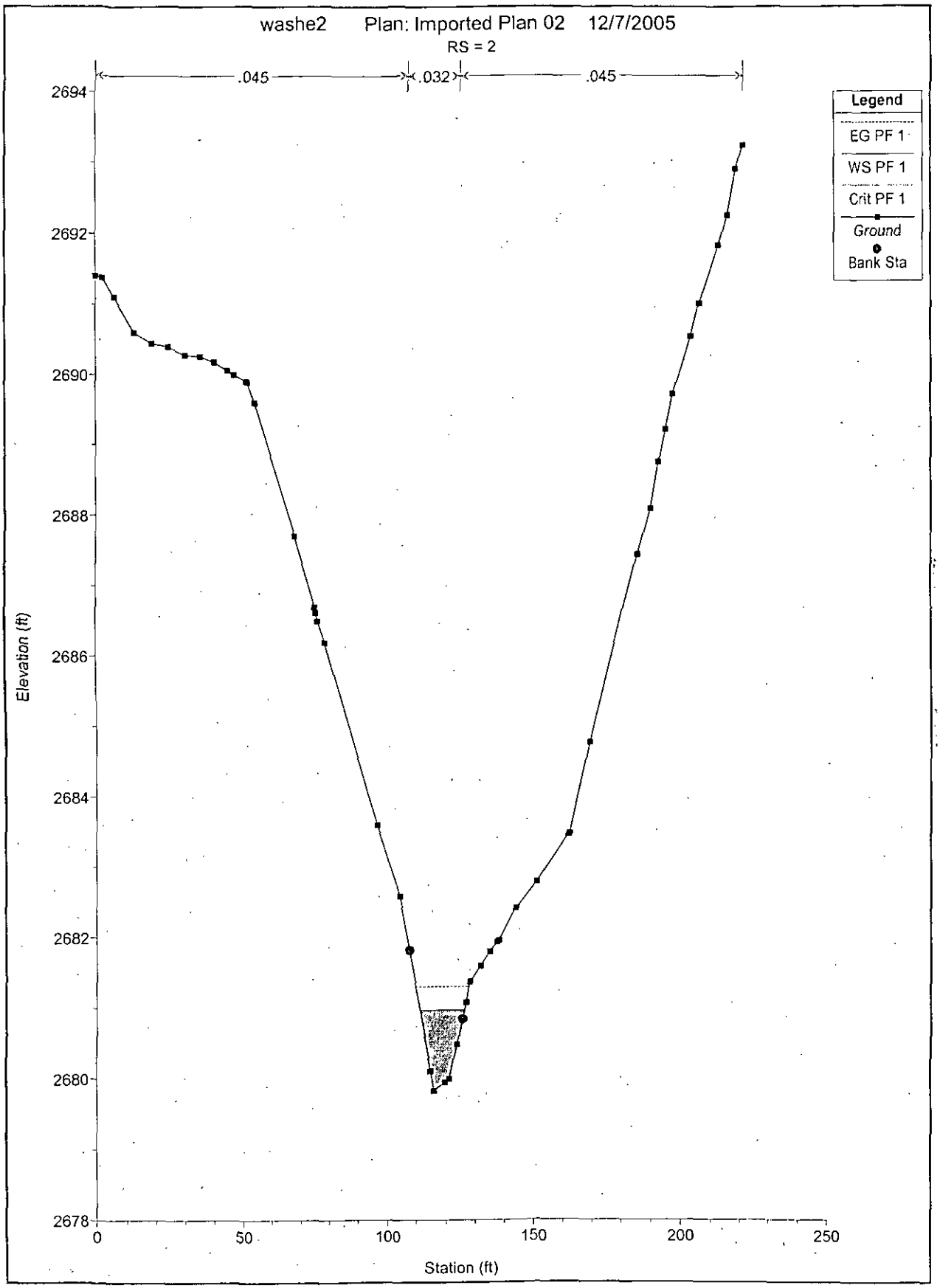

washe2 Plan: Imported Plan 02 12/7/2005
RS = 6
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
2716
2714
2712
2710
2708
2706
2704
2702
2700
0
20
40
60
80
100
120
140
160

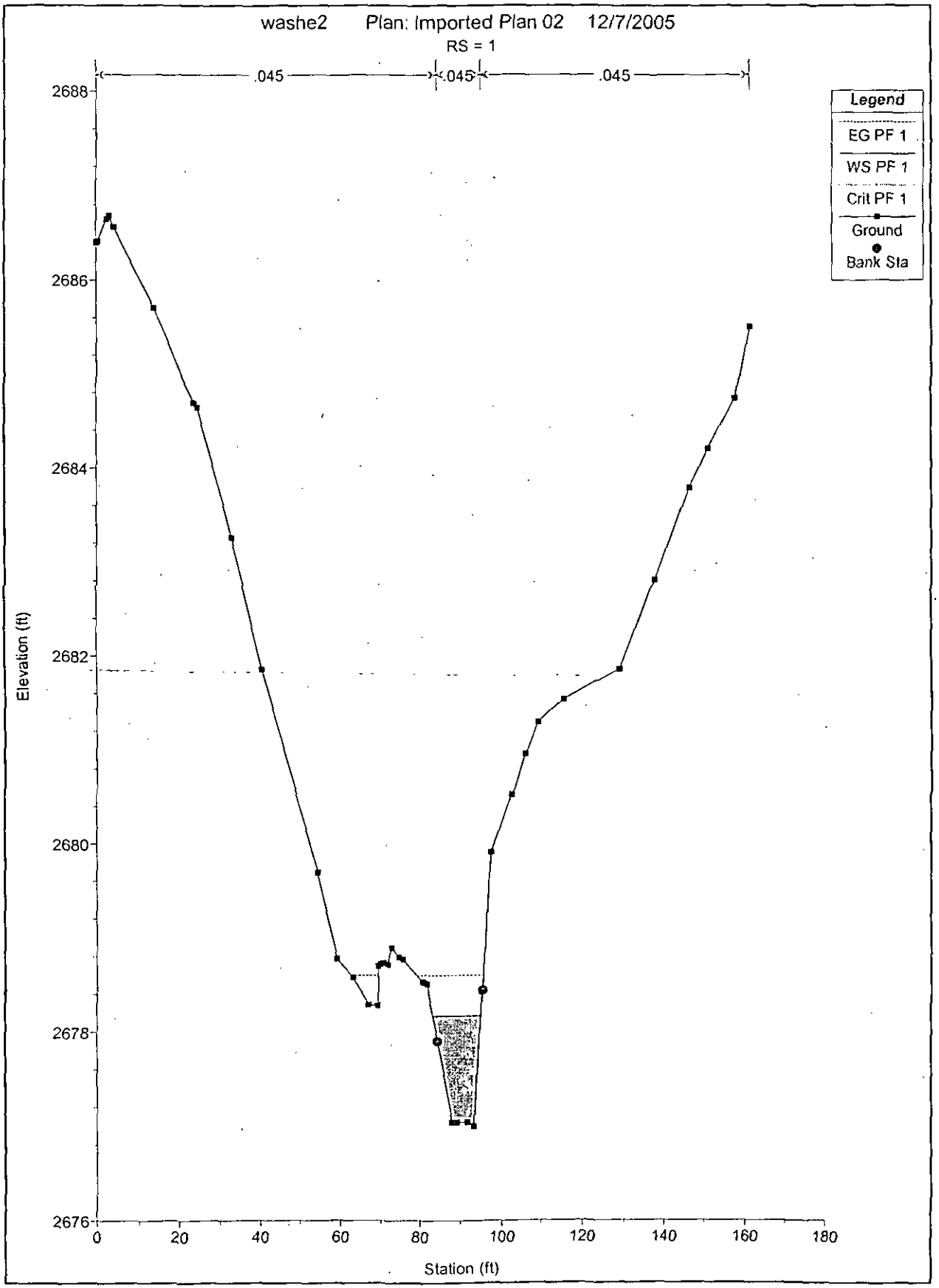

washe2 Plan: Imported Plan 02 12/7/2005
RS = 5
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2708
2706
2704
2702
2700
2698
2696
0
20
40
60
80
100
120
140
160
180
Station (ft)


washe2 Plan: Imported Plan 02 12/7/2005
RS = 4.5
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
2703
2702
2701
2700
2699
2698
2697
Elevation (ft)
0
20
40
60
80
100
Station (ft)


washe2 Plan: Imported Plan 02 12/7/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2706
2704
2702
2700
2698
2696
2694
0
50
100
150
200
Station (ft)


washe2 Plan: Imported Plan 02 12/7/2005
RS = 3
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2702
2700
2698
2696
2694
2692
2690
2688
2686
0
20
40
60
80
100
120
140
160
Station (ft)


washe2 Plan: Imported Plan 02 12/7/2005
RS = 2
.045
.032
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2694
2692
2690
2688
2686
2684
2682
2680
2678
0
50
100
150
200
250
Station (ft)


washe2 Plan: Imported Plan 02 12/7/2005
RS = 1
.045
.045
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
2688
2686
2684
2682
2680
2678
2676
0
20
40
60
80
100
120
140
160
180
Station (ft)

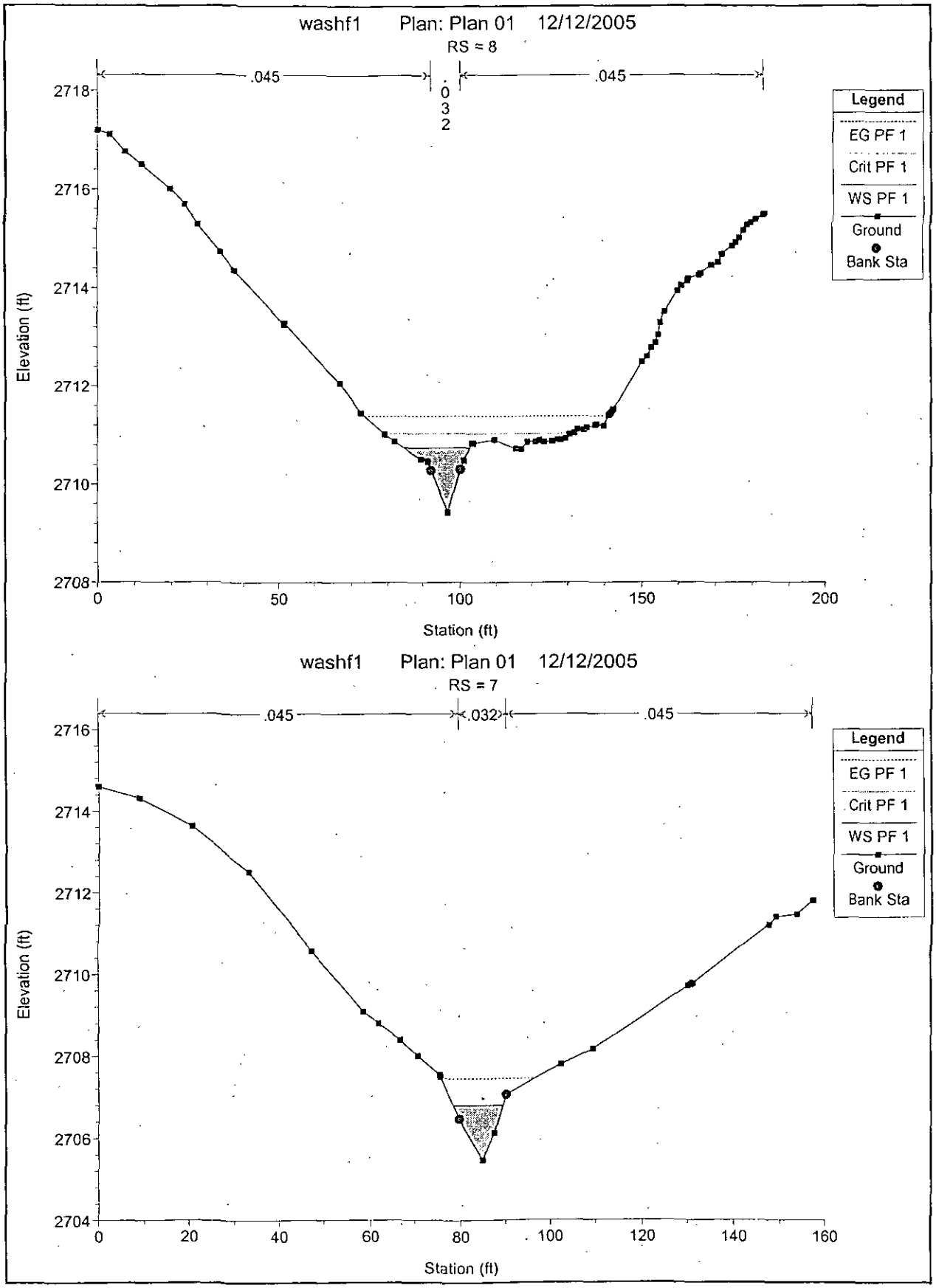
WASH R1

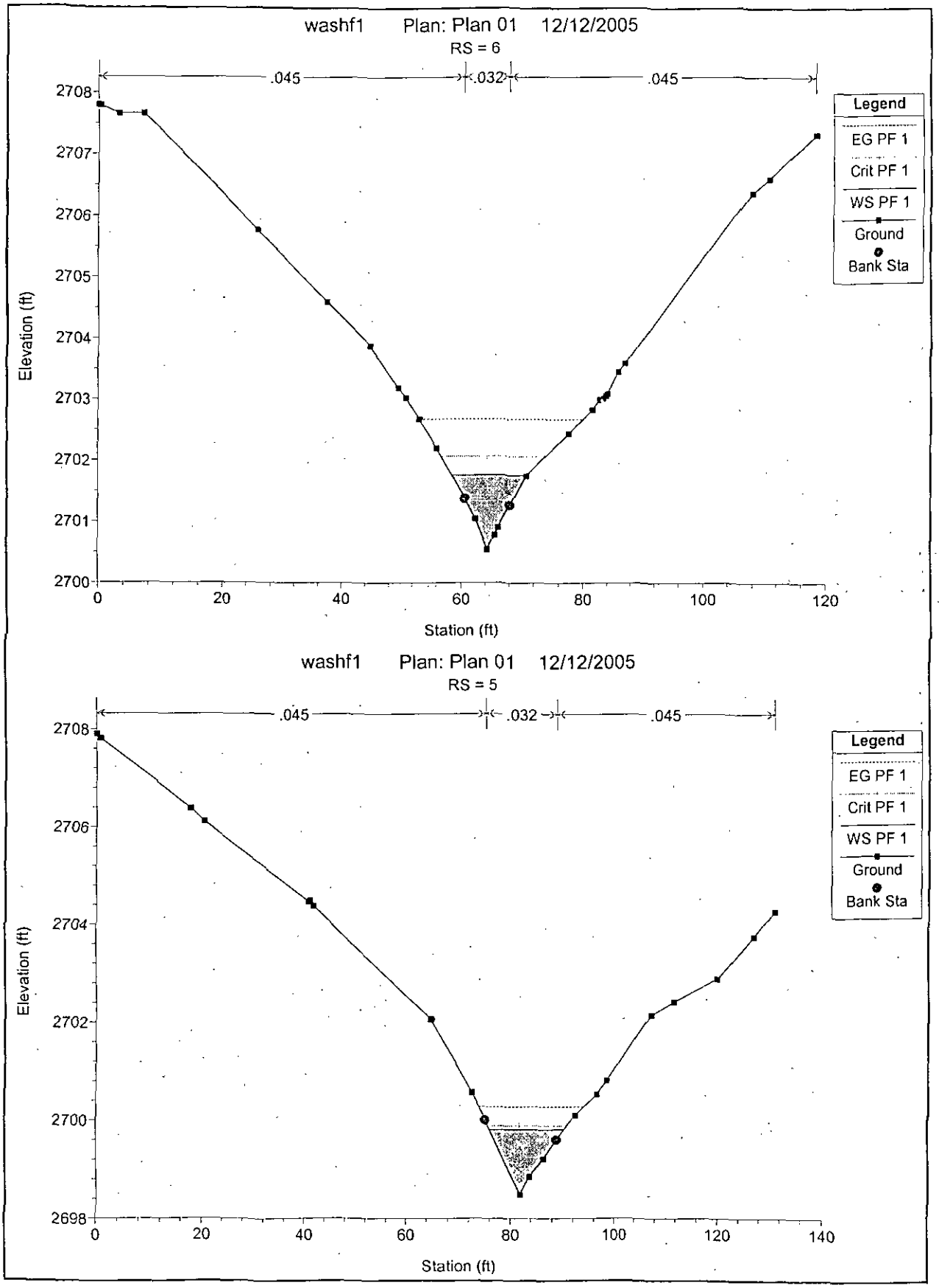
HEC-RAS Plan: Plan 01 River: RIVER-1 Reach: Reach-1 Profile: PF 1

