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BUCKEYE/SUN VALLEY AREA DRAINAGE MASTER STUDY
TECHNICAL DATA NOTEBOOK

CONTRACT FCD 2002C027

VOLUME IV-B: AREA 2 HYDROLOGY, HYDRAULICS, AND FLOODPLAIN DELINEATION REPORT

FINAL

PREPARED FOR

Flood Control District of Maricopa County

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Buckeye/Sun Valley Area Drainage Master Study

Contract FCD 2002C027

Technical Data Notebook

Volume IV-B: Area 2 Hydrology & Hydraulics Report

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Prepared for

Flood Control District of Maricopa County

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1 Introduction

1.1 Purpose of the Study

The Flood Control District of Maricopa County (District) contracted with PBS&J to perform the Buckeye/Sun Valley Area Drainage Master Study (ADMS) to identify drainage, erosion, and sediment problems, evaluate existing floodplain delineations and delineate additional floodplains, identify a range of solutions, and develop preliminary development guidelines for the area. The ADMS encompasses 280 square miles and is divided into four distinct hydrologic study areas.

The purpose of Technical Data Notebook Volume IV-B is to provide updated hydrology for existing and future conditions and hydraulic models for existing conditions floodplain analysis for Area 2. Approximately 12.5 miles of floodplain will be delineated for a 100-year flood event.

1.2 Project Authorization

A notice to proceed (NTP) for this study was issued in June 2003 by the District. The FCD Contract Number for this project is 2002C027 and Ms. Valerie Swick is the project manager from the District.

1.3 Location of Study

Area 2 is located in the southwest portion of the Buckeye/Sun Valley ADMS Area as shown in Figure 1-1. The area covers approximately 12 square miles and is bounded by the Buckeye Flood Retarding Structure #1 (FRS) on the north, the Hassayampa River on the west, Johnson Road on the east, and the Southern Pacific Railroad on the south. The area covers part of Township 1N Range 5W and a small portion of Township 1S Range 5W.

1.4 Methodology Used for Hydrology and Hydraulics

The previous hydrology model of the area (McLaughlin Kmetty Engineers, 1992) was used as a basis for and comparison to the results produced in this study. HEC-1 embedded in WMS Version 7.0 (September 2003) was used to model the hydrologic response of the watershed for the 100-year, 6- and 24-hour events. The HEC-1 parameters were determined using the methods

described in the Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology, hereinafter referred to as the Hydrology Manual (Sabol et al., 1995).

The steady flow model, HEC-RAS version 3.1.2, was used to model the hydraulic response of the tributaries draining into the lower Hassayampa River. The HEC-RAS model parameters were determined using the methods described in the Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics, hereinafter referred to as the Hydraulics Manual (Sabol et al., 1995).

1.5 Acknowledgements

Ms. Valerie Swick, CFM (Project Manager, Flood Control District of Maricopa County) and Mr. Amir Motamedi, P.E. (Branch Manager, Flood Control District of Maricopa County) provided guidance during the course of study. Dr. Bing Zhao, P.E., (Branch Manager, Engineering Division, Flood Control District of Maricopa County) and Ms. Julie Cox (Hydrologist, Engineering Division, Flood Control District of Maricopa County) provided advice on technical issues and other suggestions. Mr. Joe Blanton (Town Manager, Town of Buckeye) provided assistance in historical flooding records. Ms. Kathryn Gross (Hydrologist, Engineering Division, Flood Control District of Maricopa County) and Mr. Richard Harris (Project Manager, Flood Control District of Maricopa County) completed the studies floodplain reviews.

1.6 Brief Description of Study Results

The results of the Area 2 hydrology study indicate that the 100-year, 6-hour storm event peak flows and runoff volumes are generally larger compared to the 100-year, 24-hour storm event. Overall the average unit discharge (cfs/mi^2) is comparable to similar conditions in the region and indirect methods outlined in the Hydrology Manual.

The future condition hydrologic analysis reveals an approximate increase of 13% in excess runoff volume generated from overland flow within future development. All increased runoff was contained in retention basins simulated as diversion outflows in HEC-1 (USACE, 1998).

One unique situation in this area is the fact that the reaches modeled were created before the construction of the FRS located upstream of the delineations. In the past, larger flows were

routed through this area from the White Tank Mountains and into the Hassayampa River. The runoff from pre-FRS conditions created channels that generally contained the 100-year flood event. After construction of the FRS, runoff from the White Tank Mountains was contained behind the FRS, which drains into the Hassayampa River, and does not enter the reaches delineated in this study.

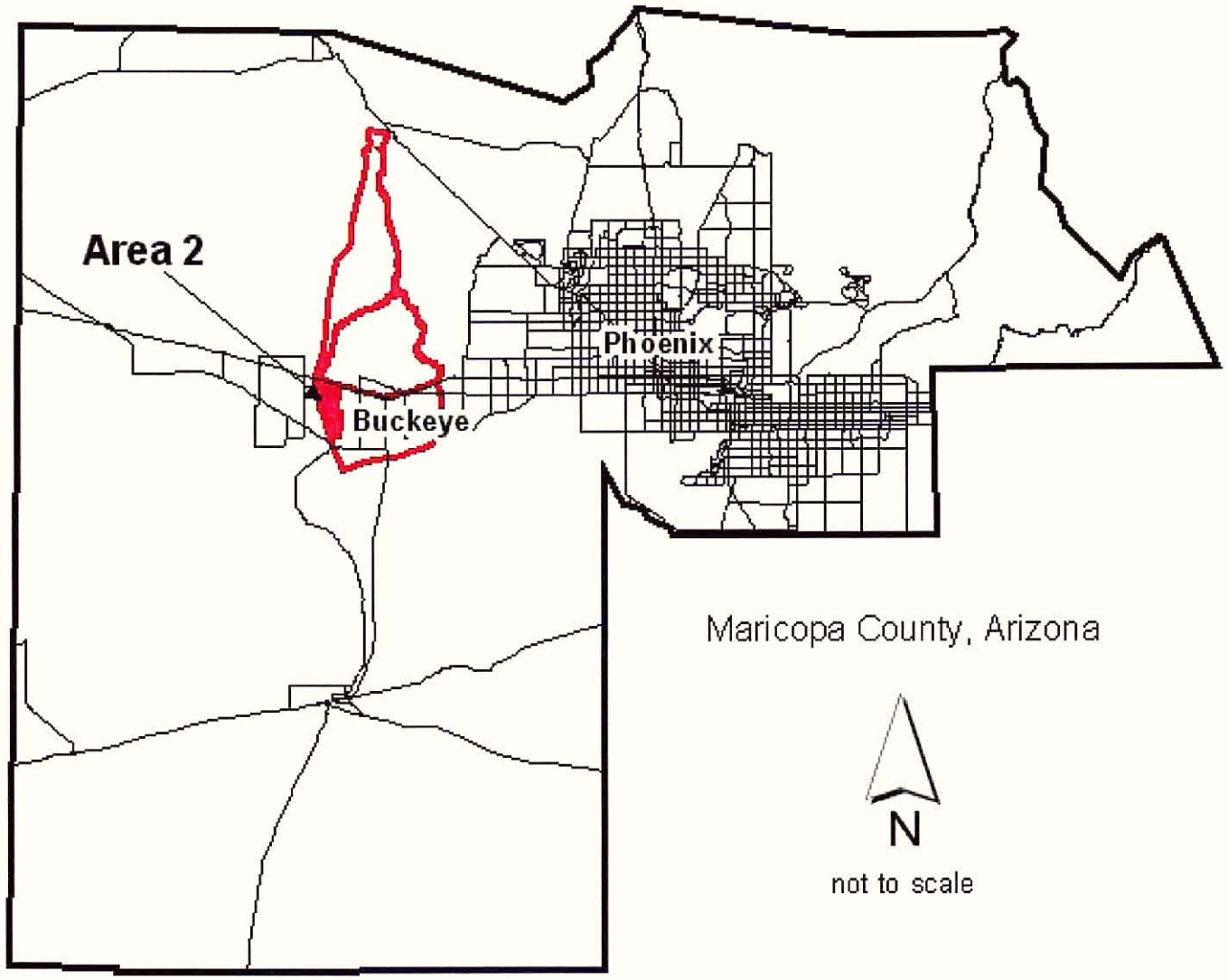

Figure 1-1 Buckeye/Sun Valley ADMS Vicinity Map

2 Flood Control District of Maricopa County Abstract

2.1 General Information

2.1.1 Community Name

The Town of Buckeye, Arizona and unincorporated areas of Maricopa County

2.1.2 Community Number

040037 and 040039

2.1.3 County

Maricopa

2.1.4 State

Arizona

2.1.5 Date Study Accepted

N/A

2.1.6 Study Contractor

PBS&J, 4601 DTC Blvd, Suite 700, Denver, Colorado, 80237.

Technical contact: Steve Rogers, P.E., CFM

2.1.7 State Technical Reviewer

N/A

2.1.8 Local Technical Reviewer

Flood Control District of Maricopa County, Arizona

2.1.9 River or Stream Name

Tributaries 1E, 3E, and 4E of the Hassayampa River

2.1.10 Reach Description

The watershed for the Hassayampa Area (Area 2) of the Buckeye/Sun Valley ADMS is approximately 12 square miles, and includes three separate tributaries to the Hassayampa River. The watershed boundaries include the FRS on the north, Johnson Road on the east, Southern Pacific Railroad on the south, and the Hassayampa River on the west. Flow directions are generally in a southwest direction and all runoff empties into the Hassayampa River. These tributaries are located just south of I-10 on the eastern side of the Hassayampa River in Buckeye, Arizona. The watershed is mostly natural desert land with very few dwellings, and small portion of the land is used for agriculture.

2.1.11 Study Type

Detailed hydrology and hydraulics.

2.2 Mapping Information

2.2.1 USGS Quad Sheets

N/A

2.2.2 Mapping for Hydrology Study

Two-foot contour maps derived from 50-foot mass points and breaklines digital elevation model (DEM) and one-foot resolution MrSid format orthophotography provided by the District in 2003 were used as the base mapping for the Area 2 hydrology study.

2.2.2 Mapping for Hydraulic Study

Two-foot contour maps derived from 50-foot mass points and breaklines digital elevation model (DEM) and one-foot resolution MrSid format orthophotography provided by the District in 2003 were used as the base mapping for the Area 2 hydrology study.

2.3 Hydrology

2.3.1 Model or Method Used

The methodologies for this study included Green & Ampt rainfall/runoff losses with S-graph unit hydrographs and normal depth routing using 8-point cross sections.

2.3.2 Storm Frequency and Duration

For both existing and future conditions, the following storm frequencies and durations were used:

- 100-year, 6-hour
- 100-year, 24-hour

2.3.3 Hydrograph Type

S-graphs (Agricultural, Desert/Rangeland, and Phoenix Valley) that were developed for Maricopa County.

2.3.4 Frequencies Determined

100-year

2.3.5 List of Gages Used in Frequency Analysis or Calibration

N/A

2.3.6 Rainfall Amounts and Reference

The rainfall amounts were derived from the NOAA Atlas 2 isopluvial maps as provided in the Hydrology Manual for events up to the 100-year return frequency storm. The rainfall depths are presented in Table 4-1.

2.3.7 Unique Conditions and Problems

Special problems encountered in the course of this study are discussed in subsequent sections, including:

- Flow splits and diversions among sub-basins
- Unit hydrograph Kn-values for desert/rangeland areas
- Abandoned RID Canal
- RID baseflow

2.3.8 Coordination of Q's

Peak flows for Area 2 submitted in this report have been coordinated with Julie Cox from the District throughout the entire project. The hydrologic models were submitted for review to Ms. Cox and were revised to reflect Ms. Cox's comments. The final peak flows from the individual sub-basins from this study were consistently lower than that of McLaughlin's previous study.

2.4 Hydraulics

2.4.1 Model or Method Used

The steady flow module established in HEC-RAS (version 3.1.2), developed by the Corps of Engineers, was used to create hydraulic models that represents Tributaries 1E, 3E, and 4E of the Hassayampa River.

2.4.2 Regime

The flow regime in the hydraulic model is assumed subcritical for all reaches.

2.4.3 Frequencies for which Profiles were Computed

100-year

2.4.4 Method of Floodway Calculation

The floodway modeling methodology comes from the procedures outlined in the Hydraulics Manual. The first step was to use the encroachment method #4 with equal conveyance reduction. The guidelines allow a maximum of one-foot increase in water surface elevation. Once HEC-RAS generates the method #4 encroachments, method #1 is applied to the model. This method requires a manual selection for the location of the floodway encroachment. Method #4 acts as the starting basis for the method #1 selection. Using method #1 turns into an iterative process in some locations to keep the increase in water surface elevation under one foot.

2.4.5 Unique Conditions and Problems

Special problems encountered in the course of this study are discussed in subsequent sections, including:

- Datum conversion from NGVD 1929 to NAVD 1988
- Negative surcharges
- Baseline for Tributary 4E, Reach 1 at Limit of Detailed Study
- Extended cross-sections

2.5 Additional Study Information

N/A

3 Survey and Mapping Information

3.1 Field Survey Information

The first field investigation was conducted on January 12, 2004, to scope out the critical features of the watershed and to identify problematic areas. Pictures #1-21 (Appendix C) were taken to document field conditions. A second field survey was conducted on February 5, 2004, after the sub-basin boundaries were delineated, and the physical parameters for each basin were selected Photos taken during the second field survey are not included because a description of the photos does not exist.

The third survey was conducted on April 7, 2004, to determine channel routings and other hydraulic parameters. The survey included a typical 8-point cross section measurement, and estimation of Manning's "n" for left overbank (LOB), main channel, and right overbank (ROB) (Appendix C, Photos L01-PX to L21-PX). The nomenclature first gives the location number and then the photo number taken at that location. The fourth and fifth field surveys were conducted on May 21, 2004, and August 4, 2004, respectively. Unfortunately, a description of the photos taken during final two field visits does not exist, and these photos will not be included in Appendix C.

3.2 Mapping

Kenney Aerial Mapping, Inc. prepared mapping for Buckeye Areas 1 and 2 and a portion of Area 3 for the District in 2003. The new mapping provided two-foot contour data. Aerial photography was flown in December 2003 as part of the District's ongoing effort to maintain current aerial photography for the entire county. The aerial photography provided by the District for the study area is 2003 one-foot resolution orthophotography images in MrSID format. Elevation reference marks used in floodplain mapping was provided by Engineering Alliance and is noted on all floodplain work maps.

The mapping datum reflects the national standards used by the District. The horizontal datum is the projected State Plane NAD 1983, Arizona Central, while the vertical datum is the NAVD 1988 system.

4 Hydrology

4.1 Method Description

The hydrologic response of Area 2 to the 100-year 6-hour and 100-year 24-hour storm events was simulated using the modified U.S. Army Corps of Engineers HEC-1 (May 1998) computer program embedded in WMS 7.0 (January 2003). The HEC-1 parameters were determined using the methods described in the Hydrology Manual. The computational interval used to determine the unit hydrograph for each sub-basin was 5 minutes.

4.2 Parameter Estimation

This section includes a complete description of the methodology and calculations used to develop the hydrology.

4.2.1 Drainage Area Boundaries

The watershed for the Hassayampa Area (Area 2) of the Buckeye/Sun Valley ADMS is approximately 12 square miles. The boundaries include the FRS on the north, Johnson Road on the east, Southern Pacific Railroad on the south, and the Hassayampa River on the west. Flow directions are generally in a southwest direction and all runoff empties into the Hassayampa River.

The watershed is mostly natural desert land with very few dwellings. A small portion of the land is used for agriculture. Other structures to note include Interstate 10, the Roosevelt Irrigation District Canal and multiple paved and unpaved roads. Figure 4-1 (Pocket) shows the drainage area boundaries, major sub-basin boundaries, and concentration points.

4.2.2 Watershed Work Maps

The watershed work maps include the HEC-1 schematic map (Figure 4-1, Pocket), the drainage basin map showing lag flow paths and routing reaches (Figure 4-2, Pocket), soil map (Figure 4-3, Pocket), land use maps for existing and future conditions (Figures 4-4A and 4-4B, Pocket), flow maps for existing and future conditions (Figures 4-5A and 4-5B, Pocket), and watershed workmap (Figure 4-6, Pocket). The naming convention for each sub-basin uses letters in sequential order according to the sub-watershed. For example, sub-watershed E contains 4 sub-

basins labeled E1 through E4. Each concentration point is labeled according to the name of the sub-watershed with the most upstream concentration point labeled first in sequential order. For example, sub-watershed E has three concentration points labeled 1E through 3E. The routing reaches are named according to the beginning and ending concentration points. For example, routing reach 1E-2E begins at point 1E and ends at point 2E.

4.2.3 Gage Data

There is no existing precipitation gage station or stream gage station within the study watershed.

4.2.4 Statistical Parameters

Statistical parameters such as rainfall depths and rainfall distributions for each storm event are based on the data and methodologies provided in the Hydrology Manual.

4.2.5 Precipitation

4.2.5.1 Rainfall Depths

The NOAA Atlas 2 rainfall depth isopluvial maps are stored as digital files in WMS. Each area-weighted point precipitation value is computed automatically using tools provided in WMS according to the watershed size and location. The point precipitation summary is shown in Table 4-1. Point precipitation-values are then adjusted with aerial reduction factors (JD record) in HEC-1. WMS also provides tools to compute aerial reduction according to the Depth-Area Reduction Curves as outlined in the Hydrology Manual.

Table 4-1 Summary of Rainfall Depths

Storm Event	Depth [in]
100-yr, 6-hr	3.29
100-yr, 24-hr	4.10

4.2.5.2 Rainfall Distributions

Both the 6-hour and 24-hour rainfall distributions are based on the Hydrology Manual. WMS provides tools to automatically produce rainfall distributions for various rainfall depths and events. The 24-hour rainfall distribution provided in the Hydrology Manual is the SCS Type II

distribution. The 6-hour rainfall distribution varies with the size of the sub-basin and is interpolated from five different dimensionless storm patterns provided in the Hydrology Manual.

4.2.6 Physical Parameters

This section describes the methods used for estimation of the physical hydrologic parameters such as rainfall loss, unit hydrograph, and lag time.

4.2.6.1 Rainfall Losses

The Green-Ampt procedure was used to compute rainfall losses in accordance with the Hydrology Manual. The District provided digital soil and land use files (GIS shape file format) to compute the Green-Ampt parameters. The digital soil file corresponds to SCS soils maps (Camp, 1986). The GIS land use shape file is based on the 2000 digital GIS data given by the Maricopa Association of Governments (MAG 2000), which is the most current land use information. Figures 4-3, 4-4A, and 4-4B describe the soil and land use conditions.

WMS provides a tool to perform the Green-Ampt calculations automatically using the land use shape file, soil shape file, and soil and land use lookup tables. The lookup tables relate each unique soil and land use type to essential parameters such as XKSAT, RTIMP, and IA. Both the soil and land use lookup tables were originally provided by the District, and then each entry was evaluated and modified as necessary according to the characteristics of the region. These lookup tables can be found in Appendix D.2, while the Green-Ampt rainfall loss parameters used in the HEC-1 input files (Appendix D.6) can be found in Table D.2-3 and D.2-4 for existing and future conditions, respectively. For future conditions, the Green-Ampt parameters were estimated based on the general plan land use shape file also provided by the DISTRICT. This study assumes that the Green & Ampt loss parameters do not change with storm return frequencies.

Six major land uses were identified for the watershed, which are vacant, transportation, large lot residential/single family (1 dwelling per acre to 2 dwelling per acre), very small lot residential/single family, agriculture, and water (MAG, 2000). The surface retention losses, percent imperviousness, and vegetation cover for each land use type were estimated based on the Hydrology Manual and digital GIS land use maps (MAG, 2000). The values used for surface retention loss values, percent imperviousness, and vegetation cover are shown, in Appendix D.2.

4.2.6.2 Unit Hydrograph

The Maricopa County S-Graph method was used to compute unit hydrographs in accordance with the Hydrology Manual. The Maricopa County S-Graph most relevant to this area is the Desert/Rangeland S-Graph. The unit hydrographs were computed automatically using WMS. The input for WMS to determine the unit hydrograph includes the S-Graph type and lag time. The unit hydrographs can be found in the UI records in each HEC-1 output file (see Appendix D.6).

4.2.6.3 Lag Time

Four parameters were used to estimate the lag time for each sub-basin. These four parameters are the watershed hydraulic length (L), the slope of the longest overland flow path (S), the distance along the main channel from the point of reference to a point opposite the centroid (L_{ca}), and the basin roughness (Kn). WMS has the tools to compute the first three parameters (L, L_{ca}, and S) using GIS data and contour maps. However, the L_{ca} algorithm used in WMS has limitations and sometimes returns incorrect values. Therefore, the L_{ca} parameter was computed using the tools in AutoCAD to manually measure the distance. The basin roughness is a composite Manning's n-value for all the channels in the sub-basin. An appropriate basin roughness value is determined for each sub-basin based on field observation, aerial photographs, soil maps, and land use maps. Lag time for each basin is calculated by using the formula in the Hydrology Manual. The parameters for lag time calculation are summarized in Table D.2-5 (Appendix D.2).

Desert/Rangeland S-graphs are used for gently sloping natural areas and were used exclusively for this area. The selection of the Kn-value correlates with the type of S-graph selected. As a result, the Kn-value range is 0.02 to 0.03 as shown in Table 5-4 of the Hydrology Manual. However, based upon our field survey of the base material, vegetation, obstruction, and irregularity in the basins, we determined a range of 0.04 to 0.06 was more appropriate. The selection of the Kn-value is in agreement with studies conducted with similar surface geographic watersheds (Zhao, 2003).

4.2.6.4 Channel Routing Parameters

The normal depth channel routing in HEC-1 was used to route runoff hydrographs through sub-basins. The routing paths for the drainage area can be found in Figure 4-2. The channel routing

parameters include NSTPS (the number of sub-reaches to be divided for the routing reach by HEC-1), initial outflow, Manning's n-values for LOB, main channel, and ROB, reach length, bed slope for the routing reach, and an eight-point cross section (RX-RY data). The initial outflow was set as the initial inflow, which is usually zero cfs, implying a dry channel when routing starts. The eight-point cross section data was obtained from field survey (See Appendix C survey notes). The reach length and channel bed slope are automatically computed using tools provided in WMS 7.0. The estimation of Manning's n-value was based on field observations, aerial photos, land use maps, and soil maps using the procedures in USGS technical report Estimated Manning's Roughness Coefficients for Stream Channels and Floodplain in Maricopa County, Arizona. (USGS, 1991). NSTEPS values for routing reaches were calculated by an iterative process in WMS 7.0. All channel routing parameters are summarized in Table D.3-1 through Table D.3-2 in Appendix D.3.

4.3 Problems Encountered During the Study

4.3.1 Special Problems and Solutions

Several issues have already been discussed in the previous sections, such as unit hydrographs and basin roughness Kn-values. This section covers specials issues encountered during the study.

4.3.1.1 Land Use Determination

Figures 4-4a and 4-4b show a road system in the upper central portion of the vacant land use area. After examining aerial photography in the area, it was determined that there is one dwelling unit per 26 acres. Additionally, most of the parcels are approximately four and one-half acres. Due to the extremely low residential density, the area was modeled as being vacant.

4.3.1.2 Abandoned RID Canal

The Roosevelt Irrigation District's canal runs east to west through the Buckeye area delivering water to this vast agriculture region. The canal ends at Johnson Road with a wasteway continuing westward. Originally the canal was constructed to carry excess water to the west and drain into the Hassayampa River. However, this portion of the canal has been abandoned and the excess irrigation water currently empties into White Tanks Wash, created before the construction of the FRS.

The abandoned canal does play a role in how the runoff in this area drains to the south and into the Hassayampa River. In sub-basin A1, the canal is breached, allowing runoff to continue its natural path towards the Hassayampa River. There is a breach in the canal in sub-basin C1, but the wash is blocked by the adjacent canal maintenance road. The road creates some upstream storage, which was included in the hydraulic model outlined in Section 5. In sub-basin E3, the canal has been removed where White Tank Wash cuts through.

4.3.1.3 RID Base Flow

The RID is allocated a maximum flow of 450 cfs per discussion with Stan Ashby, Superintendent of the RID. Under normal operating conditions, the gate at Johnson Road remains closed. The gate is opened only during maintenance or if the canal is threatened with overtopping. The assumption is made that during storm events the gate is opened to allow the maximum flow though to combine with runoff in sub-basin E3. Therefore, the HEC-1 model was set up with a base flow of 450 cfs in sub-basin E3.

4.3.1.4 Model Warning and Error Messages

No error messages are presented in the computer model output files. There are several warning messages regarding channel routing, including the following:

```
*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN
2617. TO 3974.

THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN
PEAK INFLOWS.

THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A
LONGER REACH.)
```

A test was conducted by decreasing NSTEPS until the warning message disappeared. Since the "modified puls" routing method was not used, and there is less than 3% difference in peak discharge after the NSTEPS was changed, this type of warning was ignored.

4.4 Calibration

Calibration was not performed due to the lack of gage stations within the watershed. However, verification was performed (see Section 4.5.2, this report).

4.5 Final Results

4.5.1 Hydrologic Analysis Results

Tables 4-2 and 4-3 list the existing and future condition results, respectively, for each sub-basin, routed flows, and combination points in Area 2. The volume from sub-basin E3 seems high, but it includes the base flow used to simulate inflow from the RID. The unit discharge rates are all fairly close and in the range of 450-600 cfs. Each sub-basin in this area has similar characteristics, so a relatively narrow range is expected for the unit discharge. Exceptions occur with the sub-basins that are considerably smaller, and, as expected, the unit discharge is higher. Tables 4-4 and 4-5 give runoff volumes for concentration points for existing and future 100-year, 6-hour conditions models and the runoff volumes for all concentration points for the future and future with retention 100-year, 6-hour models, respectively.

The discharges used for Tributary 4E do not necessarily correspond to the HEC-1 output because there were split flows and combined flows from the sub-basins. The discharge at Tributary 4E, Reach 3 cross-section 3.710 is 500 cfs and was calculated using the discharge calculated at HEC-1 Station A1 which is 929 cfs. Since cross-section 3.710 is the limit of detailed study and occurs upstream from Station A1 (HEC-RAS Station 2.395), the 500 cfs was computed by using a ratio of the known drainage areas (0.91 mi^2 for Station 3.710 and 1.63 mi^2) to the calculated discharge for Station A1. The discharge from Tributary 4E, Reach 2 cross-section 1.965 was computed using the HEC-RAS optimization function for split flow. It was determined that 299 cfs would be split to this cross-section out of the 929 cfs total. The discharge at Tributary 4E1, Reach 2 cross-section 0.647 is 630 cfs. This discharge was split from the discharge at Tributary 4E, Reach 3 cross-section 2.395 (929 cfs) using the HEC-RAS optimization function for split flow. The discharge at Tributary 4E1, Reach 1 is 1052 cfs which is a combination of the discharges for Tributary 4E1, Reach 2 cross-section 0.647 and Tributary 4E2, Reach 1 cross-section 0.201. The discharge at Tributary 4E2, Reach 1 cross-section 0.281 is 422 cfs from the HEC-1 model station 2R. The discharge at Tributary 4E, Reach 1 cross-section 1.238 is a combination of Tributary 4E1, Reach 1 cross-section 0.201 (1052 cfs) and Tributary 4E, Reach 2 cross-section 1.965 (299 cfs). Table 4-6 gives summary of the discharges for Tributary 4E.

Table 4-2 Existing Condition Hydrologic Response

		100-year 6-hour				100-year 24-hour			
	Area [mi]	Peak [cfs]	T_p [hr]	Volume [ac-ft]	Unit Discharge [cfs/mi^2]	Peak [cfs]	T_p [hr]	Volume [ac-ft]	Unit Discharge [cfs/mi^2]
1E	2.69	1,318	5.00	170	182.14	1,236	13.00	158	170.81
1E-2E	2.69	1,250	5.50	170	172.74	1,166	13.50	158	161.14
2E	3.63	1,840	5.42	6,408	139.64	1,813	13.42	6,404	137.59
2E-3E	3.63	1,779	5.75	6,390	135.01	1,750	13.75	6,386	132.81
3E	4.37	1,807	5.75	6,422	94.62	1,822	13.75	6,425	95.41
A1	1.63	929	5.00	113	349.66	803	12.92	98	302.23
B1	0.30	422	4.42	24	4688.89	307	12.42	18	3411.11
C1	0.95	758	4.67	70	839.89	613	12.67	55	679.22
D1	0.69	646	4.58	53	1356.86	497	12.58	40	1043.90
E1	1.47	772	5.08	101	357.26	656	13.00	86	303.58
E2	1.22	713	5.00	87	479.04	590	13.00	73	396.40
E3	0.94	1,095	4.75	6,259	1239.25	976	12.75	6,247	1104.57
E4	0.74	559	4.75	51	1020.82	435	12.67	40	794.38

Table 4-3 Future Condition Hydrologic Response with Retention

		100-year 6-hour				100-year 24-hour			
	Area [mi]	Peak [cfs]	T_p [hr]	Volume [ac-ft]	Unit Discharge [cfs/mi^2]	Peak [cfs]	T_p [hr]	Volume [ac-ft]	Unit Discharge [cfs/mi^2]
1E	2.69	1,347	5.25	110	186.15	1,263	13.17	94	174.54
1E-2E	2.69	976	6.00	110	134.88	873	14.00	94	120.65
2E	3.63	1,484	6.00	1,701	112.62	1,402	14.00	1,690	106.40
2E-3E	3.63	1,376	6.42	1,684	104.43	1,283	14.42	1,672	97.37
3E	4.37	1,381	6.42	1,696	72.32	1,311	14.42	1,692	68.65
A1	1.63	951	4.75	48	357.94	849	12.83	62	319.55
B1	0.30	167	4.08	3	1855.56	140	12.08	3	1555.56
C1	0.95	411	4.25	9	455.40	330	12.25	9	365.65
D1	0.69	289	4.17	7	607.02	226	12.17	7	474.69
E1	1.47	835	4.92	45	386.41	708	13.00	45	327.64
E2	1.22	764	4.83	40	513.30	638	12.17	7	428.65
E3	0.94	450	0.25	11	509.28	450	0.25	1,598	509.28
E4	0.74	660	4.67	35	1205.26	503	12.67	35	918.55

Many of the future discharges are lower than the existing discharges, and this can be attributed to changes in land use.

Table 4-4 Runoff Volumes for Concentration Points for Existing & Future 100-Year, 6-Hour Conditions

		100-YR 6-HR (existing)		100-YR 6-HR (future)		% Increase	
Station	Area [mi2]	Peak [cfs]	Volume [ac-ft]	Peak [cfs]	Volume [ac-ft]	Peak	Volume
A1	1.63	929	113	1,023	127	10.12%	12.39%
B1	0.30	422	24	454	27	7.58%	12.50%
C1	0.95	758	70	829	79	9.37%	12.86%
D1	0.69	646	53	709	60	9.75%	13.21%
E1	1.47	772	101	854	114	10.62%	12.87%
E2	1.22	713	87	787	98	10.38%	12.64%
E3*	0.94	1,095	6,259	1,199	1,623	9.50%	-74.07%
E4	0.74	559	51	660	66	18.07%	29.41%

*Sub-basin has a base flow of 450 cfs due to RID tailwater, which results in larger runoff volume.

Table 4-5 Runoff Volumes for Concentration Points for Future & Future with Retention for 100-Year, 6-Hour Conditions

	100-YR 6-HR (future)		100-YR 6-HR (future w/ retention)		% Increase	
Station	Peak [cfs]	Volume [ac-ft]	Peak [cfs]	Volume [ac-ft]	Peak	Volume
A1	1,023	127	951	48	-7.04%	-62.20%
B1	454	27	167	3	-63.22%	-88.89%
C1	829	79	411	9	-50.42%	-88.61%
D1	709	60	289	7	-59.24%	-88.33%
E1	854	114	835	45	-2.22%	-60.53%
E2	787	98	764	40	-2.92%	-59.18%
E3*	1,199	1,623	450	11	-62.47%	-99.32%
E4	660	66	660	35	0.00%	-46.97%

Table 4-6 Peak Discharges Used in Tributary 4E HEC-RAS Model

Tributary, Reach	Cross-Section	Peak Discharge in HEC-RAS Model (cfs)_
4E, Reach 3	3.710	500
4E, Reach 3	2.395	929
4E, Reach 2	1.965	299
4E, Reach 1	1.238	1351
4E1, Reach 2	0.647	630
4E1, Reach 1	0.201	1052
4E2, Reach 1	0.281	422

4.5.2 Verification of Results

A previous study was conducted in the area in 1992 by McLaughlin Kmetty Engineers as part of the Buckeye Area Flood Delineation Study. The sub-basin boundaries are very similar with the exception that McLaughlin Kmetty used the abandoned RID canal as part of the delineation boundaries. The assumption made in this study is that the flow continues through the abandoned canal, while McLaughlin assumed the flow to be routed along the canal to the west and then into the Hassayampa River. As a result, the sub-basins are similar in characteristics, but the sizes vary. Table 4-7 lists the comparison between the two studies by showing the sum of the area and peak flows from two sub-basins that would equal the same area relative to the other study. Five of the eight of the sub-basins compared closely to each other. The sub-basins that have dramatically different peak discharges (sub-basins C1, D1, and E4) can be attributed to changes in S-Graph assignments for the two studies. The PBS&J study used Desert-Rangeland for the S-Graph, and the MKE study used the Phoenix Valley S-Graph. Tables 4-8a and 4-8b show the existing rainfall loss parameters for the PBS&J and for MKE studies, respectively. Tables 4-9a and 4-9b give the unit hydrograph lag time calculation parameters for the PBS&J and MKE studies, respectively.

Table 4-7 Hydrologic Results Compared with MKE for the Existing 100-YR, 6-HR Conditions

Buckeye/Sun Valley ADMS				McLaughlin Kmetty Eng.		
Station	Area [mi^2]	Peak [cfs]		Station	Area [mi^2]	Peak [cfs]
A1	1.63	929		73	2.06	1375
B1	0.30	422		-	-	-
SUM	1.93	1,351	<-->	SUM	2.06	1,375
C1	0.95	758		75	0.54	594
-	-	-		78	0.41	732
SUM	0.95	758	<-->	SUM	0.95	1,326
E1	1.47	772		74	2.69	1603
E2	1.22	713		-	-	-
SUM	2.69	1,485	<-->	SUM	2.69	1,603
D1	0.69	646		76	0.06	134
-	-	-		79	0.78	891
SUM	0.69	646	<-->	SUM	0.84	1,025

Buckeye/Sun Valley ADMS				McLaughlin Kmetty Eng.		
Station	Area [mi^2]	Peak [cfs]		Station	Area [mi^2]	Peak [cfs]
E3	0.94	1095		77	0.23	353
-	-	-		80	0.64	792
SUM	0.94	1,095	<-->	SUM	0.87	1,145
E4	0.74	559		81	0.63	757
-	-	-		82	0.26	351
SUM	0.74	559	<-->	SUM	0.89	1,108

Table 4-8 Existing PBS&J Rainfall Loss Parameters

Subbasin	Area [mi^2]	IA	DTHETA	PSIF	XKSAT	RTIMP
A1	1.63	0.343	0.347	4.498	0.339	2.145
B1	0.30	0.350	0.350	4.624	0.315	0.000
C1	0.95	0.350	0.350	4.669	0.311	0.000
D1	0.69	0.350	0.350	4.642	0.317	0.000
E1	1.47	0.343	0.347	4.362	0.364	2.082
E2	1.22	0.348	0.343	4.461	0.354	2.288
E3	0.94	0.402	0.306	4.245	0.444	1.589
E4	0.74	0.389	0.324	4.185	0.421	0.000

Table 4-9 MKE Existing Rainfall Loss Parameters

Subbasin	Area [mi^2]	IA	DTHETA	PSIF	XKSAT	RTIMP
73	2.06	0.350	0.350	3.770	0.317	0.000
74	2.69	0.350	0.350	3.870	0.340	0.000
75	0.54	0.350	0.350	3.550	0.274	0.000
76	0.06	0.350	0.350	3.610	0.285	0.000
77	0.23	0.350	0.350	4.080	0.380	0.000
78	0.41	0.350	0.350	3.610	0.285	0.000
79	0.78	0.350	0.350	3.610	0.285	0.000
80	0.64	0.380	0.290	4.030	0.414	0.000
81	0.63	0.400	0.260	4.080	0.447	0.000
82	0.26	0.390	0.270	4.030	0.400	0.000

Table 4-10 PBS&J Unit Hydrograph Lag Time Calculation Parameters

Subbasin	Area [mi^2]	L [ft]	L_{ca} [ft]	Max Elev [ft]	Min Elev [ft]	S [ft/mi]	S-Graph Type	K_n	Lag [min]
A1	1.63	15,616	9,120	1,060.7	963.2	32.98	Des Rnglnd	0.050	69
B1	0.30	7,098	3,466	1,036.0	959.1	57.24	Des Rnglnd	0.050	31
C1	0.95	14,004	5,581	1,037.7	927.4	41.60	Des Rnglnd	0.050	52
D1	0.69	10,801	5,153	997.6	913.6	41.10	Des Rnglnd	0.050	46
E1	1.47	16,819	9,573	1,068.2	979.2	27.95	Des Rnglnd	0.050	75
E2	1.22	15,678	8,798	1,060.8	979.2	27.48	Des Rnglnd	0.050	70
E3	0.94	14,352	5,236	1,000.6	930.1	25.93	Des Rnglnd	0.050	56
E4	0.74	10,558	6,552	934.1	876.2	28.98	Des Rnglnd	0.050	53

Table 4-11 MKE Unit Hydrograph Lag Time Calculation Parameters

Subbasin	Area [mi^2]	L [ft]	L_{ca} [ft]	Max Elev [ft]	Min Elev [ft]	S [ft/mi]	S-Graph Type	K_n	Lag [min]
73 = A1&B1	2.06	14,520	8,818	N/A	N/A	33.00	Phx Valley	0.050	66
75 = C1	0.54	9,979	4,858	N/A	N/A	29.00	Phx Valley	0.050	46
78 = C1	0.41	5,386	3,115	N/A	N/A	59.00	Phx Valley	0.050	27
76 = D1	0.06	2,006	1,214	N/A	N/A	50.00	Phx Valley	0.050	13
79 = D1	0.78	8,606	5,861	N/A	N/A	42.00	Phx Valley	0.050	44
74 = E1&E2	2.69	16,368	7,920	N/A	N/A	30.00	Phx Valley	0.050	68
77 = E3	0.23	6,019	2,006	N/A	N/A	25.00	Phx Valley	0.050	28
80 = E3	0.64	7,498	3,854	N/A	N/A	31.00	Phx Valley	0.050	37
81 = E4	0.63	5,491	3,274	N/A	N/A	31.00	Phx Valley	0.050	31
82 = E4	0.26	5,597	4,224	N/A	N/A	32.00	Phx Valley	0.050	34

Other verifications include indirect methods presented in the Hydrology Manual. The results using indirect method No. 2 – USGS data for Arizona are presented in Figure 4-7. The LP3 regression curve and 75% tolerance limits from the USGS data are plotted along with the 100-year storm event peak discharges and trendline from this study. The results fit within the tolerance limits, and the trendline is very similar to the USGS's.

The second indirect method uses the Boughton and Malvick Envelope Curves, as presented in Figure 4-8. The Boughton and Malvick Envelope Curves are plotted along with the 100-year storm event peak discharge and trendline from this study. The results are all under the Boughton Envelope Curve, and are in agreement with the Malvick Envelope Curve.

The third indirect method of verification uses the USGS regional regression method (Thomas et al., 1995). Table 4-12 shows the USGS envelope curve data, 100-year regional data, and 100-

year low-to-middle elevation peak discharges compared to basin size. The comparison made for the three different indirect verification types indicates that the results from this study are relatively low compared with the regional 100-year discharges, but are all above the low-to-middle elevation-values. The results are in agreement with those studies conducted in comparable areas (Zhao, 2003).

Table 4-12 USGS Regression Data

(Digitized from Figure 41 in Thomas et al., 1995)

Drainage Area [sq-mi]	Envelope [cfs]	Regional [cfs]	Low-to-Middle Elevation [cfs]
0.1	300	182	110
0.2	700	308	156
0.3	1,162	419	192
0.4	1,600	522	222
0.5	2,028	618	249
0.6	2,500	710	273
0.7	3,000	798	296
0.8	3,500	884	317
0.9	3,887	967	336
1	4,403	1,047	355
2	7,878	1,678	505
3	10,676	2,210	621
4	13,809	2,688	720
5	16,047	3,128	806

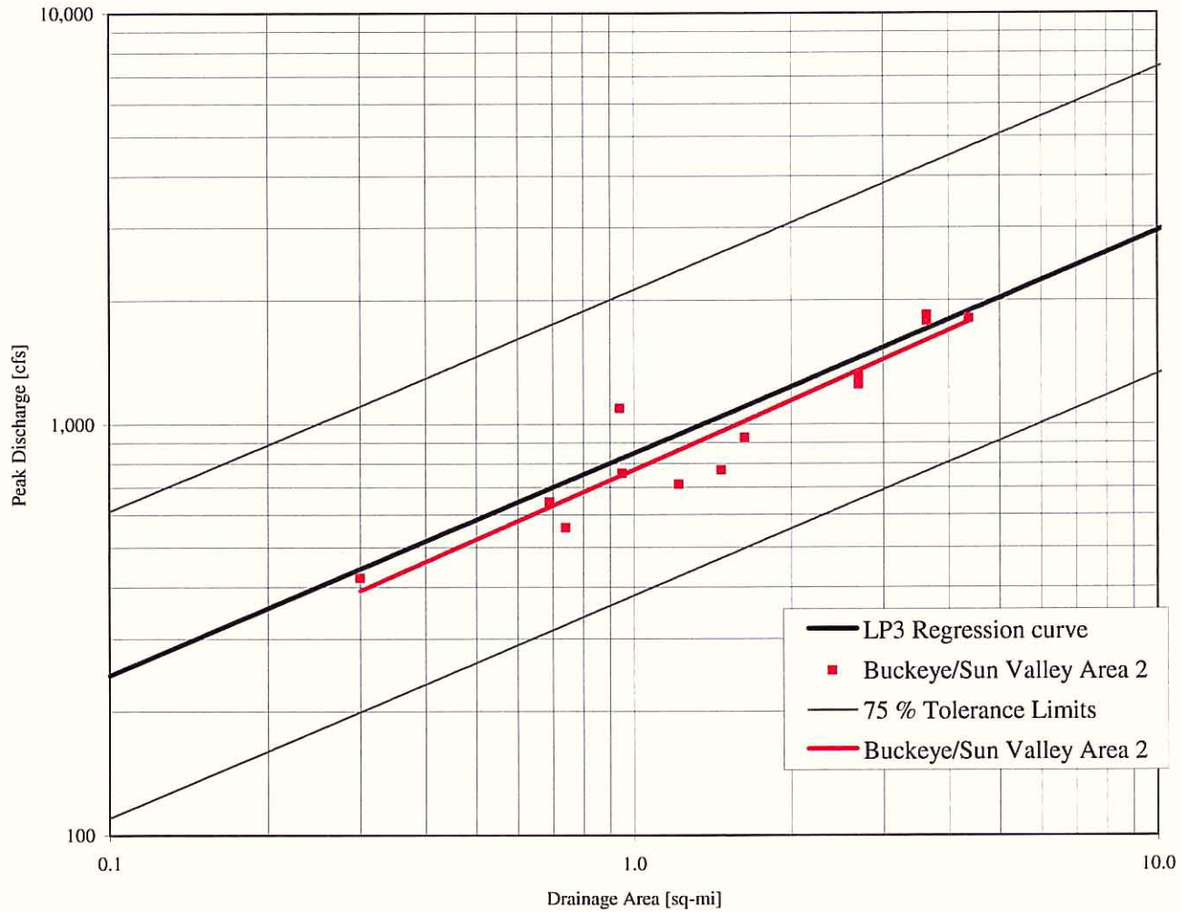

Figure 4-7 Indirect Method Verification - USGS LP3 Analysis

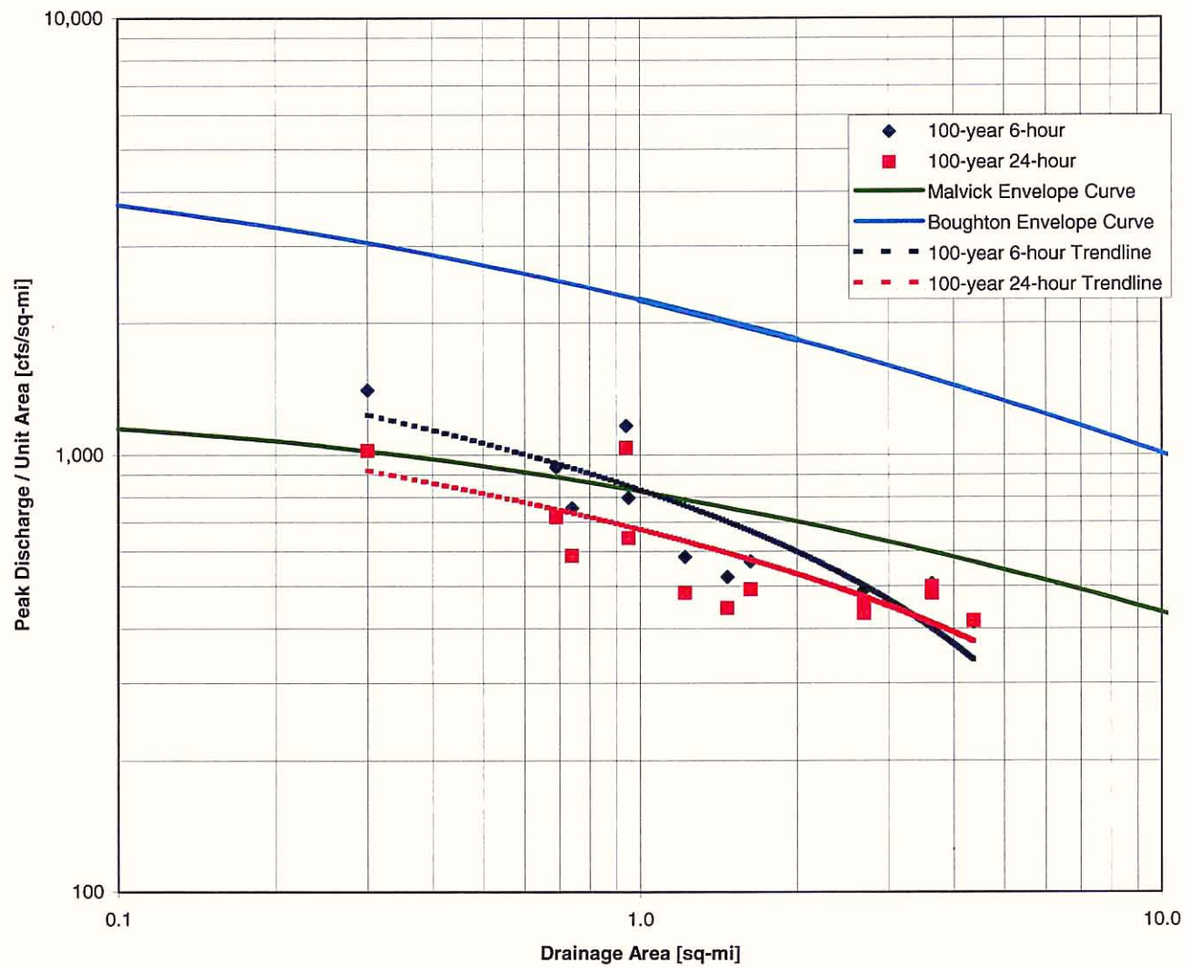

Figure 4-8 Indirect Method Verification - Boughton and Malvick Envelope Curves

5 Hydraulics

5.1 Method Description

The study area includes three separate tributaries to the Hassayampa River. These tributaries are located just south of I-10 on the eastern side of the Hassayampa River in Buckeye, Arizona. The land use for Buckeye south of I-10 is primarily agriculture fields except for this portion of the study. Although some areas in Area 2 are used for agricultural purposes, most of the land is vacant or natural desert rangeland. Just north of I-10 is the SCS Buckeye Flood Retarding Structure (FRS) #1. Before the construction of the FRS, the existing washes delineated in this study were created by runoff from the White Tank Mountains before it combined with the Hassayampa River. The contributing area for runoff after the construction of the FRS is limited to the area south or downstream of the FRS.

The model used to determine the water surface profiles, along with delineating the floodplain boundaries, was HEC-RAS, produced by the US Army Corps of Engineers. The process of creating geometry data and establishing the base for the model relied heavily on tools provided in WMS. Using WMS, cross sections were laid out spatially with an approximate spacing of 200 feet. The roughness values for each cross section were also generated using WMS and the process is outlined in section 5.3.1.2.

5.2 Work Study Maps

Twelve maps are included in this report to display the three tributaries with delineated floodplains and floodways. Sheets 1-3 contain Tributary 4E, sheets 4-5 contain Tributary 3E, and sheets 6-12 contain Tributary 1E. The nomenclature for the tributaries to the Hassayampa River originally began as the North, Central, and South Tributaries. However, the District later developed a more systematic way of naming the washes. Each reach is now named as part of the Hassayampa River East Tributary nomenclature. For example, the north reach is formally called the Hassayampa Tributary 3E. A total of six reaches were delineated and are listed below.

- Hassayampa Tributary 1E
- Hassayampa Tributary 1E1
- Hassayampa Tributary 3E

- Hassayampa Tributary 4E
- Hassayampa Tributary 4E1
- Hassayampa Tributary 4E2

Full scale (1"=200') work-study maps are provided as attachments (Figures 5-1 to 5-13, or Cover and Sheets 1 through 12).

5.3 Parameter Estimation

5.3.1 Roughness Coefficient

There are two options for entering Manning's n-values into the HEC-RAS model. In the first option, the modeler enters three separate values for the LOB, ROB and main channel. The second option allows the modeler to vary the coefficients horizontally. The later option was selected for this study to more accurately model the natural conditions. The first option specifies a change in n-value at the bank points for each cross section, but the change in n-value may not always occur at the bank point. The second option can model the exact location of the change in n-value, whether it is at the bank station or not.

Two steps were used to generate the horizontal variations in the Manning's n-value for each cross section. The first step was to determine the horizontal variations using WMS with aerial photos and field verification. WMS actually prepares the geometry data for HEC-RAS, which includes the hydraulic baseline, bank stations, and cross section locations. A second coverage in WMS divides the entire reach into multiple regions showing the different n-value locations based upon the base materials, obstructions, vegetative covers, and irregularities. When a unique Manning's n-value is assigned for each region, WMS transfers the roughness data from the GIS coverage to each cross section. For this study, the Manning's n GIS coverage was prepared by using aerial photos to identify the apparent locations where the n-value changes along each reach and cross section. Each of these locations was then field verified and photographed during the reconnaissance portion of the study. The GIS map was digitized using discerning characteristics such as reach boundaries and vegetation.

The second step was to assign a Manning's n-value for each region determined in the first step. The Manning's n coefficients were determined using the methodology outlined in "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County,

Arizona" (USGS, 1991). The basic process is to select an n-value for the bed material and then increase the value according to surface irregularities, obstructions, and vegetation as shown in equation 5-1.

$$n = n_b + n_1 + n_2 + n_3 \quad \textbf{Equation 5-1}$$

where

n_b = base value of n for a straight uniform channel

n_1 = value for surface irregularities

n_2 = value for obstructions

n_3 = value for vegetation

The base value for each tributary was determined to be similar with no major differences. It is generally a firm soil with scattered cobble approximately 1"-3". Figure 5-14 is a sample picture of the soil found in the main channel of the Tributary 3E. The same base value is used for each tributary; however, isolated areas contained less cobble and finer sands.

Figure 5-14 Typical Base Material

After the base n-value was selected, the remaining components were added with individual sections for each reach. The vegetation values range from little or no vegetation (Figure 5-15) in some overbank locations to very thick and dense shrubs and trees (Figure 5-16) near the end of

the RID Canal. Most overbank sections had little or no obstructions, while the main channels varied from no obstructions to dense tree trunks and exposed roots. The channel irregularities were negligible with smooth channel characteristics except for some locations where the RID Canal dumps water into the Tributary 1E causing irregularities. These values are shown in Figure 5-17 with each n-value shaded and the location of the photographs taken during the field reconnaissance portion of the study. Each photograph can be found in Appendix E1.2 with an explanation of the location and direction.

Figure 5-15 Typical Overbank Section with Sparse Vegetation

Figure 5-16 Typical Overbank Section with Dense Vegetation

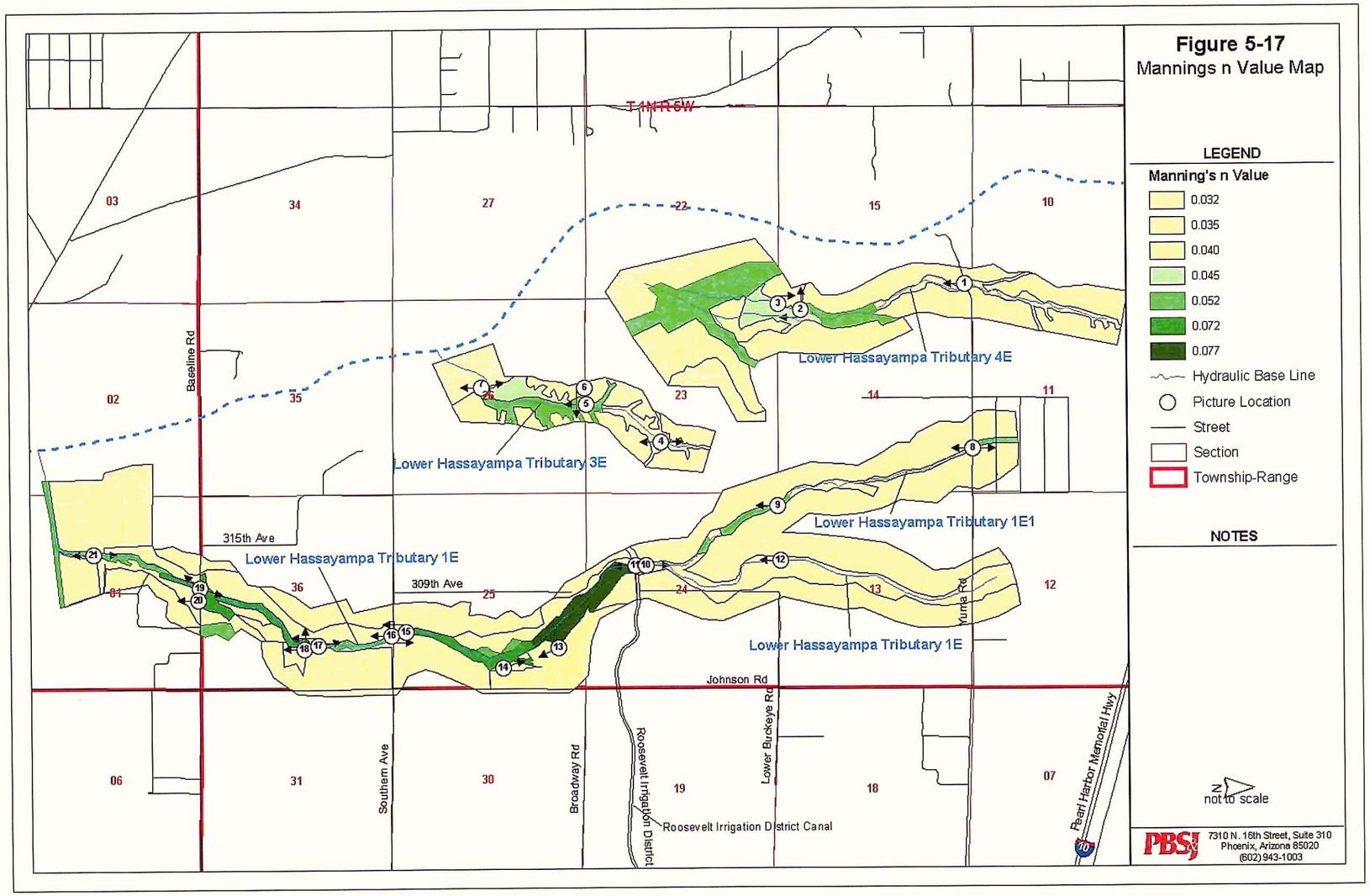

Figure 5-17 Manning's n-value Map

5.3.2 Expansion and Contraction Coefficients

All the expansion and contraction coefficients were set to the HEC-RAS suggestions for gradual transitions of 0.1 for contraction and 0.3 for expansion. The only exceptions were on Tributary 1E near the culverts modeled at Southern and Baseline Roads. These coefficients were set to 0.3 and 0.5 for contraction and expansion, respectively. Also, Tributary 3E included previously listed coefficients in the location of the in-line weir used to simulate the road parallel to the abandoned RID canal crossing the reach.

5.4 Cross Section Description

Initially, the cross sections were created using AutoCAD and its Land Desktop package. The minimum spacing for cross sections as outlined in the Hydraulics Manual is 500 feet. Using AutoCAD, each reach was set up as an alignment and STA labels generated. A quick and easy way to spatially generate cross sections spaced at 500 feet was to use the STA ticks and expand them to the appropriate width across the reach and floodplain. Additional modifications were performed to re-align parts of the sections perpendicular to the flow. Where needed, additional cross sections were added, removed, or redistributed to improve the simulation.

WMS was the program used to prepare the cross sections and other geometry data for HEC-RAS. The AutoCAD file with the cross sections was read into WMS. The process for extracting each cross section profile was completed using the WMS Riverine Module. WMS uses the polylines from AutoCAD and contour data to create a cross section profile. When the WMS procedure is completed, it generates the HEC-RAS *.g01 geometry file.

The first simulations in HEC-RAS used 500-foot cross section spacing. As a result, several warning messages appeared at each cross section. The description of these warnings is outlined in Section 5.7.2. To eliminate the multiple warnings, cross section spacing was reduced to approximately 200 feet.

5.5 Modeling Considerations

5.5.1 Hydraulic Jump and Drop Analysis

N/A

5.5.2 Bridges and Culverts

Two bridges were modeled within HEC-RAS. Both are located on tributary 1E. The reach intersects Southern and Baseline Roads with culverts at both locations. The input data for the HEC-RAS model such as location, length, slope, diameter, and type were obtained from a field inspection. Appendix C.3 lists the field notes and pictures obtained from the inspection.

5.5.3 Levees and Dikes

Tributary 1E contains two man-made levees. The first is located just south of Southern Road and runs parallel to the reach for about one-half mile. The second levee is on the south end of the reach just downstream of Baseline Road. Both of the levees were constructed to contain the large runoff events and prevent flooding of the agriculture areas adjacent to the reach. Figures 5-18 and 5-19 show a side-by-side comparison of the location of the south levee in 1949 and 2003.

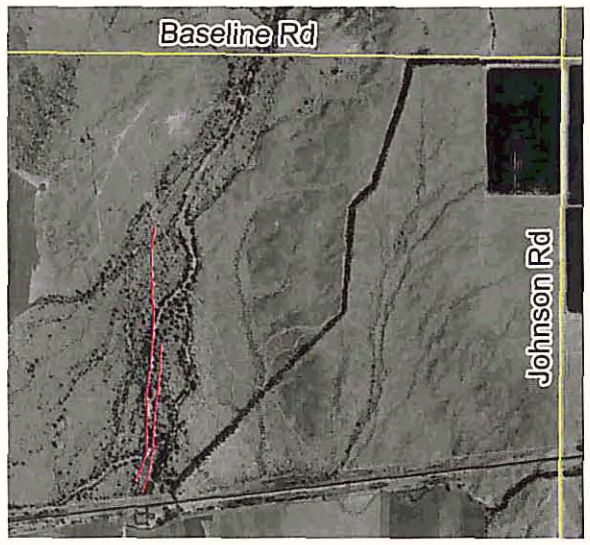

Figure 5-18 1949 aerial photo without levee

Figure 5-19 2003 aerial photo with levee

Note: the red lines depict the approximate location of the levee.

The levees were first modeled with a virtual HEC-RAS levee placed on the top of the levee. This prevents the model from using the area on the opposite side of the levee in the conveyance calculations until the levee is overtopped. After discussion with the District, another approach was used to determine the most conservative result. The HEC-RAS levee was removed, allowing

the model to distribute the flow on both sides of the levee. To be more conservative, the ineffective flow option was placed along the levee. The ineffective flow area will contain water but have no conveyance. This means the velocity is assumed to be zero. This ineffective flow remains until the flood water surface elevation (WSE) in the channel reaches the top of the levee and spills over.

5.5.4 Islands and Flow Splits

Two islands of significance exist in the study. The first is located in tributary 4E just upstream of the confluence with the Hassayampa River. This island was treated with a flow split in the model and is split into two reaches as tributary 4E and tributary 4E1. HEC-RAS allows the modeler to manually enter the distribution of flow between the two reaches or have the model automatically compute the flow distribution with the flow optimization algorithm. The later was used to more accurately obtain the flow distribution.

The second island is found in tributary 1E in reach 2. Figure 5-20 identifies the method used to model the split flow in HEC-RAS. The decision was made to have one reach and spread the cross sections over the entire region. This method was chosen because the 100-year flood event inundates the entire region and the length of the split flow is relatively short before the reaches merge.

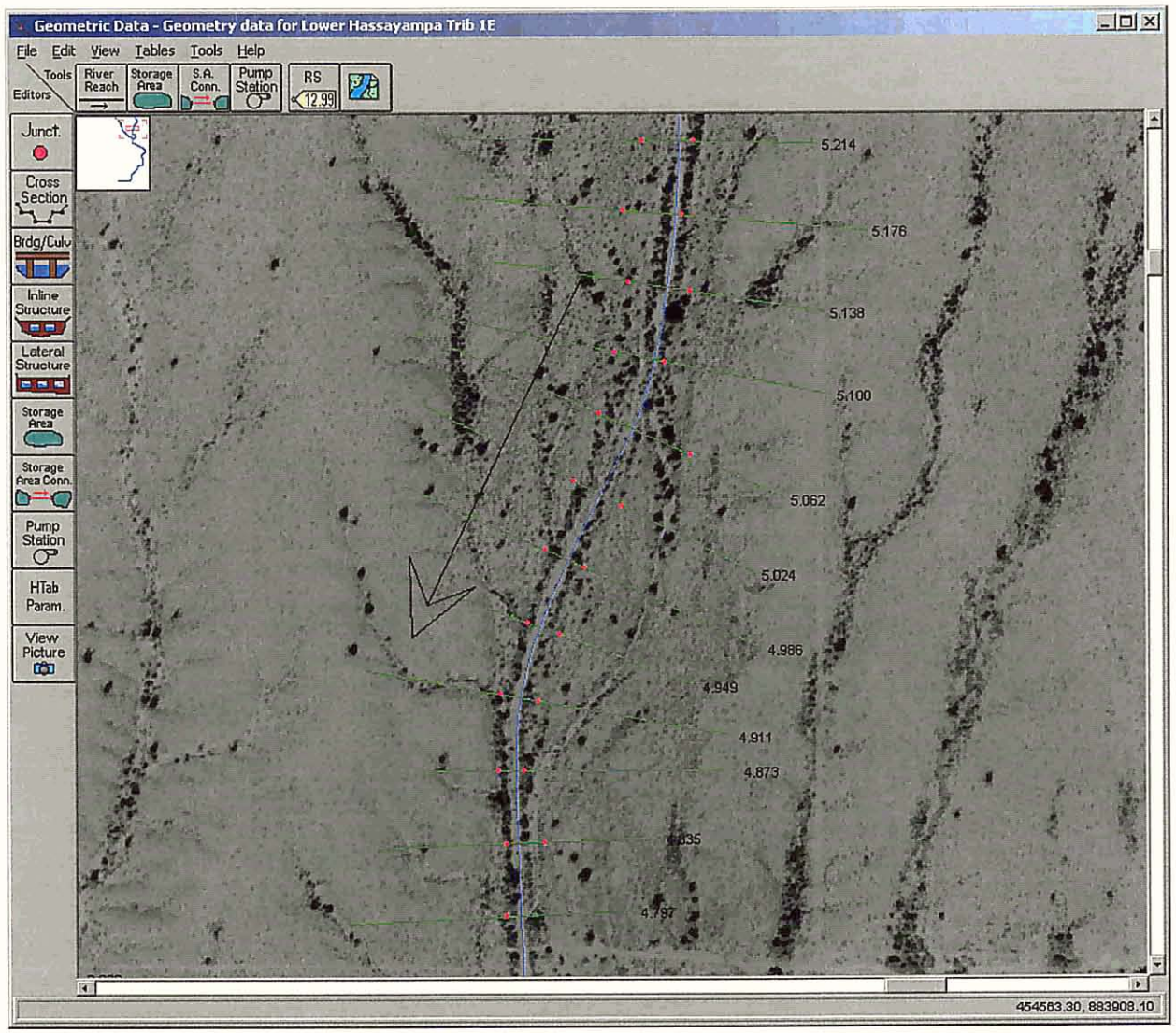

Figure 5-20 HEC-RAS screen shot of split flow in Tributary 1E reach 2

5.5.5 Ineffective Flow Areas

When using an ineffective flow area in HEC-RAS, the model includes the area in storage calculations and wetted cross-section parameters but does not include the area as part of the active flow area. Ineffective flows were used in this study to include all possible floodplain areas. In some cases, the extracted cross-sections would sufficiently convey the 100-year flood event. However, the aerial photos or contours may show additional sources of historical flooding outside the delineated boundary. Ineffective flow areas were used when cross-sections were extended to cover the floodplain, and the extension was set as an ineffective flow area. Another case where ineffective flow was used is in two locations where levees had been constructed.

Both levees are found in the Hassayampa Tributary 1E in Reach 1. These levees are also documented in sections 5.5.3.

5.5.6 Supercritical Flow

N/A

5.6 Floodway Modeling

The floodway modeling methodology comes from the procedures outlined in the Hydraulics Manual. The first step was to use the encroachment method #4 with equal conveyance reduction. The guidelines allow a maximum of one-foot increase in water surface elevation. Once HEC-RAS generates the method #4 encroachments, method #1 is applied to the model. This method requires a manual selection for the location of the floodway encroachment. Method #4 acts as the starting basis for the method #1 selection. Using method #1 turns into an iterative process in some locations to keep the increase in water surface elevation under one foot.

5.7 Problems Encountered During the Study

5.7.1 Special Problems and Solutions

5.7.1.1 Datum Conversion

Although the vertical datum conversion from NGVD 1929 to NAVD 1988 was performed using the CORPSCON program (USACE), the District wanted to provide an average conversion factor that can be used to revert back to the NGVD 1929 elevations. Using the guidelines set forth in Appendix B of FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners, it was determined that 2.08 ± 0.25 feet can be used for an average conversion factor for the study area. Table 5-1 gives the conversion factors in a reach by reach format.

Table 5-1 Datum Conversion Factors

Stream/Reach	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset	Begin Station	End Station
Tributary 1E	2.070	2.100	2.082	0.018	Entire Reach	
Tributary 3E	2.077	2.083	2.080	0.003	Entire Reach	
Tributary 4E	2.080	2.087	2.083	0.004	Entire Reach	

5.7.1.2 Negative Surcharges

For small number of cross-sections, it was impossible to eliminate negative surcharges. The range of negative surcharges is from 0.04 feet to 0.01 feet. Encroachment method 4 was used initially to set encroachment stations to a water surface elevation rise of one foot in order to give a general idea of where the encroachments. Method 1 was then used to set the final encroachment stations, ensuring that the floodway surcharge was no greater than one foot. Negative surcharges can be caused by excessive encroachment or insufficient encroachment at downstream cross-sections.

5.7.1.3 Baseline for Tributary 4E, Reach 1 at Limit of Detailed Study

During low flow periods, Tributary 4E, Reach 1, follows the presently identified baseline. For the 100-year flood, the baseline will connect with the Hassayampa River.

5.7.1.4 Extended Cross-Sections

Cross-sections 0.065 and 0.125 of Tributary 4E1, Reach 1 and 0.883 of Tributary 1E, Reach 1do not contain the floodplain limits and are extended.

5.7.2 Modeling Warning and Error Messages

No error messages were found in the hydraulic model; however, many warnings show up in each of the three delineated reaches. The following is a comprehensive list of the warnings found in the HEC-RAS model:

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.

These messages are common and required additional investigation. The initial delineation included a cross-section spacing of 500 feet. As a result, the conveyance ratio and energy loss warnings appeared at virtually every cross section. A simple test was performed to determine if decreasing the cross-section spacing would eliminate the warnings. Even with a spacing of 100 feet, the warnings remained for the majority of the cross-sections in the models. The water surface elevations from the multiple tests showed a 0.5-foot average difference between the 500

and 200 foot spacing and little change between the 200 and 100 foot spacing. The final cross-section spacing used was approximately 200 feet.

The divided flow warning exists when the flow is split within the cross-section. The divided flows in this study were not significant enough to consider using separate reaches in the HEC-RAS model.

5.8 Calibration

The area does not contain any gage data to properly calibrate the HEC-RAS model.

5.9 Final Results

5.9.1 Hydraulic Analysis Results

Tables 5-2A, 5-2B, and 5-2C give summaries of the results from the HEC-RAS models for streams, culverts, and in-line weirs, respectively.

Table 5-2 HEC-RAS Normal Stream Results Summary

	River	Sta	Q Total	Min Ch Elev	W.S. Elev	Crit.W.S.	E.G. Elev	E.G. Slope	Vel Ch	Flow Area	Top Width	Froude #
Tributary	Reach		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1E	2	5.971	713	1032.9	1035.1		1035.2	0.004045	2.64	292.8	360.79	0.47
1E	2	5.933	713	1032.4	1034.1		1034.2	0.005517	2.75	248.36	303.66	0.54
1E	2	5.895	713	1031.2	1032.9		1033.1	0.005866	3.72	210.76	238.83	0.59
1E	2	5.857	713	1030.2	1032.03		1032.2	0.003691	2.97	263.83	280.9	0.47
1E	2	5.82	713	1029.6	1030.83	1030.7	1031	0.010087	3.74	204.23	319.48	0.73
1E	2	5.782	713	1027.5	1028.96	1028.8	1029.2	0.008577	3.86	212.66	352.25	0.69
1E	2	5.744	713	1026	1027.8	1027.4	1028	0.004348	3.37	235.92	292.09	0.53
1E	2	5.706	713	1025	1026.57	1026.5	1026.8	0.00804	4.15	202.29	280.02	0.69
1E	2	5.668	713	1023.7	1025.77	1025.3	1025.9	0.00286	2.97	285.35	288.03	0.43
1E	2	5.63	713	1022.6	1024.55	1024.5	1024.9	0.010597	5.13	174.73	254.2	0.8
1E	2	5.592	713	1021.5	1023.45		1023.6	0.00401	3.21	253.52	301.32	0.5
1E	2	5.554	713	1020.5	1022.61		1022.8	0.004772	3.56	250.47	322.78	0.54
1E	2	5.517	713	1019.8	1021.52		1021.7	0.005838	3.72	222.04	270.85	0.59
1E	2	5.479	713	1018.4	1020.64		1020.8	0.00369	3.27	274.91	344.99	0.48
1E	2	5.441	713	1017.3	1019.48		1019.7	0.008417	4.17	197.31	253.67	0.7
1E	2	5.403	713	1016	1018.54		1018.7	0.003436	2.87	266.82	259.6	0.45
1E	2	5.365	713	1015.2	1017.42	1017.3	1017.7	0.007497	4.53	202.5	300.43	0.73
1E	2	5.327	713	1014.3	1016.26		1016.4	0.005178	3.17	270.31	363.67	0.54

Tributary	River Reach	Sta	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Crit.W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Ch (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #
1E	2	5.289	713	1013.2	1015.45		1015.6	0.003554	2.87	283.33	353.05	0.46
1E	2	5.252	713	1012.5	1014.58		1014.7	0.004876	3.4	242.07	323.37	0.54
1E	2	5.214	713	1011.4	1013.65		1013.8	0.004463	3.27	258.17	304.75	0.52
1E	2	5.176	713	1011	1012.75		1012.9	0.004224	3.11	251.54	260.9	0.51
1E	2	5.138	713	1010.1	1011.83	1011.5	1012	0.004829	3.03	249.84	305.36	0.52
1E	2	5.1	713	1009.3	1010.81		1011	0.005472	3.17	246.89	322.48	0.55
1E	2	5.062	713	1008	1009.52	1009.3	1009.7	0.007756	3.16	225.8	298.37	0.63
1E	2	5.024	713	1006.8	1007.99		1008.2	0.00628	2.69	216.45	247.84	0.56
1E	2	4.986	713	1005.3	1006.59		1006.8	0.007432	3.37	188.2	180.56	0.63
1E	2	4.949	713	1004	1005.3	1004.9	1005.5	0.005812	2.98	195.27	186.25	0.56
1E	2	4.911	713	1002.6	1004.17		1004.4	0.00612	3.55	209.85	204.91	0.59
1E	2	4.873	713	1001.1	1003.22		1003.4	0.004102	3.36	231.05	227.38	0.5
1E	2	4.835	713	999.96	1002.39		1002.6	0.003678	3.64	220.29	211.9	0.49
1E	2	4.797	713	998.94	1001.78	1001.3	1001.9	0.002923	3.3	261.81	222.03	0.44
1E	2	4.759	713	998.24	1001.09		1001.3	0.003615	3.89	244.96	233.65	0.5
1E	2	4.721	713	997.08	1000.11	1000.1	1000.4	0.005165	4.74	225.4	384.78	0.6
1E	2	4.683	713	996.21	998.97		999.29	0.005732	4.8	175.91	188.15	0.63
1E	2	4.646	713	995.13	998.15	997.89	998.29	0.003953	3.7	287.94	422.7	0.51
1E	2	4.569	713	993.77	996.49		996.67	0.004291	3.98	234.16	257.91	0.53
1E	2	4.506	713	992.56	994.09	994	994.41	0.012787	4.5	158.74	200.88	0.87
1E	2	4.45	713	990.72	992.09		992.21	0.004541	2.84	262.04	313.11	0.51
1E	2	4.41	713	989.24	990.75		990.97	0.008235	3.83	199.07	244.71	0.68
1E	2	4.372	713	987.79	989.46		989.63	0.005434	3.33	218.83	223.29	0.56
1E	2	4.334	713	986.47	988.17		988.34	0.007577	3.45	217.25	269.63	0.64
1E	2	4.296	713	985.26	987.37		987.47	0.002707	2.6	290.27	343.26	0.41
1E	2	4.259	713	984.2	986.59		986.74	0.005015	3.47	247.91	314.23	0.55
1E	2	4.221	713	983.28	985.24	985.12	985.45	0.008607	3.98	208.78	301.29	0.7
1E	2	4.183	713	982.46	984.01		984.14	0.004908	3.08	259.9	340.88	0.53
1E	2	4.145	713	980.83	983.05		983.19	0.004615	3.22	248.64	321.29	0.57
1E	1	4.072	1485	977.71	981.98		982.14	0.002098	3.55	531.37	481.1	0.4
1E	1	4.034	1485	977.17	981.23		981.53	0.00466	4.88	372.21	331.69	0.58
1E	1	3.996	1485	976.75	980.19		980.48	0.005981	4.73	361.84	329.41	0.64
1E	1	3.958	1485	976.36	978.99		979.22	0.00641	4.24	396.52	407.59	0.67
1E	1	3.92	1485	974.65	977.9		978.17	0.004448	4.24	364.9	209.55	0.5
1E	1	3.883	1840	972.89	977.27		977.36	0.003354	2.48	796.86	389.62	0.26
1E	1	3.845	1840	973.18	976.45		976.53	0.005039	2	848.41	569.17	0.27
1E	1	3.807	1840	972.15	975.62		975.68	0.004391	1.99	941.09	580.19	0.25
1E	1	3.769	1840	970.6	974.96		975.02	0.00316	2.17	1003.88	485.93	0.23
1E	1	3.731	1840	969.91	974.45		974.5	0.002401	2.06	1078.19	490	0.2
1E	1	3.692	1840	968.51	973.46		973.62	0.008883	3.55	642.66	433.02	0.38
1E	1	3.653	1840	967.7	971.62		971.77	0.008967	3.05	602.96	279.19	0.37
1E	1	3.614	1840	965.95	969.91		970.03	0.008034	2.81	654.65	315.88	0.34
1E	1	3.576	1840	965.03	968.2		968.34	0.008864	2.96	630.86	353.04	0.36
1E	1	3.538	1840	964.98	967.77		967.83	0.001097	1.05	1190.56	504.35	0.13

Tributary	River Reach	Sta	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Crit.W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Ch (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #
1E	1	3.5	1840	964.98	967.32	966.21	967.4	0.005747	2.18	845.37	657.4	0.28
1E	1	3.462	1840	964.39	965.81		965.94	0.007291	1.74	752.49	682.14	0.29
1E	1	3.425	1840	962.84	964.66		964.73	0.004649	1.76	908.4	673.91	0.25
1E	1	3.387	1840	961.58	963.67		963.74	0.005836	1.93	896.1	746.89	0.28
1E	1	3.349	1840	958.53	961.87		961.99	0.013483	2.81	689.57	674.94	0.42
1E	1	3.311	1840	956.92	960.4		960.47	0.004758	2.2	868.2	571.03	0.27
1E	1	3.273	1840	956.99	959.61		959.68	0.00335	2.04	879.55	739.89	0.29
1E	1	3.235	1840	957.19	958.92		958.97	0.003603	1.71	982.62	1113.78	0.28
1E	1	3.197	1840	957.09	957.98	957.74	958.08	0.005325	1.67	786.93	1123.88	0.41
1E	1	3.122	1840	954.55	955.54	955.26	955.68	0.008032	1.69	696.04	890.96	0.34
1E	1	3.084	1840	953.01	954.13	953.7	954.24	0.004393	1.38	725.79	776.25	0.3
1E	1	3.046	1840	951.29	952.6		952.78	0.009127	1.54	587.6	712.53	0.37
1E	1	2.972	1840	947.98	951.2	950.49	951.26	0.003099	1.83	946.78	980.19	0.27
1E	1	2.935	1840	947.76	950.4	949.88	950.5	0.006366	2.58	729.21	762.44	0.39
1E	1	2.897	1840	945.11	948.35	948.05	948.51	0.014688	3.27	582.82	675.34	0.54
1E	1	2.852	1840	942.97	946.83		946.91	0.003628	2.32	834.64	567.42	0.28
1E	1	2.814	1840	940.58	944.72	944.09	945.28	0.027753	6.11	316.04	271.6	0.75
1E	1	2.776	1840	935.88	942.83		943.05	0.005601	3.72	494.84	131.63	0.34
1E	1	2.738	1840	935.33	942.13		942.23	0.002883	2.64	696.71	221.98	0.26
1E	1	2.7	1840	933.97	941.48		941.61	0.003361	2.92	649.27	350.39	0.29
1E	1	2.662	1840	932.7	940.42		940.63	0.007733	3.98	550.02	489.89	0.39
1E	1	2.624	1840	932.37	939.14		939.27	0.005768	3.37	645.08	535.6	0.33
1E	1	2.587	1840	931.08	938.3		938.4	0.003566	2.72	763.08	504.93	0.26
1E	1	2.549	1840	930.62	937.24		937.4	0.00821	3.34	580.37	513.14	0.38
1E	1	2.511	1840	929.6	935.96		936.1	0.005151	3.16	635.36	494.75	0.31
1E	1	2.473	1840	928.97	934.2		934.49	0.013925	4.55	434.7	295.52	0.5
1E	1	2.445	1840	925.8	933.32	931.82	933.4	0.003699	2.49	820	616.99	0.27
1E	1	2.438	Culvert									
1E	1	2.432	1840	925.1	933.32	930.89	933.34	0.000511	1.39	1636.96	1039.46	0.14
1E	1	2.397	1840	925.18	932.67	930.56	933.03	0.005332	4.85	379.33	642.78	0.47
1E	1	2.359	1840	924.16	931.69	930.02	932	0.004852	4.49	414.72	748.59	0.47
1E	1	2.321	1840	923.1	930.85	928.56	931.14	0.00376	4.31	426.86	973.81	0.43
1E	1	2.283	1840	922.06	929.19	928.14	929.89	0.011304	6.72	273.88	658.79	0.67
1E	1	2.245	1840	920.8	927.63	926.41	928.41	0.011248	7.1	259.21	803.7	0.65
1E	1	2.208	1840	919.91	926.26	925.17	926.54	0.00693	4.69	449.93	713.98	0.49
1E	1	2.17	1840	919.28	925.15	923.97	925.36	0.004651	3.79	503.45	740.65	0.42
1E	1	2.132	1840	919.47	923.88	923.39	924.14	0.00853	4.37	477.61	956.86	0.57
1E	1	2.094	1840	918.12	922.92	922.54	923.02	0.003654	2.59	745.11	1053.56	0.34
1E	1	2.056	1840	917.85	921.31	920.89	921.69	0.013244	4.9	375.19	729.6	0.66
1E	1	2.018	1840	917.34	919.37	919.3	919.78	0.021439	5.41	358.08	350.53	0.85
1E	1	1.98	1840	915.76	917.83		918.01	0.004499	1.44	569.32	469.94	0.25
1E	1	1.942	1840	913.68	916.7		916.87	0.007411	2.47	573.85	550.57	0.34
1E	1	1.905	1840	912.11	915.8		915.89	0.003937	2.31	810.52	681.26	0.26
1E	1	1.867	1840	910.82	915.01		915.12	0.005276	2.88	689.15	562.66	0.31

Tributary	River Reach	Sta	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Crit.W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Ch (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #
1E	1	1.829	1840	909.8	914.16		914.25	0.003606	2.48	754.73	504.11	0.26
1E	1	1.791	1840	909.24	913.29		913.44	0.004456	2.59	627.8	399.23	0.28
1E	1	1.753	1840	907.65	912.6		912.69	0.002776	2.19	772.82	380.82	0.23
1E	1	1.715	1840	908.98	911.67		911.87	0.005038	4.06	566.39	331.97	0.53
1E	1	1.677	1840	908.63	910.61		910.8	0.005213	2.77	549.26	396.65	0.45
1E	1	1.64	1840	907.51	910.03		910.18	0.004027	1.67	659.27	423.56	0.25
1E	1	1.602	1840	905.46	908.48		908.66	0.008391	3.02	542.77	362.14	0.37
1E	1	1.564	1840	903.79	907.29		907.42	0.004557	2.47	654.01	374.75	0.3
1E	1	1.526	1840	903.14	906.38		906.5	0.004362	2.36	693.54	412.04	0.28
1E	1	1.488	1840	902.09	905.47		905.55	0.002909	1.95	807.84	406.74	0.23
1E	1	1.45	1840	901.42	904.87		904.98	0.005242	2.12	703.61	379.08	0.29
1E	1	1.412	1840	901.99	903.21		903.36	0.008912	1.53	614.41	351.93	0.32
1E	1	1.374	1840	899.69	902.66		902.71	0.001972	1.31	1048.44	480.59	0.18
1E	1	1.33	1840	896	901.9	900.66	902.01	0.00609	2.71	715.6	425.18	0.32
1E	1	1.323	Culvert									
1E	1	1.312	1840	895.5	900.91		901.05	0.005055	3.02	661.89	525.37	0.33
1E	1	1.223	1840	894.87	898.35		898.46	0.004631	2.45	691.3	606.21	0.32
1E	1	1.185	1840	891.67	897.21	896.22	897.38	0.005917	3.18	567.2	353.05	0.36
1E	1	1.147	1840	891.54	894.77		895.26	0.022071	5.82	334.93	214.41	0.66
1E	1	1.109	1840	890.15	894.38		894.5	0.001209	2.84	747.76	272.92	0.27
1E	1	1.072	1840	889.38	893.22	893.22	893.79	0.018717	7.01	330.06	264.53	0.79
1E	1	1.035	1840	887.45	892.14	890.56	892.27	0.00216	2.91	666.15	326.15	0.31
1E	1	0.997	1840	886.6	891.52	890.79	891.69	0.00388	3.66	559.16	342.95	0.4
1E	1	0.959	1840	886.08	890.65	889.91	890.87	0.004712	4.09	518.53	500.32	0.43
1E	1	0.921	1840	883.54	888.92	888.35	889.41	0.012084	5.69	336.46	354.97	0.64
1E	1	0.883	1840	883.53	888.61	886.4	888.69	0.001439	2.02	816.89	758.51	0.22
1E	1	0.845	1840	882.26	887.76	886.7	888.11	0.007126	5.08	416.19	970.1	0.51
1E	1	0.807	1840	881.36	886.49	885.43	886.79	0.005942	4.71	453.12	800.78	0.47
1E	1	0.77	1840	879.87	885.68	883.6	885.93	0.003181	3.99	461.5	1071.84	0.37
1E	1	0.732	1840	879.39	885.14	882.88	885.35	0.002565	3.66	502.44	1417.21	0.33
1E	1	0.695	1840	879.28	884.29	882.7	884.63	0.005403	4.74	388.53	2101.77	0.45
1E	1	0.656	1840	877.73	882.15	881.54	882.88	0.014638	6.84	269.18	1985.71	0.72
1E	1	0.618	1840	876.82	880.99	880.54	881.15	0.004775	3.98	666.44	2226.17	0.42
1E	1	0.58	1840	876.54	879.43	879.25	879.74	0.011433	5.08	424.39	962.57	0.62
1E	1	0.542	1840	875.92	878.35	878.35	878.43	0.00409	2.68	846.28	1841.36	0.36
1E	1	0.494	1840	875.29	877.59		877.63	0.002597	2.19	1119.25	1678.23	0.28
1E	1	0.418	1840	872.76	876.37	876.17	876.46	0.003696	3.29	909.83	1438.42	0.36
1E	1	0.342	1840	870.9	874.92	874.67	875.03	0.003412	3.29	818.07	1223.42	0.35
1E	1	0.266	1840	870.13	873.68	873.14	873.76	0.002925	2.88	854.23	1117.04	0.33
1E	1	0.19	1840	867.74	872.24	871.8	872.4	0.004007	3.69	598.58	676.93	0.39
1E1	1	1.927	772	1036	1038.19	1037.7	1038.3	0.007018	3.19	249.77	217.25	0.47
1E1	1	1.889	772	1034.6	1036.56		1036.8	0.008428	3.8	203.93	152.83	0.52
1E1	1	1.851	772	1033.2	1035.35		1035.5	0.004905	2.97	266.3	203.97	0.41
1E1	1	1.813	772	1032.2	1034.67		1034.8	0.002657	2.46	314.37	169.23	0.32

Tributary	River Reach	Sta	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Crit.W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Ch (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #
1E1	1	1.775	772	1031.2	1033.06	1033.1	1033.6	0.018468	5.92	130.32	120.8	1.01
1E1	1	1.737	772	1028.9	1031.16		1031.4	0.006285	4.23	182.45	112.69	0.59
1E1	1	1.699	772	1027.6	1029.7		1030	0.008415	4.35	177.34	135.97	0.67
1E1	1	1.661	772	1026.4	1028.62		1028.8	0.004187	3.56	217.14	140.63	0.5
1E1	1	1.624	772	1025.2	1027.32		1027.7	0.008005	4.74	162.75	107.61	0.68
1E1	1	1.586	772	1024	1026.2		1026.4	0.004786	3.65	211.68	144.4	0.53
1E1	1	1.548	772	1022.7	1024.88	1024.5	1025.2	0.007945	4.46	173.26	173.79	0.67
1E1	1	1.51	772	1021.6	1023.57		1023.8	0.005876	3.87	199.52	144.28	0.58
1E1	1	1.472	772	1019.8	1022.1		1022.4	0.007882	4.67	165.42	111.82	0.68
1E1	1	1.434	772	1018.8	1020.99		1021.2	0.004821	3.6	214.67	146.71	0.52
1E1	1	1.396	772	1017.6	1019.98	1019.3	1020.2	0.004953	3.83	201.55	230.14	0.52
1E1	1	1.358	772	1016.3	1018.59		1019	0.008149	4.76	162.11	96.83	0.65
1E1	1	1.321	772	1014.9	1017.21		1017.4	0.006562	3.88	198.87	161.7	0.62
1E1	1	1.283	772	1014	1016.43		1016.6	0.002886	3.2	241.6	129.78	0.41
1E1	1	1.245	772	1013.4	1015.7		1015.9	0.004132	3.59	215.14	122.93	0.48
1E1	1	1.207	772	1012.6	1014.81		1015	0.004646	3.73	206.97	128.12	0.52
1E1	1	1.169	772	1011.6	1013.58		1013.8	0.008621	3.76	219.66	261.97	0.63
1E1	1	1.131	772	1010.4	1012.5		1012.6	0.003937	2.91	265.5	197.41	0.44
1E1	1	1.093	772	1010	1011.56		1011.7	0.005367	3.09	250.13	213.77	0.5
1E1	1	1.052	772	1008.9	1010.36		1010.5	0.005836	3.18	242.65	211.09	0.52
1E1	1	1.008	772	1007.7	1009.35		1009.5	0.003584	2.52	306.54	272.67	0.42
1E1	1	0.968	772	1006.9	1008.35		1008.5	0.005985	3.05	253.18	231.6	0.51
1E1	1	0.929	772	1005.9	1007.33		1007.5	0.004262	2.86	282.06	296.77	0.47
1E1	1	0.89	772	1004.6	1006.39		1006.6	0.004397	3.24	237.95	182.46	0.5
1E1	1	0.852	772	1003.7	1005.46		1005.6	0.005092	3.13	246.43	219.06	0.52
1E1	1	0.814	772	1003.1	1004.45		1004.6	0.005025	2.98	258.84	235.12	0.5
1E1	1	0.777	772	1002.2	1003.81		1003.9	0.002462	2.3	336.38	276.34	0.37
1E1	1	0.739	772	1000.8	1003.04		1003.2	0.005513	3	257.31	163.79	0.42
1E1	1	0.701	772	1000.1	1002.01		1002.1	0.004934	2.89	266.75	170.46	0.41
1E1	1	0.663	772	999.36	1001.16		1001.3	0.003909	2.52	305.85	234.89	0.39
1E1	1	0.625	772	997.84	1000.34	999.55	1000.5	0.003966	2.85	270.48	171.32	0.4
1E1	1	0.587	772	997.22	999.18	998.61	999.35	0.008267	3.32	232.56	234.7	0.49
1E1	1	0.549	772	996.07	997.78		997.92	0.006192	2.98	259.49	196.93	0.46
1E1	1	0.511	772	994.58	996.69		996.81	0.004973	2.74	281.93	194.89	0.4
1E1	1	0.474	772	993.8	995.53	994.97	995.66	0.006687	2.9	266.47	230.26	0.45
1E1	1	0.436	772	992.37	993.76		993.93	0.011617	3.39	227.97	208.39	0.57
1E1	1	0.398	772	990.83	992.37		992.46	0.004918	2.32	332.31	299.43	0.39
1E1	1	0.359	772	990	991.17		991.27	0.006832	2.6	297.63	342.56	0.48
1E1	1	0.319	772	988.16	989.93		990.06	0.004973	2.95	261.79	286.58	0.54
1E1	1	0.293	772	987.23	989.3		989.45	0.00385	3.06	252	203.65	0.49
1E1	1	0.254	772	986.34	988.32		988.44	0.006233	2.83	272.88	214.35	0.44
1E1	1	0.216	772	985.47	987.4		987.49	0.003665	2.3	338.38	262.28	0.34
1E1	1	0.178	772	984.61	986.31		986.53	0.006348	3.8	203.22	172.39	0.62
1E1	1	0.141	772	983.8	985.41		985.54	0.003888	3.16	279.53	318.22	0.49

Tributary	River Reach	Sta	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Crit.W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Ch (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #
1E1	1	0.102	772	981.93	984.28		984.51	0.006541	3.91	197.7	168.96	0.63
1E1	1	0.062	772	979.57	983.01		983.27	0.00531	4.13	186.94	120.73	0.58
3E	1	1.553	758	975.75	980.26		980.55	0.0043	4.33	175.07	61.04	0.45
3E	1	1.515	758	975.25	978.87	978.15	979.38	0.008237	5.72	132.47	166.36	0.65
3E	1	1.478	758	974.47	978.71	976.45	978.78	0.001093	2.1	361.17	171	0.23
3E	1	1.44	758	972.65	978.71	974.05	978.72	0.000082	0.83	916.39	269.12	0.07
3E	1	1.421	758	971.21	978.7		978.71	0.000041	0.76	1079.68	188.72	0.05
3E	1	1.402	758	971.23	978.69		978.71	0.000059	1.13	869.63	305.76	0.08
3E	1	1.378	758	969.69	978.69	971.48	978.7	0.000012	0.52	1702.8	295.77	0.03
3E	1	1.359	Inl Struct									
3E	1	1.326	758	964.75	967.85		968.02	0.003915	3.41	231.39	160.13	0.45
3E	1	1.288	758	963.35	965.76	965.74	966.37	0.021149	6.26	121.03	96.54	0.99
3E	1	1.25	758	960.53	964.36		964.57	0.004428	4.05	219.06	150.03	0.49
3E	1	1.213	758	959.99	962.5	962.44	962.99	0.016935	5.96	138.71	119.94	0.9
3E	1	1.175	758	957.5	960.29		960.49	0.008858	3.86	217.9	227.9	0.63
3E	1	1.137	758	956.46	958.91		959.08	0.005667	3.73	240.21	226.38	0.53
3E	1	1.099	758	955.19	957.42		957.71	0.009189	4.88	189.32	174.24	0.68
3E	1	1.061	758	952.35	956.25		956.45	0.004442	3.92	226.35	166.48	0.49
3E	1	1.023	758	951.49	955.09	954.5	955.4	0.006243	4.6	178.06	118.04	0.58
3E	1	0.985	758	950.08	953.47	953.06	953.74	0.011327	4.44	186.72	127.29	0.59
3E	1	0.948	758	949.22	951.95	951.27	952.07	0.00585	2.92	278.38	201.69	0.41
3E	1	0.91	758	948.55	950.44		950.6	0.009743	3.33	252.16	259.77	0.52
3E	1	0.872	758	946.4	948.6		948.75	0.00859	3.47	254.02	225.11	0.5
3E	1	0.834	758	944.2	946.84	946.43	947.01	0.008834	3.8	238.78	199.9	0.52
3E	1	0.796	758	942.92	945.39		945.48	0.006229	3.09	321.46	316.96	0.43
3E	1	0.758	758	940.79	943.89		944.04	0.008282	3.62	264.67	254.69	0.5
3E	1	0.72	758	940.27	942.5		942.57	0.006367	2.78	366.3	458.71	0.42
3E	1	0.682	758	938.56	941.04	940.75	941.16	0.008217	3.55	313.83	404.29	0.49
3E	1	0.645	758	936.61	939.58		939.68	0.006585	2.94	314.41	330.92	0.43
3E	1	0.607	758	935.34	938.26		938.38	0.00636	2.93	271.44	205.38	0.43
3E	1	0.569	758	934.96	937.15		937.26	0.005166	2.83	293.59	215.46	0.39
3E	1	0.531	758	933.64	935.87		936.05	0.007727	3.72	226.37	149.78	0.49
3E	1	0.493	758	932.49	934.11		934.25	0.009937	3.07	256.47	246.19	0.51
3E	1	0.455	758	930.91	932.28		932.37	0.009027	2.49	322.07	449.19	0.47
3E	1	0.418	758	929.91	930.86	930.48	930.92	0.005956	2.07	377.21	520.12	0.4
3E	1	0.379	758	927.99	929.33		929.44	0.009624	2.84	305.64	441.89	0.5
3E	1	0.299	758	925.61	926.64		926.68	0.004516	1.94	466.88	787.26	0.38
3E	1	0.229	758	923.45	924.26	924.07	924.33	0.009689	2.36	362.55	766.13	0.53
3E	1	0.167	758	921.81	922.87		922.9	0.002469	1.39	604.98	994.45	0.28
3E	1	0.089	758	920.48	921.26	921.06	921.31	0.007004	1.75	455.86	1028.84	0.43
4E	3	3.71	500	1031.7	1033.74		1034	0.012721	4.22	129.1	191.77	0.74
4E	3	3.673	500	1030.5	1032.5		1032.6	0.004177	2.59	193.27	180.92	0.44
4E	3	3.635	500	1029.3	1031.41		1031.6	0.006707	3.17	159.64	166.69	0.55
4E	3	3.602	500	1028.2	1030.41		1030.6	0.005022	3.04	164.49	148.67	0.51

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4E	3	3.56	500	1027.4	1028.83		1029	0.010273	3.46	144.77	186.5	0.68
4E	3	3.522	500	1026	1027.45		1027.6	0.005353	2.58	194.09	224.15	0.49
4E	3	3.485	500	1024.8	1026.37		1026.5	0.005377	2.85	175.18	171.24	0.5
4E	3	3.448	500	1023.7	1025.1	1024.8	1025.3	0.007633	3.22	166.27	199.75	0.57
4E	3	3.41	500	1022.1	1023.8		1023.9	0.005714	2.9	193	246.49	0.5
4E	3	3.372	500	1020.6	1022.53	1022.3	1022.7	0.007123	3.86	163.29	218.23	0.58
4E	3	3.335	500	1019.8	1021.26		1021.4	0.006163	2.92	185.53	241.73	0.51
4E	3	3.297	500	1018.2	1019.57	1019.5	1019.7	0.01171	3.45	161.39	277.44	0.68
4E	3	3.26	500	1016.8	1018.04	1017.7	1018.1	0.005691	2.49	209.54	292.65	0.48
4E	3	3.222	500	1014.8	1016.81		1017	0.005663	3.45	154.18	140.14	0.54
4E	3	3.184	500	1013.9	1015.73		1015.9	0.005412	3.42	181.85	222.19	0.51
4E	3	3.147	500	1012.8	1014.56		1014.7	0.00719	3.43	165.14	211.23	0.57
4E	3	3.11	500	1011.5	1013.6		1013.7	0.00379	2.9	212.45	239.45	0.43
4E	3	3.072	500	1010.1	1012.63	1012.3	1012.8	0.006485	3.57	149.39	141.2	0.56
4E	3	3.036	500	1008.7	1011.55	1010.8	1011.8	0.004693	3.61	139.98	95.52	0.49
4E	3	2.998	500	1007.4	1010.44	1010.2	1010.7	0.006479	4.21	152.73	174.51	0.57
4E	3	2.96	500	1006.8	1008.89	1008.6	1009.1	0.009434	3.71	140.48	165.05	0.65
4E	3	2.923	500	1004.6	1007.14		1007.4	0.007983	4.04	131.08	179.37	0.68
4E	3	2.886	500	1003.9	1005.77	1005.7	1005.9	0.00694	2.99	220.16	484.69	0.54
4E	3	2.848	500	1002.8	1004.51		1004.6	0.006326	2.64	237.95	508.96	0.51
4E	3	2.81	500	1001.9	1002.99	1002.8	1003.1	0.009052	2.72	192.1	355.67	0.58
4E	3	2.772	500	999.87	1001.42		1001.5	0.006241	2.52	184.88	221.42	0.5
4E	3	2.735	500	998.33	1000.19		1000.3	0.006883	3.09	174.35	207.11	0.54
4E	3	2.697	500	997.02	998.69		998.86	0.006978	3.6	161.25	191.56	0.57
4E	3	2.659	500	995.66	997.43		997.56	0.006322	3.14	172.87	190.26	0.55
4E	3	2.622	500	994.72	996.29		996.43	0.005125	3.12	170.65	163.3	0.49
4E	3	2.584	500	993.44	994.95		995.13	0.008526	3.7	150.07	181.62	0.62
4E	3	2.546	500	992.17	993.8		993.91	0.004335	2.86	192.69	198.68	0.46
4E	3	2.508	500	990.44	992.18	992.12	992.47	0.014334	4.64	121.44	154.16	0.81
4E	3	2.47	500	989.54	991.02		991.08	0.00378	2.37	244.54	332.02	0.41
4E	3	2.433	500	988.08	990.08		990.18	0.006083	3.04	197.14	265.8	0.51
4E	3	2.395	929	986.85	988.6		988.73	0.007884	2.97	335.71	332.73	0.46
4E	3	2.362	929	985.99	987.47		987.55	0.006391	1.97	415.84	450.38	0.39
4E	3	2.324	929	984.67	986.17		986.25	0.006229	2.26	425.87	488.46	0.4
4E	3	2.287	929	983.74	984.94		985.01	0.005687	1.9	429.82	447.52	0.38
4E	3	2.249	929	981.96	983.63		983.72	0.007351	2.77	381.29	394.14	0.46
4E	3	2.211	929	981.09	982.32		982.4	0.005743	2.31	415.92	433.44	0.39
4E	3	2.171	929	979.71	981.12		981.2	0.005846	2.31	416.59	467.28	0.39
4E	3	2.132	929	978.23	979.99		980.08	0.005128	2.49	413.99	404.82	0.38
4E	3	2.093	929	976.84	978.55	978.22	978.69	0.009474	3.14	314.25	332.82	0.52
4E	3	2.055	929	974.12	977.2		977.3	0.005147	2.83	403.32	479.48	0.44
4E	3	2.017	929	974.39	976.34		976.4	0.004042	2.26	491.25	645.96	0.38
4E	2	1.965	299	971.56	974.41		974.54	0.010062	3	122.66	325.01	0.62
4E	2	1.927	299	970.67	973.53		973.58	0.002629	1.96	182.58	217.42	0.31

Tributary	River Reach	Sta	Q Total (cfs)	Min Ch Elev (ft)	W.S. Elev (ft)	Crit.W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Ch (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #
4E	2	1.889	299	970.51	972.39	972.27	972.57	0.012799	3.72	95.26	135.68	0.66
4E	2	1.855	299	969.32	970.06	969.89	970.13	0.012005	2.05	136.3	288.73	0.55
4E	2	1.793	299	967.04	968.14		968.19	0.003879	1.97	176.65	311	0.36
4E	2	1.751	299	965.65	966.6	966.5	966.72	0.016461	3	114.2	303.58	0.68
4E	2	1.7	299	964.32	965.24		965.27	0.002895	1.45	227.71	394.36	0.3
4E	2	1.662	299	962.84	964.08	964	964.18	0.015167	2.97	135.29	323.21	0.59
4E	2	1.597	299	960.53	961.46	961.21	961.48	0.004194	1.19	284.48	671.18	0.29
4E	2	1.521	299	956.99	957.43	957.43	957.55	0.040869	2.86	118.01	539.16	0.85
4E	2	1.452	299	953.59	954.64	954.05	954.65	0.001292	1.01	409.28	784.92	0.18
4E	1	1.238	1351	947	949.08	948.69	949.18	0.008583	2.66	536.32	645.3	0.47
4E	1	1.153	1351	945.45	947.05	946.51	947.1	0.002955	1.96	723.05	788.1	0.34
4E1	2	0.647	630	973.09	974.47		974.56	0.005597	2.47	264.61	293.89	0.44
4E1	2	0.606	630	971.61	972.72	972.58	972.84	0.012751	2.86	235.46	438.99	0.62
4E1	2	0.562	630	969.27	970.77	970.46	970.87	0.005892	2.68	273.75	366.51	0.45
4E1	2	0.513	630	966.45	968.63	968.46	968.8	0.011695	3.47	201.68	278.83	0.62
4E1	2	0.447	630	964.82	966.57		966.63	0.003728	1.98	353.84	440.59	0.35
4E1	2	0.379	630	962.81	964.65	964.25	964.78	0.006903	2.85	232.27	291.16	0.49
4E1	2	0.322	630	961.19	963.01	962.56	963.13	0.004488	2.82	245.54	299.74	0.45
4E1	1	0.201	1052	956.47	957.94	957.69	958.11	0.013666	4.07	329.79	386.18	0.7
4E1	1	0.125	1052	952.05	954.34		954.44	0.006502	2.94	445.18	485.31	0.43
4E1	1	0.065	1052	950.4	952.61		952.67	0.004799	2.52	533.79	557.76	0.37
4E2	1	0.281	422	971.63	973.68	973.52	973.88	0.017748	3.71	125.98	192.62	0.67
4E2	1	0.229	422	969.61	970.53	970.19	970.62	0.008436	1.78	183.9	266.91	0.42
4E2	1	0.172	422	966.48	967.65	967.4	967.75	0.010938	2.88	174.32	247.12	0.52
4E2	1	0.132	422	965.09	965.88	965.52	965.94	0.006175	1.77	223.27	297.99	0.37

Table 5-3 HEC-RAS Culvert Results Summary

Tributary	Reach	River Sta (ft)	Culvert	E.G. US (ft)	W.S US (ft)	E.G. IC (ft)	E.G OC (ft)	Min El Weir Flow (ft)	Q Culvert Group (cfs)	Q Weir (cfs)	Delta WS Culv (ft)	Vel US Culv (ft/s)	Vel DS Culv (ft/s)
1E	1	2.438	#1	933.41	933.32	933.4	933.4	930.05	5.07	1834.9	0	1.61	1.61
1E	1	1.323	#2	902.02	901.9	902	902	899.75	16.44	1820.4	0.99	5.23	5.23

Table 5-4 HEC-RAS In-Line Weir Results Summary

Tributary	Reach	River Sta (ft)	E.G. Elev (ft)	W.S. Elev (ft)	Q Total (cfs)	Q Weir (cfs)
3E	1	1.359	978.7	978.69	758	758

5.9.2 Verification of Results

No effective model exists for the three tributaries studied; therefore a verification of the hydraulic results can not be provided.