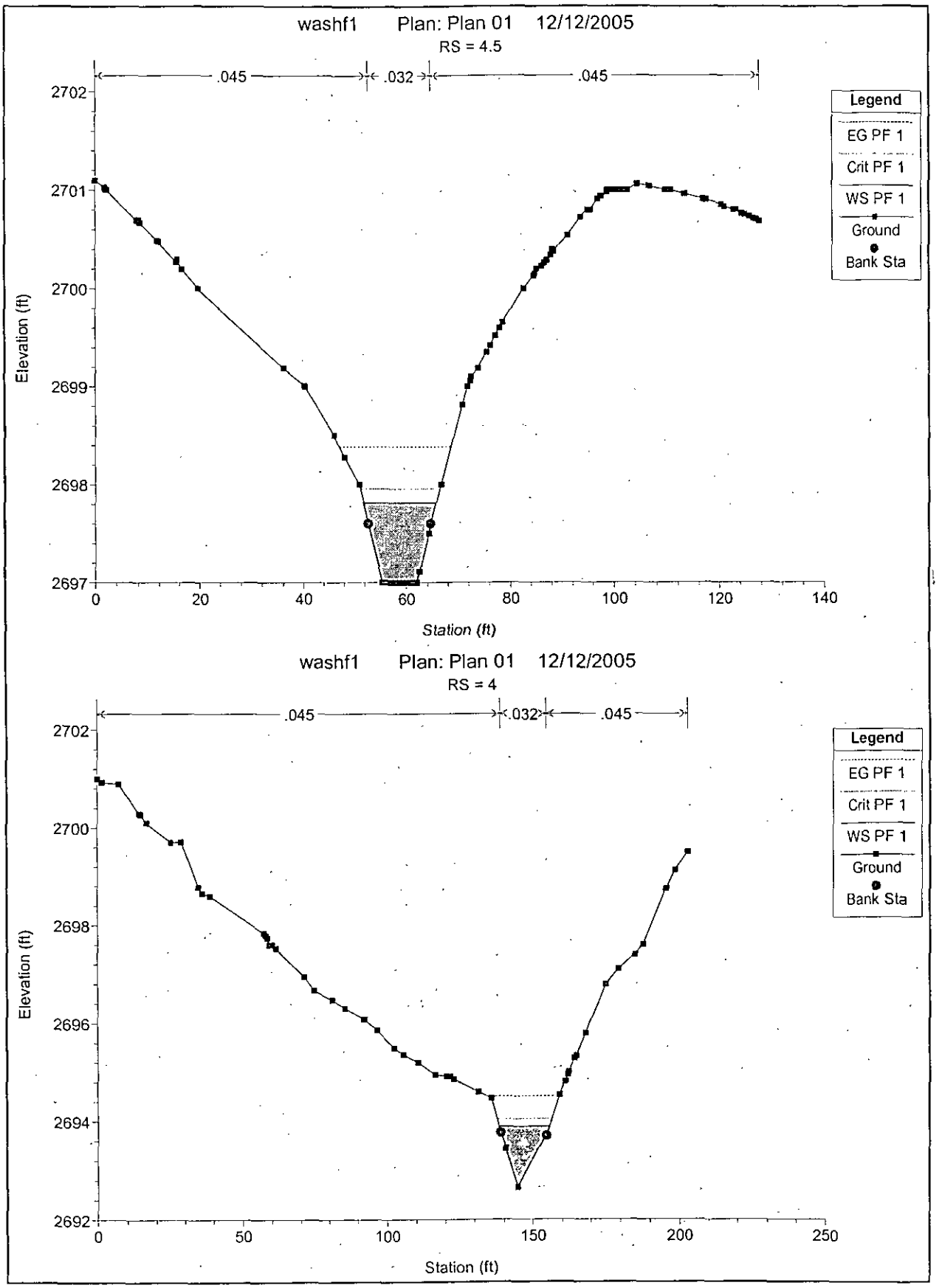
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	8	PF 1	50.00	2709.42	2710.74	2711.03	2711.38	0.025021	6.65	8.95	20.46	1.25
Reach-1	7	PF 1	50.00	2705.46	2706.81	2706.97	2707.45	0.027912	6.49	7.87	11.03	1.29
Reach-1	6	PF 1	50.00	2700.54	2701.76	2702.06	2702.68	0.039439	7.86	7.10	12.34	1.54
Reach-1	5	PF 1	50.00	2698.48	2699.81	2699.89	2700.28	0.022728	5.49	9.24	14.33	1.15
Reach-1	4.5	PF 1	50.00	2697.00	2697.81	2697.96	2698.38	0.028656	6.06	8.42	13.96	1.29
Reach-1	4	PF 1	70.00	2692.65	2693.89	2694.04	2694.51	0.030515	6.32	11.17	17.42	1.34
Reach-1	3.5	PF 1	70.00	2689.00	2690.58	2690.58	2690.99	0.011182	5.40	15.90	22.12	0.87
Reach-1	3	PF 1	70.00	2686.57	2687.76	2688.03	2688.62	0.036115	7.47	9.68	14.54	1.48
Reach-1	2	PF 1	70.00	2681.90	2683.30	2683.31	2683.60	0.016888	4.45	17.26	34.61	0.98
Reach-1	1	PF 1	87.00	2677.60	2678.75	2678.98	2679.45	0.037042	6.91	15.49	50.87	1.47

Errors Warnings and Notes for Plan : Plan 01

Location:	River: RIVER-1 Reach: Reach-1 RS: 8 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Location:	River: RIVER-1 Reach: Reach-1 RS: 7 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 6 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	selected the water surface that had the least amount of error between computed and assumed
	values.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3.5 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	used critical depth for the water surface and continued on with the calculations.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Warning:	During the standard step iterations, when the assumed water surface was set equal to critical depth,
	the calculated water surface came back below critical depth. This indicates that there is not a valid
	subcritical answer. The program defaulted to critical depth.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.


washf1 Plan: Plan 01 12/12/2005
RS = 8
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washf1 Plan: Plan 01 12/12/2005
RS = 7
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washf1 Plan: Plan 01 12/12/2005
RS = 6
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washf1 Plan: Plan 01 12/12/2005
RS = 5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washf1 Plan: Plan 01 12/12/2005
RS = 4.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washf1 Plan: Plan 01 12/12/2005
RS = 4
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.032
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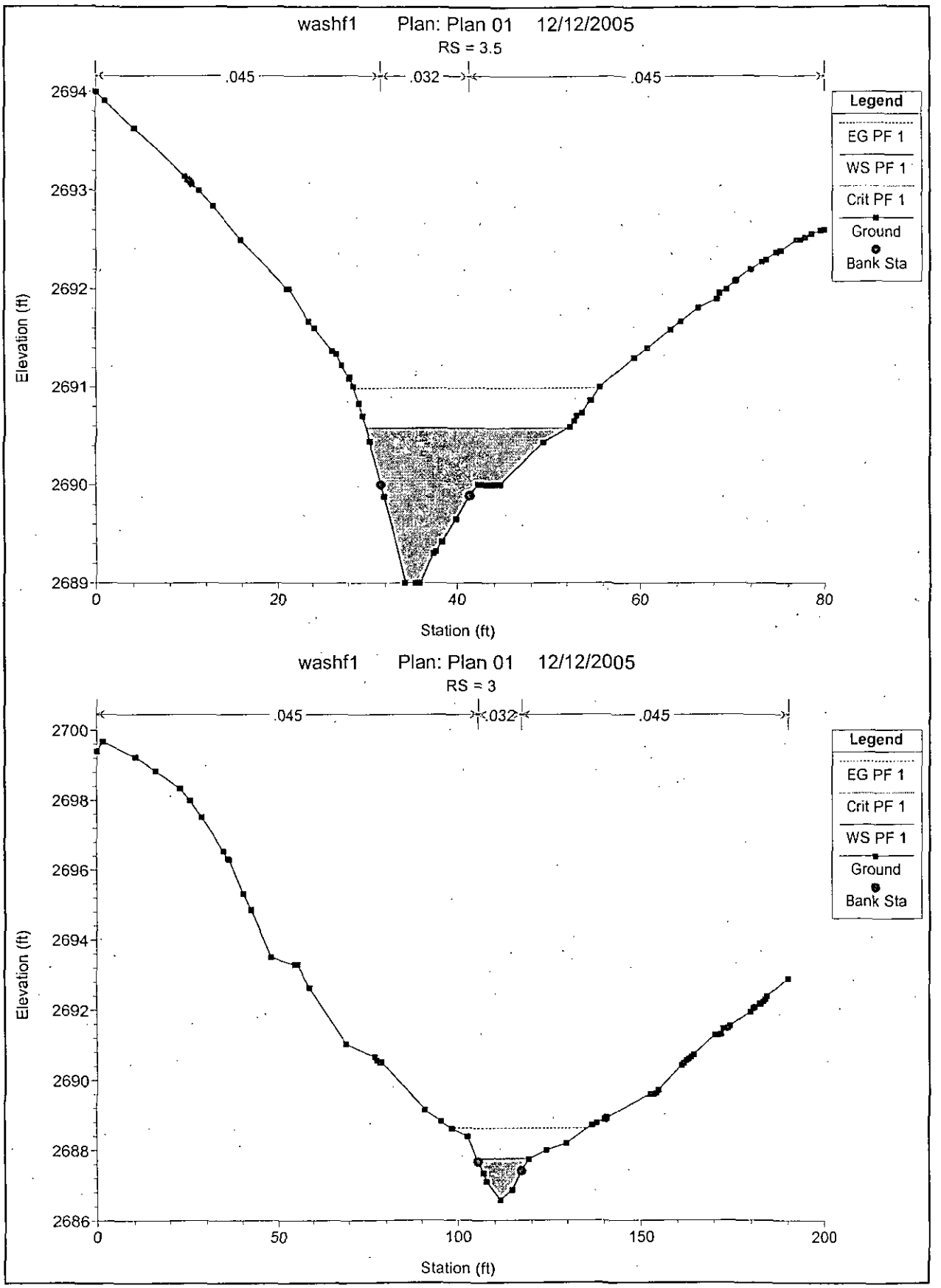
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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RS = 3.5
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washf1 Plan: Plan 01 12/12/2005
RS = 3
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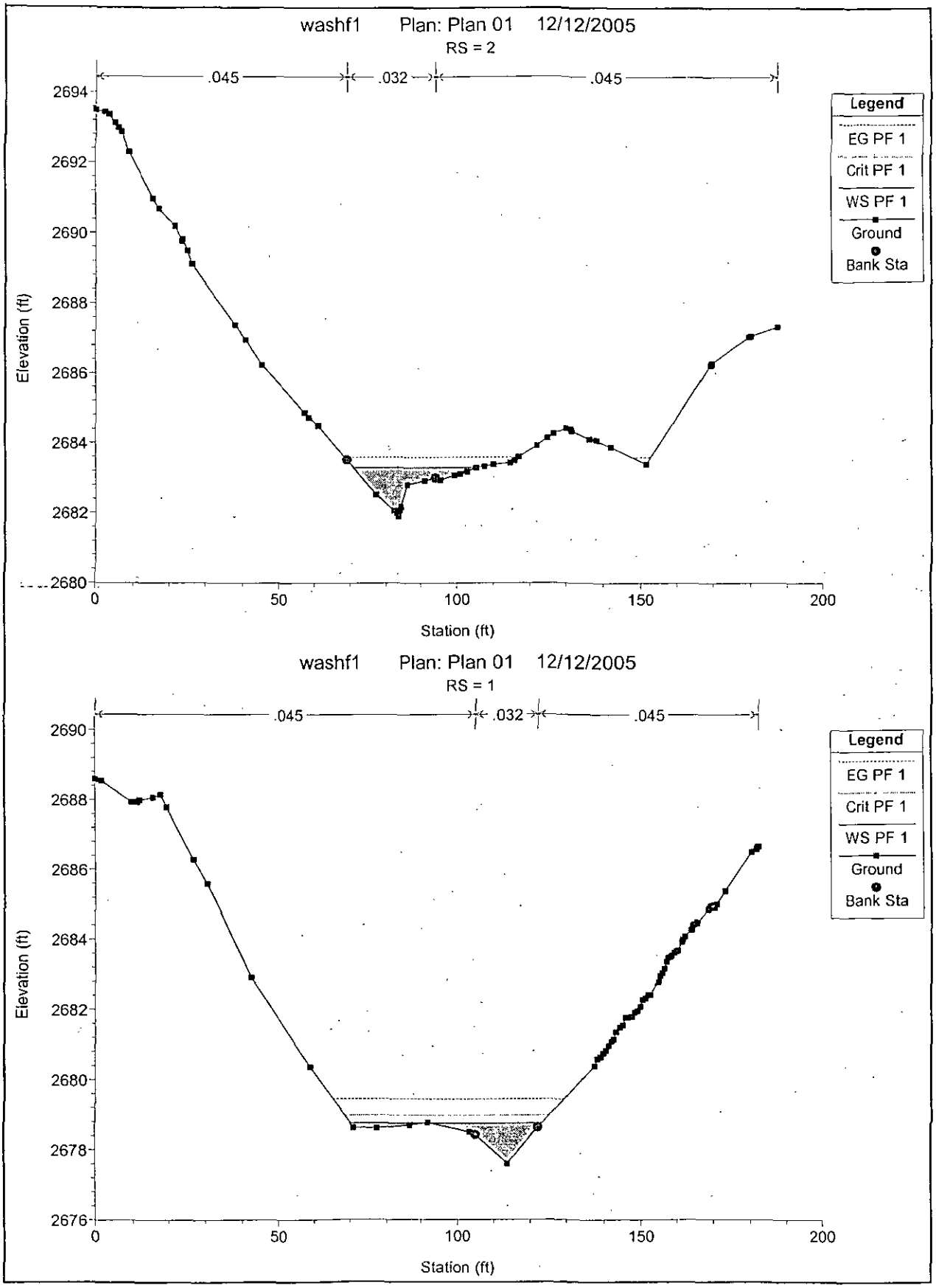
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washf1 Plan: Plan 01 12/12/2005
RS = 2
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.032
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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washf1 Plan: Plan 01 12/12/2005
RS = 1
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

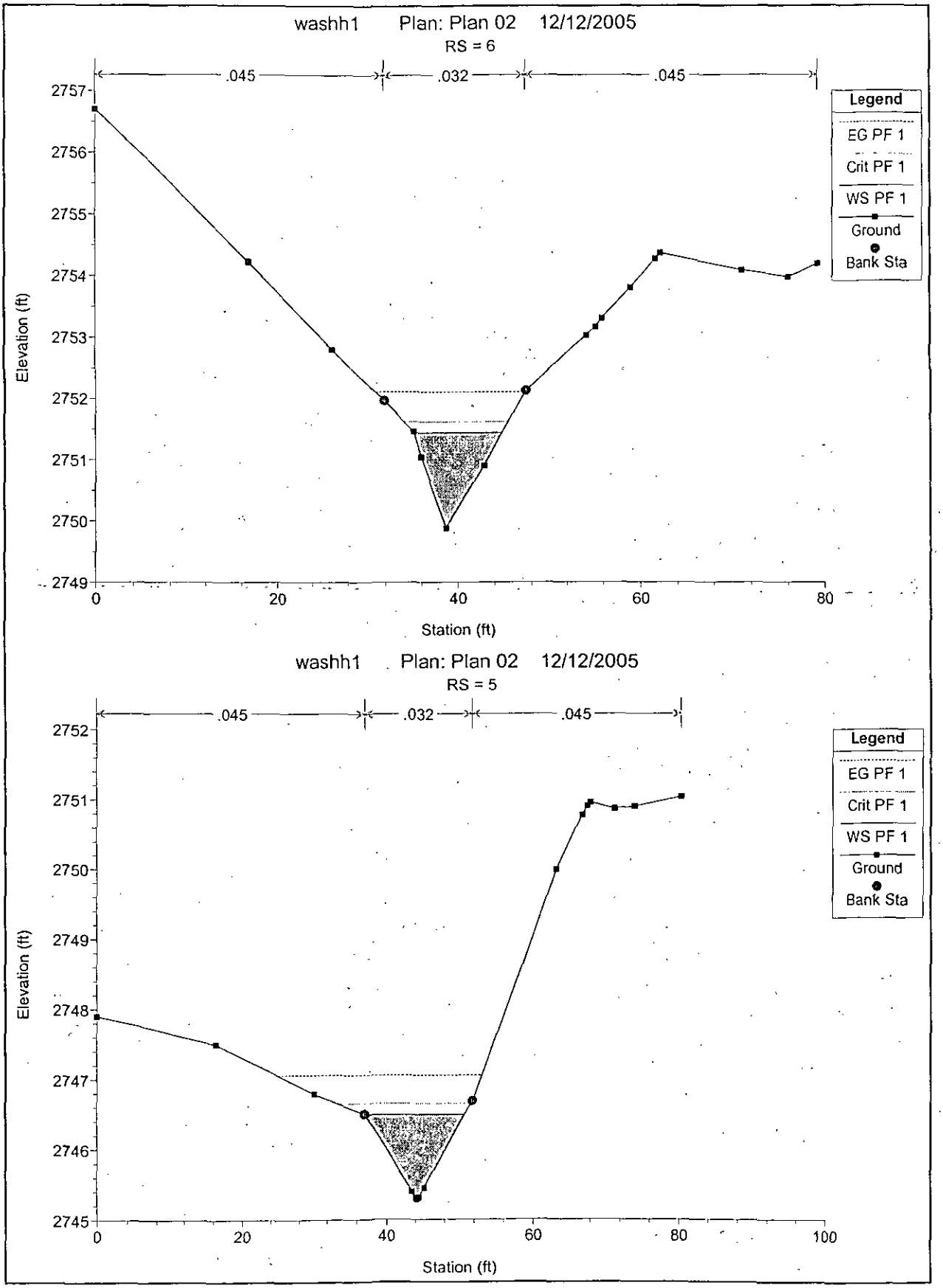
WASH H1

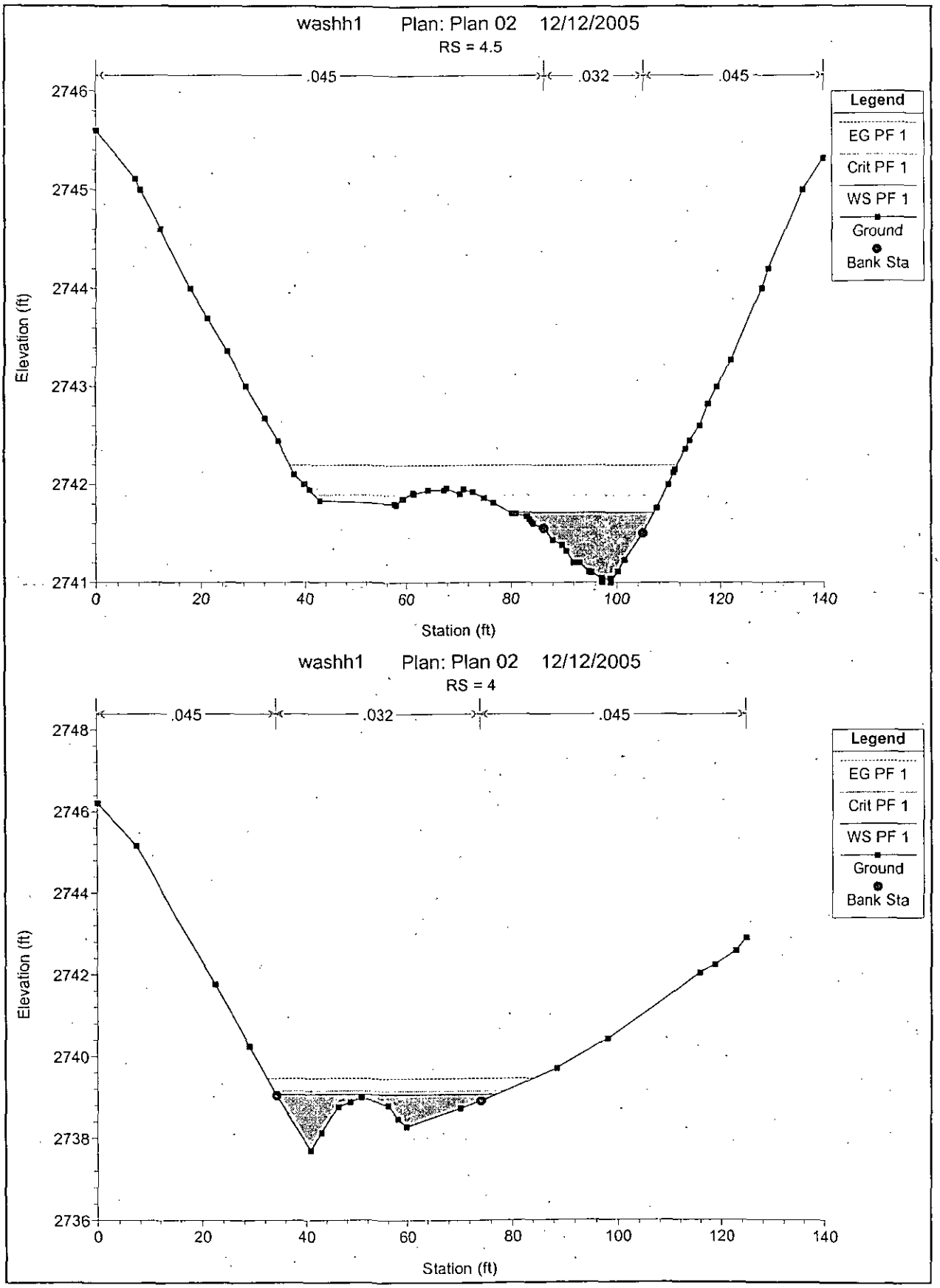
HEC-RAS Plan: Plan 02 River: RIVER-1 Reach: Reach-1 Profile: PF 1

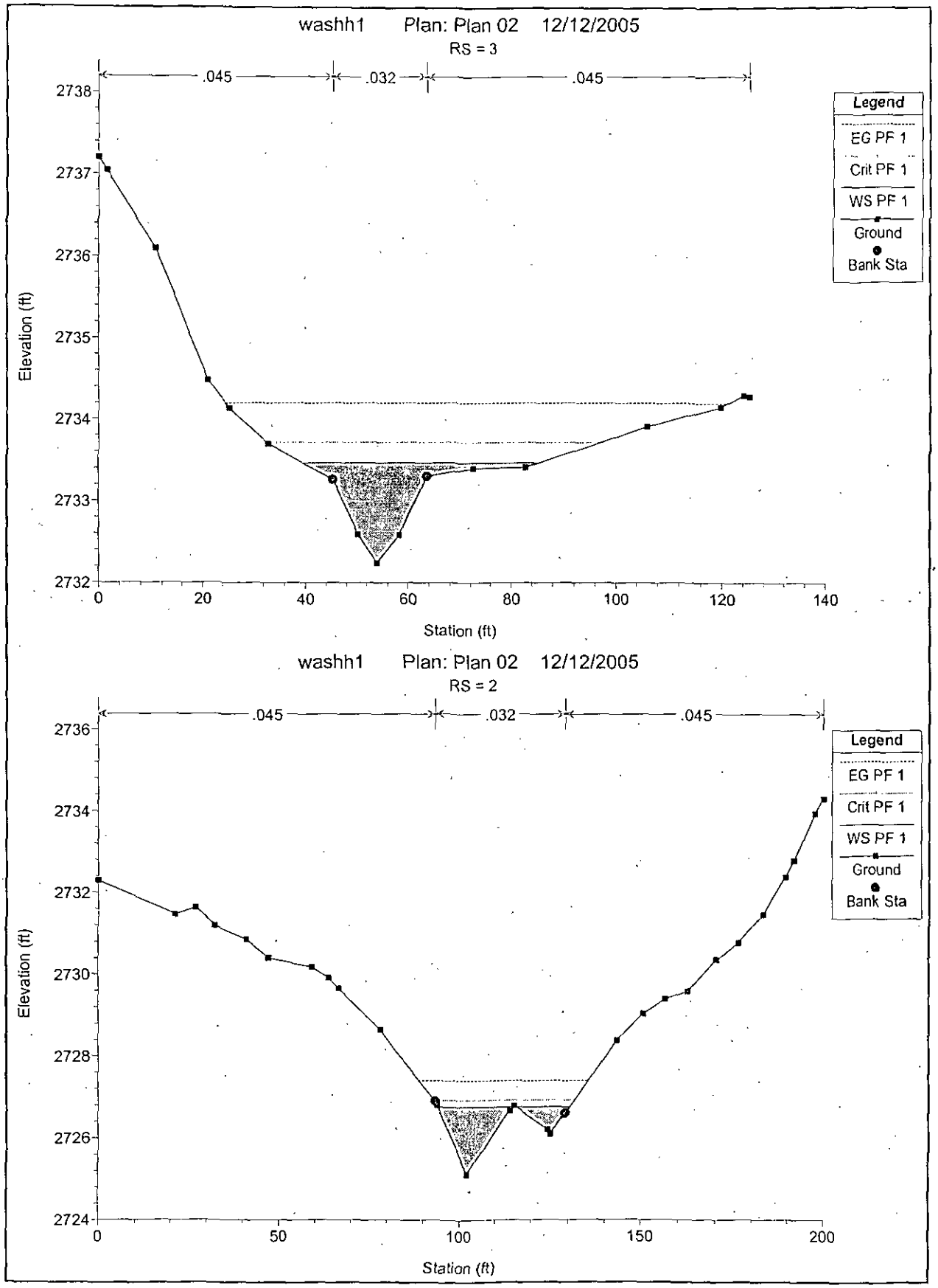
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	6	PF 1	50.00	2749.88	2751.43	2751.61	2752.10	0.028975	6.55	7.63	9.59	1.29
Reach-1	5	PF 1	50.00	2745.29	2746.49	2746.65	2747.06	0.033087	6.02	8.30	13.57	1.36
Reach-1	4.5	PF 1	50.00	2741.00	2741.71	2741.89	2742.19	0.040197	5.61	9.42	27.11	1.44
Reach-1	4	PF 1	100.00	2737.70	2739.07	2739.15	2739.46	0.029073	4.98	20.28	43.02	1.24
Reach-1	3	PF 1	100.00	2732.24	2733.47	2733.71	2734.20	0.032501	5.95	16.31	45.91	1.40
Reach-1	2	PF 1	140.00	2725.11	2726.76	2726.92	2727.40	0.036100	6.44	21.81	35.71	1.43
Reach-1	1.5	PF 1	140.00	2723.00	2724.12	2724.21	2724.61	0.017869	5.76	26.91	40.07	1.07
Reach-1	1	PF 1	140.00	2720.27	2720.72	2720.96	2721.50	0.190207	7.49	19.79	64.81	2.78

Errors Warnings and Notes for Plan : Plan 02

Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1.5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	The energy equation could not be balanced within the specified number of iterations. The program
	selected the water surface that had the least amount of error between computed and assumed
	values.
Warning:	Divided flow computed for this cross-section.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.


washh1 Plan: Plan 02 12/12/2005
RS = 6
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washh1 Plan: Plan 02 12/12/2005
RS = 5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washh1 Plan: Plan 02 12/12/2005
RS = 4.5
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washh1 Plan: Plan 02 12/12/2005
RS = 4
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washh1 Plan: Plan 02 12/12/2005
RS = 3
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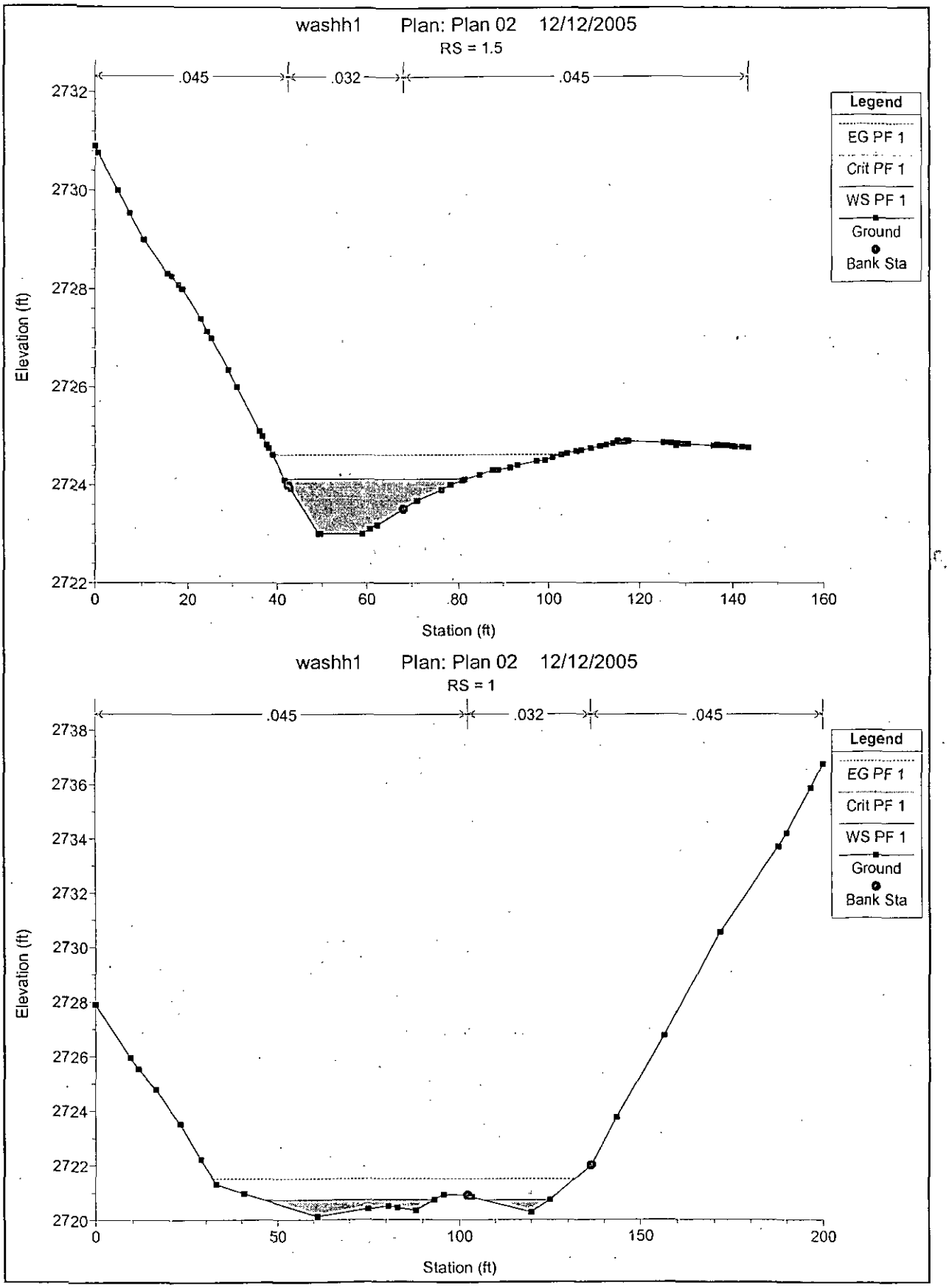
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washh1 Plan: Plan 02 12/12/2005
RS = 2
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washh1 Plan: Plan 02 12/12/2005
RS = 1.5
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.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washh1 Plan: Plan 02 12/12/2005
RS = 1
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

WASH H2

HEC-RAS Plan: Plan 02 River: RIVER-1 Reach: Reach-1 Profile: PF 1

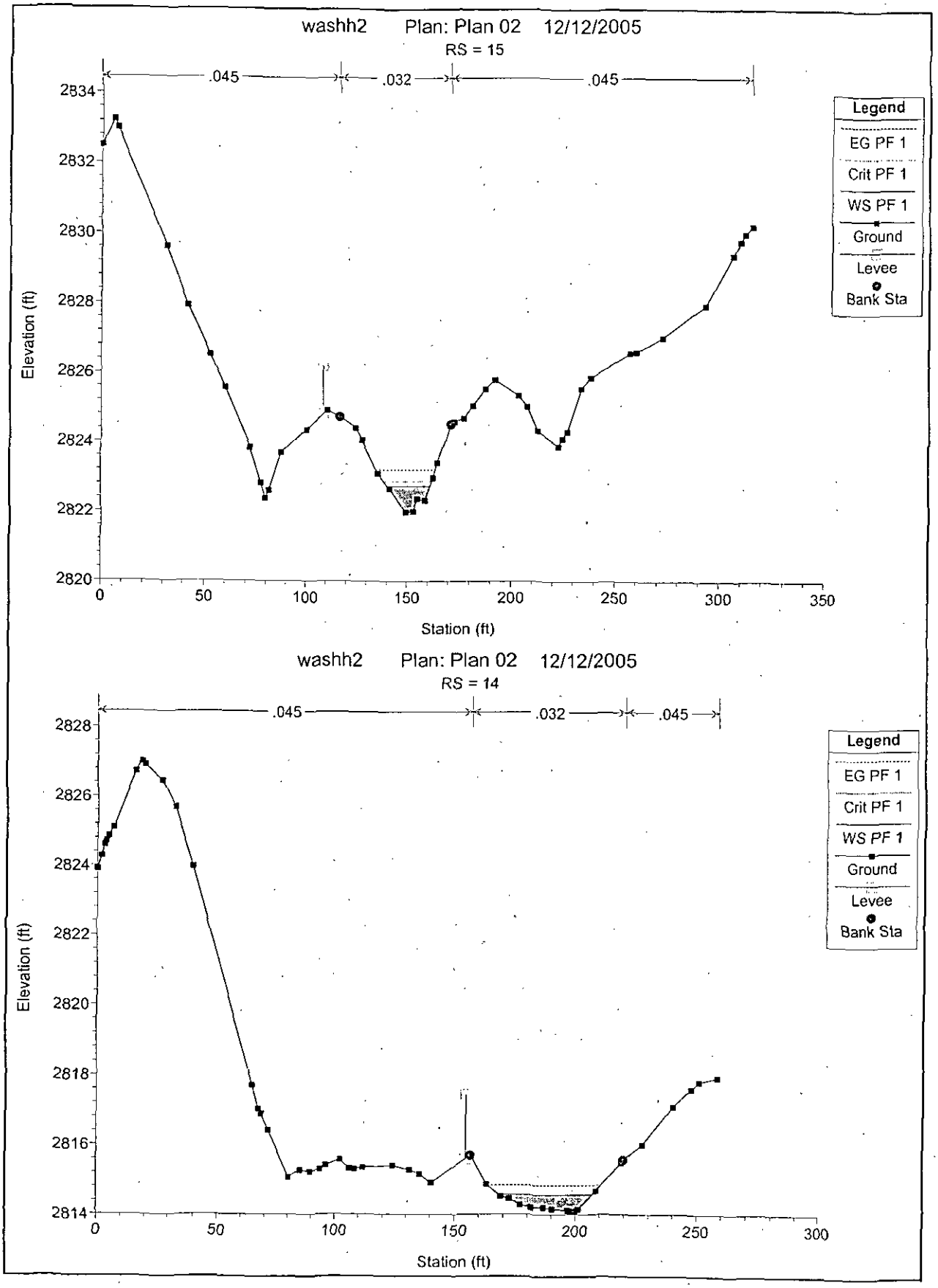
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	15	PF 1	50.00	2821.98	2822.73	2822.87	2823.20	0.043010	5.50	9.10	21.01	1.47
Reach-1	14	PF 1	50.00	2814.10	2814.57	2814.63	2814.83	0.038439	4.16	12.02	38.68	1.32
Reach-1	13	PF 1	50.00	2808.80	2809.31	2809.36	2809.54	0.036980	3.82	13.10	46.83	1.27
Reach-1	12	PF 1	50.00	2800.73	2801.22	2801.30	2801.52	0.063174	4.36	11.47	50.18	1.61
Reach-1	11.5	PF 1	50.00	2795.20	2795.75	2795.81	2796.03	0.026258	4.34	12.81	37.70	1.16
Reach-1	11	PF 1	110.00	2783.25	2784.72	2785.16	2786.12	0.060907	9.51	11.56	14.98	1.91
Reach-1	10	PF 1	110.00	2773.90	2775.20	2775.38	2775.77	0.031316	6.28	19.82	40.55	1.35
Reach-1	9	PF 1	110.00	2764.93	2766.03	2766.36	2767.06	0.053740	8.14	13.52	20.43	1.76
Reach-1	8.5	PF 1	110.00	2761.97	2762.95	2762.99	2763.16	0.009485	4.31	45.60	141.04	0.79
Reach-1	8	PF 1	110.00	2757.40	2757.99	2758.36	2760.10	0.470942	11.67	9.42	42.33	4.36
Reach-1	7	PF 1	110.00	2751.66	2752.64	2752.67	2752.98	0.016247	4.71	24.44	41.48	0.99
Reach-1	6	PF 1	110.00	2749.39	2749.94	2750.26	2751.09	0.119556	8.63	12.75	32.33	2.42
Reach-1	5	PF 1	110.00	2746.81	2747.80	2747.91	2748.30	0.028449	5.70	19.29	30.93	1.27
Reach-1	4	PF 1	110.00	2744.09	2744.94	2745.29	2746.05	0.056779	8.44	13.03	19.34	1.81
Reach-1	3	PF 1	110.00	2739.56	2740.88	2741.04	2741.47	0.031414	6.12	17.97	28.08	1.34
Reach-1	2	PF 1	155.00	2735.23	2736.17	2736.50	2737.21	0.054958	8.16	18.99	29.13	1.78
Reach-1	1	PF 1	155.00	2731.01	2731.60	2731.77	2732.21	0.046564	6.25	24.80	49.97	1.56