6 Erosion and Sediment Transport

Refer to Volume V for erosion and sediment transport studies.

Appendices

A. References

1. McLaughlin Kmetty Engineers, LTD. 1992. Buckeye Area Flood Delineation Study, Hydrology Report. *Flood Control District of Maricopa County – FCD 90-6.*

2. McLaughlin Kmetty Engineers, LTD. 1992. Buckeye Area Flood Delineation Study, Hydrology Report, Appendices AA and BB. *Flood Control District of Maricopa County – FCD 90-6.*

3. Sabol, G.V., et al. 1995. Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology. *Prepared for the Flood Control District of Maricopa County.*

4. Sabol, G.V., et al. 1995. Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics. *Prepared for the Flood Control District of Maricopa County.*

5. Hydrologic Engineering Center. 1998. HEC-1 Flood Hydrograph Package, User's Manual. *US Army Corps of Engineers.*

6. Brigham Young University. 2003. WMS 7.0 Reference Manual. Engineering Computer Graphics Laboratory, Brigham Young University, Provo, Utah.

7. Camp, P.D. 1986. Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona. *Soil Conservation Service, United States Department of Agriculture.*

8. Maricopa Association of Governments. 2000. The Digital GIS Land Use Maps for Maricopa County *(Updated every 5 years).*

9. Zhao, Bing. 2003. Hydrologic Study for Bonita Dam, Maricopa County, Arizona. *Prepared for the Flood Control District of Maricopa County.*

10. USGS. 1991. Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona. *Water Resource Diversion, USGS.*

11. FEMA. April 2003. Guidelines & Specifications for Flood Hazard Mapping Partners.

B. General Documentation & Correspondence

The general documentation and correspondence for this project are organized in the Project Administration Report for the Buckeye/Sun Valley ADMS included in Volume VIII, Supporting Documents. The following sections are included in the Project Administration Report.

B.1 Special Problem Reports

N/A

B.2 Contact (telephone) Reports

N/A

B.3 Meeting Minutes or Reports

N/A

B.4 General Correspondence

N/A

B.5 Contract Documents

N/A

C. Survey Field Notes

C.1 Survey Field Notes for Aerial Mapping Control

N/A

C.2 Survey Field Notes for Hydrologic Modeling

Photos 1 through 23 are from the January 12, 2004, field visit, and photos 24 and 32 are from the February 5, 2004, field visit.

C.3 Survey Field Notes for Hydraulic Modeling

Field survey notes for the Baseline Road and Southern Road Culverts are attached. The photos for determining Manning's n-values are in Appendix E.

Picture.1

Retention basin near end of RID just west of Johnson Road – Looking east

Picture.2

Retention basin near end of RID just west of Johnson Road – Looking west

Picture.3

North of RID between Johnson Road & end of RID - Looking east

Picture.4

North of RID between Johnson Road & end of RID - Looking east

Picture.5

North of RID looking towards end of RID

Picture.6

Minor was flowing south towards RID- Looking southeast

Picture.7
End of RID – Looking southwest

Picture.8
End of RID – Looking west

Picture.9
Intersection of RID & main channel for sub-basin C1 – Looking west

Picture.10
Intersection of RID & main channel for sub-basin C1 – Looking northwest

Picture.11
Intersection of RID & main channel for sub-basin C1

Picture.12
Wash blocked by abandoned RID

Picture.13
Abandoned RID

Picture.14
Field just south of RID & just west of Johnson Road – Looking north

Picture.15
Main flow path just south of the end of RID

Picture.16
Field just south of RID & just west of Johnson Road – Looking southeast

Picture. 17
Field just south of RID & just west of Johnson Road – Looking northwest

Picture.18
Culvert on Southern – Looking north (upstream)

Picture.19

Culvert on Southern – Looking south (downstream)

Picture.20

Culvert on Southern between 315th and 313th

Picture.21

End of wash that empties into farm field – Looking west

Picture.22

Culvert on Baseline Rd between 313th and 309th – Looking south

Picture.23

Culvert on Baseline Rd between 313th and 309th – Looking north

Picture.24

Main channel between end of RID and Southern Rd (E3) – Looking south

Picture.25
Right of bank (E3) – Looking south

Picture.26
Right of bank (E3) – Looking south

Picture.27
Left of bank between Baseline and Southern Rd & between Johnson Rd and 309th (E4) – Looking north

Picture.28
Left of bank (E4) – Looking north

Picture.29
Main channel E4 – Looking south

Picture.30
Main channel E4 – Looking south

Picture.31
Main channel E4 – Looking west

Picture.32
Left of bank E4 – Looking south

D. Hydrologic Analysis Supporting Documentation

D.1 Precipitation Data

Table D.1-1

Rainfall Amount from Isopluvial Maps in FCDMC Hydrology Manual

Storm Event	Depth [in]
100-yr, 6-hr	3.29
100-yr, 24-hr	4.10

D.2 Physical Parameter Calculations

Table D.2-1a

Existing Conditions Land Use Look-up Table for Area 2

LU Code	Land Use Description	IA	RTIMP	% Veg	Saturation
130	Large Lot Residential - Single Family (1 du per acre to 2 du per acre)	0.30	15	50	normal
160	Very Small Lot Residential - Single Family (>6 du per acre-includes mobile home	0.25	40	50	normal
610	Transportation (Includes railroads, railyards, transit centers and freeways)	0.10	80	75	normal
740	Water	0.00	100	0	wet
750	Agriculture	0.50	0	85	normal
900	Vacant (Existing land use database only)	0.35	0	25	dry

Table D.2-1b

Future Conditions Land Use Look-up Table for Area 2

LU Code	Land Use Description	IA	RTIMP	% Veg	Saturation
710	Active Open Space (Includes parks)	0.10	5	90	normal
220	Neighborhood Commercial (50,000 to 100,000 sq. ft.)	0.10	80	65	normal
110	Rural Residential (<= 1/5 du per acre)	0.30	5	30	normal

Table D.2-2

Soil Map look-up Table for Buckeye Area 2

TYPE	XKSAT	ROCKOUT	DESCRIPTION	SOIL_LID
RpE	0.29	0.00	Rillito-Perryville complex, 5 to 20 percent slopes	651545128
RaA	0.39	0.00	Rillito sandy loam, 0 to 1 percent slopes	651542120
PRB	0.28	0.00	Perryville-Rillito complex, 0 to 3 percent slopes	651505422
PeB	0.38	0.00	Perryville gravelly loam, 1 to 3 percent slopes	651502922
PeA	0.37	0.00	Perryville gravelly loam, 0 to 1 percent slopes	651502920
LEV	0.00	0.00	Man-made levee	651422862
GYD	0.26	0.00	Gunsight-Rillito complex, 0 to 10 percent slopes	651326826
GWD	0.35	0.00	Gunsight-Pinal complex, 1 to 10 percent slopes	651326426
GgA	0.25	0.00	Gilman loan, 0 to 1 percent slopes	651323320
AGB	0.40	0.00	Antho-Carrizo complex, 0 to 3 percent slopes	651203222
AdA	0.40	0.00	Antho gravelly sandy loam, 0 to 1 percent slopes	651202720
AbA	0.38	0.00	Anthosandy loam, 0 to 1 percent slopes	651202320
PT	0.40	0.00	Pinal gravelly loam	6515058
Pa	0.40	0.00	Perryville sandy loam	6515021
Lb	0.40	0.00	Laveen sandy loam	6514223
GM	0.29	0.00	Gilman-Antho association	6513244
Ge	0.26	0.00	Gilman fine sandy loam	6513229
Cp	0.40	0.00	Coolidge sandy loam	6512451
CF	0.50	0.00	Carrizo and Brios soils	6512430
Bs	0.39	0.00	Brios sandy loam	6512257
Ae	0.39	0.00	Antho-Brios sandy loams	6512029

Table D.2-3

Summary of Green & Ampt Parameters for Buckeye Area 2 Existing Conditions

Subbasin	Area [mi^2]	IA	DTHETA	PSIF	XKSAT	RTIMP
A1	1.63	0.343	0.347	4.498	0.339	2.145
B1	0.30	0.350	0.350	4.624	0.315	0.000
C1	0.95	0.350	0.350	4.669	0.311	0.000
D1	0.69	0.350	0.350	4.642	0.317	0.000
E1	1.47	0.343	0.347	4.362	0.364	2.082
E2	1.22	0.348	0.343	4.461	0.354	2.288
E3	0.94	0.402	0.306	4.245	0.444	1.589
E4	0.74	0.389	0.324	4.185	0.421	0.000

Table D.2-4

Summary of Green & Ampt Parameters for Buckeye Area2 Future Conditions

Subbasin	Area [mi^2]	IA	DTHETA	PSIF	XKSAT	RTIMP
A1	1.63	0.287	0.250	4.498	0.359	5.000
B1	0.30	0.296	0.250	4.624	0.328	5.000
C1	0.95	0.278	0.250	4.669	0.344	5.000
D1	0.69	0.300	0.250	4.642	0.332	5.000
E1	1.47	0.292	0.250	4.362	0.383	5.000
E2	1.22	0.291	0.250	4.461	0.366	5.000
E3	0.94	0.300	0.250	4.245	0.401	5.000
E4	0.74	0.273	0.250	4.185	0.422	11.823

Table D.2-5

Summary of Lag Time Estimation for Buckeye Area 2 Sub-basins

Subbasin	Area [mi^2]	L [ft]	L_{ca} [ft]	Max Elev [ft]	Min Elev [ft]	S [ft/mi]	S-Graph Type	K_n	Lag [min]
A1	1.63	15,616	9,120	1,060.7	963.2	32.98	Des Rnglnd	0.050	69
B1	0.30	7,098	3,466	1,036.0	959.1	57.24	Des Rnglnd	0.050	31
C1	0.95	14,004	5,581	1,037.7	927.4	41.60	Des Rnglnd	0.050	52
D1	0.69	10,801	5,153	997.6	913.6	41.10	Des Rnglnd	0.050	46
E1	1.47	16,819	9,573	1,068.2	979.2	27.95	Des Rnglnd	0.050	75
E2	1.22	15,678	8,798	1,060.8	979.2	27.48	Des Rnglnd	0.050	70
E3	0.94	14,352	5,236	1,000.6	930.1	25.93	Des Rnglnd	0.050	56
E4	0.74	10,558	6,552	934.1	876.2	28.98	Des Rnglnd	0.050	53

D.3 Hydrograph Routing Data

Table D.3-1

Summary of Routing Channel Parameters – Length, Slope and Manning's n

Routing Channel	L [ft]	Max El.	Min El.	S [ft/ft]	n-left	n-channel	n-right
1E-2E	9,559	979.2	930.1	0.00514	0.05	0.07	0.05
2E-3E	10,646	930.1	876.2	0.00506	0.055	0.03	0.055

Table D.3-2

Summary of Routing Channel Parameters – Representative Cross Section Cooridinates

X-Section Data				
	1E-2E		2E-3E	
Point	X	Y	X	Y
1	0	10.5	0	7.5
2	15	4.5	15	4
3	45	2	35	3
4	55	0	40	0
5	75	0	60	0
6	85	2	65	3
7	115	4.5	85	4
8	130	10.5	100	7.5

D.4 Flow Splits and Diversion Data

N/A

D.5 Hydrologic Calculations

D.5.1 HEC-1 Output File 100-Year 6-Hour

D.5.1.a HEC-1 Output File for 100-year 6-hour Storm (Existing Conditions)

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1*************************************                    *************************************
*                                   *                    *                                   *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)*                    *  U.S. ARMY CORPS OF ENGINEERS     *
*            MAY  1991              *                    *  HYDROLOGIC ENGINEERING CENTER    *
*          VERSION 4.0.1E           *                    *        609 SECOND STREET          *
*                                   *                    *     DAVIS, CALIFORNIA 95616       *
* RUN DATE _______ TIME _______     *                    *        (916) 551-1748             *
*                                   *                    *                                   *
*************************************                    *************************************

                                    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

                                        HEC-1 INPUT                                                PAGE  1

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

   1          ID   Buckeye/Sun Valley ADMS - 03 May 2004
   2          ID   PBS&J - Modelers: Jacob Lesue & Wen Chen
   3          ID   100-year 6-hour
   4          ID   Existing Conditions
   5          ID   Area 2
   6          ID   Reinfall Loss Method - Green & Ampt
   7          ID   Unit Hydrograph Method - FCDMC S-Graph
   8          ID   Channel Routing Method - Normal Depth
   9          ID   Land Use - FCDMC GIS Data; mag_landuse (2000)
  10          ID   Soil Data - USDA SCS Soil Survey (1972 & 1981)
  11          ID   Units - L(mi)   Lca(mi)   S(ft/mi)   LAG(min)
              *DIAGRAM
  12          IT       5  1JAN94       0    2000
  13          IO       3
  14          IN      15 01JAN94       0
  15          JD   3.299    0.01
              * 6-hour distribution, pattern 1.0
  16          PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
  17          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
  18          PC   0.962   0.972   0.983   0.991     1.0
  19          IN      15 01JAN94       0
  20          JD   3.279     0.5
              * 6-hour distribution, pattern 1.0
  21          PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
  22          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
  23          PC   0.962   0.972   0.983   0.991     1.0
  24          IN      15 01JAN94       0
  25          JD   3.256     1.0
              * 6-hour distribution, pattern 1.4
  26          PC     0.0  0.0084   0.016   0.025  0.0334  0.0414  0.0504  0.0584  0.0664  0.0748
  27          PC   0.087  0.0994  0.1188   0.148  0.2304  0.4067  0.7776  0.8813  0.9186  0.9452
  28          PC  0.9572  0.9684  0.9798  0.9898     1.0
  29          IN      15 01JAN94       0
  30          JD   3.167     5.0
              * 6-hour distribution, pattern 2.3
  31          PC     0.0   0.011  0.0173  0.0267  0.0387   0.049  0.0593  0.0693  0.0797  0.0903
  32          PC   0.103  0.1173  0.1383  0.1827  0.2693   0.458   0.686  0.8233  0.8893  0.9293
  33          PC  0.9487   0.962  0.9743  0.9877     1.0
  34          IN      15 01JAN94       0
  35          JD   3.101    10.0
              * 6-hour distribution, pattern 2.7
  36          PC     0.0  0.0134  0.0189  0.0287  0.0443  0.0574  0.0694  0.0818  0.0949  0.1076
  37          PC  0.1223  0.1382  0.1604  0.2063  0.2902  0.4664  0.6764  0.8069  0.8765  0.9189
  38          PC  0.9471  0.9608  0.9735  0.9873     1.0
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 39          KK      E2
 40          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 41          KM            L=2.97     Lca=1.67     S=27.48     Kn=0.050     LAG=70.0
 42          KM            S-GRAPH TYPE=DESERT RANGELAND
 43          KO       0       0     0.0       1      22
 44          BA   1.223
 45          LG   0.348   0.343   4.461   0.354   2.288
             * E2
 46          UI     0.0   58.83   58.83   58.83  144.86  208.85  279.67  342.88  405.24   457.0
 47          UI  507.81  529.31  563.74  563.74  555.85  533.62  497.45  434.25  391.56  340.11

                                          HEC-1 INPUT                                          PAGE  2

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

 48          UI  302.44  266.78  236.95  210.69  181.23  162.62  138.96  125.18   110.9    98.6
 49          UI    90.2   76.44   62.35   62.35   52.28   40.27   40.27   40.27   40.27   20.75
 50          UI   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32
 51          UI   14.32   14.32     0.0

 52          KK      E1
 53          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 54          KM            L=3.19     Lca=1.81     S=27.95     Kn=0.050     LAG=75.0
 55          KM            S-GRAPH TYPE=DESERT RANGELAND
 56          KO       0       0     0.0       1      22
 57          BA  1.4663
 58          LG   0.343   0.347   4.362   0.364   2.082
             * E1
 59          UI     0.0   65.83   65.83   65.83  133.71  212.83  283.95  353.35  417.84  469.07
 60          UI  544.82  578.46  602.95  630.83  630.83  621.37  596.51  565.09  496.91  450.85
 61          UI  395.94   351.1  316.81  280.75   249.5  222.83  197.54  180.24  148.98  137.95
 62          UI   124.1  111.01  100.93   91.12   69.77   69.77   68.29   45.06   45.06   45.06
 63          UI   45.06   44.48   16.02   16.02   16.02   16.02   16.02   16.02   16.02   16.02
 64          UI   16.02   16.02   16.02   16.02   16.02   16.02

 65          KK      1E   CNAME   1E-2E
 66          KO       0       0     0.0       0      22
 67          HC       2

 68          KK   1E-2E   CNAME      1E
 69          KO       0       0     0.0       0      22
 70          RS       7    FLOW     0.0     0.0
 71          RC    0.05    0.07    0.05  9559.0  0.0051     0.0
             * 1E-2E
 72          RX     0.0    15.0    45.0    55.0    75.0    85.0   115.0   130.0
 73          RY    10.5     4.5     2.0     0.0     0.0     2.0     4.5    10.5

 74          KK      E3
 75          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 76          KM            L=2.72     Lca=0.99     S=25.93     Kn=0.050     LAG=56.0
 77          KM            S-GRAPH TYPE=DESERT RANGELAND
 78          KO       0       0     0.0       1      22
 79          BA  0.9425
 80          BF   450.0     0.0     1.0
 81          LG   0.402   0.306   4.245   0.444   1.589
             * E3
 82          UI     0.0   56.67   56.67  101.72  193.55  277.61  352.61  421.01  484.48  516.56
 83          UI   543.1  541.36  515.53  472.72  403.34  343.83  295.16   254.8   215.6  185.13
 84          UI  160.09  132.41   113.9  101.35    86.9   70.93   60.07   56.56   38.79   38.79
 85          UI   38.79   28.75   13.79   13.79   13.79   13.79   13.79   13.79   13.79   13.79
 86          UI   13.79   13.79

 87          KK      2E   CNAME   2E-3E
 88          KO       0       0     0.0       0      22
 89          HC       2

                                          HEC-1 INPUT                                          PAGE  3

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

 90          KK   2E-3E   CNAME      2E
 91          KO       0       0     0.0       0      22
 92          RS       5    FLOW     0.0     0.0
 93          RC   0.055    0.03   0.055 10646.0  0.0051     0.0
             * 2E-3E
 94          RX     0.0    15.0    35.0    40.0    60.0    65.0    85.0   100.0
 95          RY     7.5     4.0     3.0     0.0     0.0     3.0     4.0     7.5

 96          KK      E4
 97          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 98          KM            L=2.00     Lca=1.24     S=28.98     Kn=0.050     LAG=53.0
 99          KM            S-GRAPH TYPE=DESERT RANGELAND
100          KO       0       0     0.0       1      22
101          BA  0.7401
102          BF     0.0     0.0     0.0
103          LG   0.389   0.324   4.185   0.421     0.0
             * E4
104          UI     0.0   47.02   47.02   96.57  173.26  247.62  312.68  368.15  416.75  440.62
105          UI  450.61  436.38   410.6  347.57  298.99  252.38   214.2  181.58  153.89  132.33
106          UI   107.9   92.15   80.49    72.1   52.01   49.84    39.2   32.19   32.19   31.34
107          UI   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44     0.0

108          KK      3E   CNAME     13R
109          KO       0       0     0.0       0      22
110          HC       2

111          KK     13R   CNAME      3E
112          KO       0       0     0.0       0      22
113          RN     13R

114          KK      D1
115          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
116          KM            L=2.05     Lca=0.98     S=41.10     Kn=0.050     LAG=46.0
117          KM            S-GRAPH TYPE=DESERT RANGELAND
118          KO       0       0     0.0       1      22
119          BA  0.6874
120          LG    0.35    0.35   4.642   0.317     0.0
             * D1
121          UI     0.0   50.32   50.32  141.34  228.99  312.52  384.55  444.86  474.65  481.62
122          UI  455.19  400.91  332.15  274.33  228.36  187.75  154.57  127.52  104.38   88.96
123          UI   77.15   54.45   53.33   35.26   34.44   34.44   15.23   12.25   12.25   12.25
124          UI   12.25   12.25   12.25   12.25     0.0
```

```
 125          KK      4R   CNAME      1D
 126          KO       0      0     0.0       0      22
 127          RN      4R

 128          KK      C1
 129          KM              THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 130          KM              L=2.65      Lca=1.06      S=41.60      Kn=0.050      LAG=52.0
 131          KM              S-GRAPH TYPE=DESERT RANGELAND
 132          KO       0      0     0.0       1      22
 133          BA   0.947
 134          LG    0.35    0.35   4.669   0.311     0.0
              * C1

                                          HEC-1 INPUT                                          PAGE  4

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

 135          UI     0.0   61.32   61.32  131.22  233.88  329.66  413.44  491.65  546.63  581.16
 136          UI  567.64  561.55  521.37  439.42  369.44  313.69  266.99  226.51  188.91  160.51
 137          UI  133.36   115.6   96.21    84.2   64.99   63.11   41.97   41.97   41.97   26.09
 138          UI   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92     0.0

 139          KK      3R   CNAME      1C
 140          KO       0      0     0.0       0      22
 141          RN      3R

 142          KK      B1
 143          KM              THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 144          KM              L=1.34      Lca=0.66      S=57.24      Kn=0.050      LAG=31.0
 145          KM              S-GRAPH TYPE=DESERT RANGELAND
 146          KO       0      0     0.0       1      22
 147          BA  0.3003
 148          LG    0.35    0.35   4.624   0.315     0.0
              * B1
 149          UI     0.0   32.62   70.32  160.06  235.61  291.03  312.58  291.47  230.86  173.86
 150          UI  132.12   99.49   73.87   56.67   42.44    32.8   22.33   21.44    7.94    7.94
 151          UI    7.94    7.94    7.94     0.0

 152          KK      2R   CNAME      1B
 153          KO       0      0     0.0       0      22
 154          RN      2R

 155          KK      A1
 156          KM              THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 157          KM              L=2.96      Lca=1.73      S=32.98      Kn=0.050      LAG=69.0
 158          KM              S-GRAPH TYPE=DESERT RANGELAND
 159          KO       0      0     0.0       1      22
 160          BA   1.628
 161          LG   0.343   0.347   4.498   0.339   2.145
              * A1
 162          UI     0.0   79.44   79.44   79.44  202.48  287.09  387.46  471.36  550.52  628.97
 163          UI  692.49  723.86  761.33  761.33  744.73   712.6  657.55  568.77  509.79  446.69
 164          UI  392.19  351.67  304.09   269.9  236.73  213.32   177.4  158.52  149.77  121.82
 165          UI  121.81   86.84    84.2    84.2   56.31   54.38   54.38   54.38   43.92   19.34
 166          UI   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34
 167          UI   19.34     0.0

 168          KK      1R   CNAME      1A
 169          KO       0      0     0.0       0      22
 170          RN      1R
 171          ZZ
```

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	E2	713.	5.00	175.	44.	15.	1.22		
+	HYDROGRAPH AT	E1	772.	5.08	203.	51.	17.	1.47		
+	2 COMBINED AT	1E	1318.	5.00	342.	86.	29.	2.69		
+	ROUTED TO	1E-2E	1250.	5.50	340.	86.	29.	2.69		
+	HYDROGRAPH AT	E3	1095.	4.75	578.	482.	461.	0.94		
+	2 COMBINED AT	2E	1840.	5.42	874.	557.	486.	3.63		
+	ROUTED TO	2E-3E	1779.	5.75	874.	557.	486.	3.63		
+	HYDROGRAPH AT	E4	559.	4.75	104.	26.	9.	0.74		
+	2 COMBINED AT	3E	1807.	5.75	936.	573.	491.	4.37		
+	ROUTED TO	13R	1807.	5.75	936.	573.	491.	4.37		
+	HYDROGRAPH AT	D1	646.	4.58	107.	27.	9.	0.69		
+	ROUTED TO	4R	646.	4.58	107.	27.	9.	0.69		
+	HYDROGRAPH AT	C1	758.	4.67	141.	35.	12.	0.95		
+	ROUTED TO	3R	758.	4.67	141.	35.	12.	0.95		
	HYDROGRAPH AT									

```
+                          B1      422.    4.42        49.        12.        4.      0.30
        ROUTED TO
+                          2R      422.    4.42        49.        12.        4.      0.30
        HYDROGRAPH AT
+                          A1      929.    5.00       228.        57.       19.      1.63
        ROUTED TO
+                          1R      929.    5.00       228.        57.       19.      1.63

*** NORMAL END OF HEC-1 ***
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D.5.1.b HEC-1 Output File for 100-year 6-hour Storm (Future Conditions with Retention)

```
1*************************************                    *************************************
*                                   *                    *                                   *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)*                    *  U.S. ARMY CORPS OF ENGINEERS     *
*            MAY  1991              *                    *  HYDROLOGIC ENGINEERING CENTER    *
*          VERSION 4.0.1E           *                    *        609 SECOND STREET          *
*                                   *                    *     DAVIS, CALIFORNIA 95616       *
* RUN DATE _______ TIME _______     *                    *        (916) 551-1748             *
*                                   *                    *                                   *
*************************************                    *************************************

                                        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

                                        HEC-1 INPUT                                        PAGE  1

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

   1          ID  Buckeye/Sun Valley ADMS - November 2004
   2          ID  PBS&J - Modelers: Jacob Lesue & Wen Chen
   3          ID  100-year 6-hour
   4          ID  Future Conditions
   5          ID  Area 2
   6          ID  Rainfall Loss Method - Green & Ampt
   7          ID  Unit Hydrograph Method - FCDMC S-Graph
   8          ID  Channel Routing Method - Normal Depth
   9          ID  Land Use - FCDMC GIS Data: mag_genplan (2000)
  10          ID  Soil Data - USDA SCS Soil Survey (1972 & 1981)
  11          ID  Units - L(mi)   Lca(mi)   S(ft/mi)   LAG(min)
              *DIAGRAM
  12          IT       5 01JAN94       0     500
  13          IO       3
  14          IN      15 01JAN94       0
  15          JD   3.299    0.01
              * 6-hour distribution, pattern 1.0
  16          PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
  17          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
  18          PC   0.962   0.972   0.983   0.991     1.0
  19          IN      15 01JAN94       0
  20          JD   3.279     0.5
              * 6-hour distribution, pattern 1.0
  21          PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
  22          PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
  23          PC   0.962   0.972   0.983   0.991     1.0
  24          IN      15 01JAN94       0
  25          JD   3.256     1.0
              * 6-hour distribution, pattern 1.4
  26          PC     0.0  0.0084   0.016   0.025  0.0334  0.0414  0.0504  0.0584  0.0664  0.0748
  27          PC   0.087  0.0994  0.1188   0.148  0.2304  0.4067  0.7778  0.8813  0.9186  0.9452
  28          PC  0.9572  0.9684  0.9798  0.9898     1.0
  29          IN      15 01JAN94       0
  30          JD   3.167     5.0
              * 6-hour distribution, pattern 2.3
  31          PC     0.0   0.011  0.0173  0.0267  0.0387   0.049  0.0593  0.0693  0.0797  0.0903
  32          PC   0.103  0.1173  0.1383  0.1827  0.2693   0.458   0.686  0.8233  0.8893  0.9293
  33          PC  0.9487   0.962  0.9743  0.9877     1.0
  34          IN      15 01JAN94       0
  35          JD   3.101    10.0
              * 6-hour distribution, pattern 2.7
  36          PC     0.0  0.0134  0.0189  0.0287  0.0443  0.0574  0.0694  0.0818  0.0949  0.1076
  37          PC  0.1223  0.1382  0.1604  0.2063  0.2902  0.4664  0.6764  0.8069  0.8765  0.9189
  38          PC  0.9471  0.9608  0.9735  0.9873     1.0

  39          KK      E2
  40          KO       0       0     0.0       1      22
  41          BA   1.223
  42          LG   0.291    0.25   4.461   0.366     5.0
```

```
            * E2
 43         UI     0.0   58.83   58.83   58.83  144.86  208.85  279.67  342.88  405.24   457.0
 44         UI  507.81  529.31  563.74  563.74  555.85  533.62  497.45  434.25  391.56  340.11
 45         UI  302.44  266.78  236.95  210.69  181.23  162.62  138.96  125.18   110.9    98.6
 46         UI    90.2   76.44   62.35   62.35   52.28   40.27   40.27   40.27   40.27   20.75
 47         UI   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32
                                          HEC-1 INPUT                                          PAGE  2
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48         UI   14.32   14.32     0.0

 49         KK    E2-O
 50         KO       0       0     0.0       0      22
 51         DT   E2ret    40.0     0.0
            * Curve
 52         DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 53         DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
            * Curve
 54         DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 55         DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

 56         KK      E1
 57         KO       0       0     0.0       1      22
 58         BA  1.4663
 59         LG   0.292    0.25   4.362   0.383     5.0
            * E1
 60         UI     0.0   65.83   65.83   65.83  133.71  212.83  283.95  353.35  417.84  469.07
 61         UI  544.82  578.46  602.95  630.83  630.83  621.37  596.51  565.09  496.91  450.85
 62         UI  395.94   351.1  316.81  280.75   249.5  222.83  197.54  180.24  148.98  137.95
 63         UI   124.1  111.01  100.93   91.12   69.77   69.77   68.29   45.06   45.06   45.06
 64         UI   45.06   44.48   16.02   16.02   16.02   16.02   16.02   16.02   16.02   16.02
 65         UI   16.02   16.02   16.02   16.02   16.02   16.02

 66         KK    E1-O
 67         KO       0       0     0.0       0      22
 68         DT   E1ret    45.0     0.0
            * Curve
 69         DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 70         DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
            * Curve
 71         DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 72         DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

 73         KK      1E   CNAME    1E-2E
 74         KO       0       0     0.0       0      22
 75         HC       2

 76         KK    1E-2E   CNAME      1E
 77         KO       0       0     0.0       0      22
 78         RS       9    FLOW     0.0     0.0
 79         RC    0.05    0.07    0.05  9559.0  0.0051     0.0
            * 1E-2E
 80         RX     0.0    15.0    45.0    55.0    75.0    85.0   115.0   130.0
 81         RY    10.5     4.5     2.0     0.0     0.0     2.0     4.5    10.5

 82         KK      E3
 83         KO       0       0     0.0       1      22
 84         BA  0.9425
 85         BF   450.0     0.0     1.0
 86         LG     0.3    0.25   4.245   0.401     5.0
            * E3
 87         UI     0.0   56.67   56.67  101.72  193.55  277.61  352.61  421.01  484.48  516.56
 88         UI   543.1  541.36  515.83  472.72  403.34  343.83  295.16   254.8   215.6  185.13
 89         UI  160.09  132.41   113.9  101.35   86.9   70.93   60.07   56.56   38.79   38.79
                                          HEC-1 INPUT                                          PAGE  3
LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 90         UI   38.79   28.75   13.79   13.79   13.79   13.79   13.79   13.79   13.79   13.79
 91         UI   13.79   13.79

 92         KK    E3-O
 93         KO       0       0     0.0       0      22
 94         DT   E3ret    13.0     0.0
            * Curve
 95         DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 96         DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
            * Curve
 97         DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 98         DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

 99         KK      2E   CNAME    2E-3E
100         KO       0       0     0.0       0      22
101         HC       2

102         KK    2E-3E   CNAME      2E
103         KO       0       0     0.0       0      22
104         RS       6    FLOW     0.0     0.0
105         RC    0.055   0.03   0.055 10646.0  0.0051     0.0
            * 2E-3E
106         RX     0.0    15.0    35.0    40.0    60.0    65.0    85.0   100.0
107         RY     7.5     4.0     3.0     0.0     0.0     3.0     4.0     7.5

108         KK      E4
109         KO       0       0     0.0       1      22
110         BA  0.7401
111         BF     0.0     0.0     0.0
112         LG   0.273    0.25   4.185   0.422  11.823
            * E4
113         UI     0.0   47.02   47.02   96.57  173.26  247.62  312.68  368.15  416.75  440.62
114         UI  450.61  436.38   410.6  347.57  298.99  252.38   214.2  181.58  153.89  132.33
115         UI   107.9   92.15   80.49    72.1   52.01   49.84    39.2   32.19   32.19   31.34
116         UI   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44     0.0

117         KK    E4-O
118         KO       0       0     0.0       0      22
119         DT   E4ret    35.0     0.0
            * Curve
120         DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
121         DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
            * Curve
```

```
122          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
123          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

124          KK      3E   CNAME     13R
125          KO       0       0     0.0       0      22
126          HC       2

                                    HEC-1 INPUT                                          PAGE  4

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

127          KK     13R   CNAME      3E
128          KO       0       0     0.0       0      22
129          RN     13R

130          KK      D1
131          KO       0       0     0.0       1      22
132          BA  0.6874
133          LG     0.3    0.25   4.642   0.332     5.0
             * D1
134          UI     0.0   50.32   50.32  141.34  228.99  312.52  384.55  444.86  474.65  481.62
135          UI  455.19  400.91  332.15  274.33  228.36  187.75  154.57  127.52  104.38   88.96
136          UI   77.15   54.45   53.33   35.26   34.44   34.44   15.23   12.25   12.25   12.25
137          UI   12.25   12.25   12.25   12.25     0.0

138          KK    D1-O
139          KO       0       0     0.0       0      22
140          DT   D1ret     7.0     0.0
             * Curve
141          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
142          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
143          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
144          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

145          KK      4R   CNAME      1D
146          KO       0       0     0.0       0      22
147          RN      4R

148          KK      C1
149          KO       0       0     0.0       1      22
150          BA   0.947
151          LG   0.278    0.25   4.669   0.344     5.0
             * C1
152          UI     0.0   61.32   61.32  131.22  233.88  329.66  413.44  491.65  546.63  581.16
153          UI  587.64  561.55  521.37  439.42  369.44  313.69  266.99  226.51  188.91  160.51
154          UI  133.36   115.6   96.21    84.2   64.99   63.11   41.97   41.97   41.97   26.09
155          UI   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92     0.0

156          KK    C1-O
157          KO       0       0     0.0       0      22
158          DT   C1ret     9.0     0.0
             * Curve
159          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
160          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
161          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
162          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

163          KK      3R   CNAME      1C
164          KO       0       0     0.0       0      22
165          RN      3R

                                    HEC-1 INPUT                                          PAGE  5

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

166          KK      B1
167          KO       0       0     0.0       1      22
168          BA  0.3003
169          LG   0.296    0.25   4.624   0.328     5.0
             * B1
170          UI     0.0   32.62   70.32  160.06  235.61  291.03  312.58  291.47  230.86  173.86
171          UI  132.12   99.49   73.87   56.67   42.44    32.8   22.33   21.44    7.94    7.94
172          UI    7.94    7.94    7.94     0.0

173          KK    B1-O
174          KO       0       0     0.0       0      22
175          DT   B1ret     3.0     0.0
             * Curve
176          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
177          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
178          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
179          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

180          KK      2R   CNAME      1B
181          KO       0       0     0.0       0      22
182          RN      2R

183          KK      A1
184          KO       0       0     0.0       1      22
185          BA   1.628
186          LG   0.287    0.25   4.498   0.359     5.0
             * A1
187          UI     0.0   79.44   79.44   79.44  202.48  287.09  367.46  471.36  550.52  628.97
188          UI  692.49  723.86  761.33  761.33  744.73   712.6  657.55  568.77  509.79  446.69
189          UI  392.19  351.67  304.09   269.9  236.73  213.32   177.4  158.52  149.77  121.82
190          UI  121.81   86.84    84.2    84.2   56.31   54.38   54.38   54.38   43.92   19.34
191          UI   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34
192          UI   19.34     0.0

193          KK    A1-O
194          KO       0       0     0.0       0      22
195          DT   A1ret    48.0     0.0
             * Curve
196          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
197          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
198          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
199          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
```

```
200        KK     1R   CNAME     1A
201        KO      0       0    0.0       0      22
202        RN     1R
203        ZZ
```

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	E2	787.	5.00	197.	49.	29.	1.22		
+	DIVERSION TO	E2ret	764.	4.83	81.	20.	12.	1.22		
+	HYDROGRAPH AT	E2-O	734.	5.17	117.	29.	17.	1.22		
+	HYDROGRAPH AT	E1	854.	5.08	228.	57.	33.	1.47		
+	DIVERSION TO	E1ret	835.	4.92	91.	23.	13.	1.47		
+	HYDROGRAPH AT	E1-O	799.	5.25	139.	35.	20.	1.47		
+	2 COMBINED AT	1E	1347.	5.25	221.	55.	32.	2.69		
+	ROUTED TO	1E-2E	976.	6.00	220.	55.	32.	2.69		
+	HYDROGRAPH AT	E3	1199.	4.75	603.	488.	472.	0.94		
+	DIVERSION TO	E3ret	450.	0.25	23.	6.	3.	0.94		
+	HYDROGRAPH AT	E3-O	1199.	4.75	603.	488.	469.	0.94		
+	2 COMBINED AT	2E	1484.	6.00	778.	534.	495.	3.63		
+	ROUTED TO	2E-3E	1376.	6.42	778.	534.	490.	3.63		
+	HYDROGRAPH AT	E4	660.	4.67	132.	33.	19.	0.74		
+	DIVERSION TO	E4ret	660.	4.67	71.	18.	10.	0.74		
+	HYDROGRAPH AT	E4-O	589.	4.92	62.	16.	9.	0.74		
+	2 COMBINED AT	3E	1381.	6.42	803.	540.	493.	4.37		
+	ROUTED TO	13R	1381.	6.42	803.	540.	493.	4.37		
+	HYDROGRAPH AT	D1	709.	4.58	121.	30.	18.	0.69		
+	DIVERSION TO	D1ret	289.	4.17	14.	4.	2.	0.69		
+	HYDROGRAPH AT	D1-O	709.	4.58	107.	27.	15.	0.69		
+	ROUTED TO	4R	709.	4.58	107.	27.	15.	0.69		
+	HYDROGRAPH AT	C1	829.	4.67	160.	40.	23.	0.95		
+	DIVERSION TO	C1ret	411.	4.25	18.	5.	3.	0.95		
+	HYDROGRAPH AT	C1-O	829.	4.67	142.	36.	20.	0.95		
+	ROUTED TO	3R	829.	4.67	142.	36.	20.	0.95		
+	HYDROGRAPH AT	B1	454.	4.42	55.	14.	8.	0.30		
+	DIVERSION TO	B1ret	167.	4.08	6.	2.	1.	0.30		
+	HYDROGRAPH AT	B1-O	454.	4.42	49.	12.	7.	0.30		
+	ROUTED TO	2R	454.	4.42	49.	12.	7.	0.30		
+	HYDROGRAPH AT	A1	1023.	4.92	255.	64.	37.	1.63		
+	DIVERSION TO	A1ret	951.	4.75	97.	24.	14.	1.63		
+	HYDROGRAPH AT	A1-O	994.	5.08	159.	40.	23.	1.63		
	ROUTED TO									

```
+                        1R      994.    5.08        159.        40.        23.      1.63

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

D.5.1.c HEC-1 Output File for 100-year 6-hour Storm (Future Conditions with No Retention)

```
1*************************************                    *************************************
*                                   *                    *                                   *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)*                    *  U.S. ARMY CORPS OF ENGINEERS     *
*            MAY  1991              *                    *  HYDROLOGIC ENGINEERING CENTER    *
*          VERSION 4.0.1E           *                    *        609 SECOND STREET          *
*                                   *                    *     DAVIS, CALIFORNIA 95616       *
* RUN DATE _________ TIME _________ *                    *       (916) 551-1748              *
*                                   *                    *                                   *
*************************************                    *************************************

                                   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

                                        HEC-1 INPUT                                        PAGE  1

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

  1           ID  Buckeye/Sun Valley ADMS - November 2004
  2           ID  PBS&J - Modelers: Jacob Lesue & Wen Chen
  3           ID  100-year 6-hour
  4           ID  Future Conditions
  5           ID  Area 2
  6           ID  Rainfall Loss Method - Green & Ampt
  7           ID  Unit Hydrograph Method - FCDMC S-Graph
  8           ID  Channel Routing Method - Normal Depth
  9           ID  Land Use - FCDMC GIS Data: meg_genplan (2000)
 10           ID  Soil Data - USDA SCS Soil Survey (1972 & 1981)
 11           ID  Units - L(mi)   Lca(mi)   S(ft/mi)   LAG(min)
              *DIAGRAM
 12           IT       5 01JAN94       0     500
 13           IO       3
 14           IN      15 01JAN94       0
 15           JD   3.299    0.01
              * 6-hour distribution, pattern 1.0
 16           PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
 17           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
 18           PC   0.962   0.972   0.983   0.991     1.0
 19           IN      15 01JAN94       0
 20           JD   3.279     0.5
              * 6-hour distribution, pattern 1.0
 21           PC     0.0   0.008   0.016   0.025   0.033   0.041    0.05   0.058   0.066   0.074
 22           PC   0.087   0.099   0.118   0.138   0.216   0.377   0.834   0.911   0.931    0.95
 23           PC   0.962   0.972   0.983   0.991     1.0
 24           IN      15 01JAN94       0
 25           JD   3.256     1.0
              * 6-hour distribution, pattern 1.4
 26           PC     0.0  0.0084   0.016   0.025  0.0334  0.0414  0.0504  0.0584  0.0664  0.0748
 27           PC   0.087  0.0994  0.1188   0.148  0.2304  0.4067  0.7778  0.8813  0.9186  0.9452
 28           PC  0.9572  0.9684  0.9798  0.9898     1.0
 29           IN      15 01JAN94       0
 30           JD   3.167     5.0
              * 6-hour distribution, pattern 2.3
 31           PC     0.0   0.011  0.0173  0.0267  0.0387   0.049  0.0593  0.0693  0.0797  0.0903
 32           PC   0.103  0.1173  0.1383  0.1827  0.2693   0.458   0.686  0.8233  0.8893  0.9293
 33           PC  0.9487   0.962  0.9743  0.9877     1.0
 34           IN      15 01JAN94       0
 35           JD   3.101    10.0
              * 6-hour distribution, pattern 2.7
 36           PC     0.0  0.0134  0.0189  0.0287  0.0443  0.0574  0.0694  0.0818  0.0949  0.1076
 37           PC  0.1223  0.1382  0.1604  0.2063  0.2902  0.4664  0.6764  0.8069  0.8765  0.9189
 38           PC  0.9471  0.9608  0.9735  0.9873     1.0

 39           KK      E2
 40           KO       0       0     0.0       1      22
 41           BA   1.223
 42           LG   0.291    0.25   4.461   0.366     5.0
              * E2
 43           UI     0.0   58.83   58.83   58.83  144.86  208.85  279.67  342.88  405.24   457.0
 44           UI  507.81  529.31  563.74  563.74  555.85  533.62  497.45  434.25  391.56  340.11
 45           UI  302.44  266.78  236.95  210.69  181.23  162.62  138.96  125.18   110.9    98.6
 46           UI    90.2   76.44   62.35   62.35   52.28   40.27   40.27   40.27   40.27   20.75
 47           UI   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32
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                                        HEC-1 INPUT                                                                    PAGE  2

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

  48          UI   14.32   14.32     0.0

  49          KK      E1
  50          KO       0       0     0.0       1      22
  51          BA  1.4663
  52          LG   0.292    0.25   4.362   0.383     5.0
              * E1
  53          UI     0.0   65.83   65.83   65.83  133.71  212.83  283.95  353.35  417.84  469.07
  54          UI  544.82  578.46  602.95  630.83  630.83  621.37  596.51  565.09  496.91  450.85
  55          UI  395.94   351.1  316.81  280.75   249.5  222.83  197.54  180.24  148.98  137.95
  56          UI   124.1  111.01  100.93   91.12   69.77   69.77   68.29   45.06   45.06   45.06
  57          UI   45.06   44.48   16.02   16.02   16.02   16.02   16.02   16.02   16.02   16.02
  58          UI   16.02   16.02   16.02   16.02   16.02   16.02

  59          KK      1E   CNAME   1E-2E
  60          KO       0       0     0.0       0      22
  61          HC       2

  62          KK   1E-2E   CNAME      1E
  63          KO       0       0     0.0       0      22
  64          RS       6    FLOW     0.0     0.0
  65          RC    0.05    0.07    0.05  9559.0  0.0051     0.0
              * 1E-2E
  66          RX     0.0    15.0    45.0    55.0    75.0    85.0   115.0   130.0
  67          RY    10.5     4.5     2.0     0.0     0.0     2.0     4.5    10.5

  68          KK      E3
  69          KO       0       0     0.0       1      22
  70          BA  0.9425
  71          BF   450.0     0.0     1.0
  72          LG     0.3    0.25   4.245   0.401     5.0
              * E3
  73          UI     0.0   56.67   56.67  101.72  193.55  277.61  352.61  421.01  484.48  516.56
  74          UI   543.1  541.36  515.53  472.72  403.34  343.83  295.16   254.8   215.6  185.13
  75          UI  160.09  132.41   113.9  101.35    86.9   70.93   60.07   56.56   38.79   38.79
  76          UI   38.79   28.75   13.79   13.79   13.79   13.79   13.79   13.79   13.79   13.79
  77          UI   13.79   13.79

  78          KK      2E   CNAME   2E-3E
  79          KO       0       0     0.0       0      22
  80          HC       2

  81          KK   2E-3E   CNAME      2E
  82          KO       0       0     0.0       0      22
  83          RS       6    FLOW     0.0     0.0
  84          RC   0.055    0.03   0.055 10646.0  0.0051     0.0
              * 2E-3E
  85          RX     0.0    15.0    35.0    40.0    60.0    65.0    85.0   100.0
  86          RY     7.5     4.0     3.0     0.0     0.0     3.0     4.0     7.5

                                        HEC-1 INPUT                                                                    PAGE  3

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

  87          KK      E4
  88          KO       0       0     0.0       1      22
  89          BA  0.7401
  90          BF     0.0     0.0     0.0
  91          LG   0.273    0.25   4.185   0.422  11.823
              * E4
  92          UI     0.0   47.02   47.02   96.57  173.26  247.62  312.68  368.15  416.75  440.62
  93          UI  450.61  436.38   410.6  347.57  298.99  252.38   214.2  181.58  153.89  132.33
  94          UI   107.9   92.15   80.49    72.1   52.01   49.84    39.2   32.19   32.19   31.34
  95          UI   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44     0.0

  96          KK      3E   CNAME     13R
  97          KO       0       0     0.0       0      22
  98          HC       2

  99          KK     13R   CNAME      3E
 100          KO       0       0     0.0       0      22
 101          RN     13R

 102          KK      A1
 103          KO       0       0     0.0       1      22
 104          BA   1.628
 105          LG   0.287    0.25   4.498   0.359     5.0
              * A1
 106          UI     0.0   79.44   79.44   79.44  202.48  287.09  387.46  471.36  550.52  628.97
 107          UI  692.49  723.86  761.33  761.33  744.73   712.6  657.55  568.77  509.79  446.69
 108          UI  392.19  351.67  304.09   269.9  236.73  213.32   177.4  158.52  149.77  121.82
 109          UI  121.81   86.84    84.2    84.2   56.31   54.38   54.38   54.38   43.92   19.34
 110          UI   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34
 111          UI   19.34     0.0

 112          KK      1R   CNAME      1A
 113          KO       0       0     0.0       0      22
 114          RN      1R

 115          KK      D1
 116          KO       0       0     0.0       1      22
 117          BA  0.6874
 118          LG     0.3    0.25   4.642   0.332     5.0
              * D1
 119          UI     0.0   50.32   50.32  141.34  228.99  312.52  384.55  444.86  474.65  481.62
 120          UI  455.19  400.91  332.15  274.33  228.36  187.75  154.57  127.52  104.38   88.96
 121          UI   77.15   54.45   53.33   35.26   34.44   34.44   15.23   12.25   12.25   12.25
 122          UI   12.25   12.25   12.25   12.25     0.0

 123          KK      4R   CNAME      1D
 124          KO       0       0     0.0       0      22
 125          RN      4R
```

HEC-1 INPUT PAGE 4

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

  126         KK      C1
  127         KO       0       0     0.0       1      22
  128         BA   0.947
  129         LG   0.278    0.25   4.669   0.344     5.0
              * C1
  130         UI     0.0   61.32   61.32  131.22  233.88  329.66  413.44  491.65  546.63  581.16
  131         UI  587.64  561.55  521.37  439.42  369.44  313.69  266.99  226.51  188.91  160.51
  132         UI  133.36   115.6   96.21    84.2   64.99   63.11   41.97   41.97   41.97   26.09
  133         UI   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92     0.0

  134         KK      3R   CNAME      1C
  135         KO       0       0     0.0       0      22
  136         RN      3R

  137         KK      B1
  138         KO       0       0     0.0       1      22
  139         BA  0.3003
  140         LG   0.296    0.25   4.624   0.328     5.0
              * B1
  141         UI     0.0   32.62   70.32  160.06  235.61  291.03  312.58  291.47  230.86  173.86
  142         UI  132.12   59.49   73.87   56.67   42.44    32.8   22.33   21.44    7.94    7.94
  143         UI    7.94    7.94    7.94     0.0

  144         KK      2R   CNAME      1B
  145         KO       0       0     0.0       0      22
  146         RN      2R
  147         ZZ
```

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	E2	787.	5.00	197.	49.	29.	1.22		
+	HYDROGRAPH AT	E1	854.	5.08	228.	57.	33.	1.47		
+	2 COMBINED AT	1E	1477.	5.00	390.	98.	57.	2.69		
+	ROUTED TO	1E-2E	1394.	5.50	389.	98.	57.	2.69		
+	HYDROGRAPH AT	E3	1199.	4.75	603.	488.	472.	0.94		
+	2 COMBINED AT	2E	2057.	5.33	949.	577.	523.	3.63		
+	ROUTED TO	2E-3E	2010.	5.75	949.	577.	518.	3.63		
+	HYDROGRAPH AT	E4	660.	4.67	132.	33.	19.	0.74		
+	2 COMBINED AT	3E	2087.	5.67	1040.	600.	532.	4.37		
+	ROUTED TO	13R	2087.	5.67	1040.	600.	532.	4.37		
+	HYDROGRAPH AT	A1	1023.	4.92	255.	64.	37.	1.63		
+	ROUTED TO	1R	1023.	4.92	255.	64.	37.	1.63		
+	HYDROGRAPH AT	D1	709.	4.58	121.	30.	18.	0.69		
+	ROUTED TO	4R	709.	4.58	121.	30.	18.	0.69		
+	HYDROGRAPH AT	C1	829.	4.67	160.	40.	23.	0.95		
+	ROUTED TO	3R	829.	4.67	160.	40.	23.	0.95		
+	HYDROGRAPH AT	B1	454.	4.42	55.	14.	8.	0.30		
+	ROUTED TO	2R	454.	4.42	55.	14.	8.	0.30		

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

D.5.2 HEC-1 Output File 100-Year 24-Hour

D.5.2.a HEC-1 Output File for 100-Year 24-Hour (Existing Conditions)

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1*********************************************
*                                           *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)       *
*            MAY  1991                      *
*          VERSION 4.0.1E                   *
*                                           *
*  RUN DATE _________ TIME _________        *
*                                           *
*********************************************

*********************************************
*                                           *
*   U.S. ARMY CORPS OF ENGINEERS            *
*   HYDROLOGIC ENGINEERING CENTER           *
*         609 SECOND STREET                 *
*      DAVIS, CALIFORNIA 95616              *
*          (916) 551-1748                   *
*                                           *
*********************************************

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

                                    HEC-1 INPUT                                                    PAGE  1

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

  1           ID   Buckeye/Sun Valley ADMS - 03 May 2004
  2           ID   PBS&J - Modelers: Jacob Lesue & Wen Chen
  3           ID   100-year 24-hour
  4           ID   Existing Conditions
  5           ID   Area 2
  6           ID   Rainfall Loss Method - Green & Ampt
  7           ID   Unit Hydrograph Method - FCDMC S-Graph
  8           ID   Channel Routing Method - Normal Depth
  9           ID   Land Use - FCDMC GIS Data: mag_landuse (2000)
 10           ID   Soil Data - USDA SCS Soil Survey (1972 & 1981)
 11           ID   Units - L(mi)   Lca(mi)   S(ft/mi)   LAG(min)
              *DIAGRAM
 12           IT       5  1JAN94       0    2000
 13           IO       3
 14           IN      15 01JAN94       0
 15           JD   4.104    0.01
              * 24-hour distribution
 16           PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 17           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 18           PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 19           PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 20           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 21           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 22           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 23           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 24           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 25           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 26           IN      15 01JAN94       0
 27           JD   3.899    10.0
              * 24-hour distribution
 28           PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 29           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 30           PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 31           PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 32           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 33           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 34           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 35           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 36           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 37           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0

 38           KK      E2
 39           KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 40           KM            L=2.97      Lca=1.67      S=27.48      Kn=0.050      LAG=70.0
 41           KM            S-GRAPH TYPE=DESERT RANGELAND
 42           KO       0       0     0.0       1      22
 43           BA   1.223
 44           LG   0.348   0.343   4.461   0.354   2.288
              * E2
 45           UI     0.0   58.83   58.83   58.83  144.86  208.85  279.67  342.88  405.24   457.0
 46           UI  507.81  529.31  563.74  563.74  555.85  533.62  497.45  434.25  391.56  340.11
 47           UI  302.44  266.78  236.95  210.69  181.23  162.62  138.96  125.16   110.9    98.6
 48           UI    90.2   76.44   62.35   62.35   52.28   40.27   40.27   40.27   40.27   20.75
 49           UI   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32
 50           UI   14.32   14.32     0.0

                                    HEC-1 INPUT                                                    PAGE  2

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

 51           KK      E1
 52           KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 53           KM            L=3.19      Lca=1.81      S=27.95      Kn=0.050      LAG=75.0
 54           KM            S-GRAPH TYPE=DESERT RANGELAND
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 55          KO       0       0     0.0       1      22
 56          BA  1.4663
 57          LG   0.343   0.347   4.362   0.364   2.082
             * E1
 58          UI     0.0   65.83   65.83   65.83  133.71  212.83  283.95  353.35  417.84  469.07
 59          UI  544.82  578.46  602.95  630.83  630.83  621.37  596.51  565.09  496.91  450.85
 60          UI  395.94   351.1  316.81  280.75   249.5  222.83  197.54  180.24  148.98  137.95
 61          UI   124.1  111.01  100.93   91.12   69.77   69.77   68.29   45.06   45.06   45.06
 62          UI   45.06   44.48   16.02   16.02   16.02   16.02   16.02   16.02   16.02   16.02
 63          UI   16.02   16.02   16.02   16.02   16.02   16.02

 64          KK      1E   CNAME   1E-2E
 65          KO       0       0     0.0       0      22
 66          HC       2

 67          KK   1E-2E   CNAME      1E
 68          KO       0       0     0.0       0      22
 69          RS       7    FLOW     0.0     0.0
 70          RC    0.05    0.07    0.05  9559.0  0.0051     0.0
             * 1E-2E
 71          RX     0.0    15.0    45.0    55.0    75.0    85.0   115.0   130.0
 72          RY    10.5     4.5     2.0     0.0     0.0     2.0     4.5    10.5

 73          KK      E3
 74          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 75          KM            L=2.72     Lca=0.99     S=25.93     Kn=0.050     LAG=56.0
 76          KM            S-GRAPH TYPE=DESERT RANGELAND
 77          KO       0       0     0.0       1      22
 78          BA  0.9425
 79          BF   450.0     0.0     1.0
 80          LG   0.402   0.306   4.245   0.444   1.589
             * E3
 81          UI     0.0   56.67   56.67  101.72  193.55  277.61  352.61  421.01  464.48  516.56
 82          UI   543.1  541.36  515.53  472.72  403.34  343.83  295.16   254.8   215.6  185.13
 83          UI  160.09  132.41   113.9  101.35   86.9   70.93   60.07   56.56   38.79   38.79
 84          UI   38.79   28.75   13.79   13.79   13.79   13.79   13.79   13.79   13.79   13.79
 85          UI   13.79   13.79

 86          KK      2E   CNAME   2E-3E
 87          KO       0       0     0.0       0      22
 88          HC       2

 89          KK   2E-3E   CNAME      2E
 90          KO       0       0     0.0       0      22
 91          RS       5    FLOW     0.0     0.0
 92          RC   0.055    0.03   0.055 10646.0  0.0051     0.0
             * 2E-3E
 93          RX     0.0    15.0    35.0    40.0    60.0    65.0    85.0   100.0
 94          RY     7.5     4.0     3.0     0.0     0.0     3.0     4.0     7.5
                                          HEC-1 INPUT                                          PAGE  3
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 95          KK      E4
 96          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 97          KM            L=2.00     Lca=1.24     S=28.98     Kn=0.050     LAG=53.0
 98          KM            S-GRAPH TYPE=DESERT RANGELAND
 99          KO       0       0     0.0       1      22
100          BA  0.7401
101          BF     0.0     0.0     0.0
102          LG   0.389   0.324   4.185   0.421     0.0
             * E4
103          UI     0.0   47.02   47.02   96.57  173.26  247.62  312.68  368.15  416.75  440.62
104          UI  450.61  436.38  410.6  347.57  298.99  252.38   214.2  181.58  153.89  132.33
105          UI   107.9   92.15   80.49    72.1   52.01   49.84    39.2   32.19   32.19   31.34
106          UI   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44     0.0

107          KK      3E   CNAME     13R
108          KO       0       0     0.0       0      22
109          HC       2

110          KK     13R   CNAME      3E
111          KO       0       0     0.0       0      22
112          RN     13R

113          KK      D1
114          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
115          KM            L=2.05     Lca=0.98     S=41.10     Kn=0.050     LAG=46.0
116          KM            S-GRAPH TYPE=DESERT RANGELAND
117          KO       0       0     0.0       1      22
118          BA  0.6874
119          LG    0.35    0.35   4.642   0.317     0.0
             * D1
120          UI     0.0   50.32   50.32  141.34  228.99  312.52  384.55  444.86  474.65  481.62
121          UI  455.19  400.91  332.15  274.33  228.36  187.75  154.57  127.52  104.38   88.96
122          UI   77.15   54.45   53.33   35.26   34.44   34.44   15.23   12.25   12.25   12.25
123          UI   12.25   12.25   12.25   12.25     0.0

124          KK      4R   CNAME      1D
125          KO       0       0     0.0       0      22
126          RN      4R

127          KK      C1
128          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
129          KM            L=2.65     Lca=1.06     S=41.60     Kn=0.050     LAG=52.0
130          KM            S-GRAPH TYPE=DESERT RANGELAND
131          KO       0       0     0.0       1      22
132          BA   0.947
133          LG    0.35    0.35   4.669   0.311     0.0
             * C1
134          UI     0.0   61.32   61.32  131.22  233.88  329.66  413.44  491.65  546.63  581.16
135          UI  587.64  561.55  521.37  439.42  369.44  313.69  266.99  226.51  188.91  160.51
136          UI  133.36   115.6   96.21    84.2   64.99   63.11   41.97   41.97   41.97   26.09
137          UI   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92     0.0
                                          HEC-1 INPUT                                          PAGE  4
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

138          KK      3R   CNAME      1C
139          KO       0       0     0.0       0      22
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140          RN      3R

141          KK      B1
142          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
143          KM            L=1.34     Lca=0.66     S=57.24     Kn=0.050     LAG=31.0
144          KM            S-GRAPH TYPE=DESERT RANGELAND
145          KO       0       0     0.0       1      22
146          BA  0.3003
147          LG    0.35    0.35   4.624   0.315     0.0
             * B1
148          UI     0.0   32.62   70.32  160.06  235.61  291.03  312.58  291.47  230.86  173.86
149          UI  132.12   99.49   73.87   56.67   42.44    32.8   22.33   21.44    7.94    7.94
150          UI    7.94    7.94    7.94     0.0

151          KK      2R   CNAME      1B
152          KO       0       0     0.0       0      22
153          RN      2R

154          KK      A1
155          KM            THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
156          KM            L=2.96     Lca=1.73     S=32.98     Kn=0.050     LAG=69.0
157          KM            S-GRAPH TYPE=DESERT RANGELAND
158          KO       0       0     0.0       1      22
159          BA   1.628
160          LG   0.343   0.347   4.498   0.339   2.145
             * A1
161          UI     0.0   79.44   79.44   79.44  202.48  287.09  387.46  471.36  550.52  628.97
162          UI  692.49  723.86  761.33  761.33  744.73   712.6  657.55  568.77  509.79  446.69
163          UI  392.19  351.67  304.09   269.9  236.73  213.32   177.4  158.52  149.77  121.82
164          UI  121.81   86.84    84.2    84.2   56.31   54.38   54.38   54.38   43.92   19.34
165          UI   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34
166          UI   19.34     0.0

167          KK      1R   CNAME      1A
168          KO       0       0     0.0       0      22
169          RN      1R
170          ZZ
```

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	E2	590.	13.00	144.	37.	12.	1.22		
+	HYDROGRAPH AT	E1	656.	13.00	171.	44.	15.	1.47		
+	2 COMBINED AT	1E	1236.	13.00	312.	80.	27.	2.69		
+	ROUTED TO	1E-2E	1166.	13.50	310.	80.	27.	2.69		
+	HYDROGRAPH AT	E3	976.	12.75	553.	476.	459.	0.94		
+	2 COMBINED AT	2E	1813.	13.42	858.	555.	485.	3.63		
+	ROUTED TO	2E-3E	1750.	13.75	858.	555.	485.	3.63		
+	HYDROGRAPH AT	E4	435.	12.67	60.	20.	7.	0.74		
+	2 COMBINED AT	3E	1822.	13.75	935.	574.	492.	4.37		
+	ROUTED TO	13R	1822.	13.75	935.	574.	492.	4.37		
+	HYDROGRAPH AT	D1	497.	12.58	81.	20.	7.	0.69		
+	ROUTED TO	4R	497.	12.58	81.	20.	7.	0.69		
+	HYDROGRAPH AT	C1	613.	12.67	111.	28.	9.	0.95		
+	ROUTED TO	3R	613.	12.67	111.	28.	9.	0.95		
+	HYDROGRAPH AT	B1	307.	12.42	36.	9.	3.	0.30		
+	ROUTED TO	2R	307.	12.42	36.	9.	3.	0.30		
+	HYDROGRAPH AT	A1	803.	12.92	193.	49.	16.	1.63		
+	ROUTED TO	1R	803.	12.92	193.	49.	16.	1.63		

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

D.5.2.b HEC-1 Output File for 100-Year 24-Hour (Future Conditions with Retention)

```
1*************************************                    *************************************
*                                   *                    *                                   *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)*                    *  U.S. ARMY CORPS OF ENGINEERS     *
*            MAY  1991              *                    *  HYDROLOGIC ENGINEERING CENTER    *
*          VERSION 4.0.1E           *                    *        609 SECOND STREET          *
*                                   *                    *     DAVIS, CALIFORNIA 95616       *
* RUN DATE _______ TIME _______     *                    *        (916) 551-1748             *
*                                   *                    *                                   *
*************************************                    *************************************

                                        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

                                        HEC-1 INPUT                                          PAGE  1

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

  1           ID  Buckeye/Sun Valley ADMS - November 2004
  2           ID  PBS&J - Modelers: Jacob Lesue & Wen Chen
  3           ID  100-year 24-hour
  4           ID  Future Conditions
  5           ID  Area 2
  6           ID  Rainfall Loss Method - Green & Ampt
  7           ID  Unit Hydrograph Method - FCDMC S-Graph
  8           ID  Channel Routing Method - Normal Depth
  9           ID  Land Use - FCDMC GIS Data: mag_genplan (2000)
 10           ID  Soil Data - USDA SCS Soil Survey (1972 & 1981)
 11           ID  Units - L(mi)   Lca(mi)   S(ft/mi)   LAG(min)
              *DIAGRAM
 12           IT       5 01JAN94       0     500
 13           IO       3
 14           IN      15 01JAN94       0
 15           JD   4.104    0.01
              * 24-hour distribution
 16           PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 17           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 18           PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 19           PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 20           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 21           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 22           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 23           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 24           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 25           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 26           IN      15 01JAN94       0
 27           JD   3.899    10.0
              * 24-hour distribution
 28           PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 29           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 30           PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 31           PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 32           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 33           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 34           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 35           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 36           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 37           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0
 38           IN      15 01JAN94       0
 39           JD   3.768    20.0
              * 24-hour distribution
 40           PC     0.0   0.002   0.005   0.008   0.011   0.014   0.017    0.02   0.023   0.026
 41           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056    0.06
 42           PC   0.064   0.068   0.072   0.076    0.08   0.085    0.09   0.095     0.1   0.105
 43           PC    0.11   0.115    0.12   0.126   0.133    0.14   0.147   0.155   0.163   0.172
 44           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
 45           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
 46           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
 47           PC   0.913   0.918   0.922   0.926    0.93   0.934   0.938   0.942   0.946    0.95
 48           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977    0.98
 49           PC   0.983   0.986   0.989   0.992   0.995   0.998     1.0

                                        HEC-1 INPUT                                          PAGE  2

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

 50           KK      E2
 51           KO       0       0     0.0       1      22
 52           BA   1.223
 53           LG   0.291    0.25   4.461   0.366     5.0
              * E2
 54           UI     0.0   58.83   58.83   58.83  144.86  208.85  279.67  342.88  405.24   457.0
 55           UI  507.81  529.31  563.74  563.74  555.85  533.62  497.45  434.25  391.56  340.11
```

```
 56          UI  302.44  266.78  236.95  210.69  181.23  162.62  138.96  125.18   110.9    98.6
 57          UI    90.2   76.44   62.35   62.35   52.28   40.27   40.27   40.27   40.27   20.75
 58          UI   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32   14.32
 59          UI   14.32   14.32     0.0

 60          KK    E2-O
 61          KO       0       0     0.0       0      22
 62          DT   E2ret    40.0     0.0
             * Curve
 63          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 64          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
 65          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 66          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

 67          KK      E1
 68          KO       0       0     0.0       1      22
 69          BA  1.4663
 70          LG   0.292    0.25   4.362   0.383     5.0
             * E1
 71          UI     0.0   65.83   65.83   65.83  133.71  212.83  283.95  353.35  417.84  469.07
 72          UI  544.82  578.46  602.95  630.83  630.83  621.37  596.51  565.09  496.91  450.85
 73          UI  395.94   351.1  316.81  280.75   249.5  222.83  197.54  180.24  146.98  137.95
 74          UI   124.1  111.01  100.93   91.12   69.77   69.77   68.29   45.06   45.06   45.06
 75          UI   45.06   44.48   16.02   16.02   16.02   16.02   16.02   16.02   16.02   16.02
 76          UI   16.02   16.02   16.02   16.02   16.02   16.02

 77          KK    E1-O
 78          KO       0       0     0.0       0      22
 79          DT   E1ret    45.0     0.0
             * Curve
 80          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 81          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
 82          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
 83          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

 84          KK      1E   CNAME   1E-2E
 85          KO       0       0     0.0       0      22
 86          HC       2

 87          KK   1E-2E   CNAME      1E
 88          KO       0       0     0.0       0      22
 89          RS      11    FLOW     0.0     0.0
 90          RC    0.05    0.07    0.05  9559.0  0.0051     0.0
             * 1E-2E
 91          RX     0.0    15.0    45.0    55.0    75.0    85.0   115.0   130.0
```



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

 92          RY    10.5     4.5     2.0     0.0     0.0     2.0     4.5    10.5

 93          KK      E3
 94          KO       0       0     0.0       1      22
 95          BA  0.9425
 96          BF   450.0     0.0     1.0
 97          LG     0.3    0.25   4.245   0.401     5.0
             * E3
 98          UI     0.0   56.67   56.67  101.72  193.55  277.61  352.61  421.01  484.48  516.56
 99          UI   543.1  541.36  515.53  472.72  403.34  343.83  295.16   254.8   215.6  185.13
100          UI  160.09  132.41   113.9  101.35    86.9   70.93   60.07   56.56   38.79   38.79
101          UI   38.79   28.75   13.79   13.79   13.79   13.79   13.79   13.79   13.79   13.79
102          UI   13.79   13.79

103          KK    E3-O
104          KO       0       0     0.0       0      22
105          DT   E3ret    13.0     0.0
             * Curve
106          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
107          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
108          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
109          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

110          KK      2E   CNAME   2E-3E
111          KO       0       0     0.0       0      22
112          HC       2

113          KK   2E-3E   CNAME      2E
114          KO       0       0     0.0       0      22
115          RS       6    FLOW     0.0     0.0
116          RC   0.055    0.03   0.055 10646.0  0.0051     0.0
             * 2E-3E
117          RX     0.0    15.0    35.0    40.0    60.0    65.0    85.0   100.0
118          RY     7.5     4.0     3.0     0.0     0.0     3.0     4.0     7.5

119          KK      E4
120          KO       0       0     0.0       1      22
121          BA  0.7401
122          BF     0.0     0.0     0.0
123          LG   0.273    0.25   4.185   0.422  11.823
             * E4
124          UI     0.0   47.02   47.02   96.57  173.26  247.62  312.68  368.15  416.75  440.62
125          UI  450.61  436.38   410.6  347.57  296.99  252.38   214.2  181.58  153.89  132.33
126          UI   107.9   92.15   80.49    72.1   52.01   49.84   39.2   32.19   32.19   31.34
127          UI   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44   11.44     0.0

128          KK    E4-O
129          KO       0       0     0.0       0      22
130          DT   E4ret    35.0     0.0
             * Curve
131          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
132          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
133          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
```



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

134          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
```

```
135          KK      3E   CNAME     13R
136          KO       0       0     0.0       0      22
137          HC       2

138          KK     13R   CNAME      3E
139          KO       0       0     0.0       0      22
140          RN     13R

141          KK      A1
142          KO       0       0     0.0       1      22
143          BA   1.628
144          LG   0.287    0.25   4.498   0.359     5.0
             * A1
145          UI     0.0   79.44   79.44   79.44  202.48  287.09  387.46  471.36  550.52  628.97
146          UI  692.49  723.86  761.33  761.33  744.73   712.6  657.55  568.77  509.79  446.69
147          UI  392.19  351.67  304.09   269.9  236.73  213.32   177.4  158.52  149.77  121.82
148          UI  121.81   86.84    84.2    84.2   56.31   54.38   54.38   54.38   43.92   19.34
149          UI   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34   19.34
150          UI   19.34     0.0

151          KK    A1-O
152          KO       0       0     0.0       0      22
153          DT   A1ret    48.0     0.0
             * Curve
154          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
155          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
156          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
157          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

158          KK      1R   CNAME      1A
159          KO       0       0     0.0       0      22
160          RN      1R

161          KK      D1
162          KO       0       0     0.0       1      22
163          BA  0.6874
164          LG     0.3    0.25   4.642   0.332     5.0
             * D1
165          UI     0.0   50.32   50.32  141.34  228.99  312.52  384.55  444.86  474.65  481.62
166          UI  455.19  400.91  332.15  274.33  228.36  187.75  154.57  127.52  104.38   88.96
167          UI   77.15   54.45   53.33   35.26   34.44   34.44   15.23   12.25   12.25   12.25
168          UI   12.25   12.25   12.25   12.25     0.0

169          KK    D1-O
170          KO       0       0     0.0       0      22
171          DT   D1ret     7.0     0.0
             * Curve
172          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
173          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
174          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
175          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
```



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

176          KK      4R   CNAME      1D
177          KO       0       0     0.0       0      22
178          RN      4R

179          KK      C1
180          KO       0       0     0.0       1      22
181          BA   0.947
182          LG   0.278    0.25   4.669   0.344     5.0
             * C1
183          UI     0.0   61.32   61.32  131.22  233.88  329.66  413.44  491.65  546.63  581.16
184          UI  587.64  561.55  521.37  439.42  369.44  313.69  266.99  226.51  188.91  160.51
185          UI  133.36   115.6   96.21    84.2   64.99   63.11   41.97   41.97   41.97   26.09
186          UI   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92   14.92     0.0

187          KK    C1-O
188          KO       0       0     0.0       0      22
189          DT   C1ret     9.0     0.0
             * Curve
190          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
191          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
192          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
193          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

194          KK      3R   CNAME      1C
195          KO       0       0     0.0       0      22
196          RN      3R

197          KK      B1
198          KO       0       0     0.0       1      22
199          BA  0.3003
200          LG   0.296    0.25   4.624   0.328     5.0
             * B1
201          UI     0.0   32.62   70.32  160.06  235.61  291.03  312.58  291.47  230.86  173.86
202          UI  132.12   99.49   73.87   56.67   42.44    32.8   22.33   21.44    7.94    7.94
203          UI    7.94    7.94    7.94     0.0

204          KK    B1-O
205          KO       0       0     0.0       0      22
206          DT   B1ret     3.0     0.0
             * Curve
207          DI     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
208          DI  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
             * Curve
209          DQ     0.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0
210          DQ  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0  2000.0

211          KK      2R   CNAME      1B
212          KO       0       0     0.0       0      22
213          RN      2R
214          ZZ
```

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	E2	638.	13.00	159.	42.	24.	1.22		
+	DIVERSION TO	E2ret	638.	12.92	79.	20.	12.	1.22		
+	HYDROGRAPH AT	E2-O	587.	13.17	84.	22.	12.	1.22		
+	HYDROGRAPH AT	E1	708.	13.00	188.	49.	28.	1.47		
+	DIVERSION TO	E1ret	708.	13.00	88.	23.	13.	1.47		
+	HYDROGRAPH AT	E1-O	686.	13.17	104.	27.	15.	1.47		
+	2 COMBINED AT	1E	1263.	13.17	185.	47.	27.	2.69		
+	ROUTED TO	1E-2E	873.	14.00	181.	47.	27.	2.69		
+	HYDROGRAPH AT	E3	1042.	12.75	570.	481.	468.	0.94		
+	DIVERSION TO	E3ret	450.	0.25	23.	6.	3.	0.94		
+	HYDROGRAPH AT	E3-O	1042.	12.75	570.	481.	465.	0.94		
+	2 COMBINED AT	2E	1402.	14.00	744.	528.	492.	3.63		
+	ROUTED TO	2E-3E	1283.	14.42	743.	528.	487.	3.63		
+	HYDROGRAPH AT	E4	503.	12.67	103.	28.	16.	0.74		
+	DIVERSION TO	E4ret	503.	12.67	66.	18.	10.	0.74		
+	HYDROGRAPH AT	E4-O	337.	13.08	40.	11.	6.	0.74		
+	2 COMBINED AT	3E	1311.	14.42	780.	538.	492.	4.37		
+	ROUTED TO	13R	1311.	14.42	780.	538.	492.	4.37		
+	HYDROGRAPH AT	A1	864.	12.92	212.	56.	32.	1.63		
+	DIVERSION TO	A1ret	849.	12.83	94.	24.	14.	1.63		
+	HYDROGRAPH AT	A1-O	830.	13.08	122.	31.	18.	1.63		
+	ROUTED TO	1R	830.	13.08	122.	31.	18.	1.63		
+	HYDROGRAPH AT	D1	540.	12.58	92.	24.	14.	0.69		
+	DIVERSION TO	D1ret	226.	12.17	13.	4.	2.	0.69		
+	HYDROGRAPH AT	D1-O	540.	12.58	81.	21.	12.	0.69		
+	ROUTED TO	4R	540.	12.58	81.	21.	12.	0.69		
+	HYDROGRAPH AT	C1	660.	12.67	126.	33.	19.	0.95		
+	DIVERSION TO	C1ret	330.	12.25	17.	5.	3.	0.95		
+	HYDROGRAPH AT	C1-O	660.	12.67	111.	28.	16.	0.95		
+	ROUTED TO	3R	660.	12.67	111.	28.	16.	0.95		
+	HYDROGRAPH AT	B1	330.	12.42	41.	11.	6.	0.30		
+	DIVERSION TO	B1ret	140.	12.08	6.	2.	1.	0.30		
+	HYDROGRAPH AT	B1-O	330.	12.42	36.	9.	5.	0.30		
+	ROUTED TO	2R	330.	12.42	36.	9.	5.	0.30		

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

E. Hydraulic Analysis Supporting Documentation

E.1 Roughness Coefficient Estimation

For Tributaries 1E, 3E, and 4E – All Reaches

Photos L01-PX through L21-PX are from the May 21, 2004 field visit and correspond to the picture locations noted in Figure 5-17. The photo nomenclature describes the location number (LX) and also the number of the photo (PX) taken at that location.

Picture.L01-P1
Hassayampa Tributary 4E

Picture.L01-P2
Hassayampa Tributary 4E

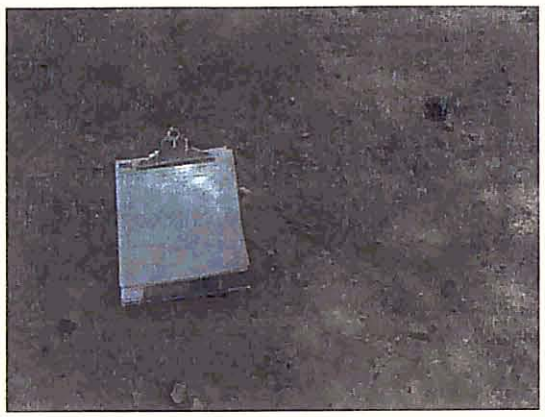
Picture.L01-P3
Hassayampa Tributary 4E

Picture.L02-P1
Hassayampa Tributary 4E

Picture.L02-P2
Hassayampa Tributary 4E

Picture.L02-P3
Hassayampa Tributary 4E

Picture.L03-P1
Hassayampa Tributary 4E



Picture.L03-P2
Hassayampa Tributary 4E

Picture.L04-P1
Hassayampa Tributary 3E

Picture.L04-P2
Hassayampa Tributary 3E

Picture.L04-P3
Hassayampa Tributary 3E

Picture.L05-P1
Hassayampa Tributary 3E

Picture.L06-P1
Hassayampa Tributary 3E

Picture.L07-P1
Hassayampa Tributary 3E

Picture.L07-P2
Hassayampa Tributary 3E

Picture.L08-P1
Hassayampa Tributary 1E

Picture. L08-P2
Hassayampa Tributary 1E

Picture.L08-P3
Hassayampa Tributary 1E

Picture.L08-P4
Hassayampa Tributary 1E

Picture.L08-P5
Hassayampa Tributary 1E

Picture.L08-P6
Hassayampa Tributary 1E

Picture.L09-P1
Hassayampa Tributary 1E

Picture.L09-P2
Hassayampa Tributary 1E

Picture.L09-P3
Hassayampa Tributary 1E

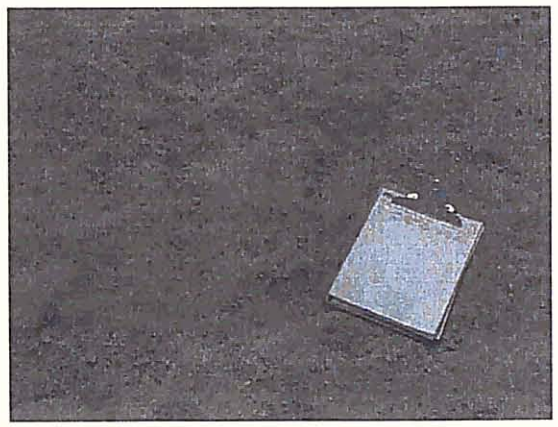
Picture.L10-P1
Hassayampa Tributary 1E

Picture.L10-P2
Hassayampa Tributary 1E

Picture.L11-P1
Hassayampa Tributary 1E

Picture.L11-P2
Hassayampa Tributary 1E

Picture.L12-P1
Hassayampa Tributary 1E



Picture.L-12-P2
Hassayampa Tributary 1E

Picture.L13-P1
Hassayampa Tributary 1E

Picture.L14-P1
Hassayampa Tributary 1E

Picture.L15-P1
Hassayampa Tributary 1E

Picture.L15-P2
Hassayampa Tributary 1E

Picture.L16-P1
Hassayampa Tributary 1E

Picture.L16-P2
Hassayampa Tributary 1E

Picture.L17-P1
Hassayampa Tributary 1E

Picture.L17-P2
Hassayampa Tributary 1E

Picture.L18-P1
Hassayampa Tributary 1E

Picture.L18-P2
Hassayampa Tributary 1E

Picture.L18-P3
Hassayampa Tributary 1E

Picture.L19-P1
Hassayampa Tributary 1E

Picture.L19-P2
Hassayampa Tributary 1E

Picture.L20-P1
Hassayampa Tributary 1E

Picture.L21-P1
Hassayampa Tributary 1E

Picture.L21-P2
Hassayampa Tributary 1E

Picture.L21-P3
Hassayampa Tributary 1E

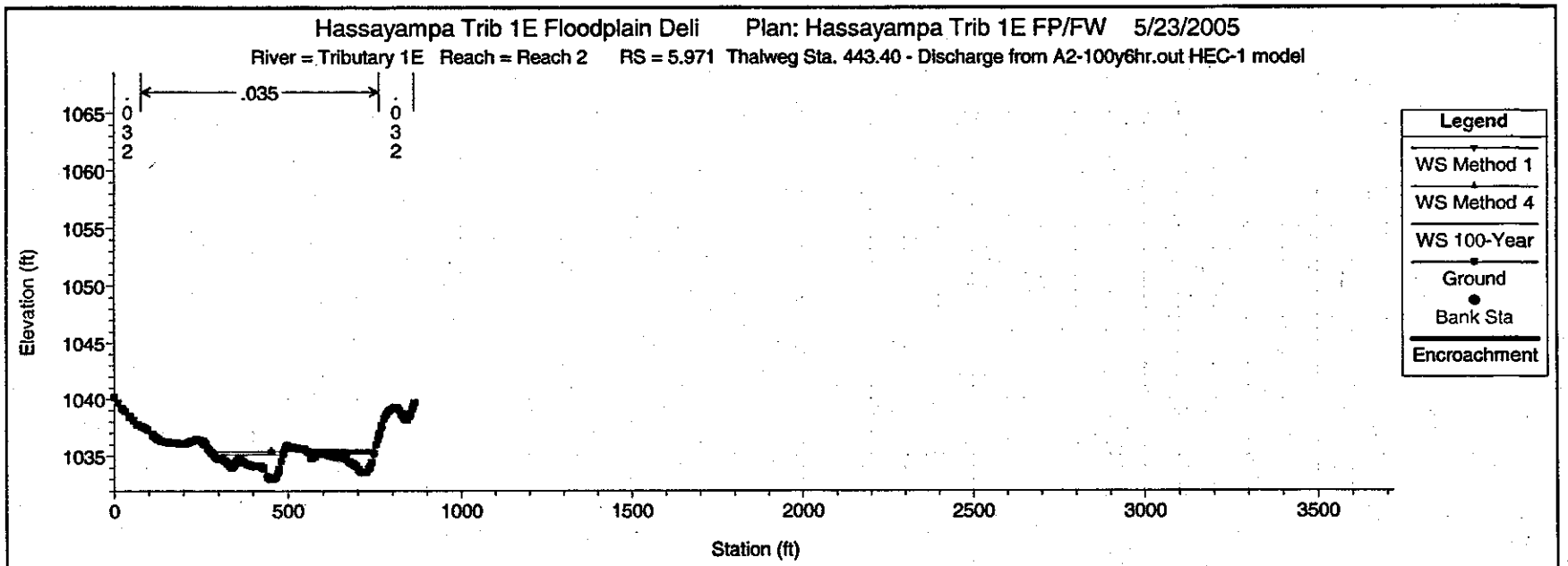
Picture.L21-P4
Hassayampa Tributary 1E

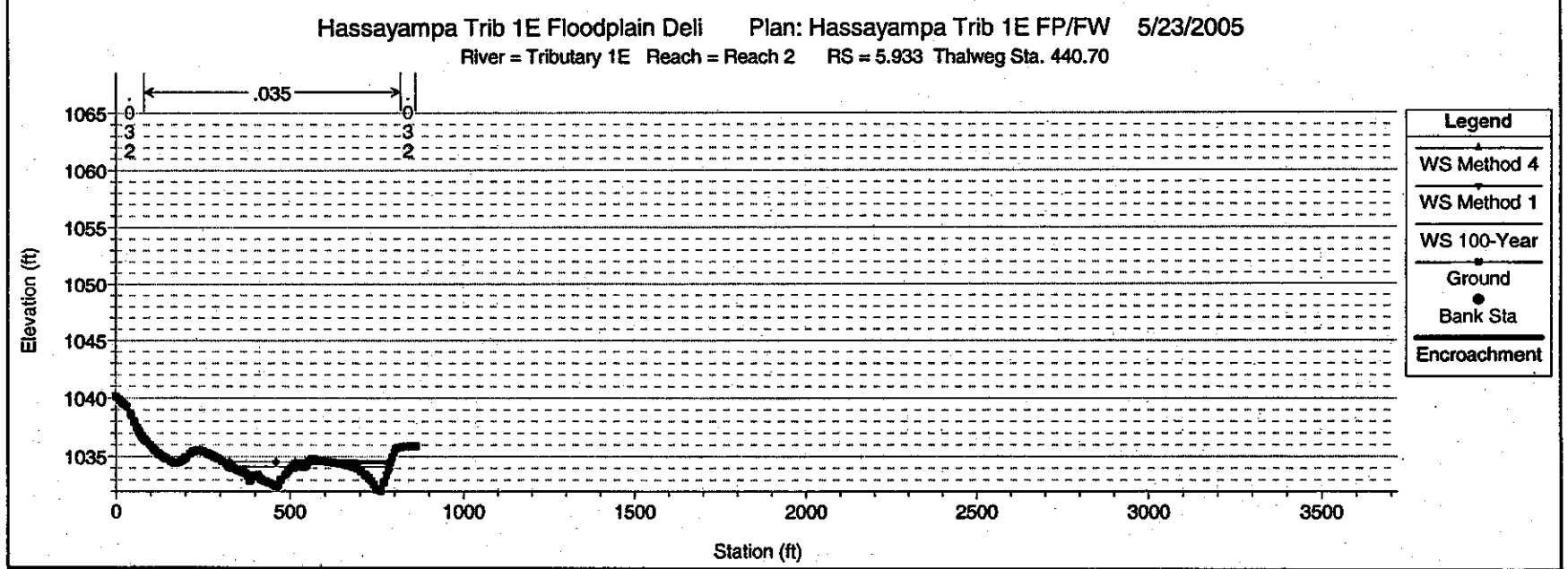
Picture.L21-P5
Hassayampa Tributary 1E

Picture.L21-P6
Hassayampa Tributary 1E

E.2 Cross Section Plots

E.2.1 Tributary 1E – All Reaches

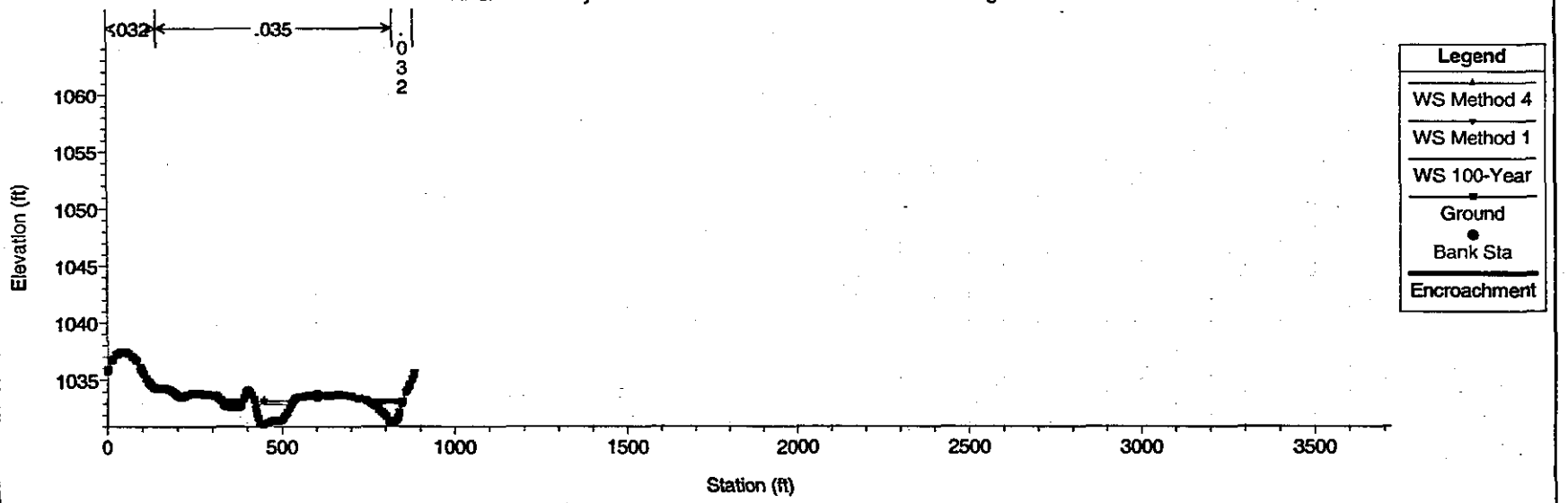




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

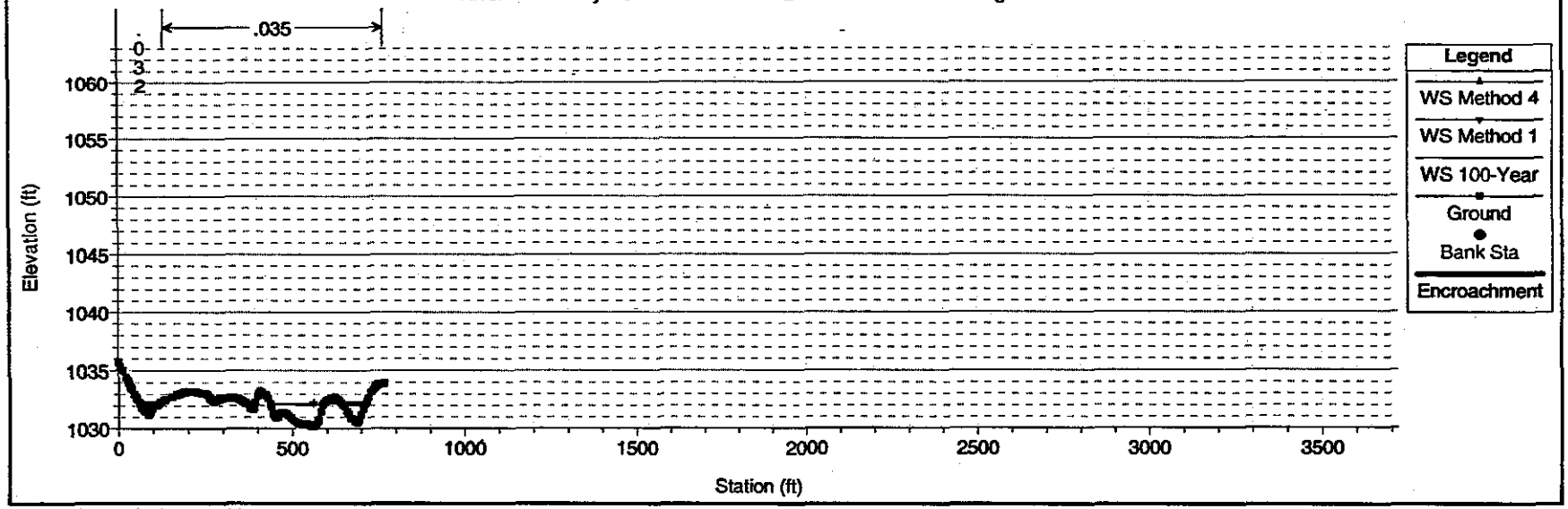
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 5.895 Thalweg Sta. 446.96