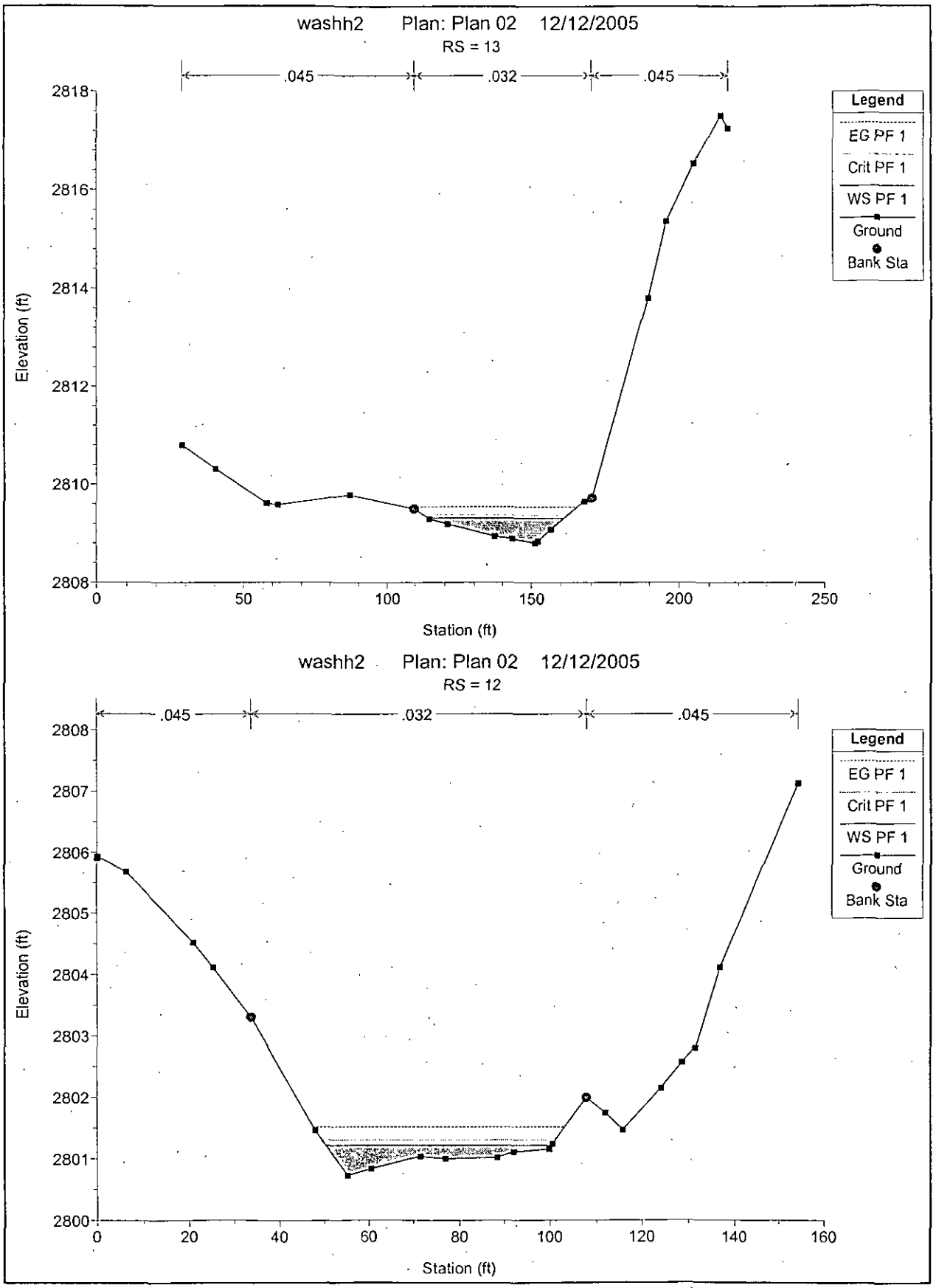
Errors Warnings and Notes for Plan : Plan 02

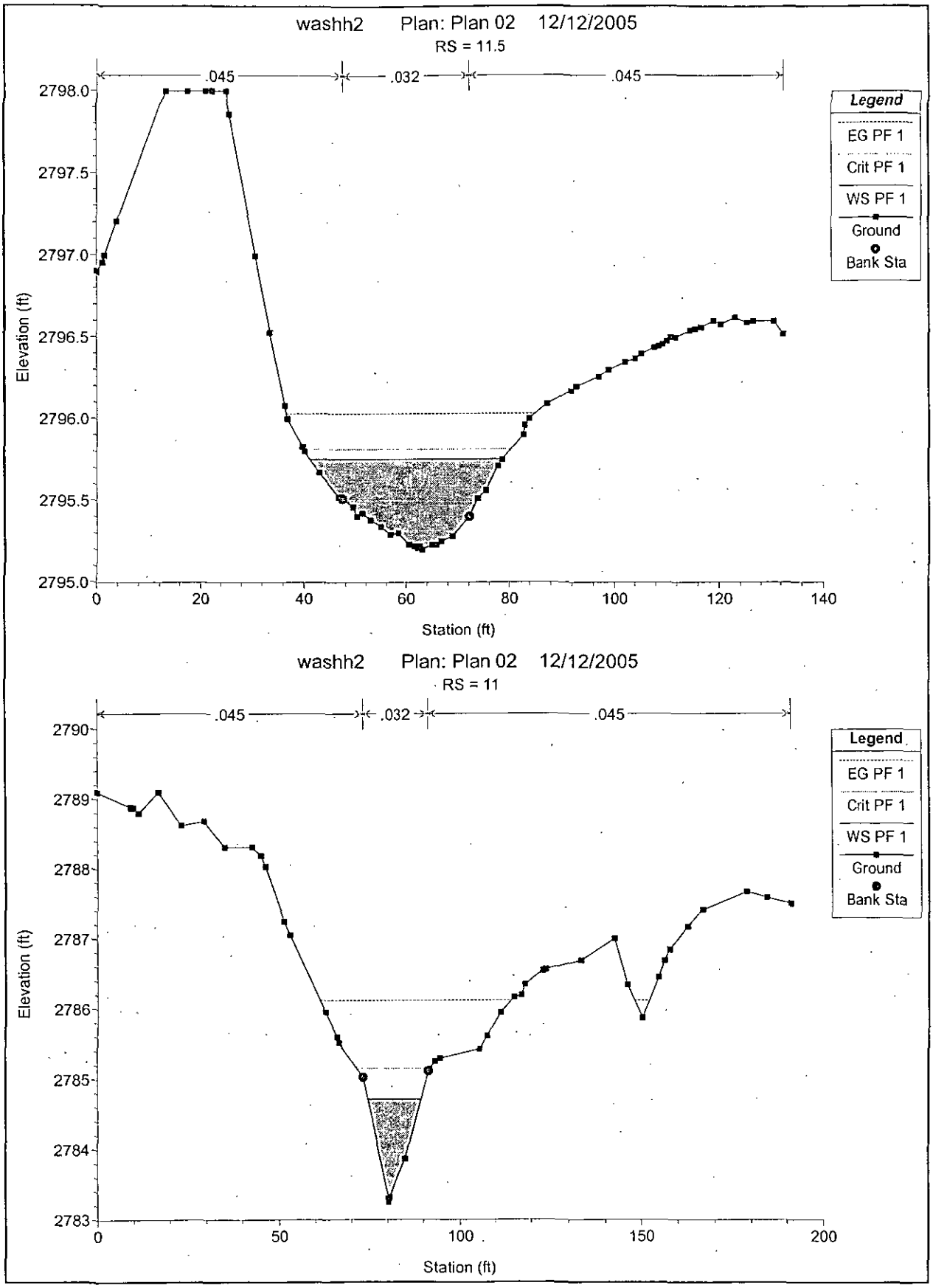
Location:	River: RIVER-1 Reach: Reach-1 RS: 15 Profile: PF 1
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, water
	surface was used.
Location:	River: RIVER-1 Reach: Reach-1 RS: 14 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, water
	surface was used.
Location:	River: RIVER-1 Reach: Reach-1 RS: 13 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 12 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 11.5 Profile: PF 1
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 11 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 10 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, water
	surface was used.
Location:	River: RIVER-1 Reach: Reach-1 RS: 9 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 8.5 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 8 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, water
	surface was used.

Errors Warnings and Notes for Plan : Plan 02 (Continued)

Location:	River: RIVER-1 Reach: Reach-1 RS: 7 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, water
	surface was used.
Location:	River: RIVER-1 Reach: Reach-1 RS: 6 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.


washh2 Plan: Plan 02 12/12/2005
RS = 15
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
washh2 Plan: Plan 02 12/12/2005
RS = 14
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


washh2 Plan: Plan 02 12/12/2005
RS = 13
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washh2 Plan: Plan 02 12/12/2005
RS = 12
.045
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washh2 Plan: Plan 02 12/12/2005
RS = 11.5
.045
.032
.045
2798.0
2797.5
2797.0
2796.5
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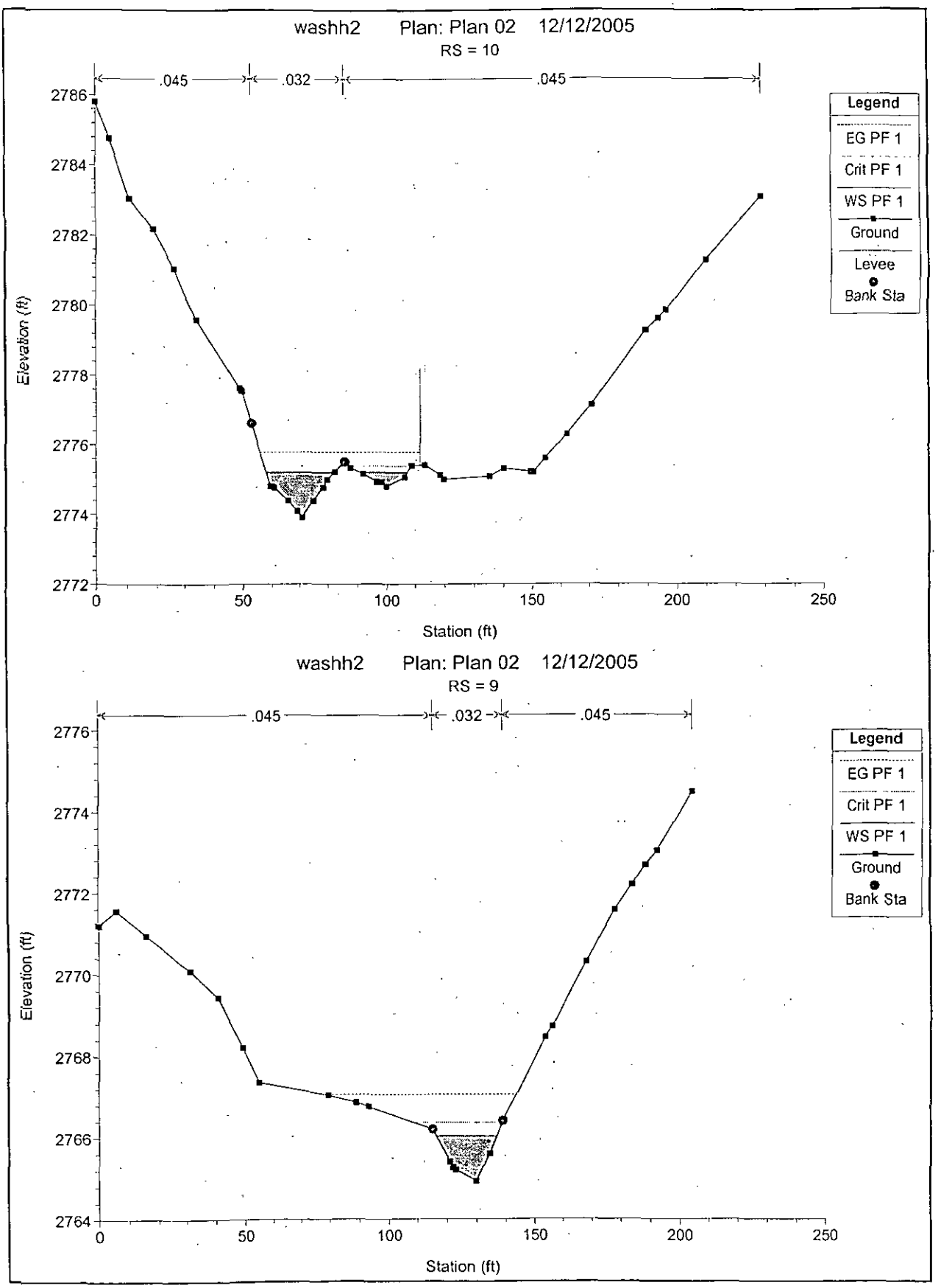
2795.5
2795.0
Elevation (ft)
0
20
40
60
80
100
120
140
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
washh2 Plan: Plan 02 12/12/2005
RS = 11
.045
.032
.045
2790
2789
2788
2787
2786
2785
2784
2783
Elevation (ft)
0
50
100
150
200
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta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Legend
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Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
washh2 Plan: Plan 02 12/12/2005
RS = 9
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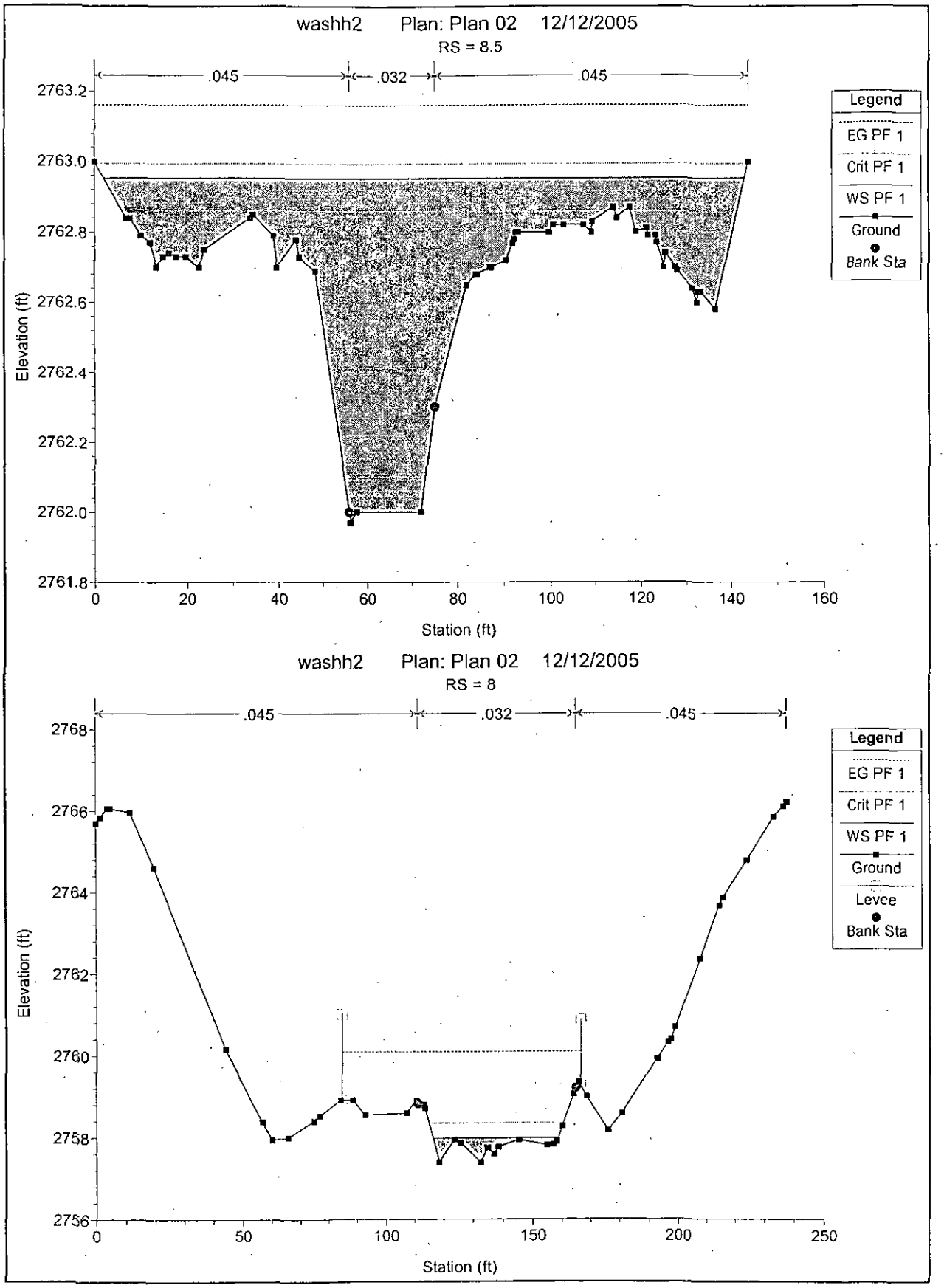
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


washh2 Plan: Plan 02 12/12/2005
RS = 8.5
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.032
.045
2763.2
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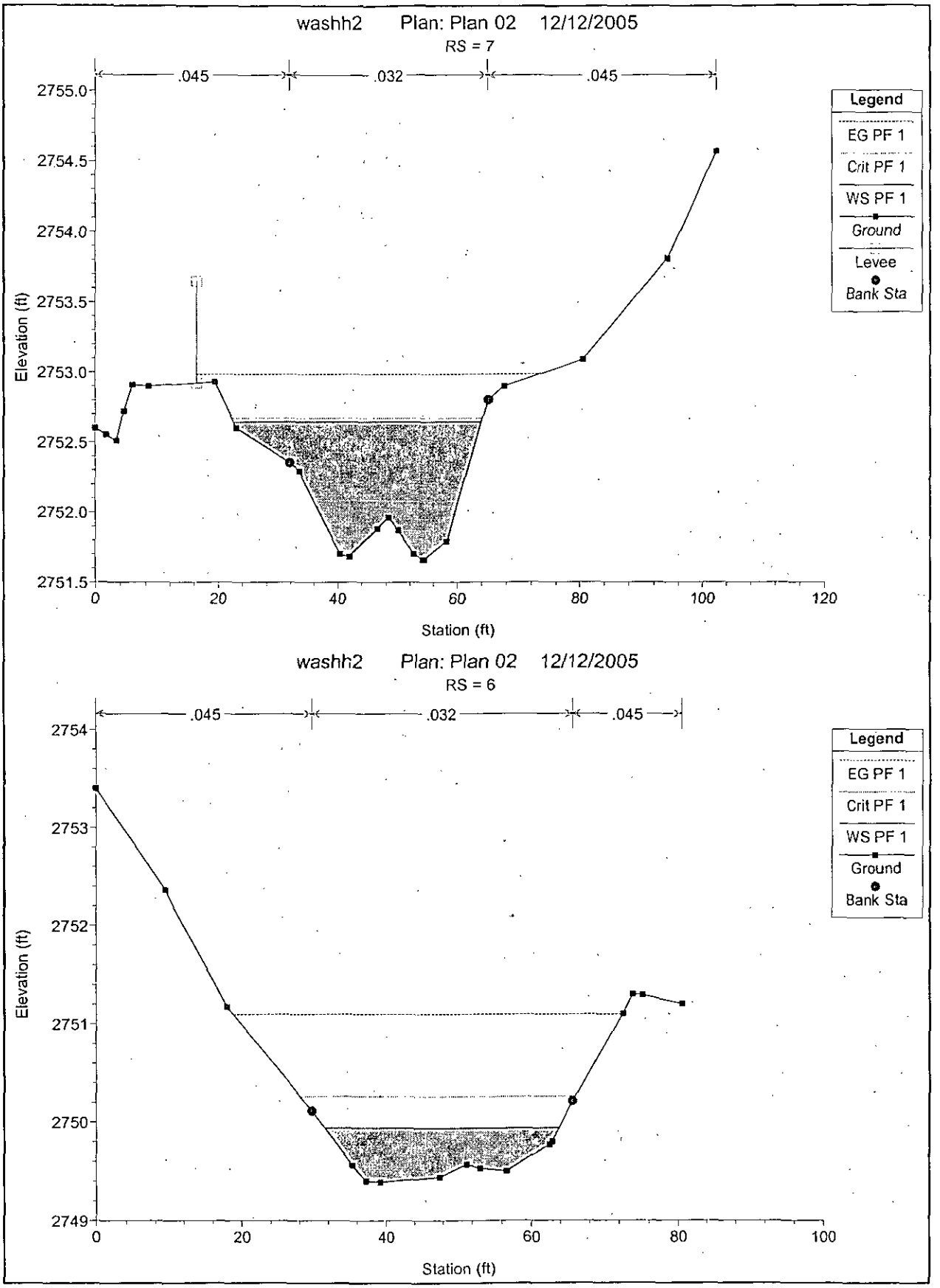
2762.8
2762.6
2762.4
2762.2
2762.0
2761.8
Elevation (ft)
0
20
40
60
80
100
120
140
160
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
washh2 Plan: Plan 02 12/12/2005
RS = 8
.045
.032
.045
2768
2766
2764
2762
2760
2758
2756
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta


washh2 Plan: Plan 02 12/12/2005
RS = 7
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.032
.045
2755.0
2754.5
2754.0
2753.5
2753.0
2752.5
2752.0
2751.5
Elevation (ft)
0
20
40
60
80
100
120
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Levee
Bank Sta
washh2 Plan: Plan 02 12/12/2005
RS = 6
.045
.032
.045
2754
2753
2752
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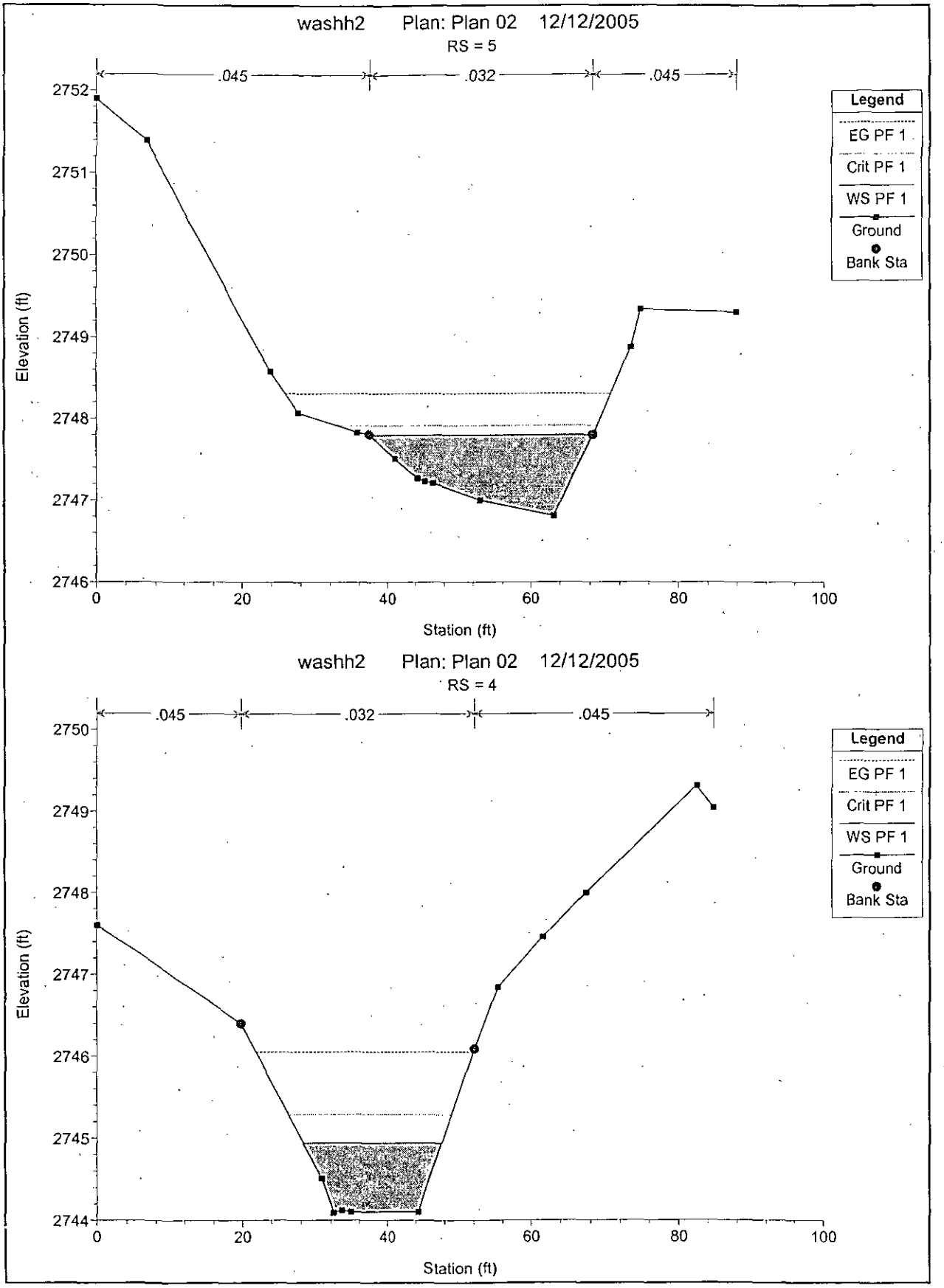
Bank Sta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WS PF 1
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Bank Sta
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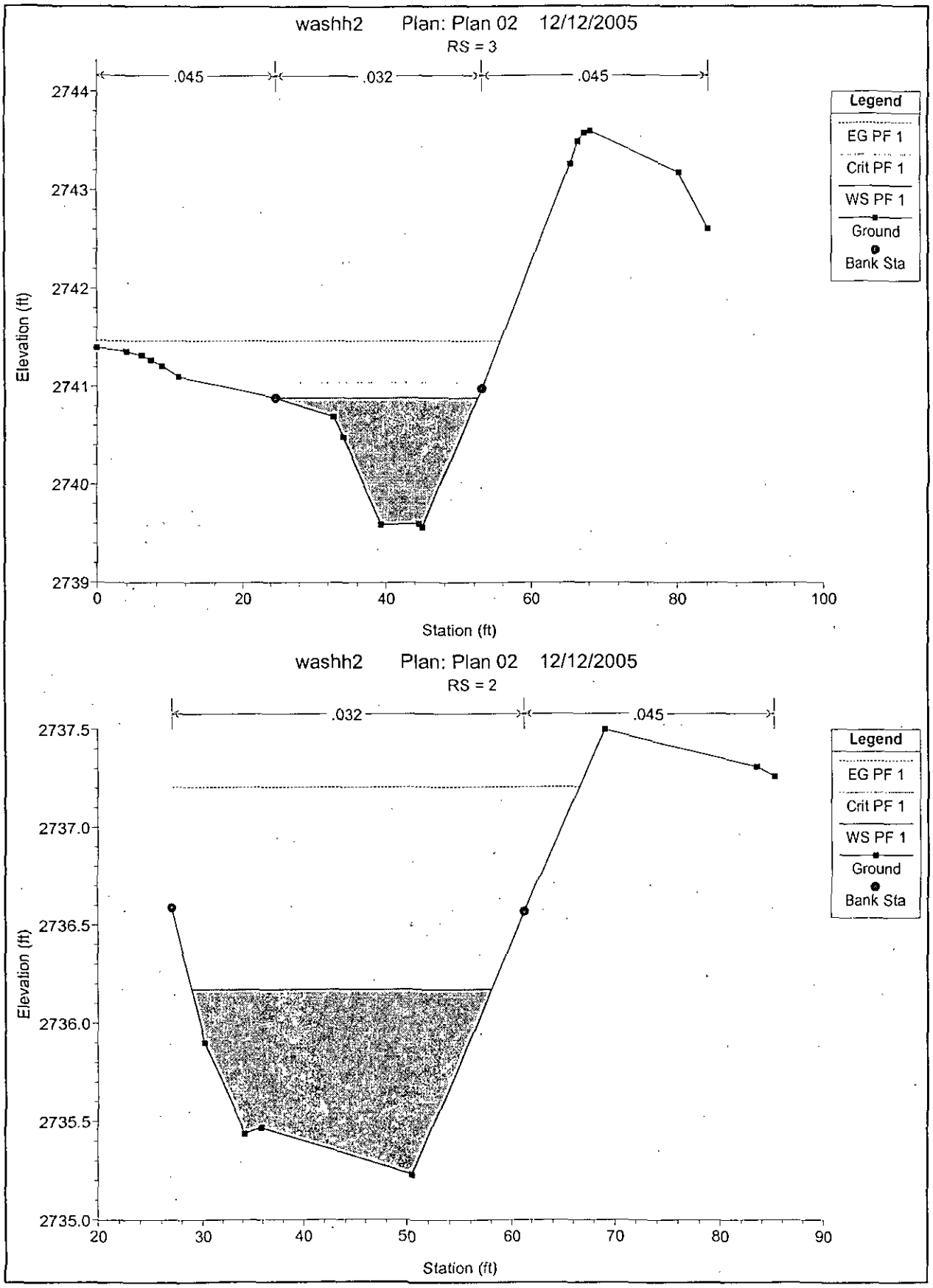
Ground
Bank Sta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WS PF 1
Ground
Bank Sta
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Station (ft)
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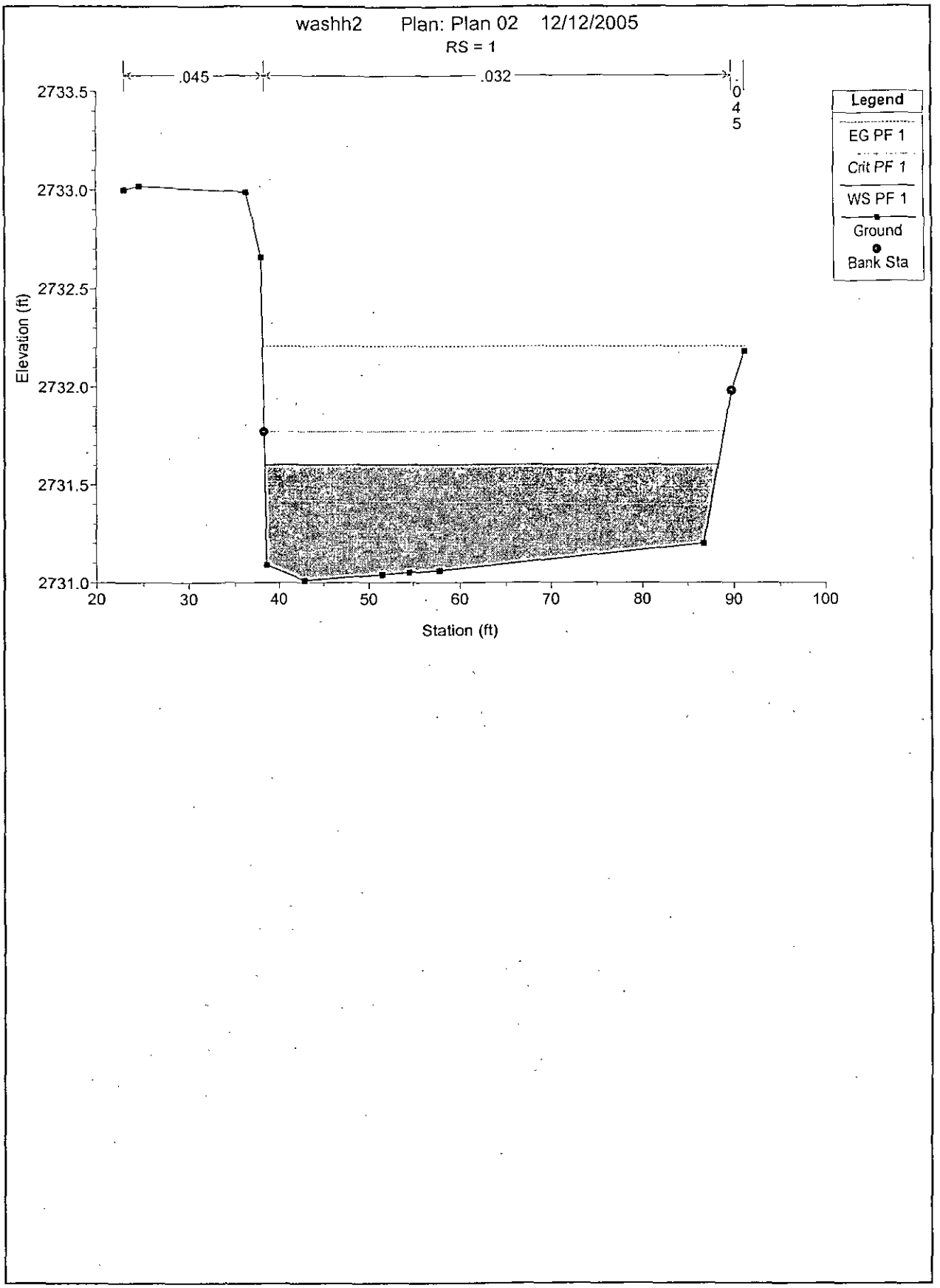
Crit PF 1
WS PF 1
Ground
Bank Sta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70
80
90
100
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