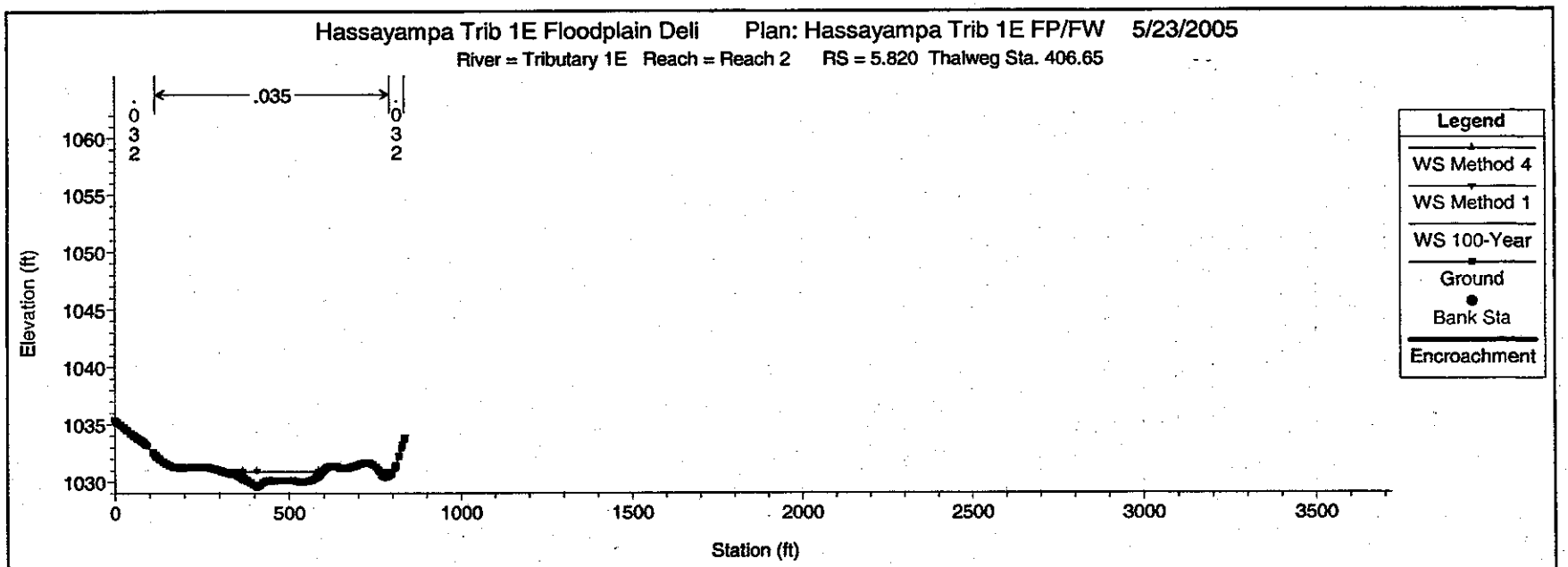


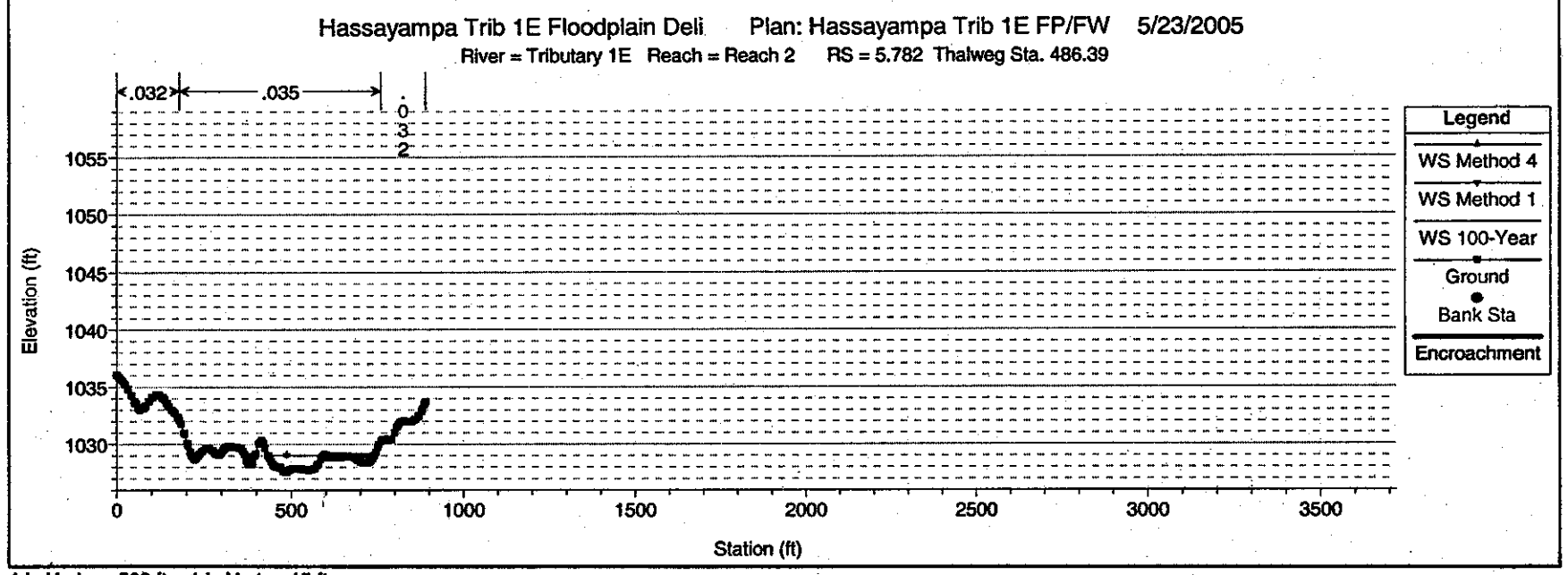
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 5.857 Thalweg Sta. 470.66



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

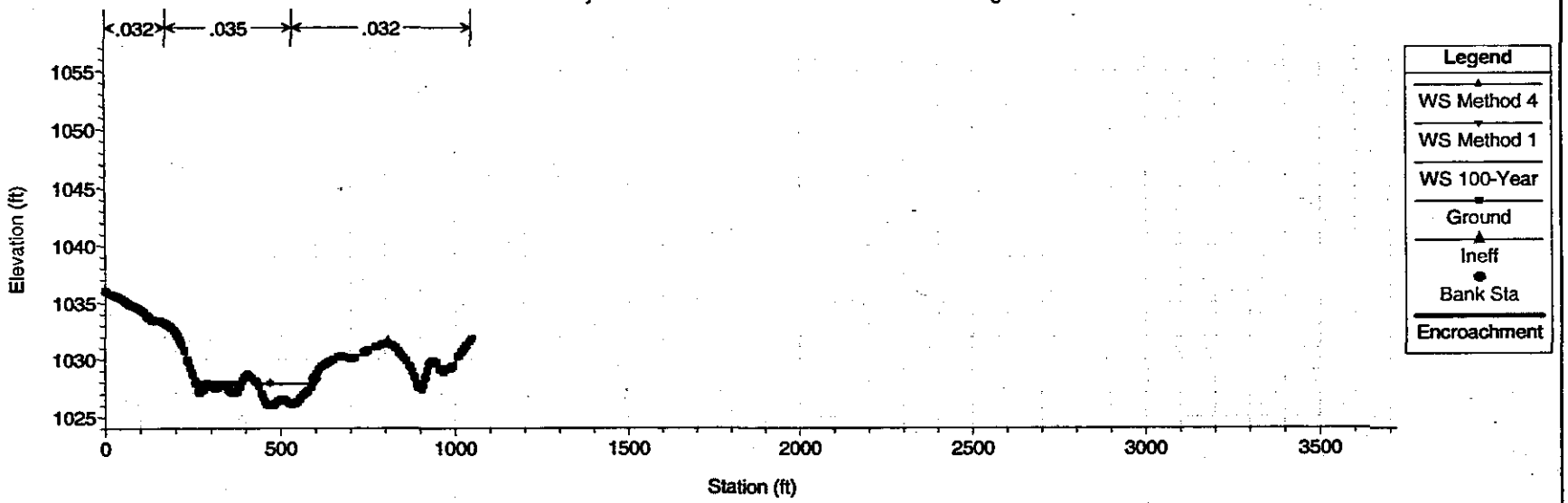




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

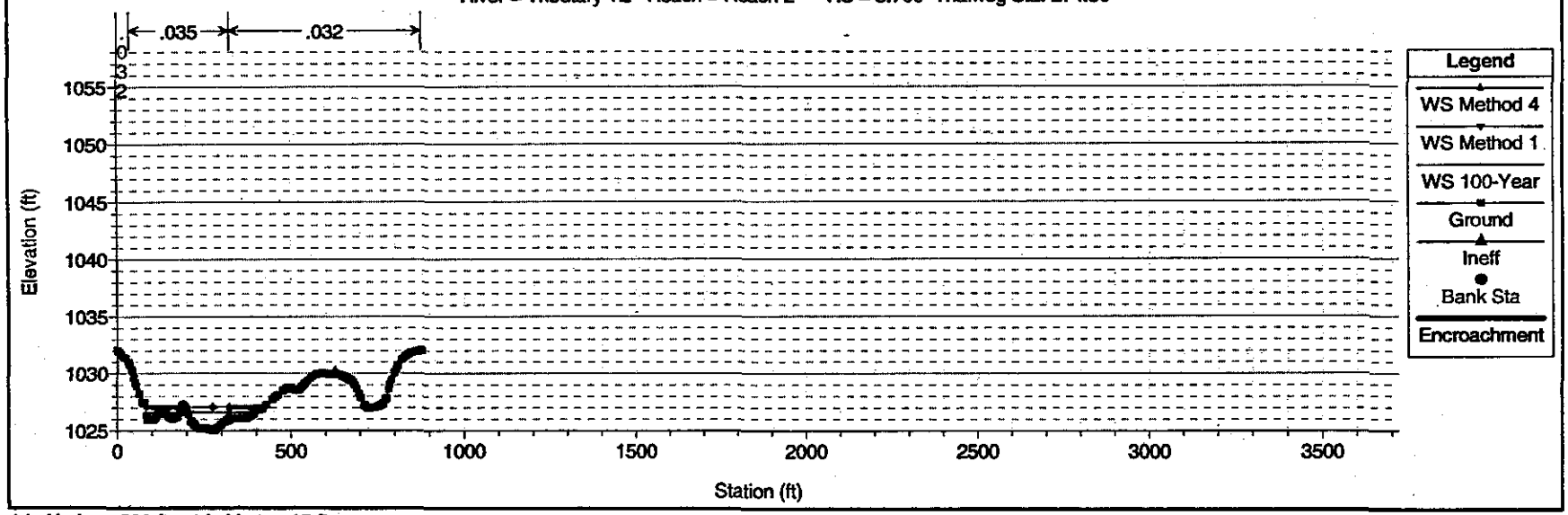
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 5.744 Thalweg Sta. 468.81

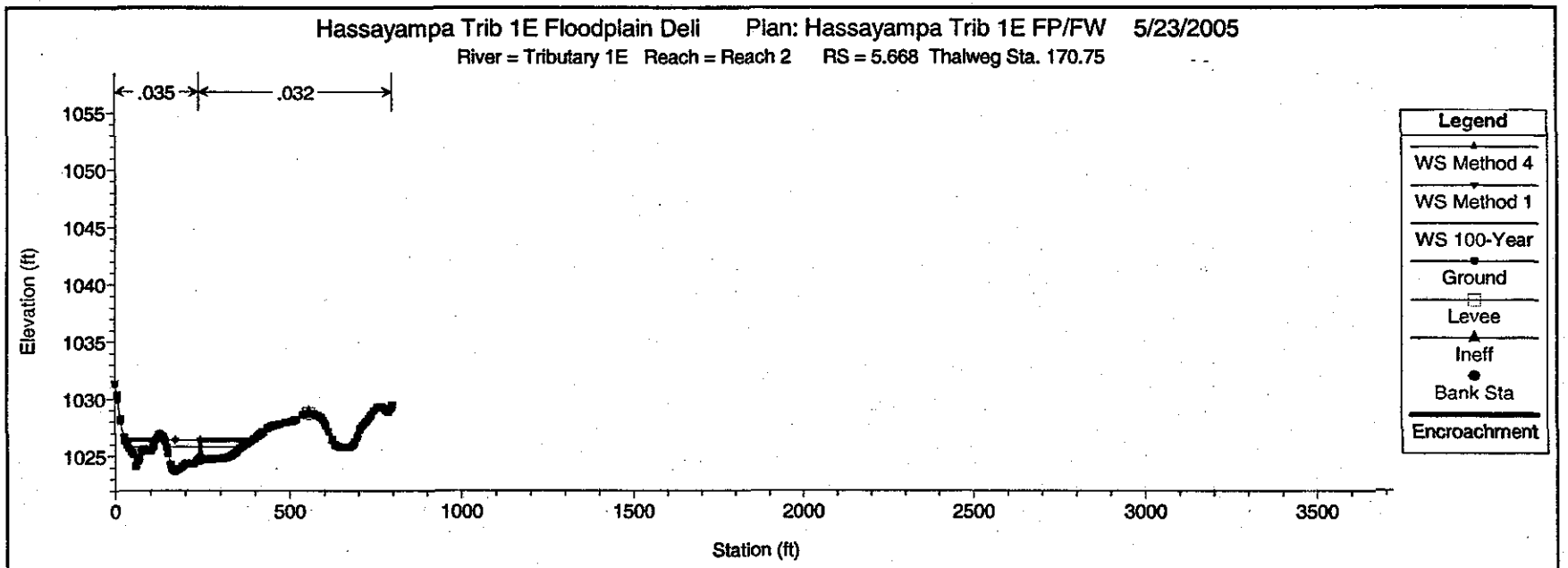


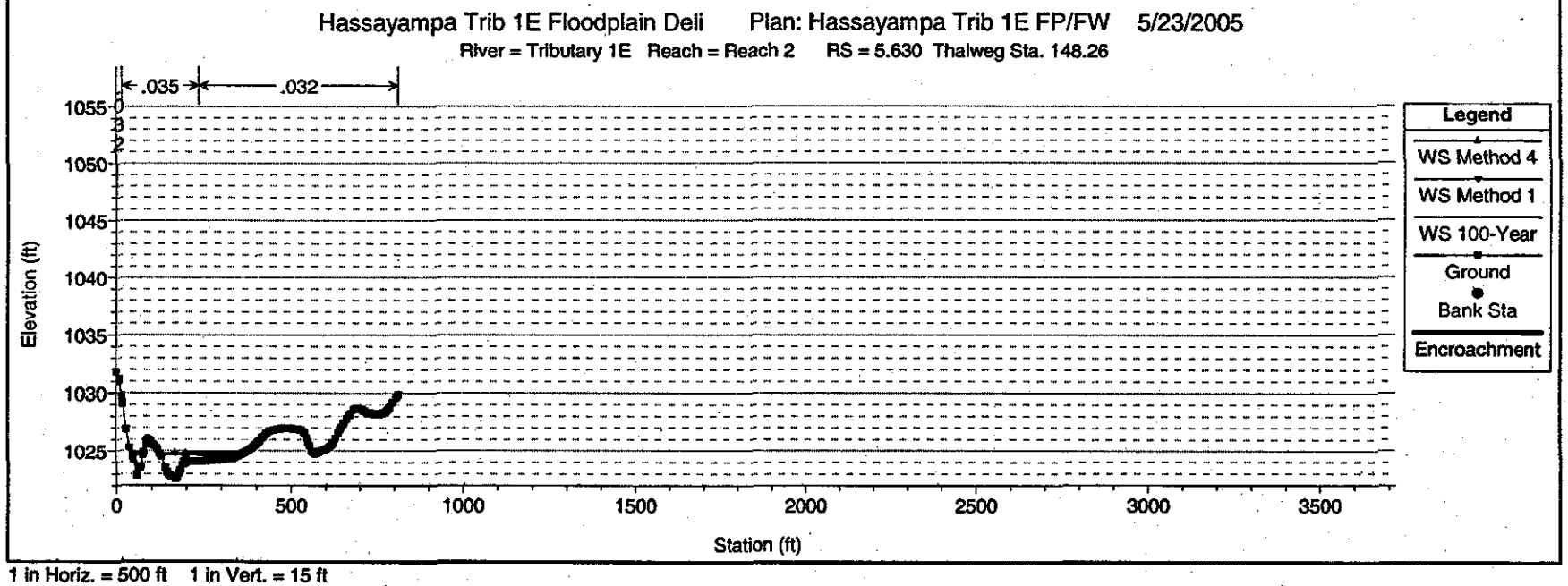
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 5.706 Thalweg Sta. 274.56



1 in Horiz. = 500 ft 1 in Vert. = 15 ft





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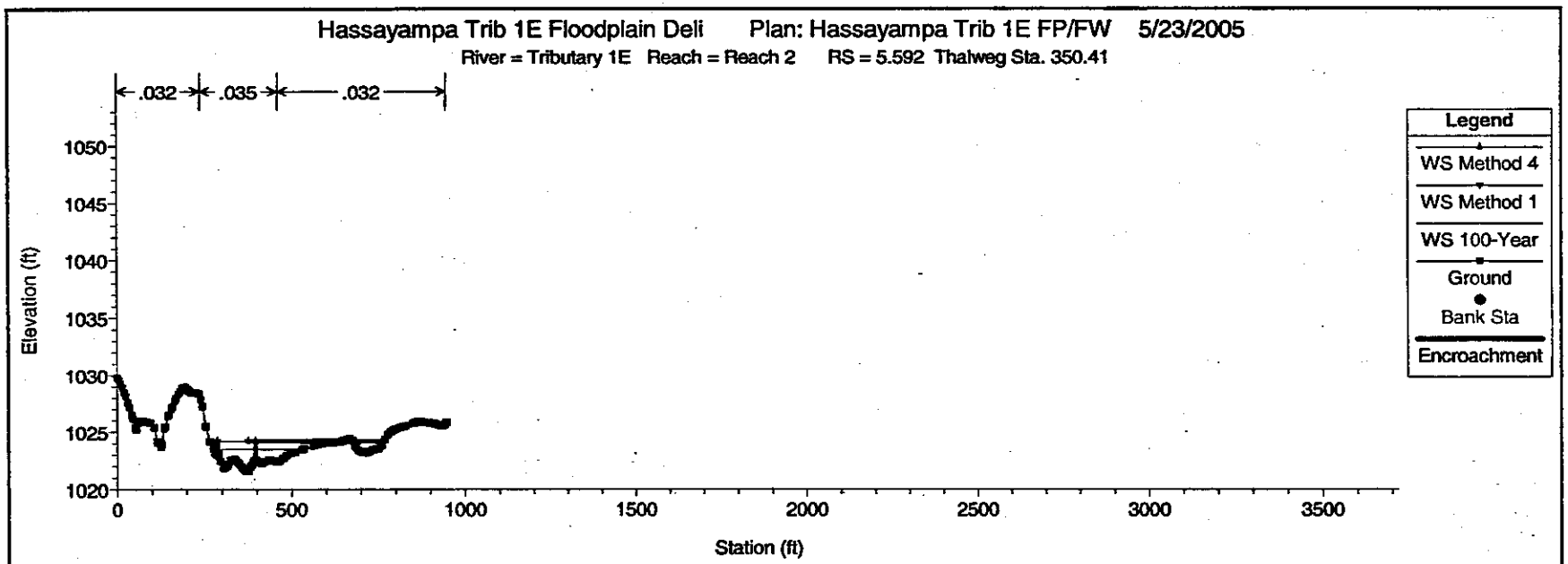
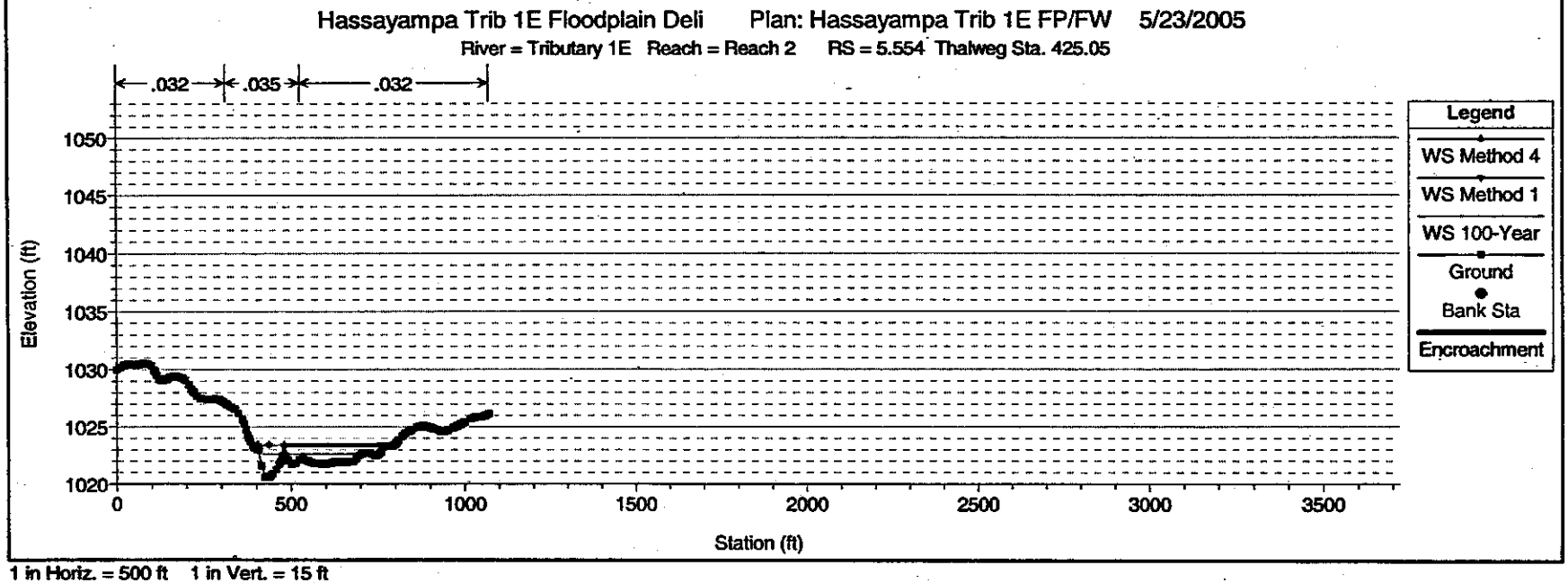
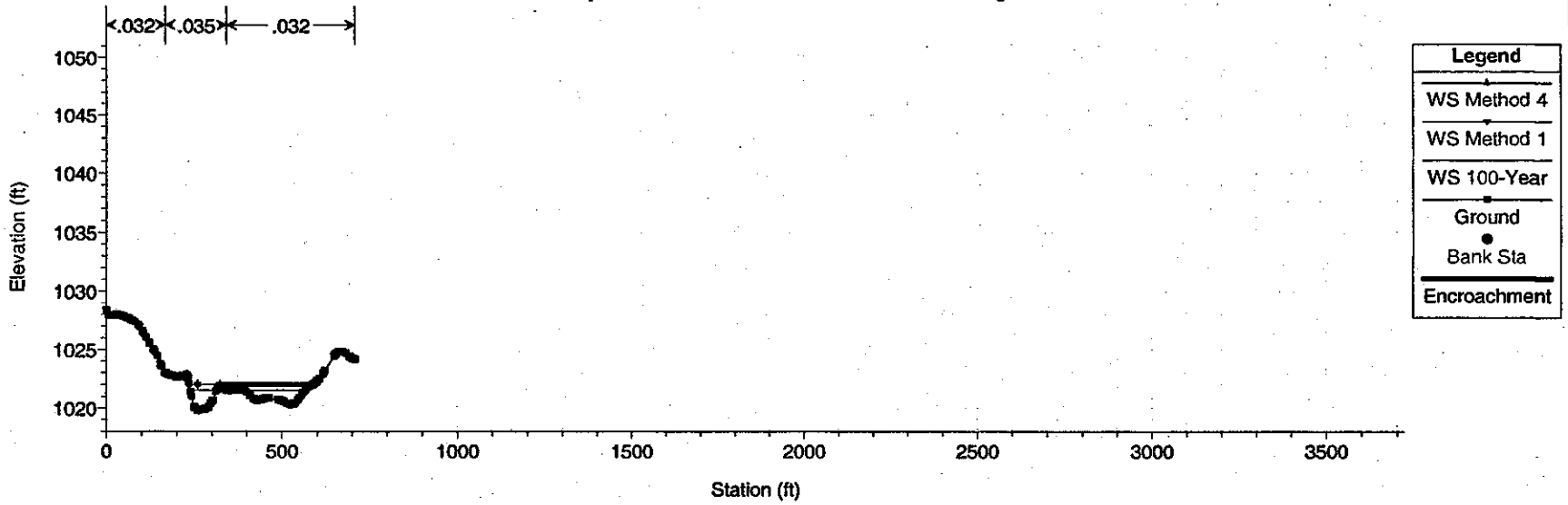




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

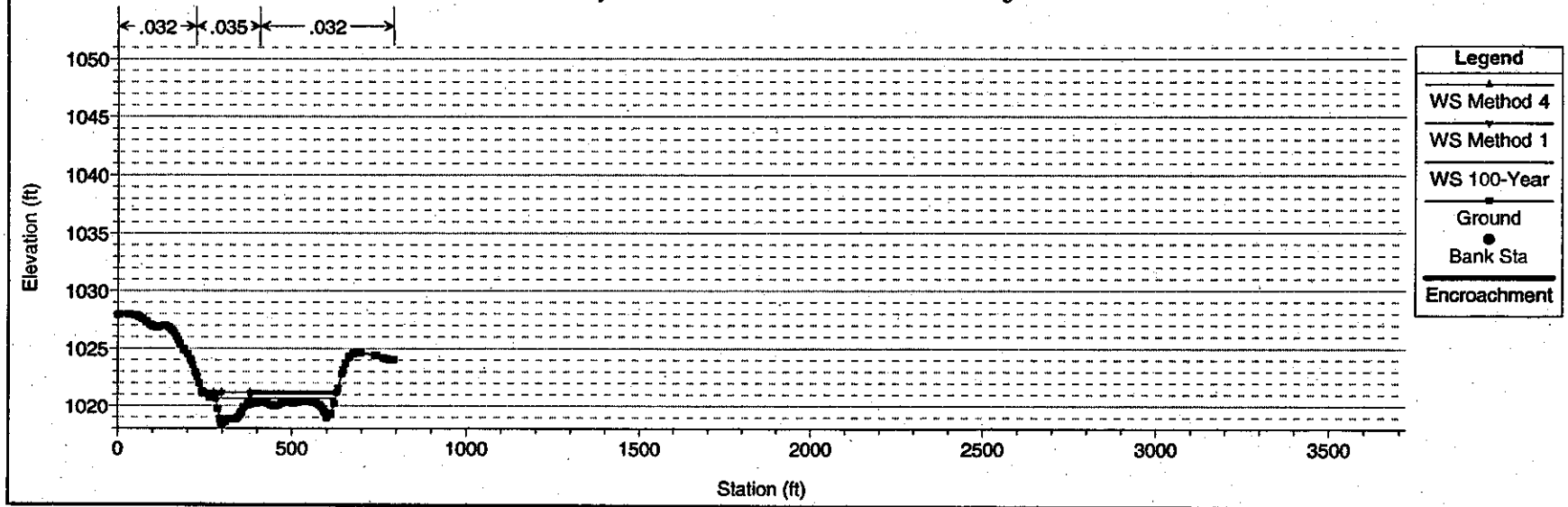
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 5.517 Thalweg Sta. 443.40

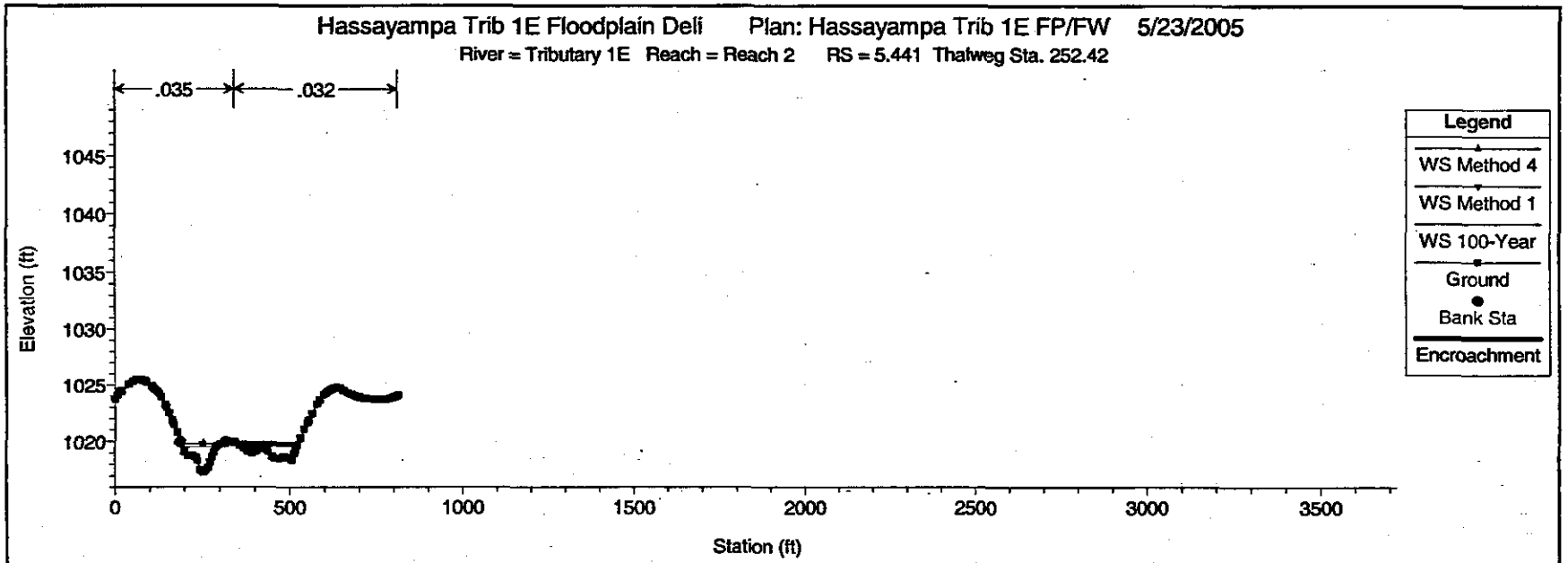


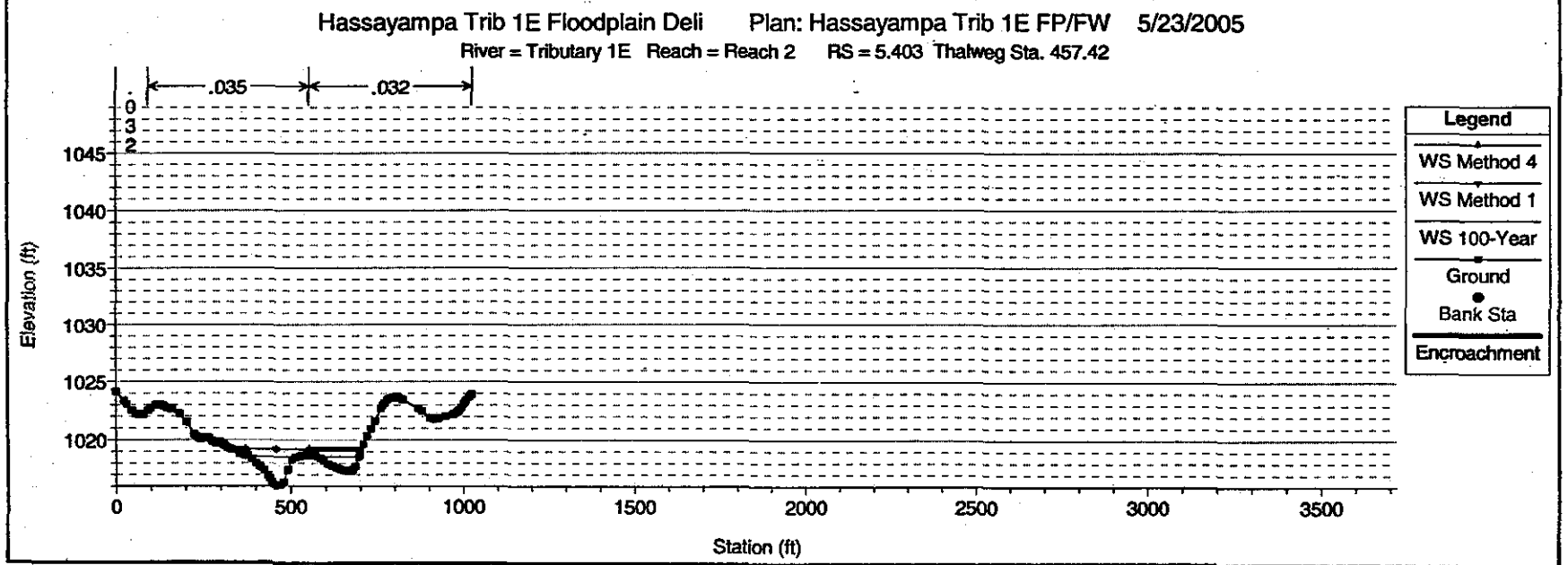
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 5.479 Thalweg Sta. 218.03

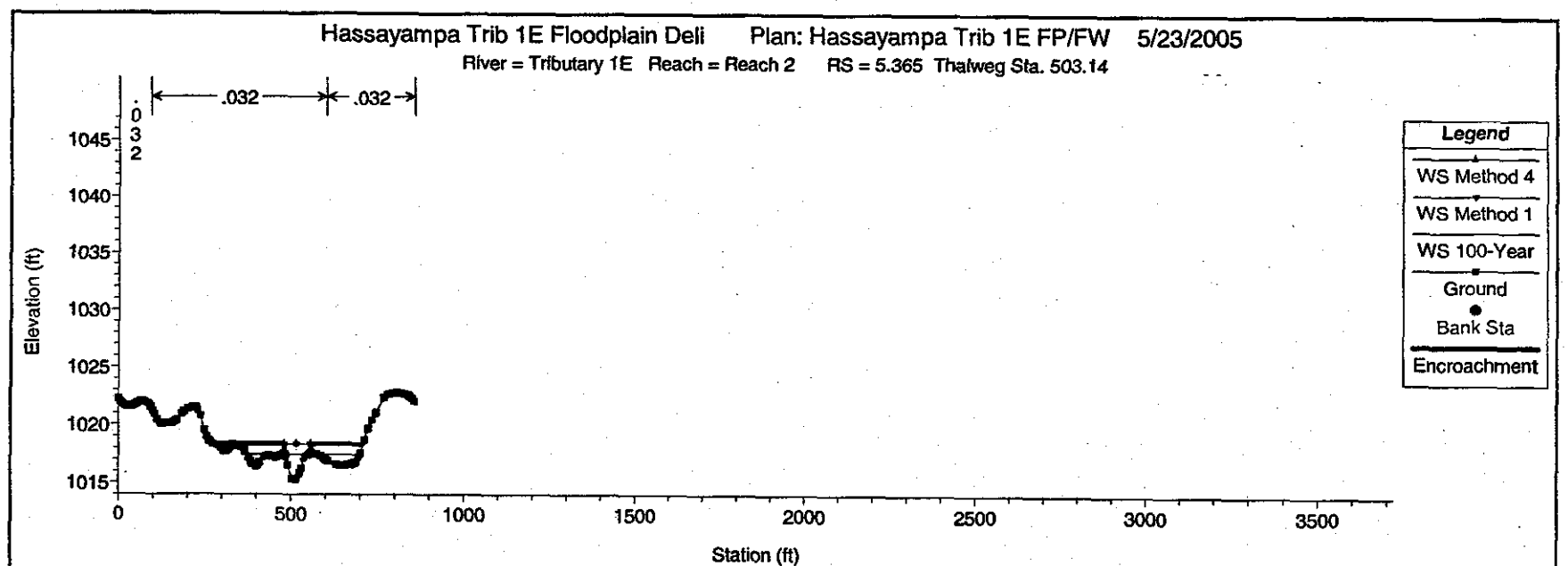


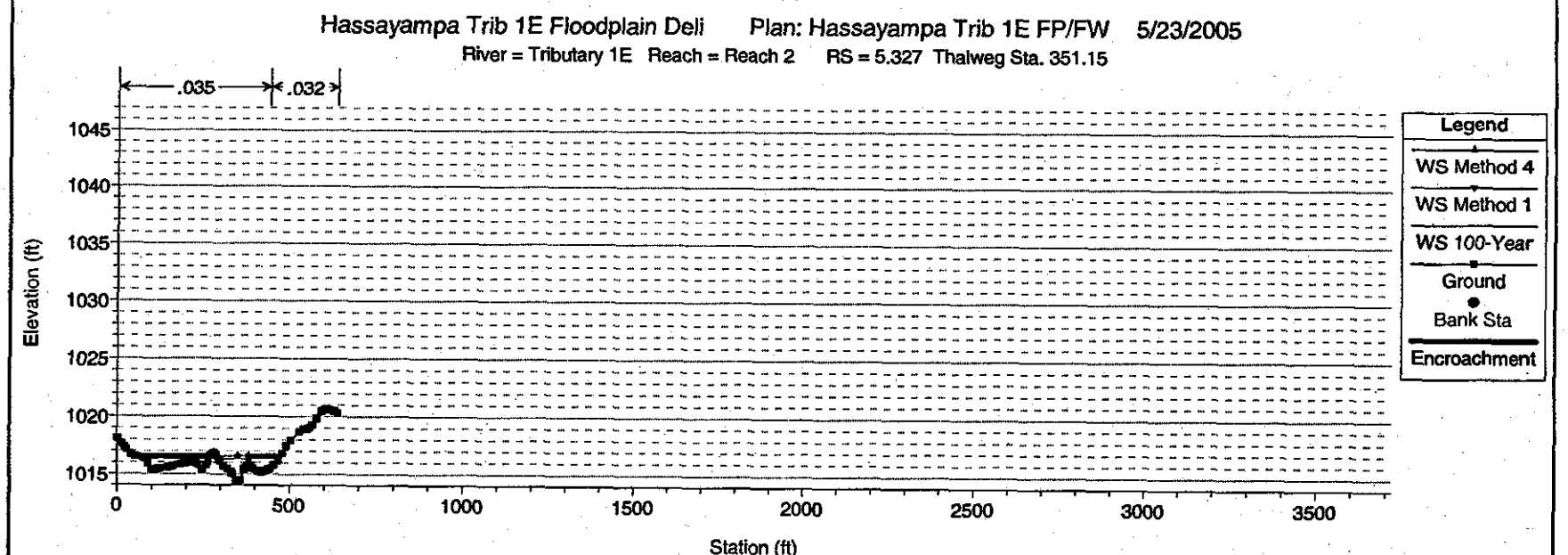
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft





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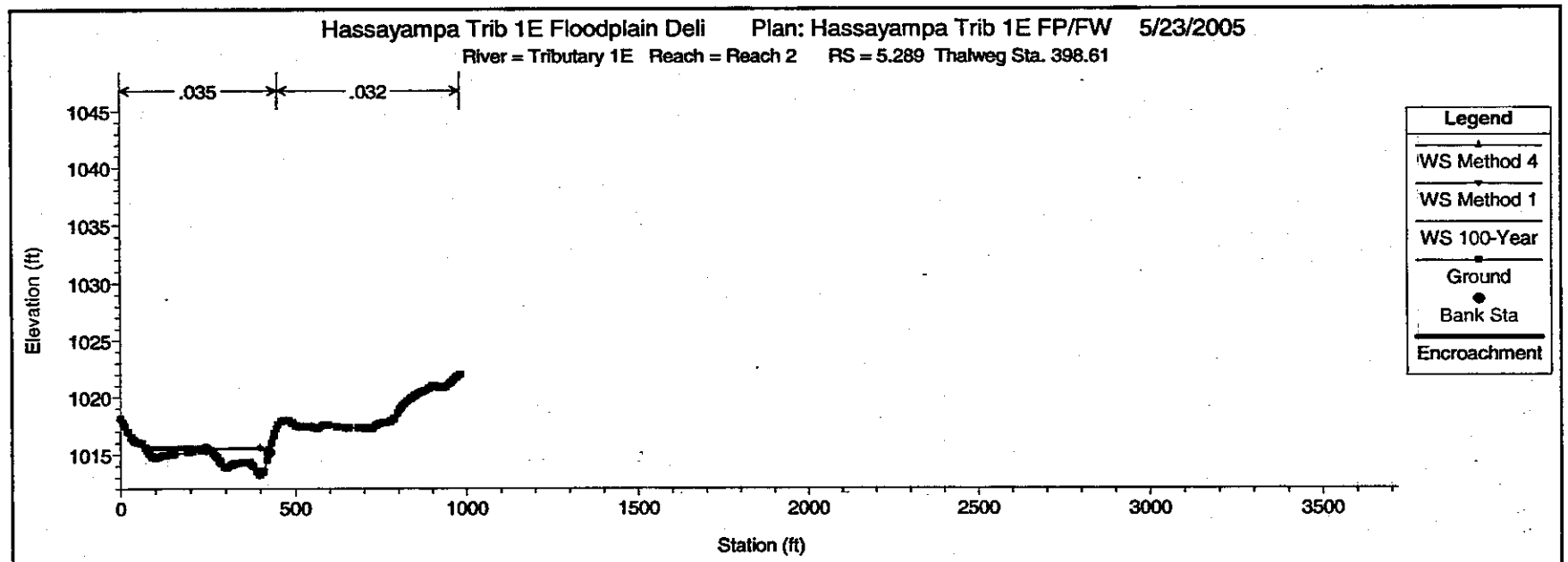

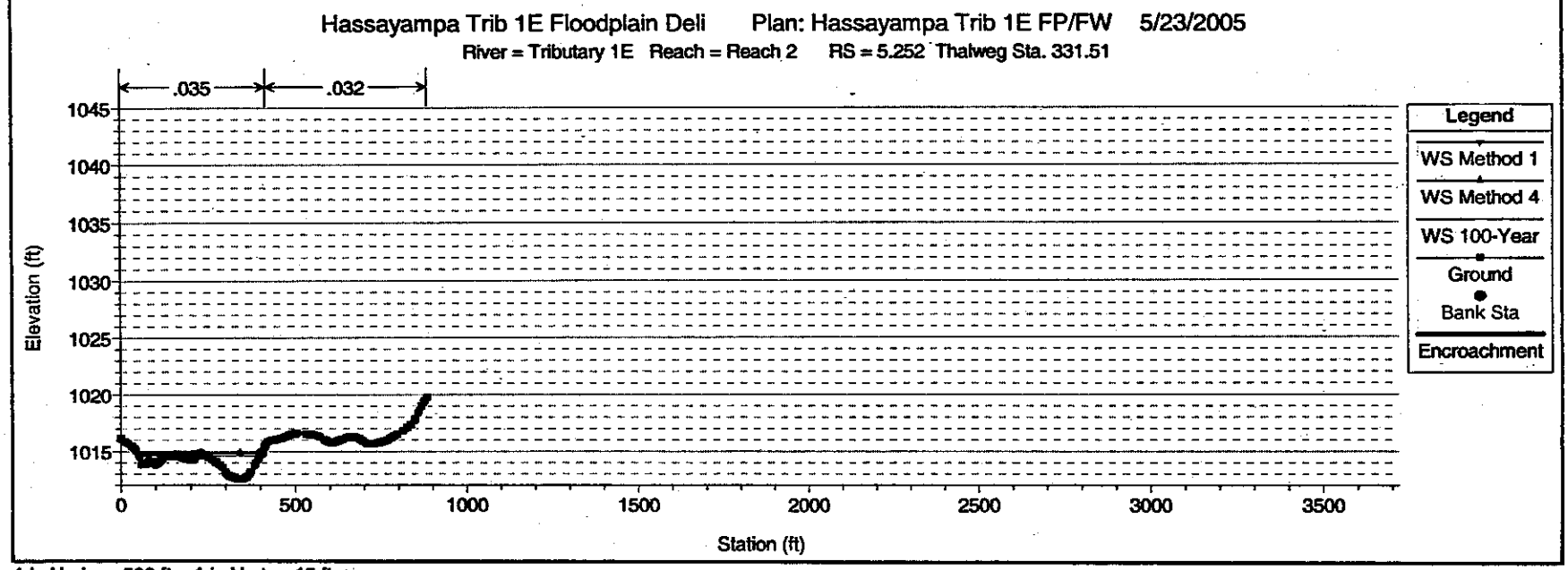

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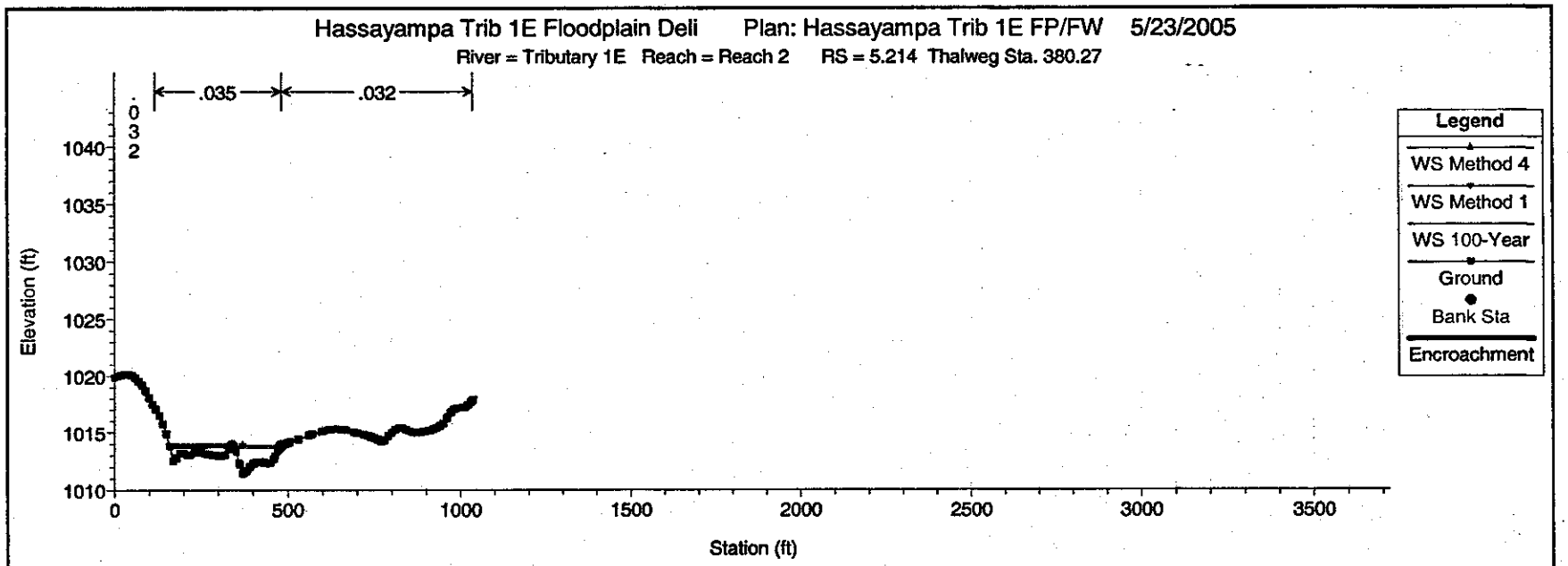
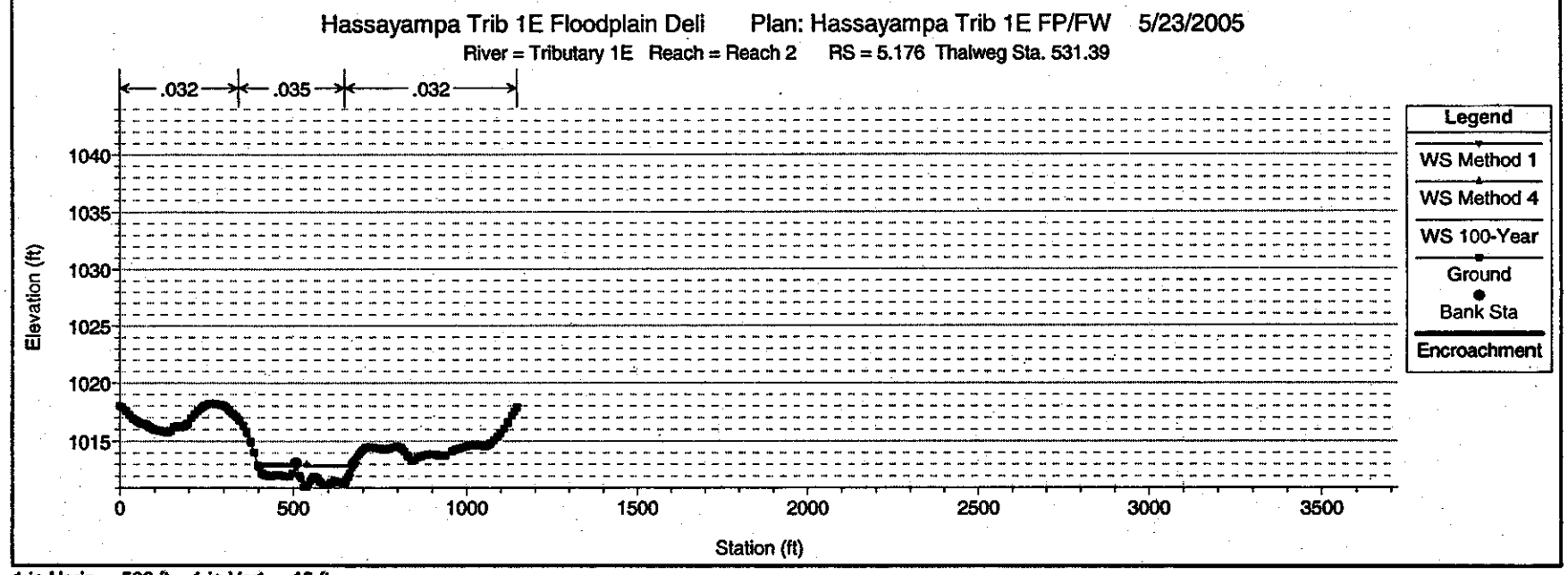
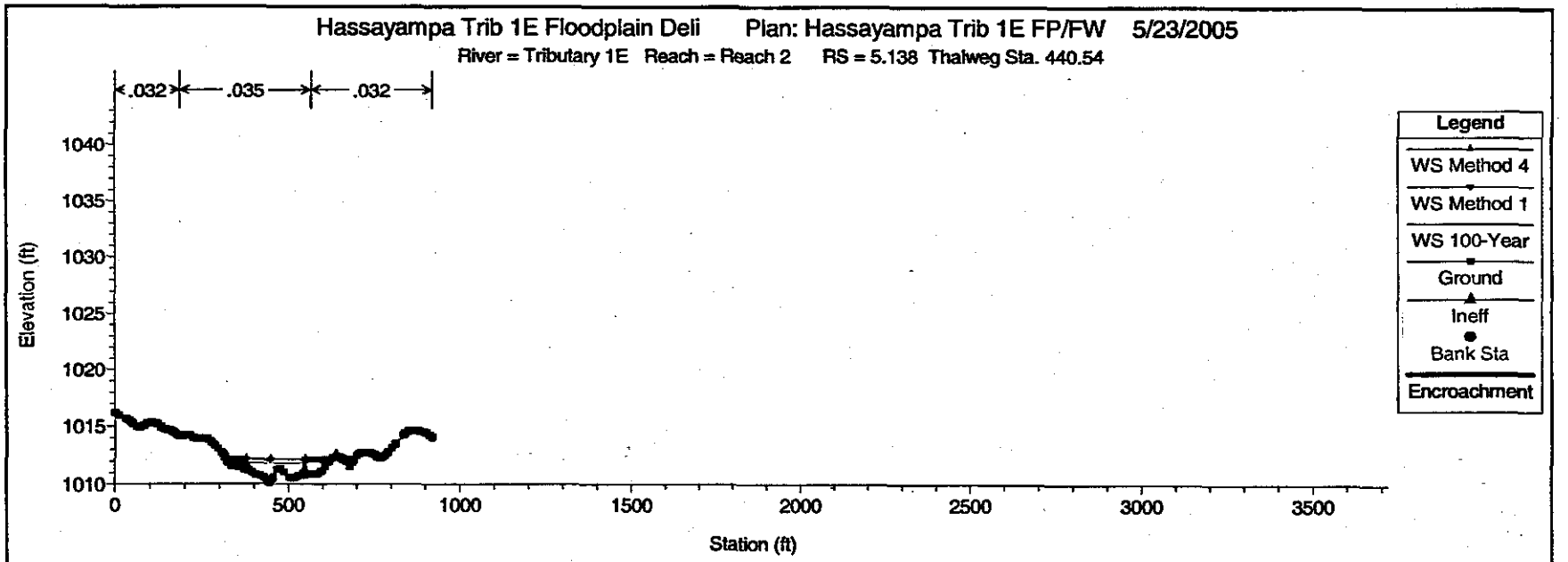
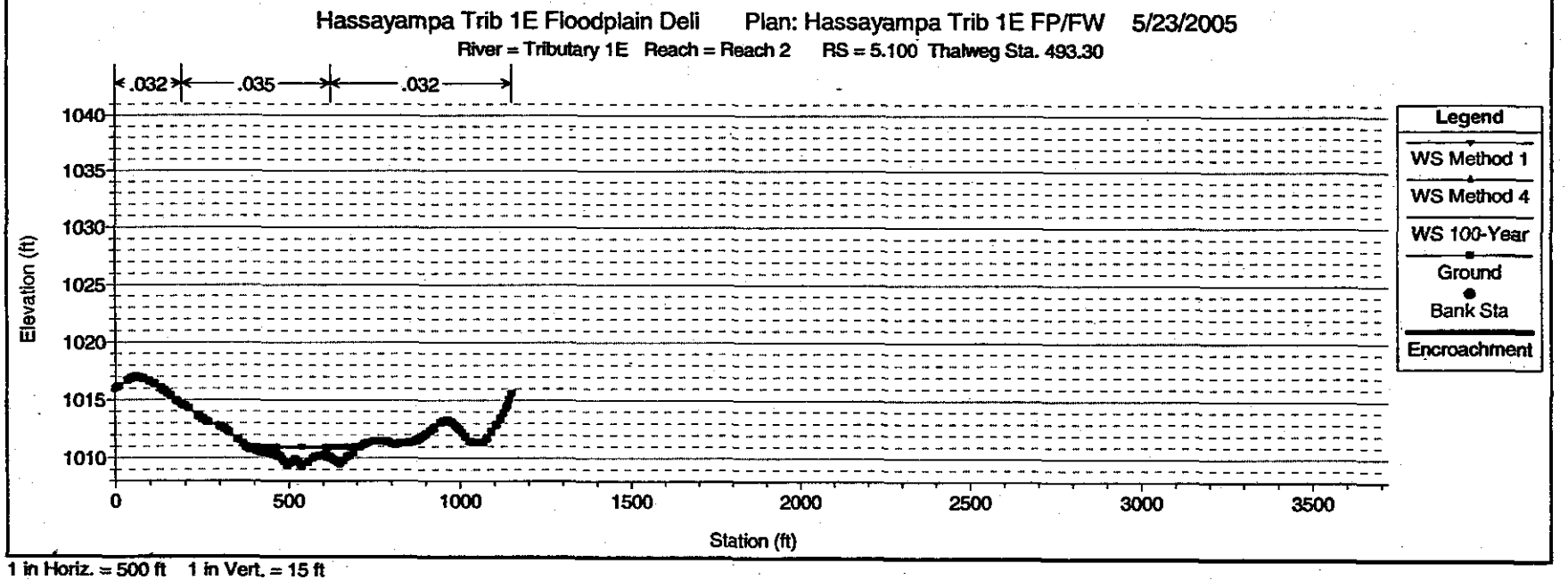




1 in Horiz. = 500 ft 1 in Vert. = 15 ft





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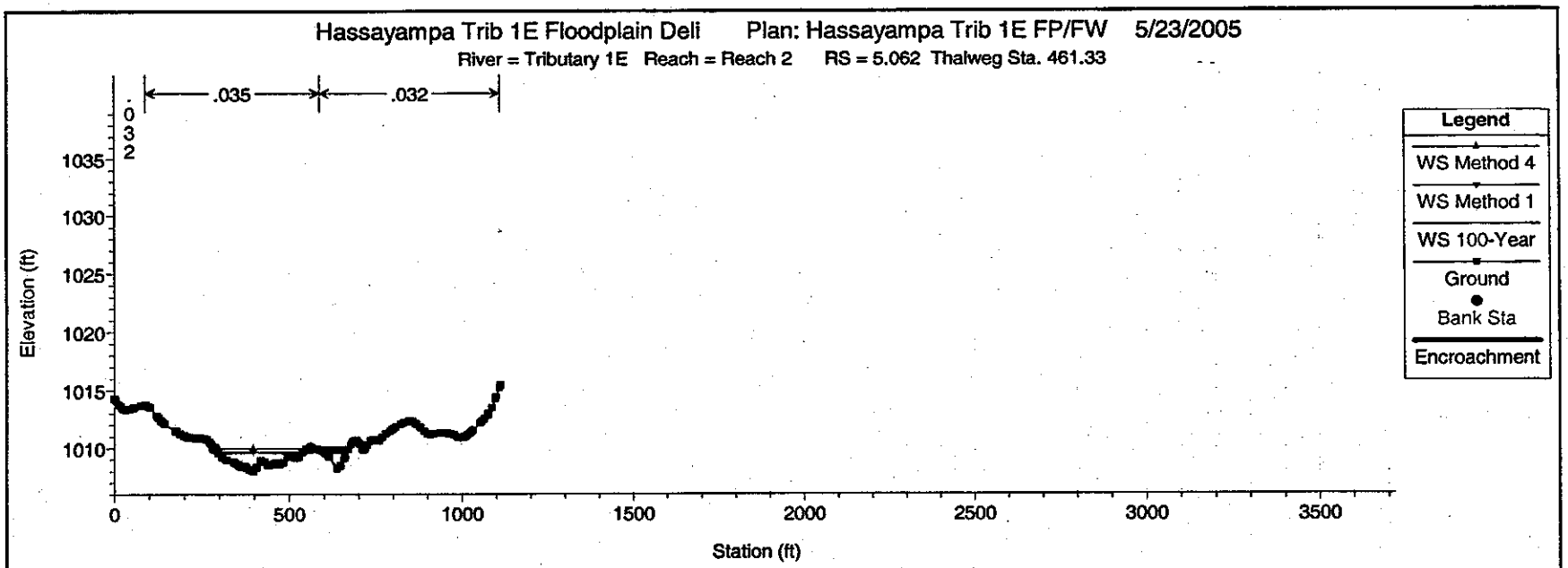
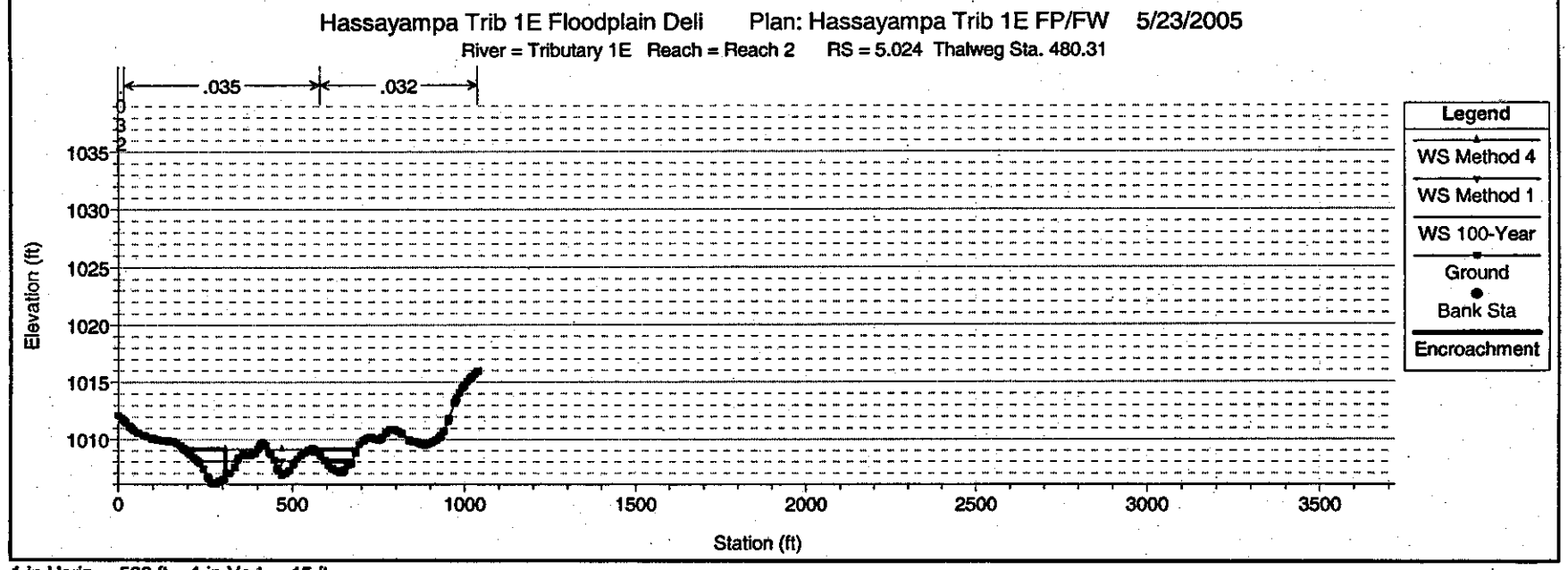
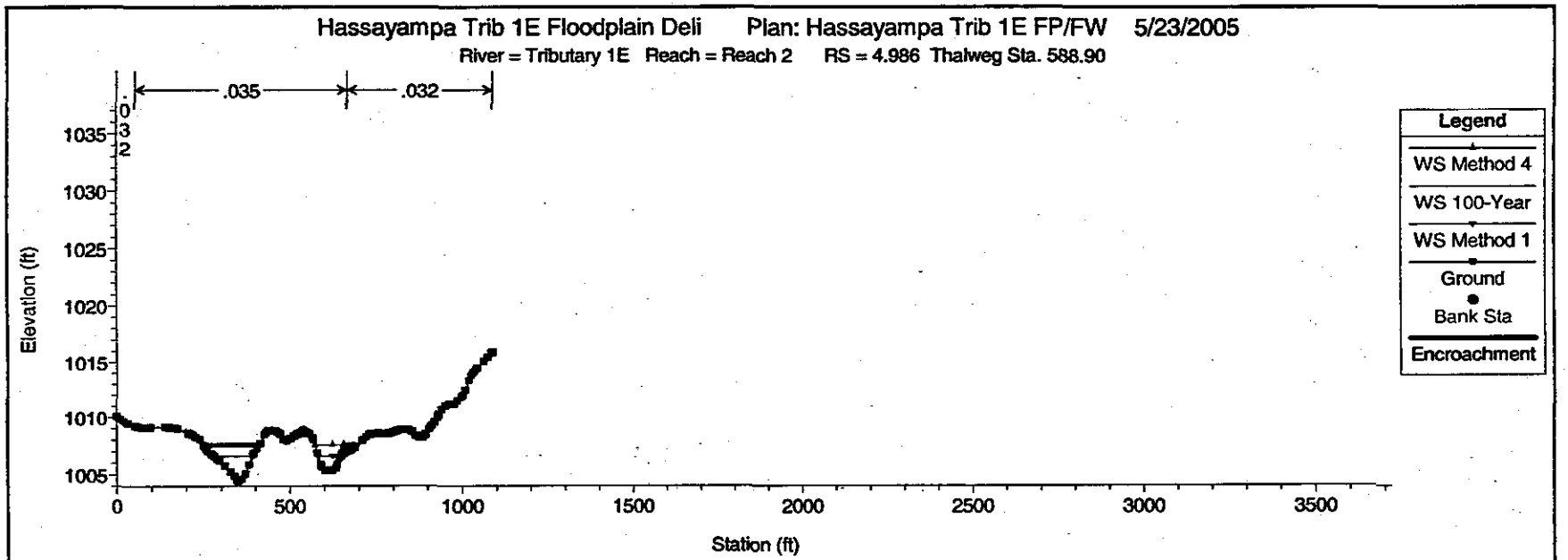
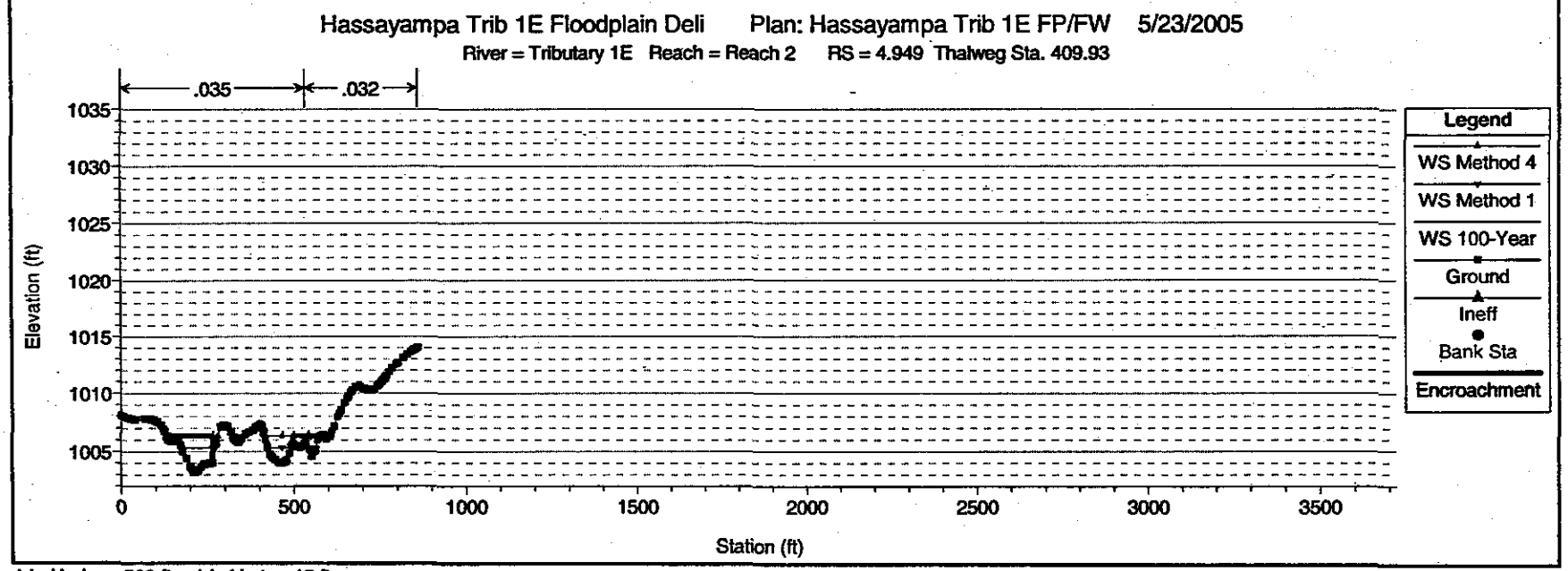


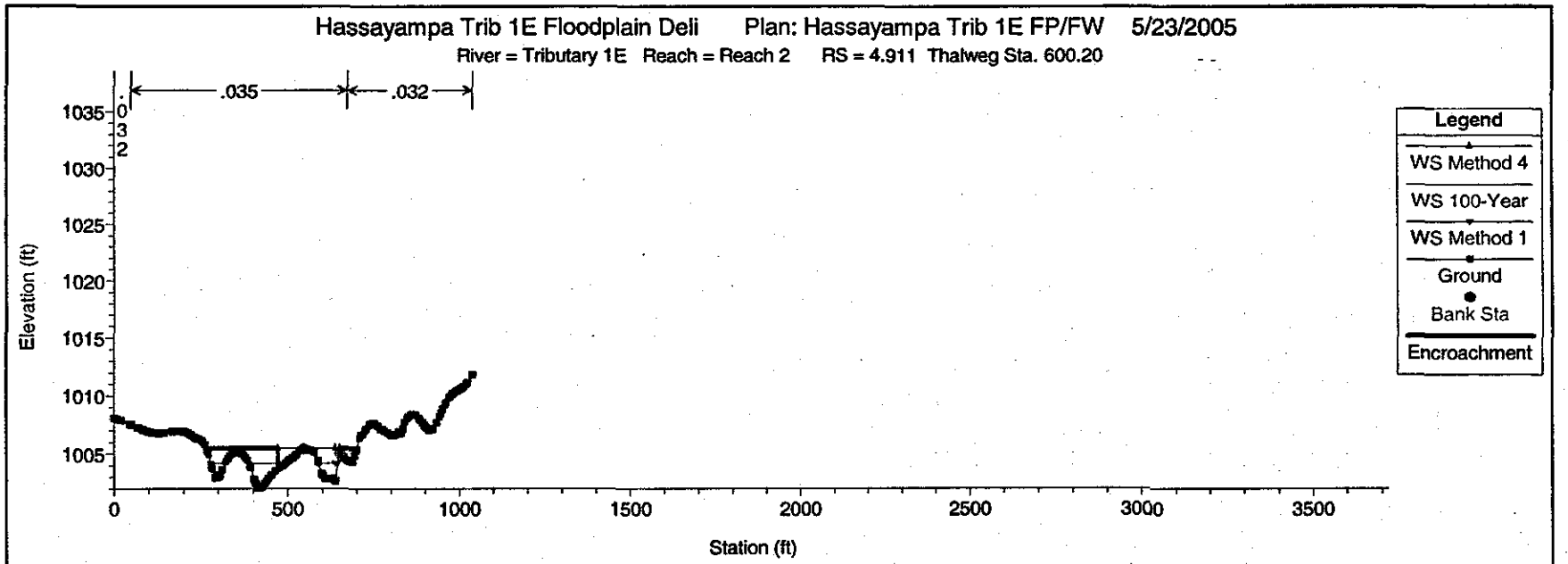


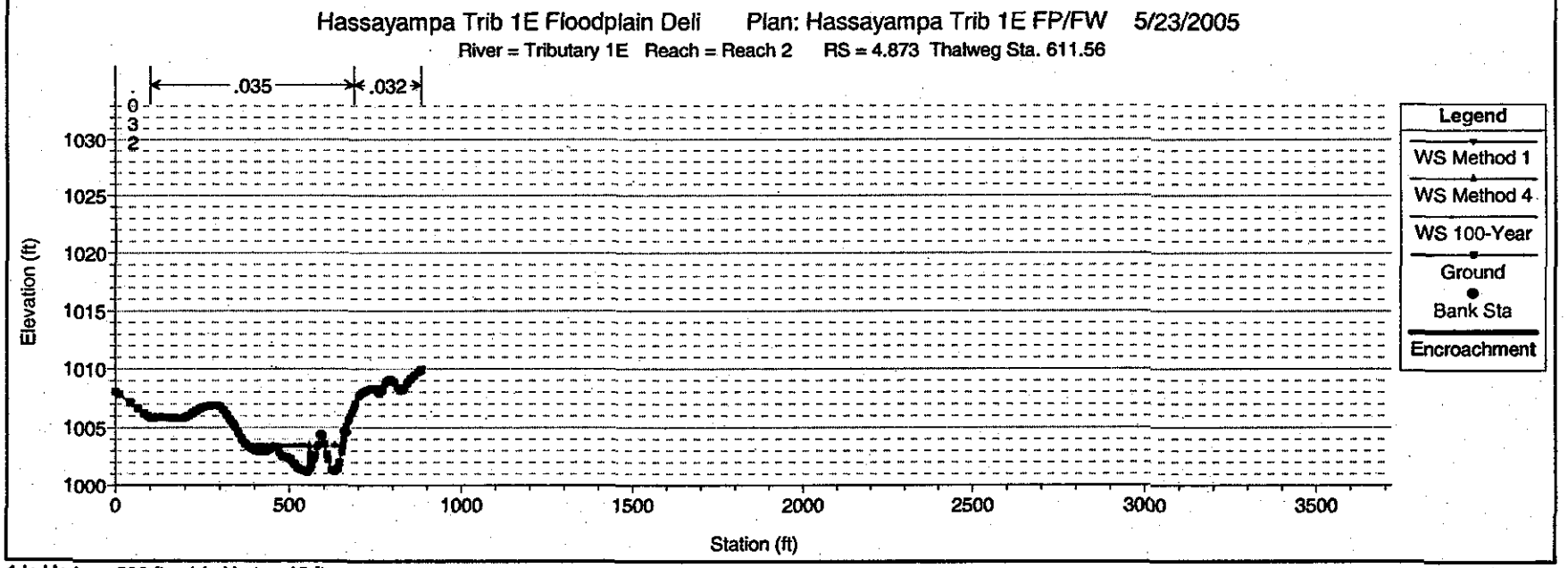
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft

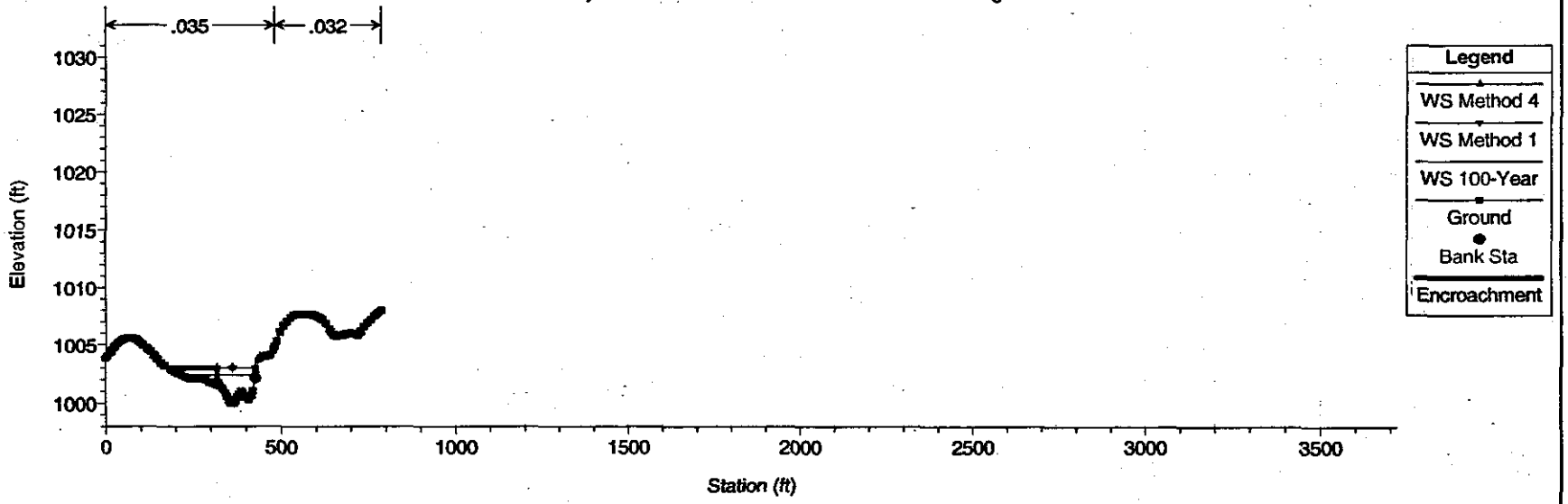




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

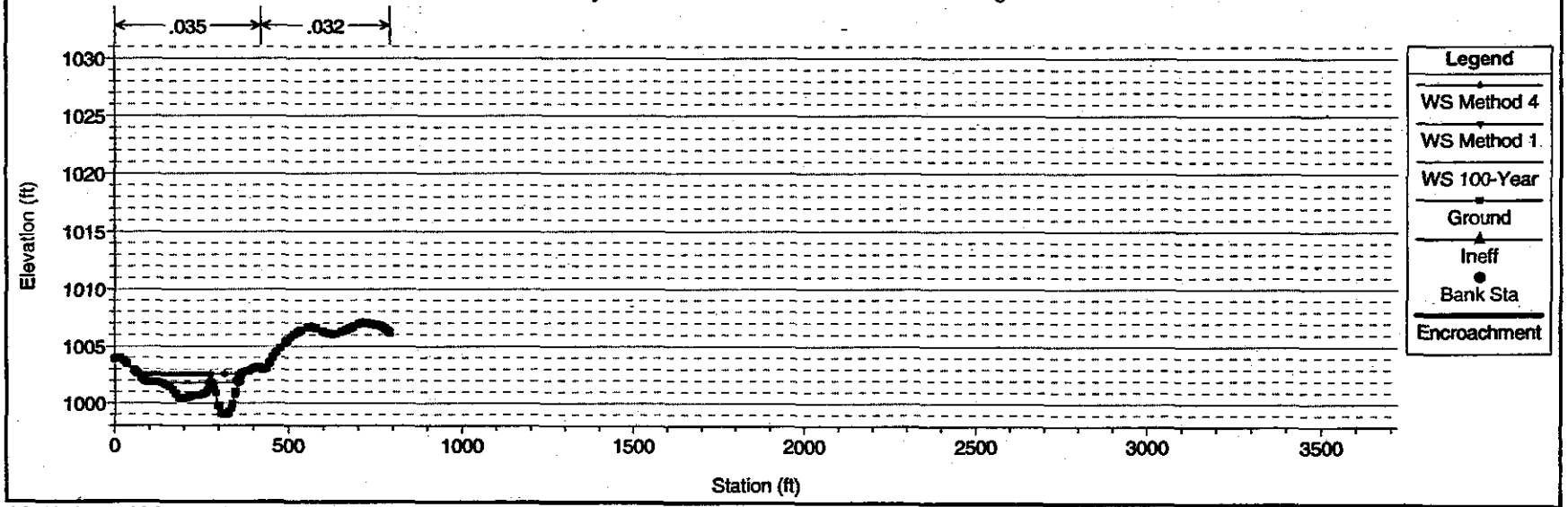
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 4.835 Thalweg Sta. 396.26



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

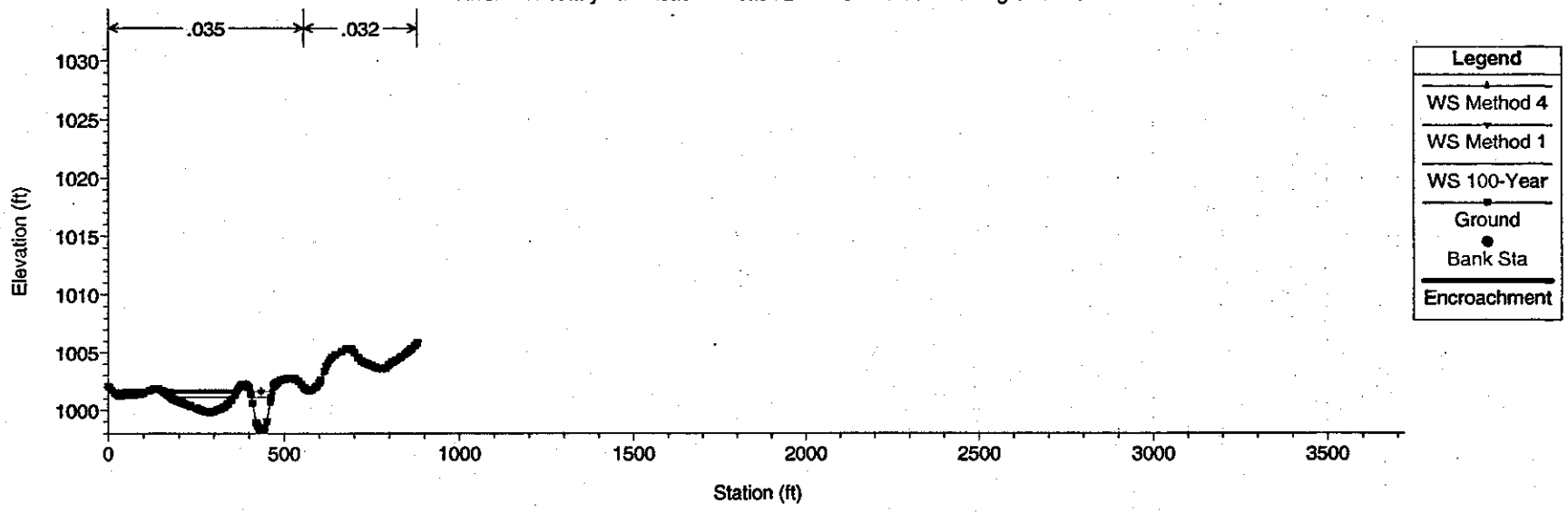
River = Tributary 1E Reach = Reach 2 RS = 4.797 Thalweg Sta. 315.66



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

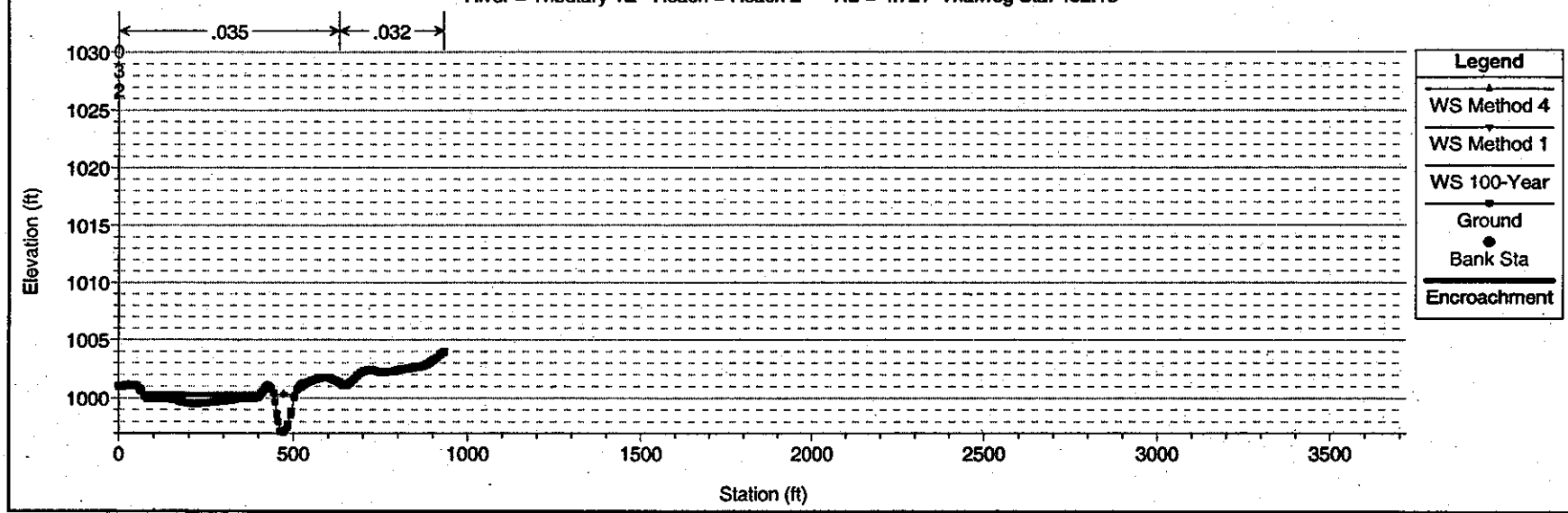
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 4.759 Thalweg Sta. 429.97



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 4.721 Thalweg Sta. 482.18



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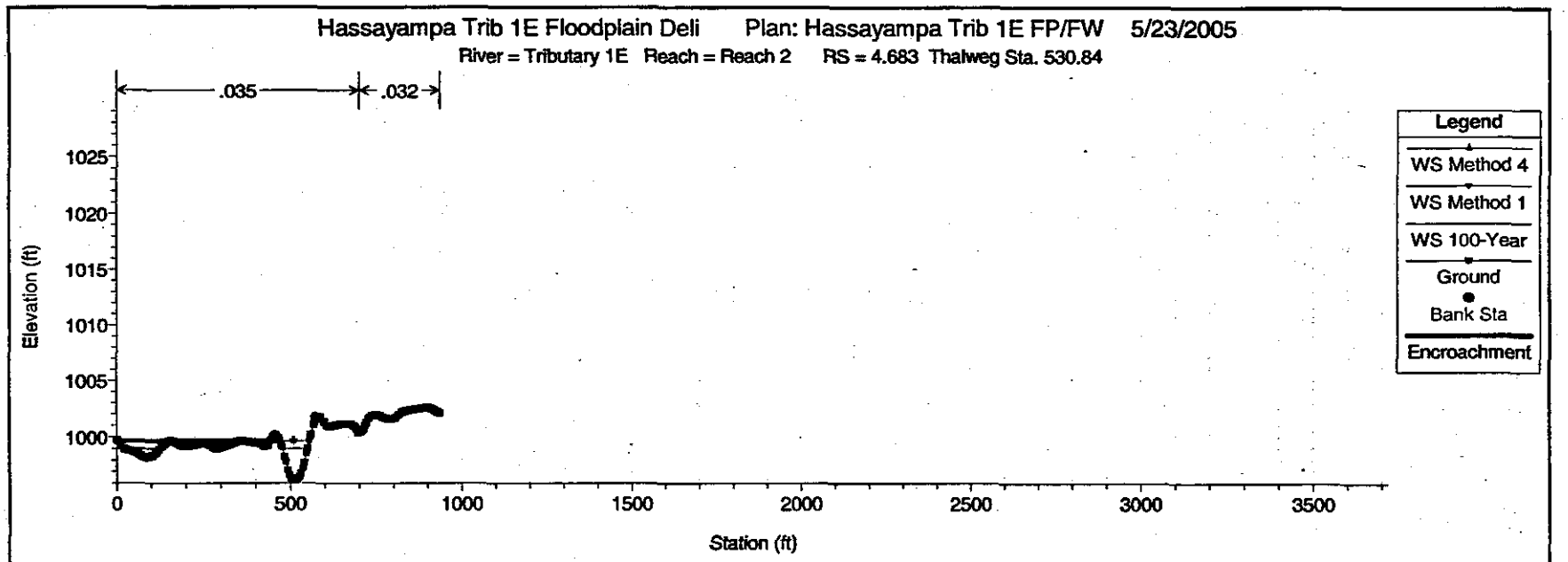
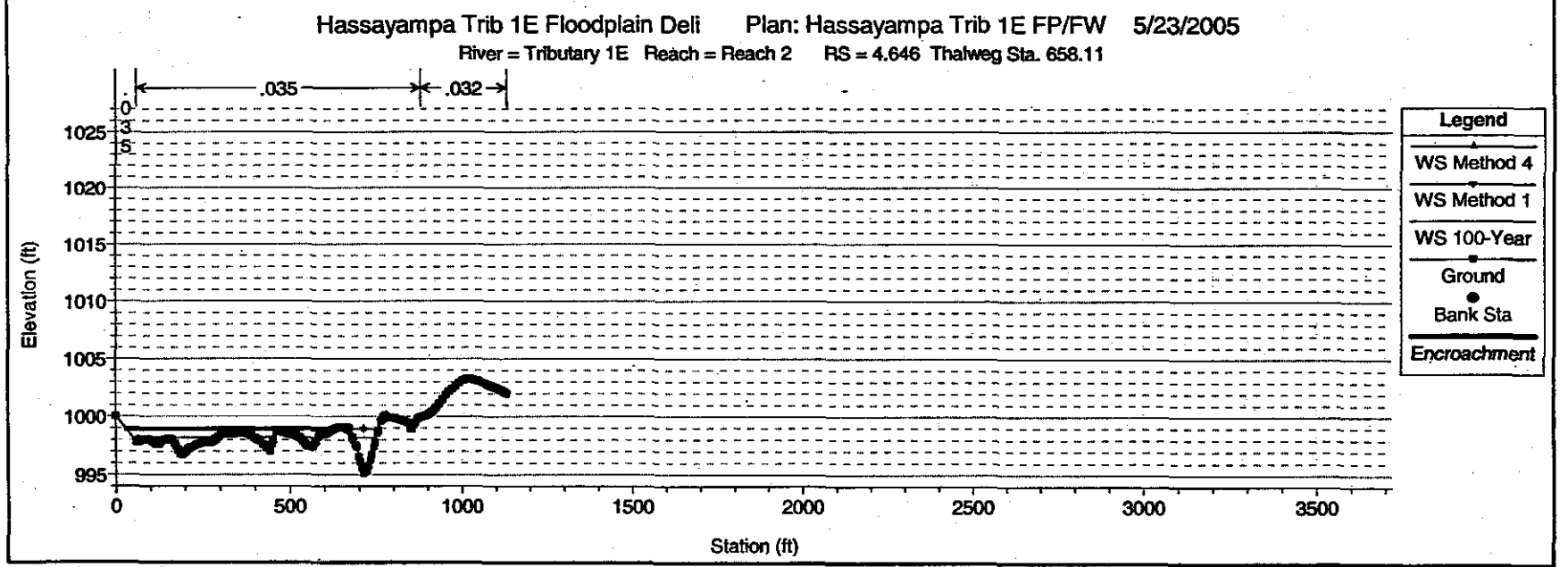
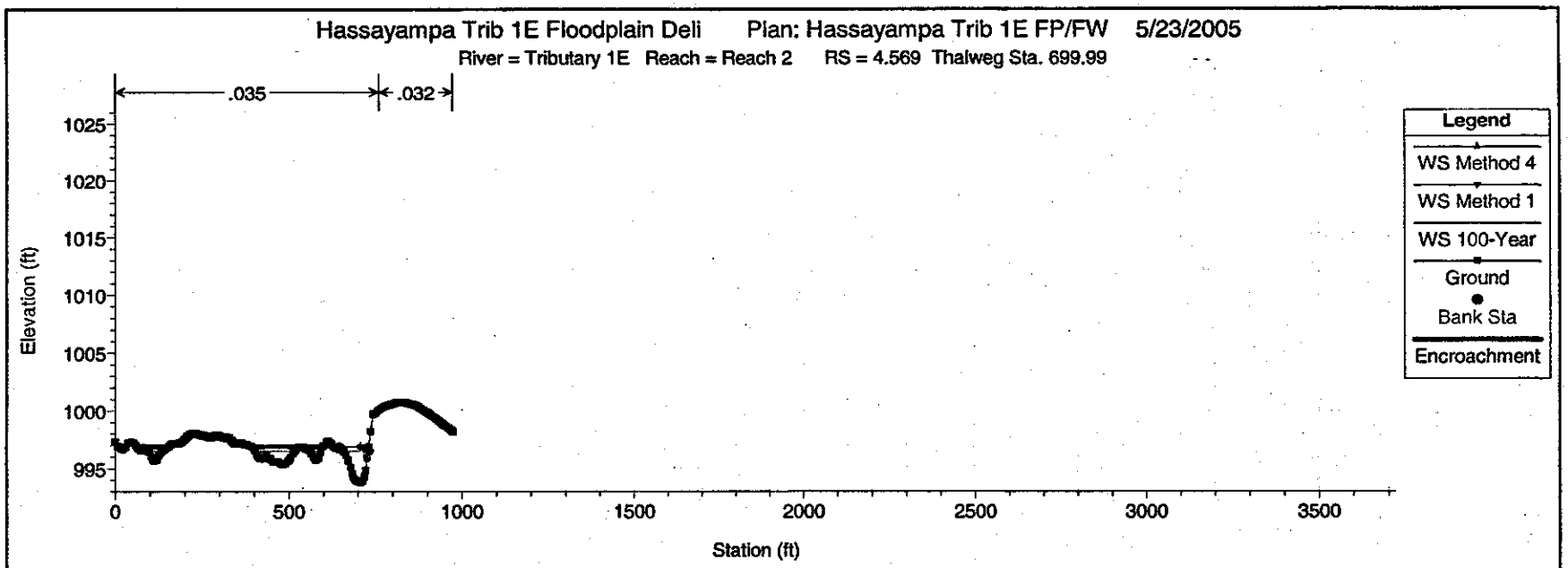
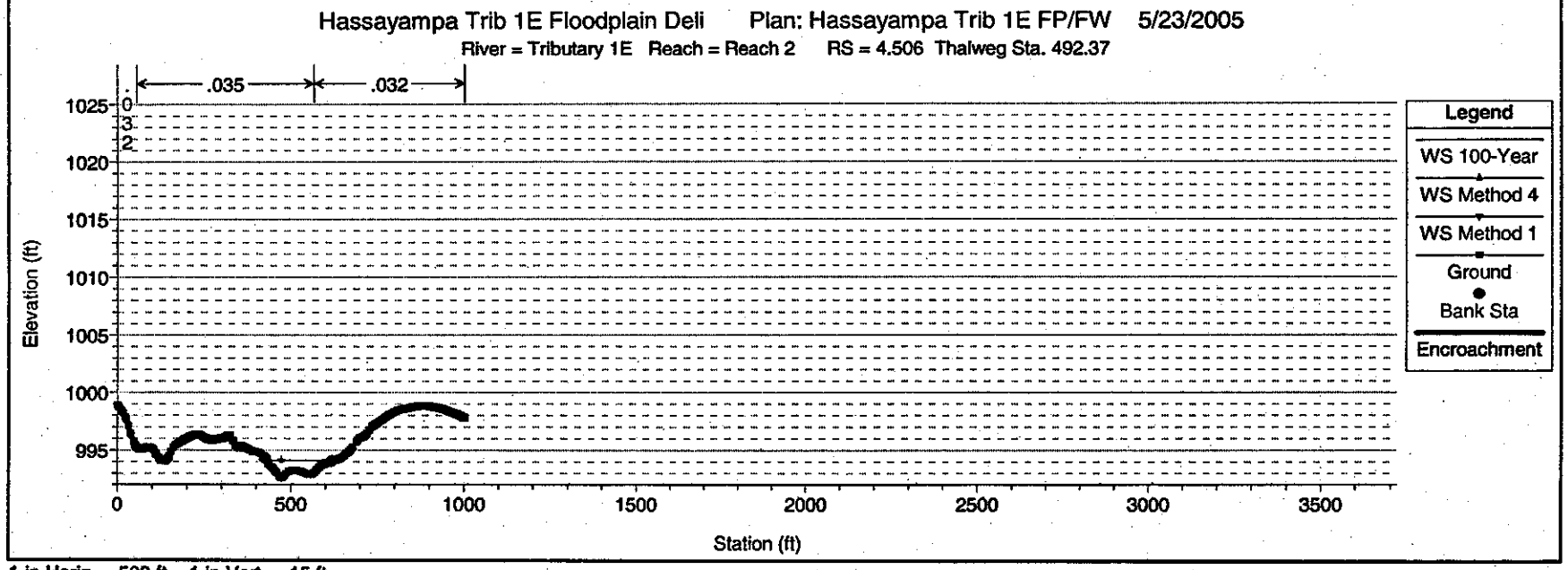


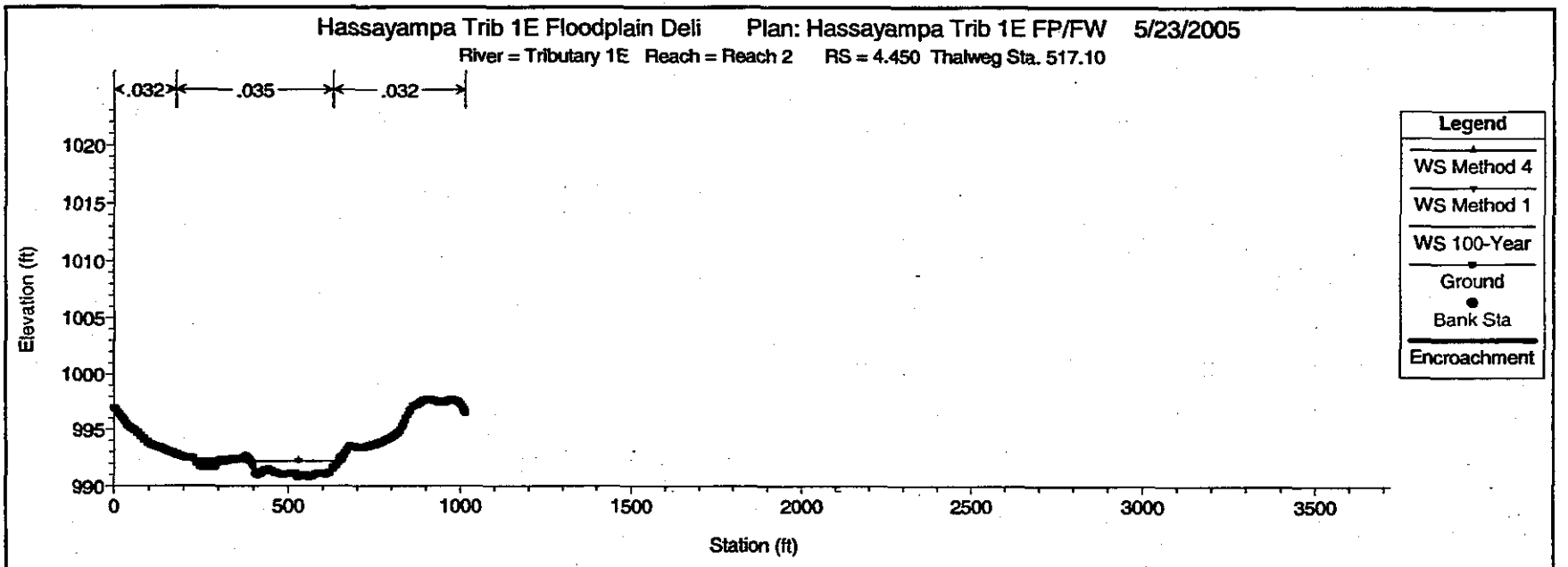


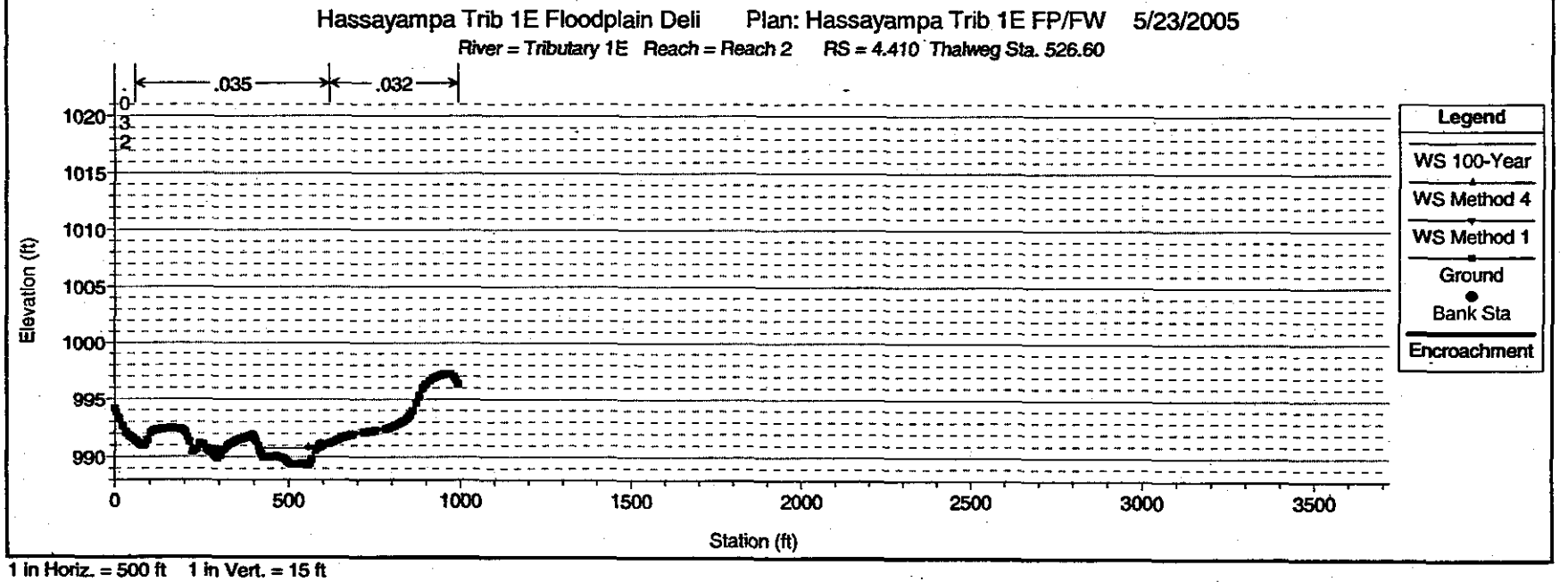
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