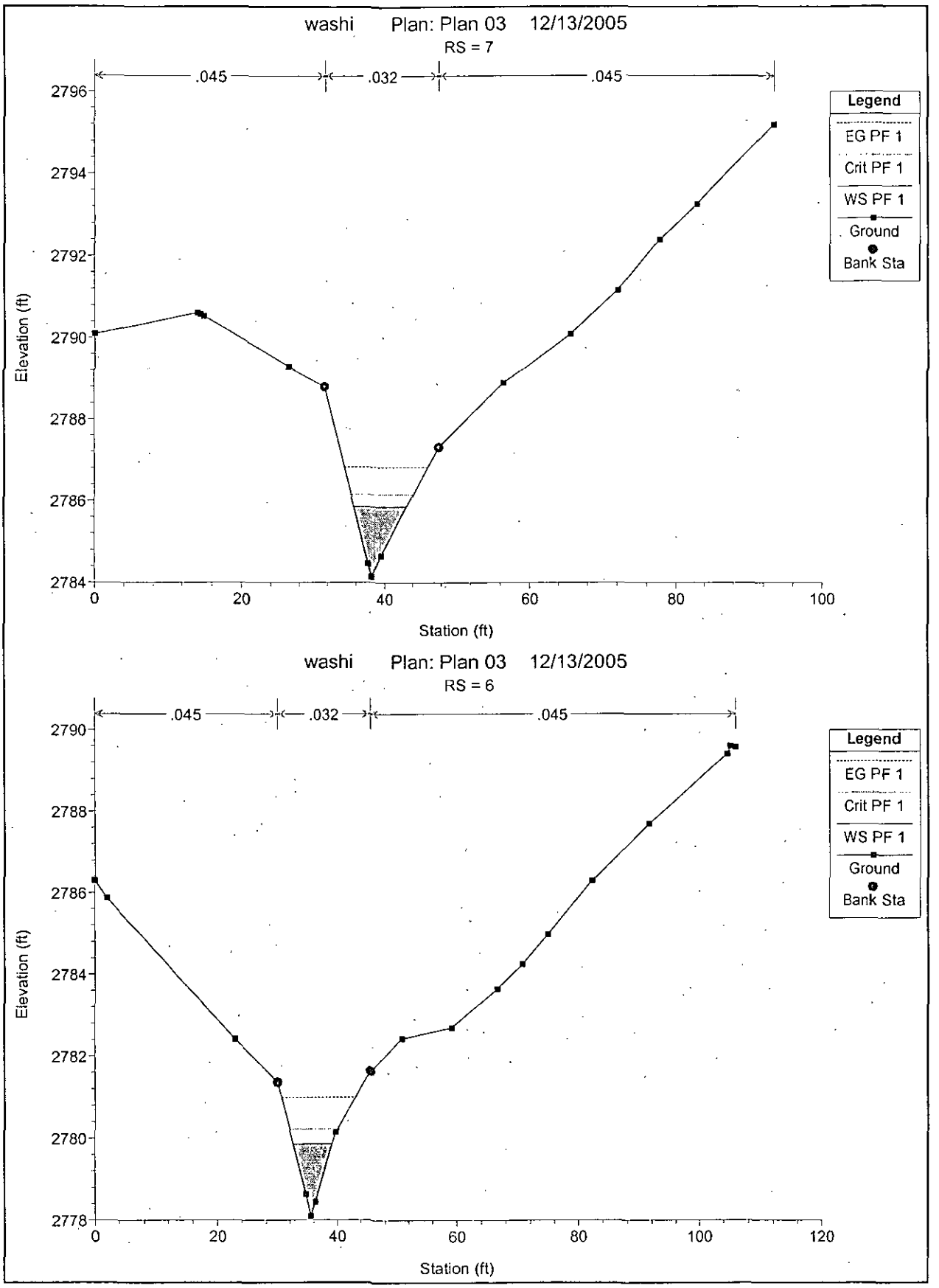
WASH I

HEC-RAS Plan: Plan 03 River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	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
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	7	PF 1	50.00	2784.14	2785.86	2786.15	2786.82	0.041077	7.86	6.36	7.51	1.50
Reach-1	6	PF 1	50.00	2778.10	2779.85	2780.22	2780.99	0.047685	8.57	5.84	6.64	1.61
Reach-1	5	PF 1	50.00	2772.66	2773.89	2774.14	2774.70	0.043982	7.22	6.92	10.54	1.57
Reach-1	4	PF 1	50.00	2768.37	2769.92	2770.18	2770.77	0.038173	7.42	6.74	8.58	1.47
Reach-1	3	PF 1	65.00	2764.31	2765.87	2766.22	2766.90	0.043829	8.14	7.99	9.95	1.60
Reach-1	2	PF 1	65.00	2760.53	2762.04	2762.47	2763.16	0.053335	8.49	7.66	10.43	1.75
Reach-1	1.5	PF 1	65.00	2757.88	2758.45	2758.55	2758.76	0.054721	4.64	15.30	60.02	1.55
Reach-1	1	PF 1	79.00	2754.90	2755.91	2756.06	2756.37	0.031284	5.78	16.24	37.92	1.32

Errors Warnings and Notes for Plan : Plan 03

Location:	River: RIVER-1 Reach: Reach-1 RS: 6 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 5 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 4 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 3 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 2 Profile: PF 1
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1.5 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for
	additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.
Location:	River: RIVER-1 Reach: Reach-1 RS: 1 Profile: PF 1
Warning:	Divided flow computed for this cross-section.
Warning:	The cross-section end points had to be extended vertically for the computed water surface.
Warning:	The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7
	or greater than 1.4. This may indicate the need for additional cross sections.
Warning:	The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
	This may indicate the need for additional cross sections.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80
100
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
washi Plan: Plan 03 12/13/2005
RS = 6
.045
.032
.045
2790
2788
2786
2784
2782
2780
2778
Elevation (ft)
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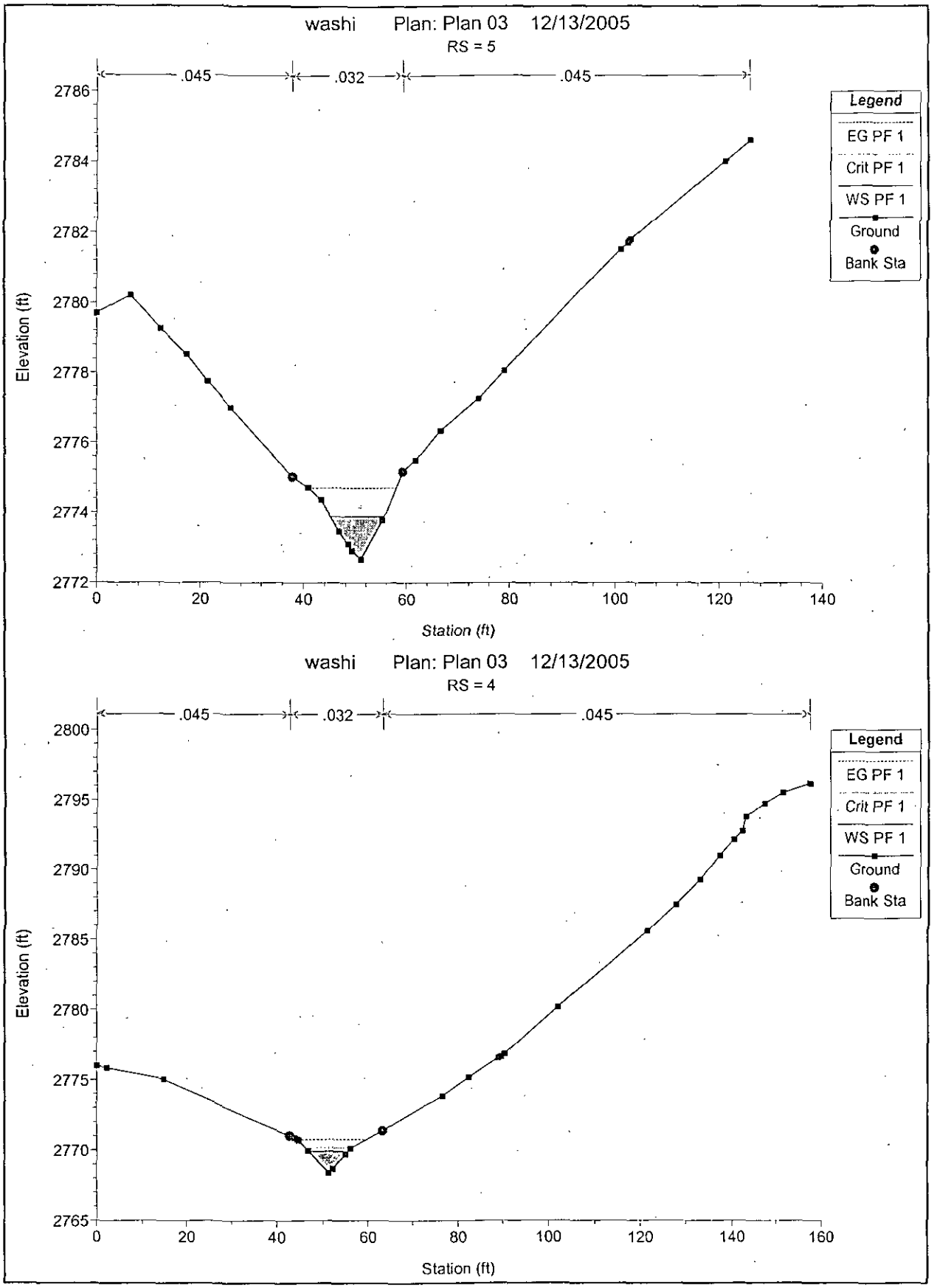
40
60
80
100
120
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta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Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
washi Plan: Plan 03 12/13/2005
RS = 4
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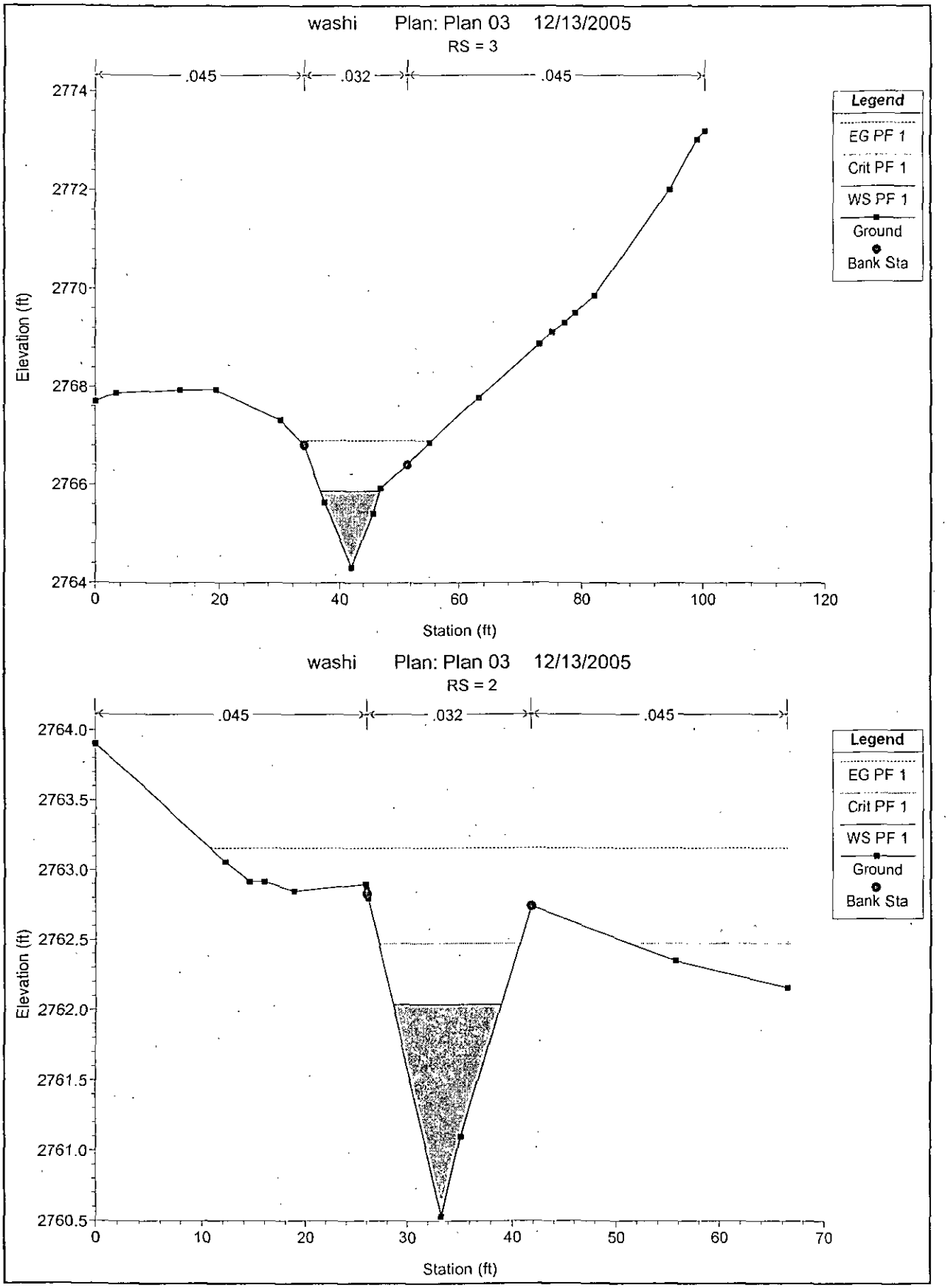
.032
.045
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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2772
2770
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2766
2764
Elevation (ft)
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20
40
60
80
100
120
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
washi Plan: Plan 03 12/13/2005
RS = 2
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.032
.045
2764.0
2763.5
2763.0
2762.5
2762.0
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2761.0
2760.5
Elevation (ft)
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30
40
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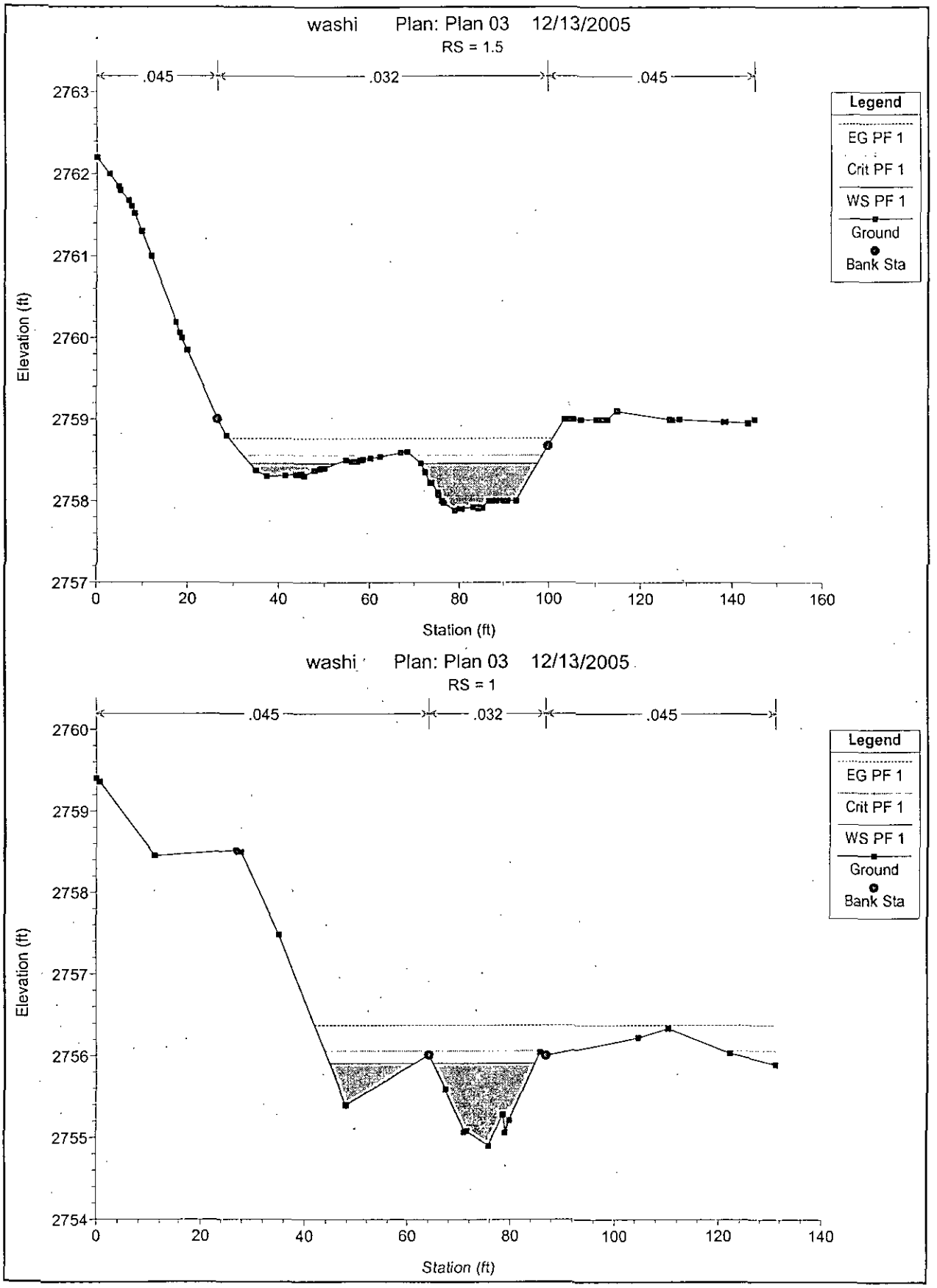
60
70
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta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2758
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Elevation (ft)
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20
40
60
80
100
120
140
160
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
washi Plan: Plan 03 12/13/2005
RS = 1
.045
.032
.045
2760
2759
2758
2757
2756
2755
2754
Elevation (ft)
0
20
40
60
80
100
120
140
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta

APPENDIX E

Detention Basin Volume Calculations

Sereno Canyon

Online Detention Volume Calculations

PROVIDED VOLUME ESTIMATE

BASIN - A1-1

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2772	1604	0.037	0.000	0.000
2773	2151	0.049	0.043	0.043
2774	2763	0.063	0.056	0.100
2775	3441	0.079	0.071	0.171