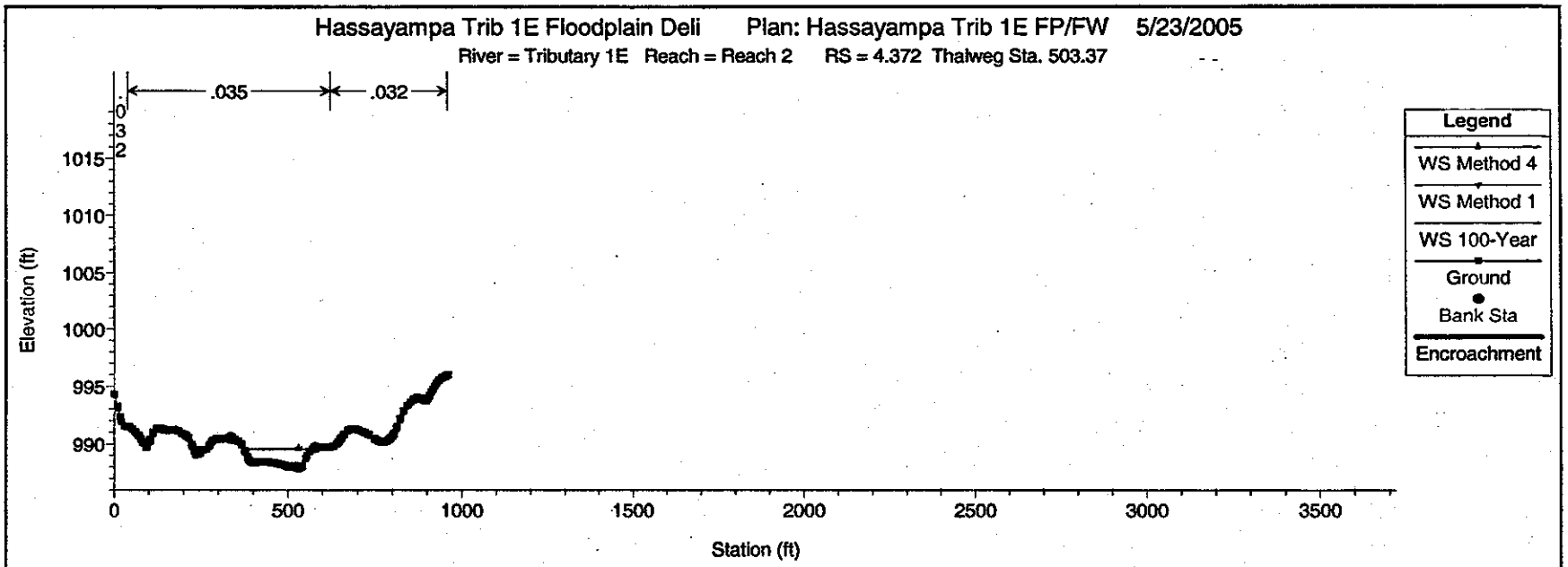


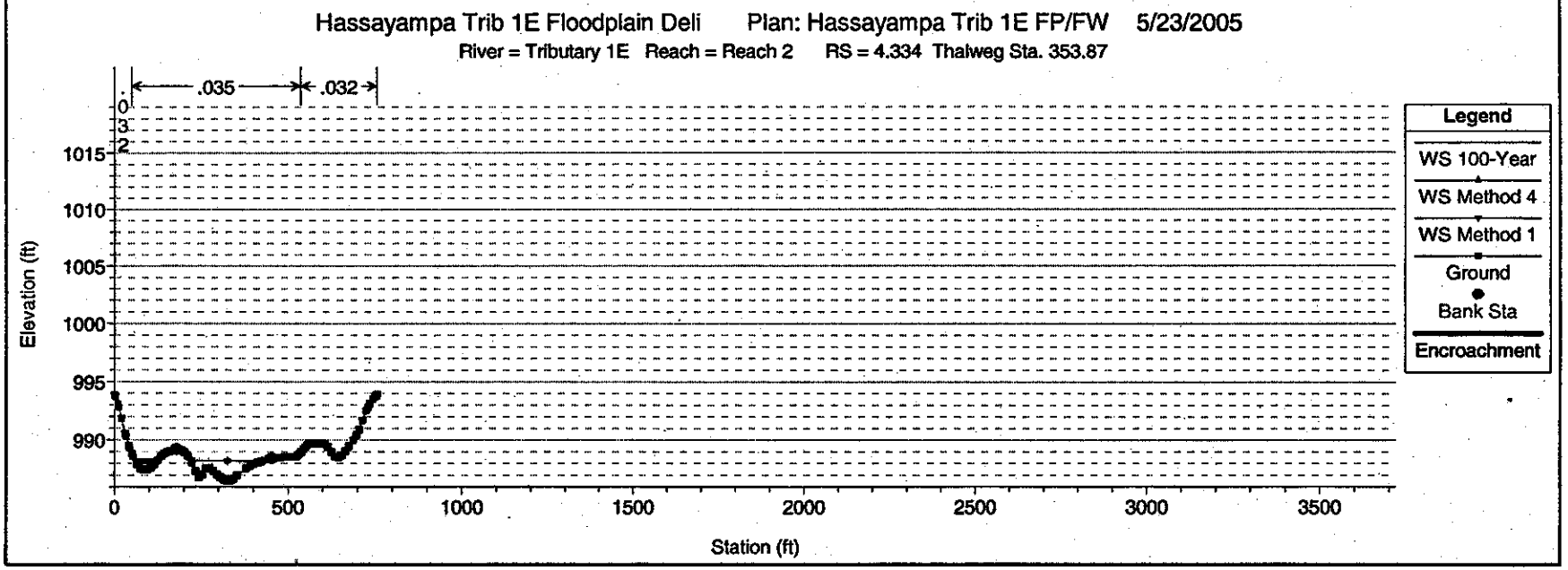
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



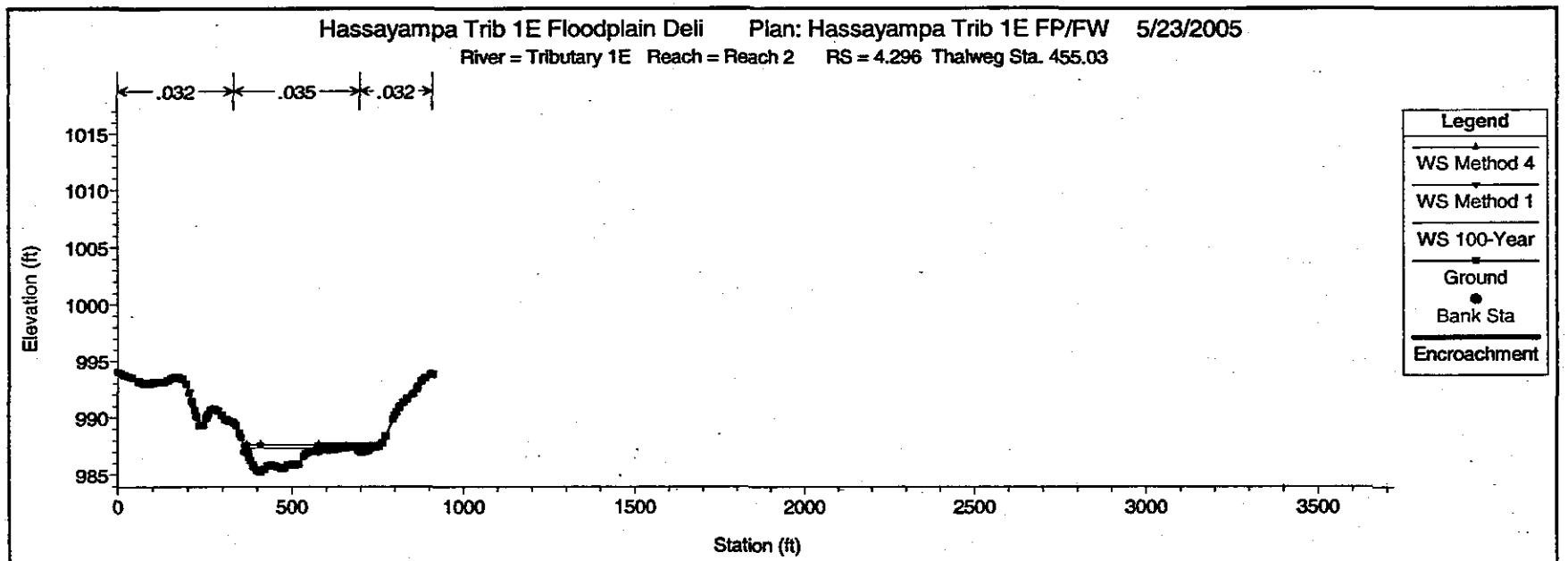


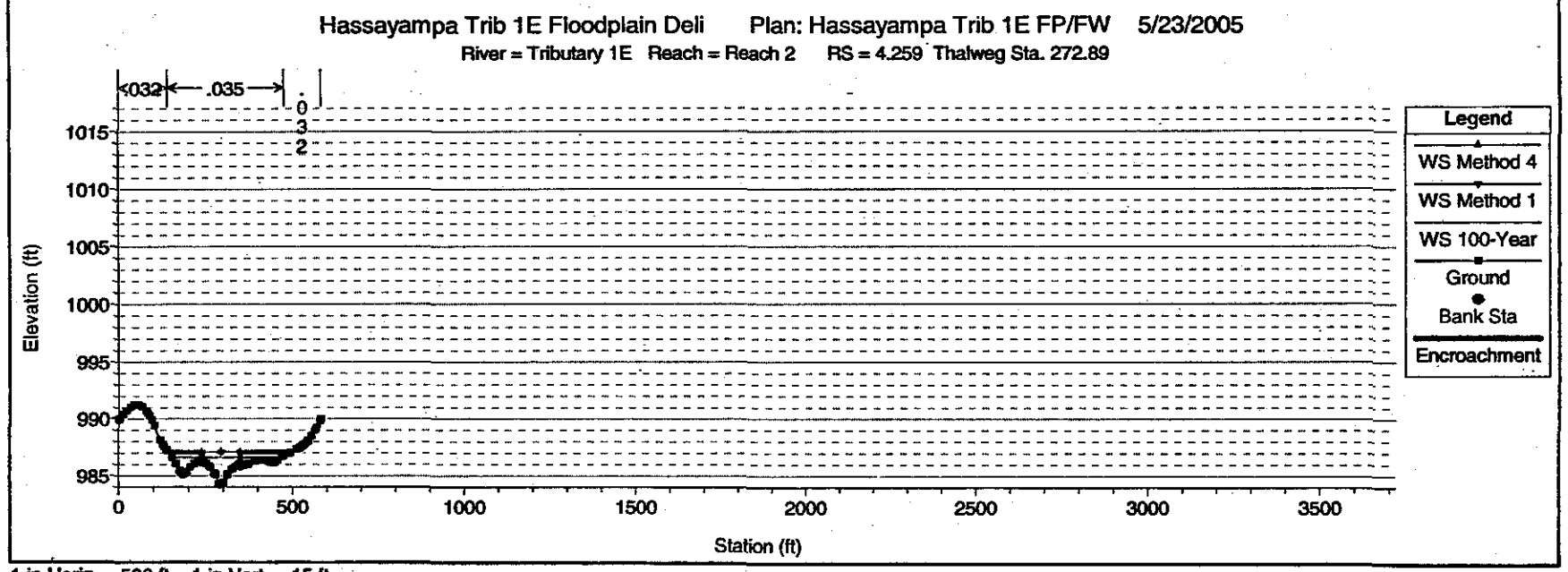
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



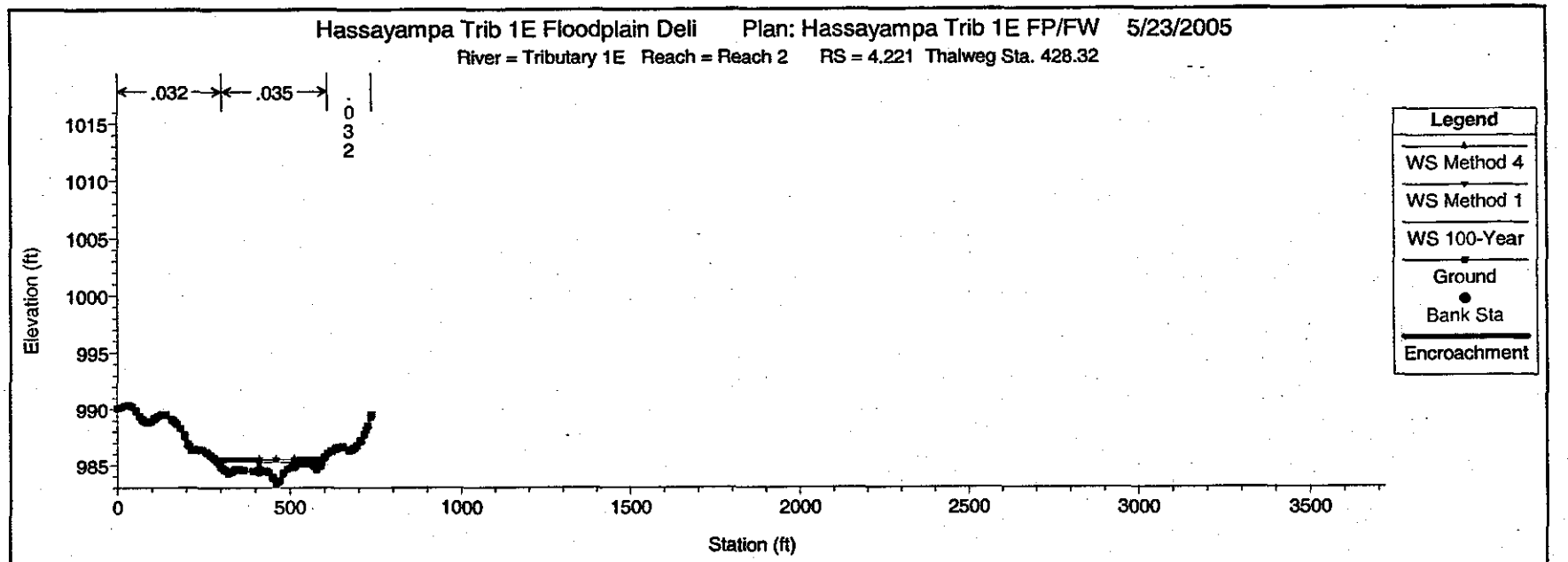


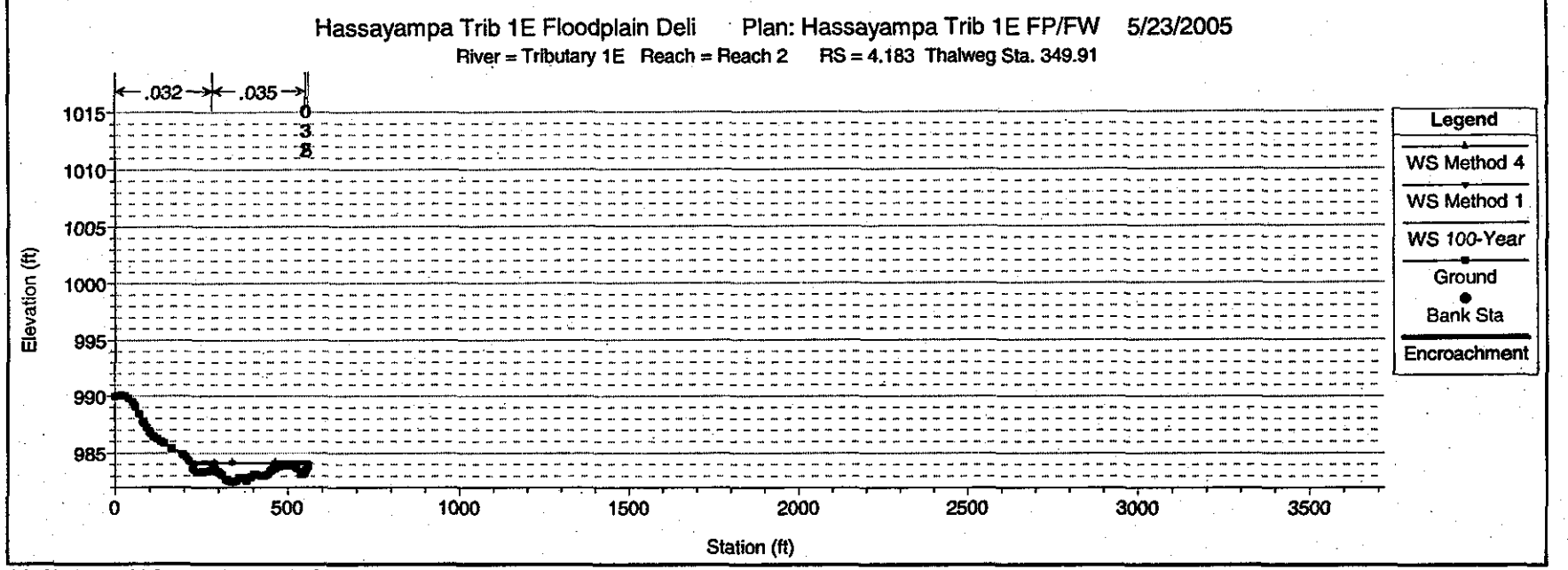
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft

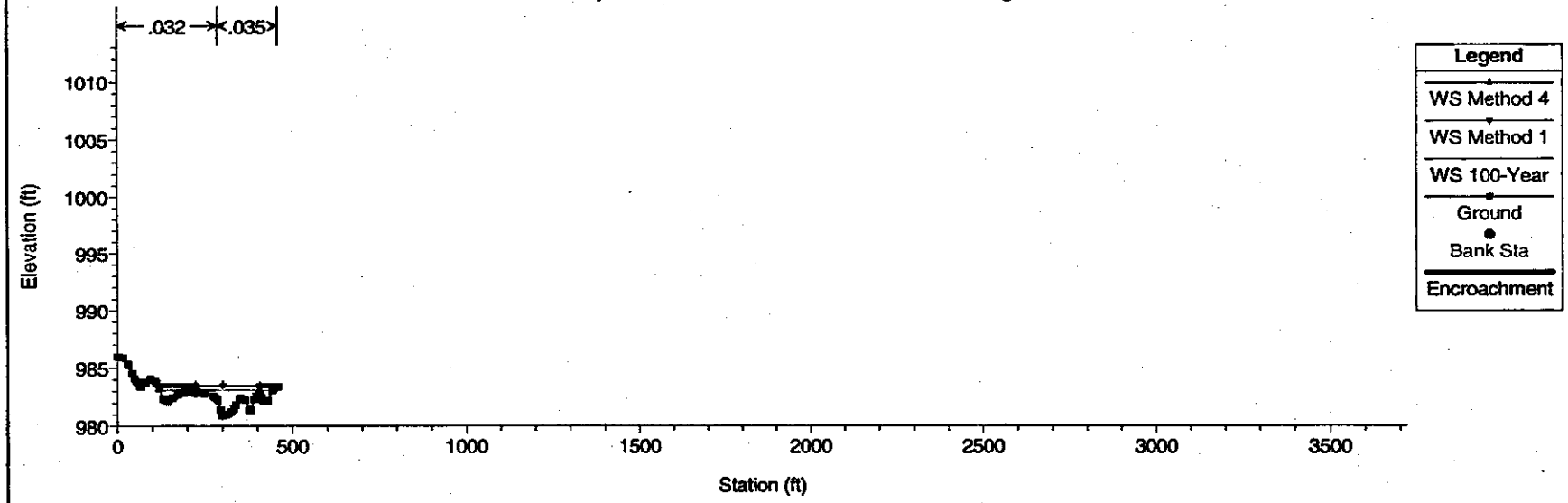




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

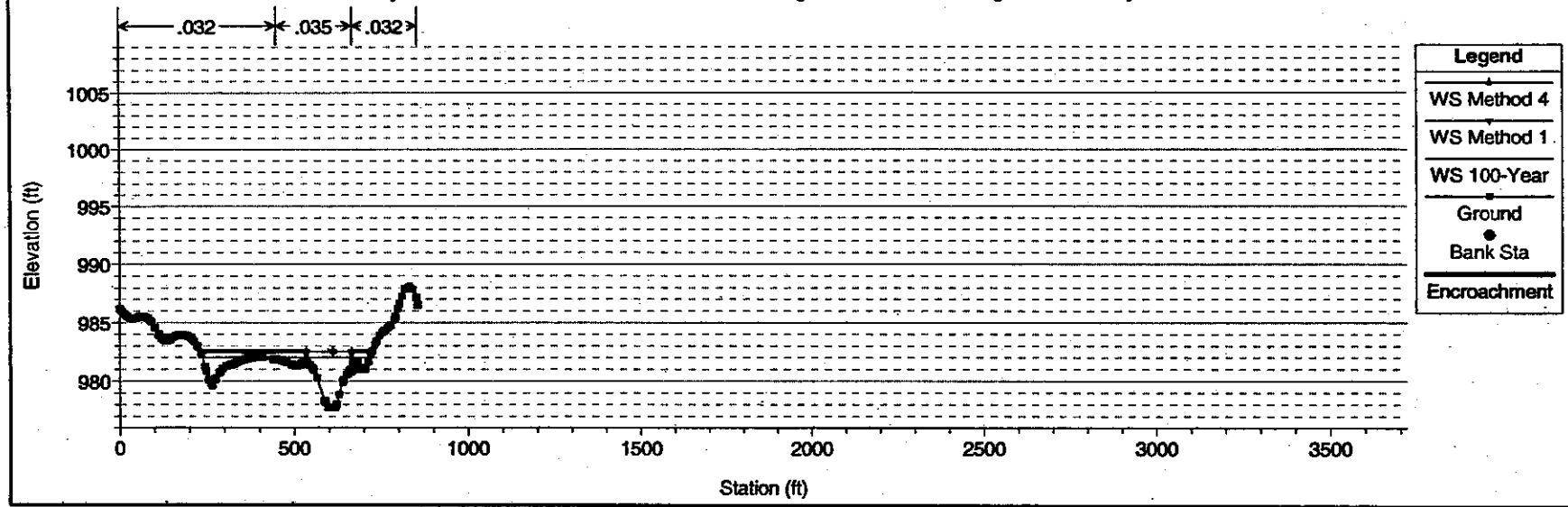
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 2 RS = 4.145 Thalweg Sta. 325.29

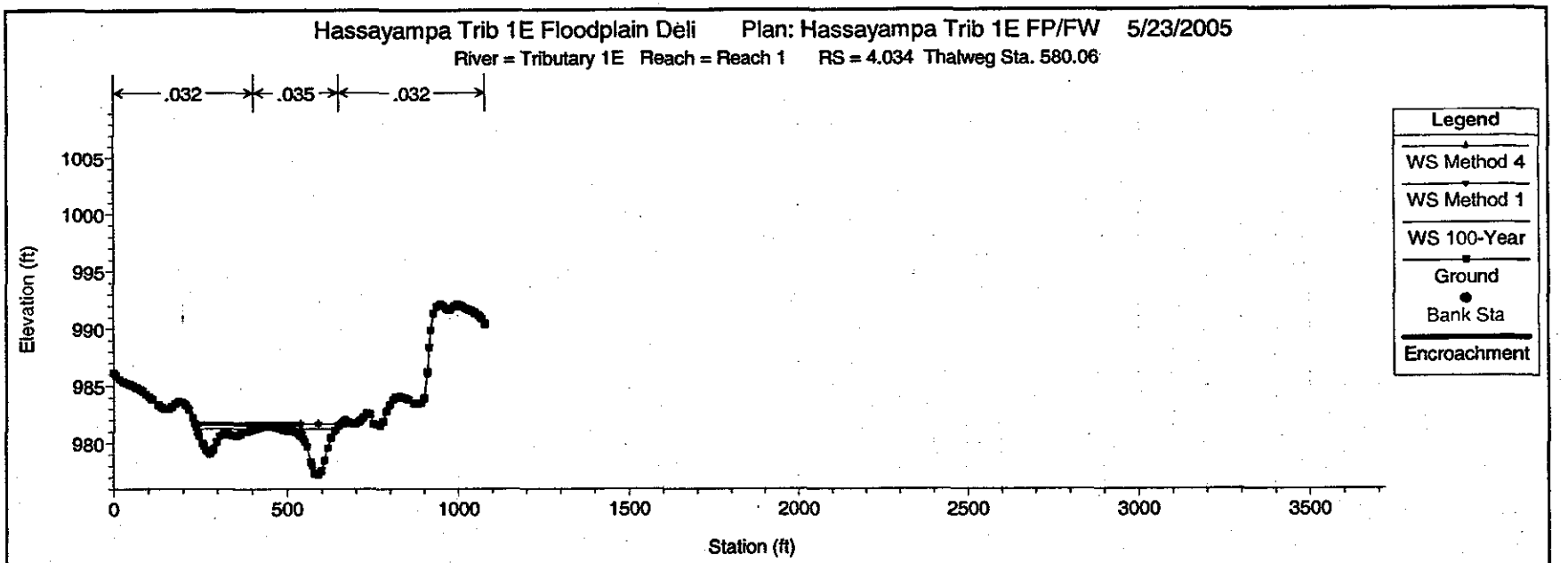


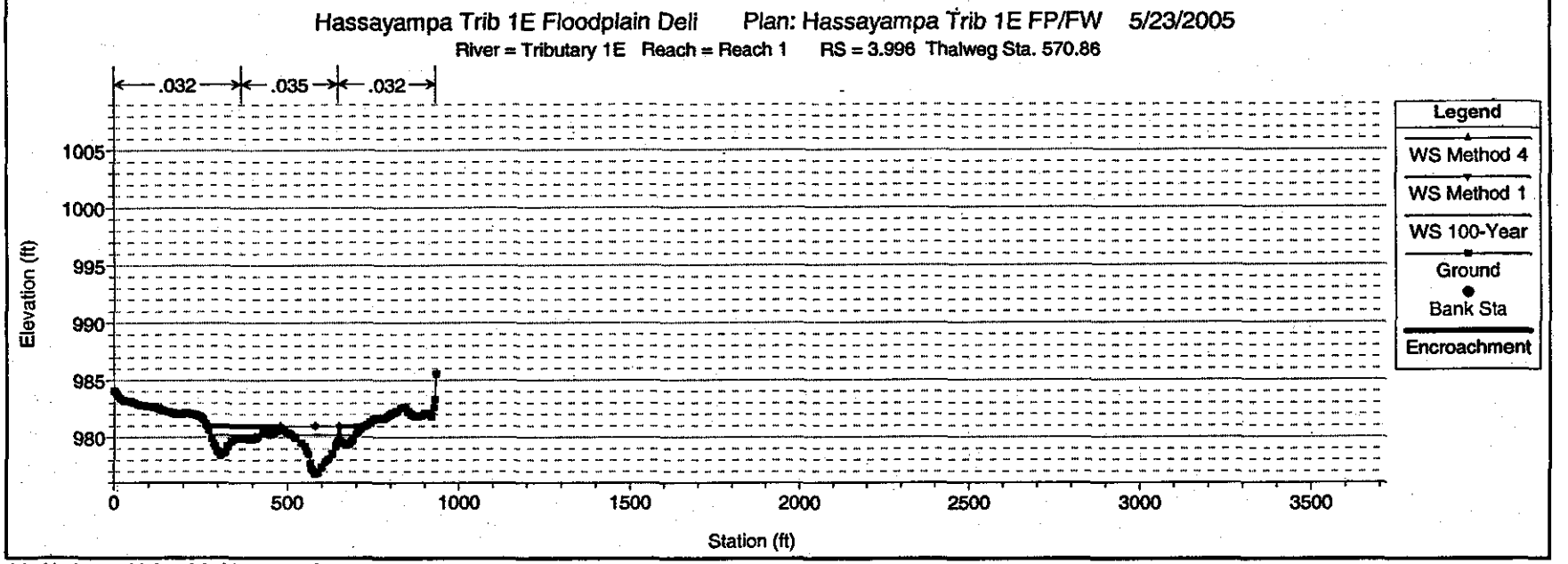
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 4.072 Thalweg Sta. 586.26 - Discharge from A2-100y6hr.out HEC-1 model

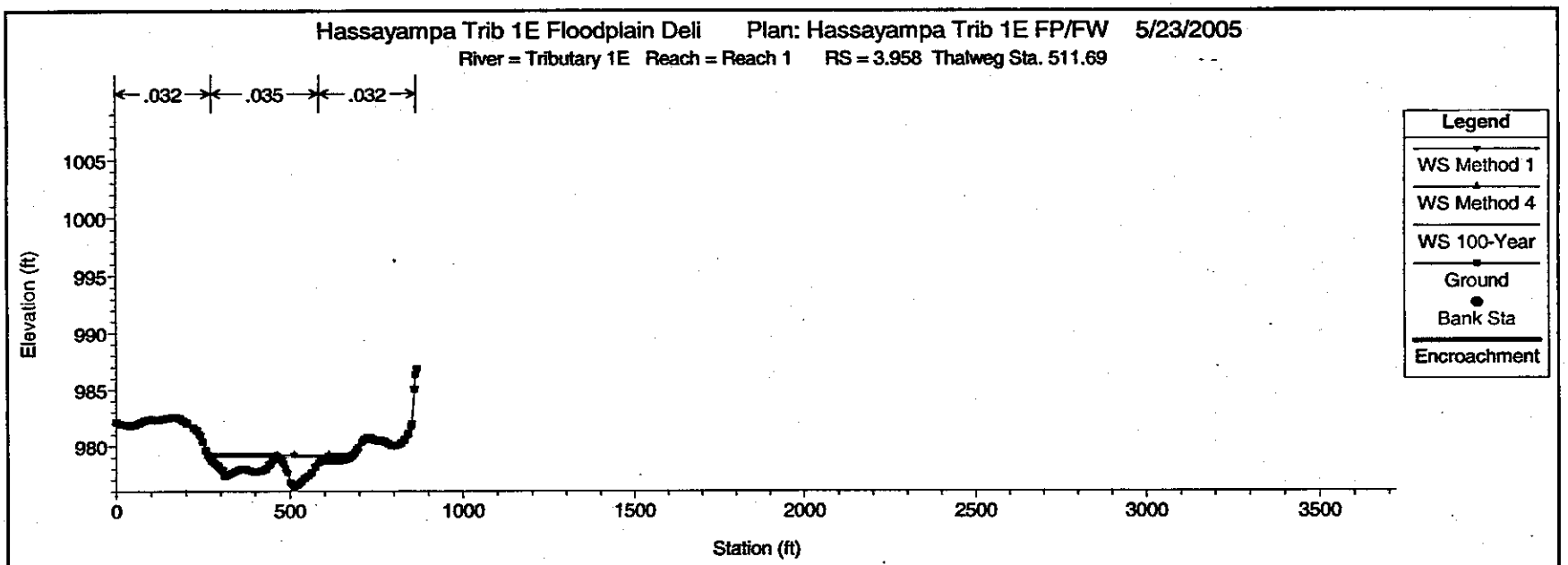


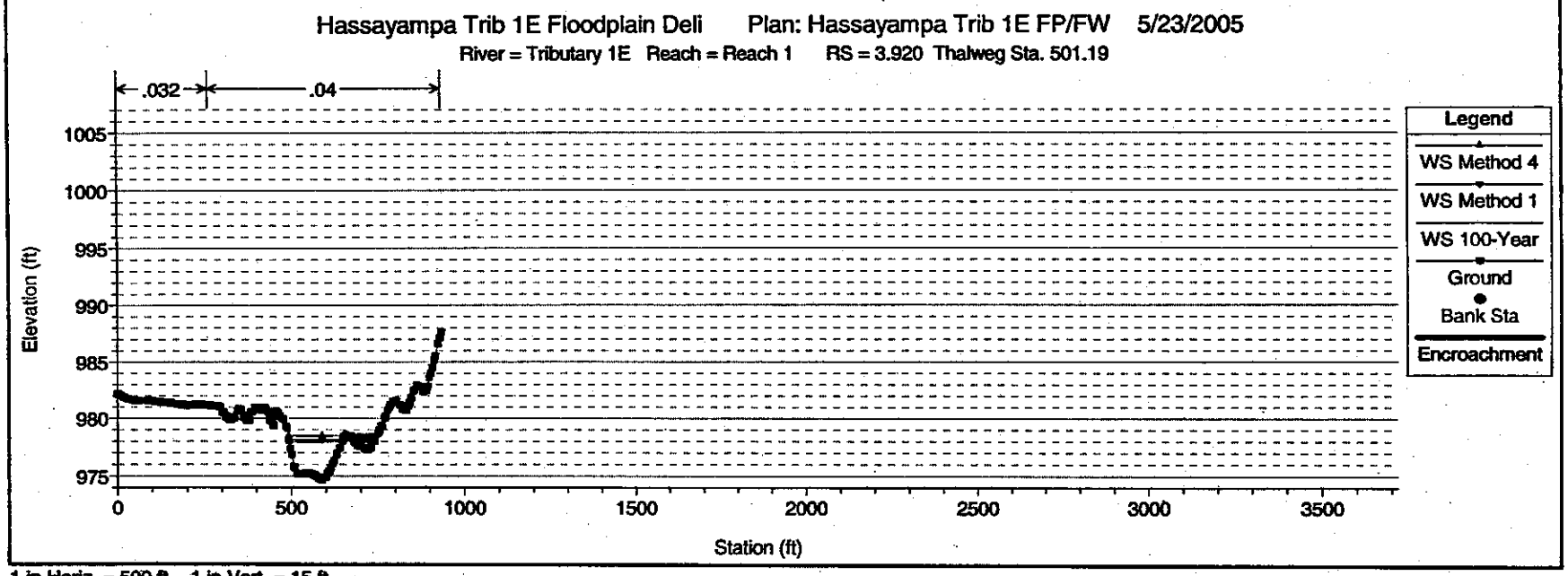
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



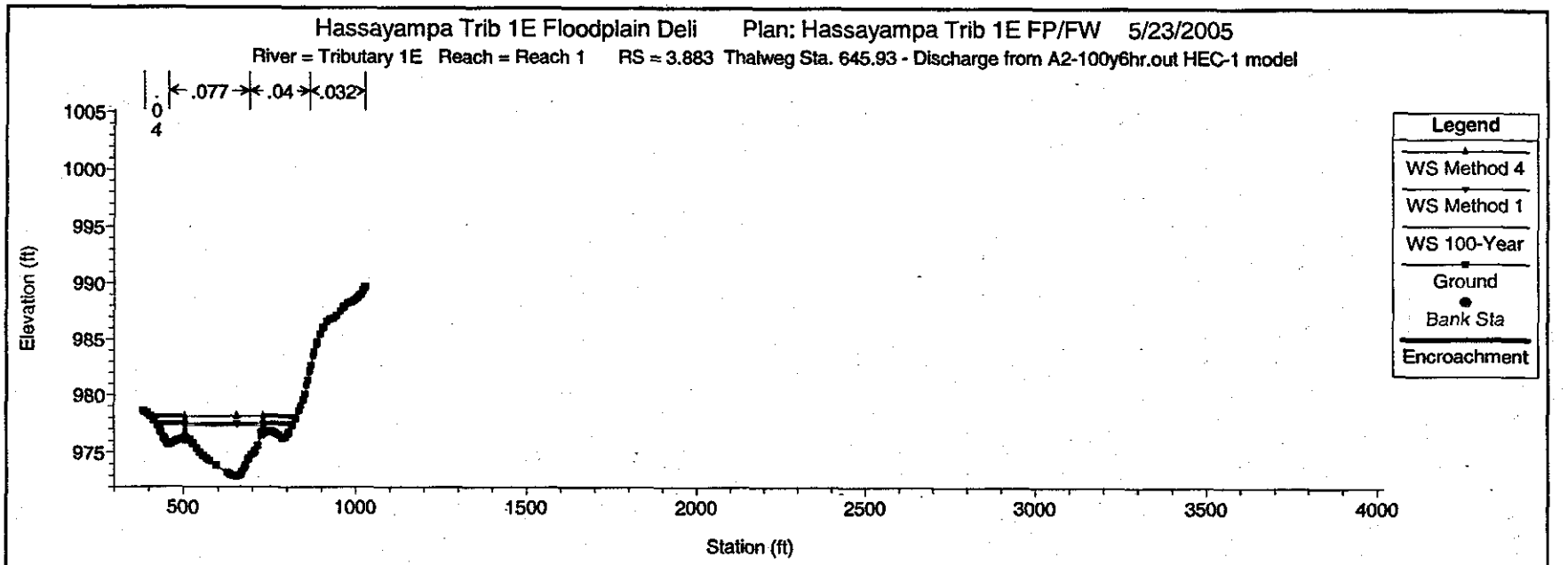


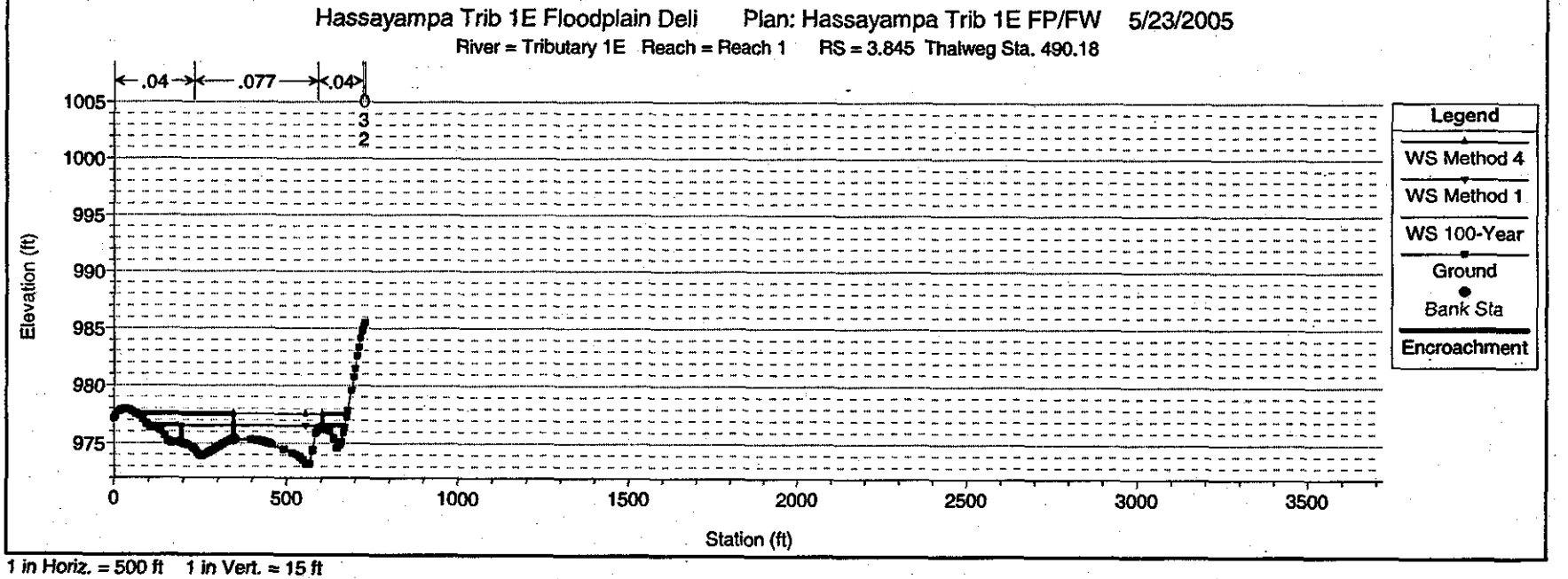
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft





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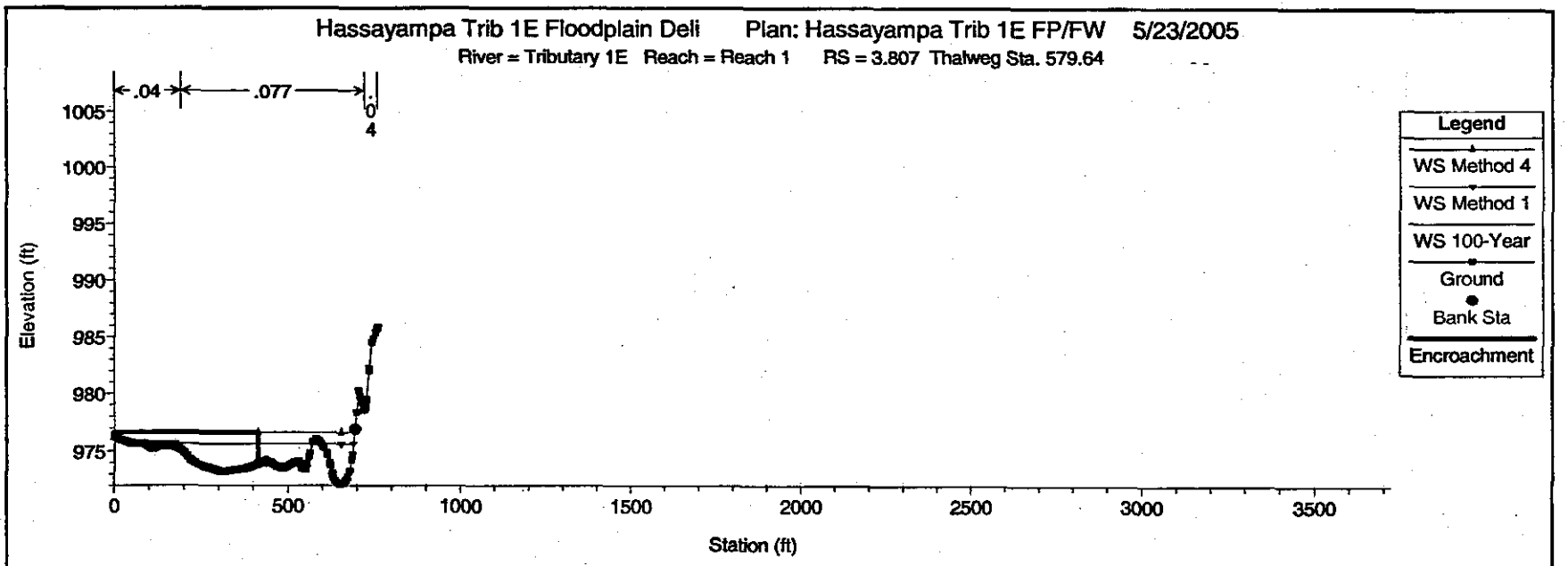
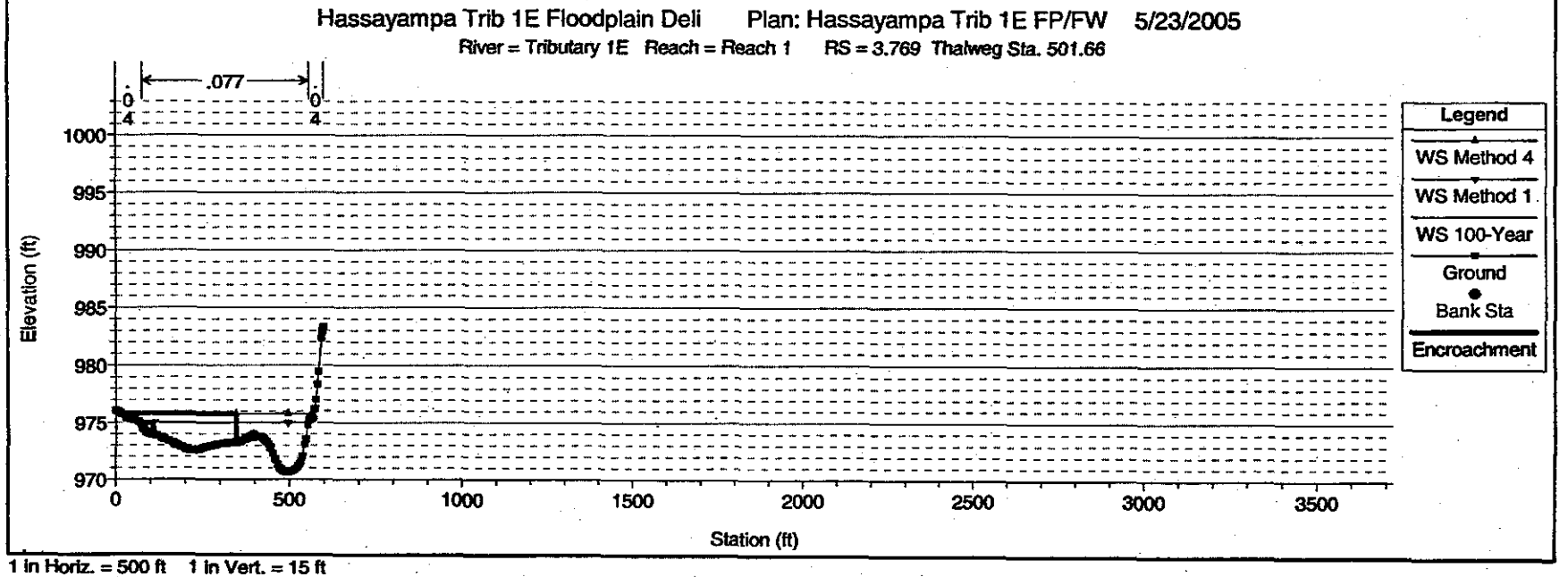
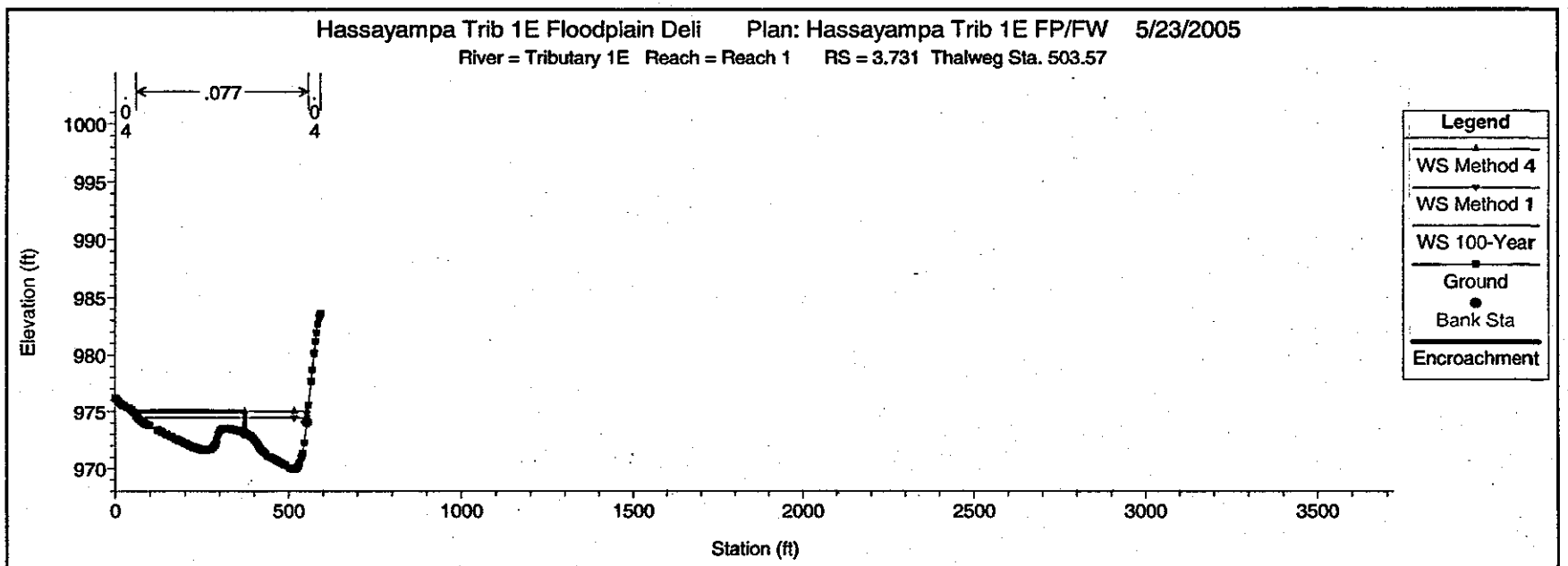
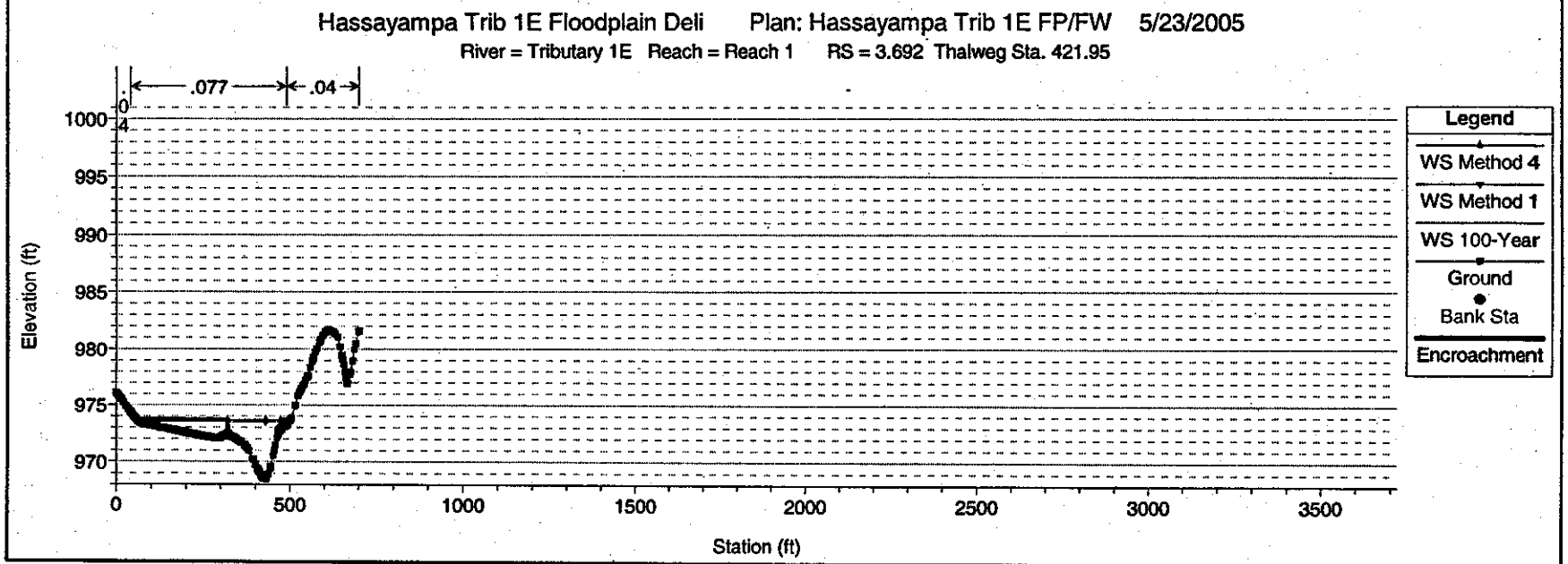




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

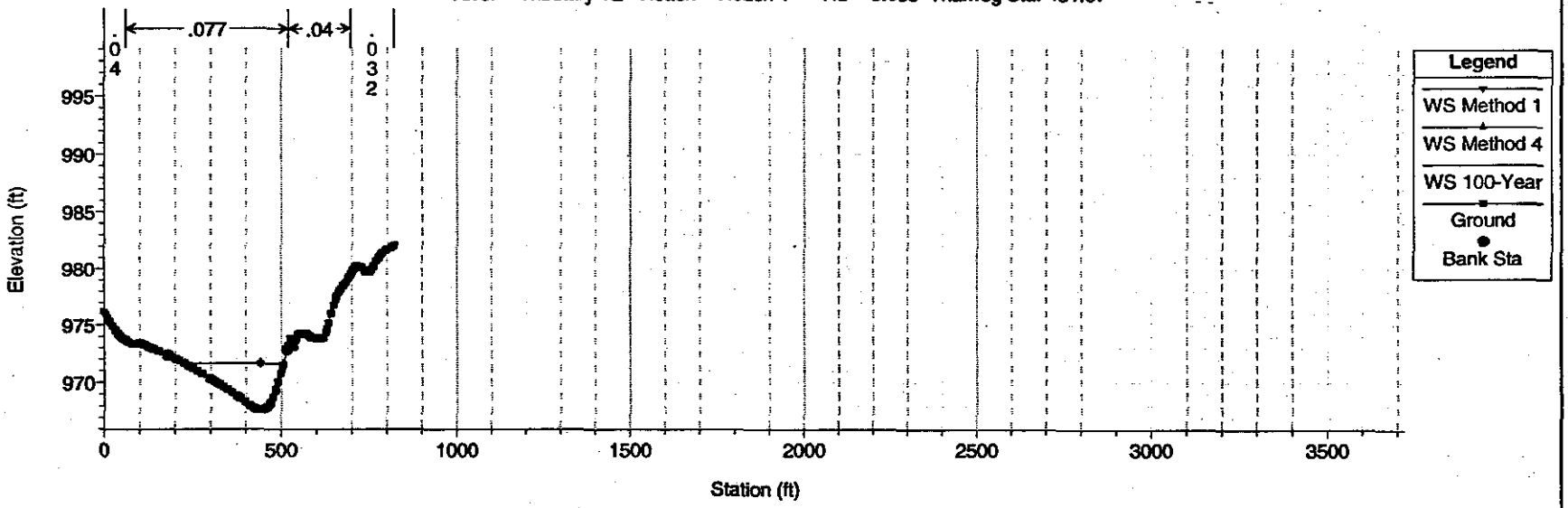




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

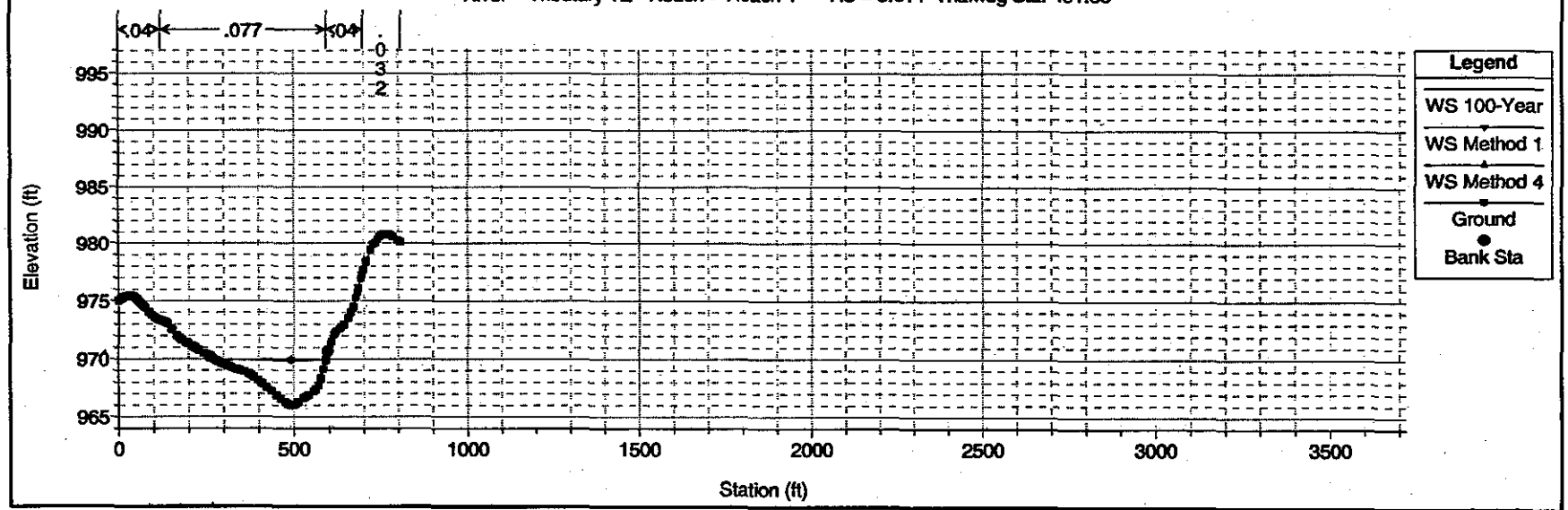
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 3.653 Thalweg Sta. 431.67

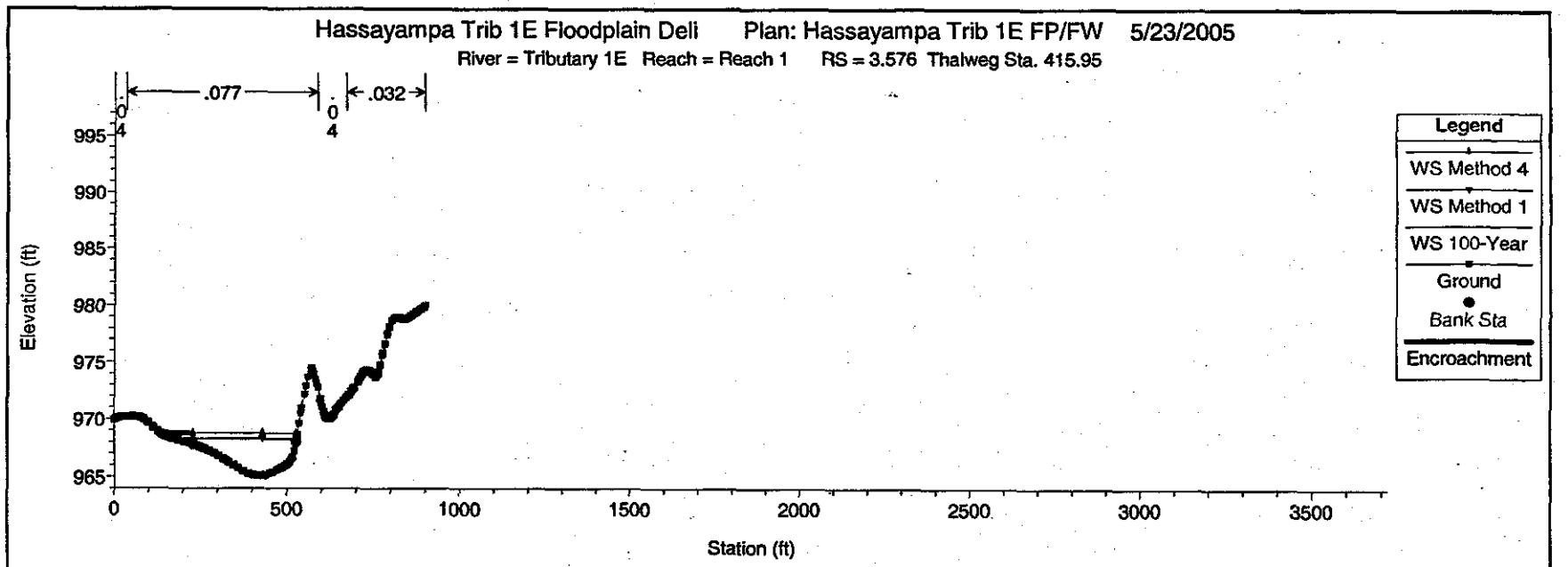


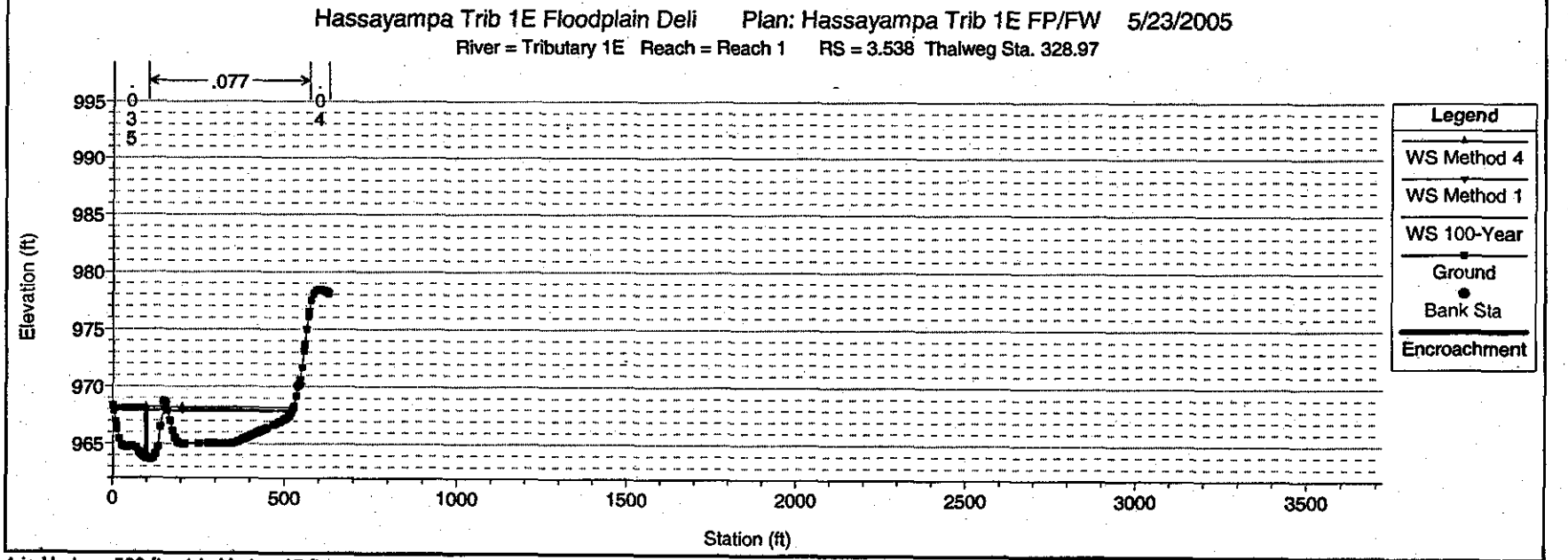
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 3.614 Thalweg Sta. 491.88



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

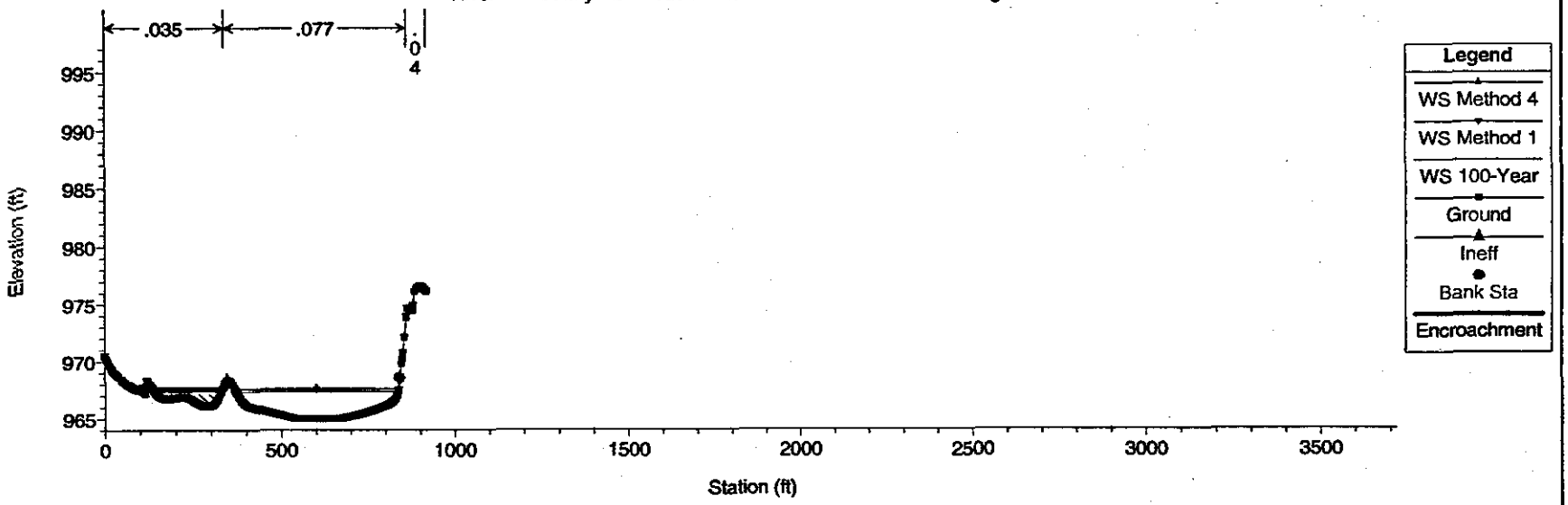




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

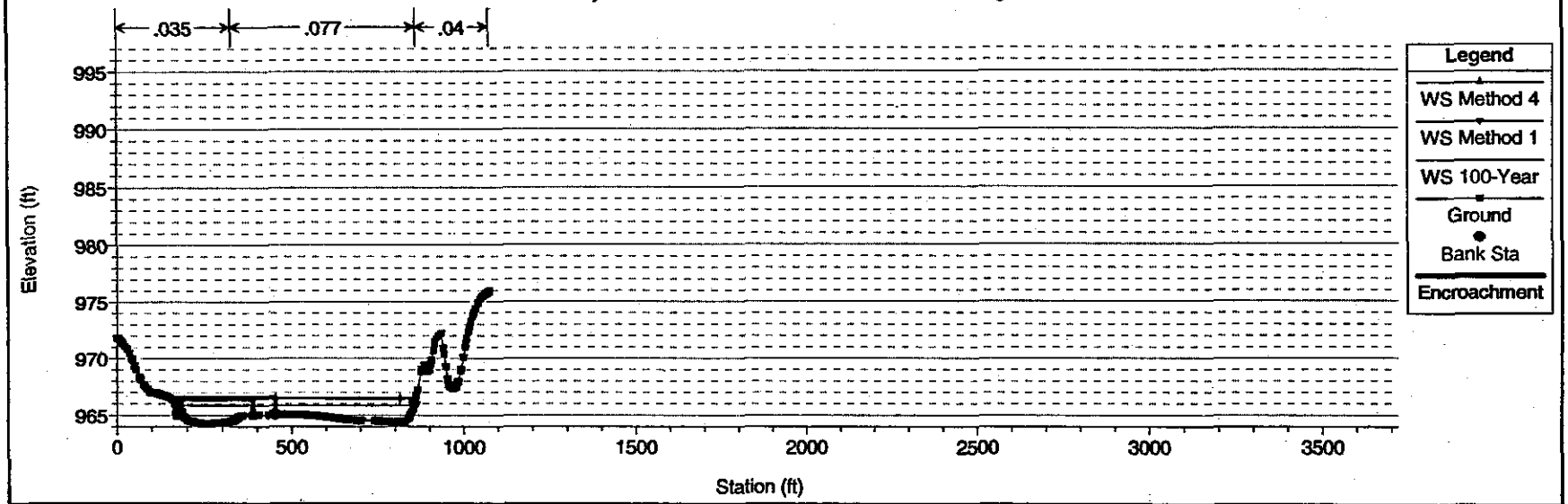
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 3.500 Thalweg Sta. 629.12

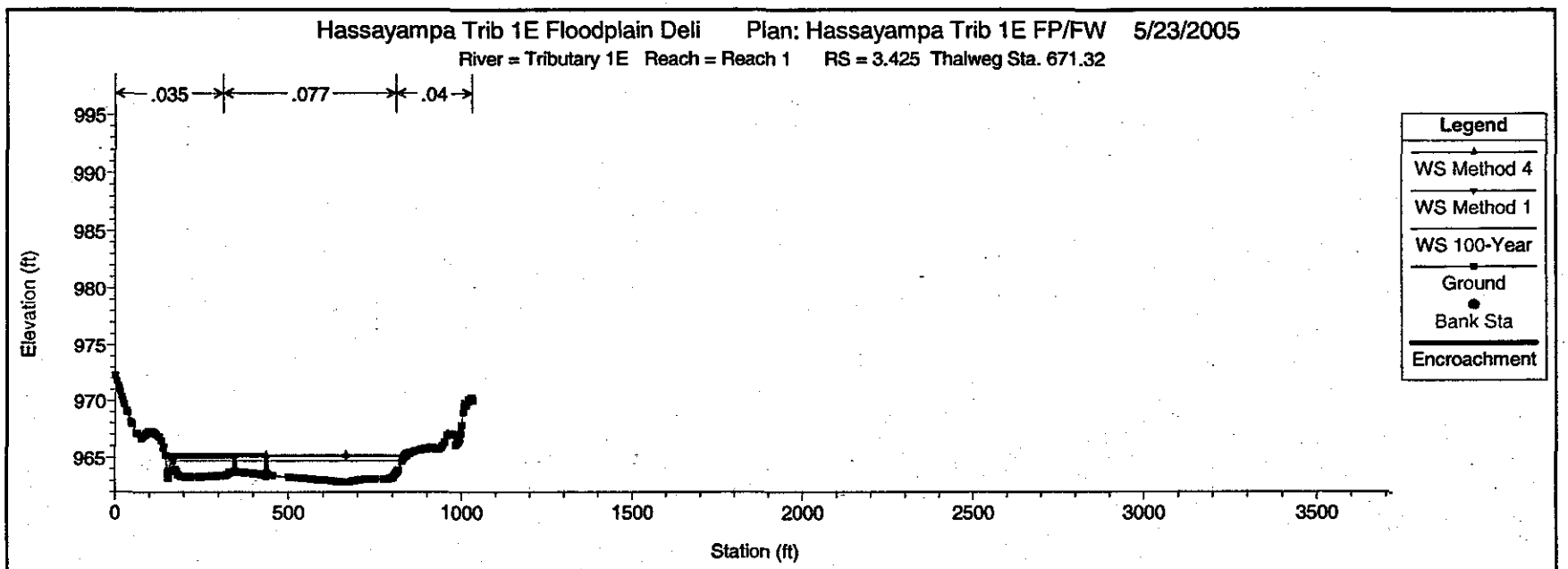


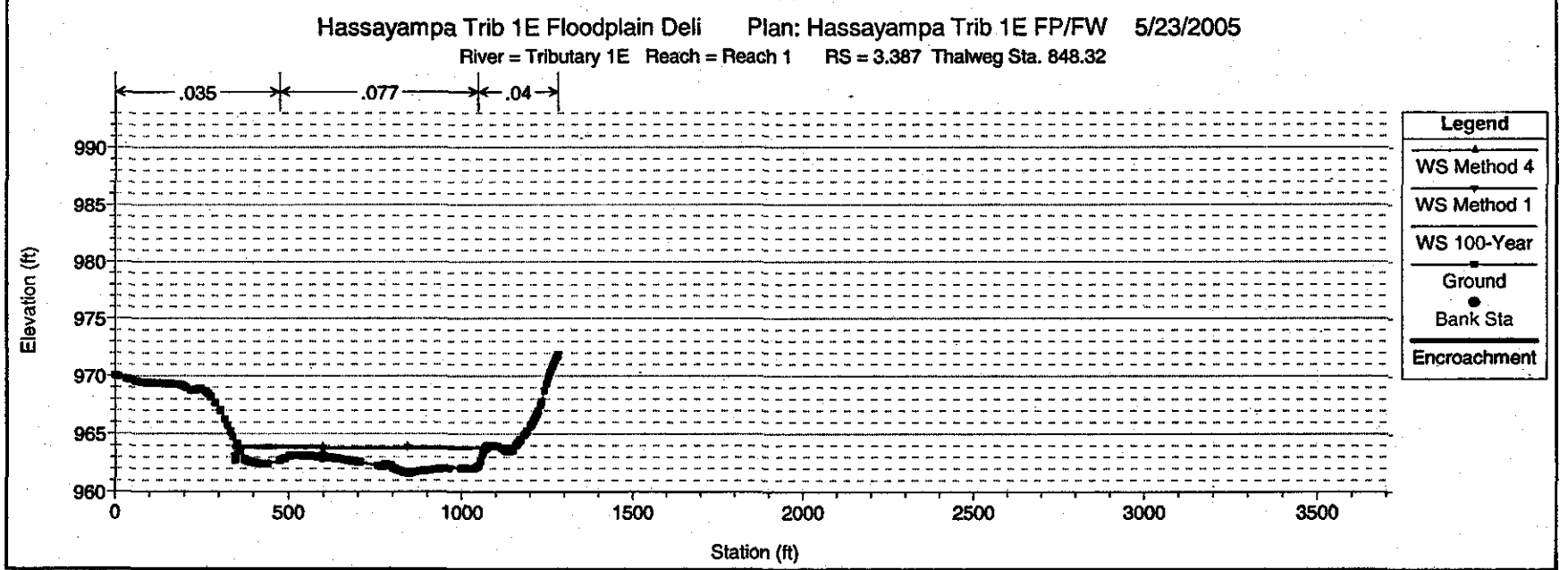
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 3.462 Thalweg Sta. 661.55

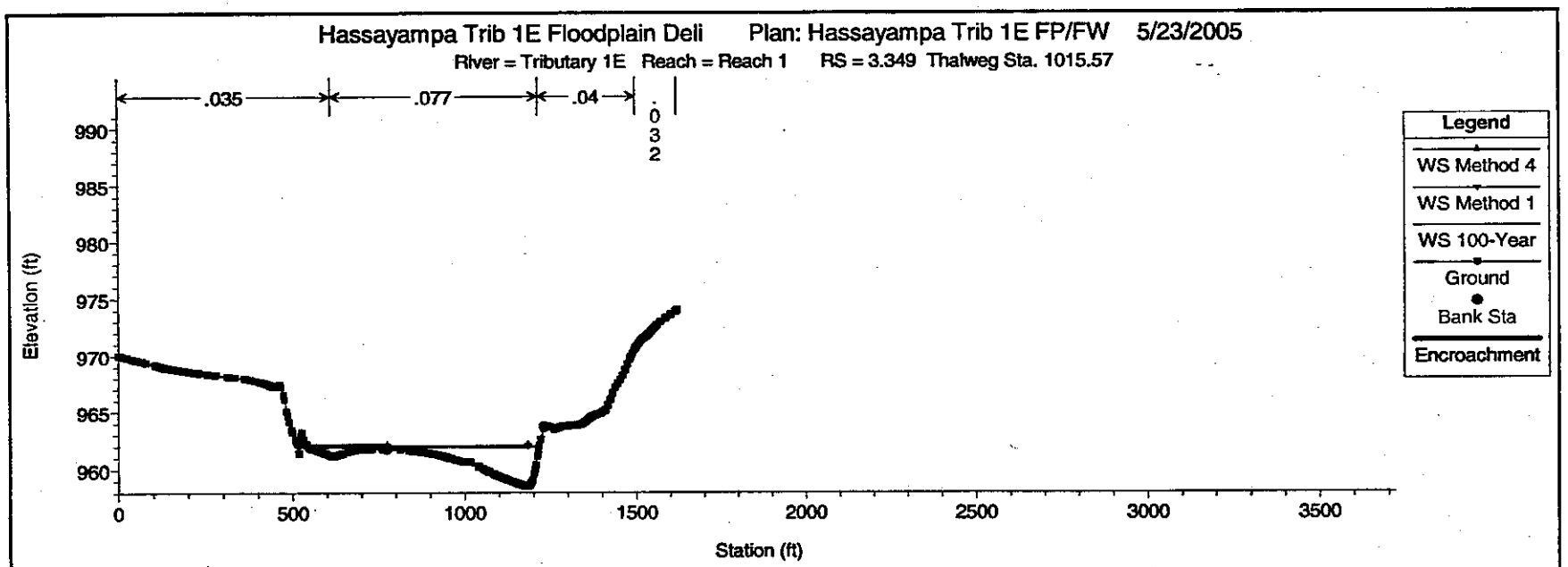


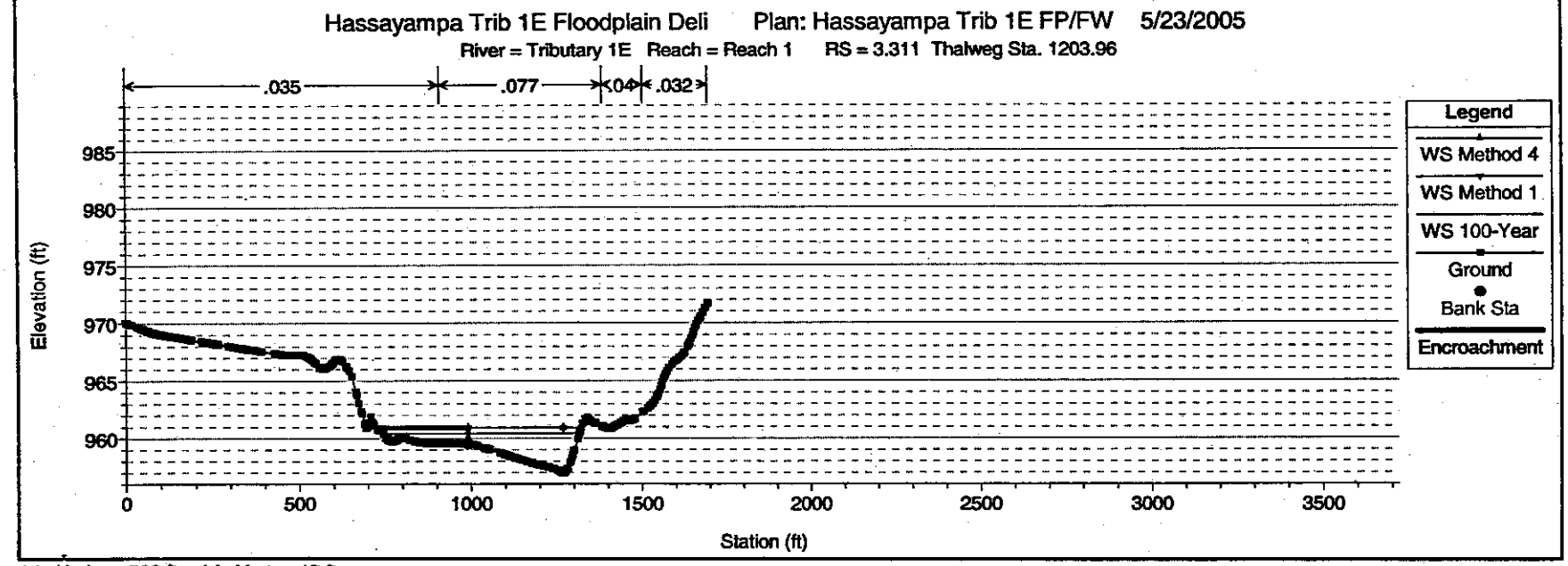
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



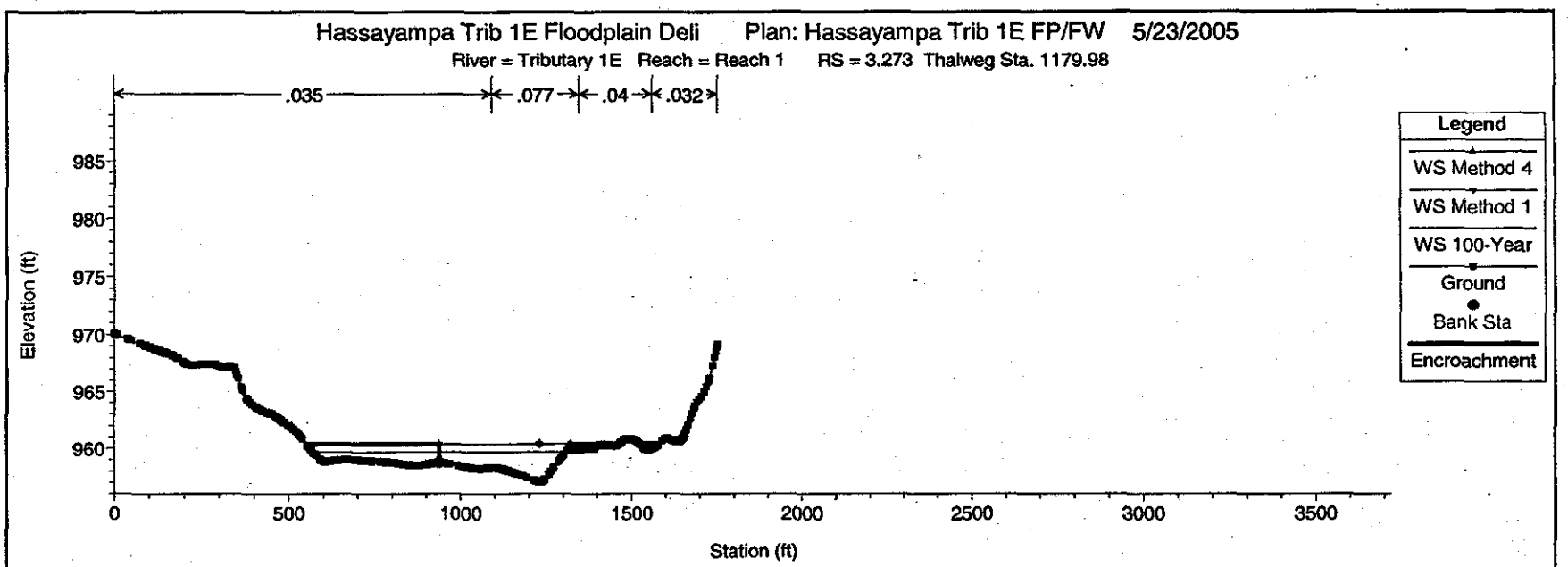


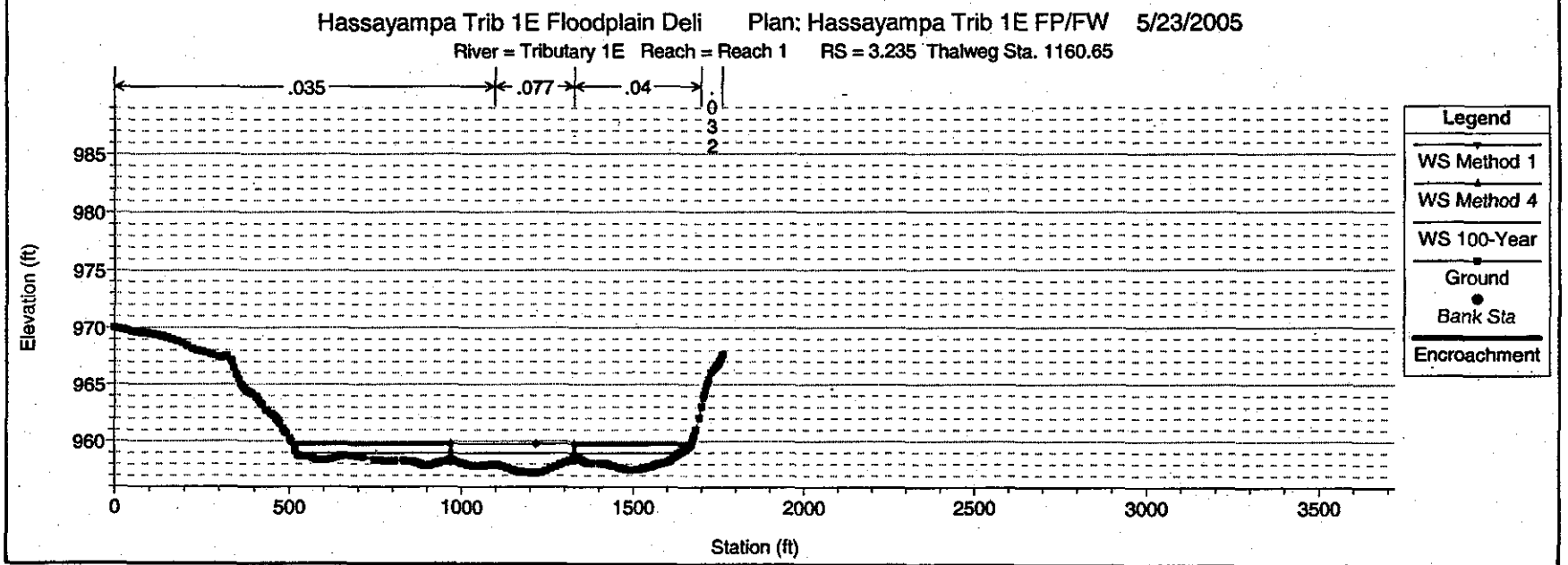
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



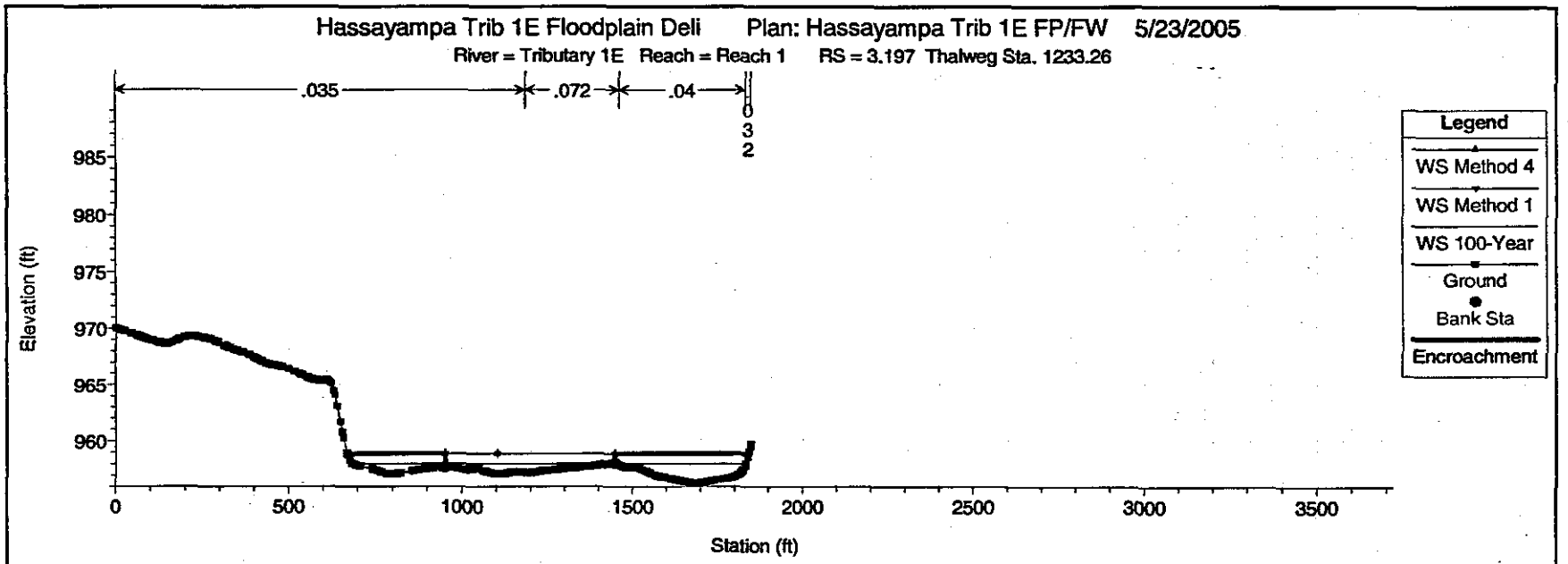


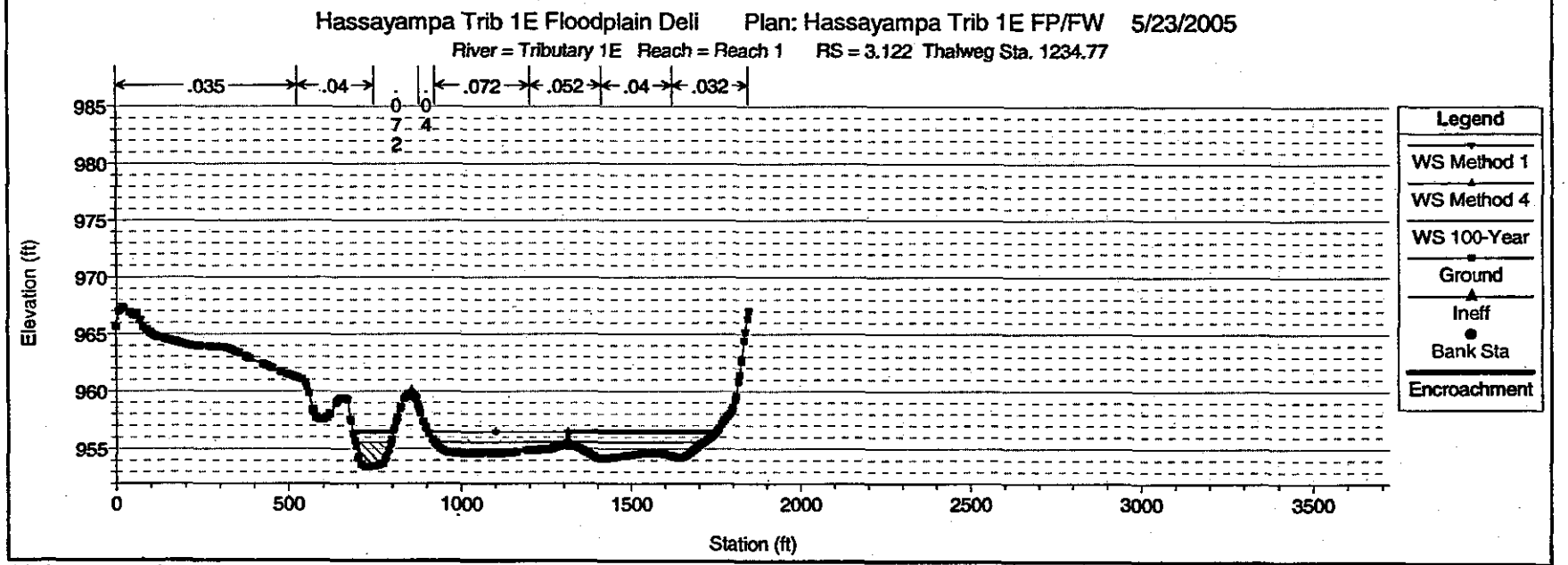
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft





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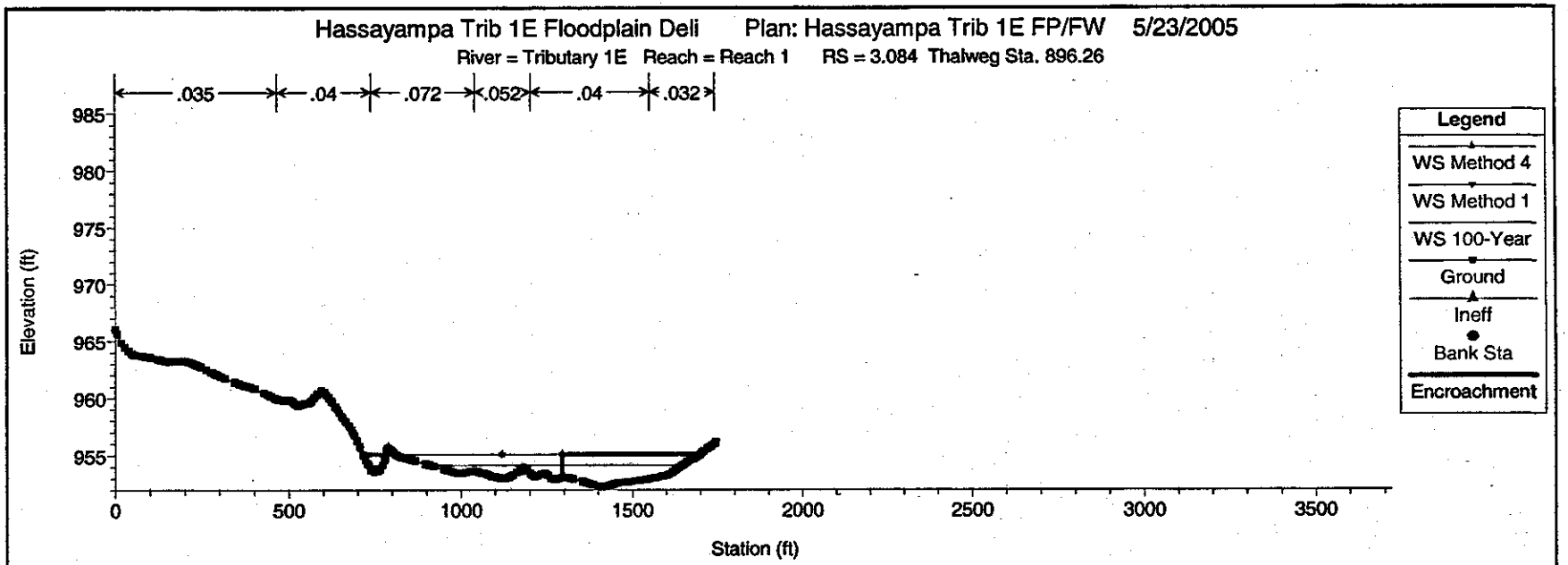

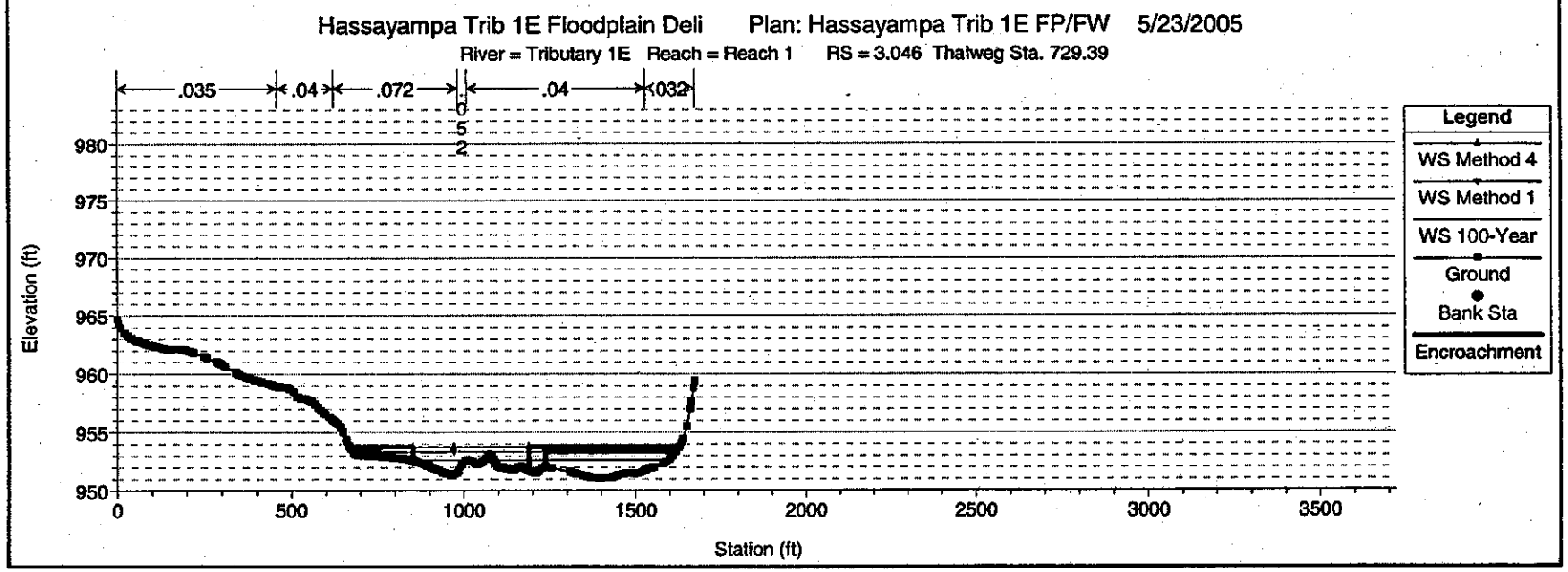

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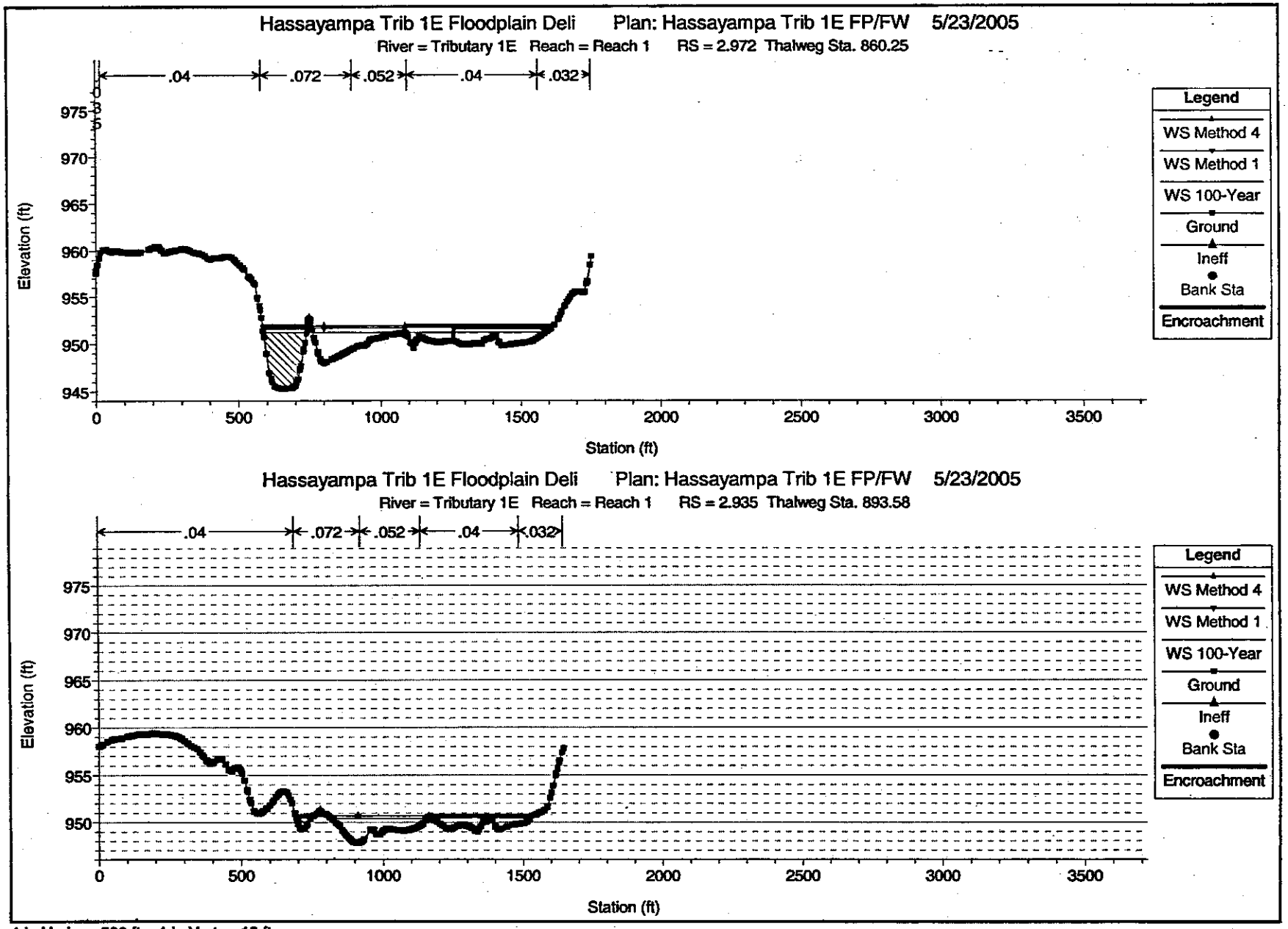

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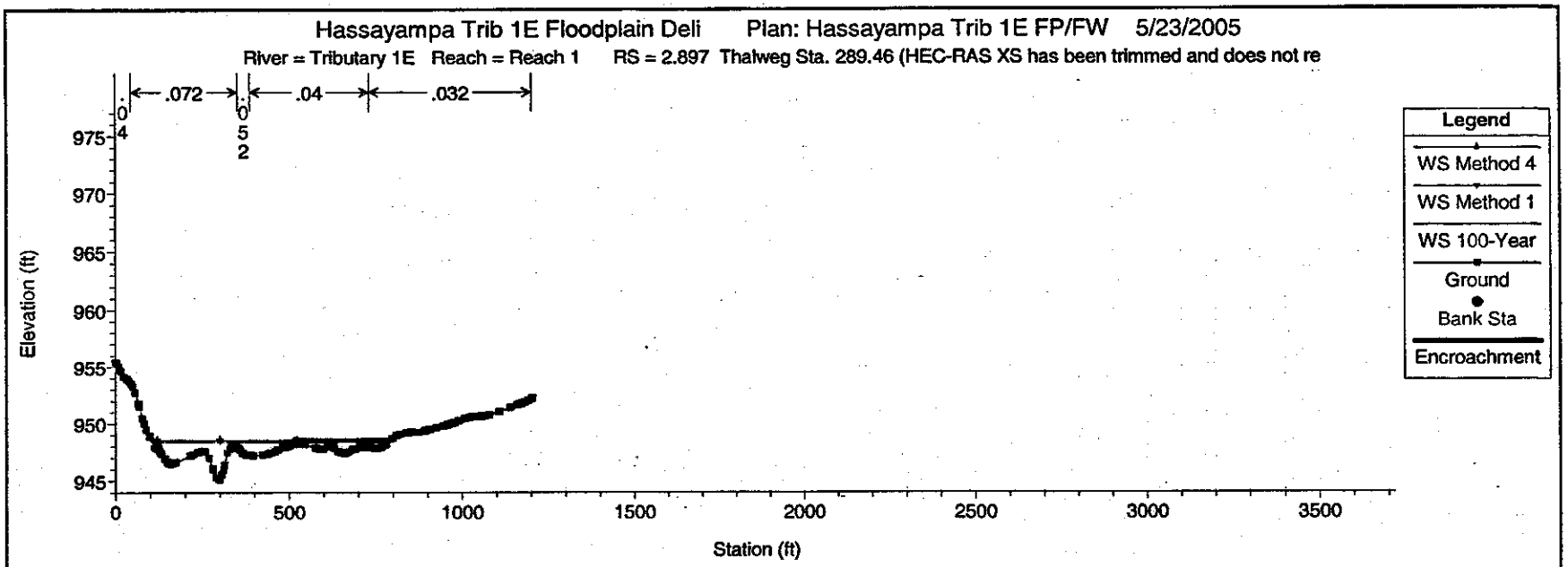

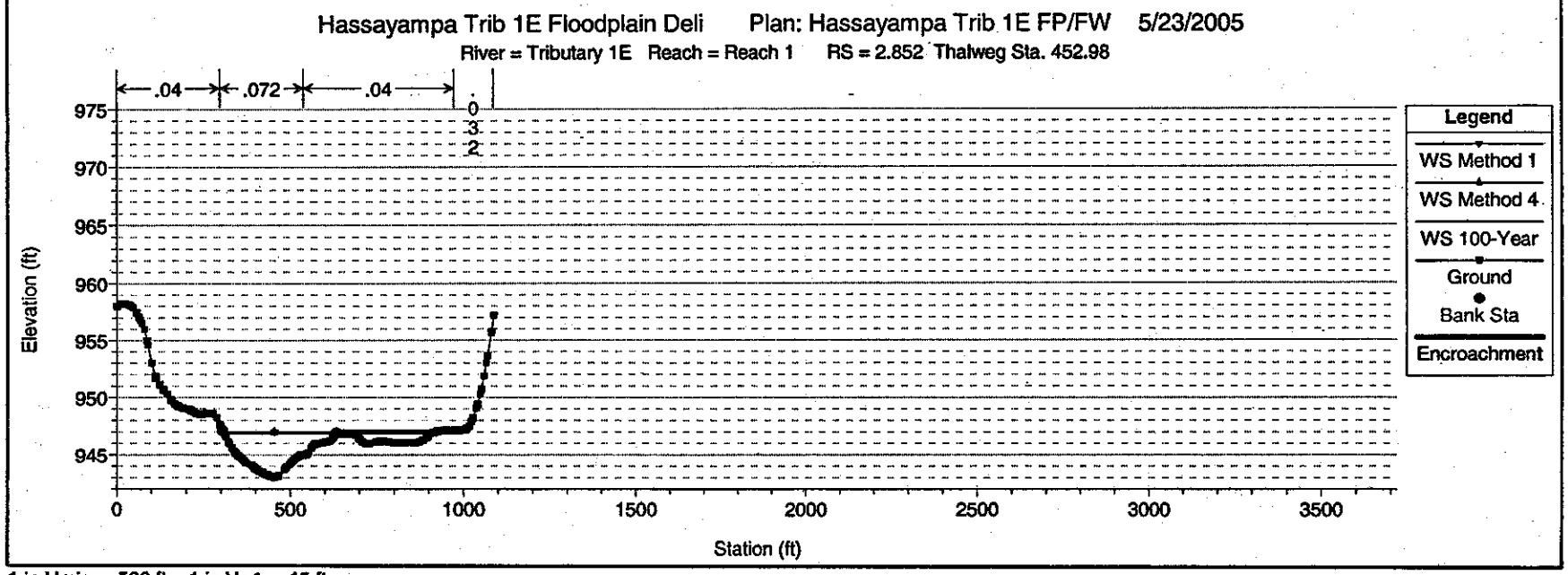

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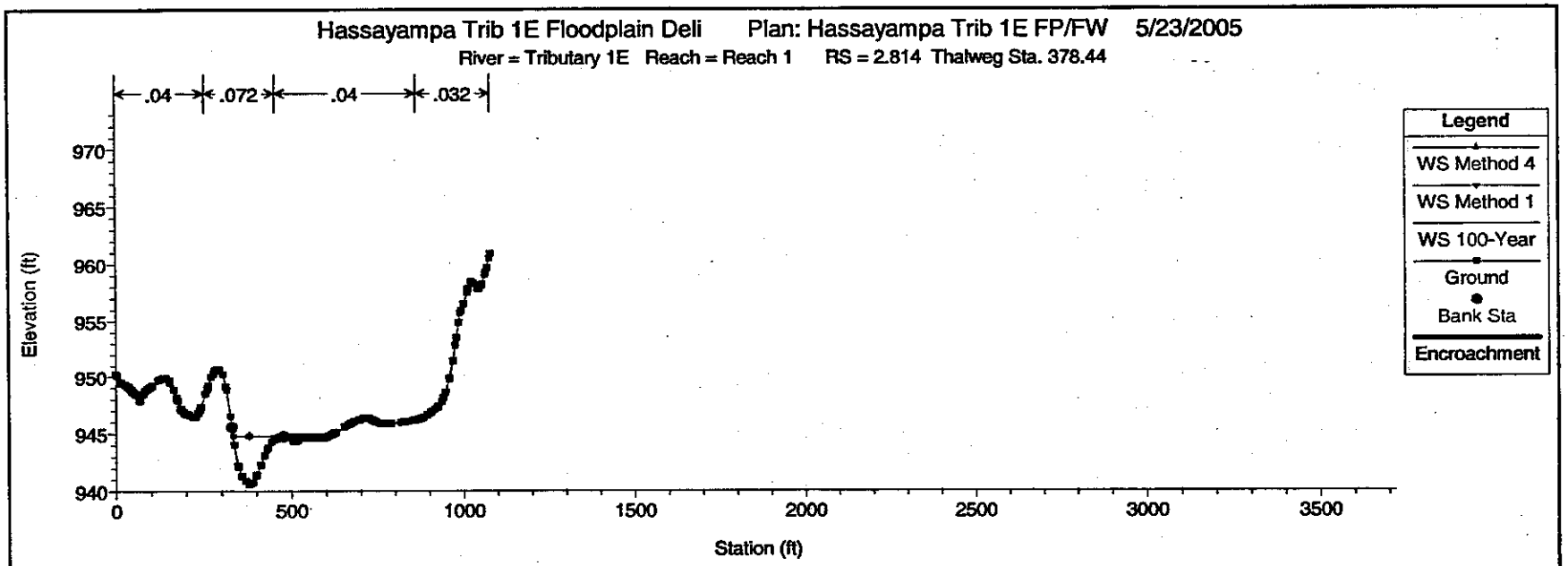

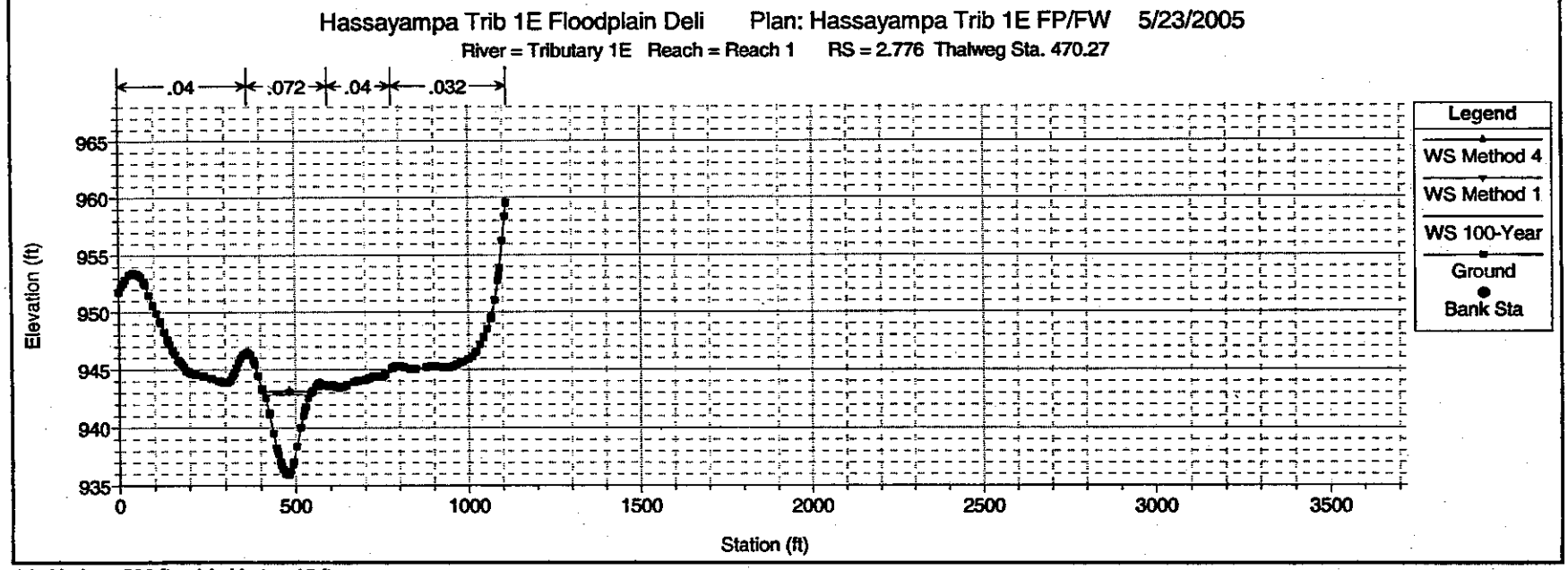

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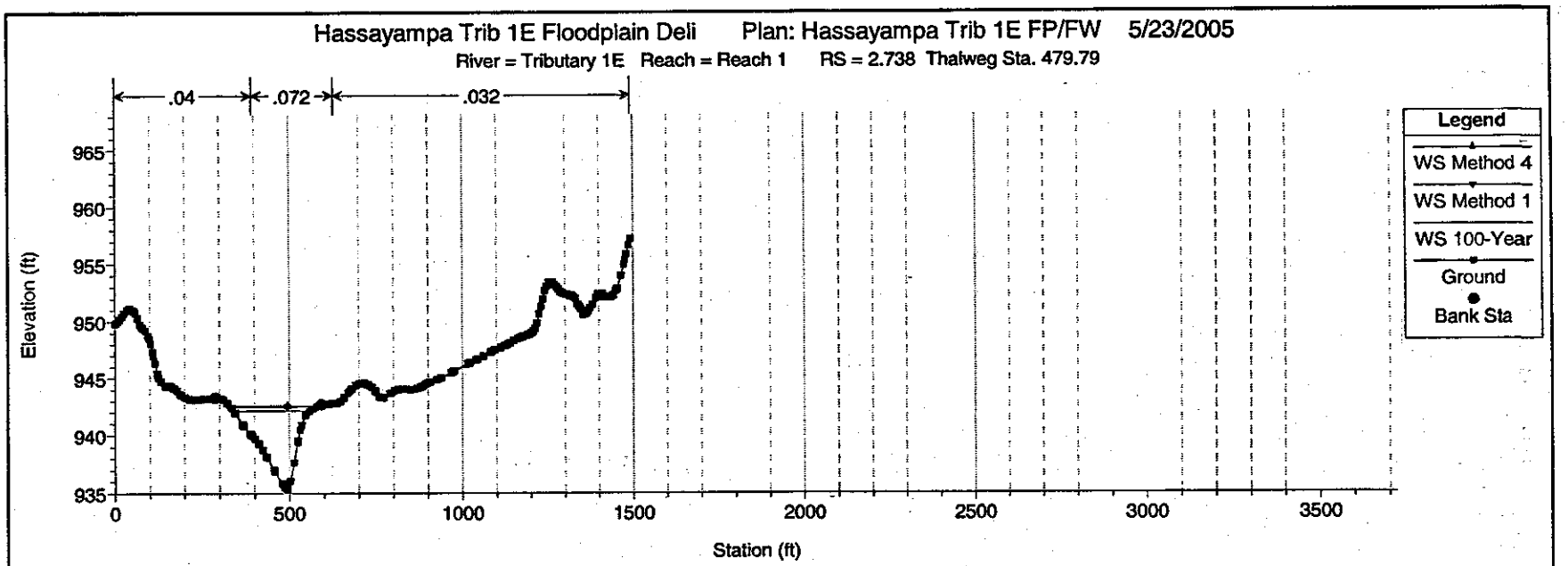

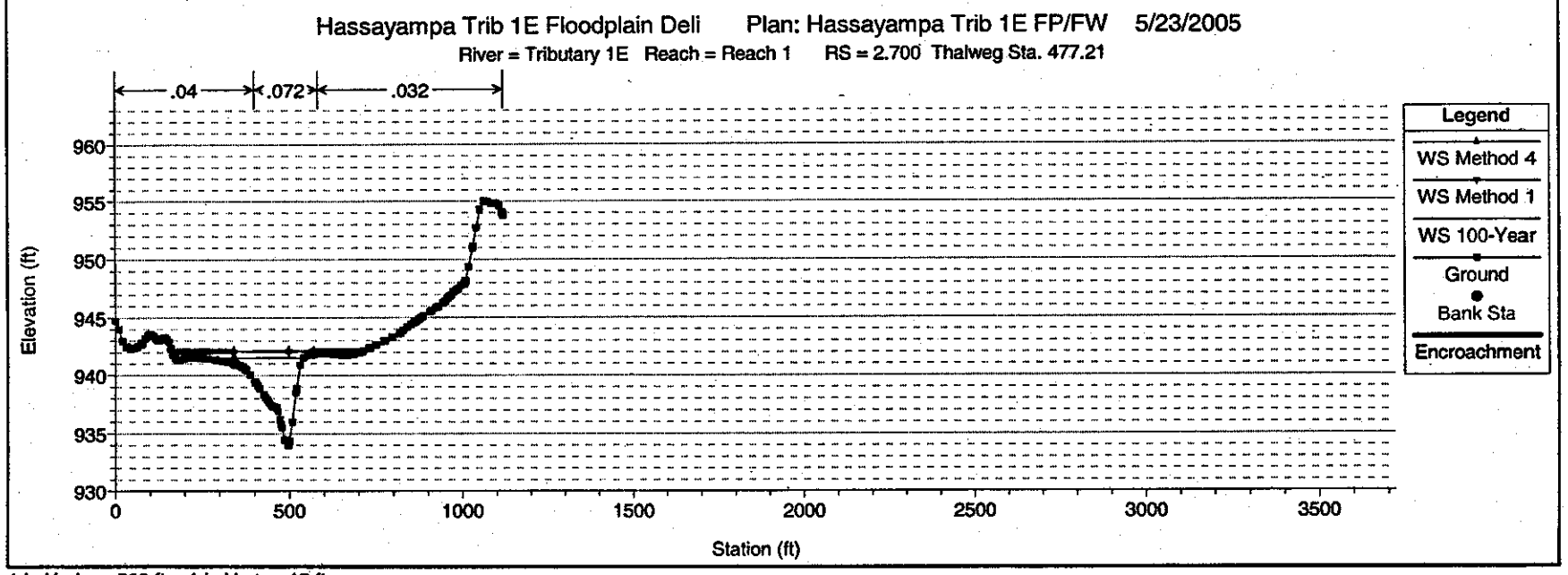

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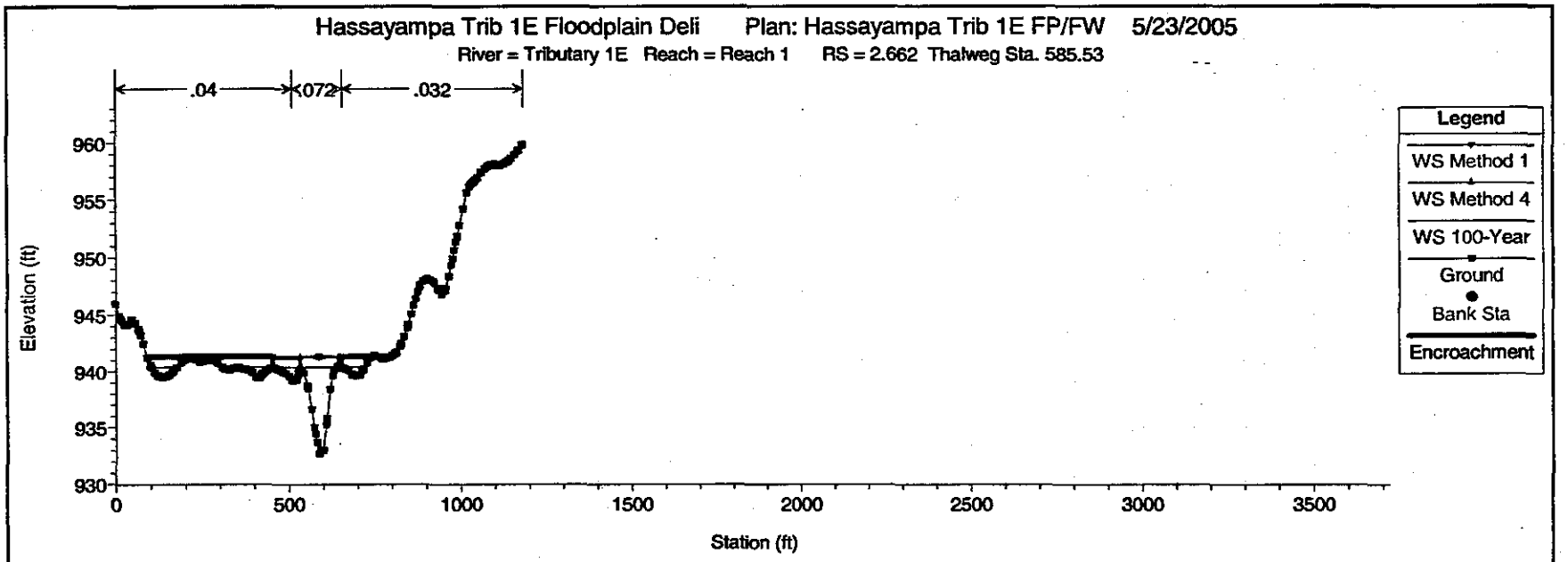
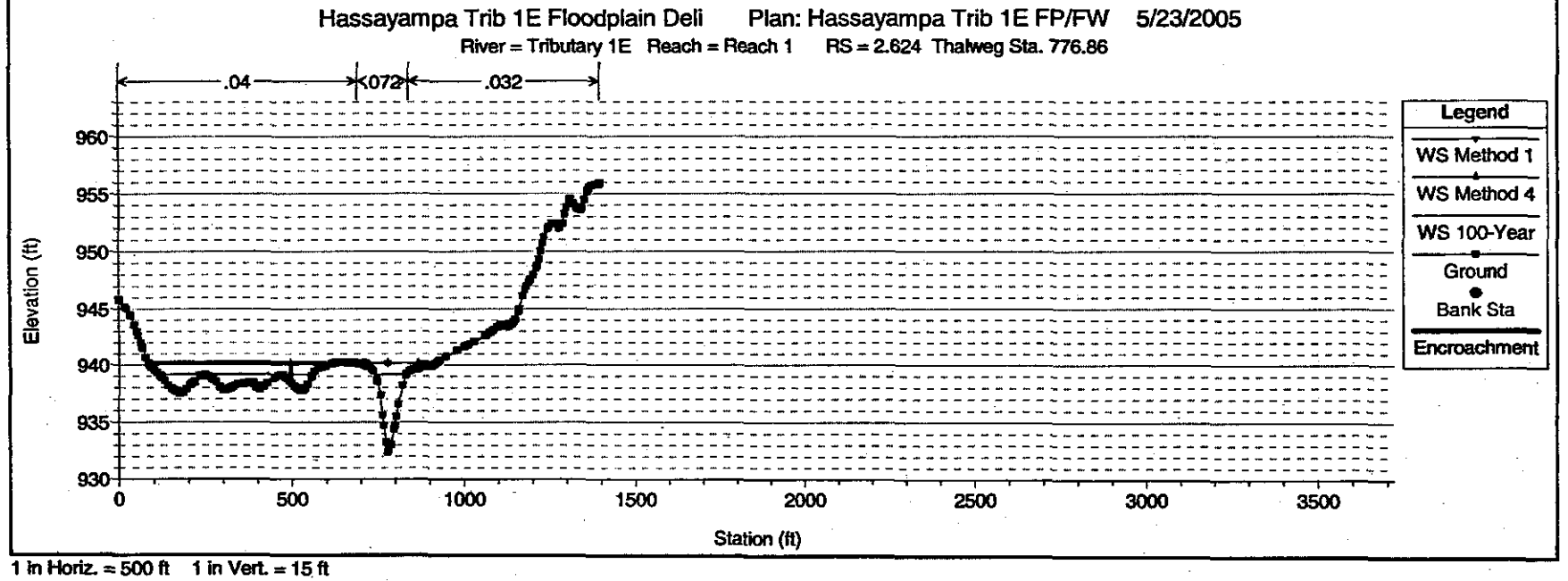
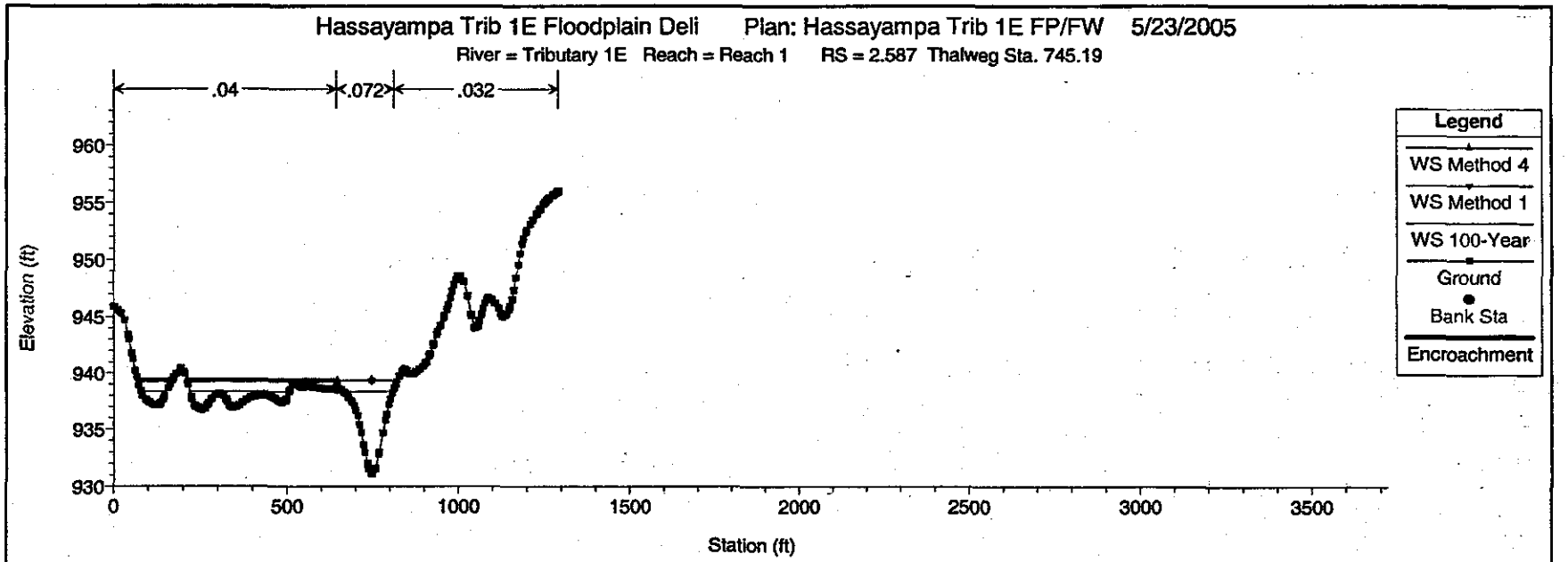
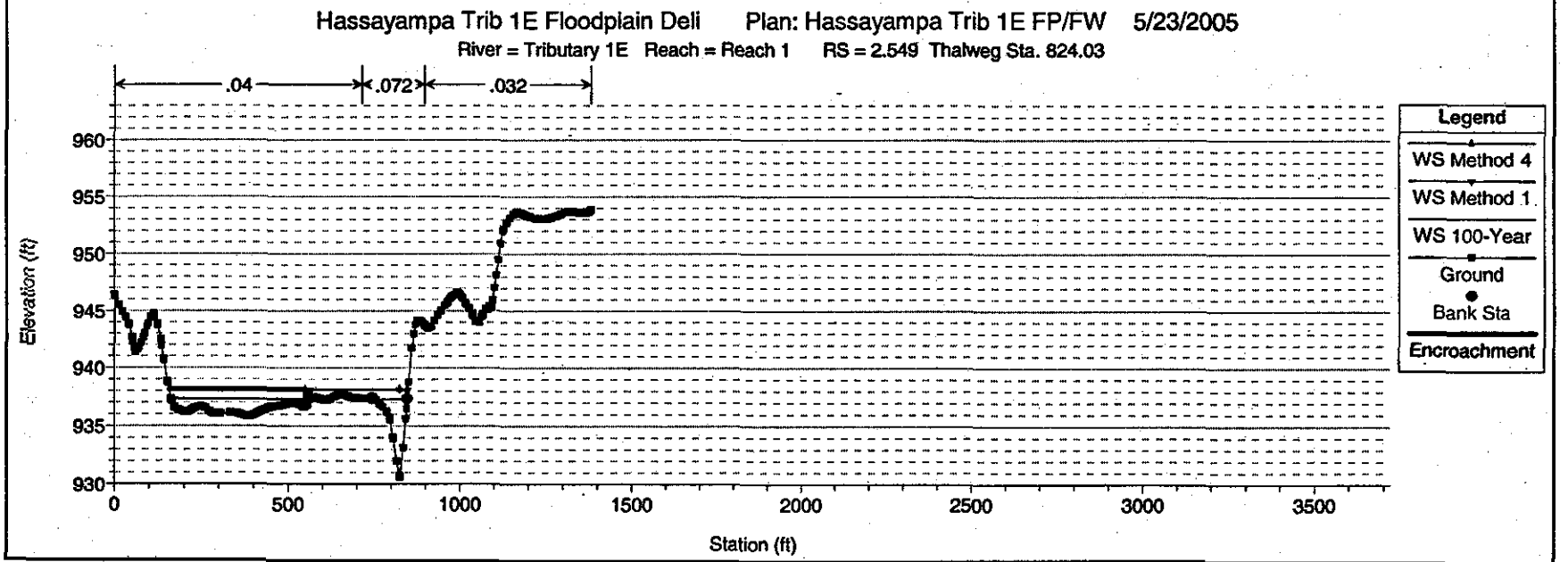


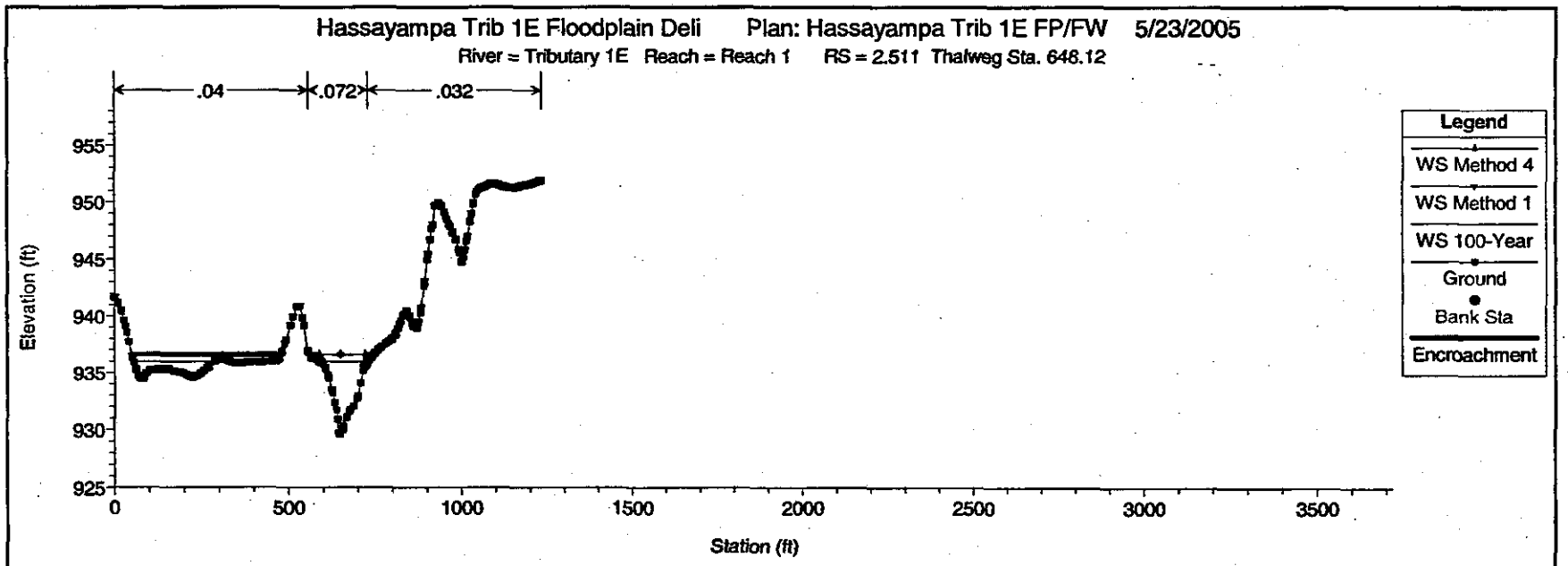


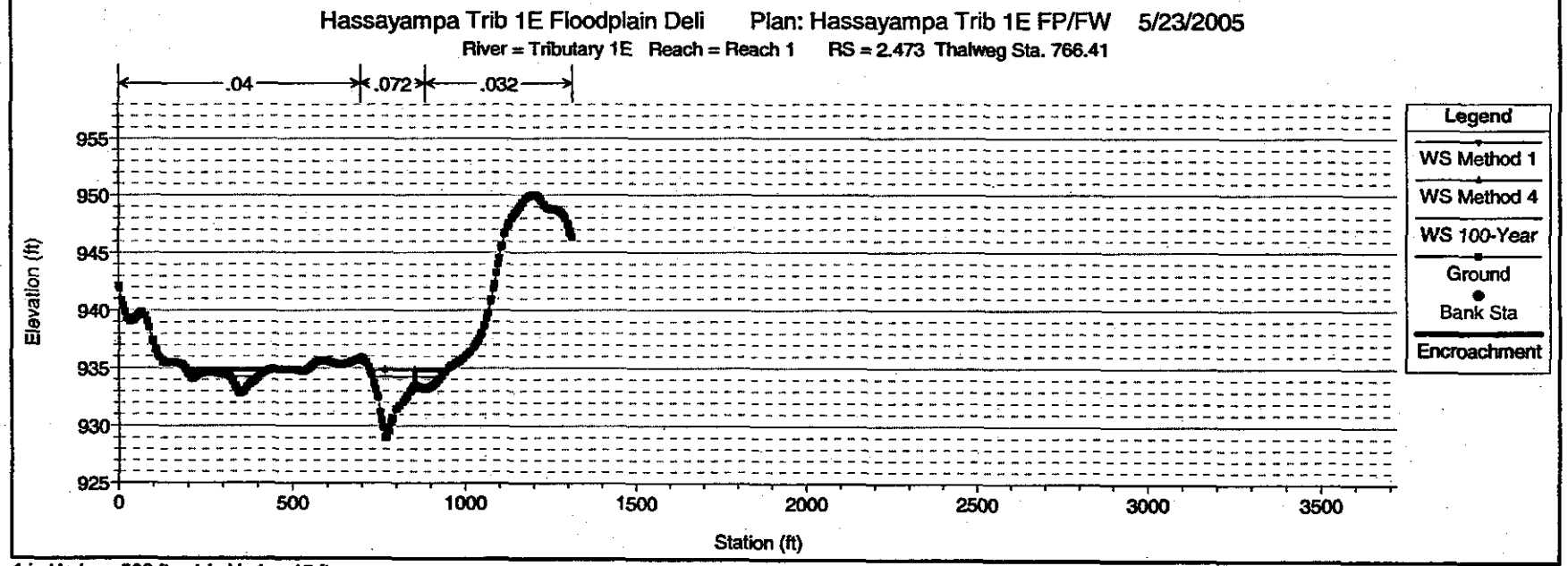
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



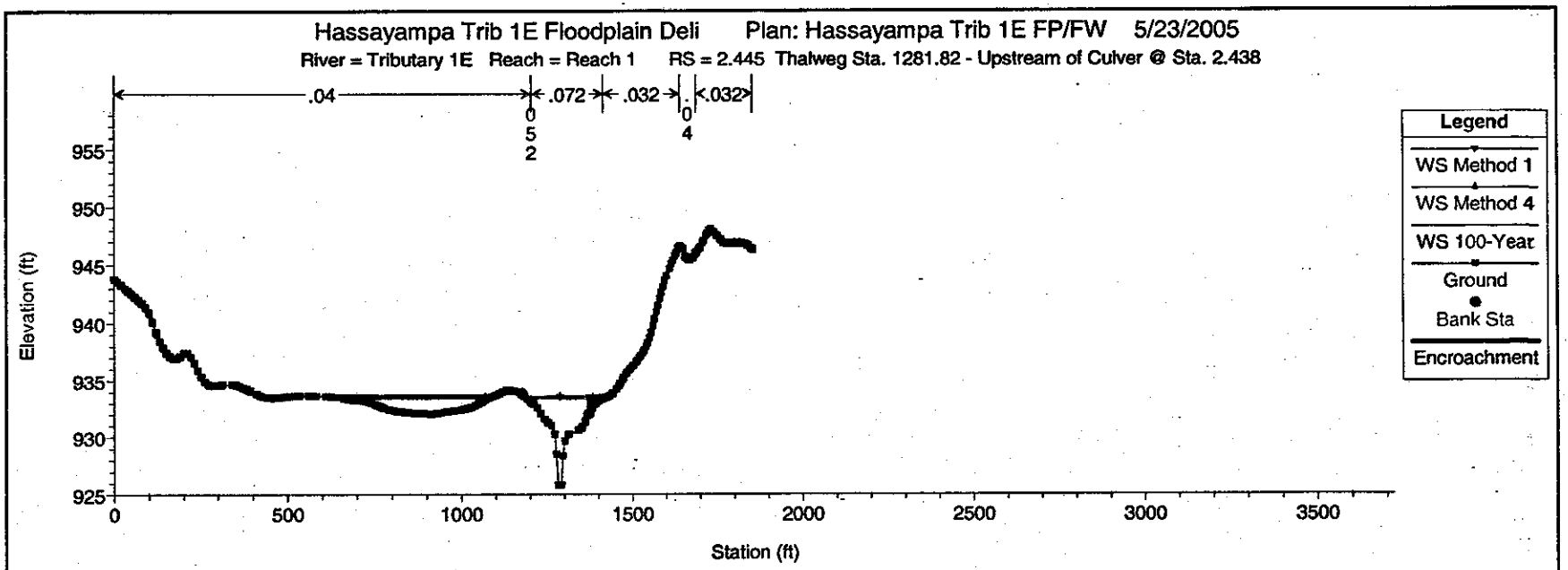


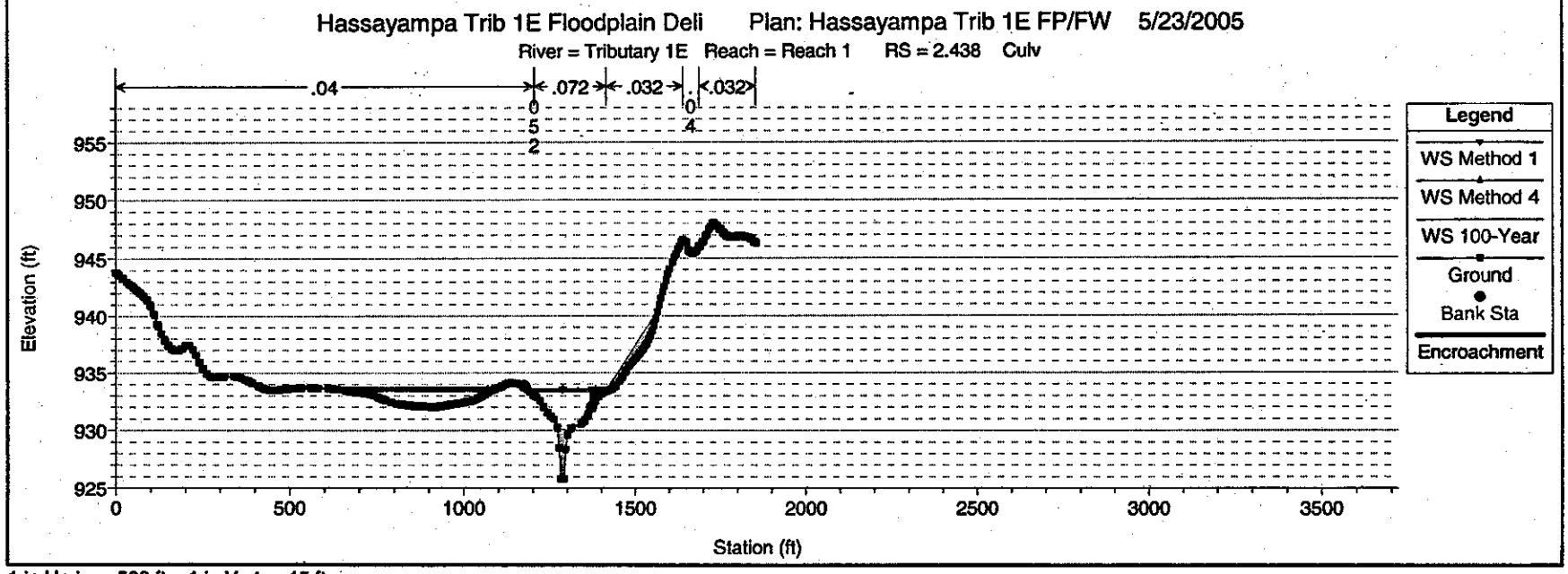
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



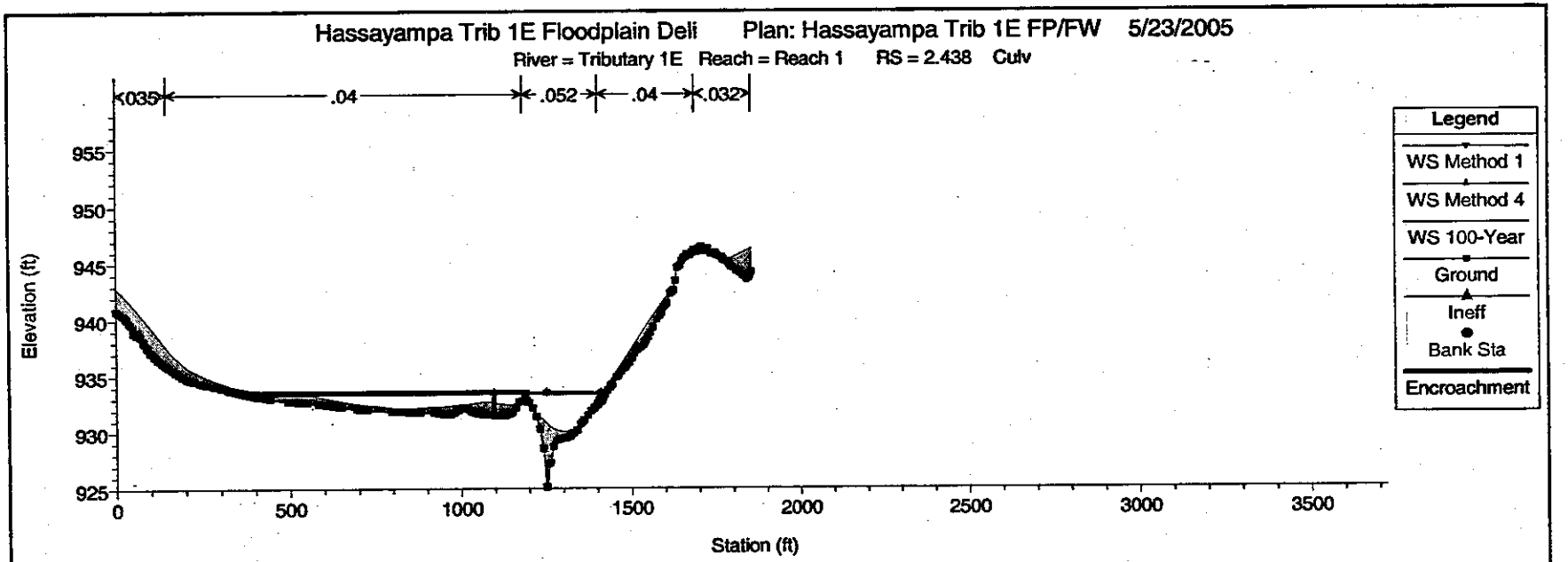


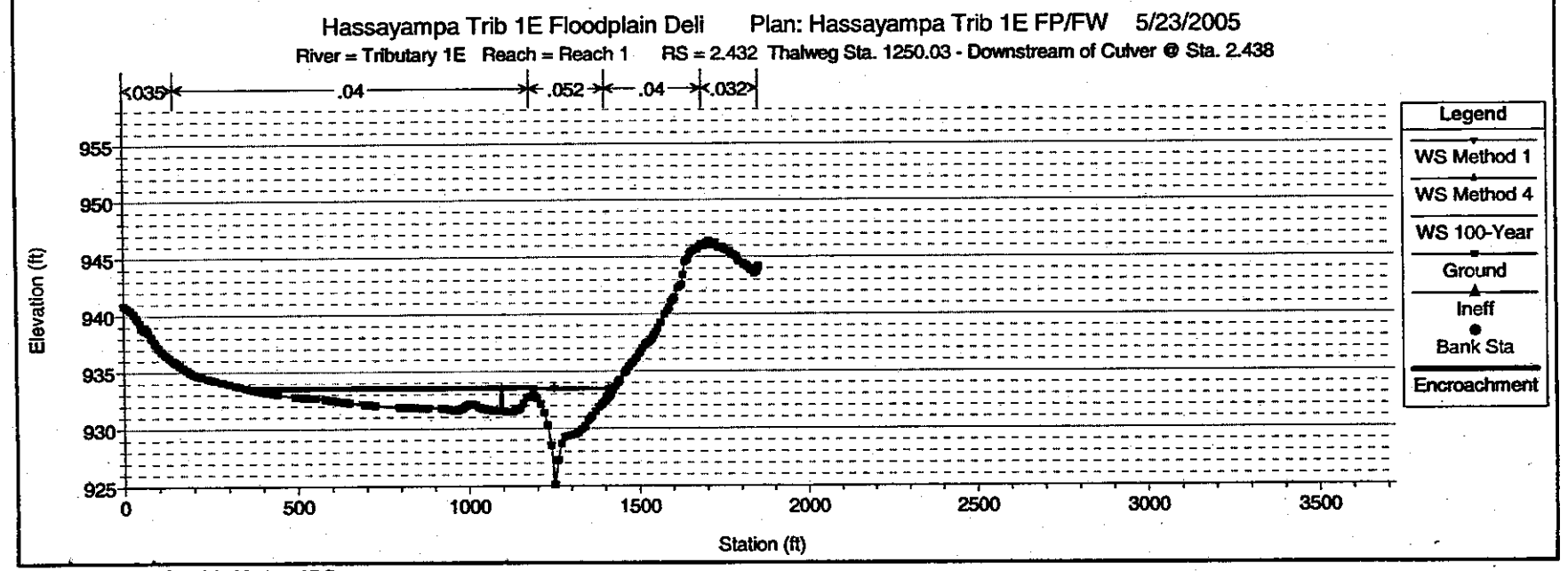
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



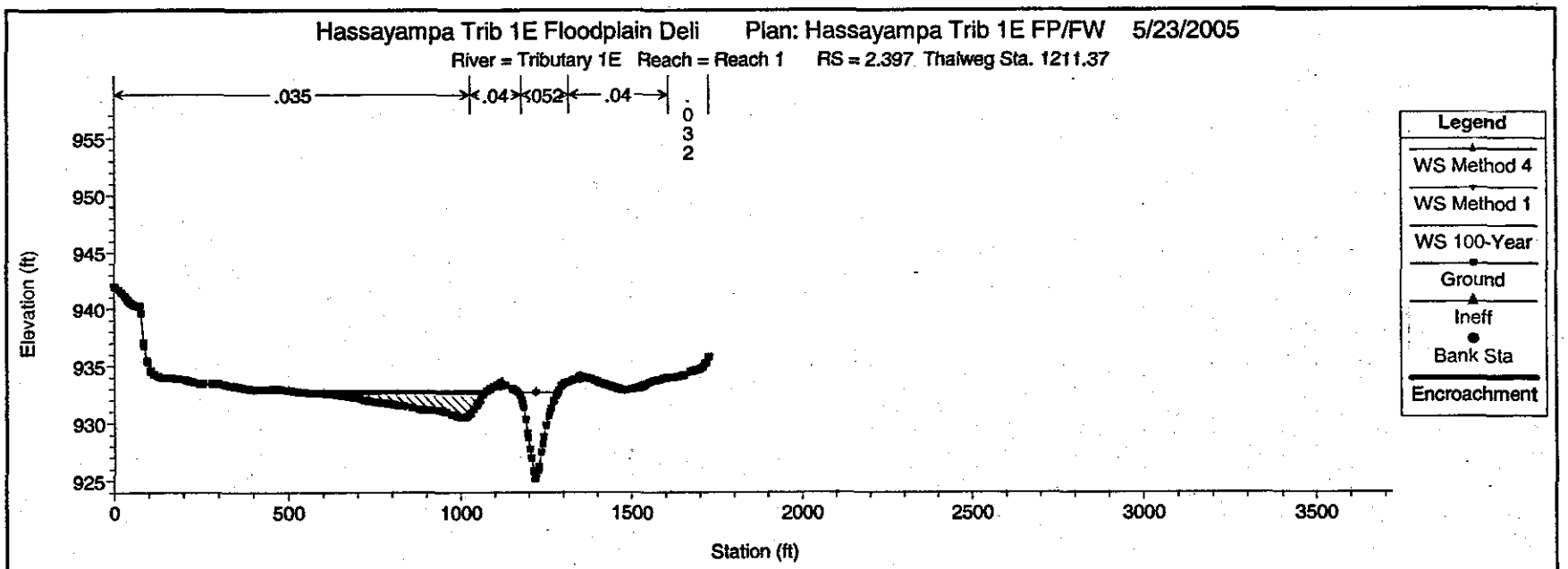


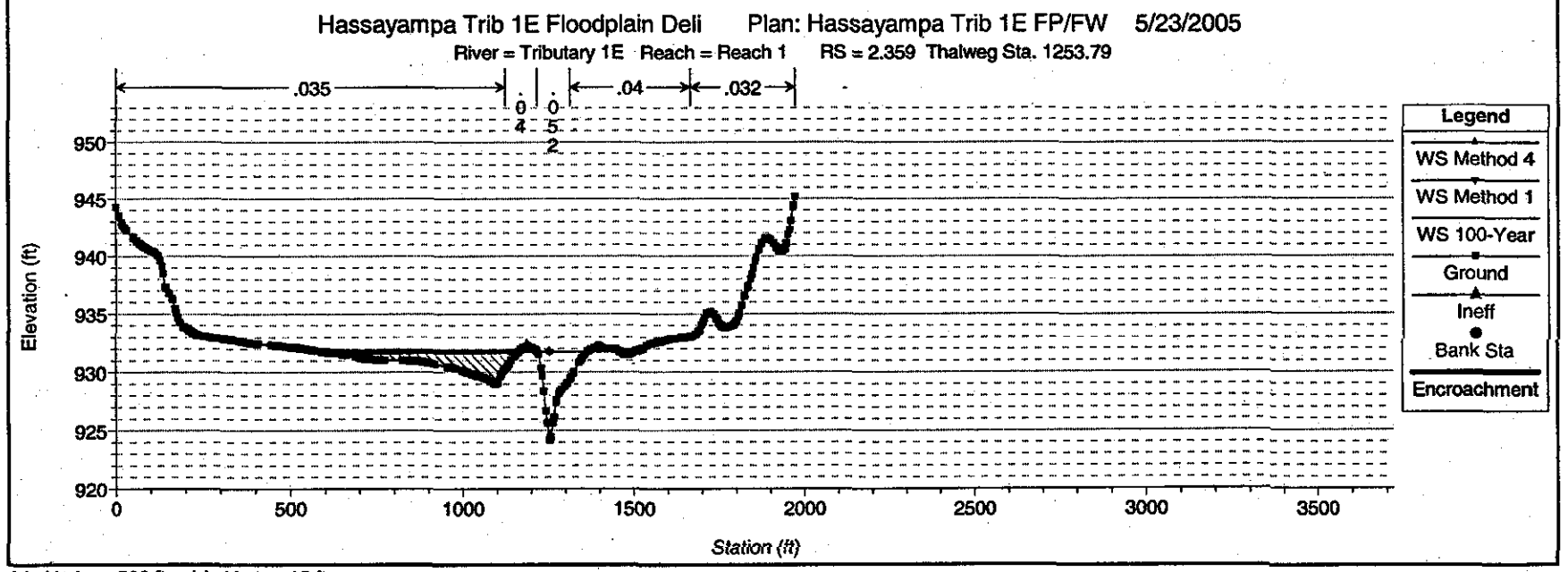
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



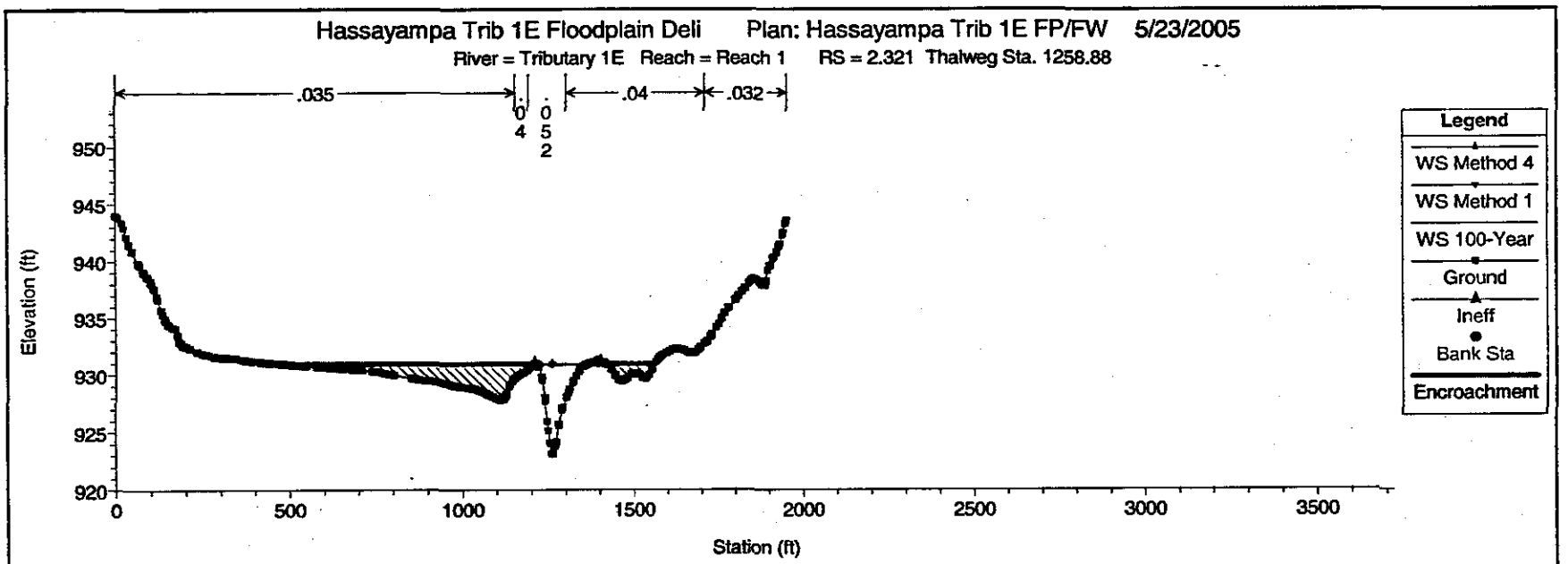


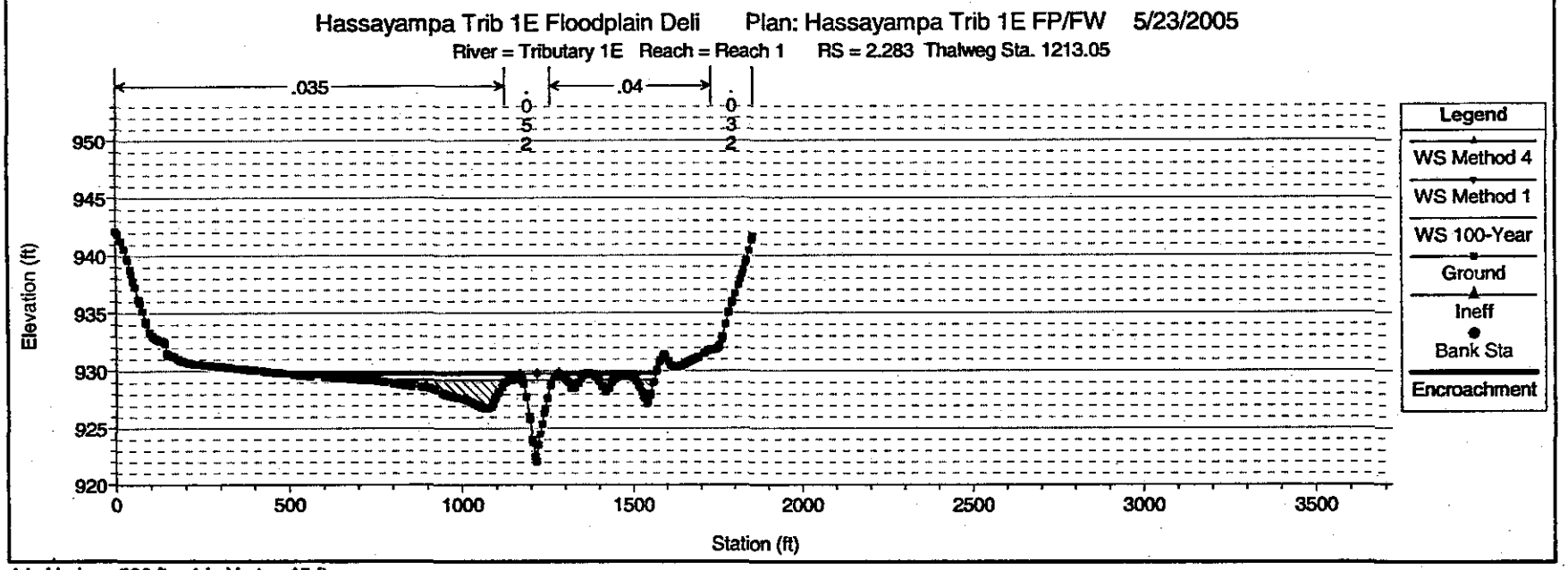
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



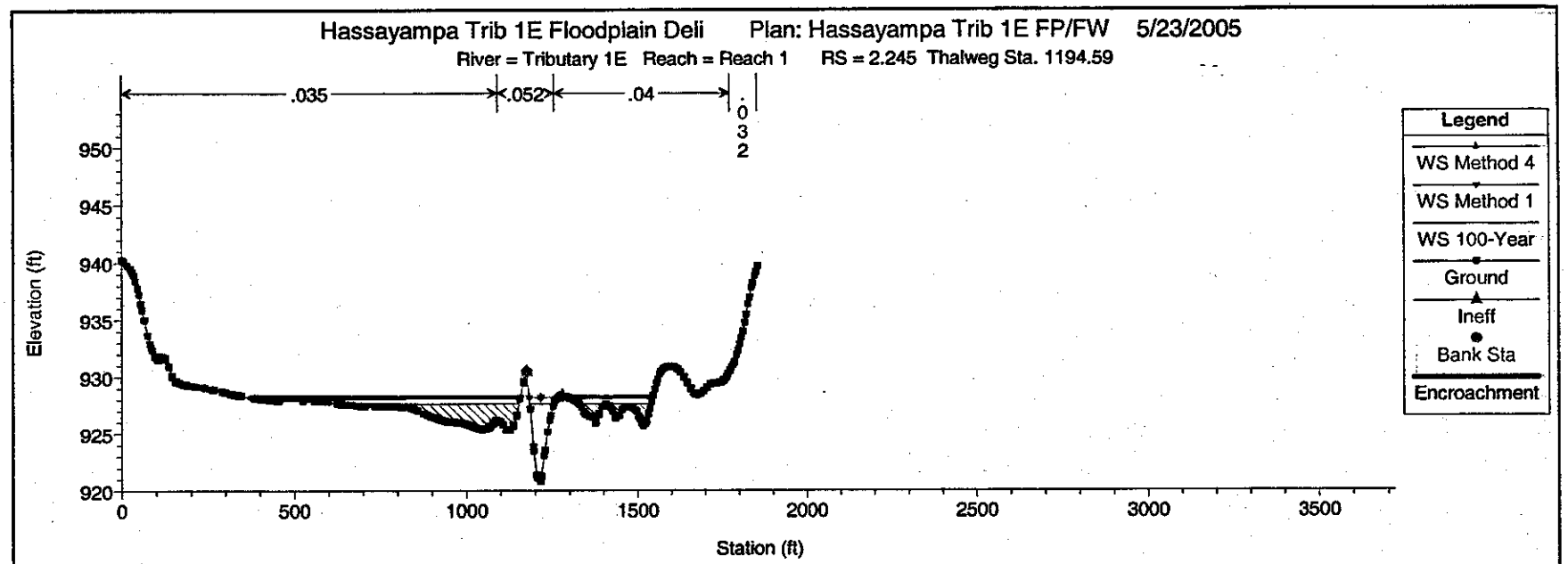


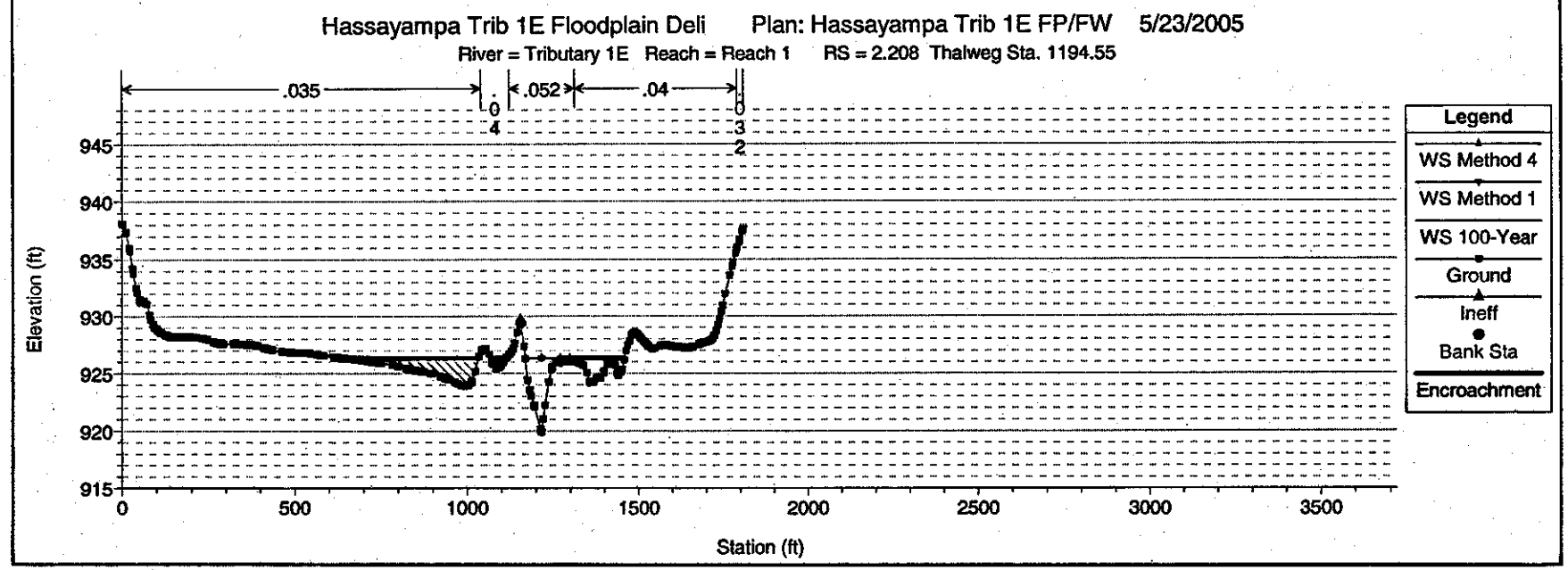
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



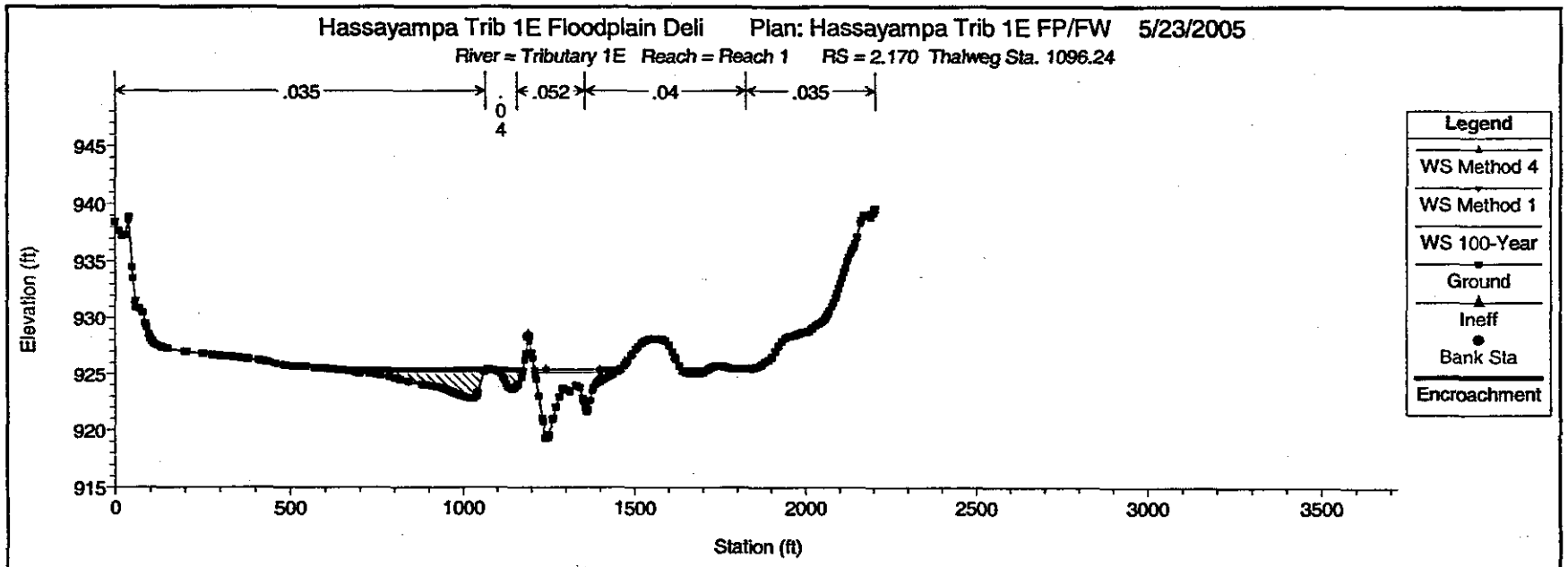


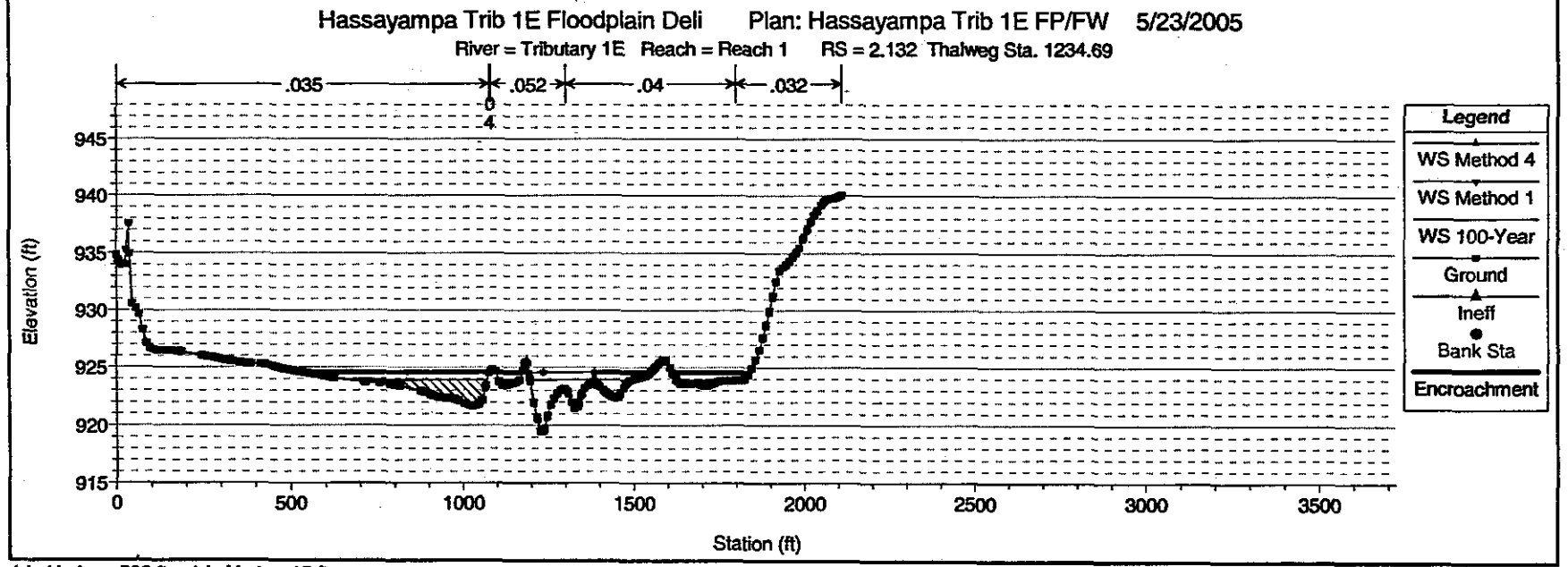
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft





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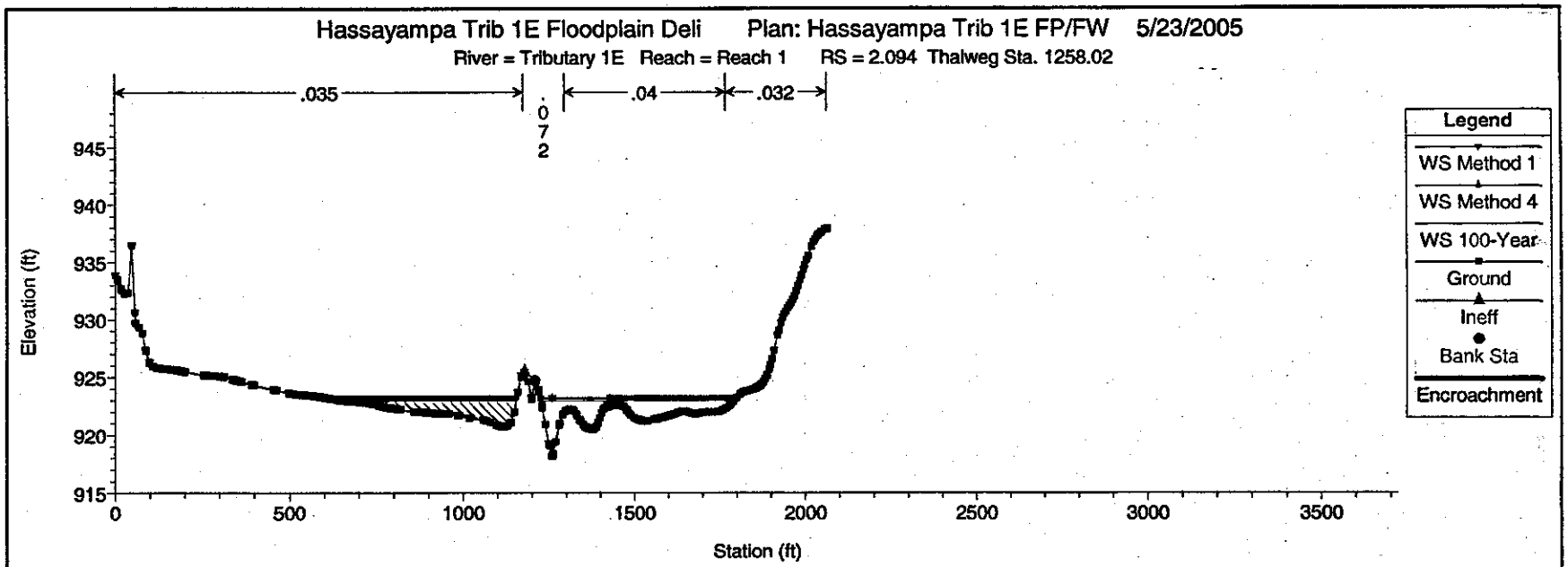

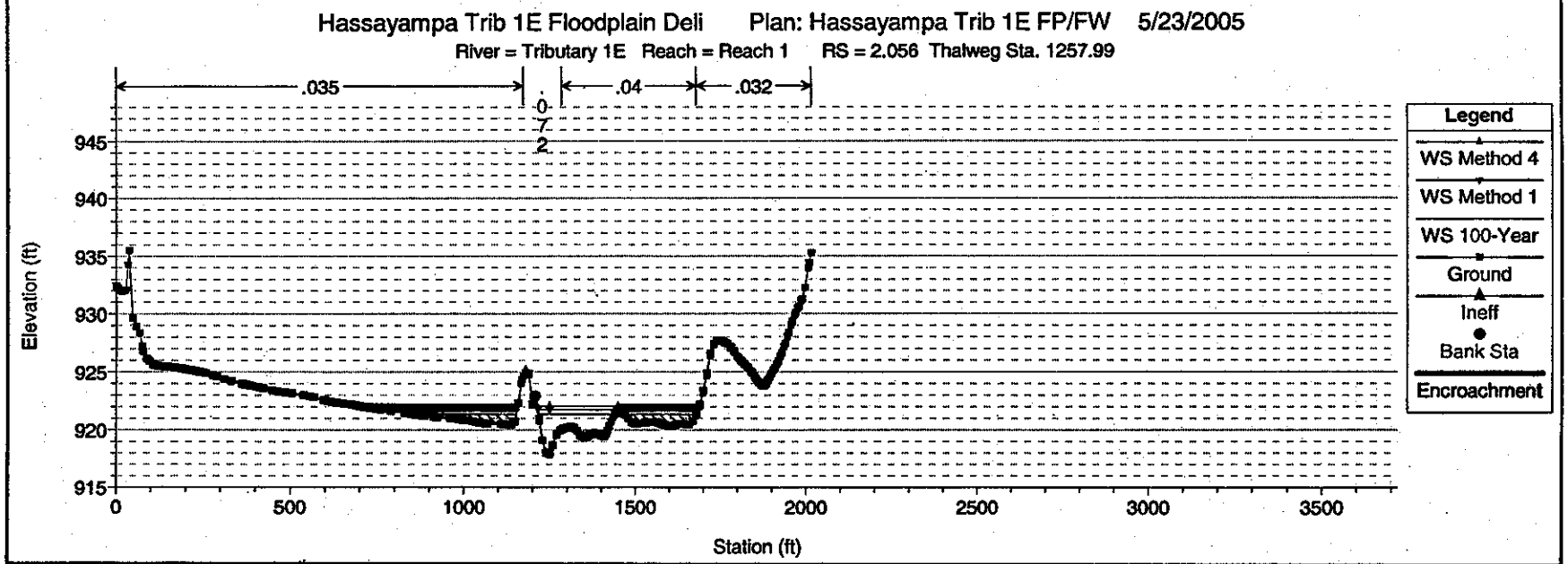

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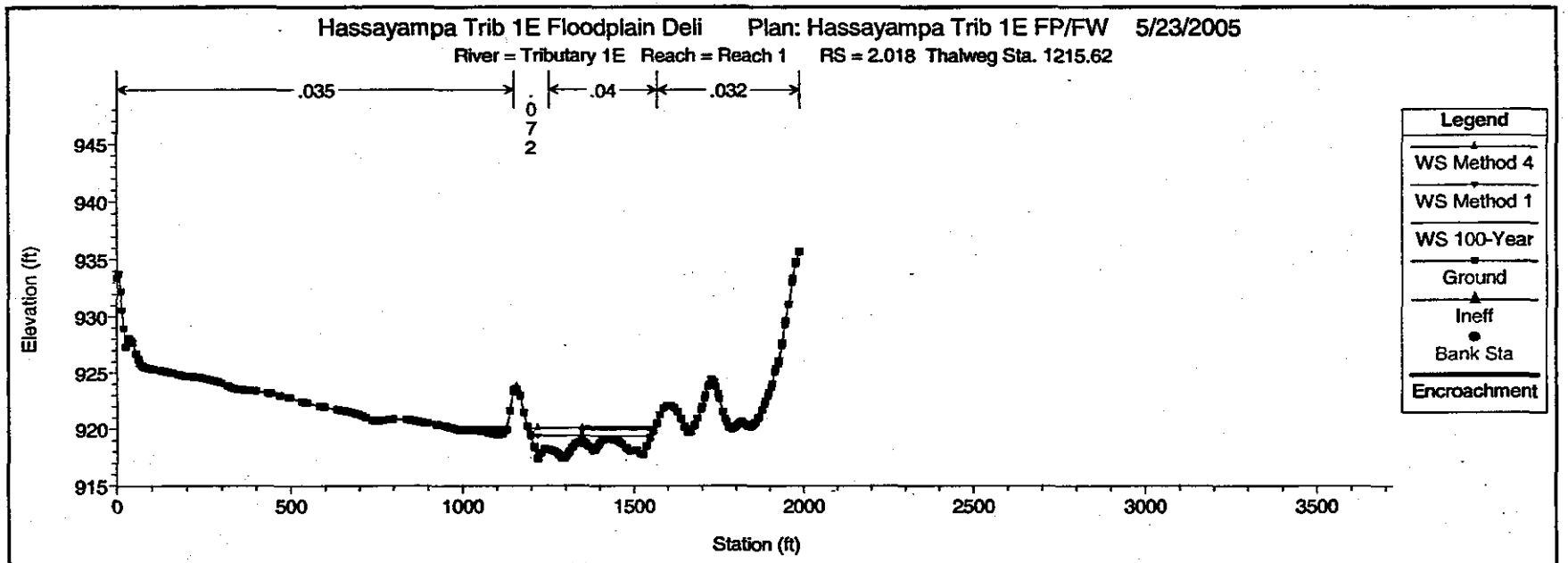
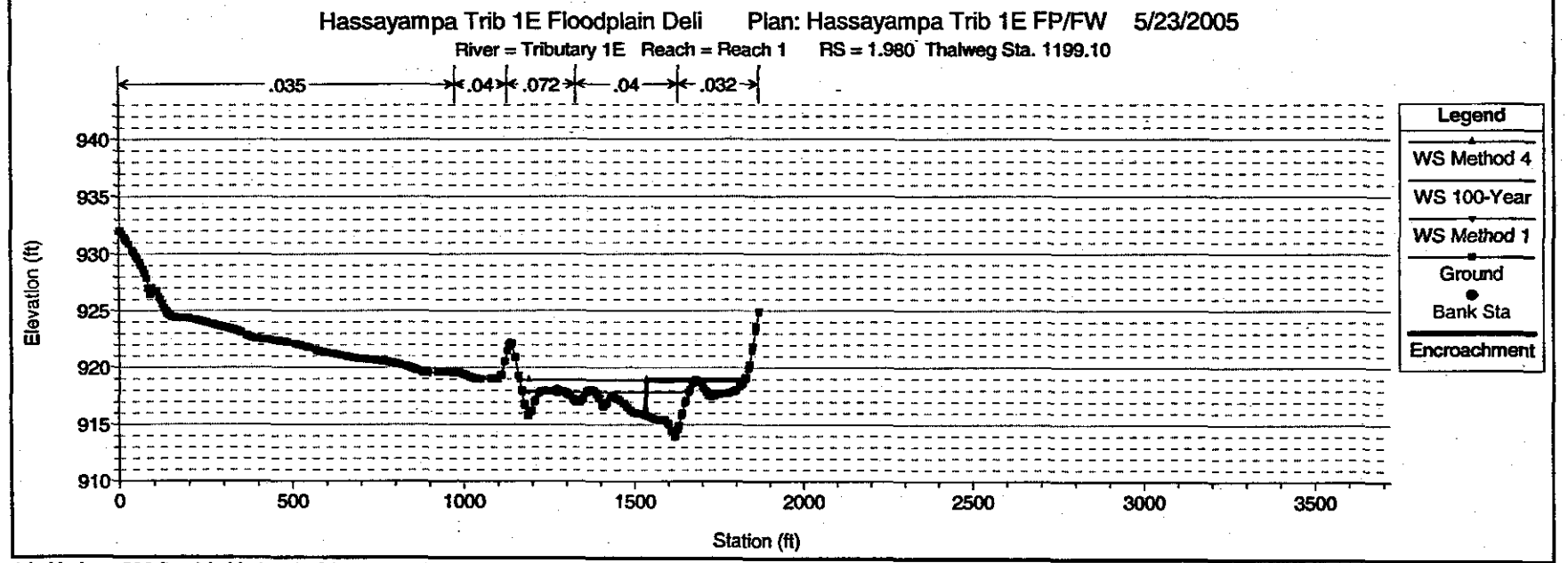
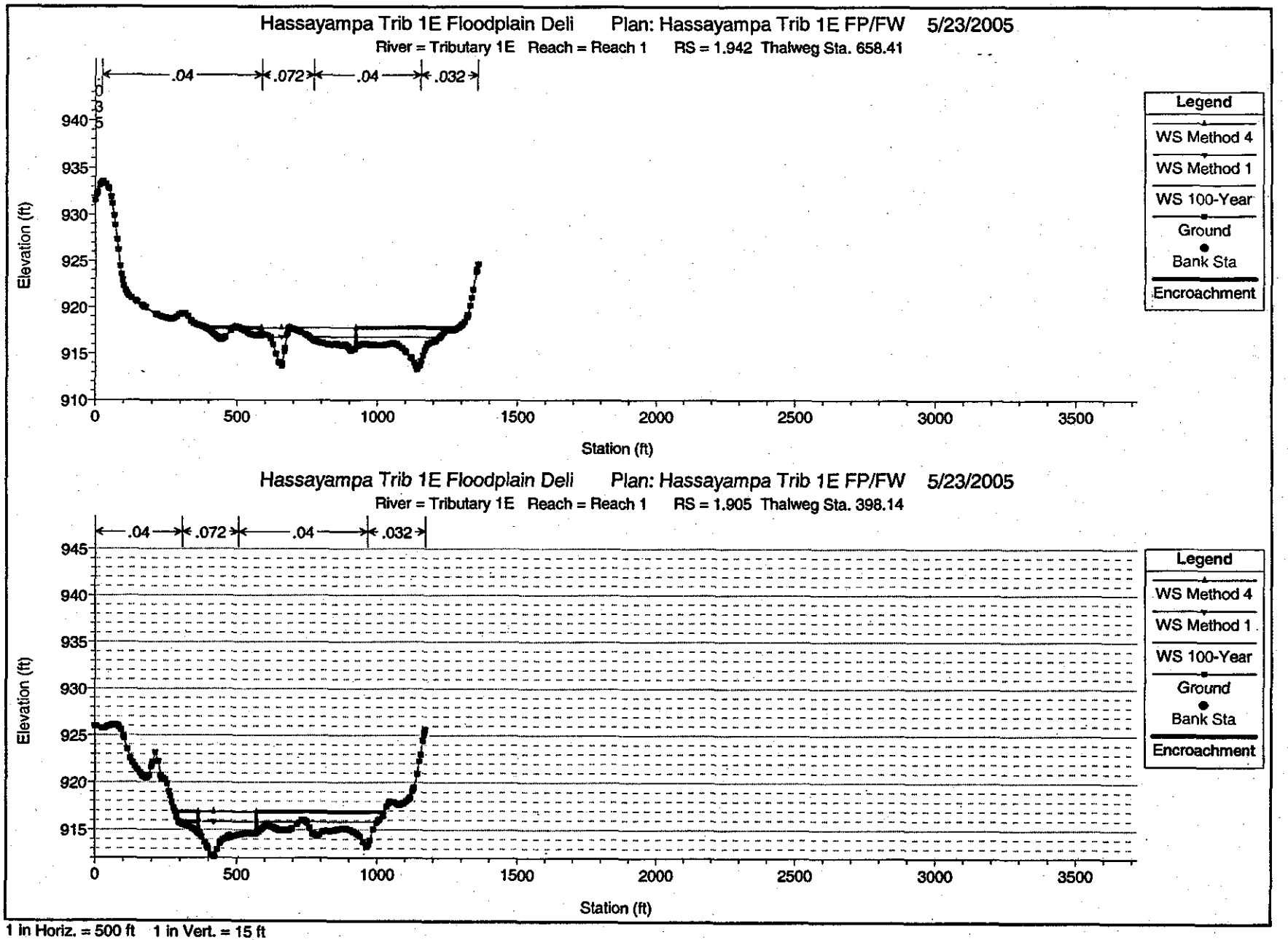




1 in Horiz. = 500 ft 1 in Vert. = 15 ft



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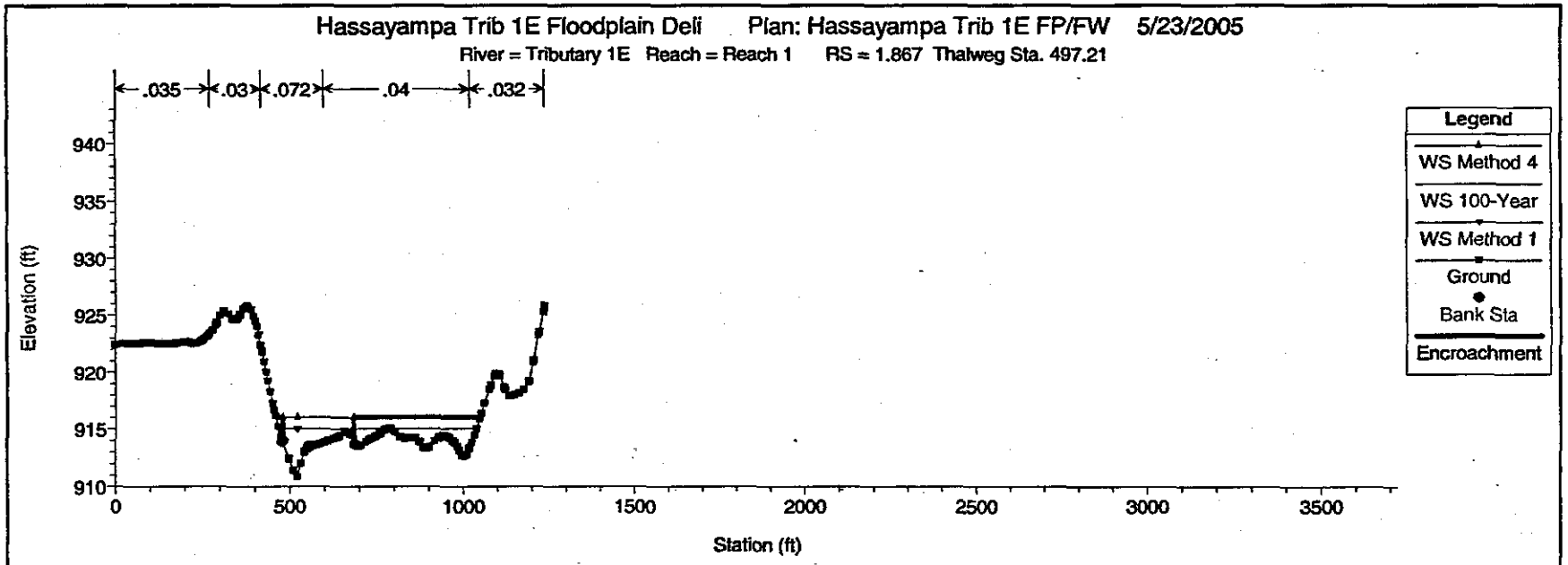
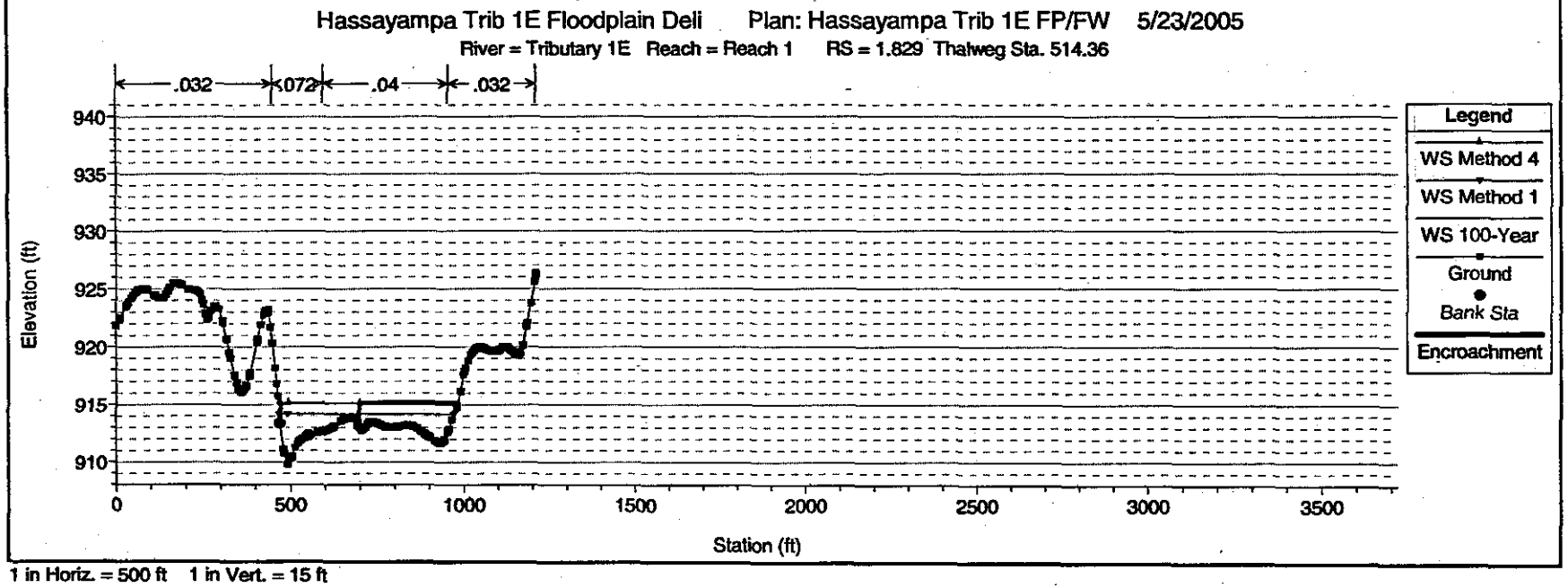
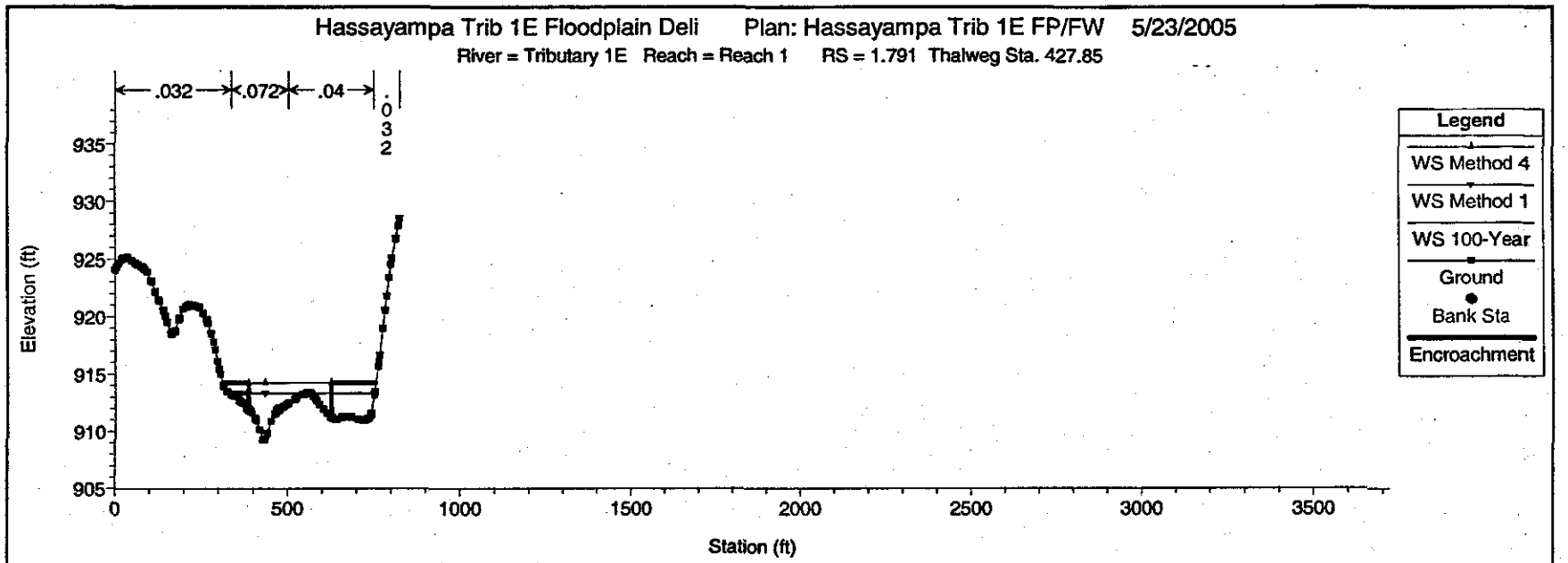
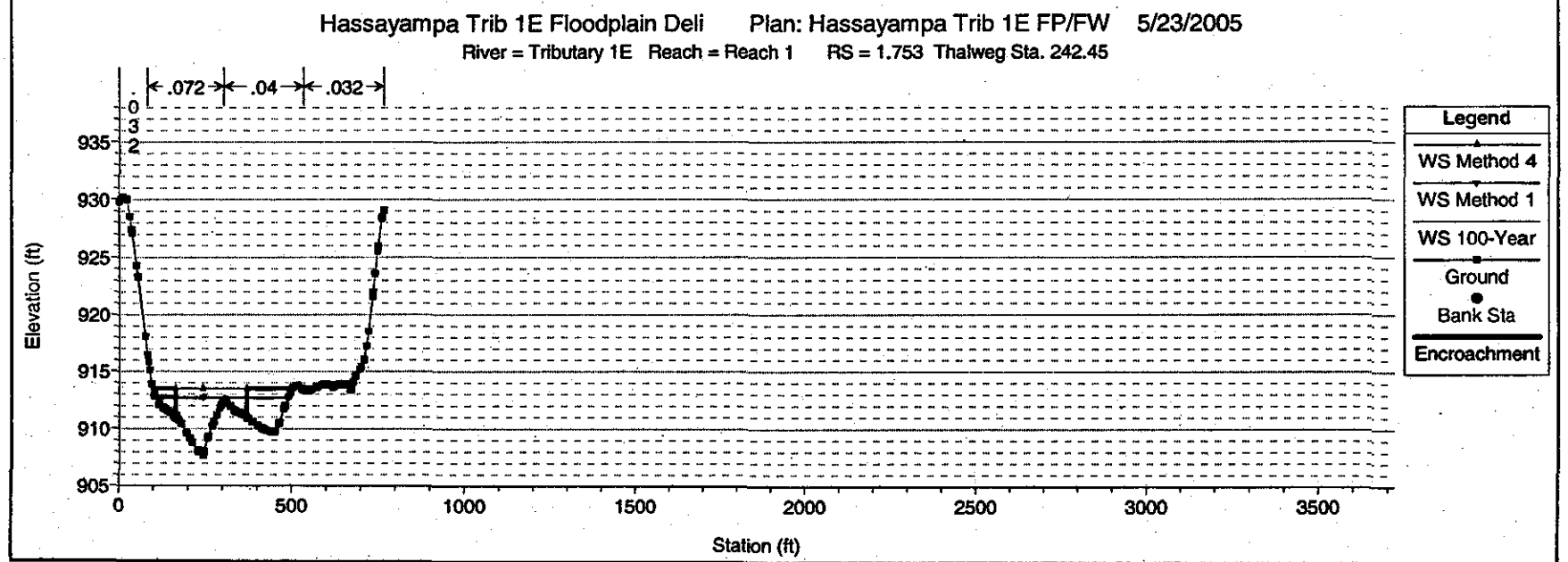