TOTAL PROVIDED VOLUME: **0.171** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - A1-2

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2756	4199	0.096	0.000	0.000
2757	5251	0.121	0.108	0.108
2758	6404	0.147	0.134	0.242
2759	7655	0.176	0.161	0.404

TOTAL PROVIDED VOLUME: **0.404** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - A2-1

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2758	323	0.007	0.000	0.000
2759	625	0.014	0.011	0.011
2760	1109	0.025	0.020	0.031
2761	1768	0.041	0.033	0.064

TOTAL PROVIDED VOLUME: **0.064** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - A2-2

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2758	47	0.001	0.000	0.000
2759	187	0.004	0.003	0.003
2760	430	0.010	0.007	0.010
2761	950	0.022	0.016	0.026

TOTAL PROVIDED VOLUME: **0.026** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - A2-3

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2733	2653	0.061	0.000	0.000
2734	3460	0.079	0.070	0.070
2735	4363	0.100	0.090	0.160
2736	5357	0.123	0.112	0.272
2737	6431	0.148	0.135	0.407

3.0' depth

TOTAL PROVIDED VOLUME: **0.407** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - B-1

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2798	809	0.019	0.000	0.000
2799	1241	0.028	0.024	0.024
2800	1804	0.041	0.035	0.058
2801	2456	0.056	0.049	0.107

TOTAL PROVIDED VOLUME: **0.107** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - B-2

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2798	2378	0.055	0.000	0.000
2799	3095	0.071	0.063	0.063
2800	3952	0.091	0.081	0.144
2801	4986	0.114	0.103	0.246

TOTAL PROVIDED VOLUME: **0.246** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - B-3

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2781	3419	0.078	0.000	0.000
2782	4333	0.099	0.089	0.089
2783	5371	0.123	0.111	0.200
2784	6633	0.152	0.138	0.338

TOTAL PROVIDED VOLUME: **0.338** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - B-4

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2768	2154	0.049	0.000	0.000
2769	2950	0.069	0.059	0.059
2770	3950	0.091	0.080	0.139
2771	4983	0.114	0.103	0.241

TOTAL PROVIDED VOLUME: **0.241** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - B-5

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2746	9320	0.191	0.000	0.000
2747	9979	0.229	0.210	0.210
2748	11724	0.269	0.249	0.459
2749	13573	0.312	0.290	0.750

TOTAL PROVIDED VOLUME: **0.750** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
A1	A1-1	0.0790	0.171		
	A1-2	0.1757	0.404		
	TOTAL	0.2547	0.574	0.53	0.044

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
A2	A2-1	0.0406	0.064		
	A2-2	0.0218	0.026		
	A2-3	0.1476	0.407		
	A2-4	0.0376	0.0504		
	A2-5	0.1274	0.2743		
	A2-6	0.1104	0.2304		
	TOTAL	0.4855	1.051	1.02	0.031

PROVIDED VOLUME ESTIMATE

BASIN - A2-4

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2792	168	0.004	0.000	0.000
2793	425	0.010	0.007	0.007
2794	866	0.020	0.015	0.022
2795	1638	0.038	0.029	0.050

TOTAL PROVIDED VOLUME: **0.050** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - A2-5

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2772	2611	0.060	0.000	0.000
2773	3485	0.080	0.070	0.070
2774	4402	0.101	0.090	0.160
2775	5549	0.127	0.114	0.274

TOTAL PROVIDED VOLUME: **0.274** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - A2-6

STAGE	AREA [ft²]	AREA [acres]	VOLUME INC [acre-feet]	VOLUME CUM [acre-feet]
2772	2085	0.048	0.000	0.000
2773	2843	0.065	0.057	0.057
2774	3745	0.086	0.076	0.132
2775	4811	0.110	0.098	0.230

TOTAL PROVIDED VOLUME: **0.230** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
B	B-1	0.0564	0.107		
	B-2	0.1145	0.246		
	B-3	0.1523	0.338		
	B-4	0.1144	0.241		
	B-5	0.3116	0.750		
	TOTAL	0.7491	1.683	1.54	0.143

PROVIDED VOLUME ESTIMATE

BASIN - C-1

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2779	4199	0.096	0.000	0.000
2780	5112	0.117	0.107	0.107
2781	6102	0.140	0.129	0.236
2782	7169	0.165	0.152	0.388

TOTAL PROVIDED VOLUME: **0.388** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
C	C-1	0.1646	0.388		
	C-2	0.1121	0.225		
	TOTAL	0.2767	0.613	0.51	0.103

PROVIDED VOLUME ESTIMATE

BASIN - C-2

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2754	1955	0.045	0.000	0.000
2755	2712	0.062	0.054	0.054
2756	3657	0.084	0.073	0.127
2757	4885	0.112	0.098	0.225

TOTAL PROVIDED VOLUME: **0.225** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - D-1

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2749	2054	0.047	0.000	0.000
2750	2819	0.065	0.056	0.056
2751	3699	0.085	0.075	0.131
2752	4712	0.108	0.097	0.227

TOTAL PROVIDED VOLUME: **0.227** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
D	D-1	0.1082	0.227		
	D-2	0.1594	0.364		
	D-3	0.2176	0.500		
	TOTAL	0.4852	1.091	1.09	0.001

PROVIDED VOLUME ESTIMATE

BASIN - D-2

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2724	3734	0.086	0.000	0.000
2725	4728	0.109	0.097	0.097
2726	5799	0.133	0.121	0.218
2727	6943	0.159	0.146	0.364

TOTAL PROVIDED VOLUME: **0.364** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - D-3

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2736	5188	0.119	0.000	0.000
2737	6505	0.149	0.134	0.134
2738	7928	0.182	0.166	0.300
2739	9480	0.218	0.200	0.500

TOTAL PROVIDED VOLUME: **0.500** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - E1-1

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2724	5286	0.121	0.000	0.000
2725	6163	0.141	0.131	0.131
2726	7100	0.163	0.152	0.284
2727	8095	0.186	0.174	0.458

TOTAL PROVIDED VOLUME: **0.458** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
E1	E1-1	0.1858	0.458		
	E1-2	0.2705	0.648		
	E1-3	0.2350	0.532		
	E1-4	0.1654	0.391		
	TOTAL	0.8567	2.029	2.01	0.019

PROVIDED VOLUME ESTIMATE

BASIN - E1-2

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2716	7154	0.164	0.000	0.000
2717	8605	0.198	0.181	0.181
2718	10153	0.233	0.215	0.396
2719	11781	0.270	0.252	0.648

TOTAL PROVIDED VOLUME: **0.648** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - E1-3

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2695	5080	0.117	0.000	0.000
2696	6952	0.160	0.138	0.138
2697	8543	0.196	0.178	0.316
2698	10236	0.235	0.216	0.532

TOTAL PROVIDED VOLUME: **0.532** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - E1-4

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2689	4285	0.098	0.000	0.000
2690	5165	0.119	0.108	0.108
2691	6138	0.141	0.130	0.238
2692	7207	0.165	0.153	0.391

TOTAL PROVIDED VOLUME: **0.391** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - E2-1

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2710	4399	0.101	0.000	0.000
2711	5399	0.124	0.112	0.112
2712	6476	0.149	0.136	0.249
2713	7667	0.176	0.162	0.411
2714	9046	0.208	0.192	0.603

4.0' depth

TOTAL PROVIDED VOLUME: **0.603** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
E2	E2-1	0.2077	0.603		
	E2-2	0.3069	0.919		
	E2-3	0.1862	0.407		
	TOTAL	0.7007	1.929	1.87	0.059

PROVIDED VOLUME ESTIMATE

BASIN - E2-2

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2694	6967	0.160	0.000	0.000
2695	8344	0.192	0.176	0.176
2696	9919	0.228	0.210	0.385
2697	11588	0.266	0.247	0.632
2698	13368	0.307	0.286	0.919

4.0' depth

TOTAL PROVIDED VOLUME: **0.919** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - E2-3

STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2682	3978	0.091	0.000	0.000
2683	5153	0.118	0.105	0.105
2684	6529	0.150	0.134	0.239
2685	8110	0.186	0.168	0.407

TOTAL PROVIDED VOLUME: **0.407** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - E3-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2711	3064	0.070	0.000	0.000
2712	4065	0.093	0.082	0.082
2713	5197	0.119	0.106	0.188
2714	6456	0.148	0.134	0.322

TOTAL PROVIDED VOLUME: **0.322** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
E3	E3-1	0.1482	0.322		
	TOTAL	0.1482	0.322	0.31	0.012

PROVIDED VOLUME ESTIMATE

BASIN - F1-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2726	4563	0.105	0.000	0.000
2727	5553	0.127	0.116	0.116
2728	6670	0.153	0.140	0.256
2729	7918	0.182	0.167	0.424

TOTAL PROVIDED VOLUME: **0.424** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
F1	F1-1	0.1818	0.424		
	F1-2	0.1987	0.462		
	F1-3	0.2059	0.483		
	F1-4	0.1128	0.227		
	TOTAL	0.6992	1.596	1.44	0.156

PROVIDED VOLUME ESTIMATE

BASIN - F1-2				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2710	4891	0.112	0.000	0.000
2711	6044	0.139	0.126	0.126
2712	7298	0.168	0.153	0.279
2713	8656	0.199	0.183	0.462

TOTAL PROVIDED VOLUME: **0.462** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - F1-3				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2696	5180	0.119	0.000	0.000
2697	6353	0.146	0.132	0.132
2698	7624	0.175	0.160	0.293
2699	8969	0.206	0.190	0.483

TOTAL PROVIDED VOLUME: **0.483** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - F1-4				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2686	1919	0.044	0.000	0.000
2687	2757	0.063	0.054	0.054
2688	3733	0.086	0.074	0.128
2689	4913	0.113	0.099	0.227

TOTAL PROVIDED VOLUME: **0.227** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - F2-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2701	1923	0.044	0.000	0.000
2702	2906	0.067	0.055	0.055
2703	3987	0.092	0.079	0.135
2704	5172	0.119	0.105	0.240

TOTAL PROVIDED VOLUME: **0.240** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
F2	F2-1	0.1187	0.240		
	F2-2	0.1329	0.254		
	F2-3	0.0462	0.075		
	TOTAL	0.2978	0.568	0.5	0.068

PROVIDED VOLUME ESTIMATE

BASIN - F2-2				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2682	1841	0.042	0.000	0.000
2683	2963	0.068	0.055	0.055
2684	4269	0.098	0.083	0.138
2685	5789	0.133	0.115	0.254

TOTAL PROVIDED VOLUME: **0.254** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - F2-3				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2692	353	0.008	0.000	0.000
2693	770	0.018	0.013	0.013
2694	1302	0.030	0.024	0.037
2695	2011	0.046	0.038	0.075

TOTAL PROVIDED VOLUME: **0.075** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - F3-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2724	178	0.004	0.000	0.000
2725	410	0.009	0.007	0.007
2726	746	0.017	0.013	0.020
2727	1279	0.029	0.023	0.043

TOTAL PROVIDED VOLUME: **0.043** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
F3	F3-1	0.0294	0.043		
	F3-2	0.1565	0.378		
	TOTAL	0.1858	0.421	0.41	0.011

PROVIDED VOLUME ESTIMATE

BASIN - F3-2				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2706	1932	0.044	0.000	0.000
2707	2855	0.066	0.055	0.055
2708	3941	0.090	0.078	0.133
2709	5286	0.121	0.106	0.239
2710	6815	0.156	0.139	0.378

4.0' depth

TOTAL PROVIDED VOLUME: **0.378** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - G-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2723	6168	0.142	0.000	0.000
2724	7712	0.177	0.159	0.159
2725	9387	0.215	0.196	0.356
2726	11197	0.257	0.236	0.592

TOTAL PROVIDED VOLUME: **0.592** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
G	G-1	0.2570	0.592		
	TOTAL	0.2570	0.592	0.52	0.072

PROVIDED VOLUME ESTIMATE

BASIN - H1-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2770	524	0.012	0.000	0.000
2771	1010	0.023	0.018	0.018
2772	1621	0.037	0.030	0.048
2773	2383	0.055	0.046	0.094

TOTAL PROVIDED VOLUME: **0.094** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
H1	H1-1	0.0547	0.094		
	H1-2	0.0307	0.044		
	H1-3	0.1655	0.474		
	H1-4	0.2362	0.5850		
	H1-5	0.2956	0.7467		
	TOTAL	0.7827	1.943	1.82	0.123

PROVIDED VOLUME ESTIMATE

BASIN - H1-2				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2766	179	0.004	0.000	0.000
2767	418	0.010	0.007	0.007
2768	757	0.017	0.013	0.020
2769	1339	0.031	0.024	0.044

TOTAL PROVIDED VOLUME: **0.044** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - H1-4				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2735	6797	0.156	0.000	0.000
2736	7887	0.181	0.169	0.169
2737	9051	0.208	0.194	0.363
2738	10290	0.236	0.222	0.585

TOTAL PROVIDED VOLUME: **0.585** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - H1-3				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2736	3296	0.076	0.000	0.000
2737	4159	0.095	0.086	0.086
2738	5099	0.117	0.106	0.192
2739	6118	0.140	0.129	0.321
2740	7208	0.165	0.153	0.474

4.0 depth

TOTAL PROVIDED VOLUME: **0.474** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - H1-5				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2727	8891	0.204	0.000	0.000
2728	10158	0.233	0.219	0.219
2729	11486	0.264	0.248	0.467
2730	12876	0.296	0.280	0.747

TOTAL PROVIDED VOLUME: **0.747** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - H2-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2772	6928	0.159	0.000	0.000
2773	8286	0.190	0.175	0.175
2774	9774	0.224	0.207	0.382
2775	11346	0.260	0.242	0.624

TOTAL PROVIDED VOLUME: **0.624** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
H2	H2-1	0.2605	0.624		
	H2-2	0.2463	0.590		
	TOTAL	0.5068	1.215	1.2	0.015

PROVIDED VOLUME ESTIMATE

BASIN - H2-2				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2785	6526	0.150	0.000	0.000
2786	7846	0.180	0.165	0.165
2787	9247	0.212	0.196	0.361
2788	10730	0.246	0.229	0.590

TOTAL PROVIDED VOLUME: **0.590** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - I-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2755	7532	0.173	0.000	0.000
2756	8664	0.199	0.186	0.186
2757	9863	0.226	0.213	0.399
2758	11132	0.256	0.241	0.640

TOTAL PROVIDED VOLUME: **0.640** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
I	I-1	0.2556	0.640		
	TOTAL	0.2556	0.640	0.63	0.010

PROVIDED VOLUME ESTIMATE

BASIN - J-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2769	3832	0.088	0.000	0.000
2770	4689	0.108	0.098	0.098
2771	5667	0.130	0.119	0.217
2772	6755	0.155	0.143	0.359
2773	7983	0.183	0.169	0.528

4.0 depth

TOTAL PROVIDED VOLUME: **0.528** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
J	J-1	0.1833	0.528		
	J-2	0.0881	0.187		
	TOTAL	0.2713	0.715	0.68	0.035

PROVIDED VOLUME ESTIMATE

BASIN - J-2				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2762	1719	0.039	0.000	0.000
2763	2323	0.053	0.046	0.046
2764	3026	0.069	0.061	0.108
2765	3836	0.088	0.079	0.187

TOTAL PROVIDED VOLUME: **0.187** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - K-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2737	4211	0.097	0.000	0.000
2738	5026	0.115	0.106	0.106
2739	5909	0.136	0.126	0.232
2740	6860	0.157	0.147	0.378

TOTAL PROVIDED VOLUME: **0.378** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
K	K-1	0.1575	0.378		
	TOTAL	0.1575	0.378	0.29	0.088

PROVIDED VOLUME ESTIMATE

BASIN - L1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2744	1366	0.031	0.000	0.000
2745	1889	0.043	0.037	0.037

1.0 depth

TOTAL PROVIDED VOLUME: **0.037** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - L2				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2722	1003	0.023	0.000	0.000
2723	2030	0.047	0.035	0.035
2724	3288	0.075	0.061	0.096
2725	4723	0.108	0.092	0.188

TOTAL PROVIDED VOLUME: **0.188** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
L	L-1	0.0434	0.037		
	L-2	0.1084	0.188		
	TOTAL	0.1518	0.225	0.21	0.015

PROVIDED VOLUME ESTIMATE

BASIN - M-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2721	2543	0.058	0.000	0.000
2722	3462	0.079	0.069	0.069
2723	4509	0.104	0.091	0.160
2724	5737	0.132	0.118	0.278

TOTAL PROVIDED VOLUME: **0.278** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
M	M-1	0.1317	0.278		
	TOTAL	0.1317	0.278	0.2	0.078

PROVIDED VOLUME ESTIMATE

BASIN - N-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2691	4188	0.096	0.000	0.000
2692	5407	0.124	0.110	0.110
2693	6760	0.155	0.140	0.250
2694	8217	0.189	0.172	0.422

TOTAL PROVIDED VOLUME: **0.422** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
N	N-1	0.1886	0.422		
	TOTAL	0.1886	0.422	0.4	0.022

PROVIDED VOLUME ESTIMATE

BASIN - O-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2676	817	0.019	0.000	0.000
2677	1226	0.028	0.023	0.023

1.0' depth

TOTAL PROVIDED VOLUME: **0.023** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
O	O-1	0.0281	0.023		
	TOTAL	0.0281	0.023	0.01	0.013

PROVIDED VOLUME ESTIMATE

BASIN - P-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2721	3682	0.085	0.000	0.000
2722	4568	0.105	0.095	0.095

1.0' depth

TOTAL PROVIDED VOLUME: **0.095** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
P	P-1	0.1049	0.095		
	TOTAL	0.1049	0.095	0.08	0.015

PROVIDED VOLUME ESTIMATE

BASIN - Q-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2764	2082	0.048	0.000	0.000
2765	2732	0.063	0.055	0.055

1.0' depth

TOTAL PROVIDED VOLUME: **0.055** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
Q	Q-1	0.0627	0.055		
	Q-2	0.0647	0.056		
	Q-3	0.1693	0.156		
	TOTAL	0.2967	0.268	0.24	0.028

PROVIDED VOLUME ESTIMATE

BASIN - Q-2				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2749	2063	0.047	0.000	0.000
2750	2818	0.065	0.056	0.056

1.0' depth

TOTAL PROVIDED VOLUME: **0.056** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - Q-3				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2744	6240	0.143	0.000	0.000
2745	7374	0.169	0.156	0.156

1.0' depth

TOTAL PROVIDED VOLUME: **0.156** acre-feet

PROVIDED VOLUME ESTIMATE

BASIN - R-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2774	2722	0.062	0.000	0.000
2775	3568	0.082	0.072	0.072

1.0' depth

TOTAL PROVIDED VOLUME: **0.072** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
R	R-1	0.0819	0.072		
	TOTAL	0.0819	0.072	0.07	0.002

PROVIDED VOLUME ESTIMATE

BASIN - S-1				
STAGE	AREA		VOLUME	
	[ft²]	[acres]	INC [acre-feet]	CUM [acre-feet]
2775	2030	0.047	0.000	0.000
2776	2639	0.061	0.054	0.054

1.0' depth

TOTAL PROVIDED VOLUME: **0.054** acre-feet

VOLUME BREAKDOWN

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
S	S-1	0.0606	0.054		
	TOTAL	0.0606	0.054	0.02	0.034

Retention Volume Calculations: Sereno Canyon

Disturbance Calculations:

Site Gross Area:
14,388,631.5541 Sq. Ft.
330.3175 Ac.