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

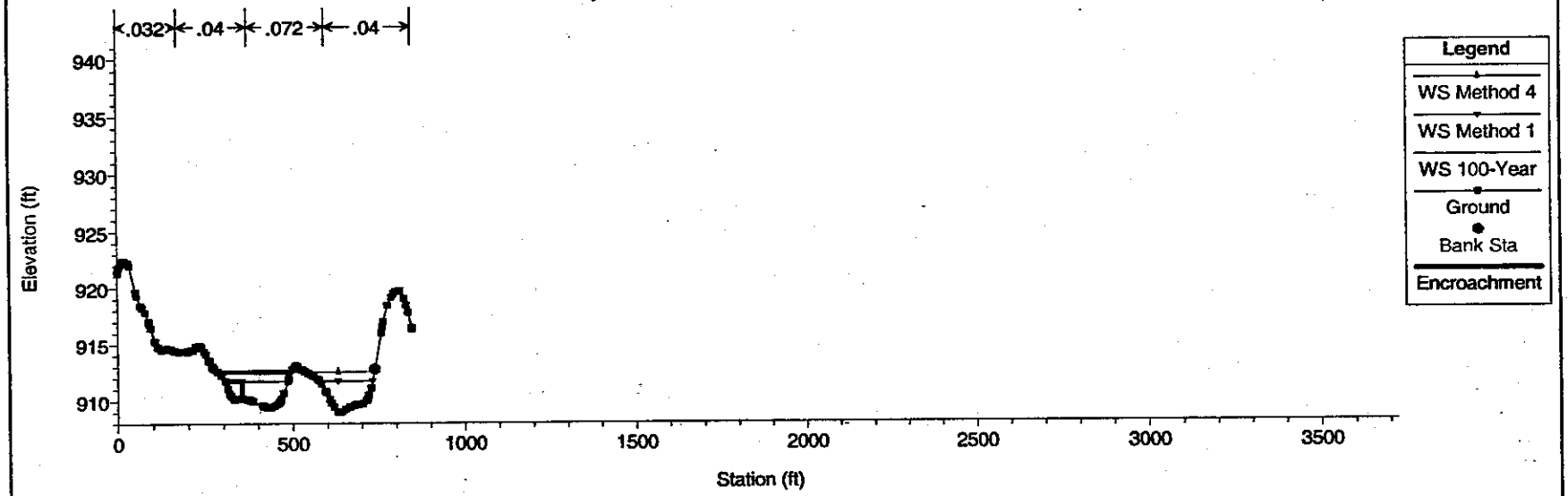




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

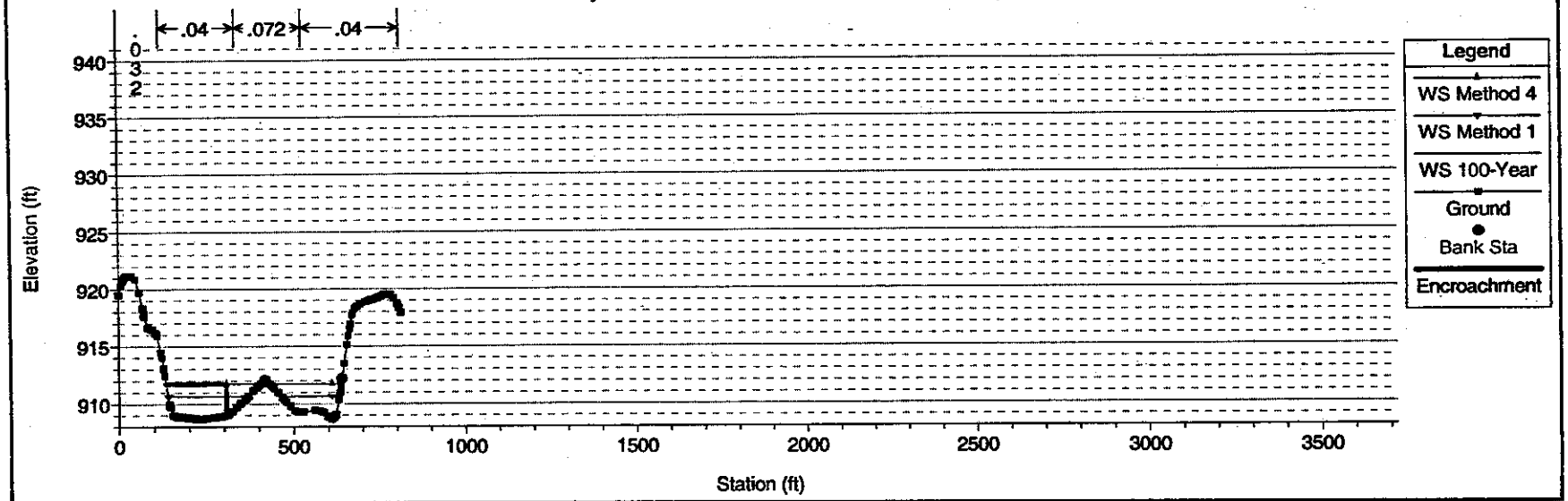
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 1.715 Thalweg Sta. 509.54



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

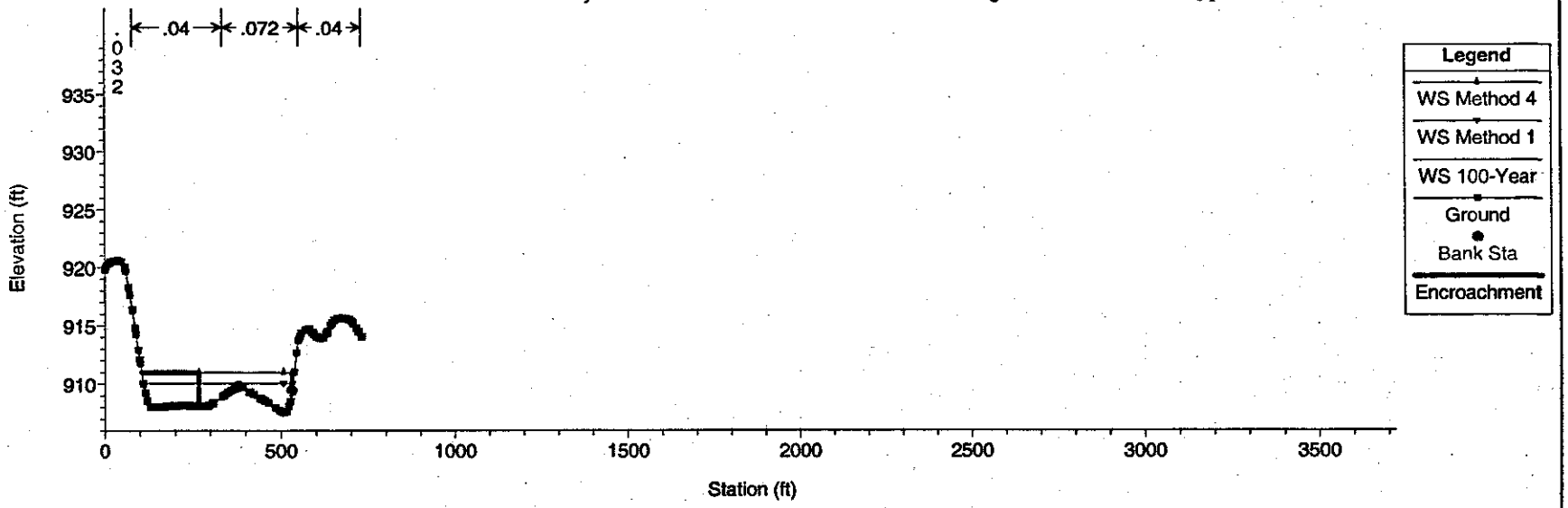
River = Tributary 1E Reach = Reach 1 RS = 1.677 Thalweg Sta. 436.39



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

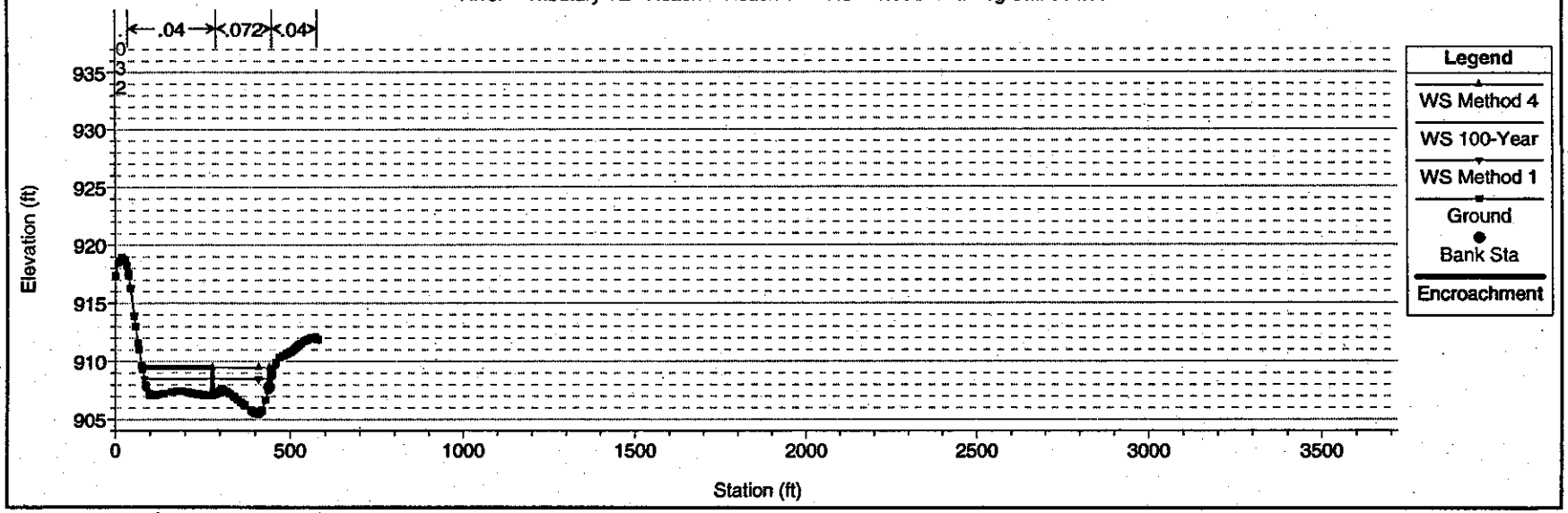
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 1.640 Thalweg Sta. 410.30



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

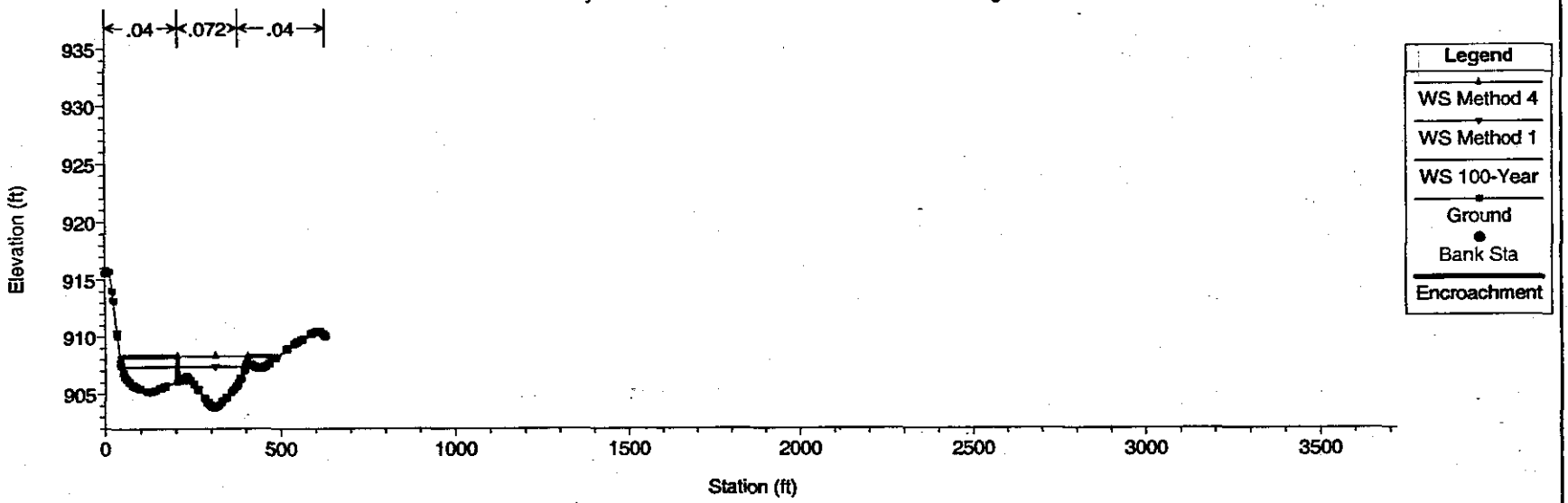
River = Tributary 1E Reach = Reach 1 RS = 1.602 Thalweg Sta. 392.99



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

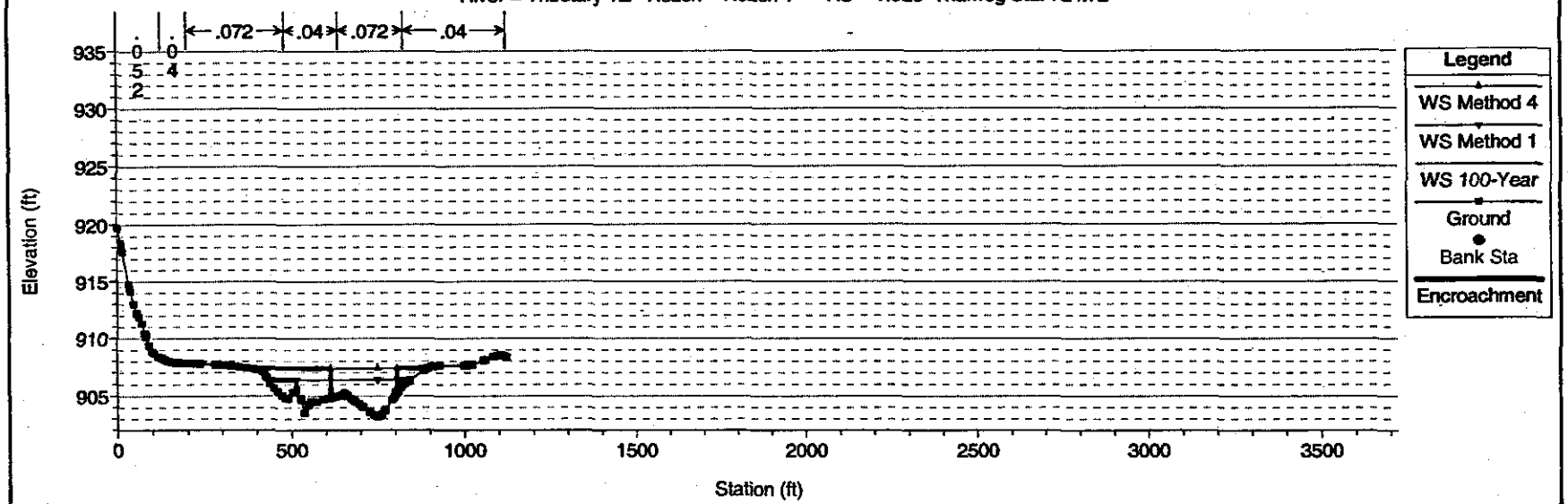
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 1.564 Thalweg Sta. 205.65

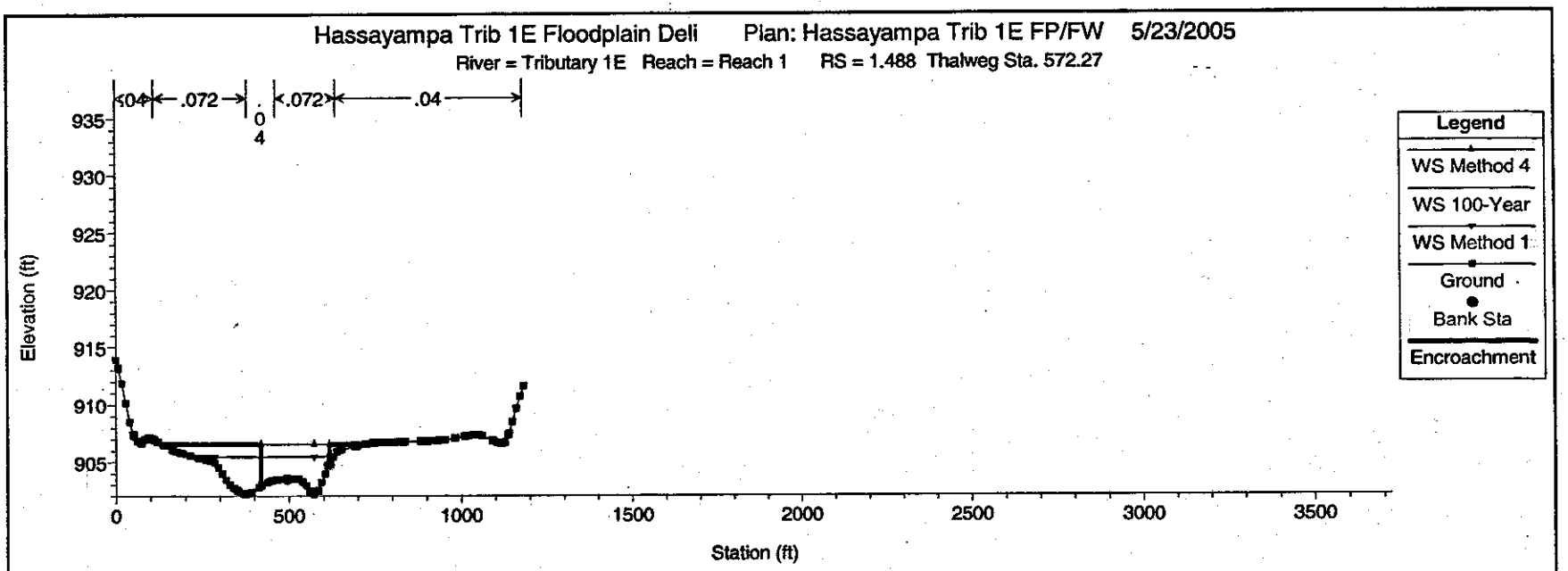


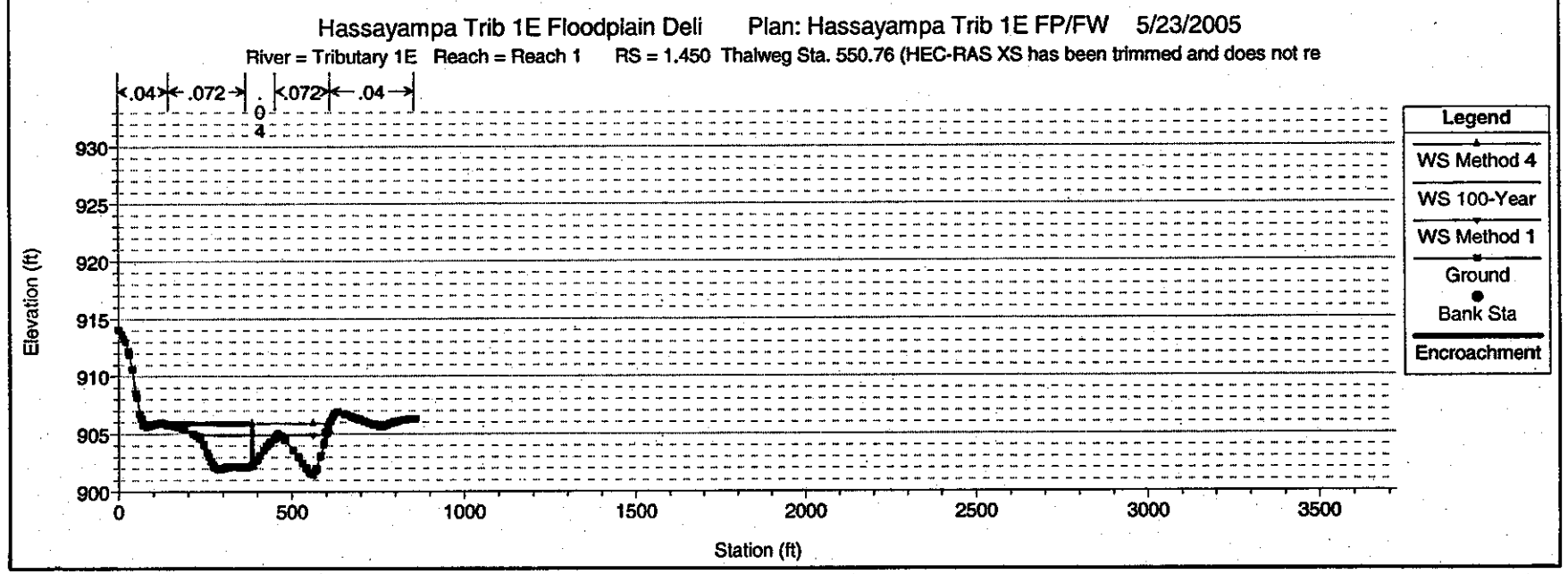
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 1.526 Thalweg Sta. 724.72

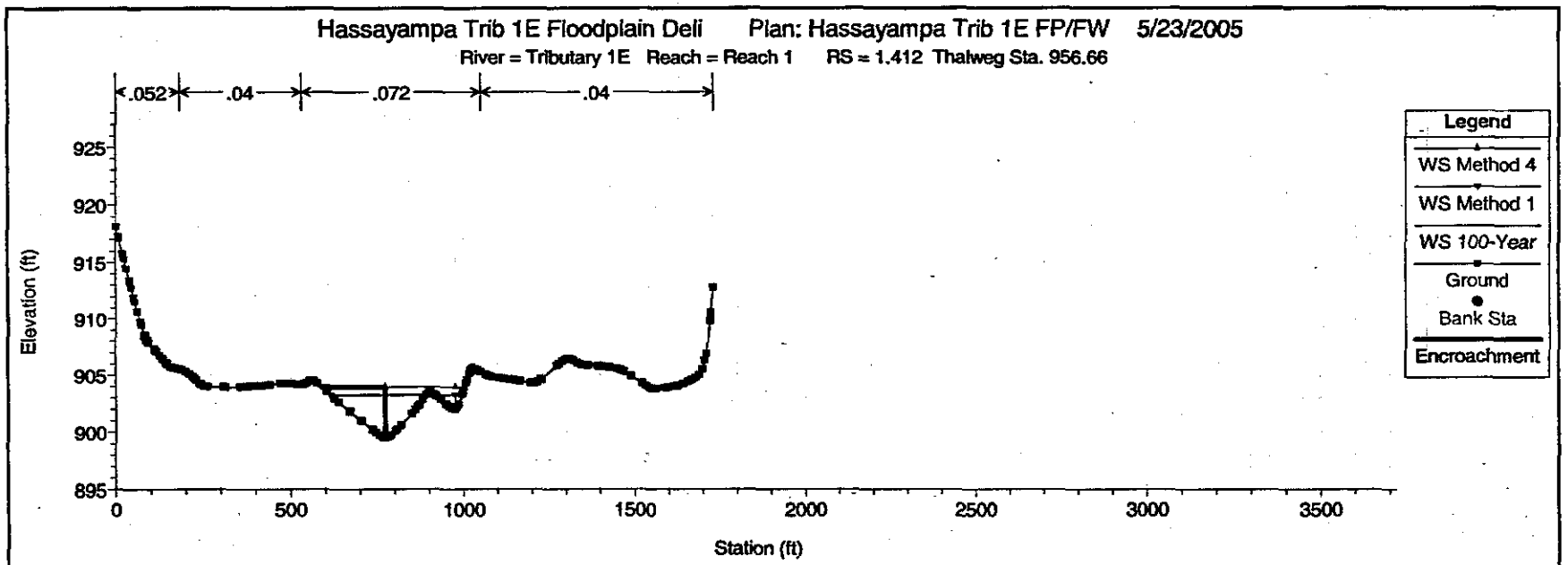


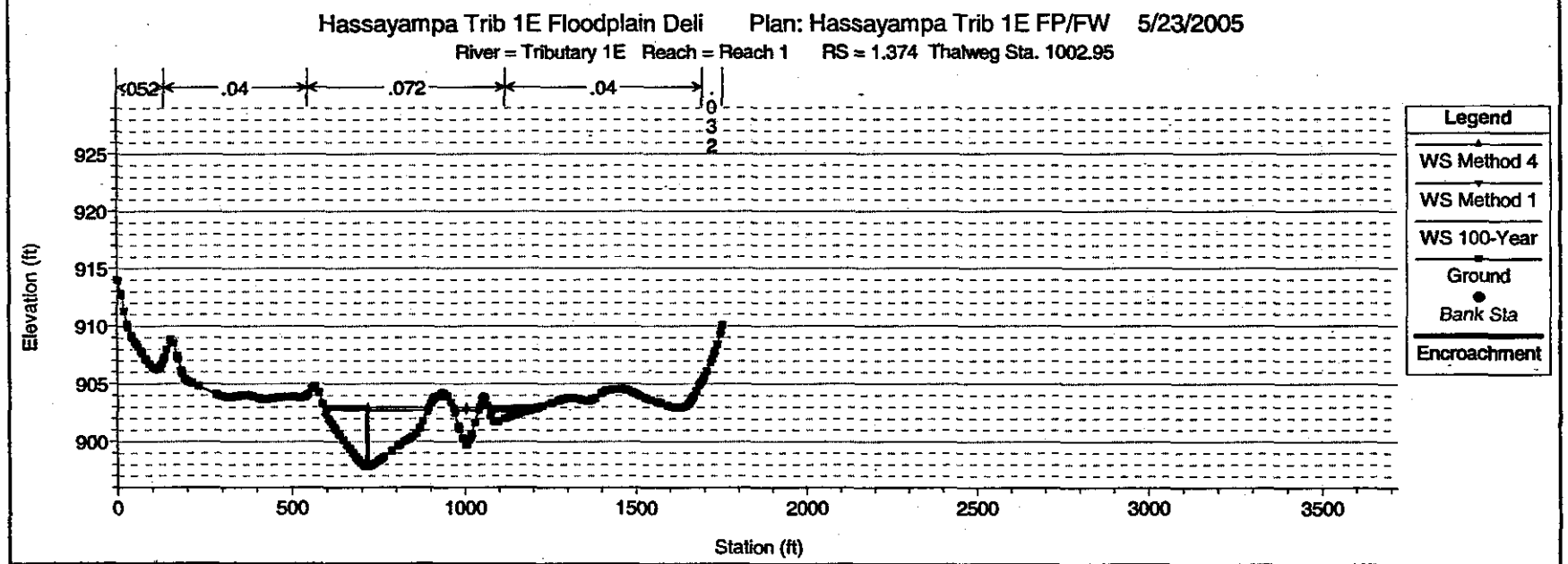
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



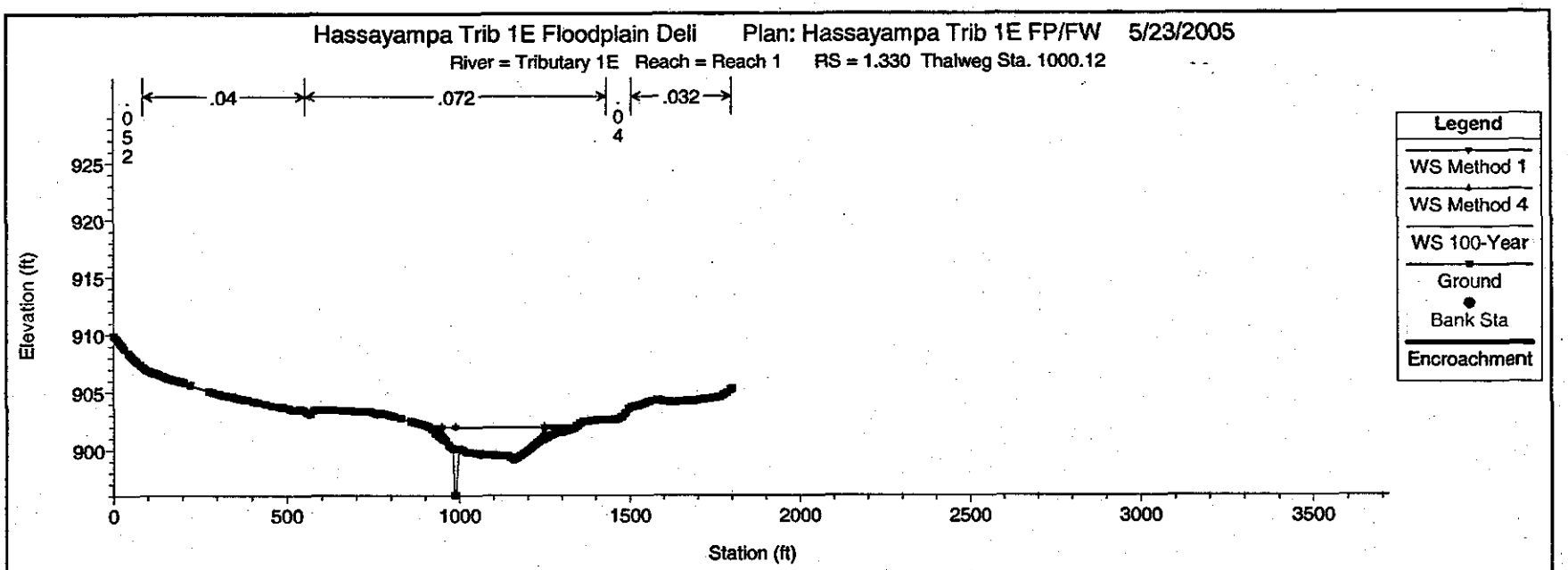


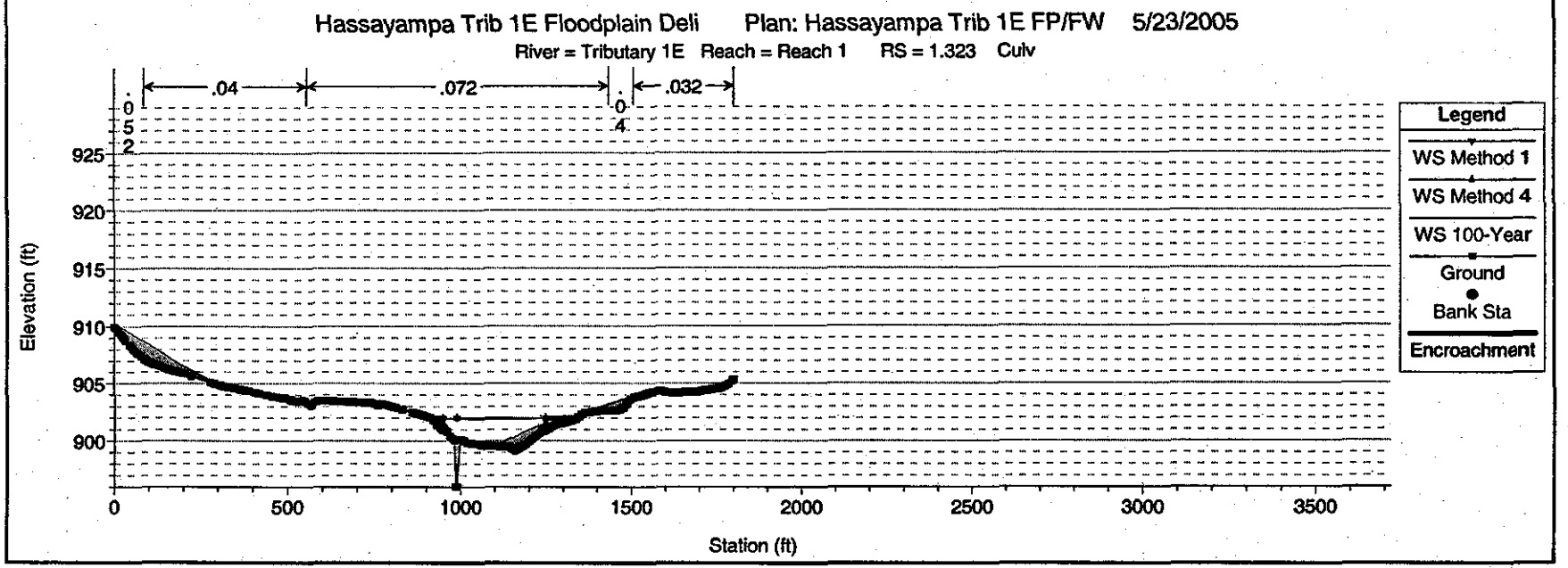
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



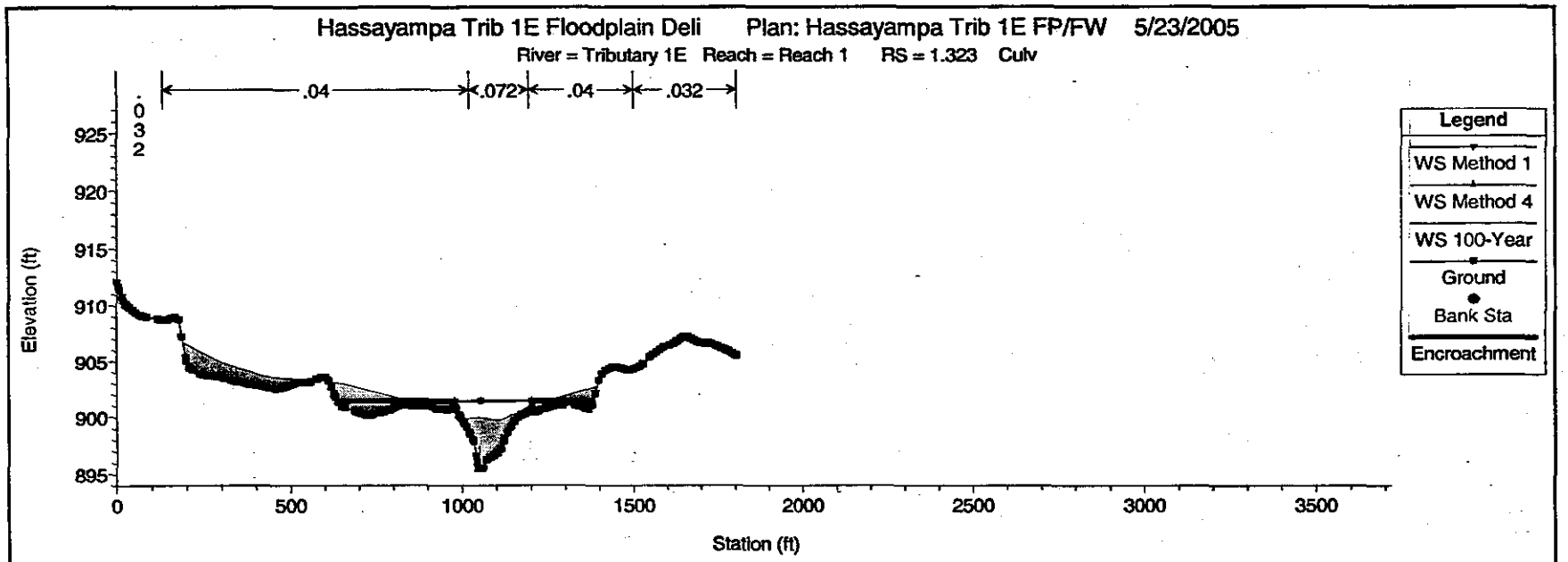


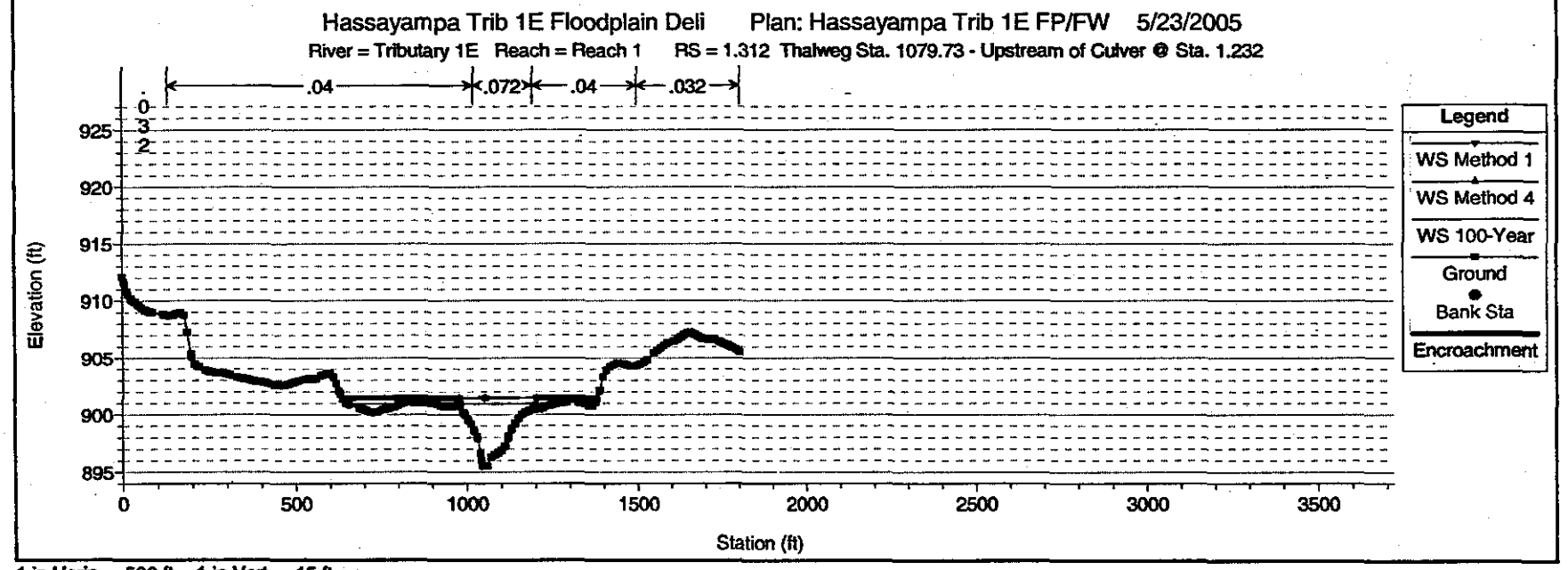
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



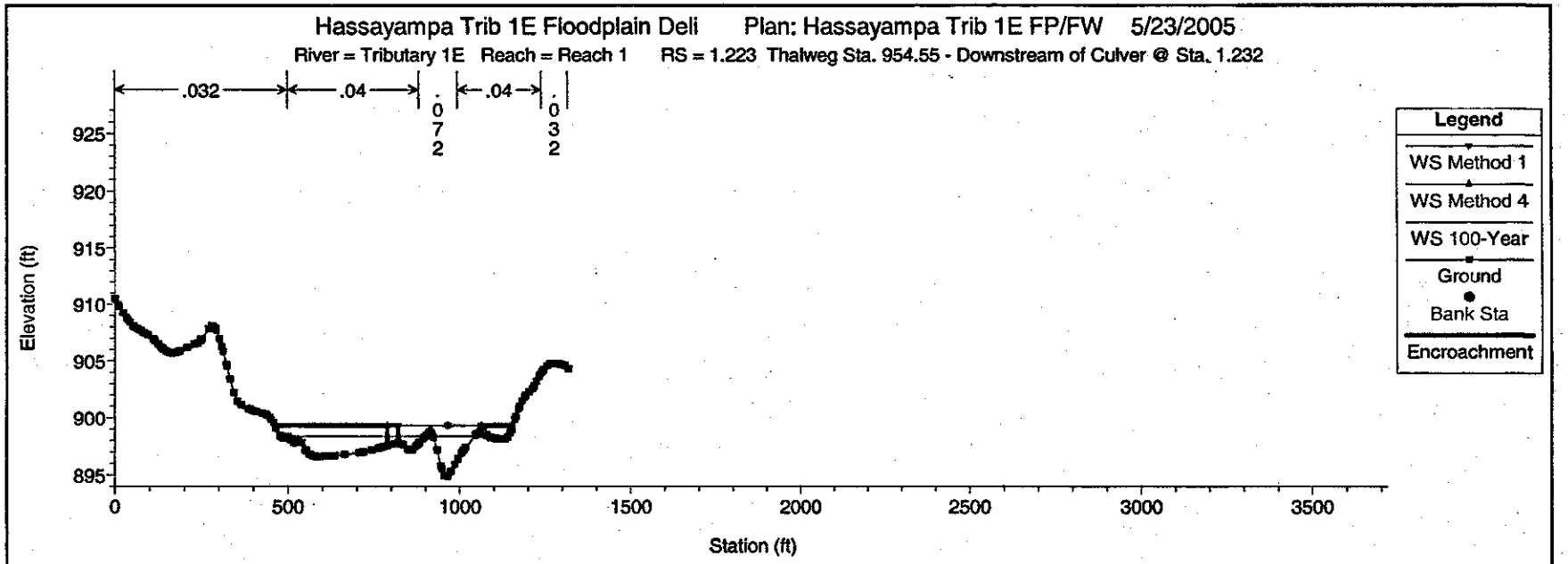


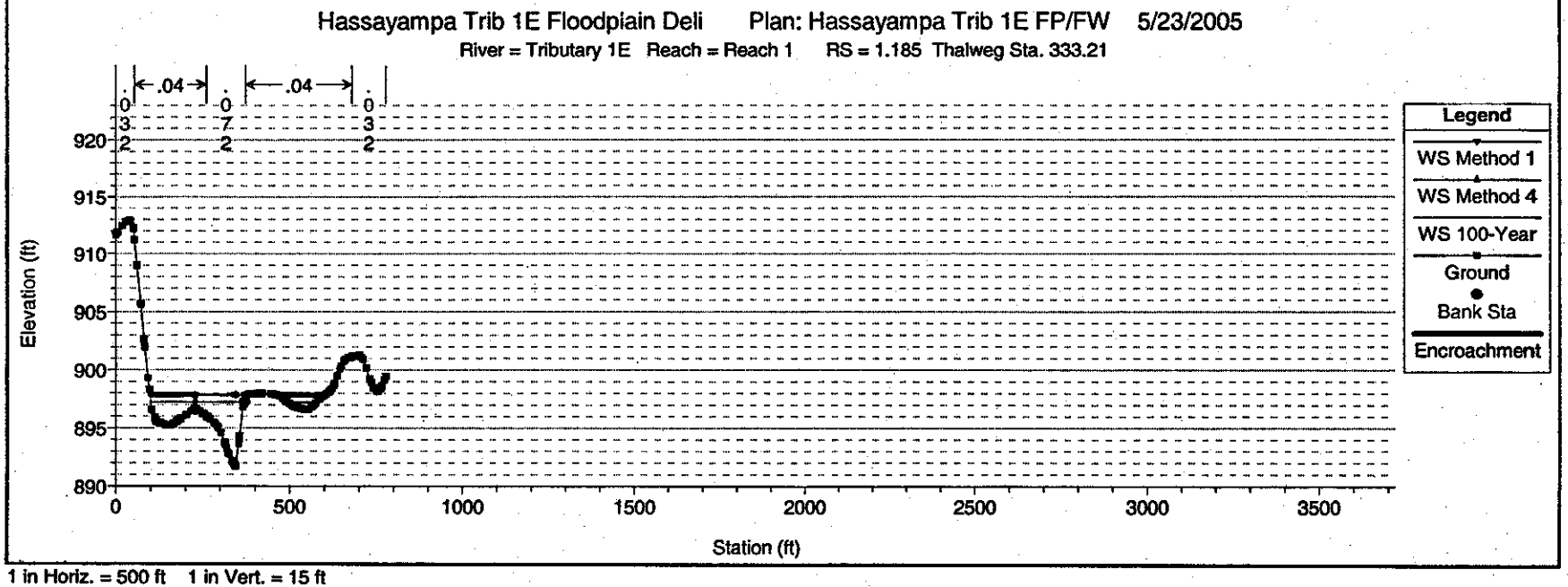
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



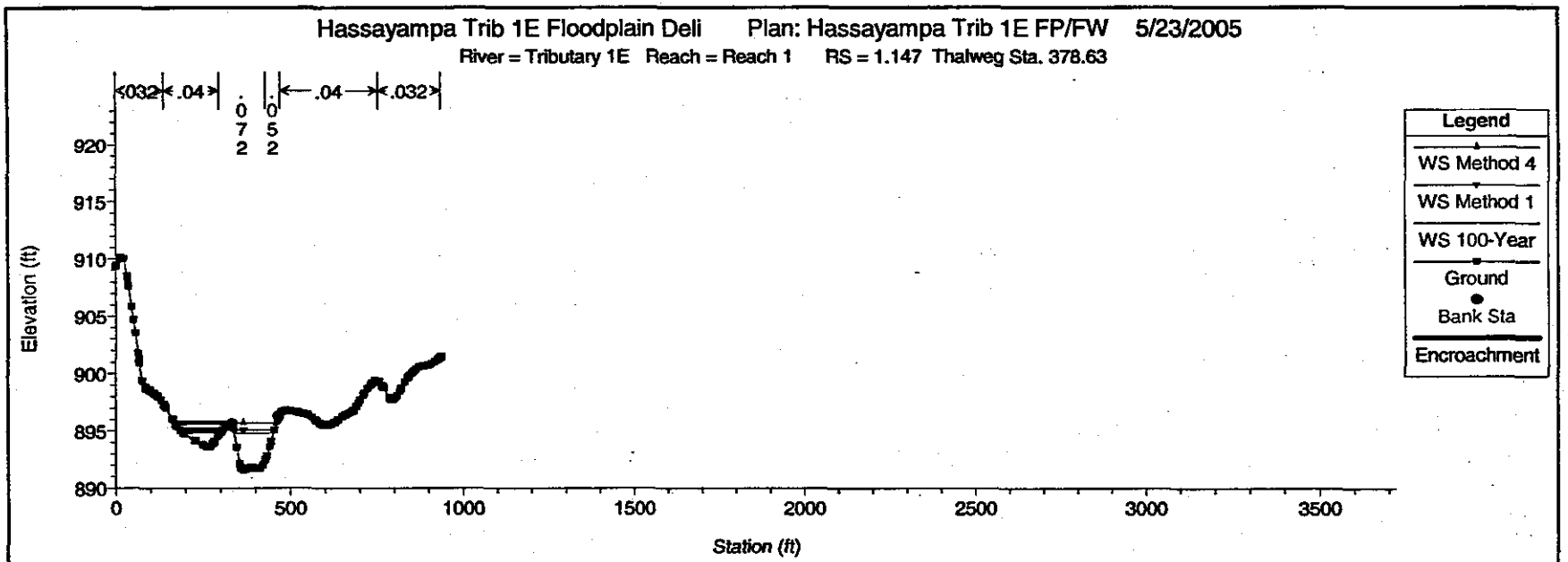


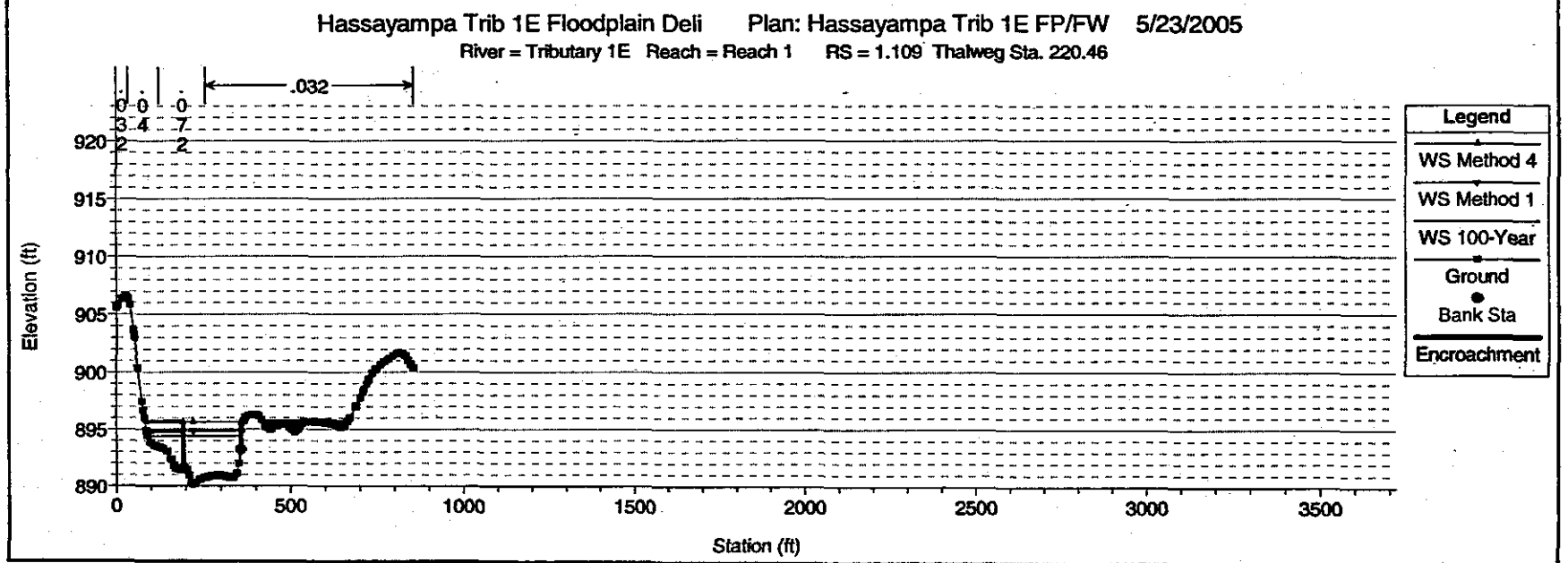
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft

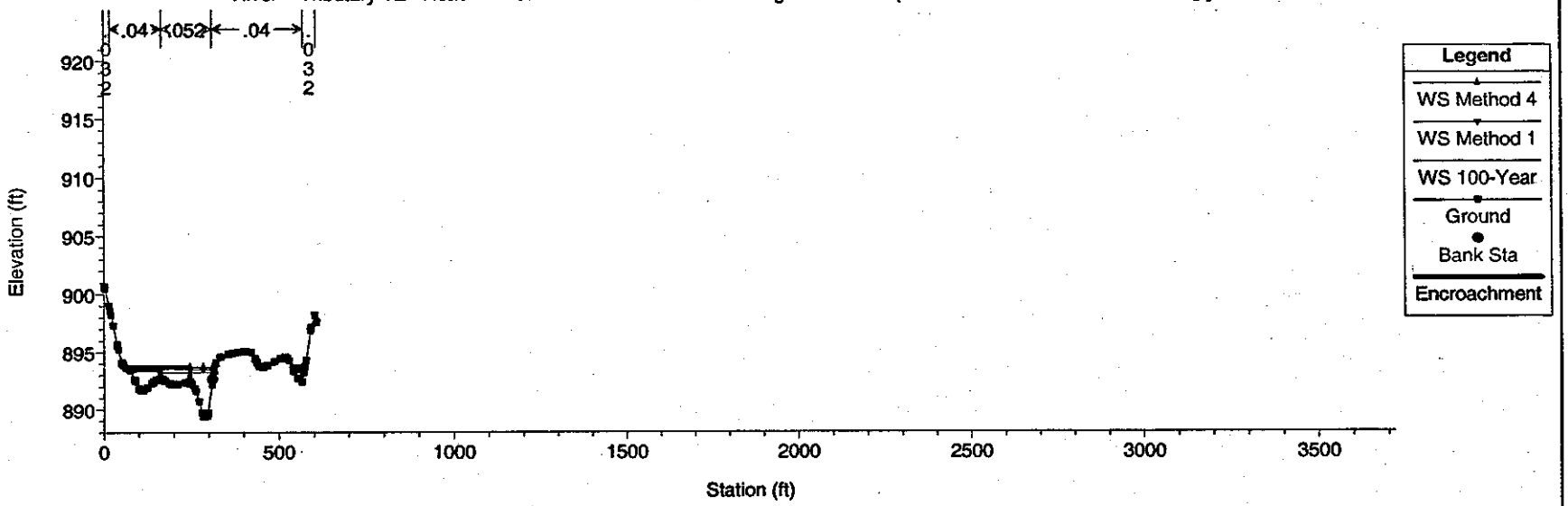




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

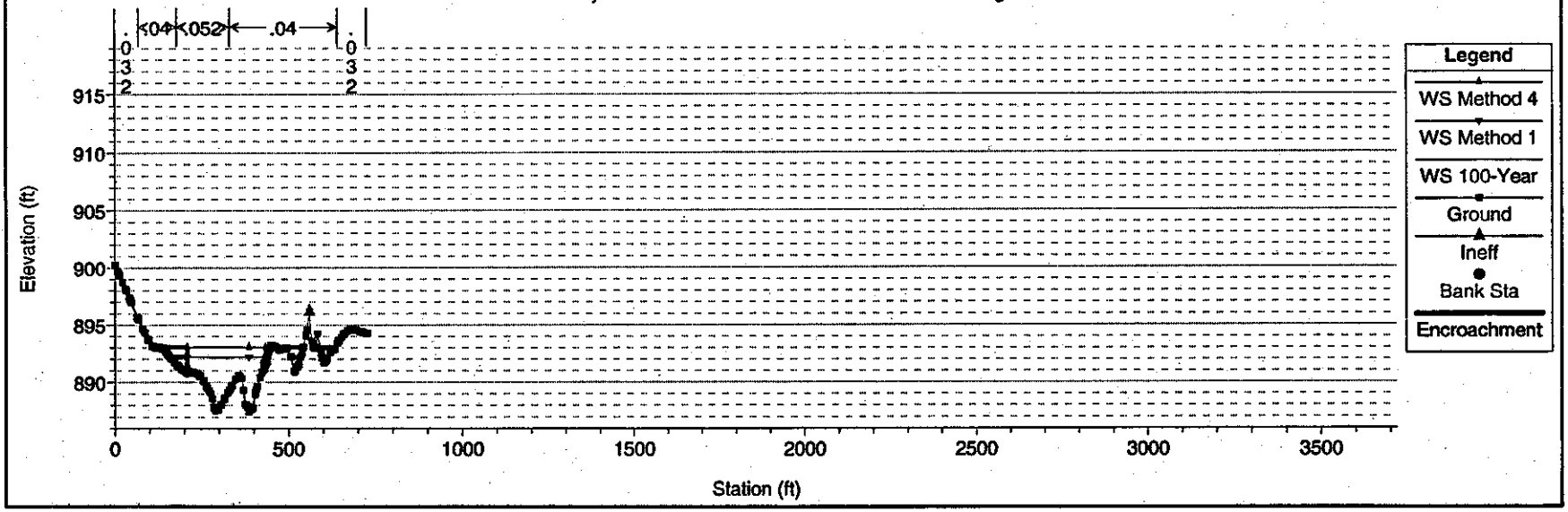
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 1.072 Thalweg Sta. 283.56 (HEC-RAS XS has been trimmed and does not re

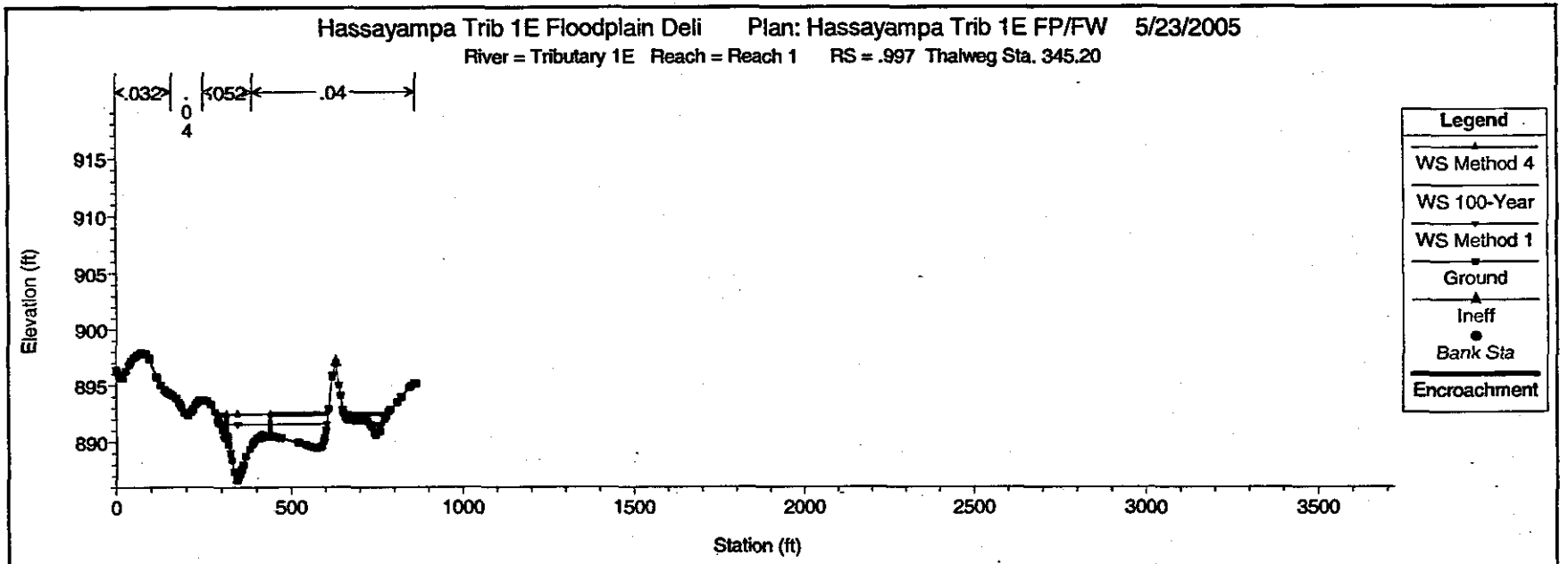


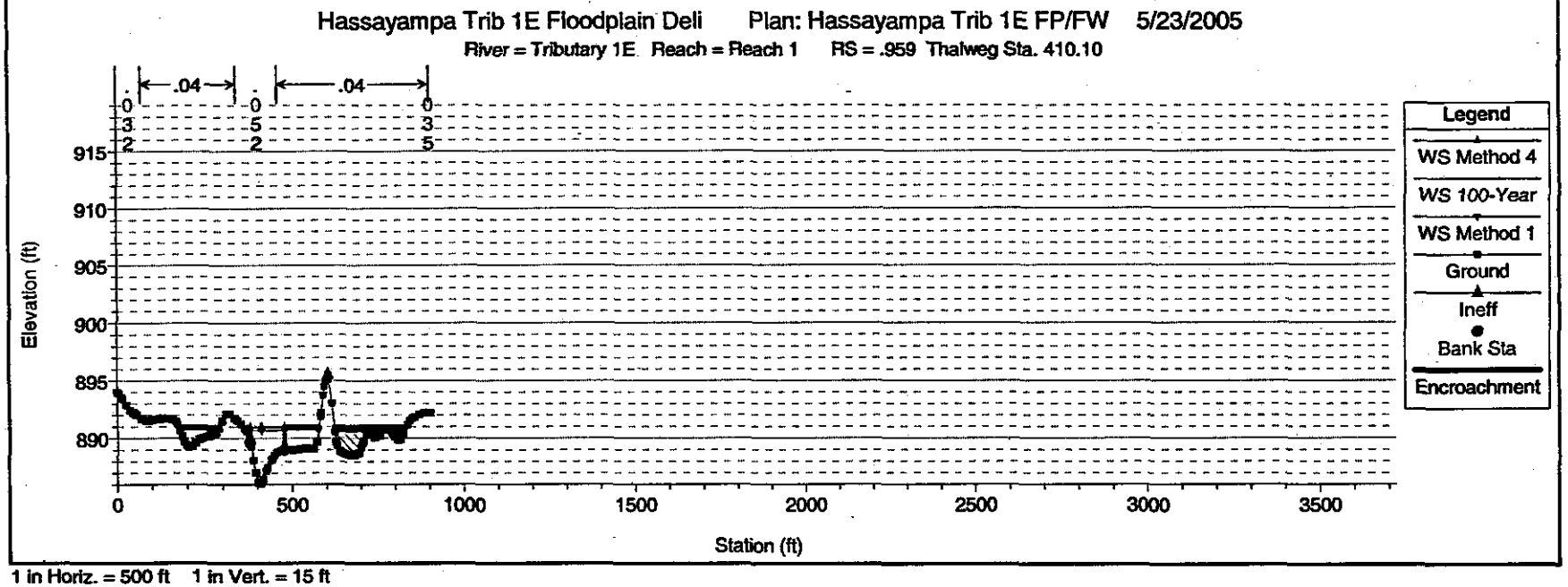
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E Reach = Reach 1 RS = 1.035 Thalweg Sta. 315.49

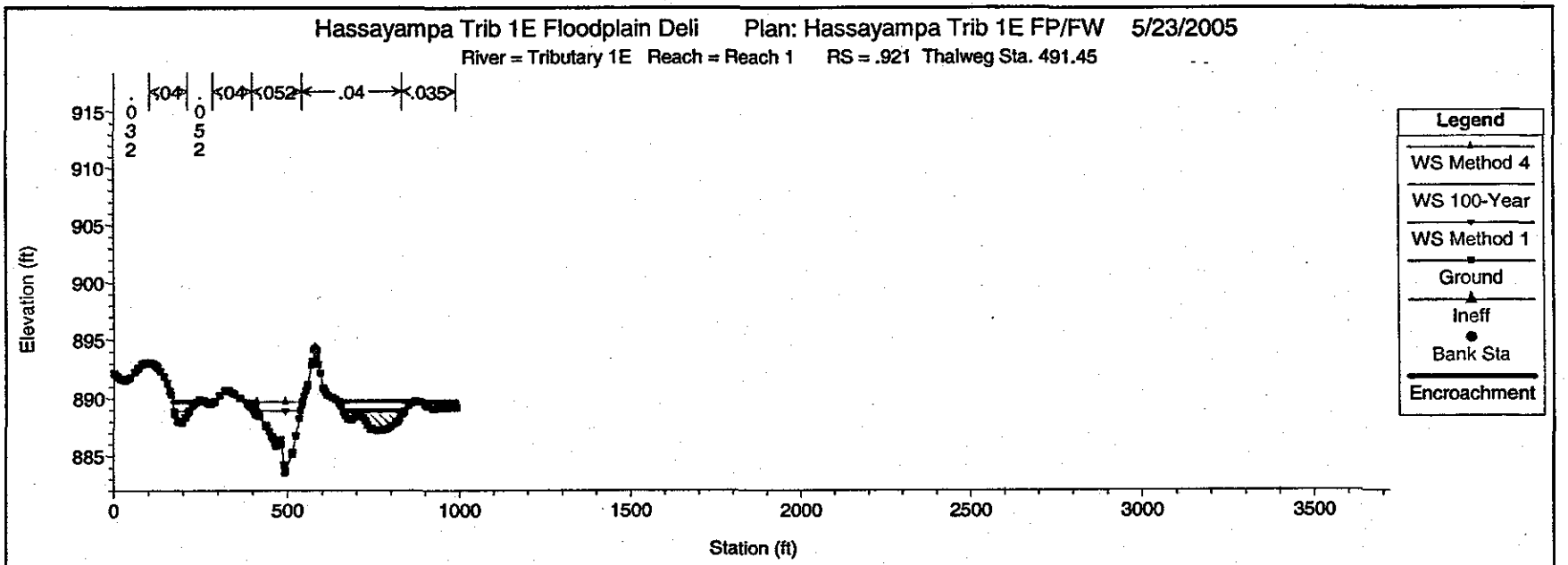


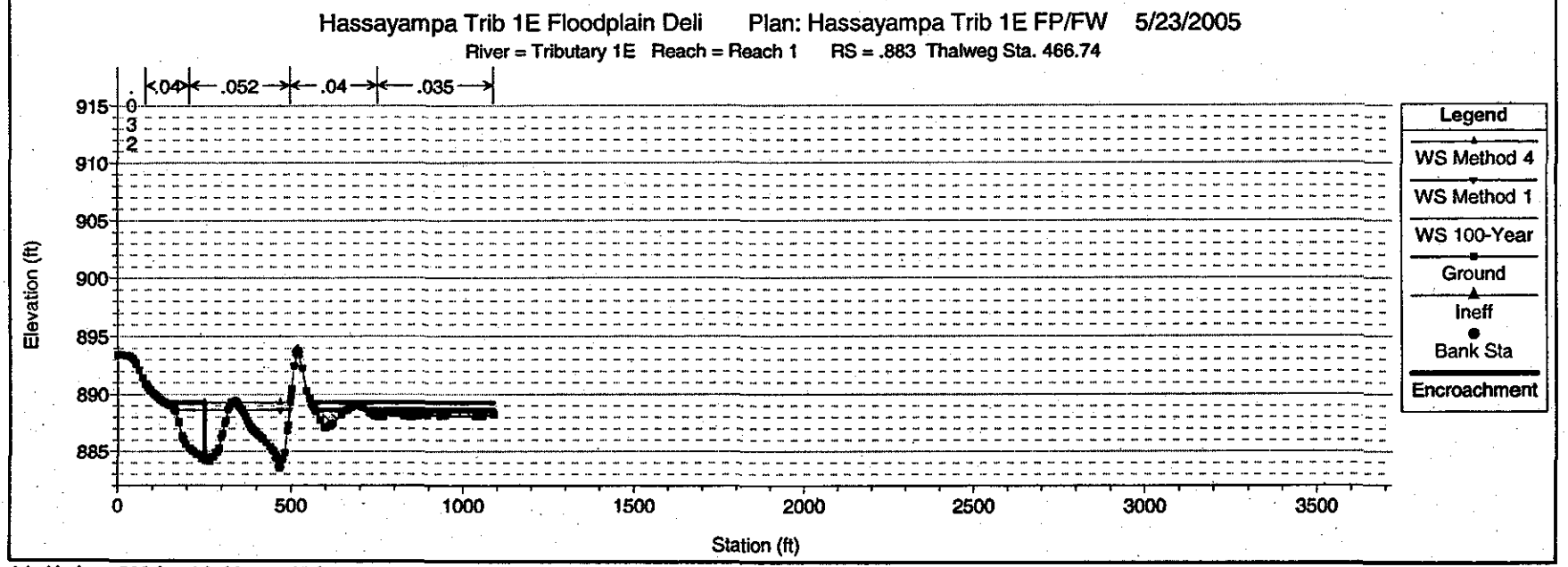
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



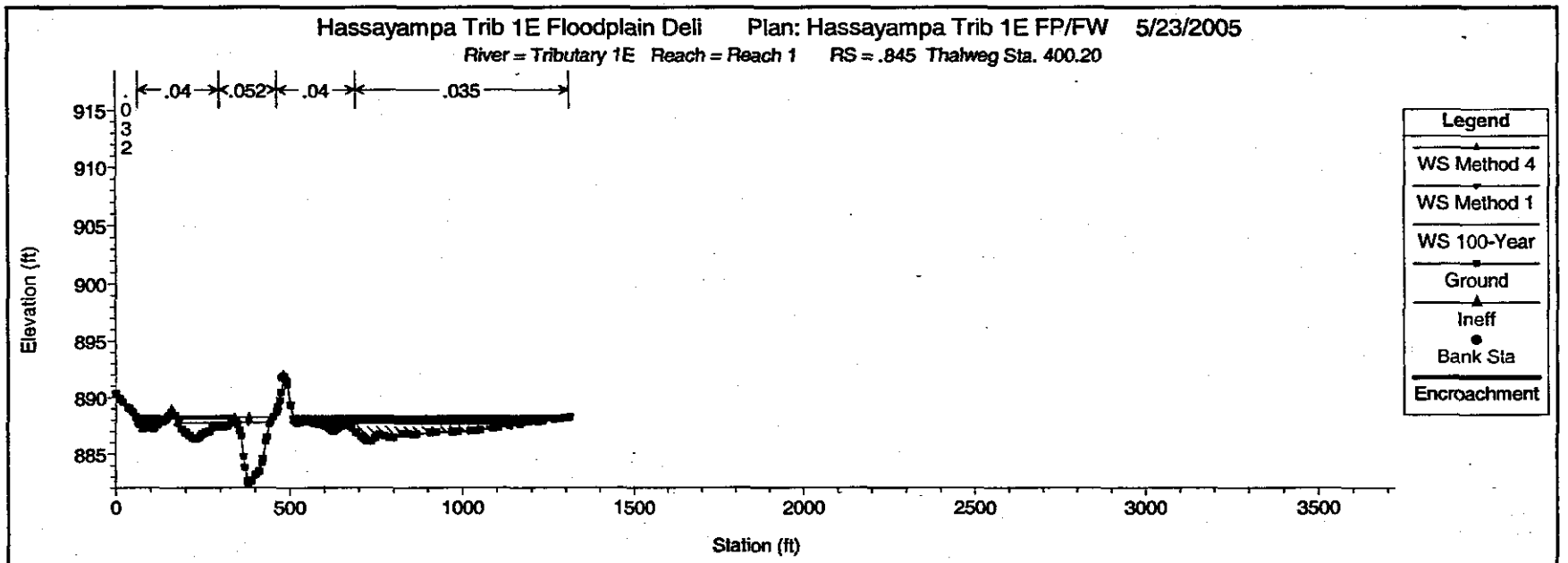


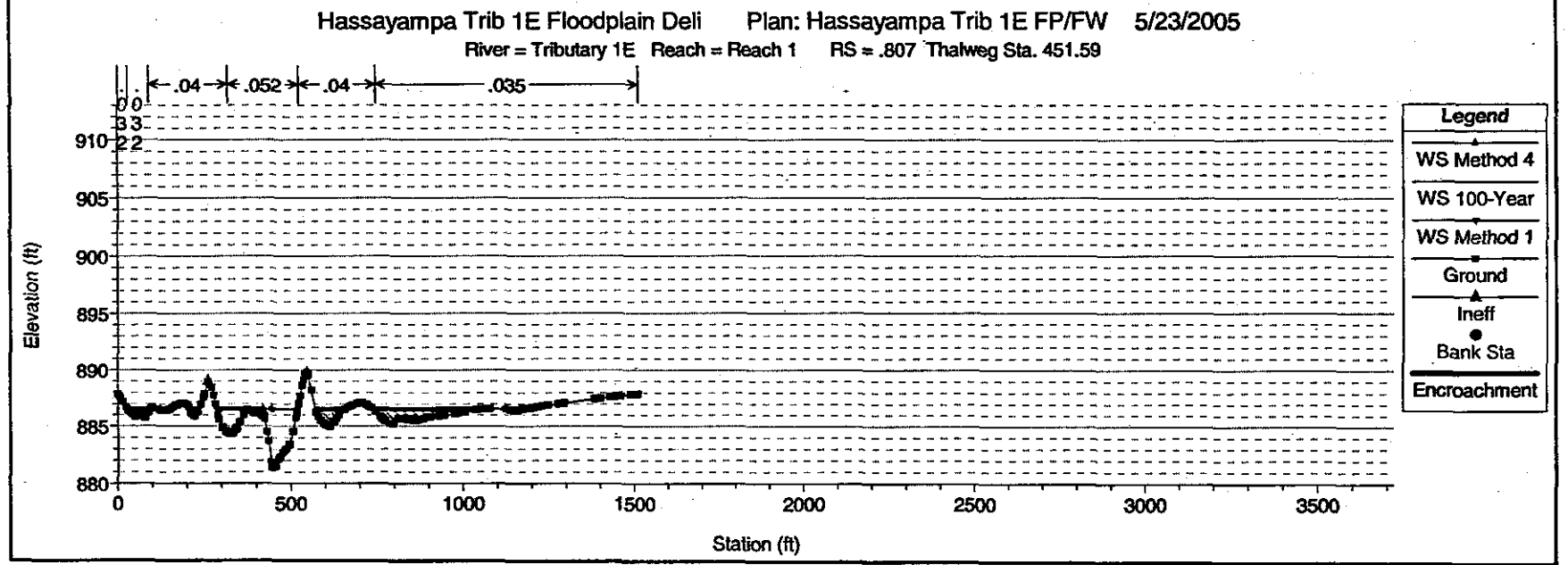
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



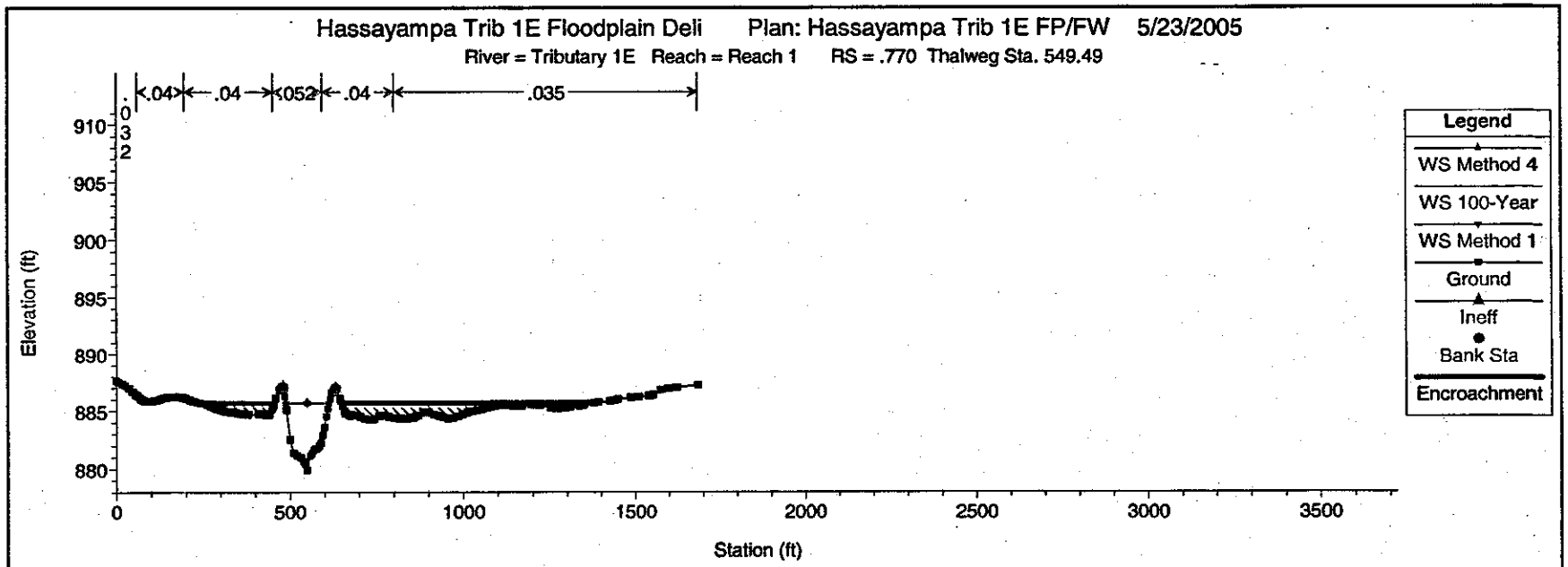


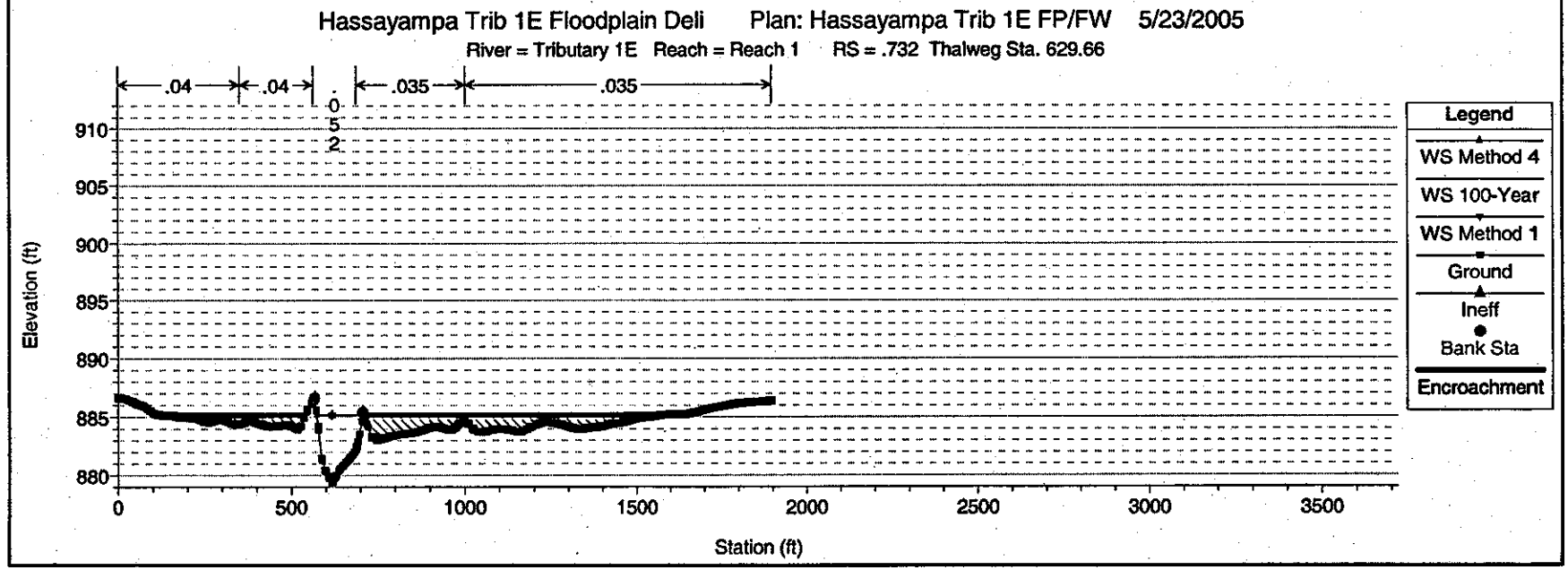
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



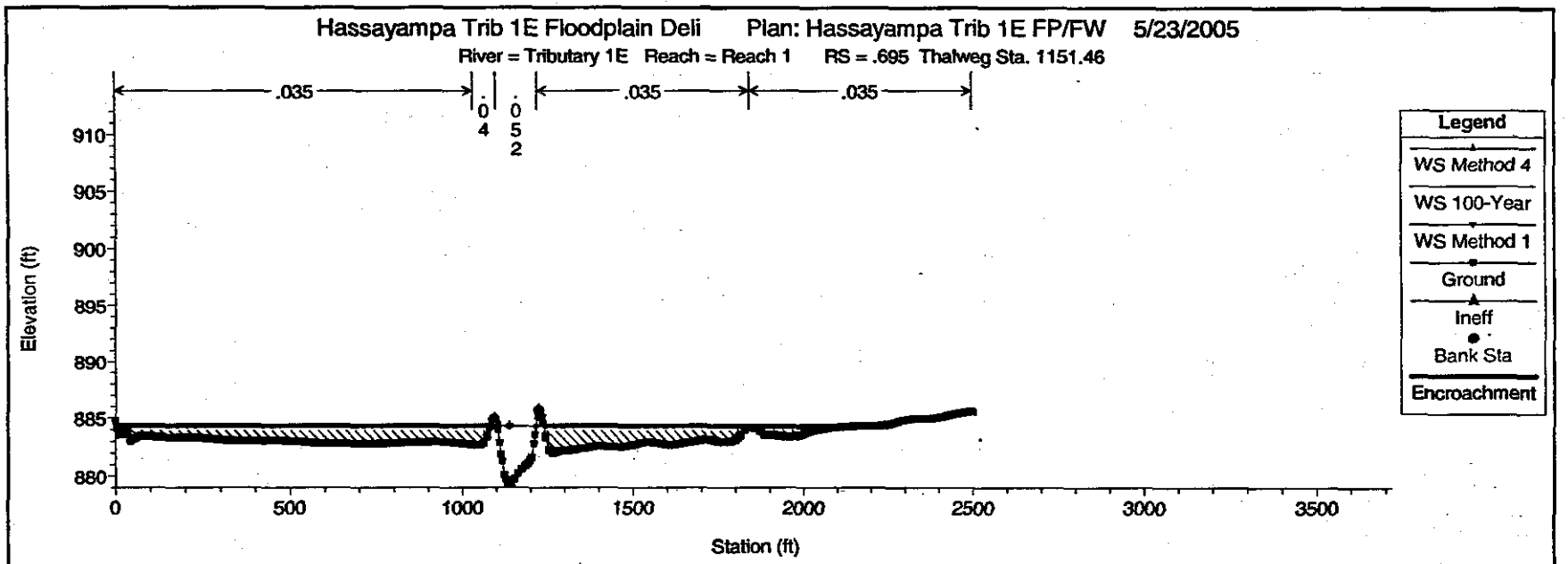


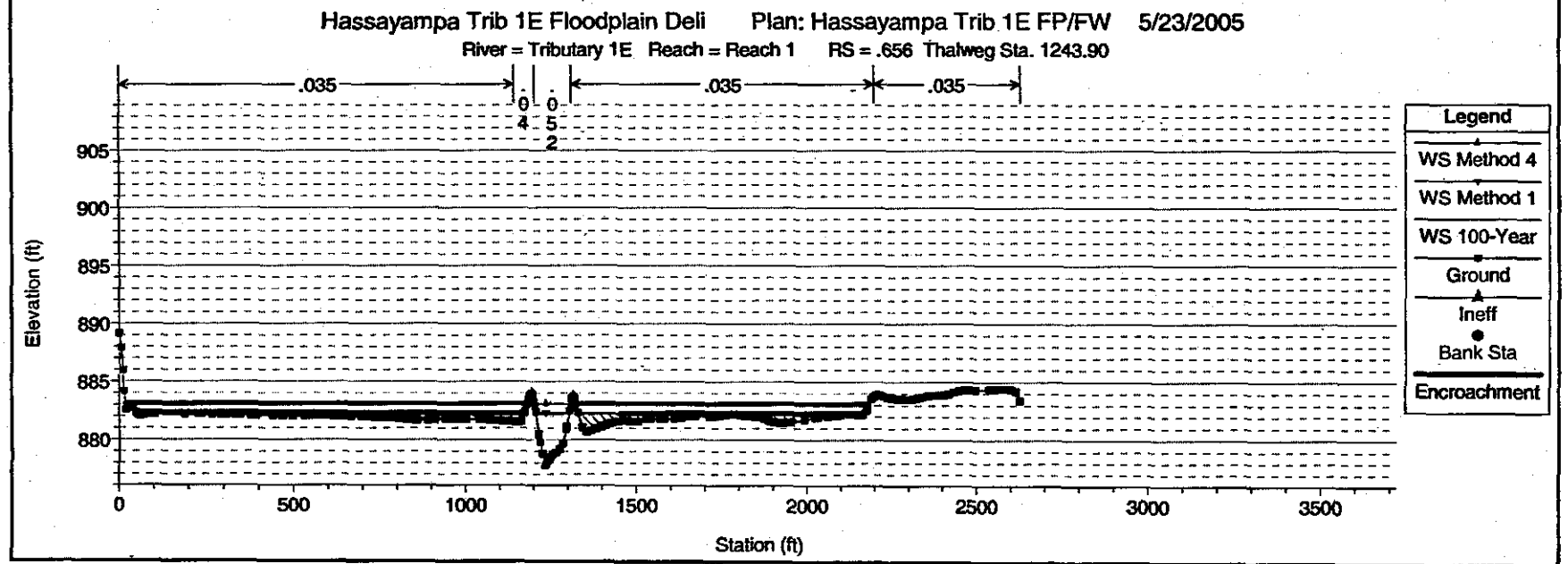
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



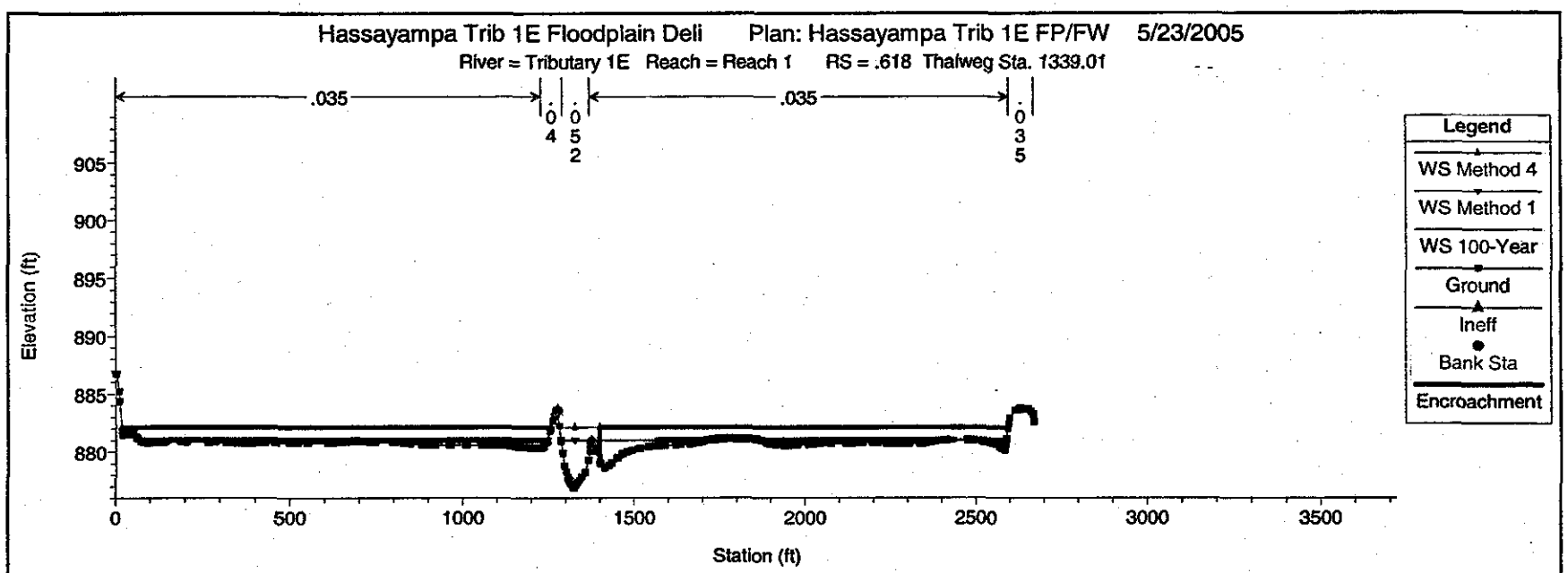


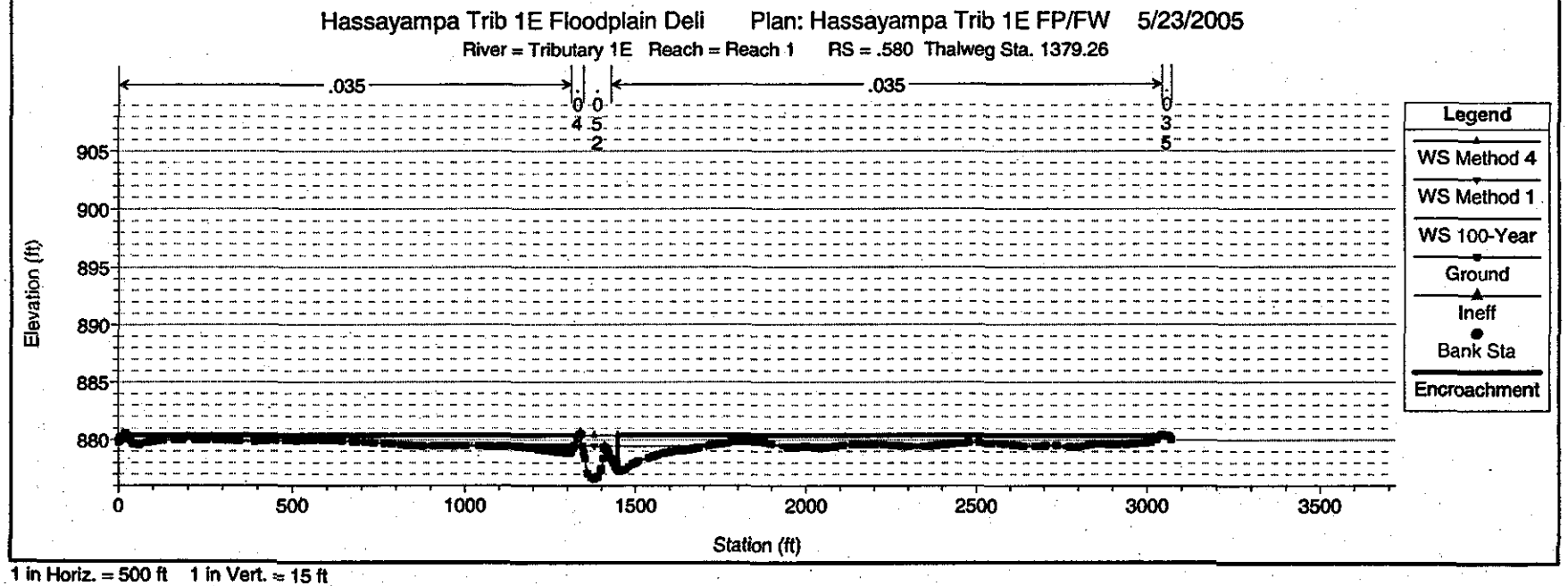
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



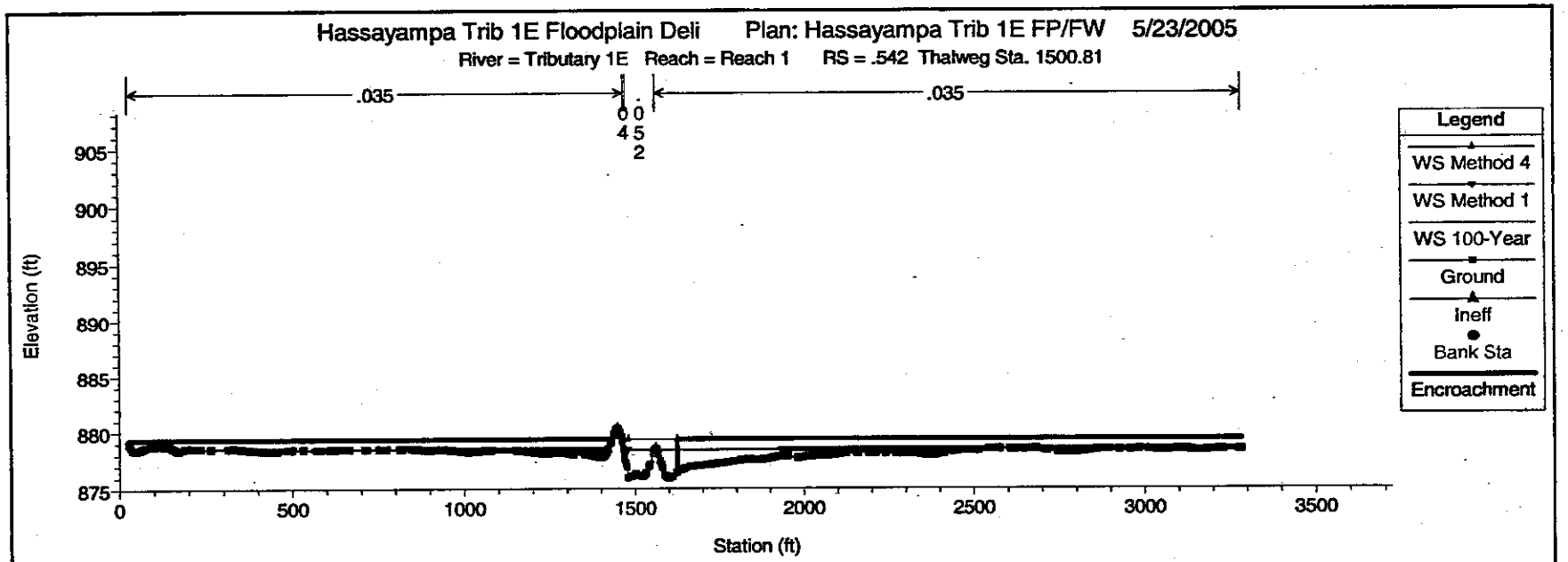


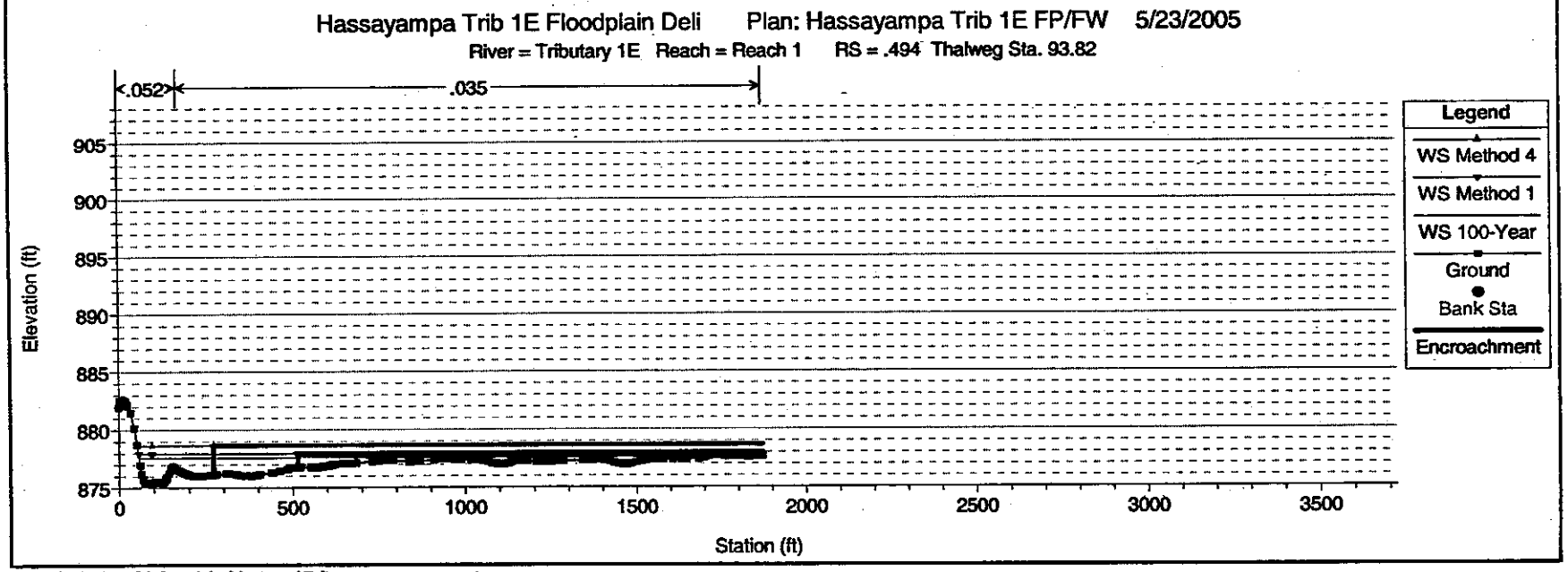
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



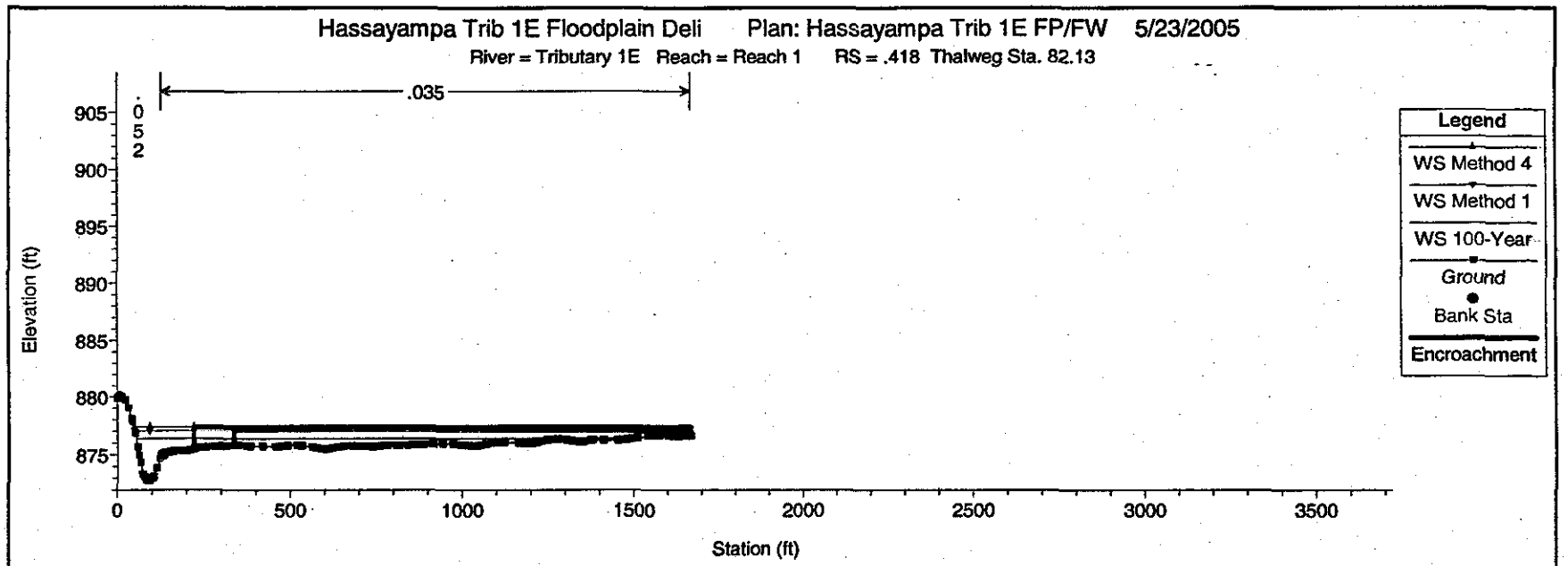


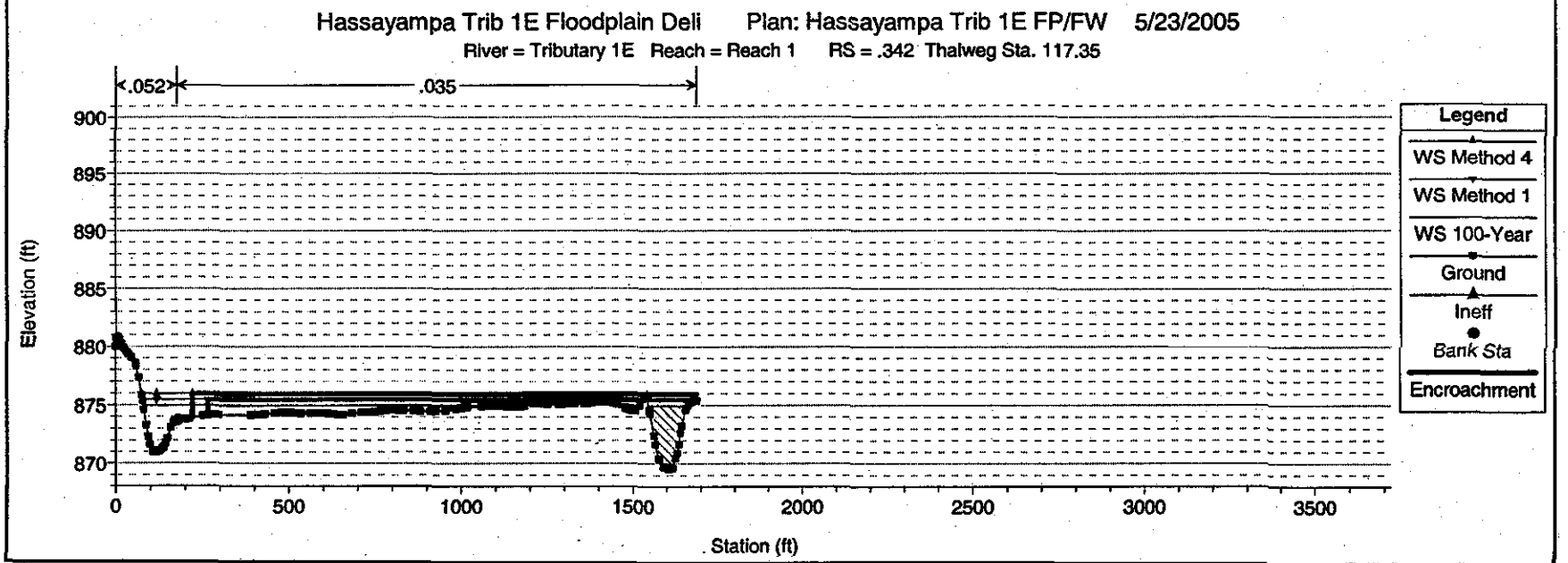
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



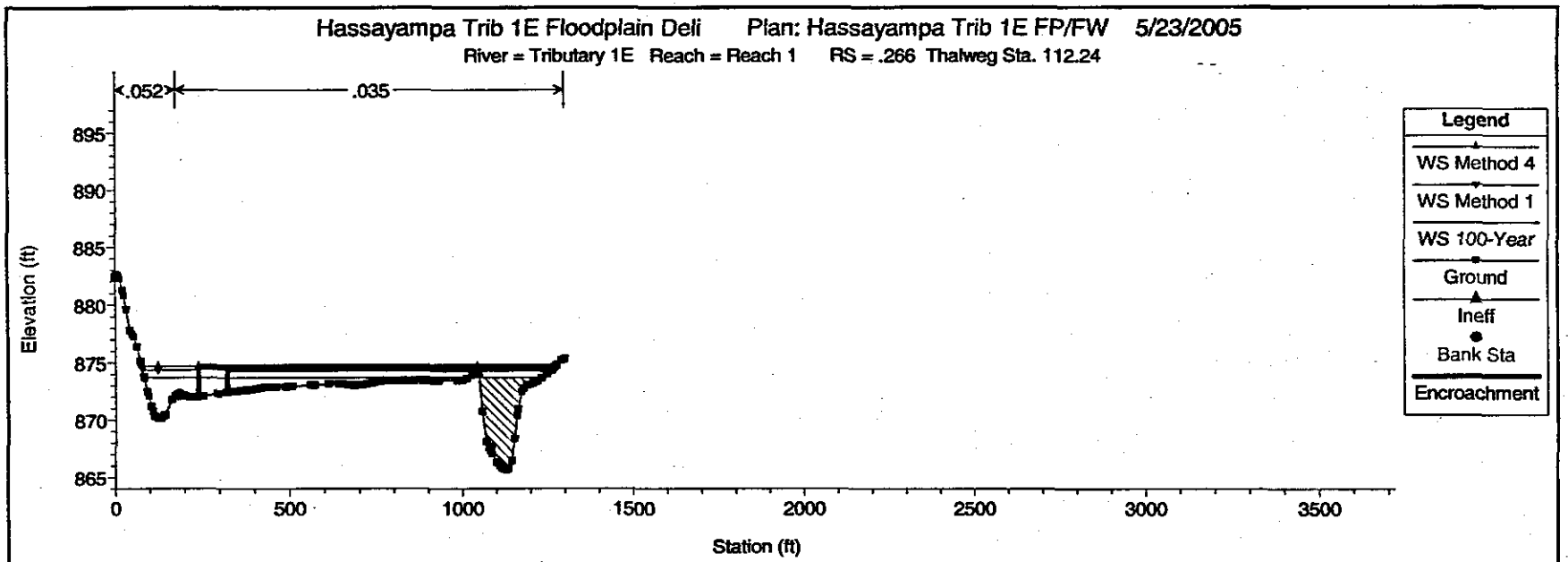


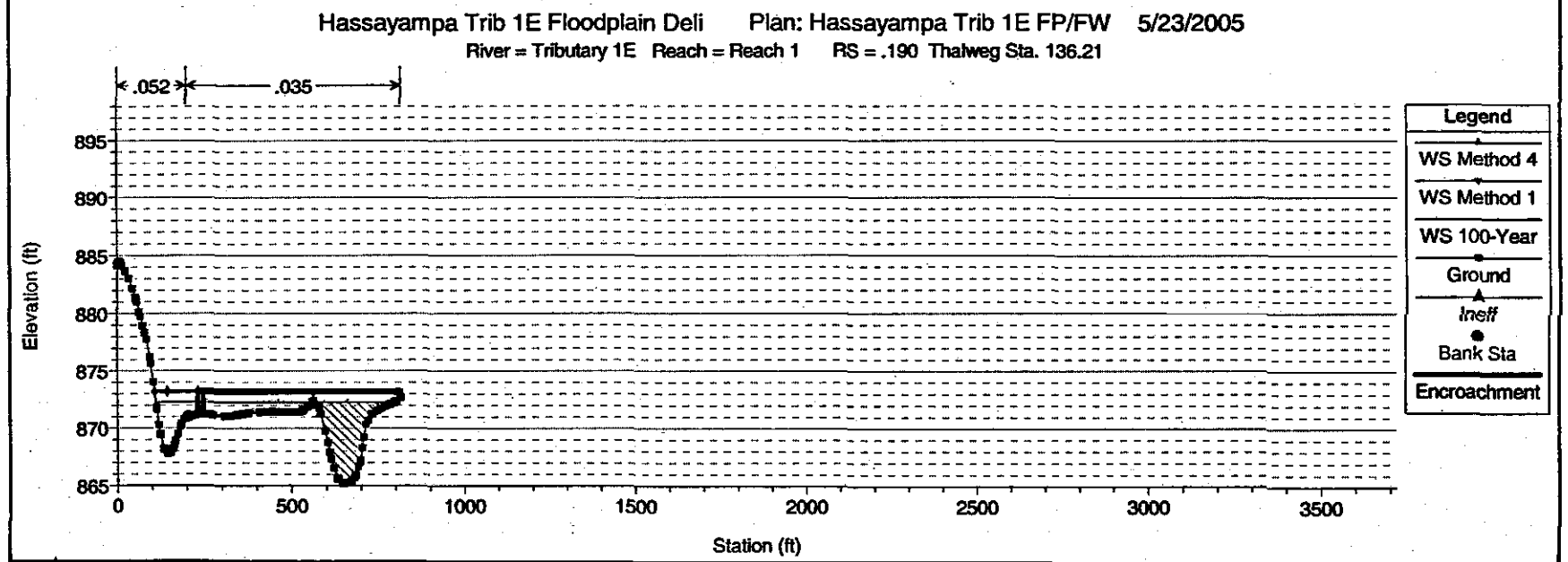
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



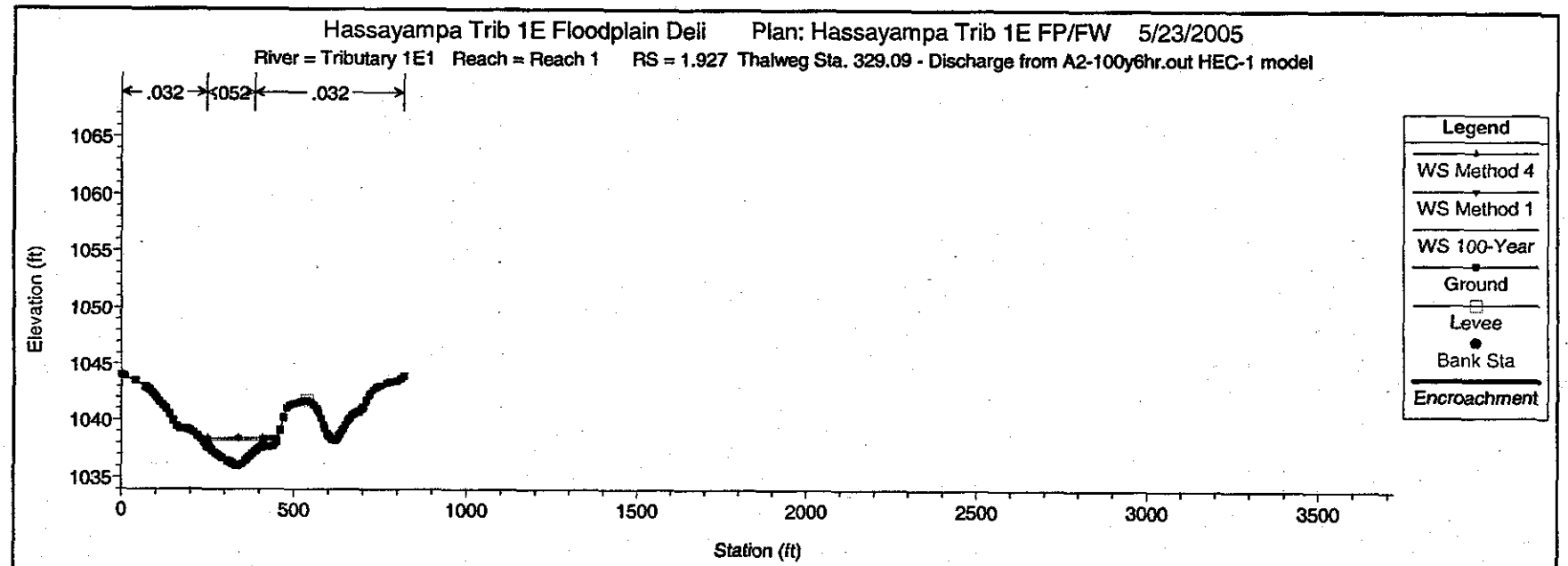


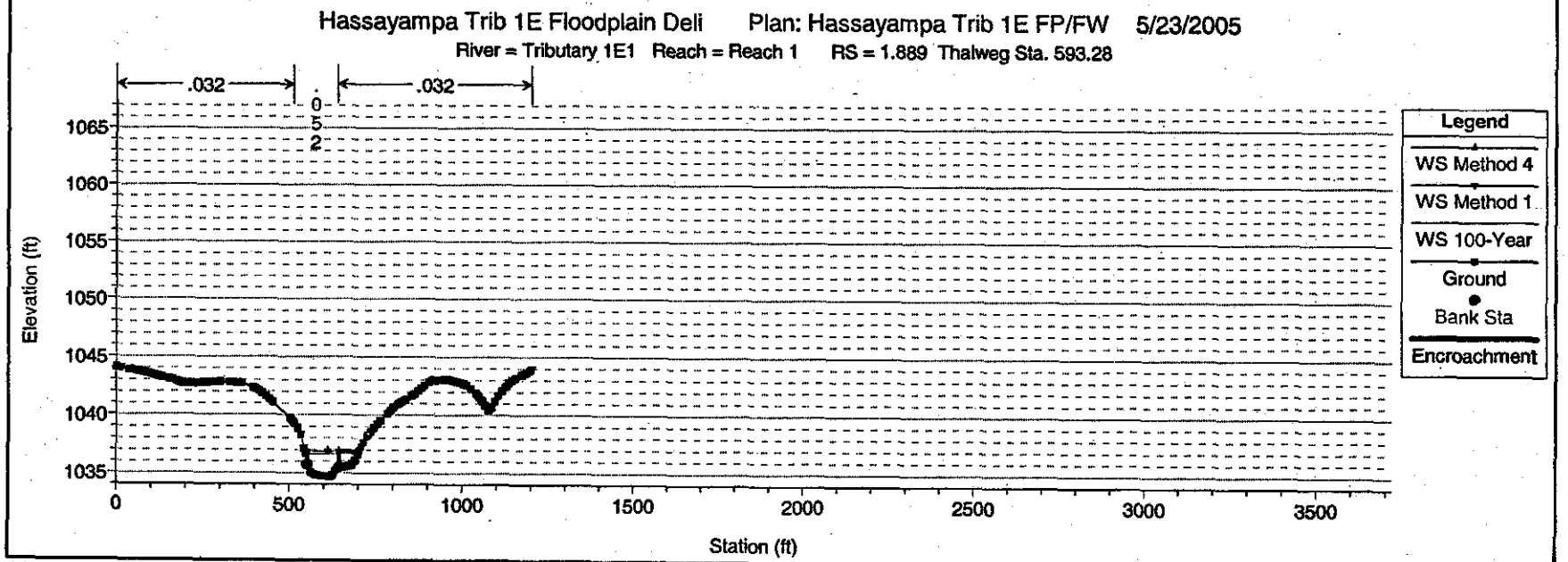
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft

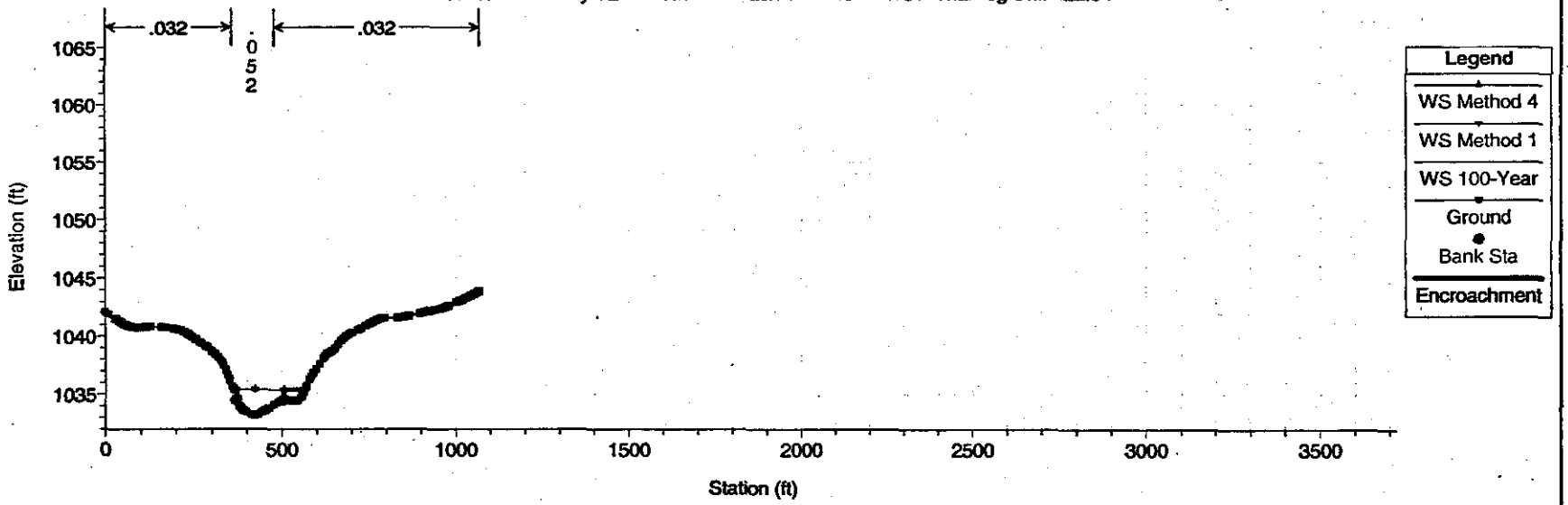




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

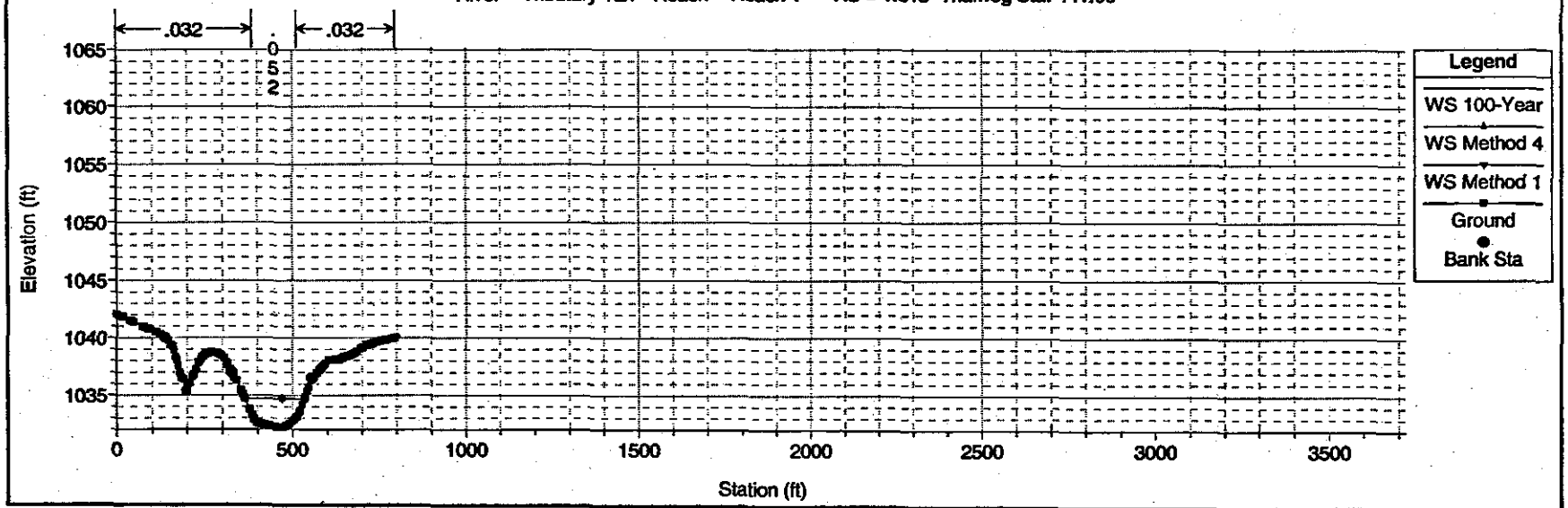
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 1.851 Thalweg Sta. 422.54

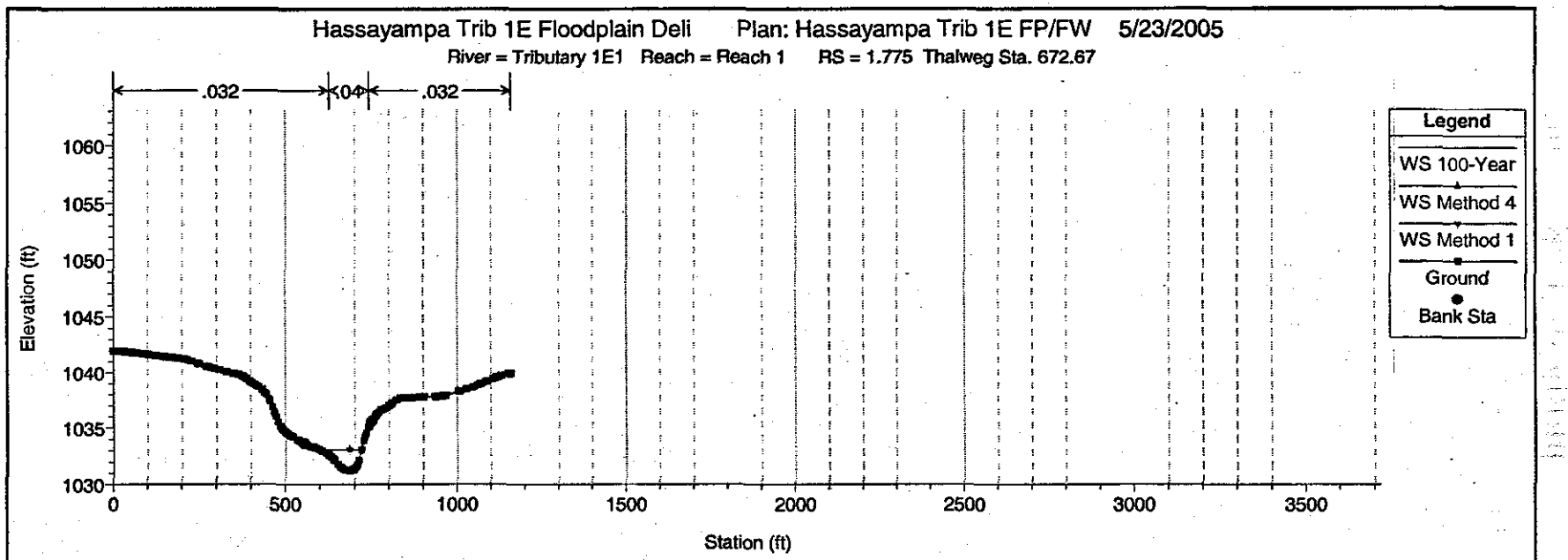


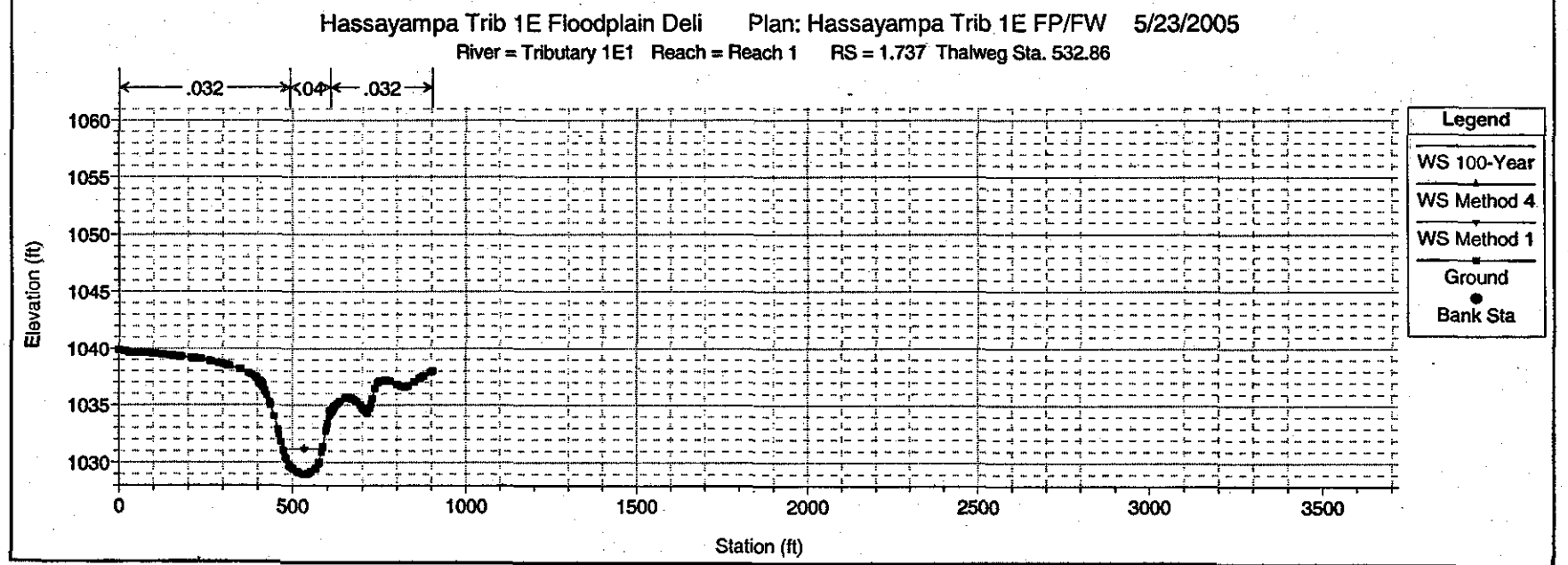
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 1.813 Thalweg Sta. 441.00

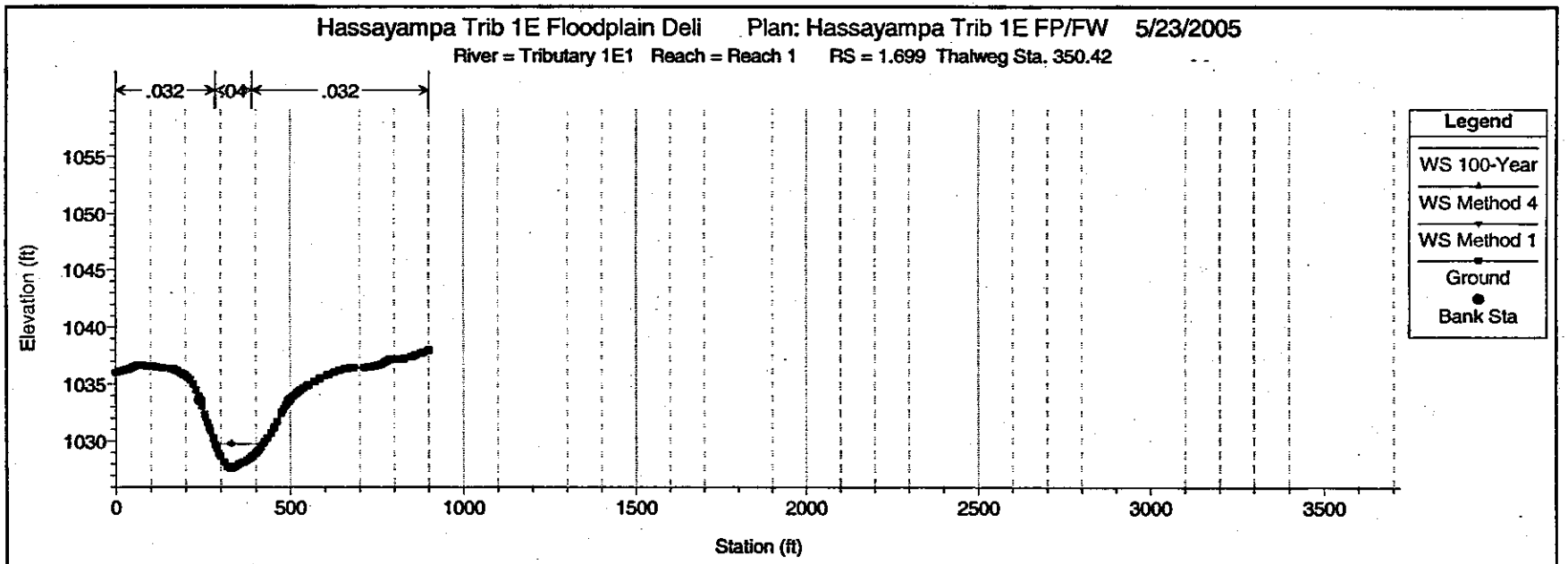


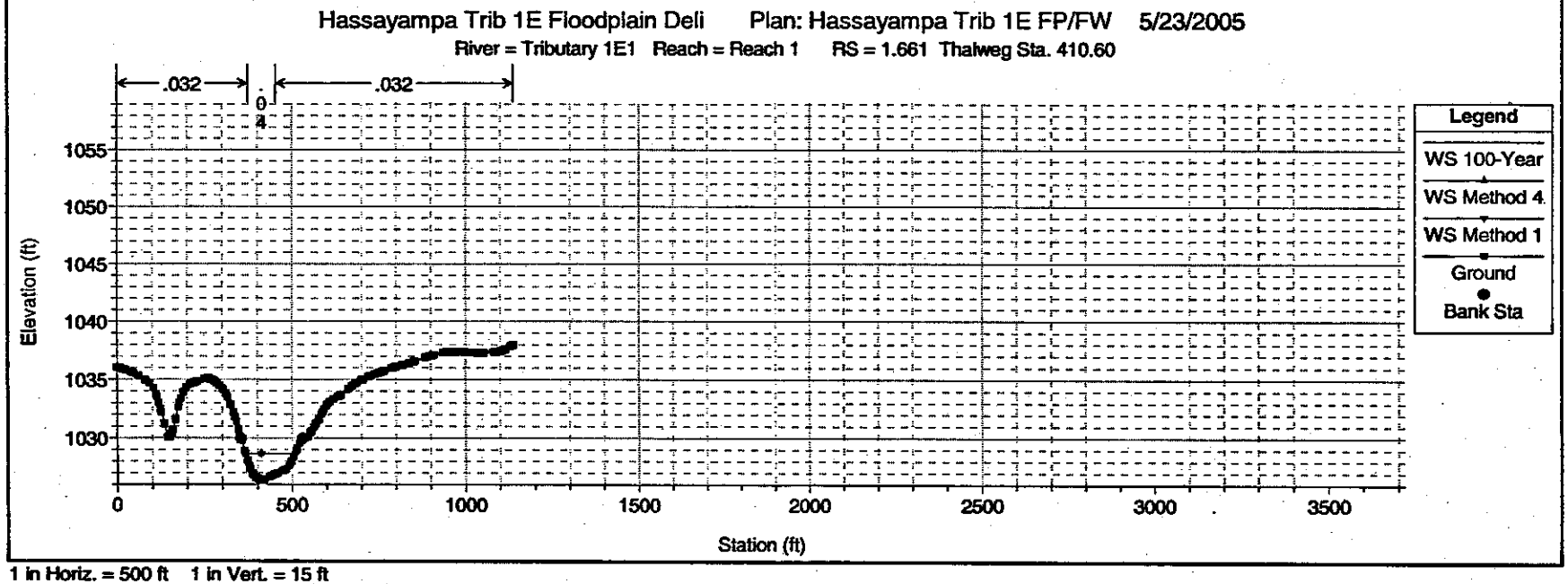
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



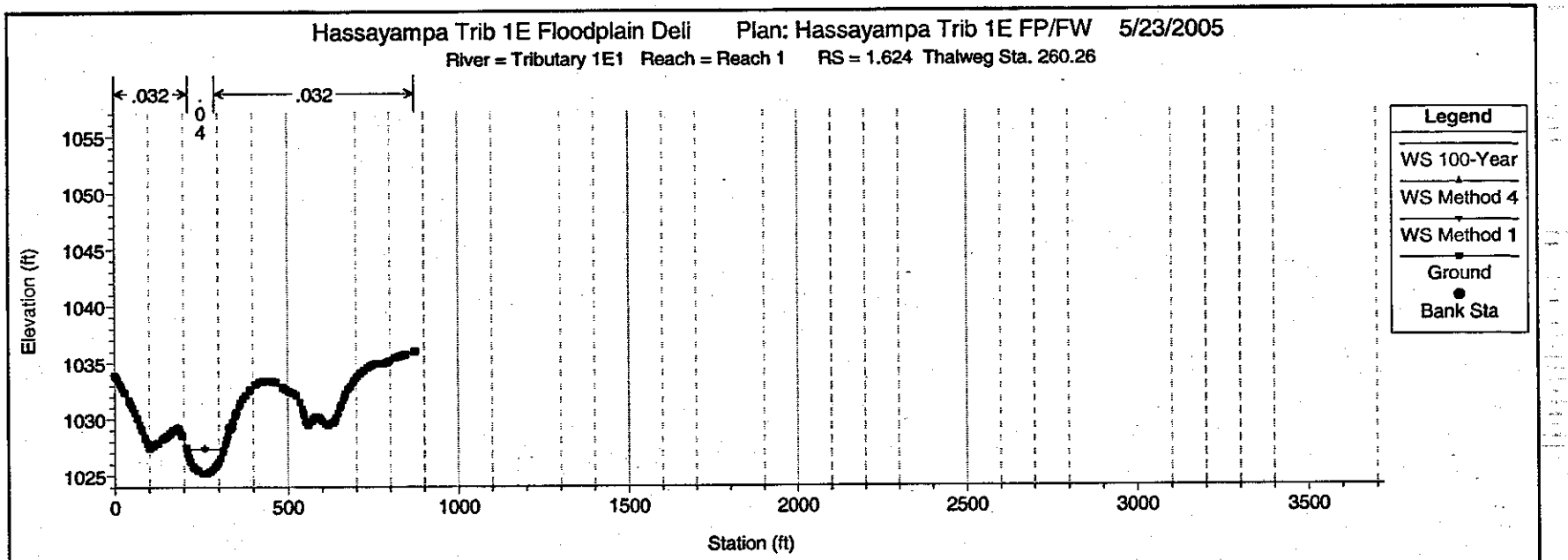


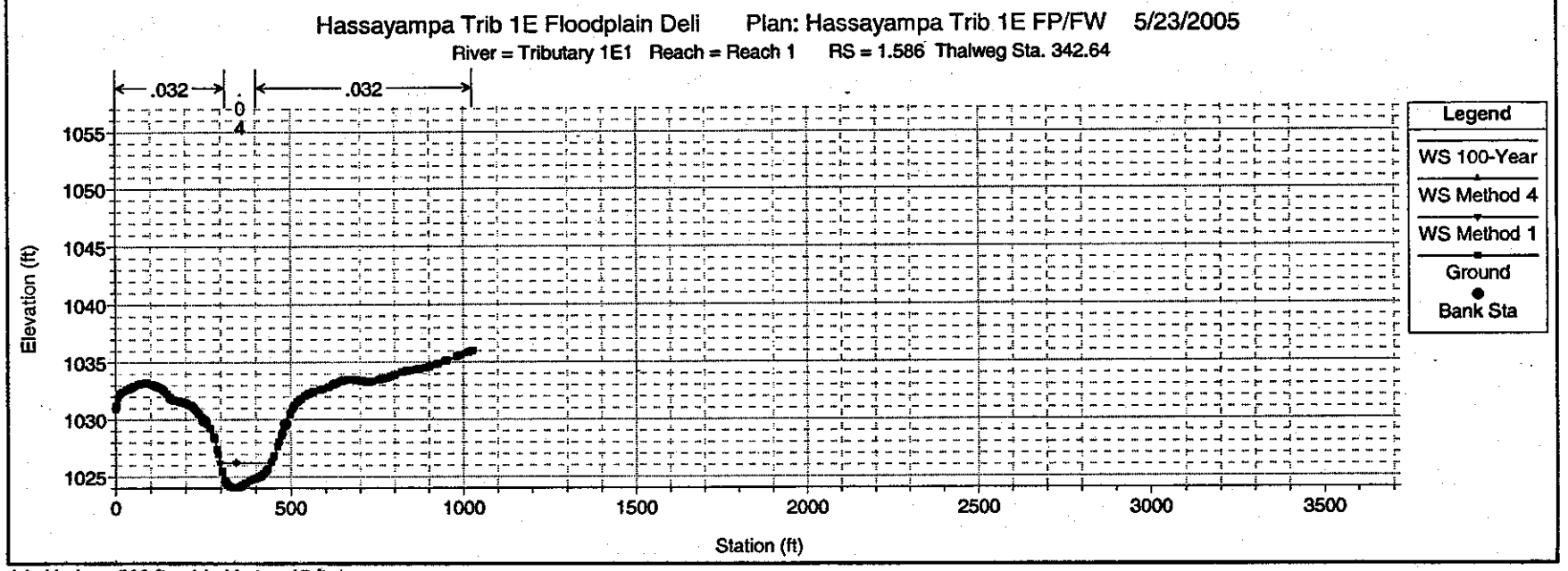
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



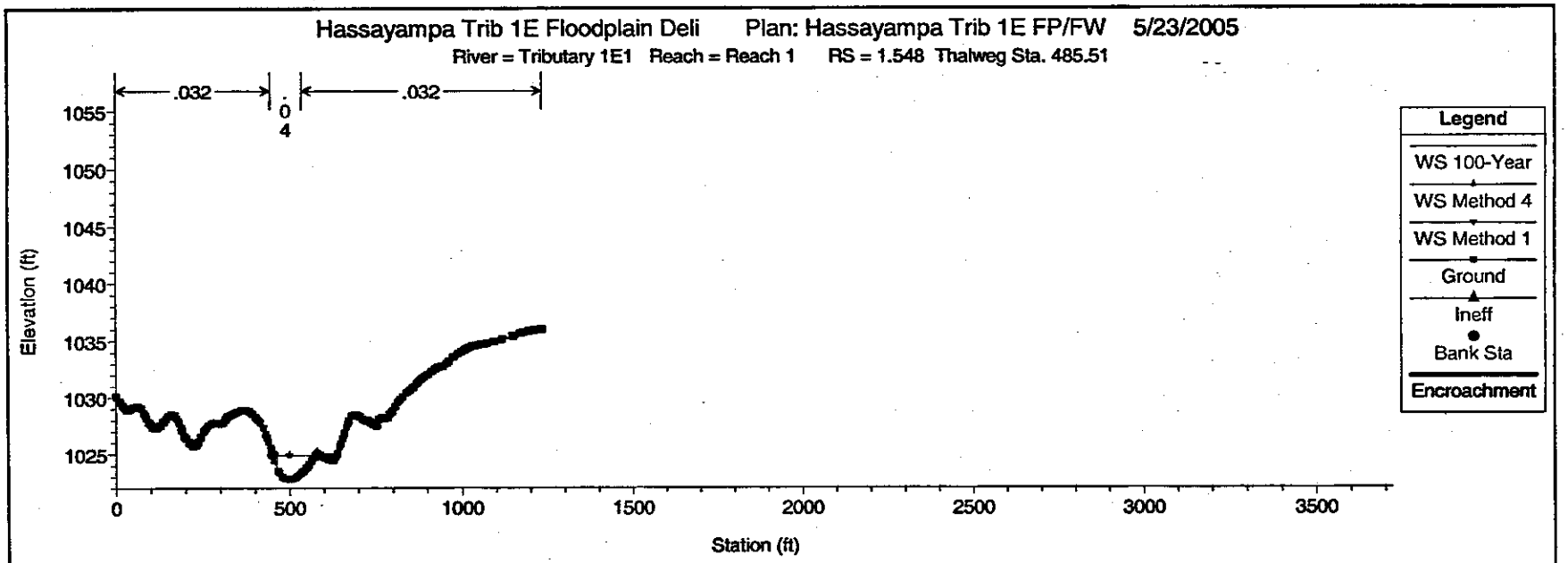


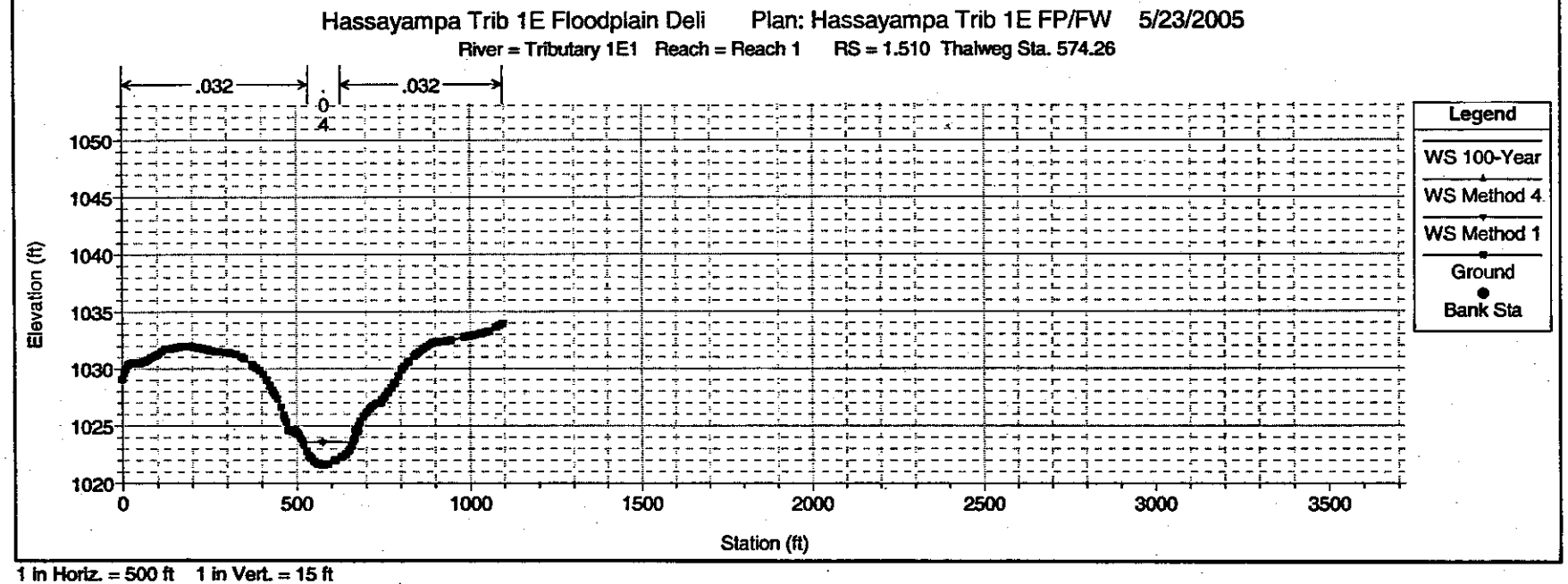
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



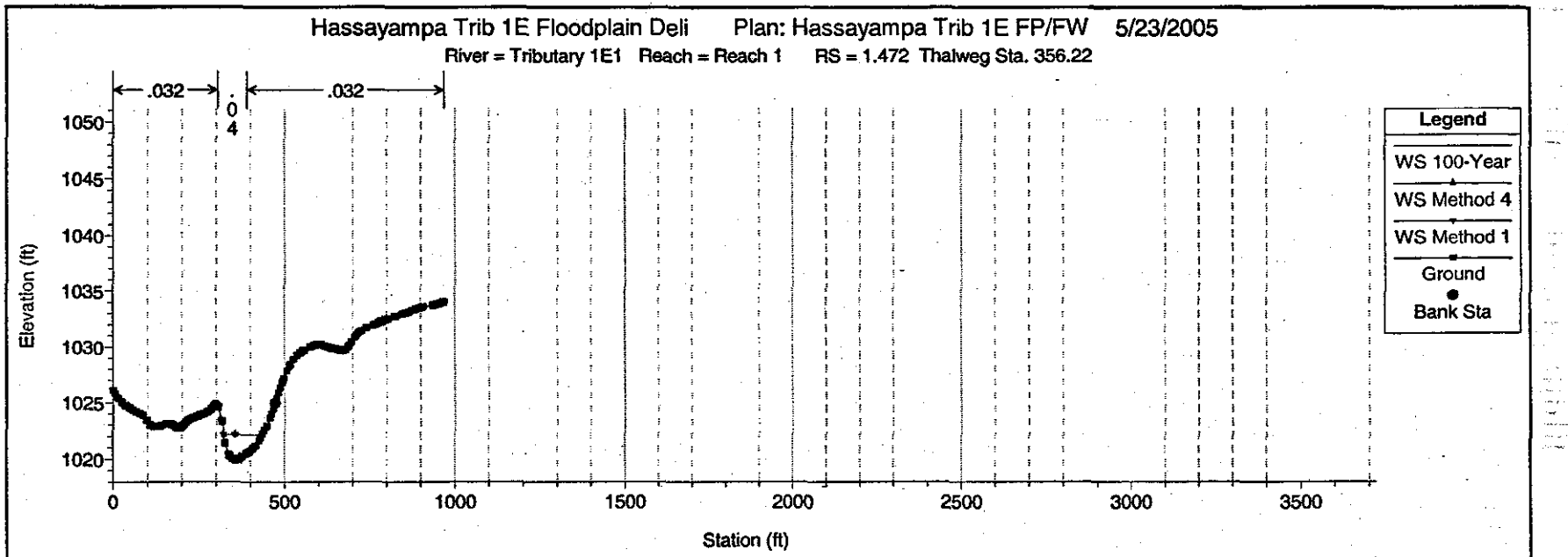


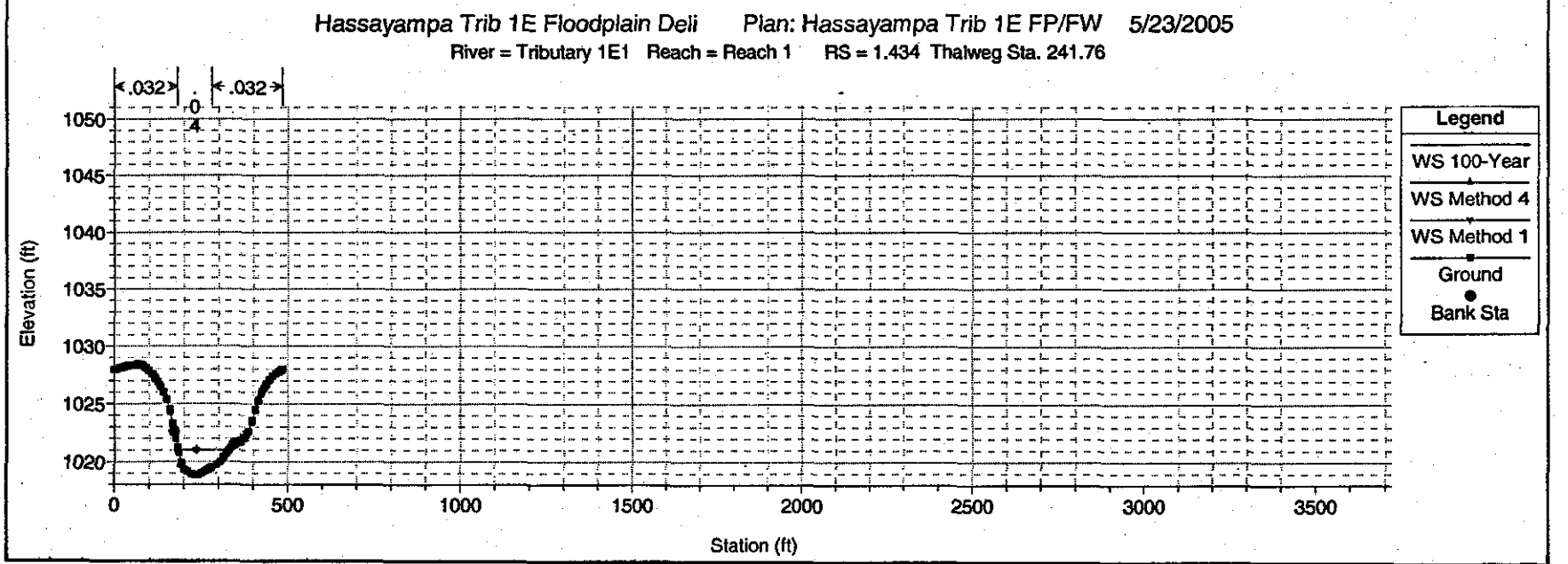
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft

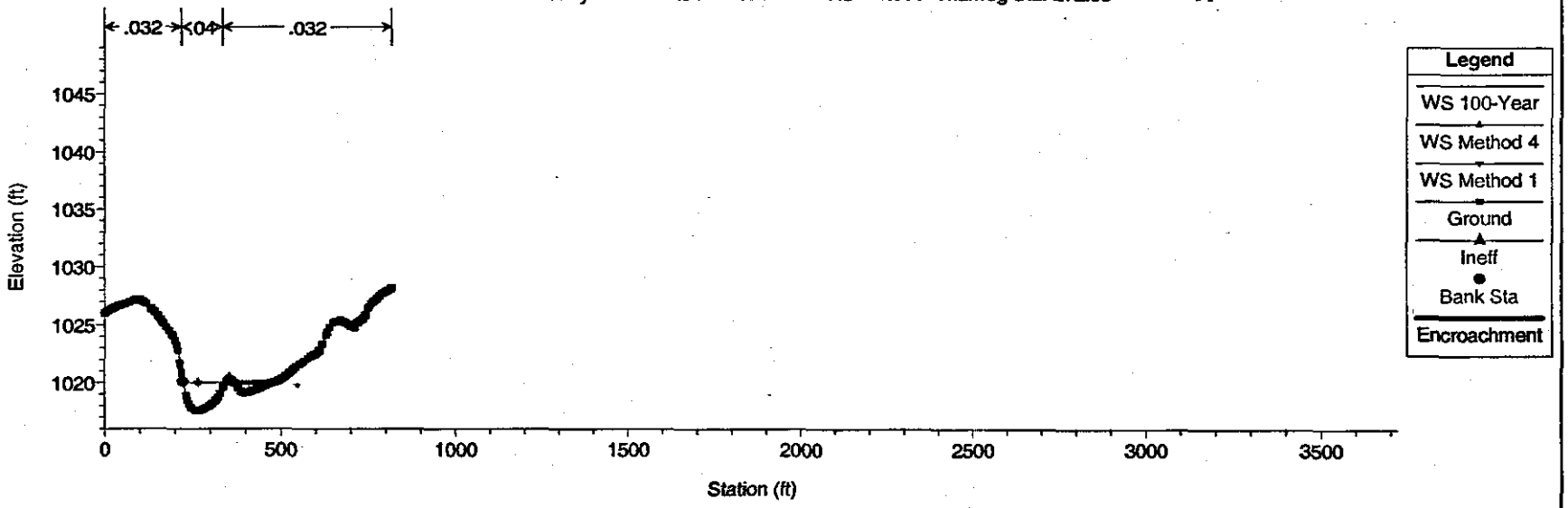




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

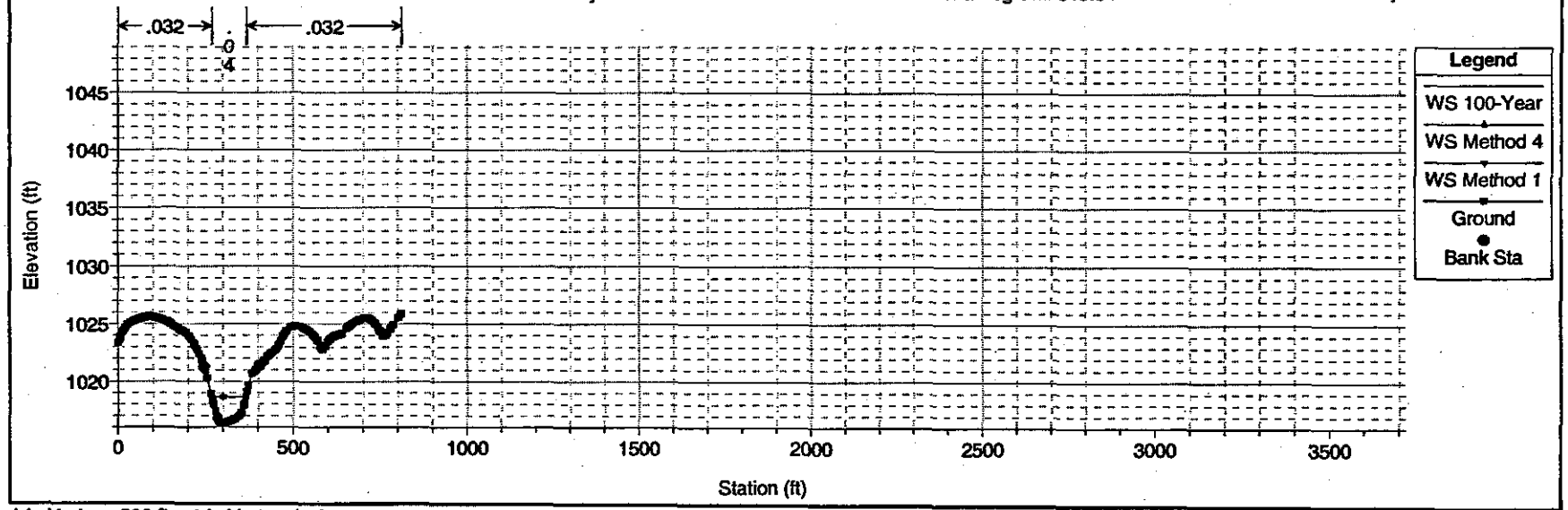
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 1.396 Thalweg Sta. 272.95



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

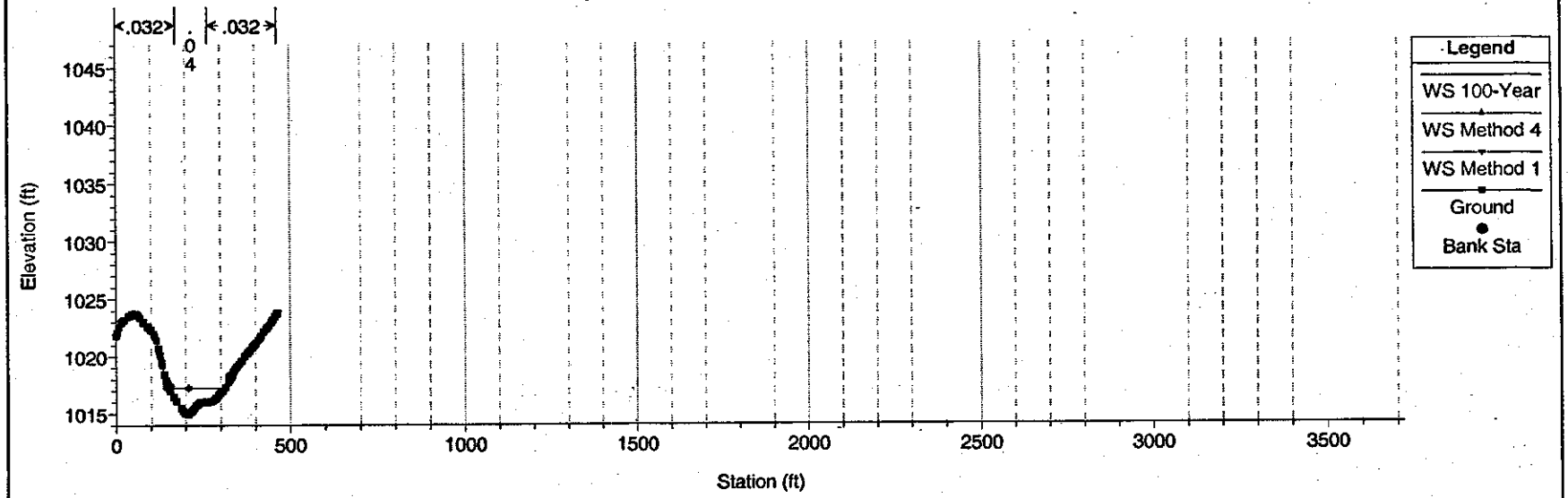
River = Tributary 1E1 Reach = Reach 1 RS = 1.358 Thalweg Sta. 315.34



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

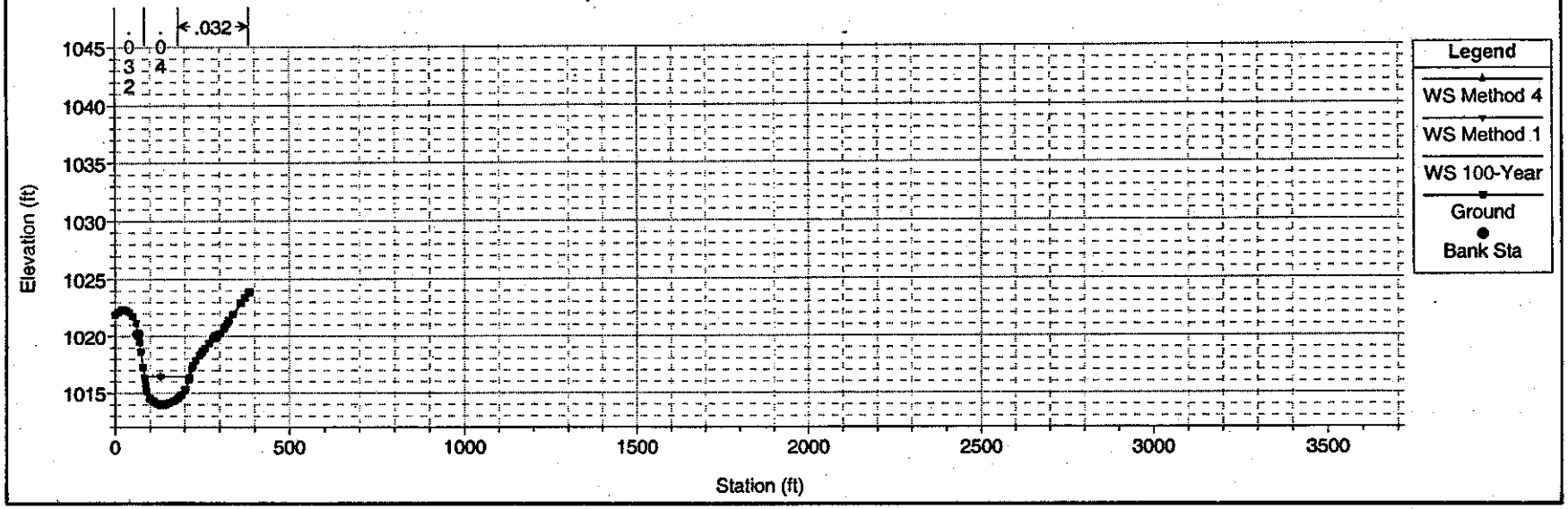
Hassayampa Trib 1E Floodplain Deli · Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 1.321 Thalweg Sta. 208.23



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

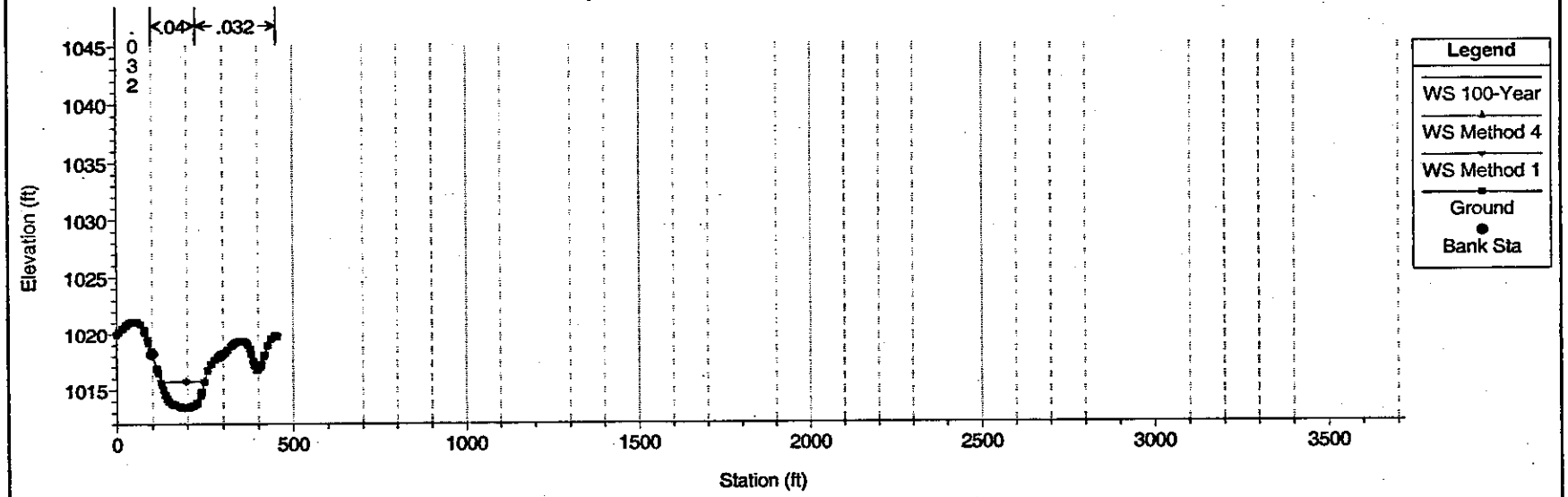
River = Tributary 1E1 Reach = Reach 1 RS = 1.283 Thalweg Sta. 136.93



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

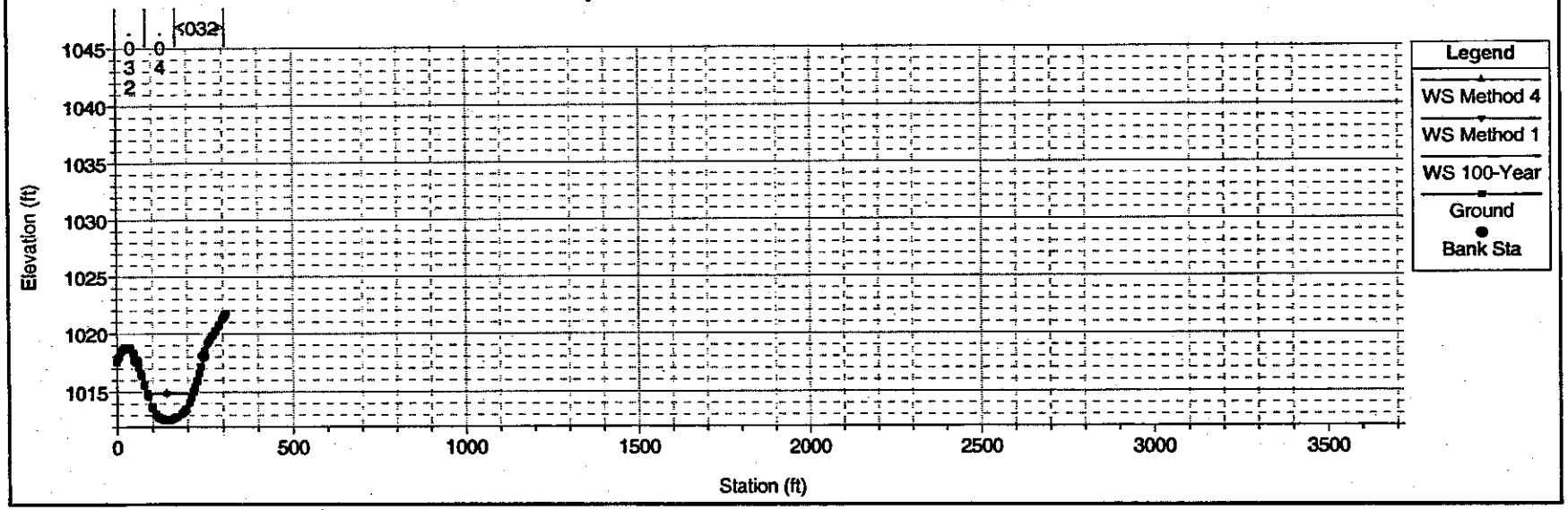
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 1.245 Thalweg Sta. 116.71



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

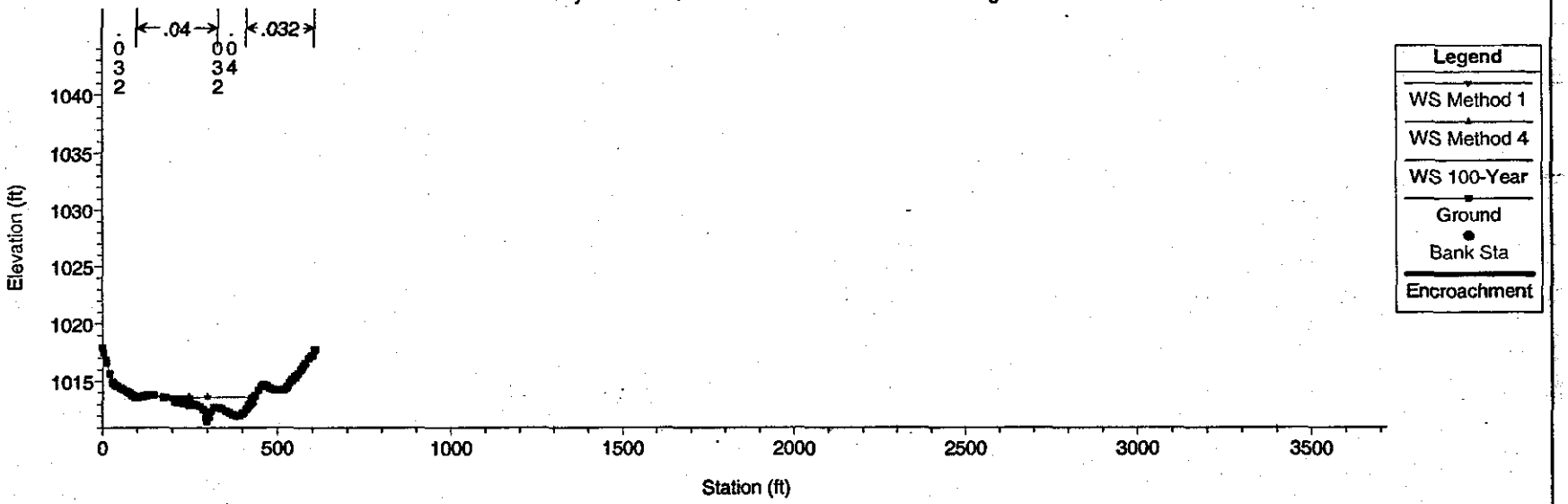
River = Tributary 1E1 Reach = Reach 1 RS = 1.207 Thalweg Sta. 140.43



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

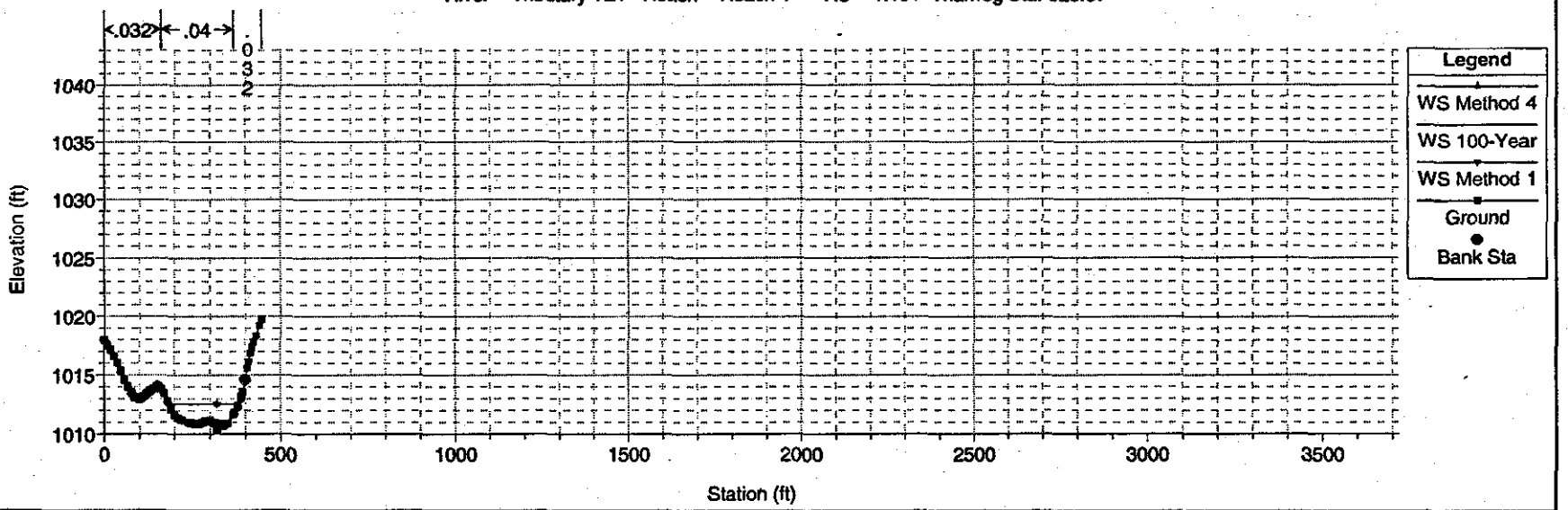
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 1.169 Thalweg Sta. 361.91

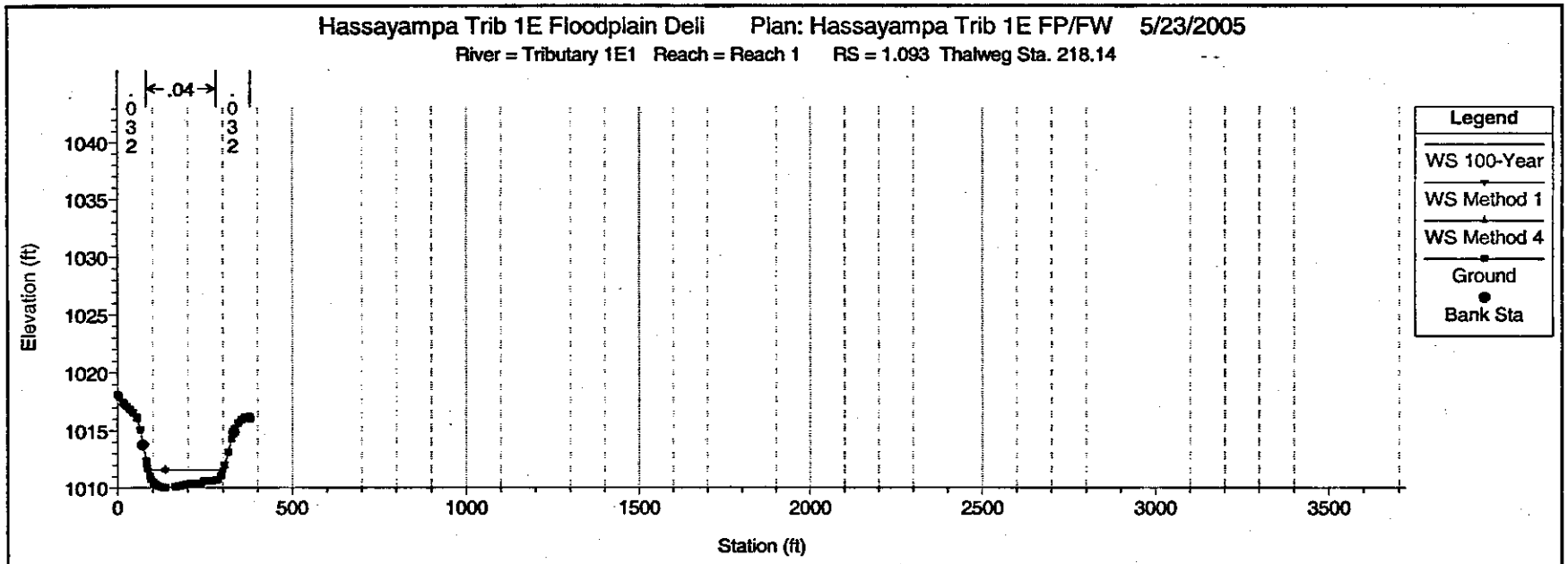


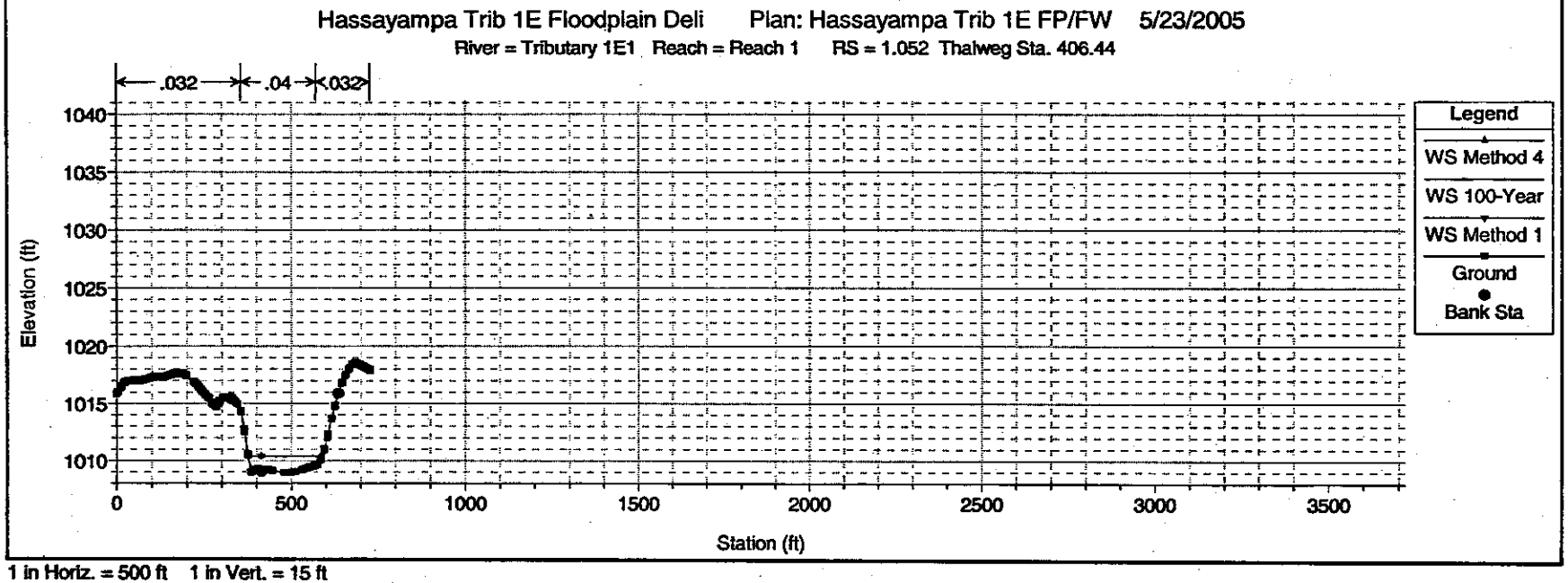
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 1.131 Thalweg Sta. 328.87

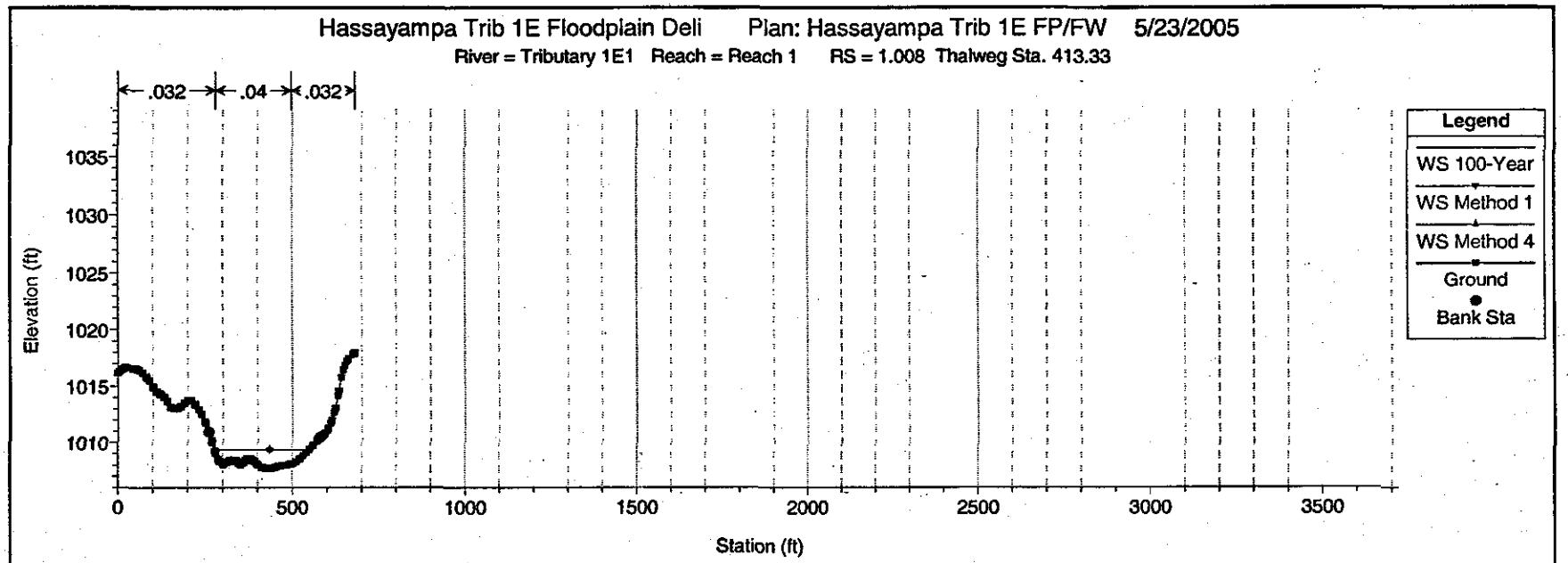


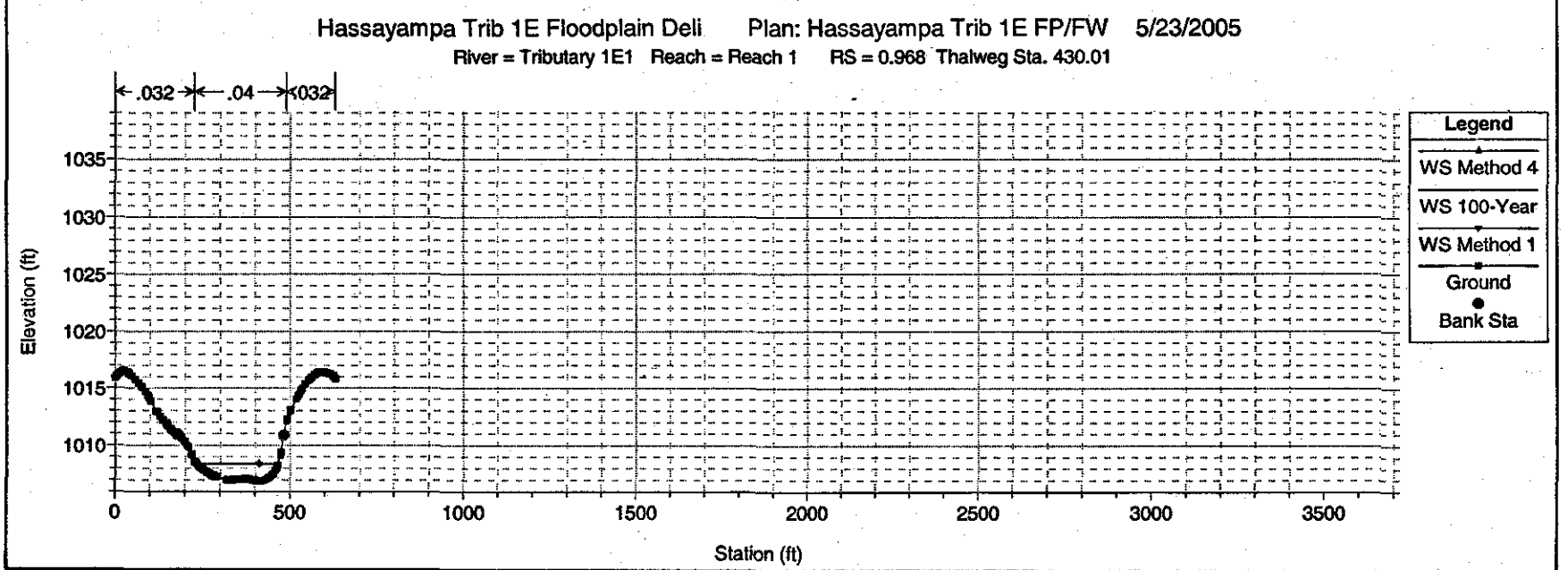
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft

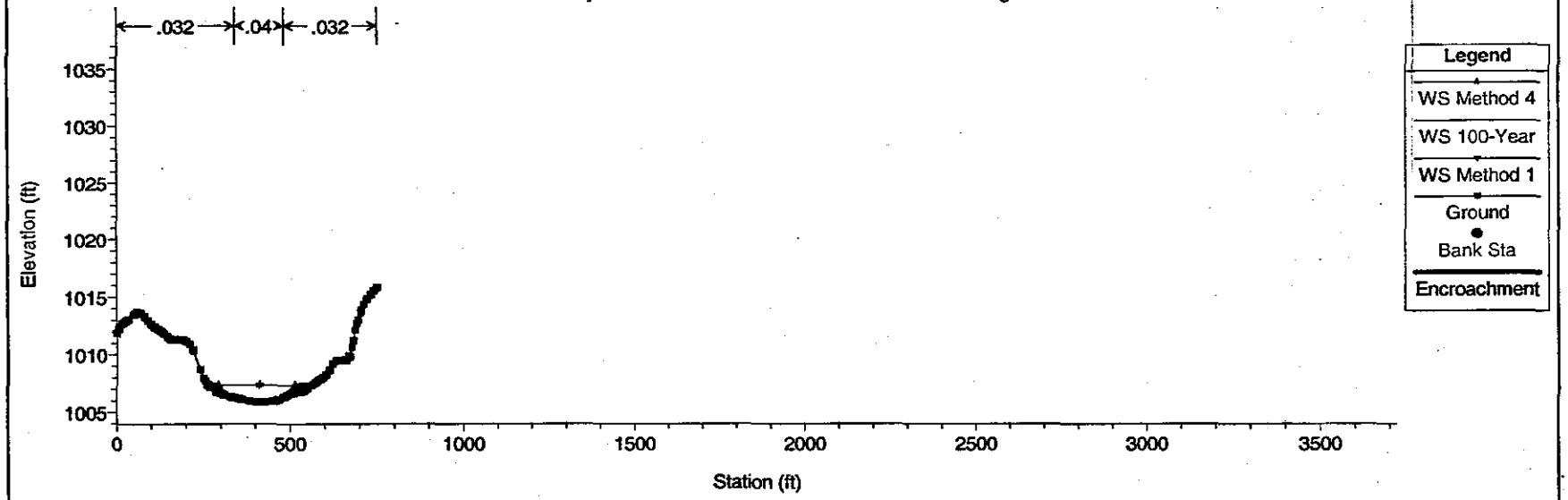




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

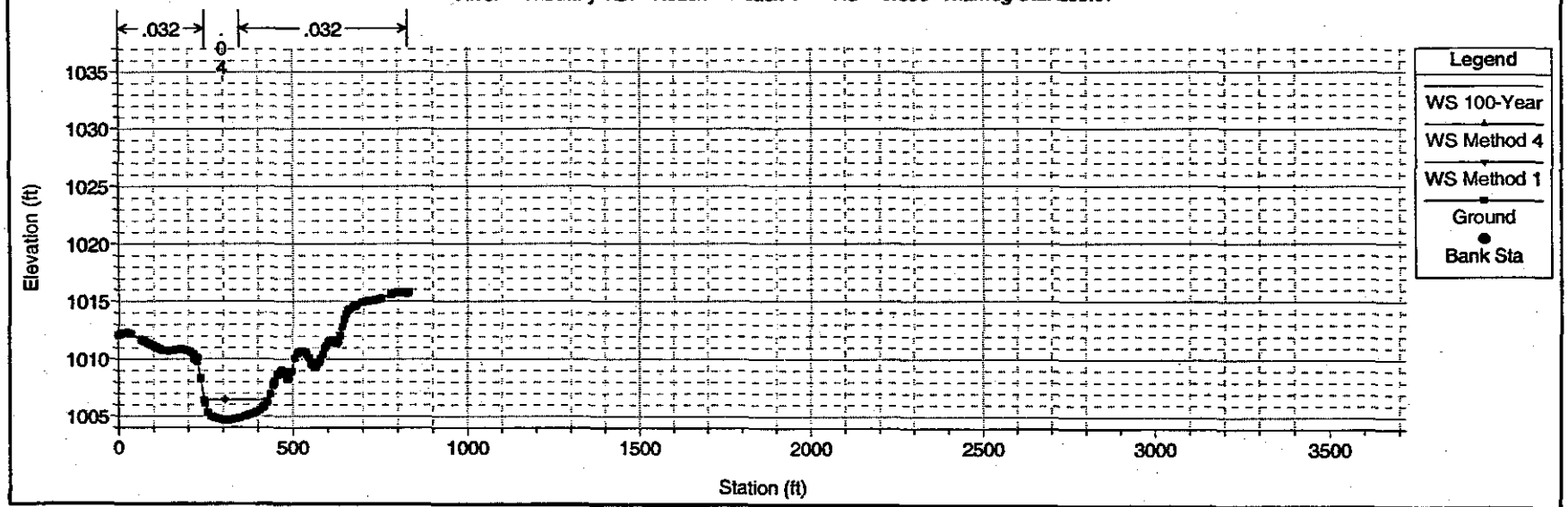
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 0.929 Thalweg Sta. 310.07



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

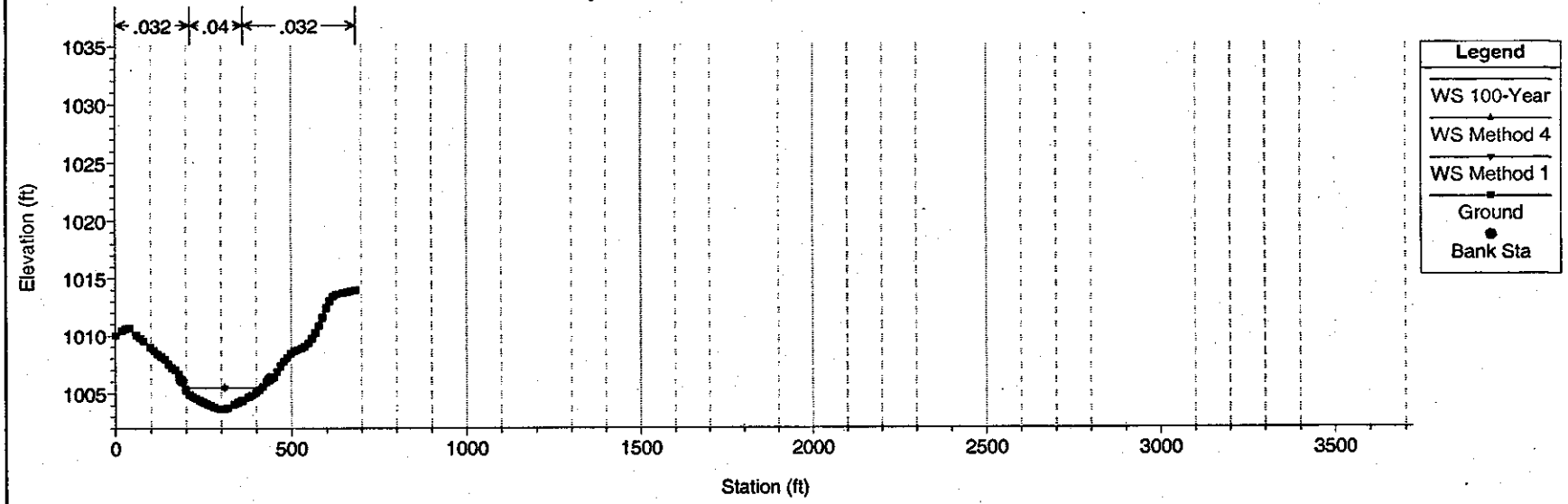
River = Tributary 1E1 Reach = Reach 1 RS = 0.890 Thalweg Sta. 295.97



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

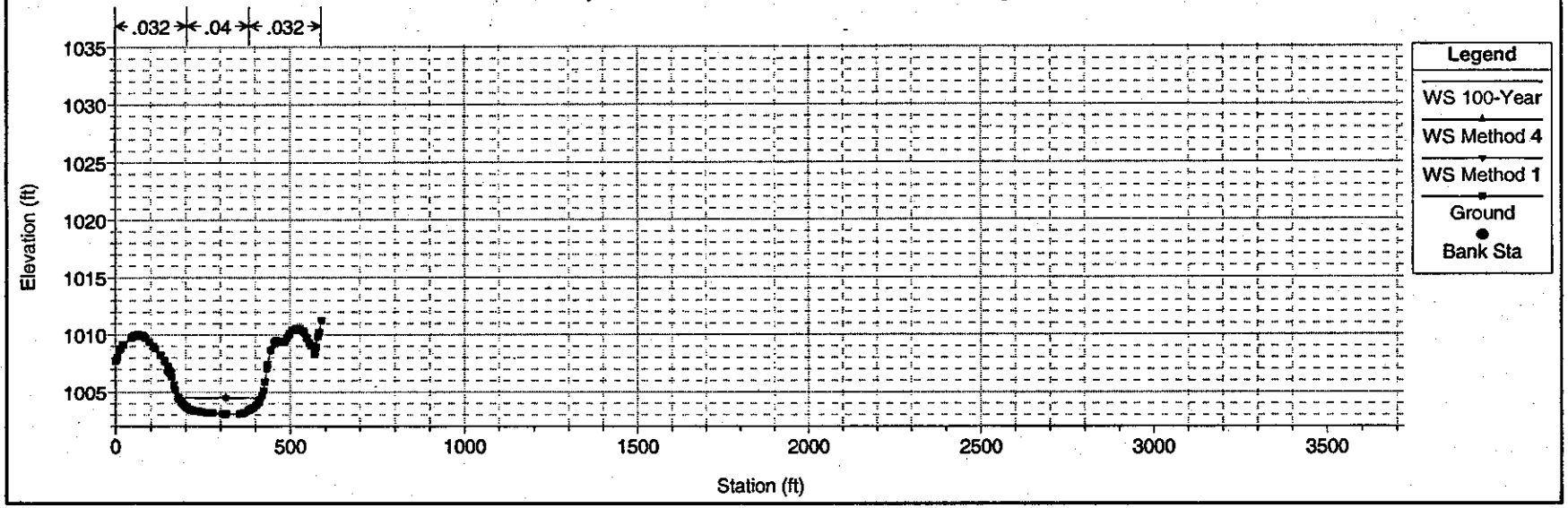
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 0.852 Thalweg Sta. 319.17



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

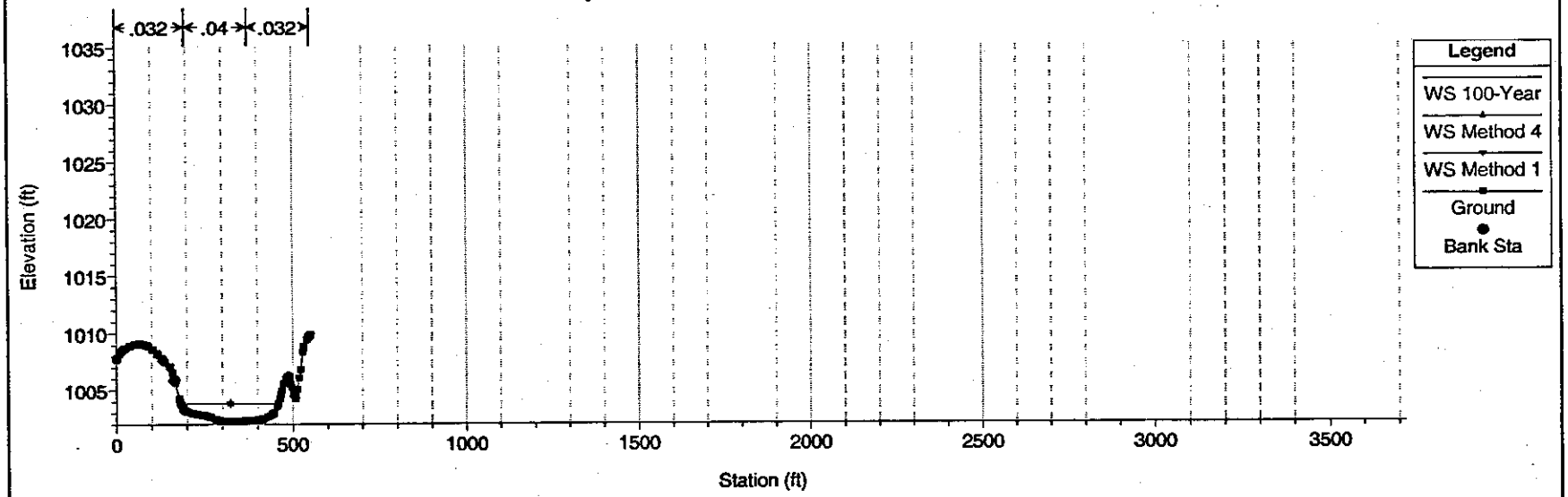
River = Tributary 1E1 Reach = Reach 1 RS = 0.814 Thalweg Sta. 314.90



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

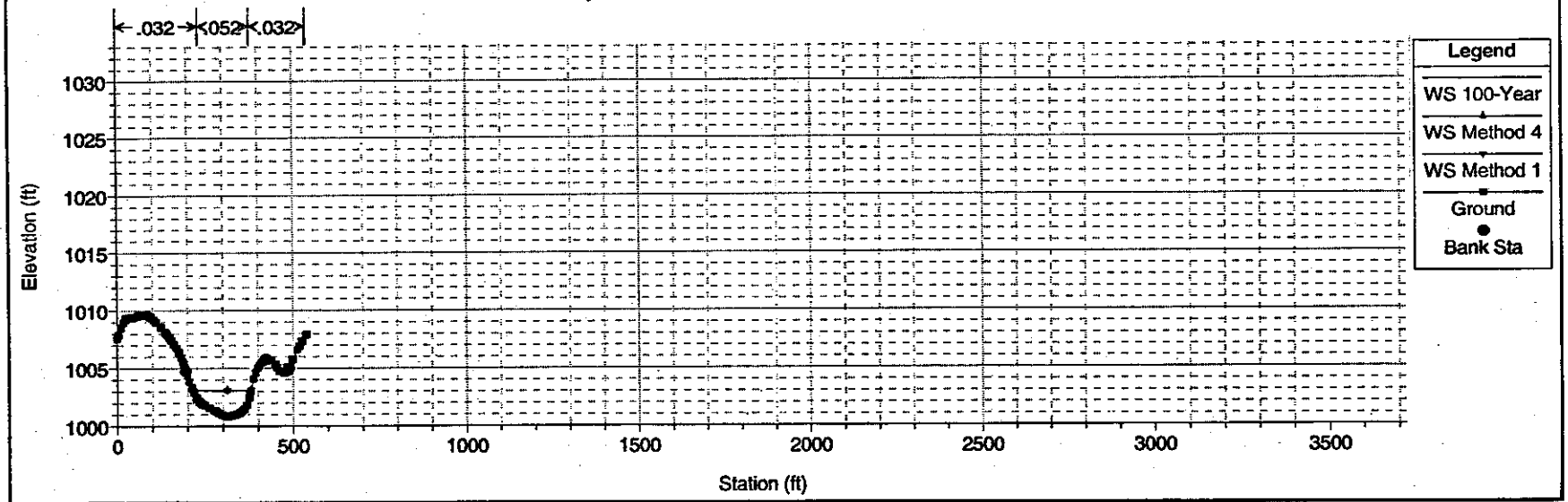
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 0.777 Thalweg Sta. 315.28

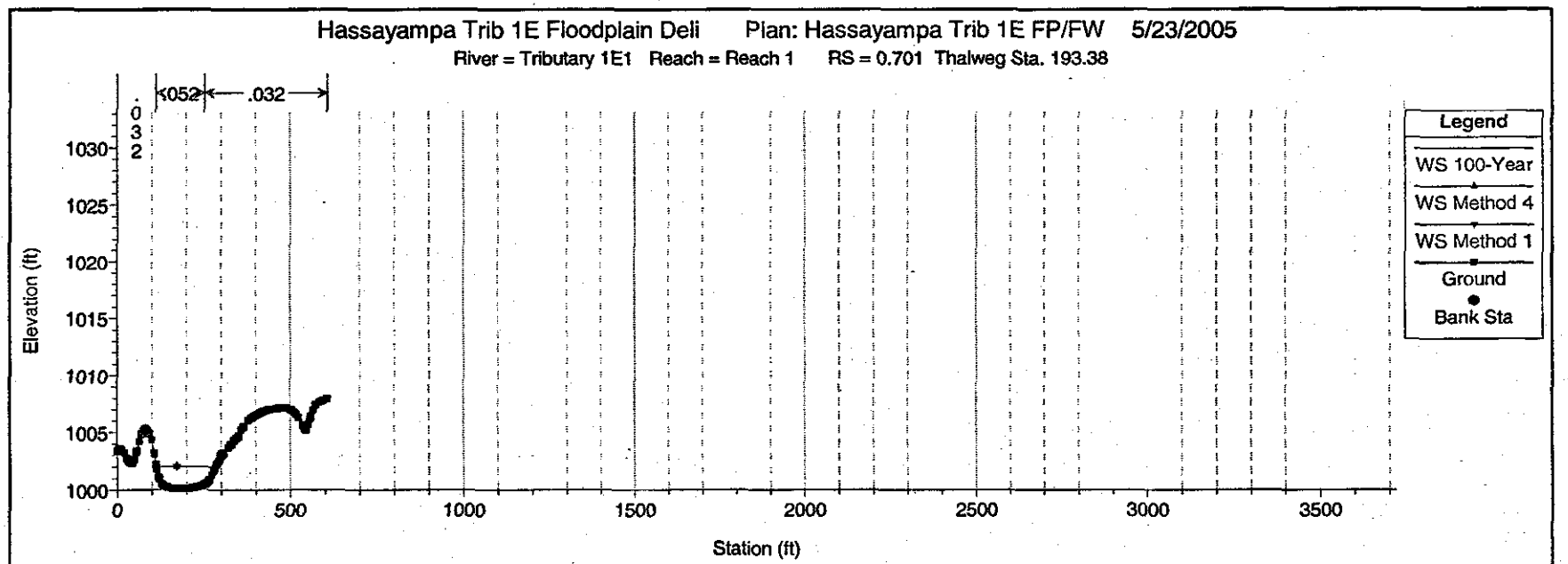


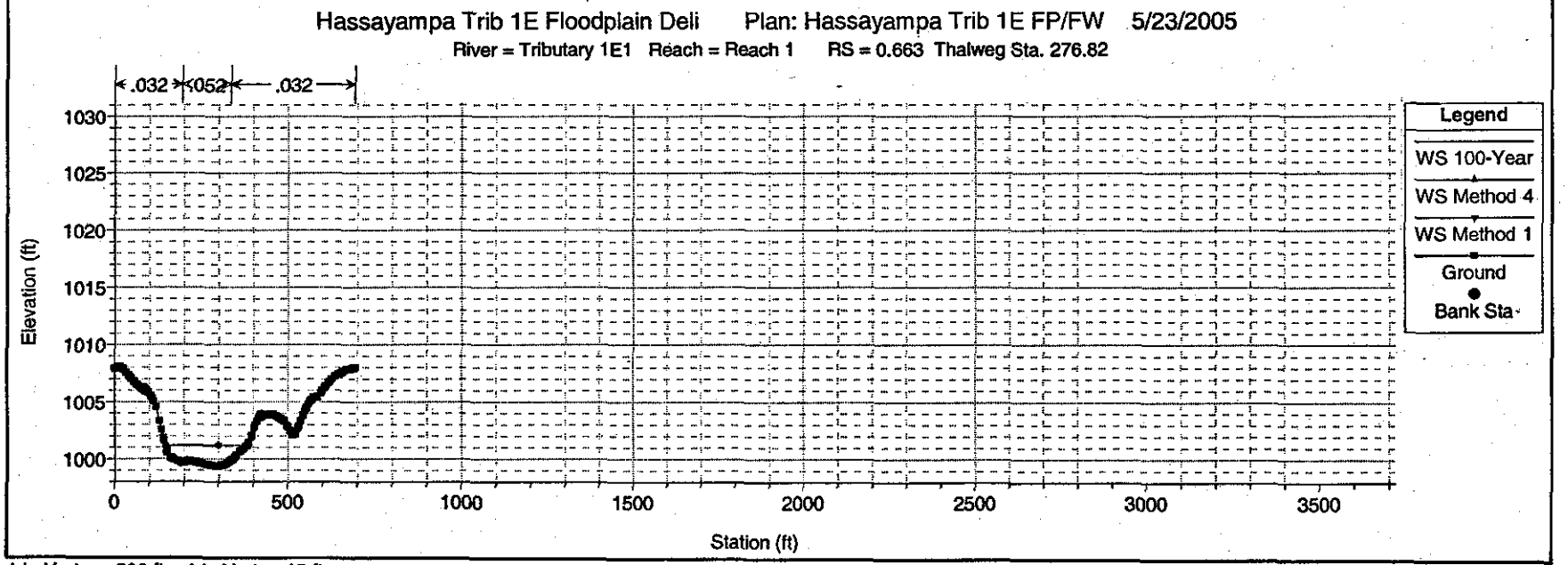
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 0.739 Thalweg Sta. 310.88