Basin Disturbance:
8.4149 Ac.

Disturbance:
2.55%

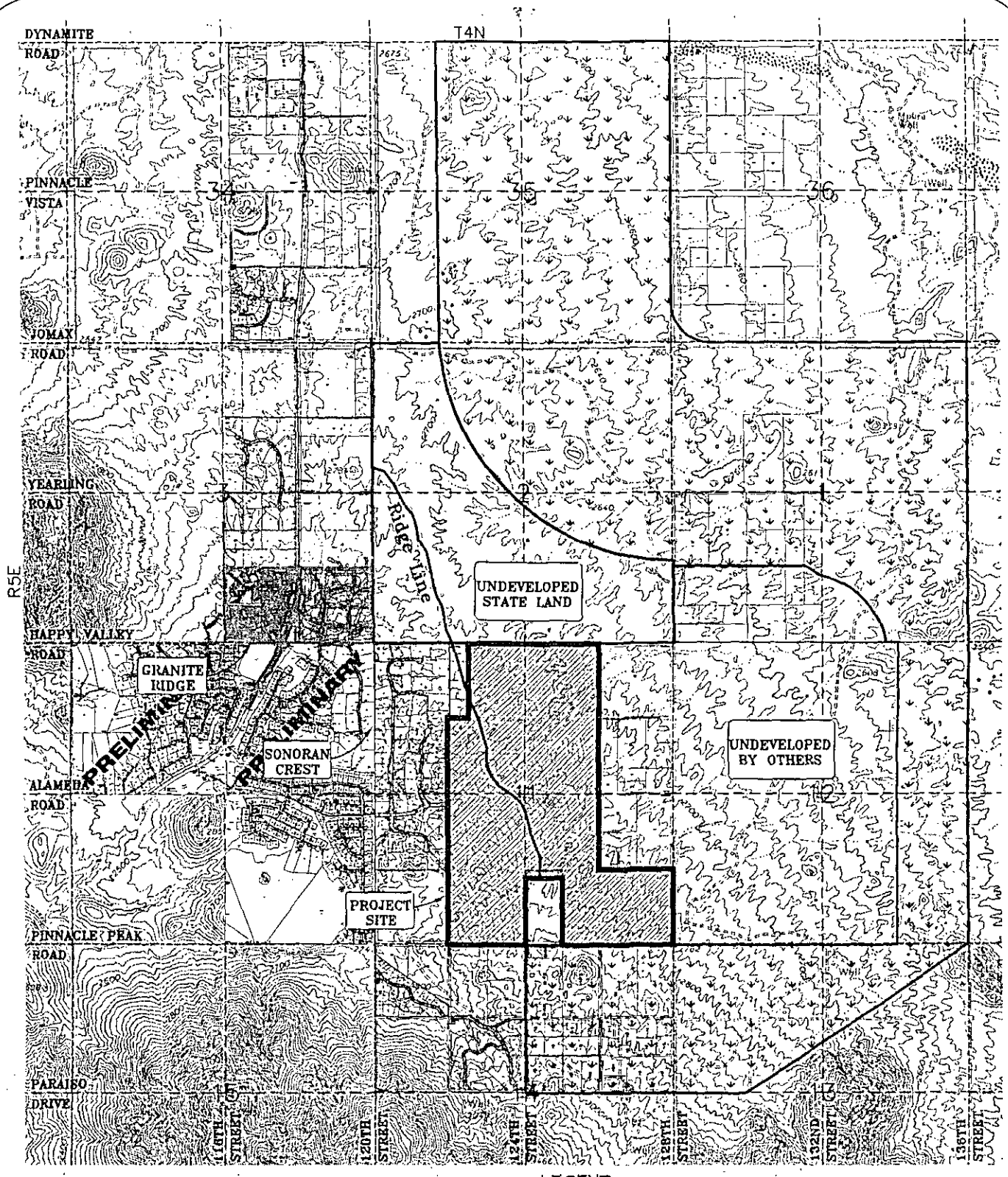
Basin locations & volumes are conceptual & are subject to change with Final Improvement Plan Design.

VOLUME BREAKDOWN TOTALS

Drainage Boundary	Sub-Basin Volumes	Disturbance Areas (acres)	100yr-2hr. Proved ac/ft	100yr-2hr. Required ac/ft	Volume Shortage / Excess ±
A1	A1-1 - A1-2	0.2547	0.574	0.53	0.044
A2	A2-1 - A2-3	0.4855	1.051	1.02	0.031
B	B1 - B5	0.7491	1.683	1.54	0.143
C	C1 - C2	0.2767	0.613	0.51	0.103
D	D1 - D2	0.4852	1.091	1.09	0.001
E1	E1-1 - E1-4	0.8567	2.029	2.01	0.019
E2	E2-1 - E2-2	0.7007	1.929	1.87	0.059
E3	E3-1	0.1482	0.322	0.31	0.012
F1	F1-1 - F1-4	0.6992	1.596	1.44	0.156
F2	F2-1 - F2-3	0.2978	0.568	0.5	0.068
F3	F3-1 - F3-2	0.1858	0.421	0.41	0.011
G	G1	0.2570	0.592	0.52	0.072
H1	H1-1 - H1-3	0.7827	1.943	1.82	0.123
H2	H2-1 - H2-2	0.5068	1.215	1.2	0.015
I	I1	0.2556	0.640	0.63	0.010
J	J1 - J2	0.2713	0.715	0.68	0.035
K	K1	0.1575	0.378	0.29	0.088
L	L1 - L2	0.1518	0.225	0.21	0.015
M	M1	0.1317	0.278	0.2	0.078
N	N1	0.1886	0.422	0.4	0.022
O	O1	0.0281	0.023	0.01	0.013
P	P1	0.1049	0.095	0.08	0.015
Q	Q1 - Q3	0.2967	0.268	0.24	0.028
R	R1	0.0819	0.072	0.07	0.002
S	S1	0.0606	0.054	0.02	0.034
	TOTAL	8.4149	18.796	17.6	1.196

PLATE 1

Vicinity Map



CROWN COMMUNITY DEVELOPMENT
A Henry Crown Company

SERENO CANYON

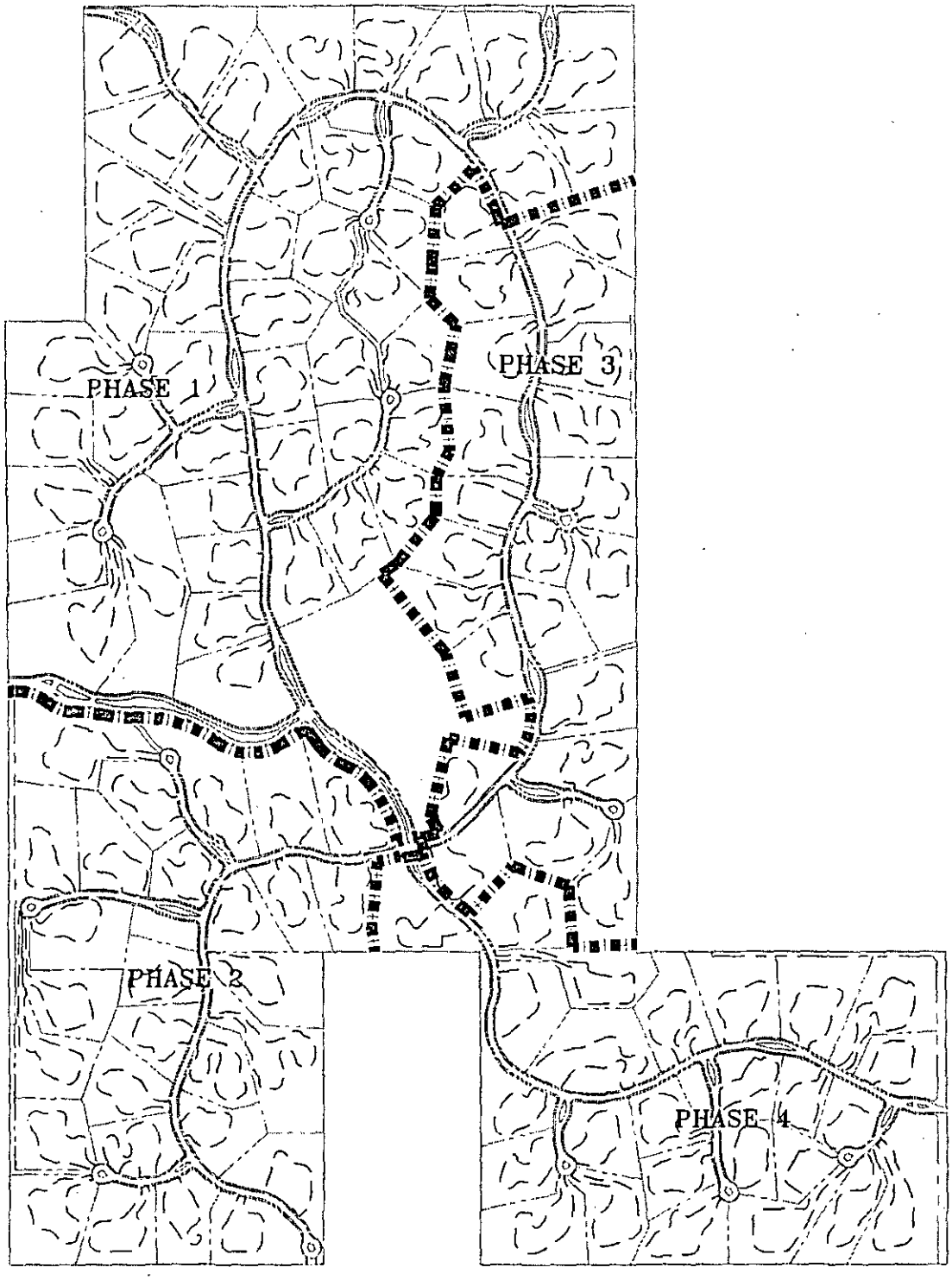
Plate 1
"Vicinity Map"

WOOD/PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors
(602) 335-8500

N:\2004\042054\Project Support\Hydro\Exhibits\FDR\ PLATE 01-VICINITYMAP.dwg - Sep 28,2005

PLATE 1A

Phasing Map



700 0 350 700

1 inch = 700 ft.

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Plate 1A

"Phasing Map"

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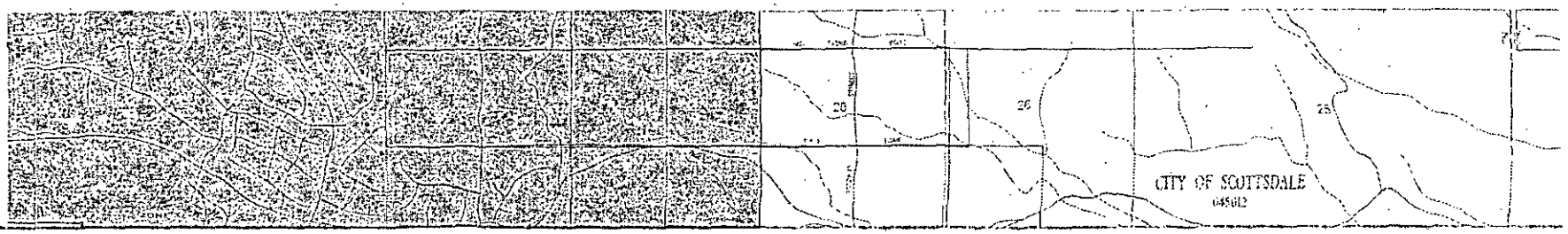
PLATE 2

Flood Insurance Rate Map (FIRM)



2400 0 1200 2400

Horz. 1 in. = 2400 ft.

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Plate 2

"Flood Insurance Rate Map"

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PLATE 3

Soils Classification Map

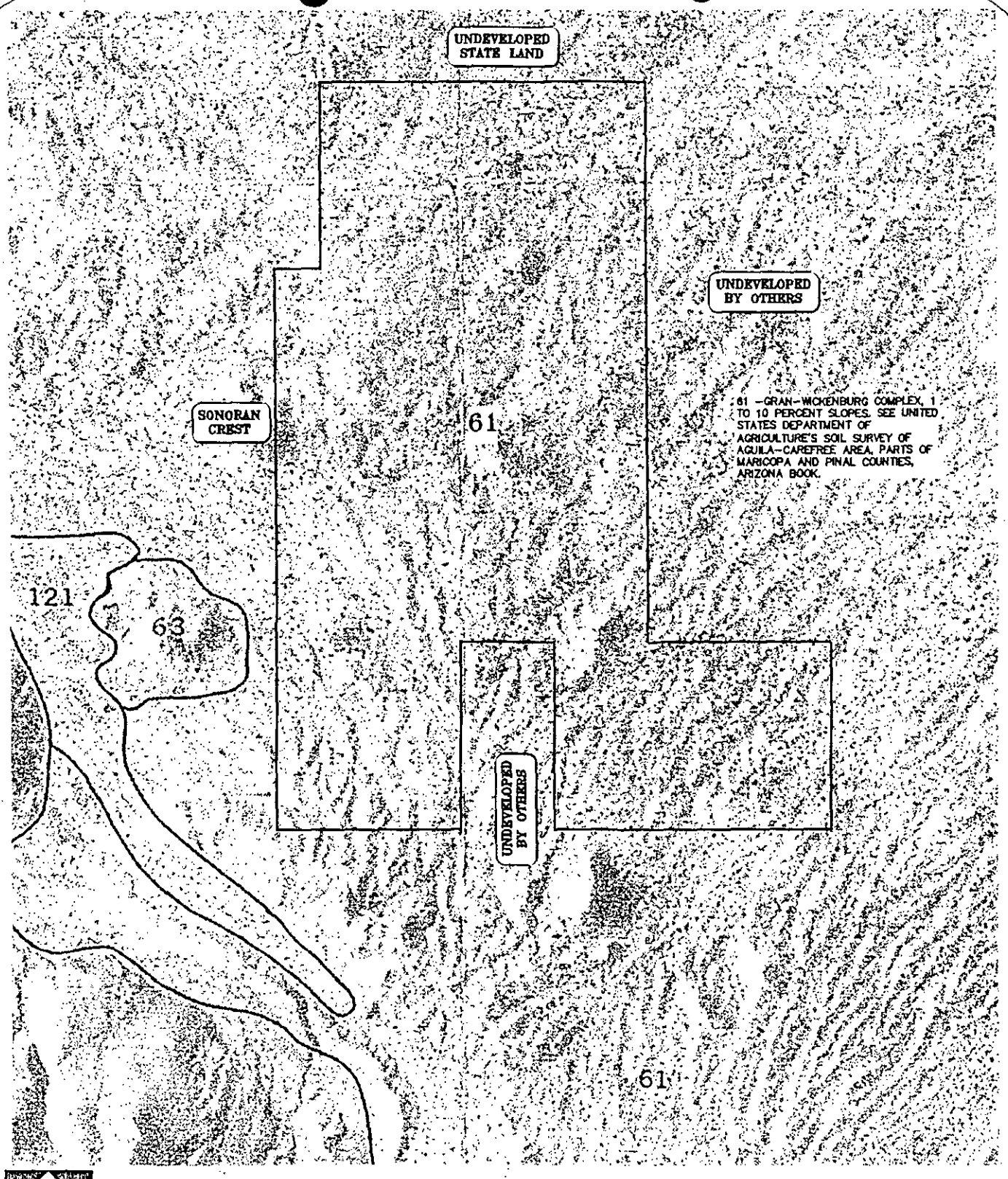

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Plate 3

"Soils Classification"

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PLATE 4

404 Washes

PLATE 5

Color Topographic Aerial Photograph

PLATE 6

Off-Site Watershed Area Map

PLATE 7

Pre-Development Drainage Site Plan

PLATE 8

Pre-Development Grading and Drainage Plan

PLATE 9

Post-Development Drainage Site Plan

PLATE 10

Post-Development Grading and Drainage Plan