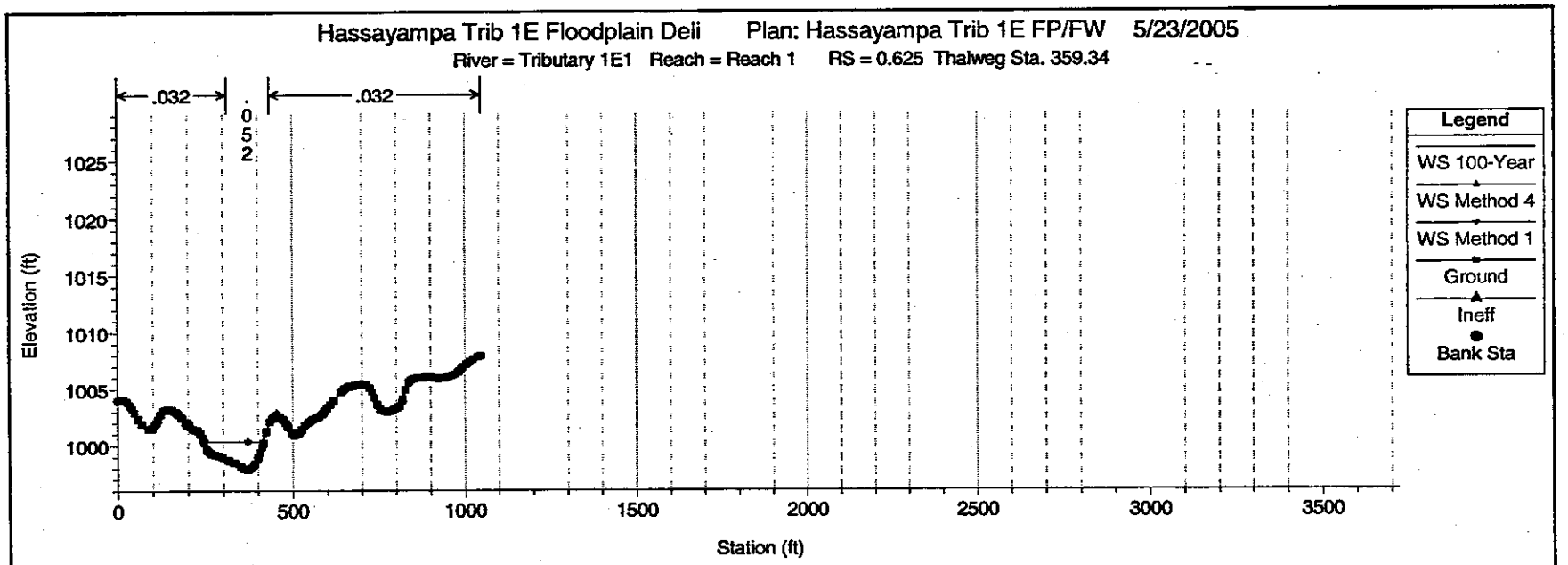


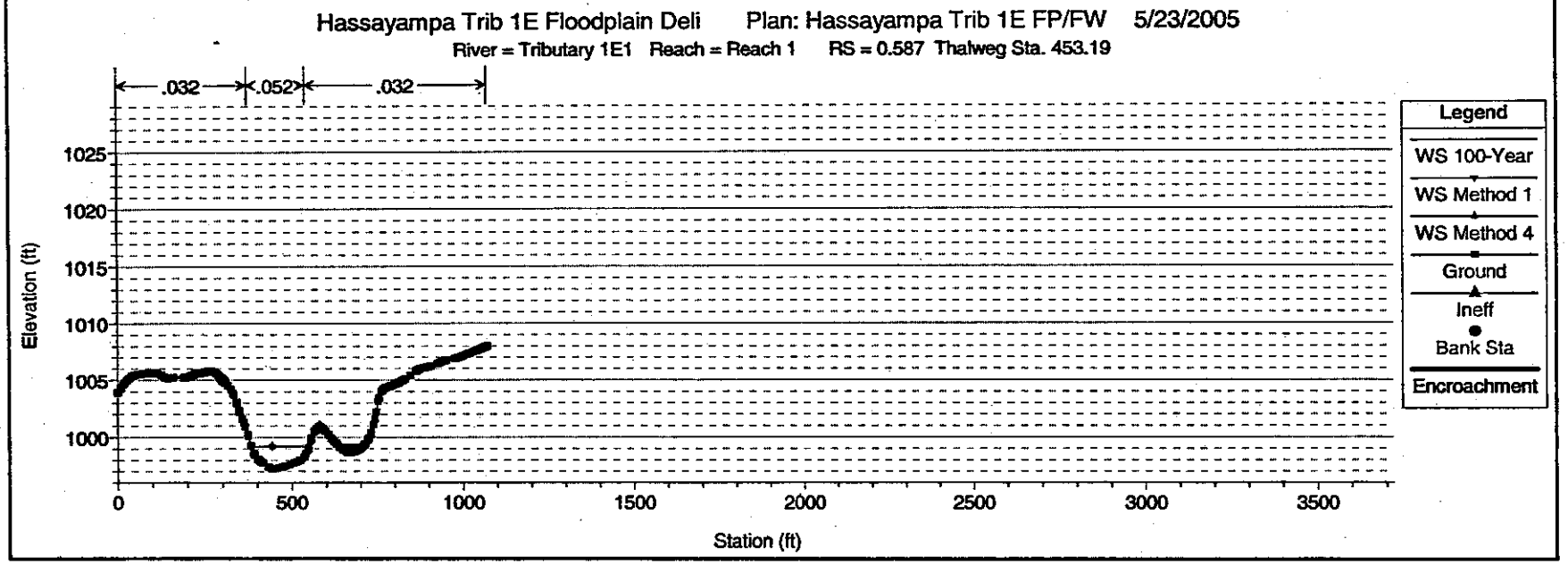
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



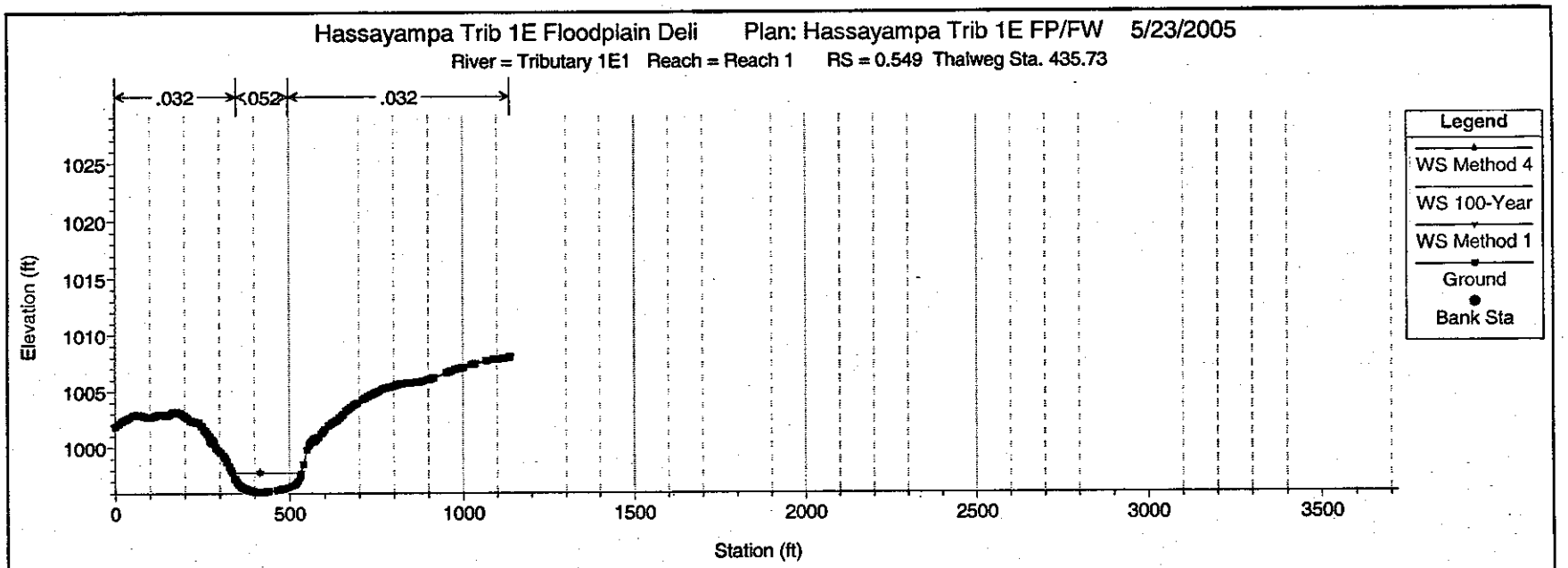


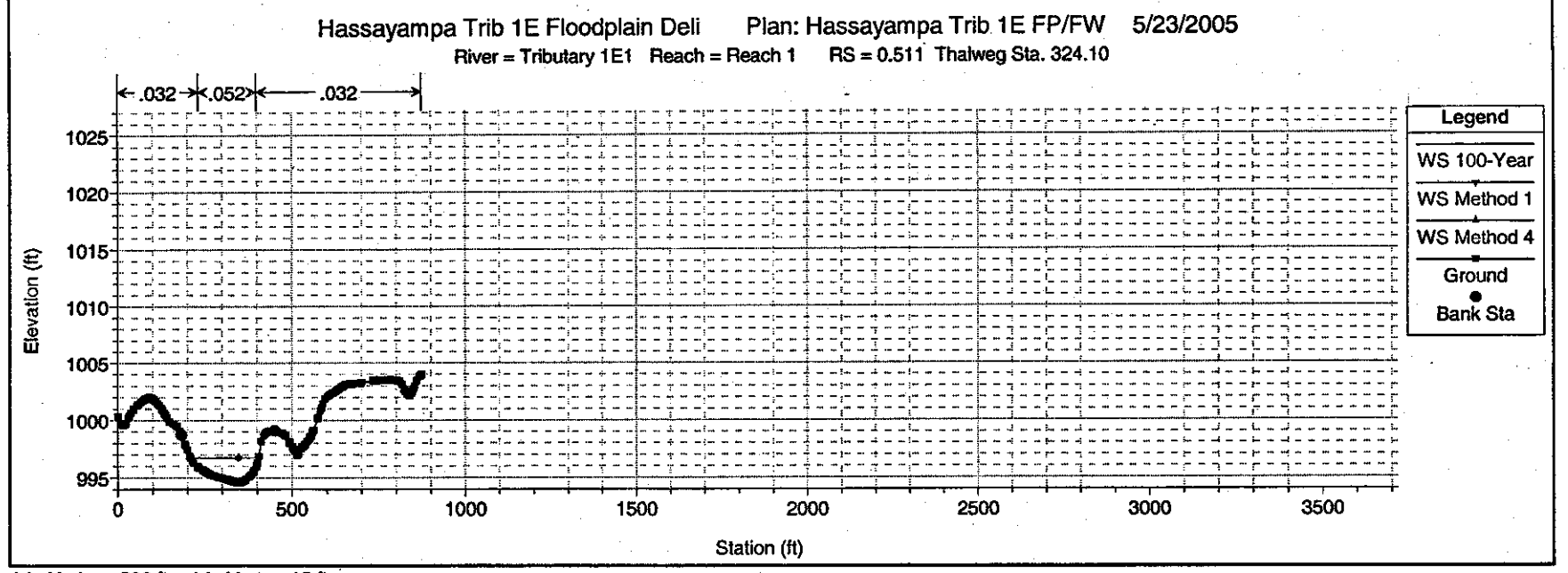
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





1 in Horiz. = 500 ft 1 in Vert. = 15 ft

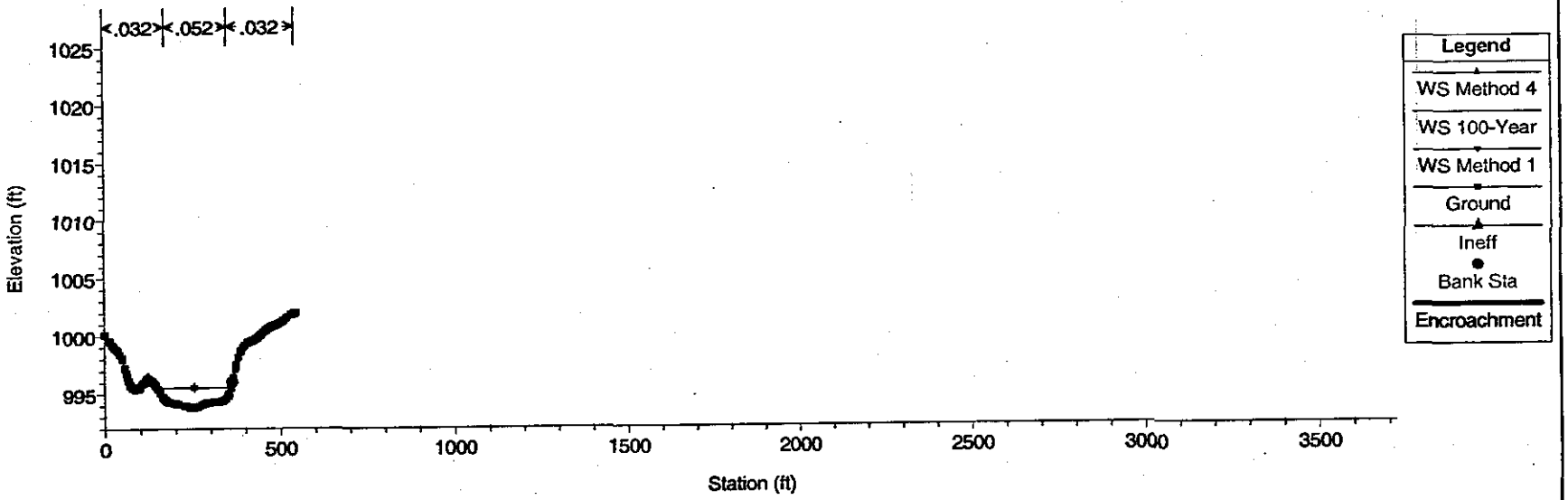




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

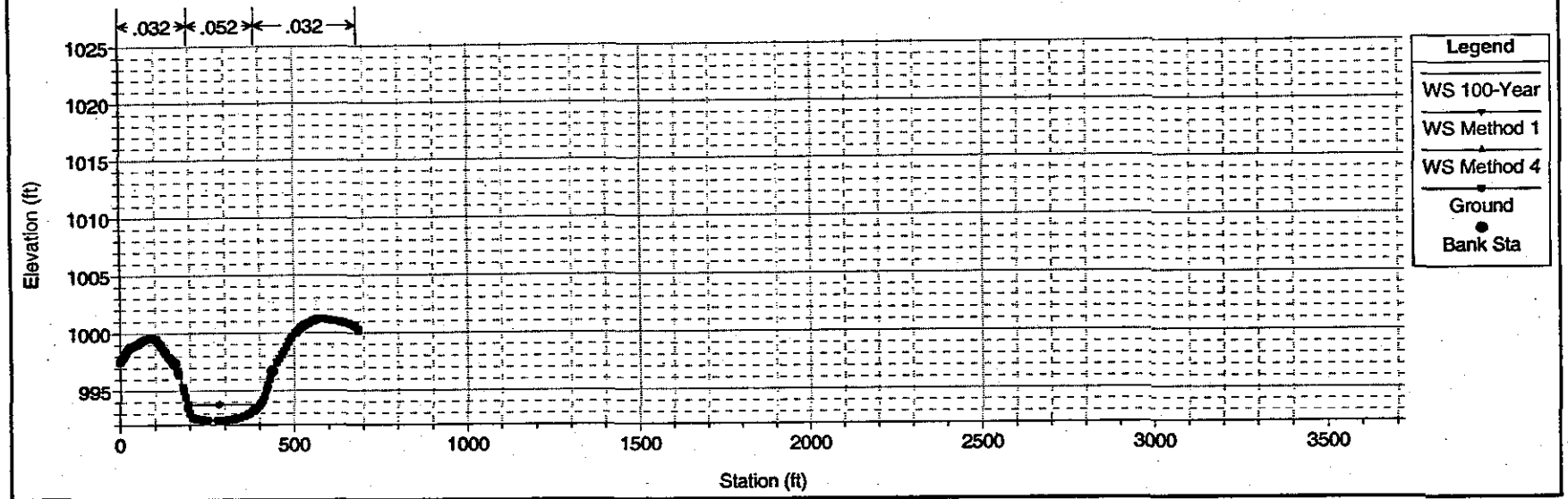
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 0.474 Thalweg Sta. 264.96



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

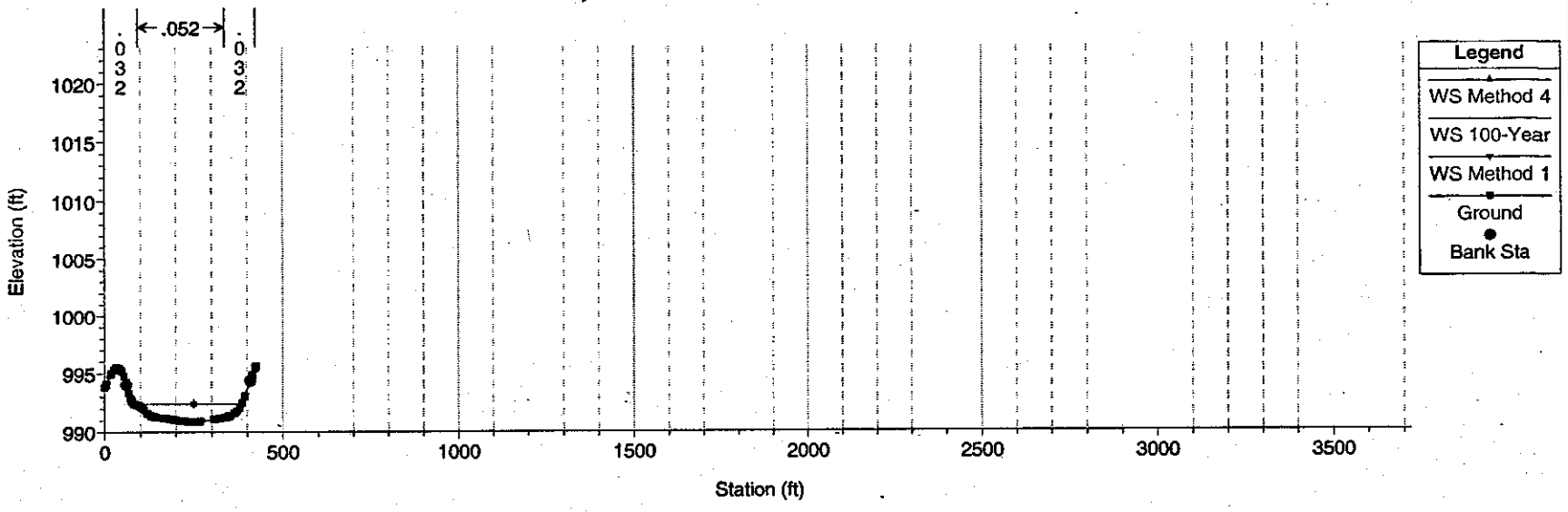
River = Tributary 1E1 Reach = Reach 1 RS = 0.436 Thalweg Sta. 312.93



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

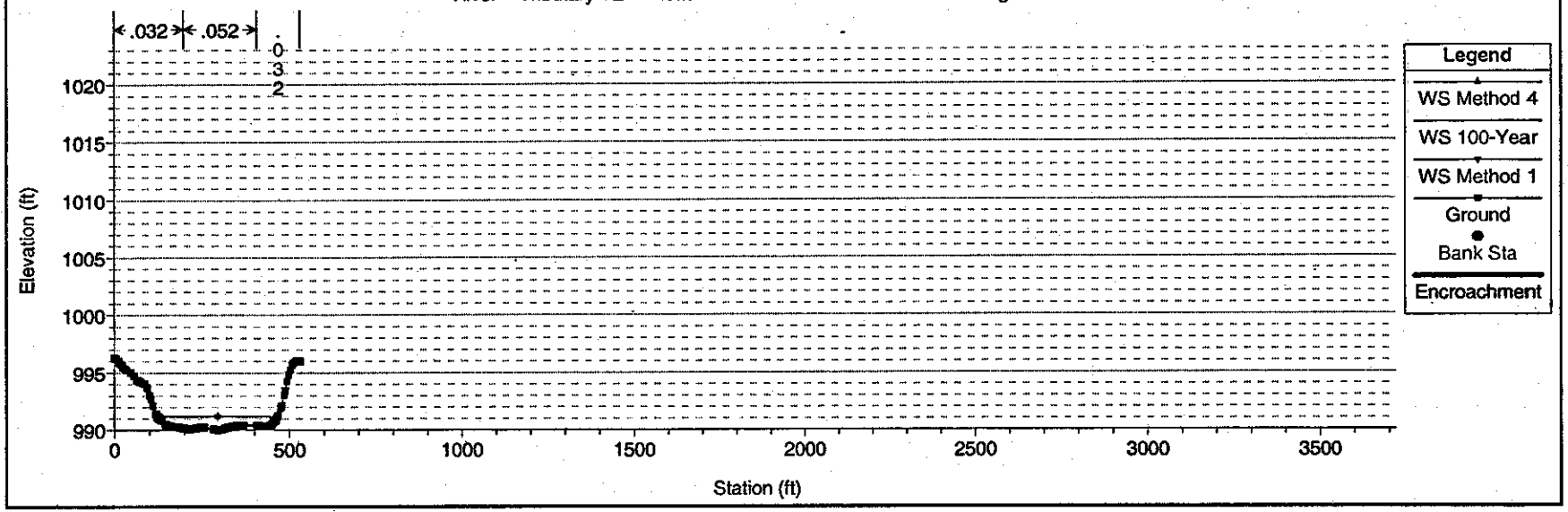
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 0.398 Thalweg Sta. 226.53



Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

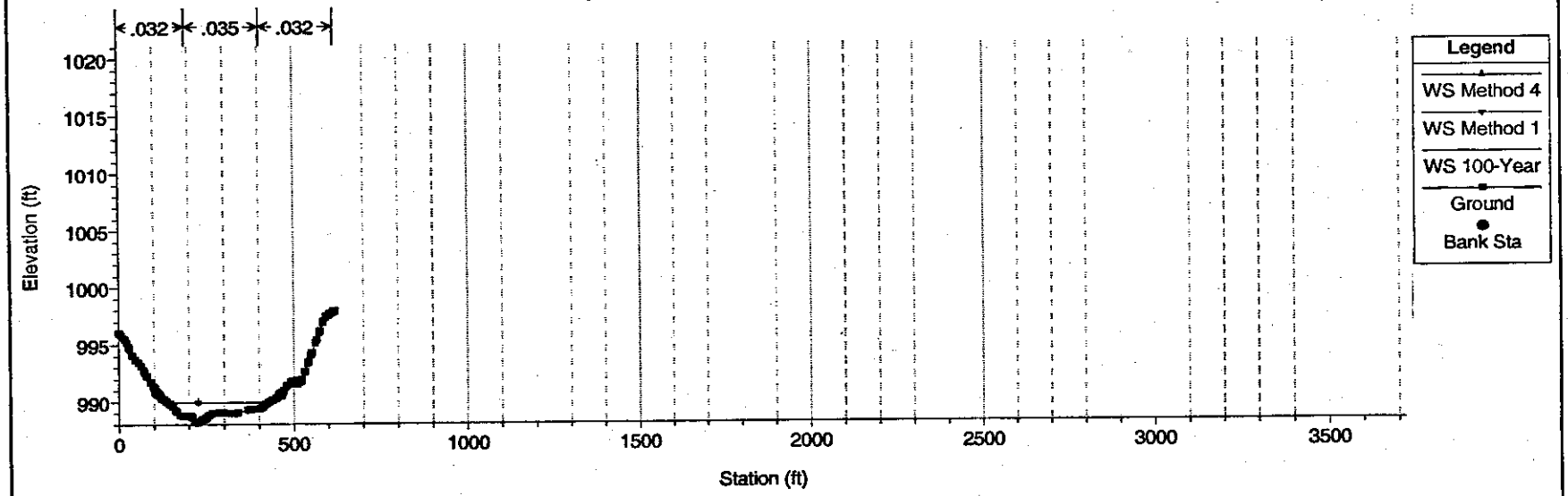
River = Tributary 1E1 Reach = Reach 1 RS = 0.359 Thalweg Sta. 283.14



1 in Horiz. = 500 ft 1 in Vert. = 15 ft

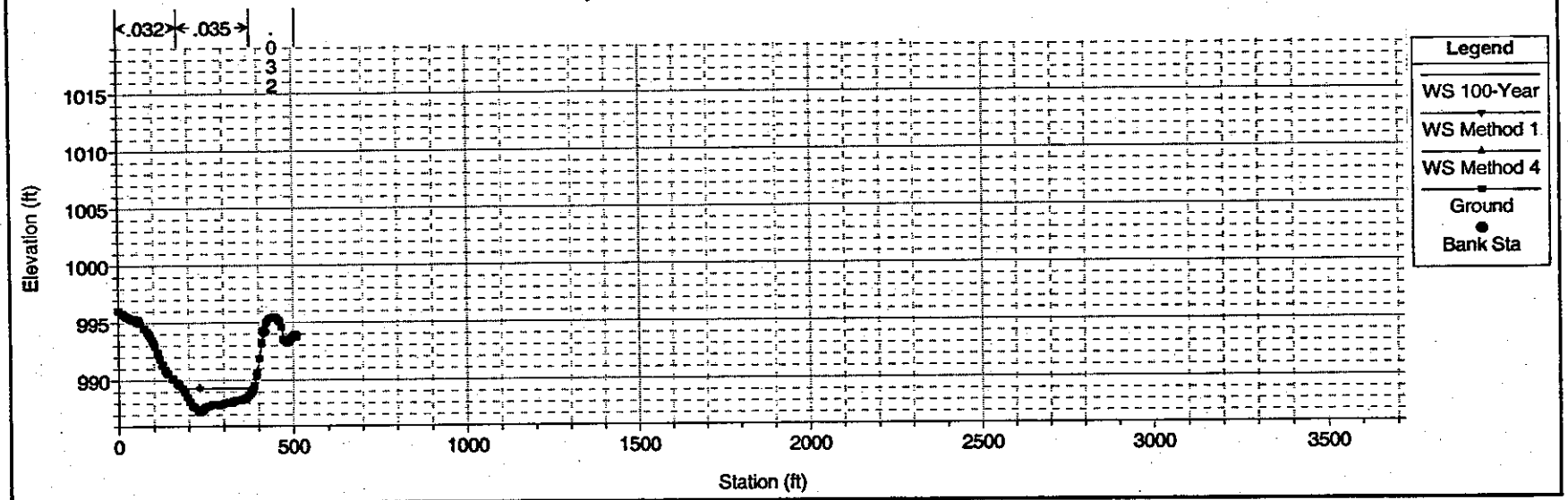
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 0.319 Thalweg Sta. 215.76

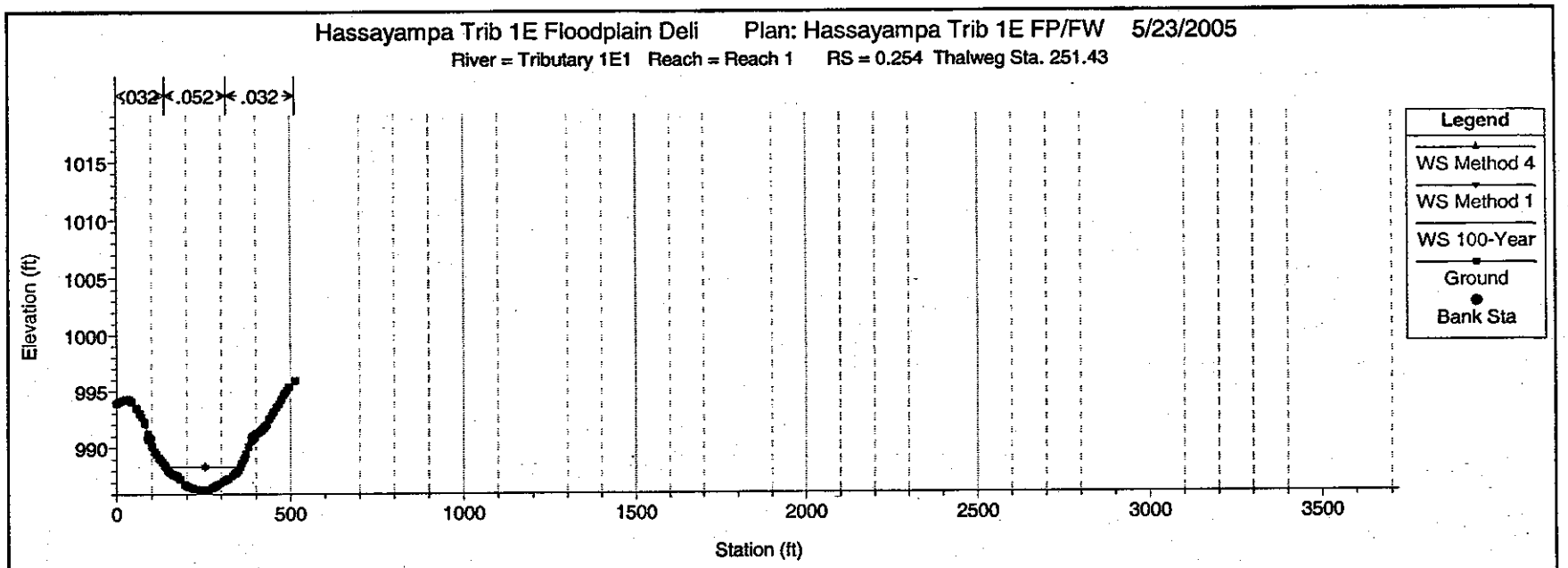


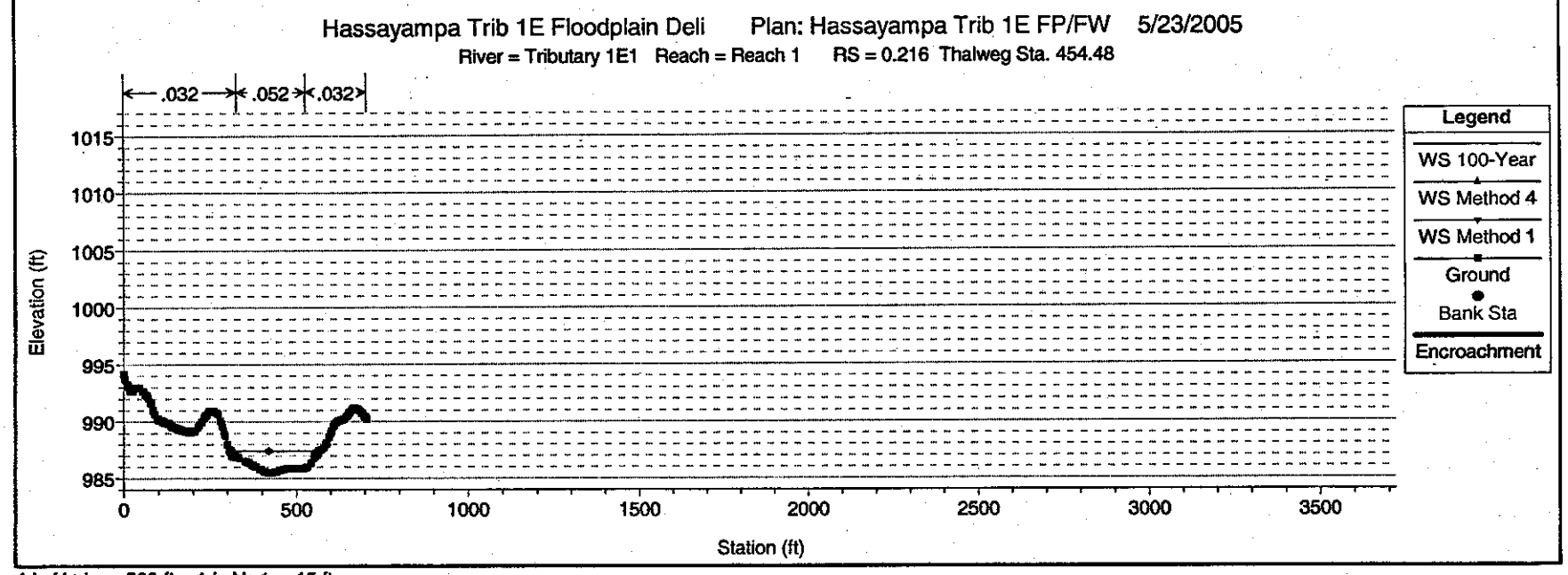
Hassayampa Trib 1E Floodplain Deli Plan: Hassayampa Trib 1E FP/FW 5/23/2005

River = Tributary 1E1 Reach = Reach 1 RS = 0.293 Thalweg Sta. 230.90

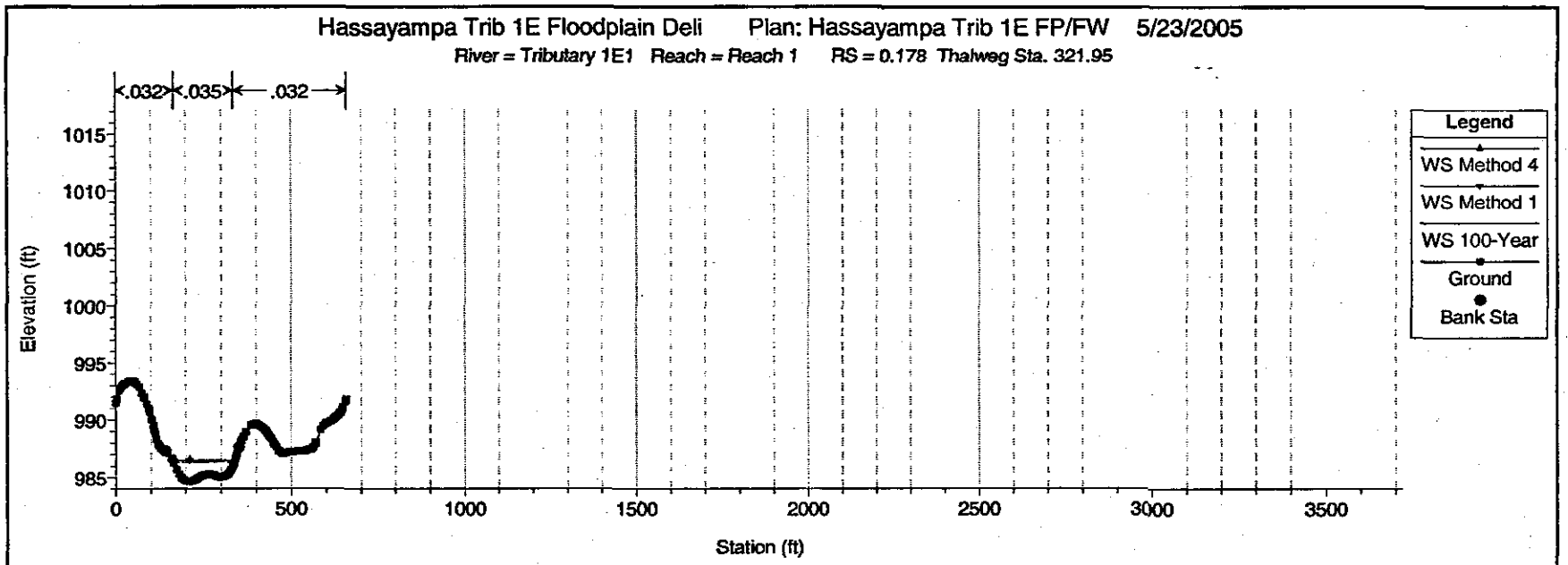


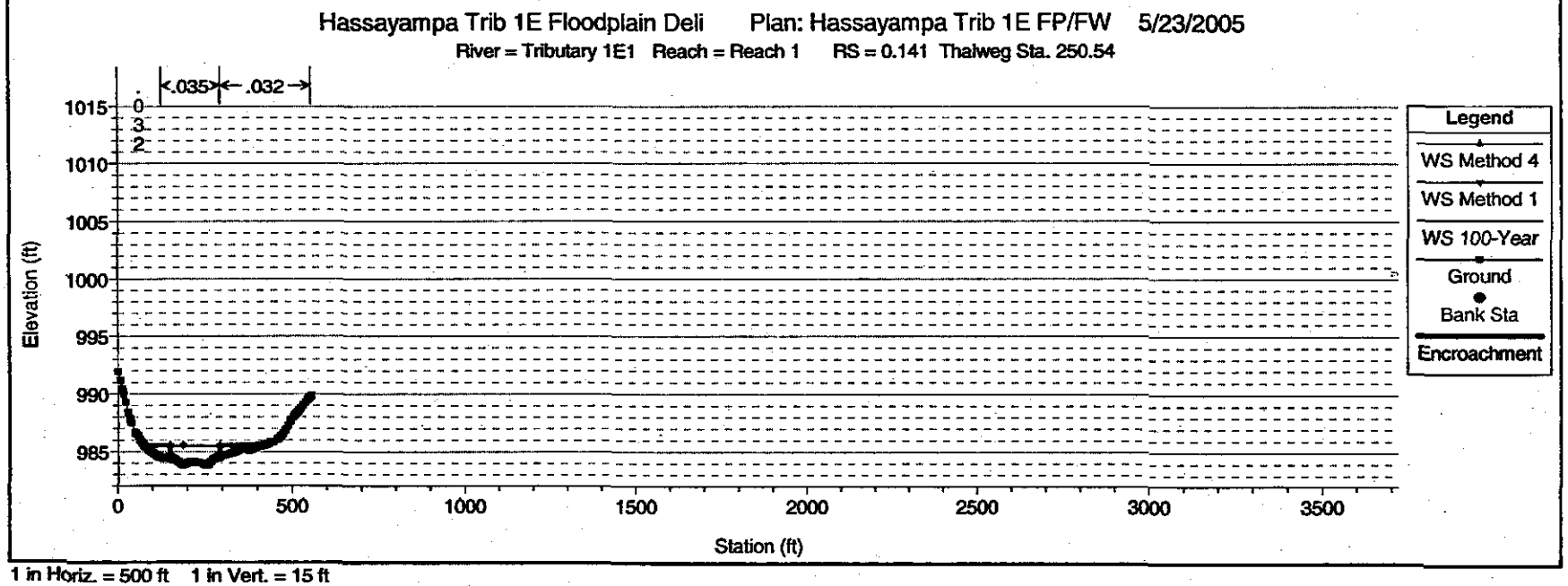
1 in Horiz. = 500 ft 1 in Vert. = 15 ft



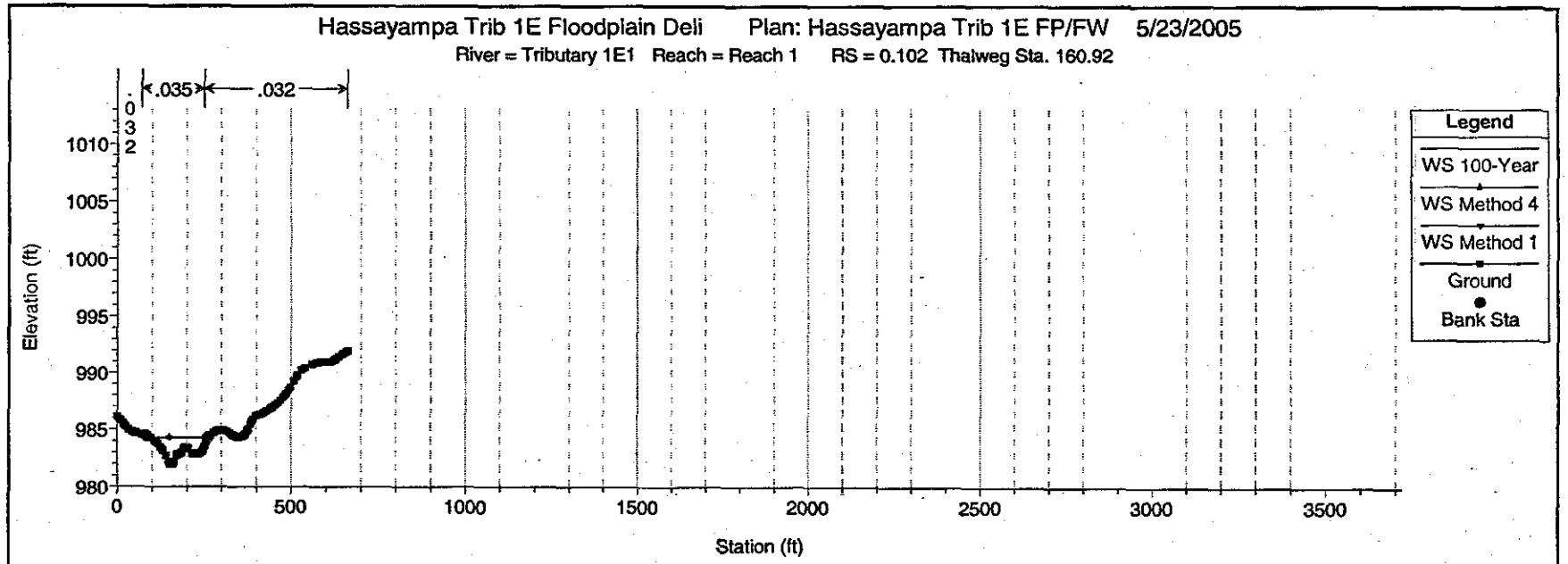


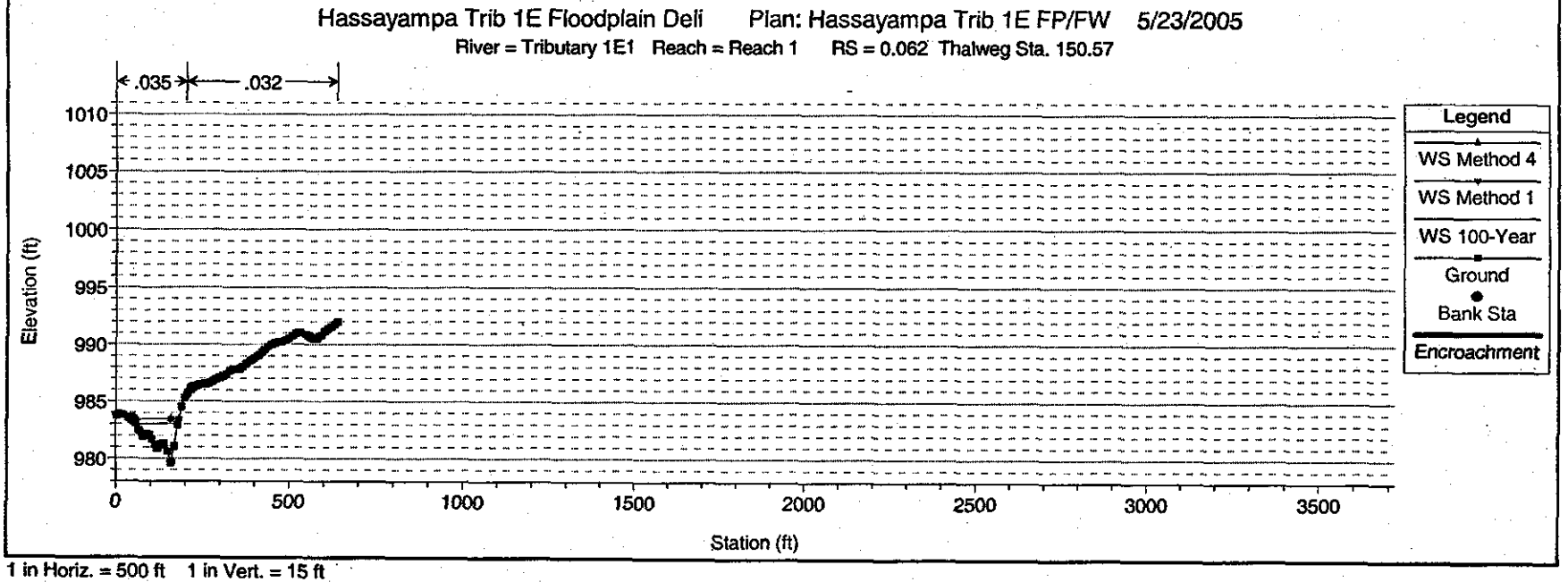
1 in Horiz. = 500 ft 1 in Vert. = 15 ft





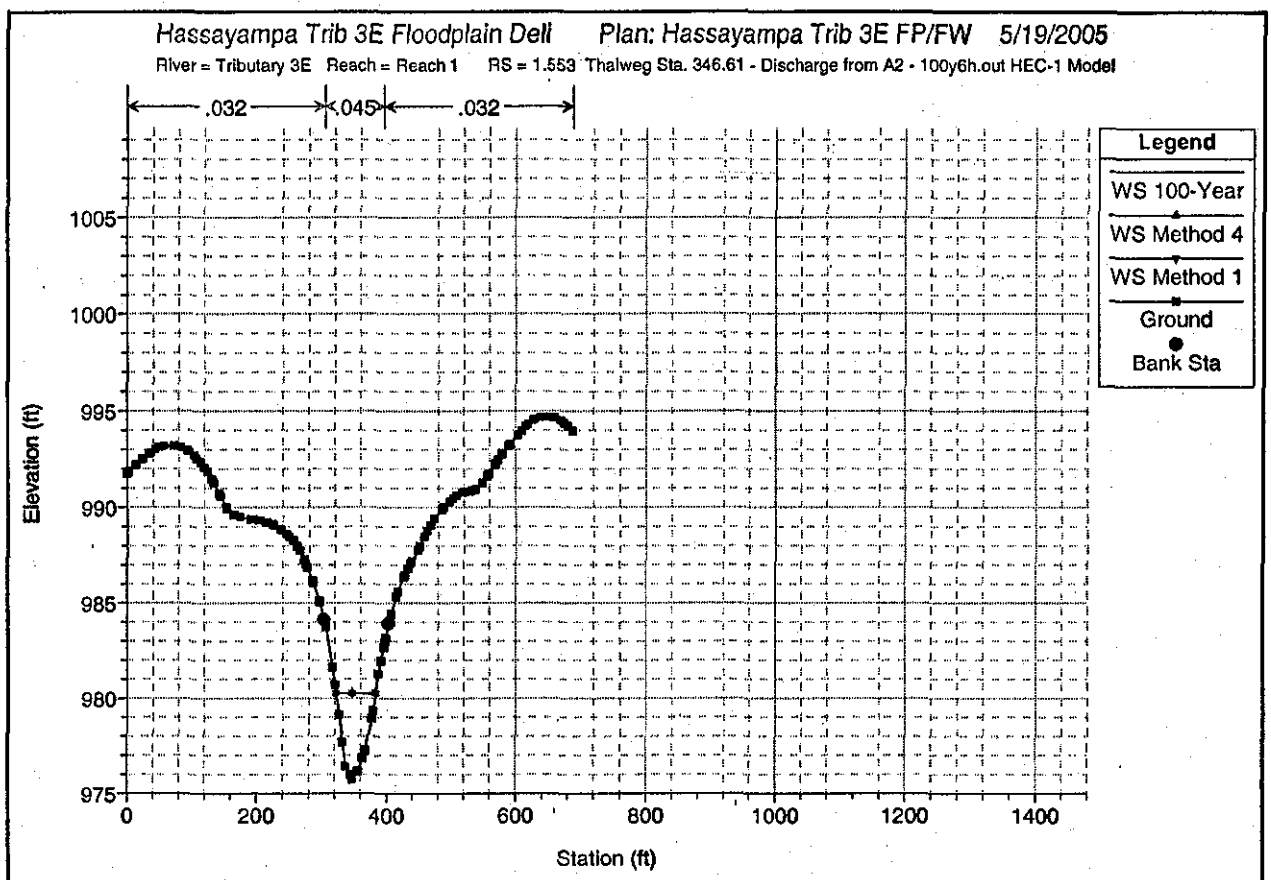
1 in Horiz. = 500 ft 1 in Vert. = 15 ft

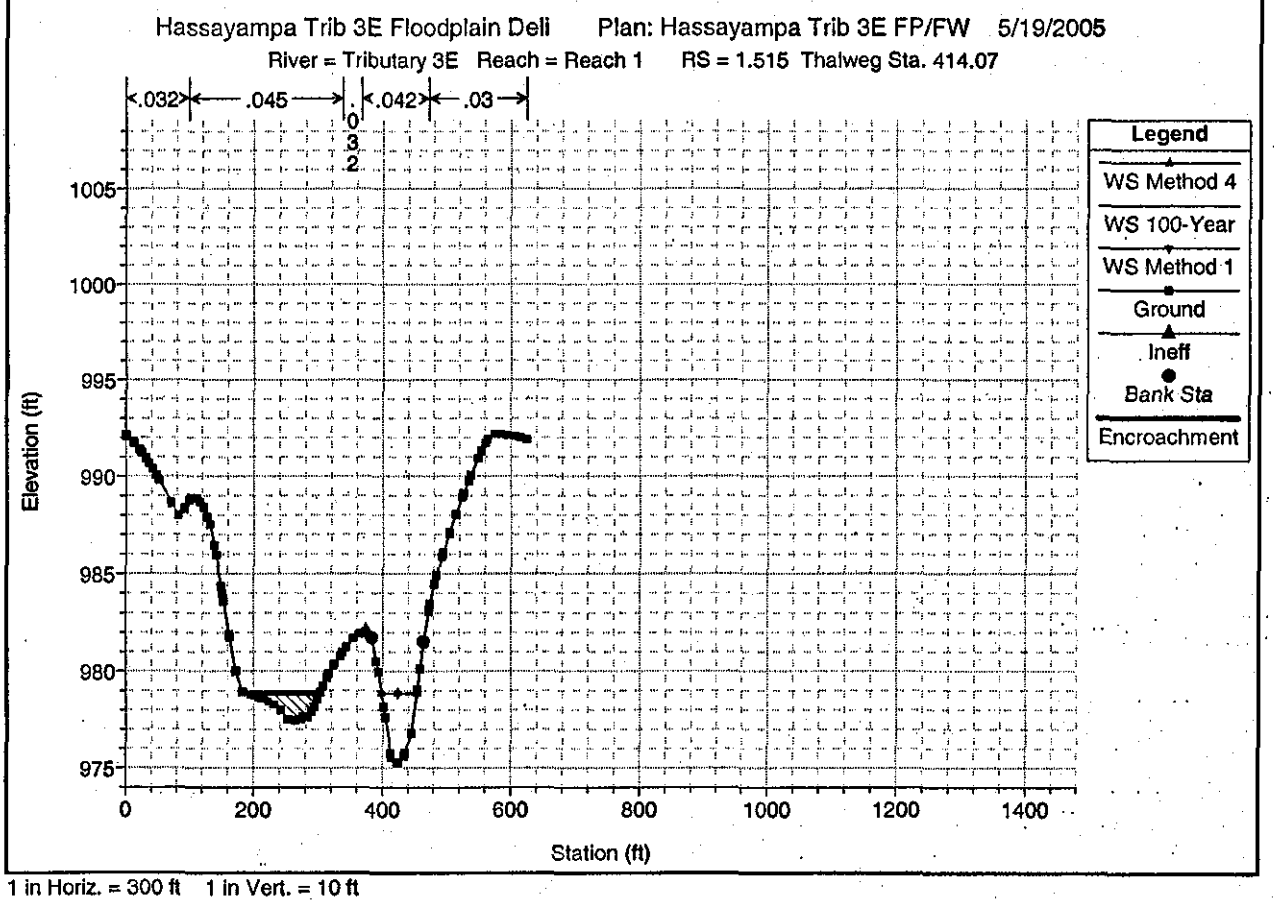




1 in Horiz. = 500 ft 1 in Vert. = 15 ft

3.2.2 Tributary 3E – All Reaches

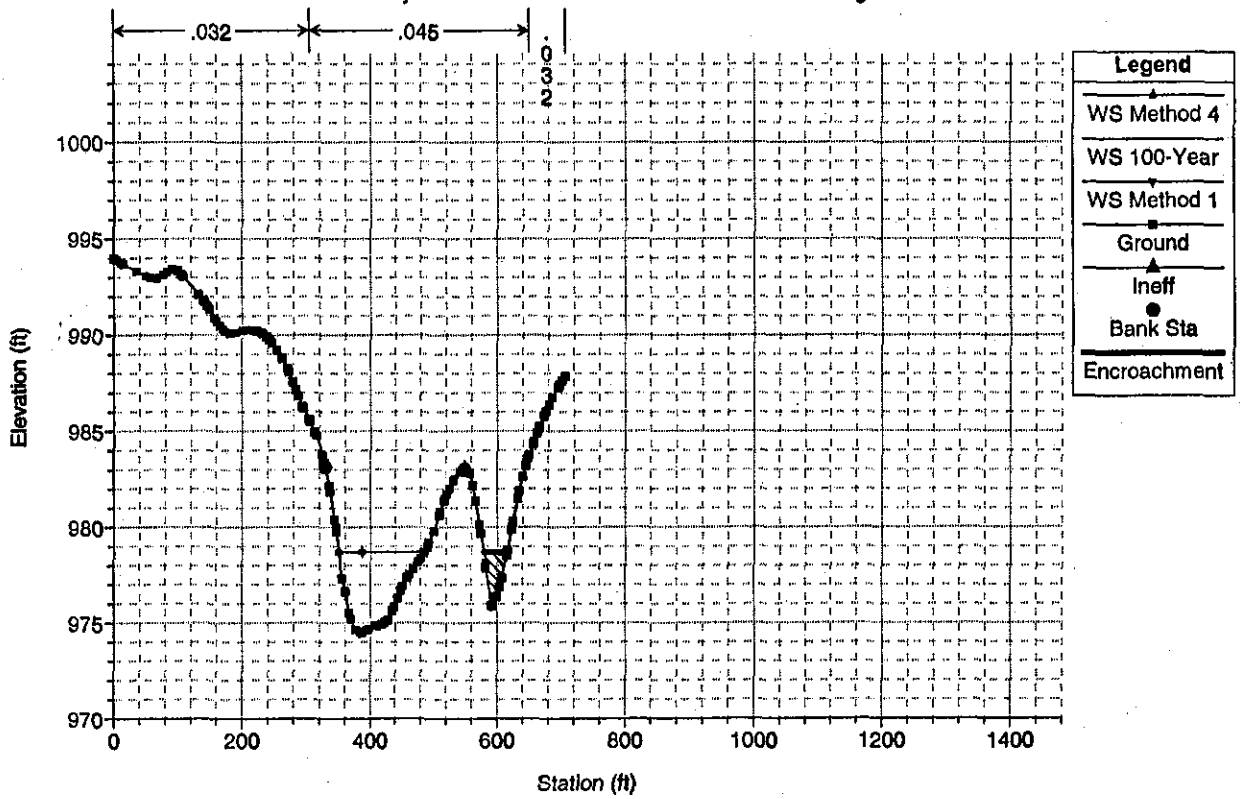




1 in Horiz. = 300 ft 1 in Vert. = 10 ft

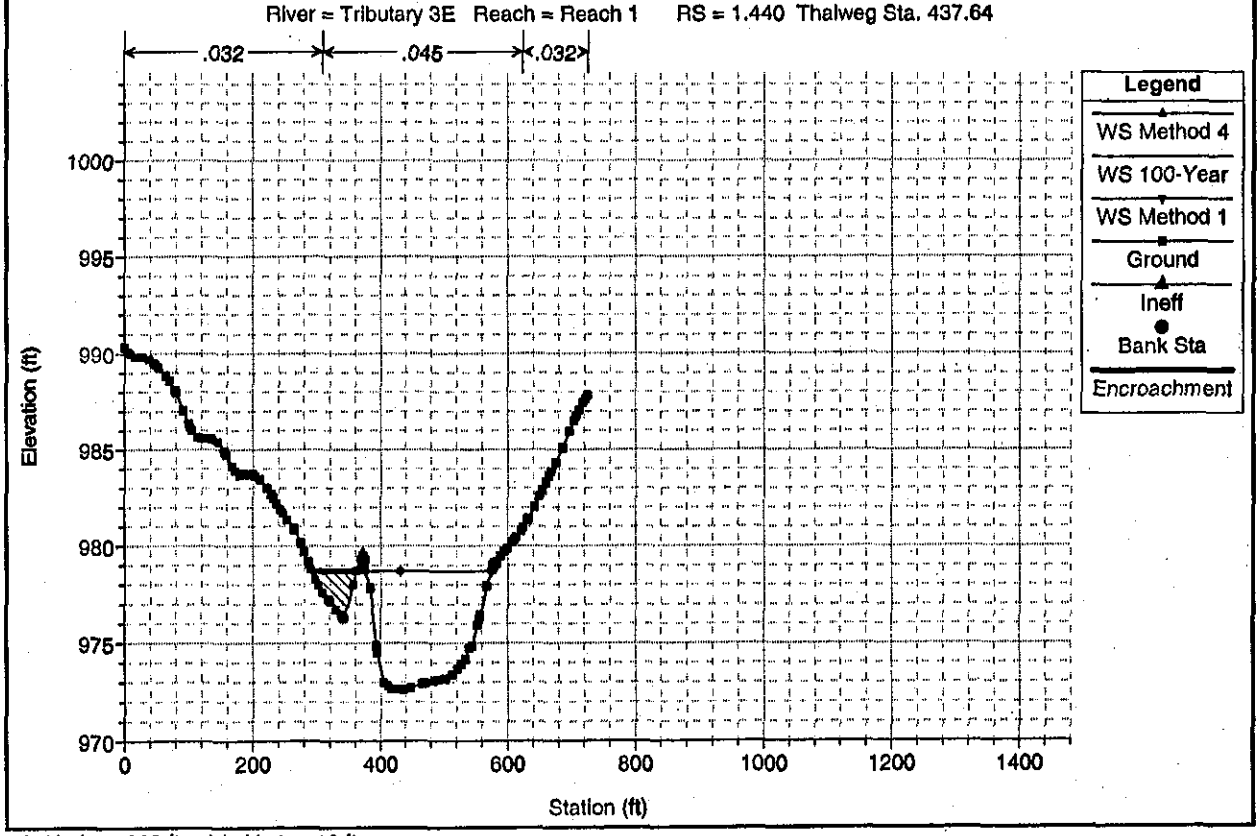
Hassayampa Trib 3E Floodplain Dell Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 1.478 Thalweg Sta. 418.11



Hassayampa Trib 3E Floodplain Dell Plan: Hassayampa Trib 3E FP/FW 5/19/2005

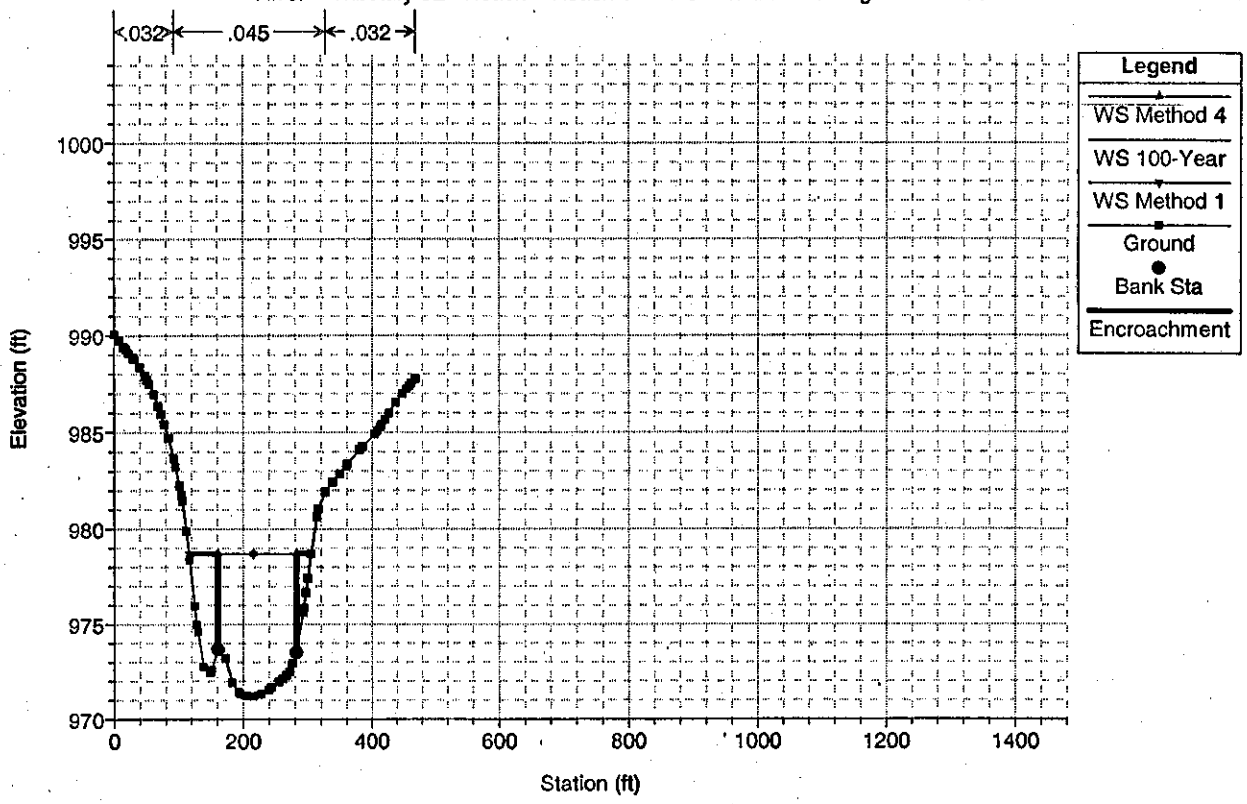
River = Tributary 3E Reach = Reach 1 RS = 1.440 Thalweg Sta. 437.64



1 in Horiz. = 300 ft 1 in Vert. = 10 ft

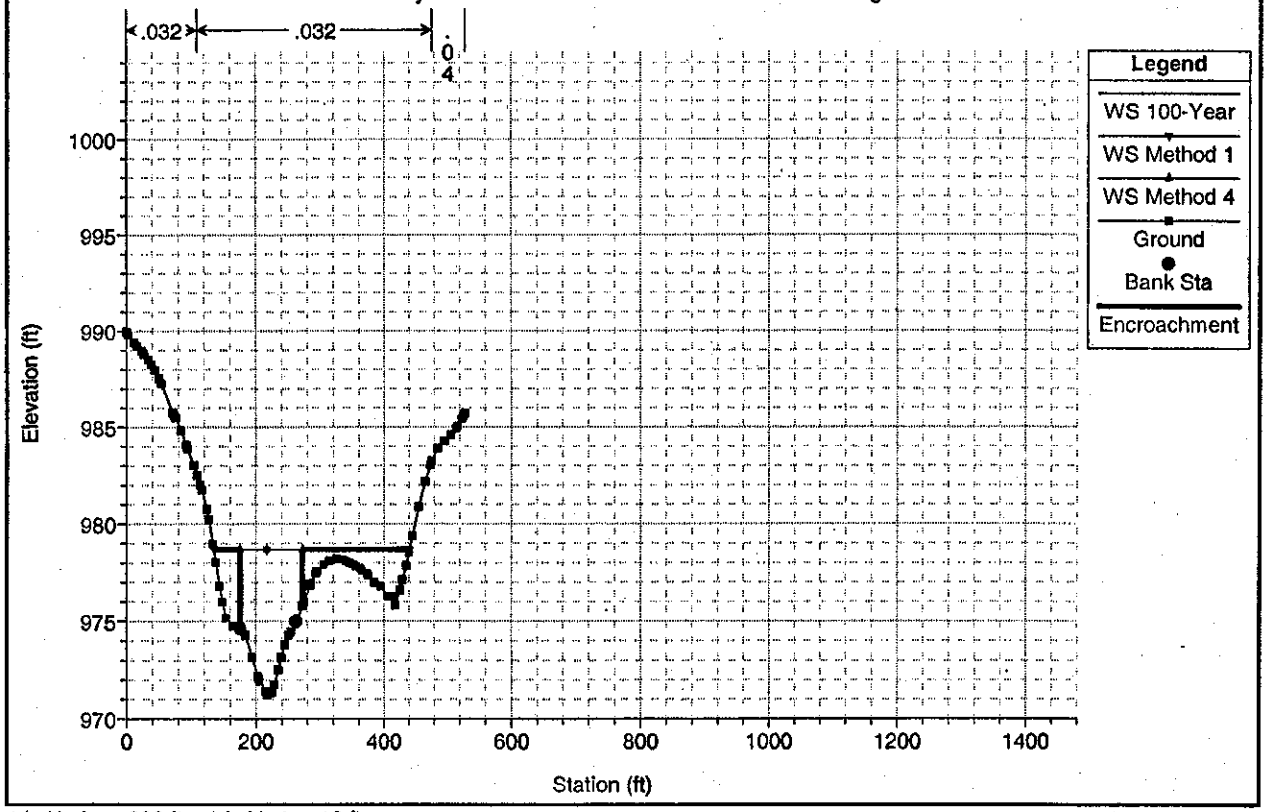
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 1.421 Thalweg Sta. 216.68



Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

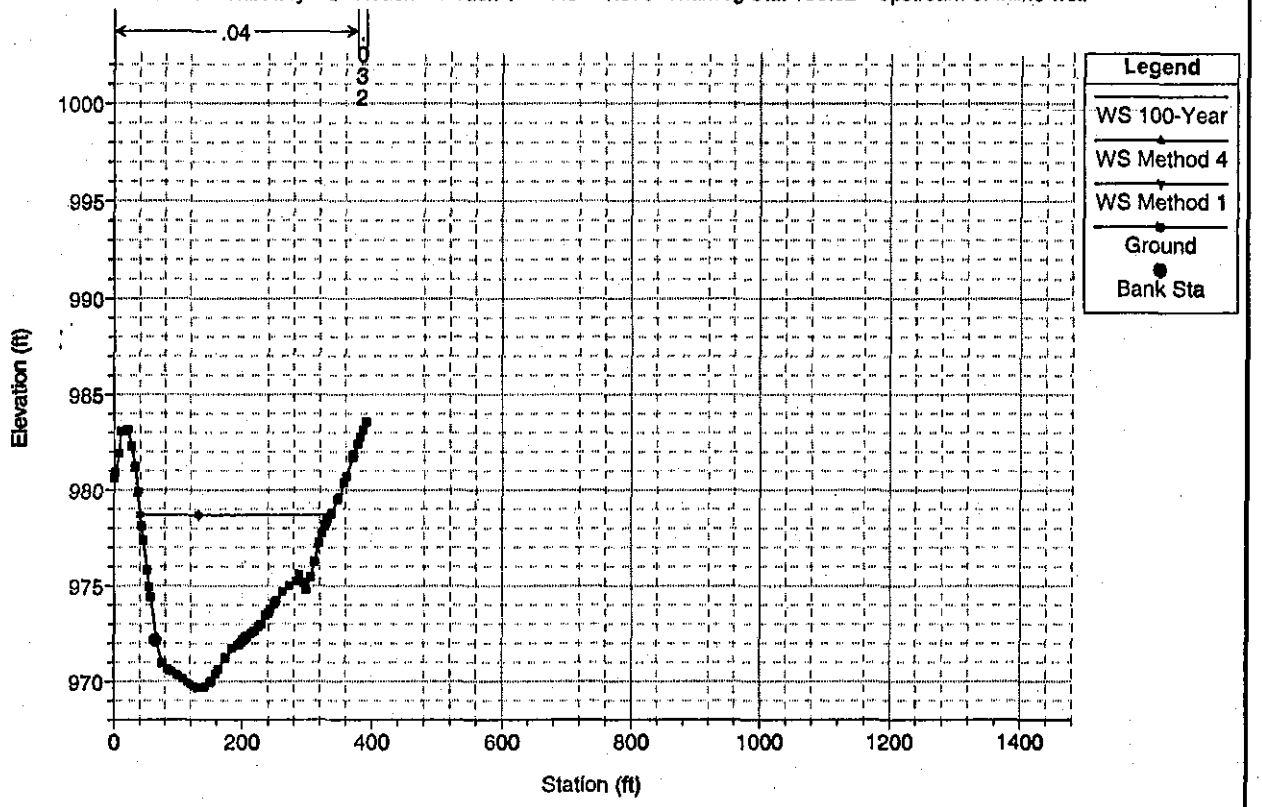
River = Tributary 3E Reach = Reach 1 RS = 1.402 Thalweg Sta. 217.26



1 in Horiz. = 300 ft 1 in Vert. = 10 ft

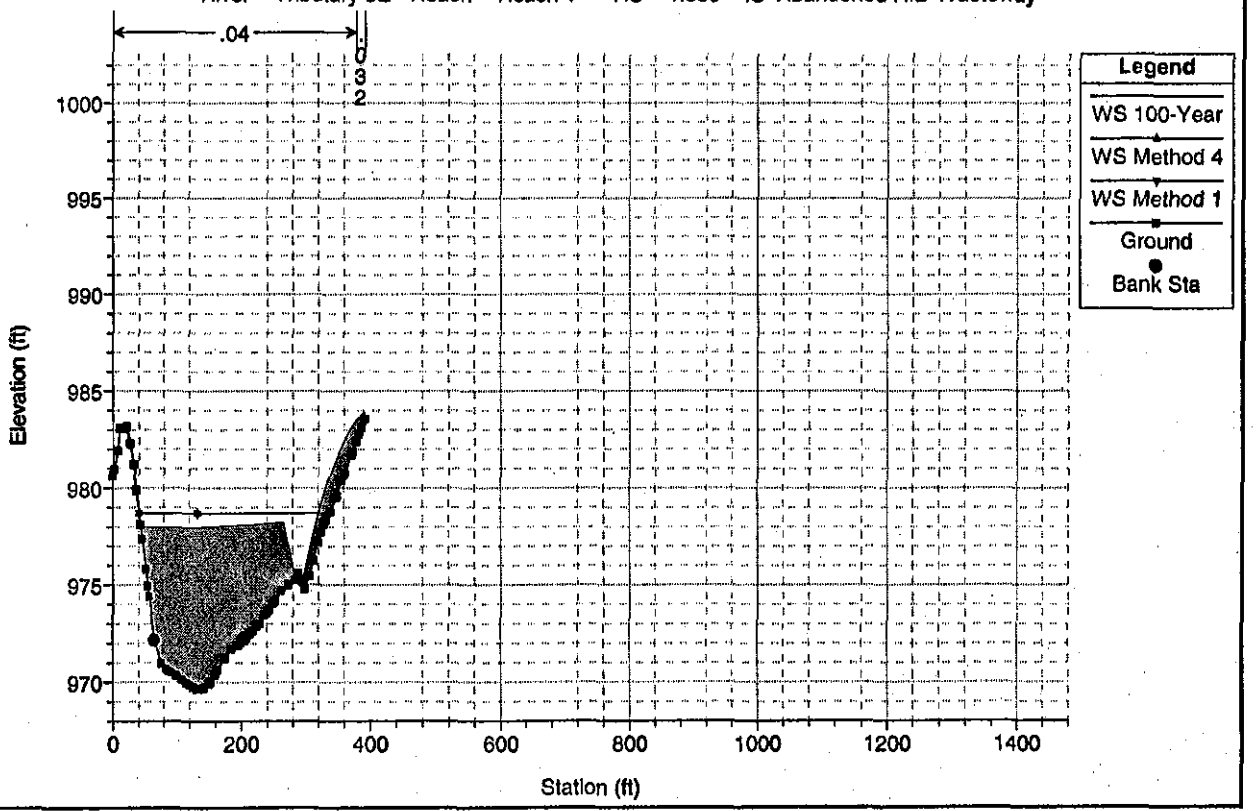
Hassayampa Trib 3E Floodplain Dell Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 1.378 Thalweg Sta. 130.82 - Upstream of Inline weir



Hassayampa Trib 3E Floodplain Dell Plan: Hassayampa Trib 3E FP/FW 5/19/2005

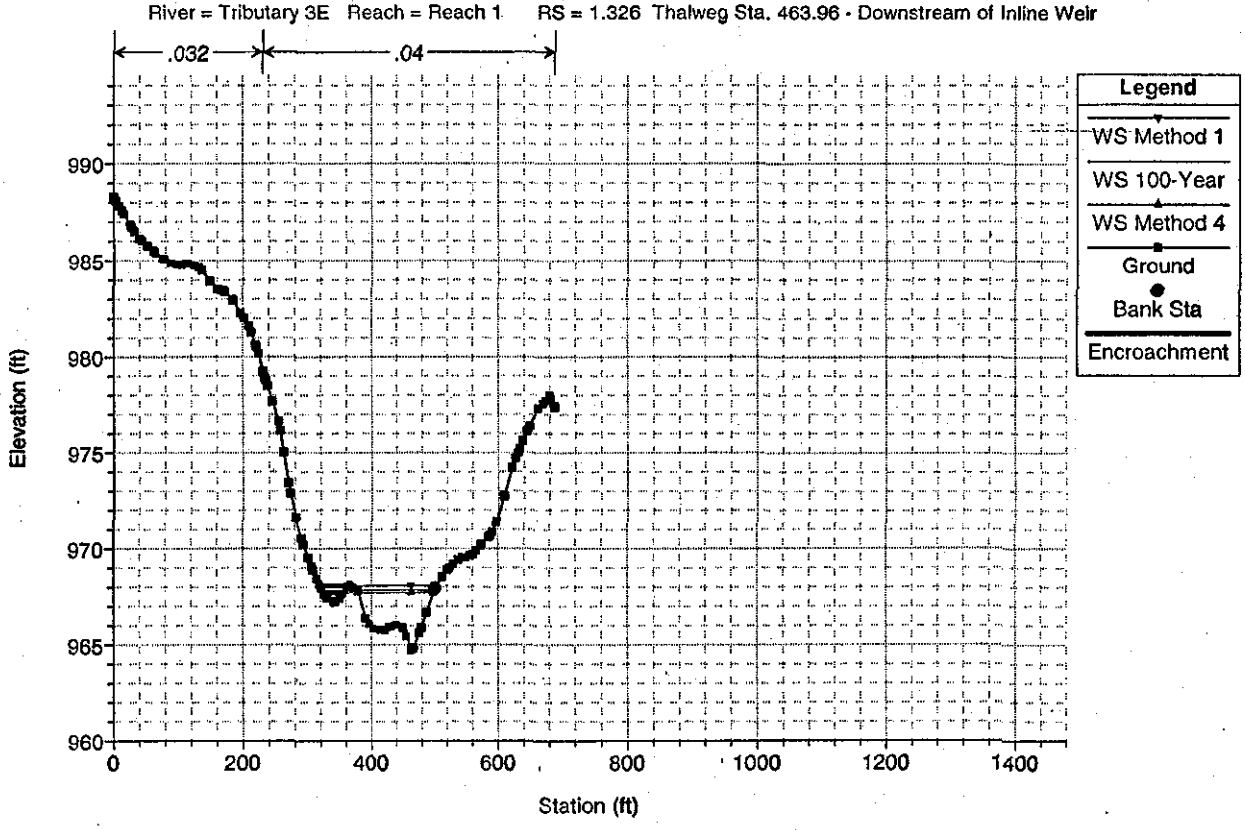
River = Tributary 3E Reach = Reach 1 RS = 1.359 IS Abandoned RID Wasteway



1 in Horiz. = 300 ft 1 in Vert. = 10 ft

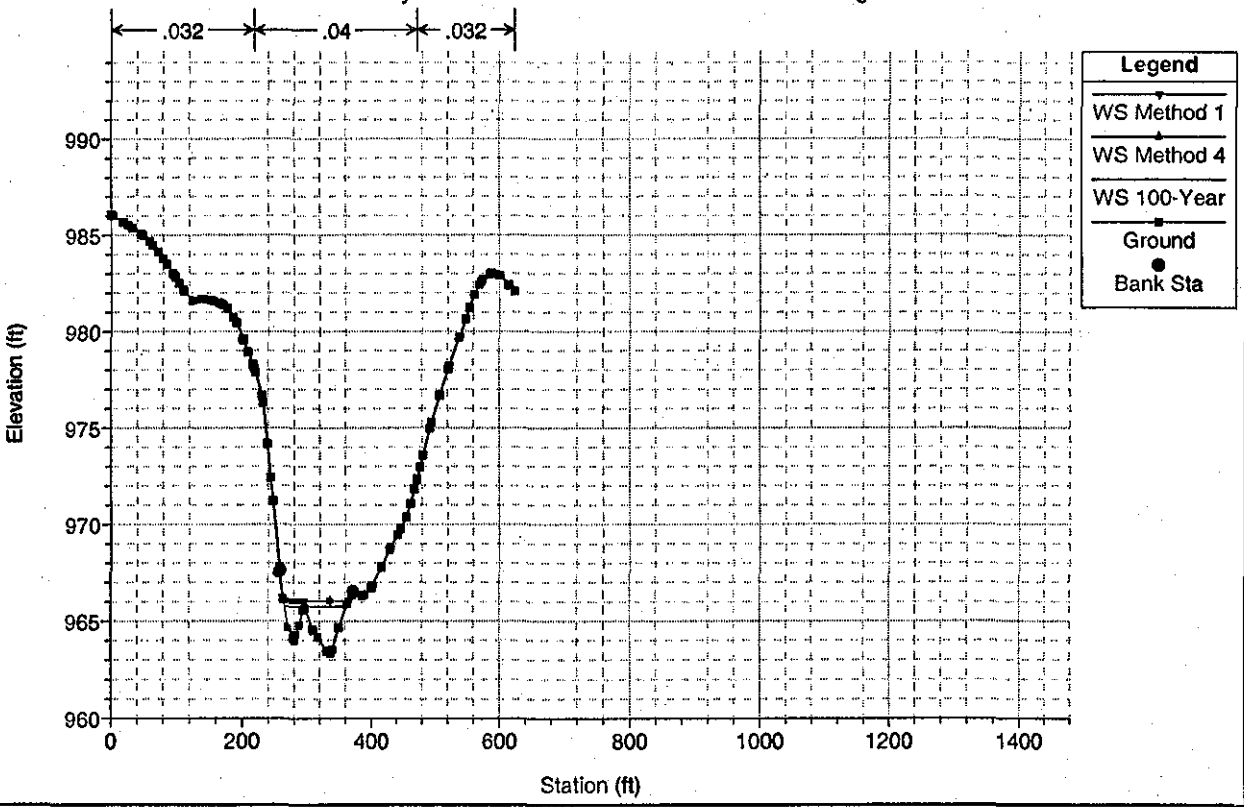
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 1.326 Thalweg Sta. 463.96 - Downstream of Inline Weir

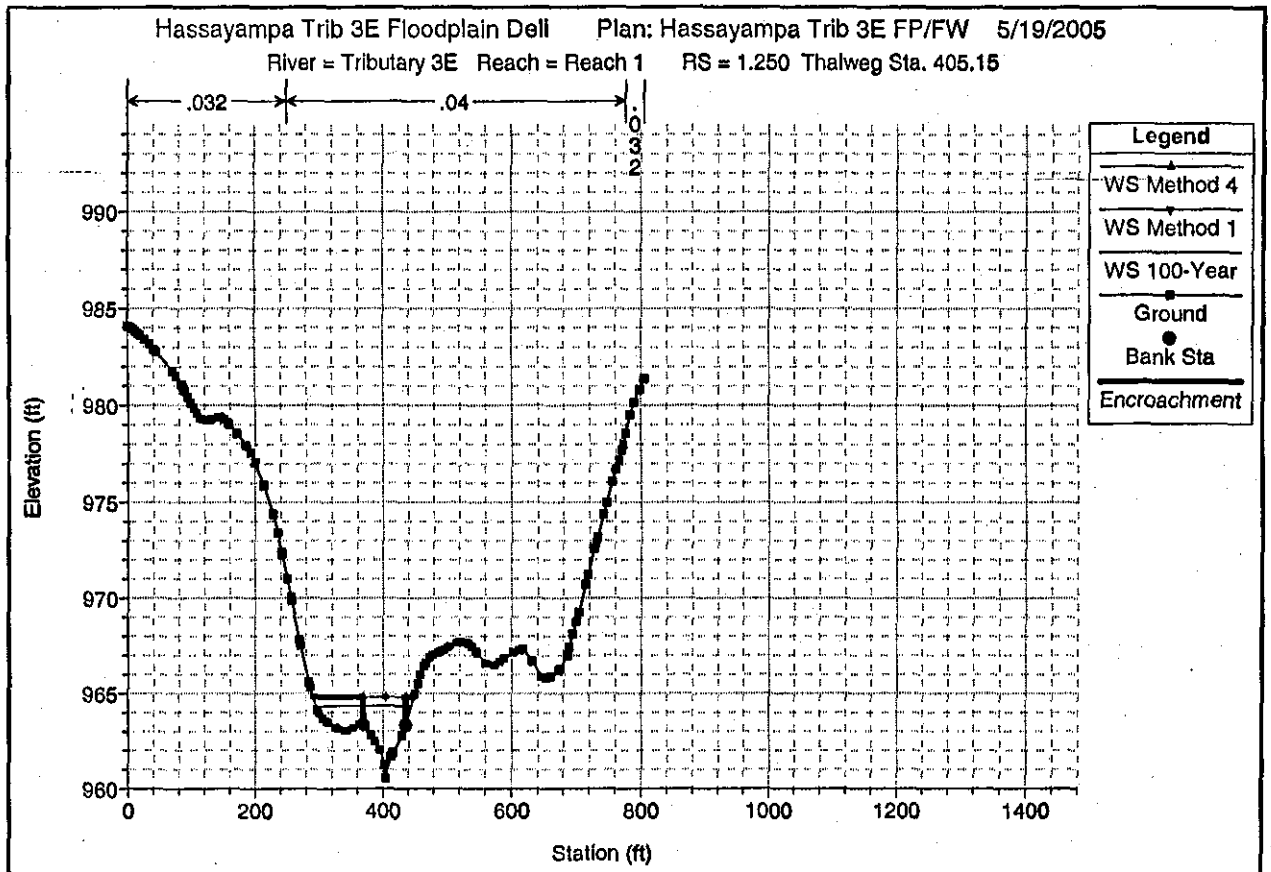


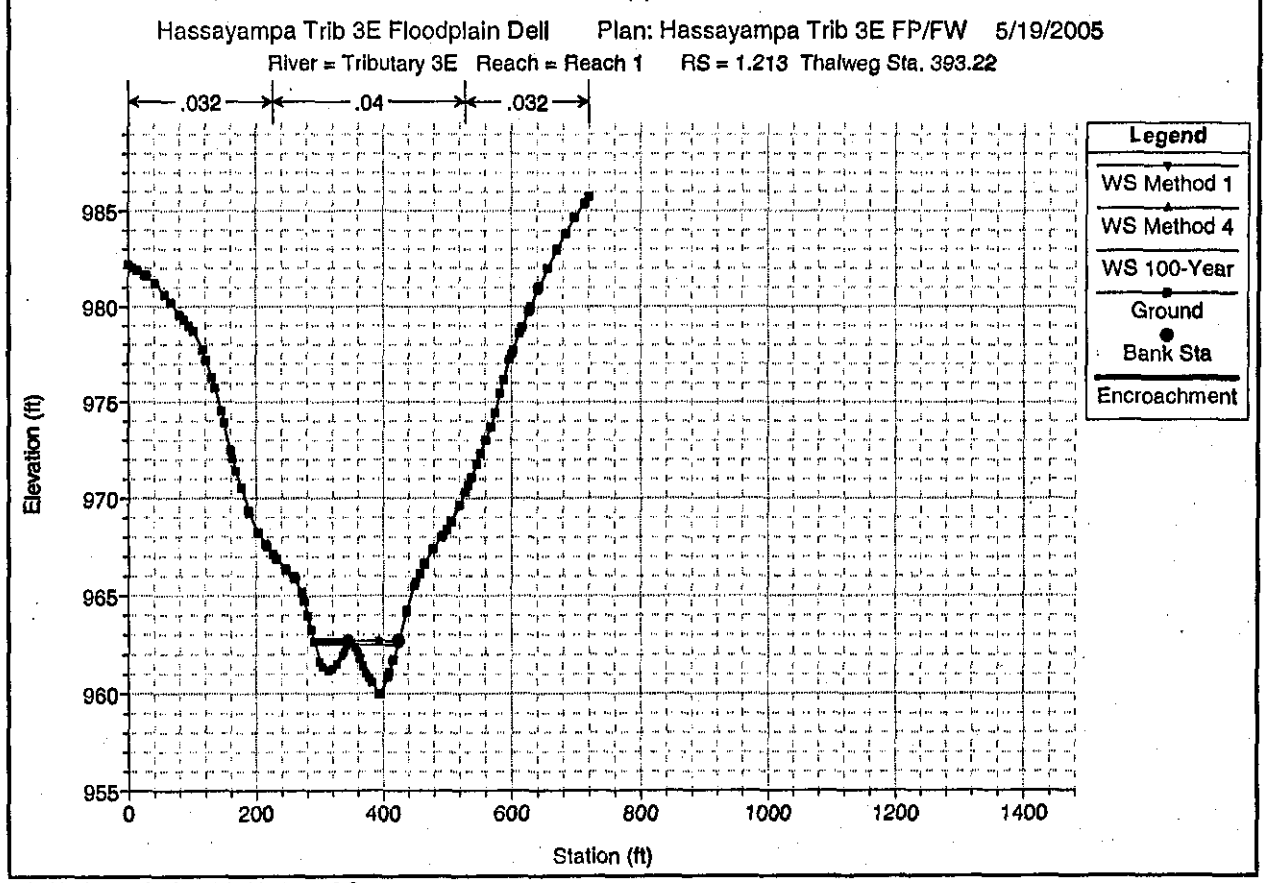
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 1.288 Thalweg Sta. 336.63



1 in Horiz. = 300 ft 1 in Vert. = 10 ft

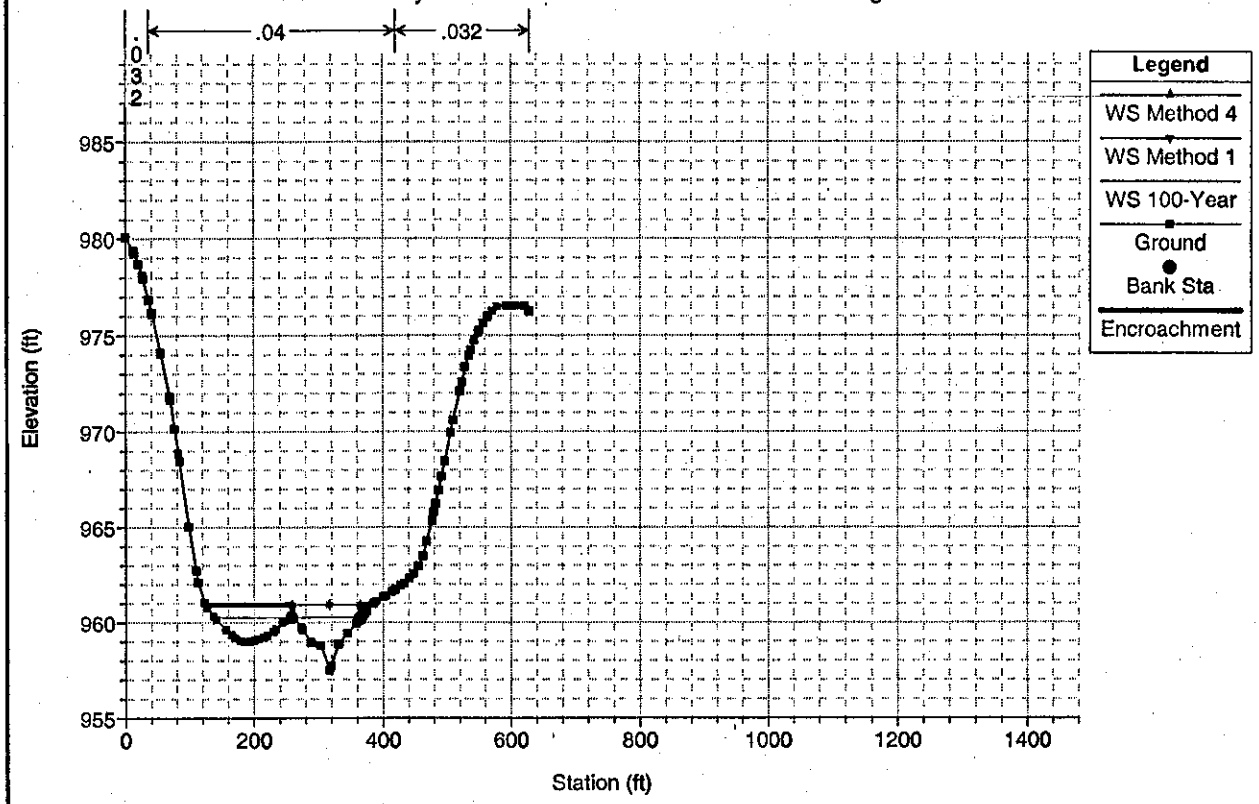




1 in Horiz. = 300 ft 1 in Vert. = 10 ft

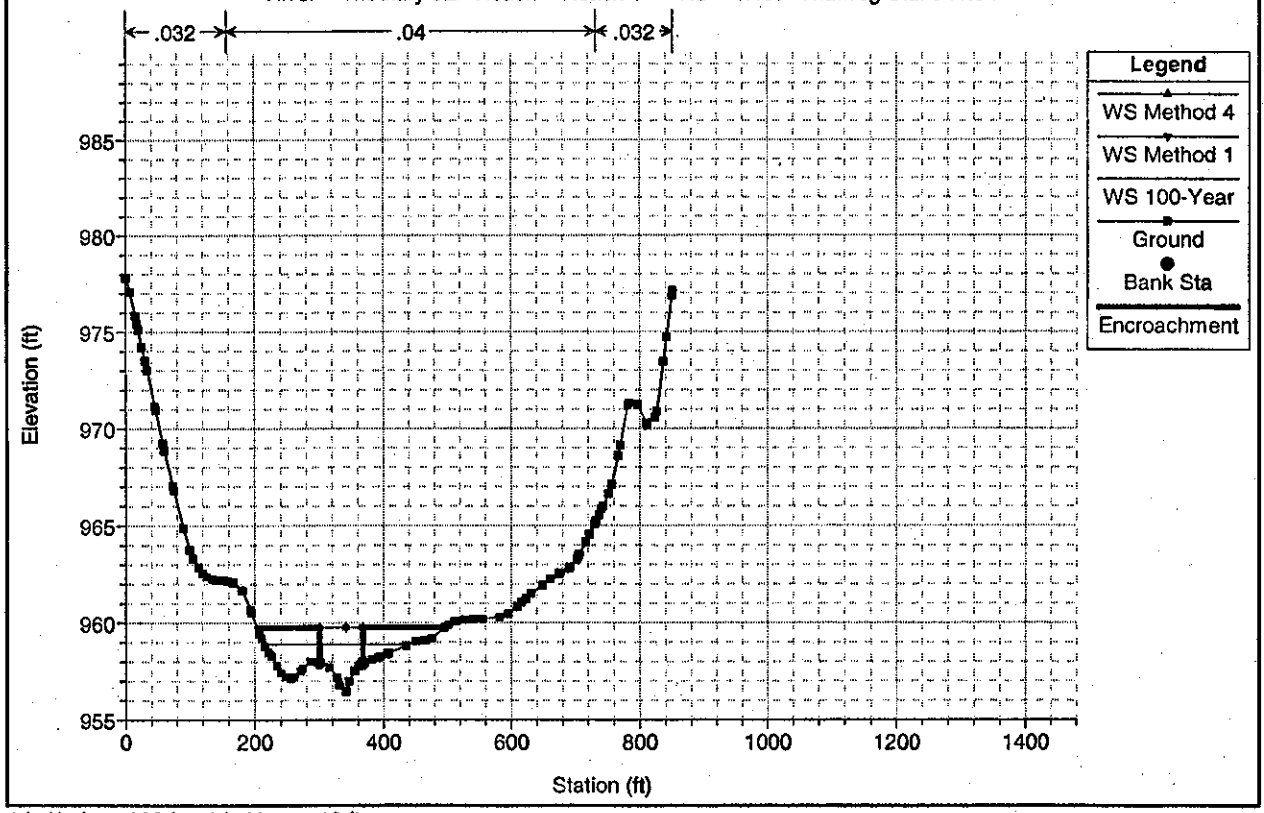
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 1.175 Thalweg Sta. 316.96



Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

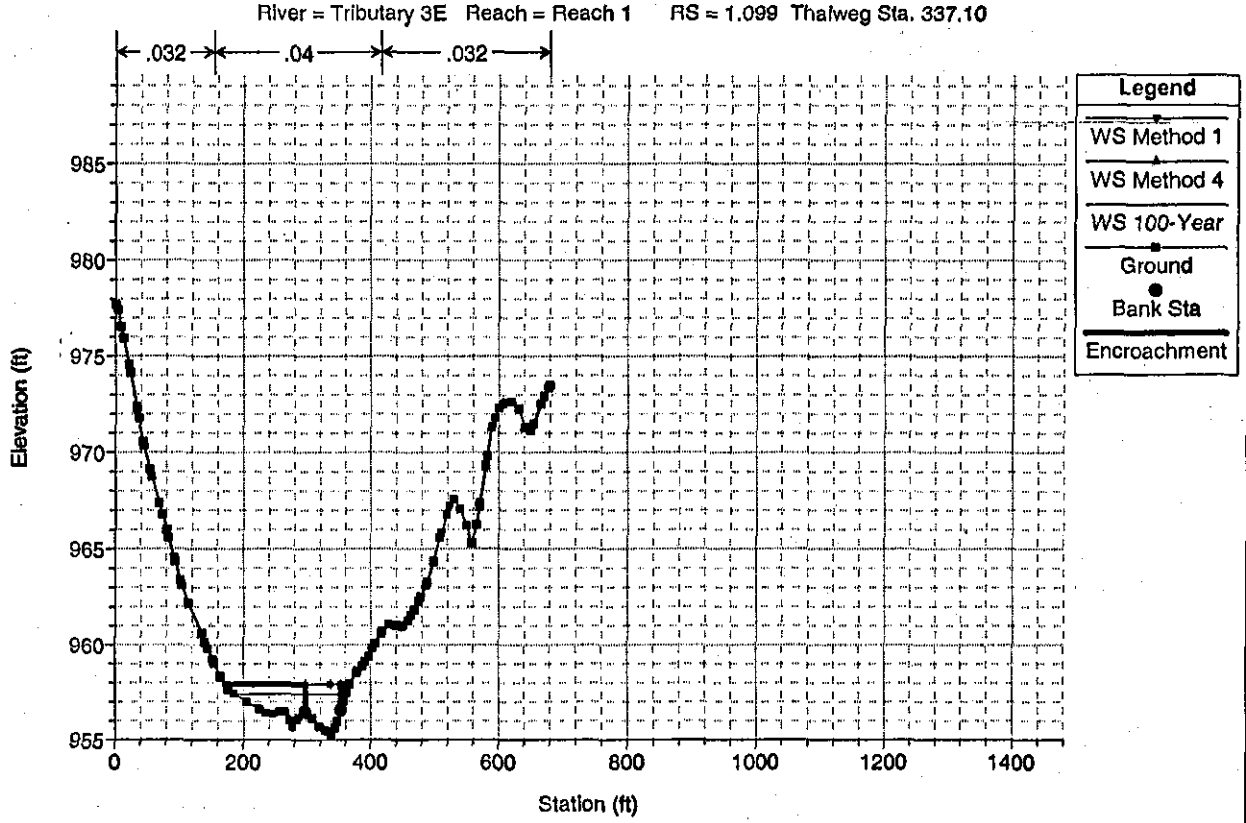
River = Tributary 3E Reach = Reach 1 RS = 1.137 Thalweg Sta. 341.54



1 in Horiz. = 300 ft 1 in Vert. = 10 ft

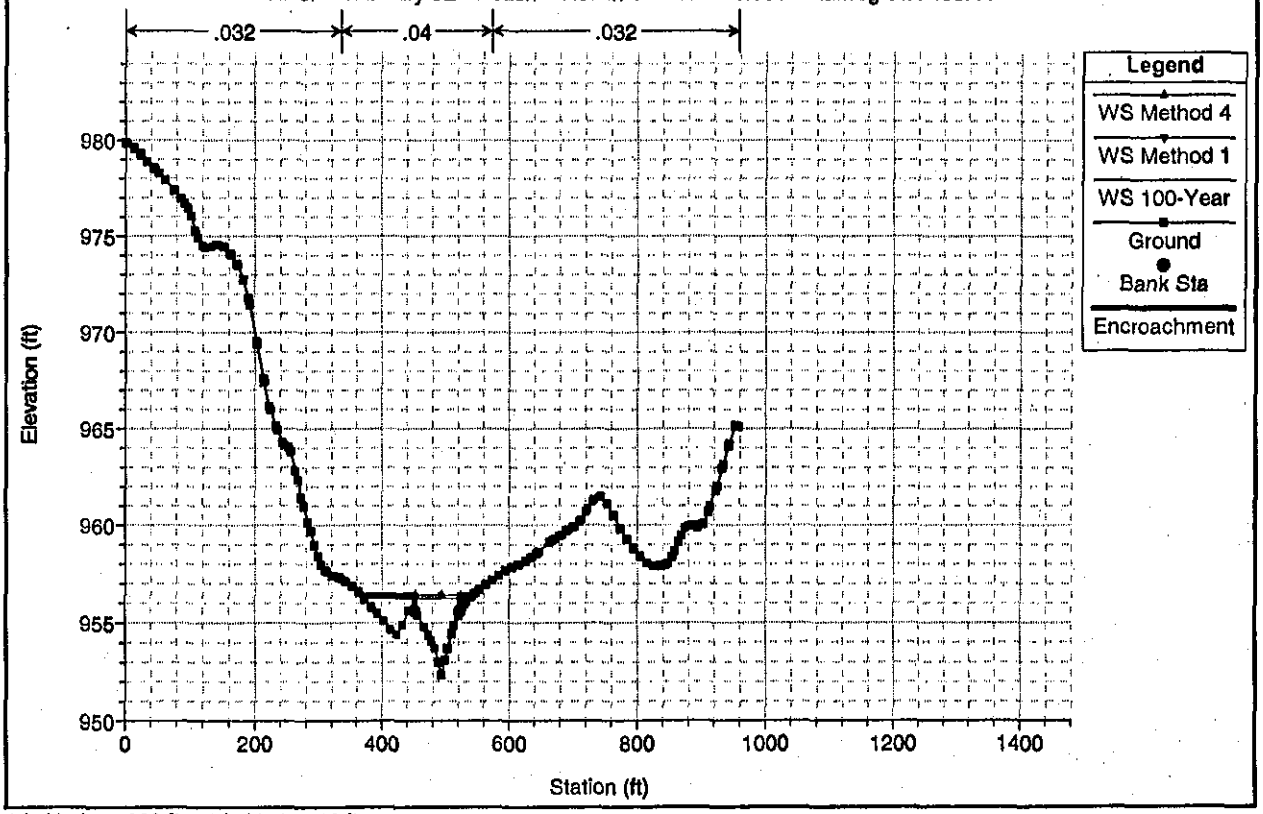
Hassayampa Trib 3E Floodplain Dell Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 1.099 Thalweg Sta. 337.10

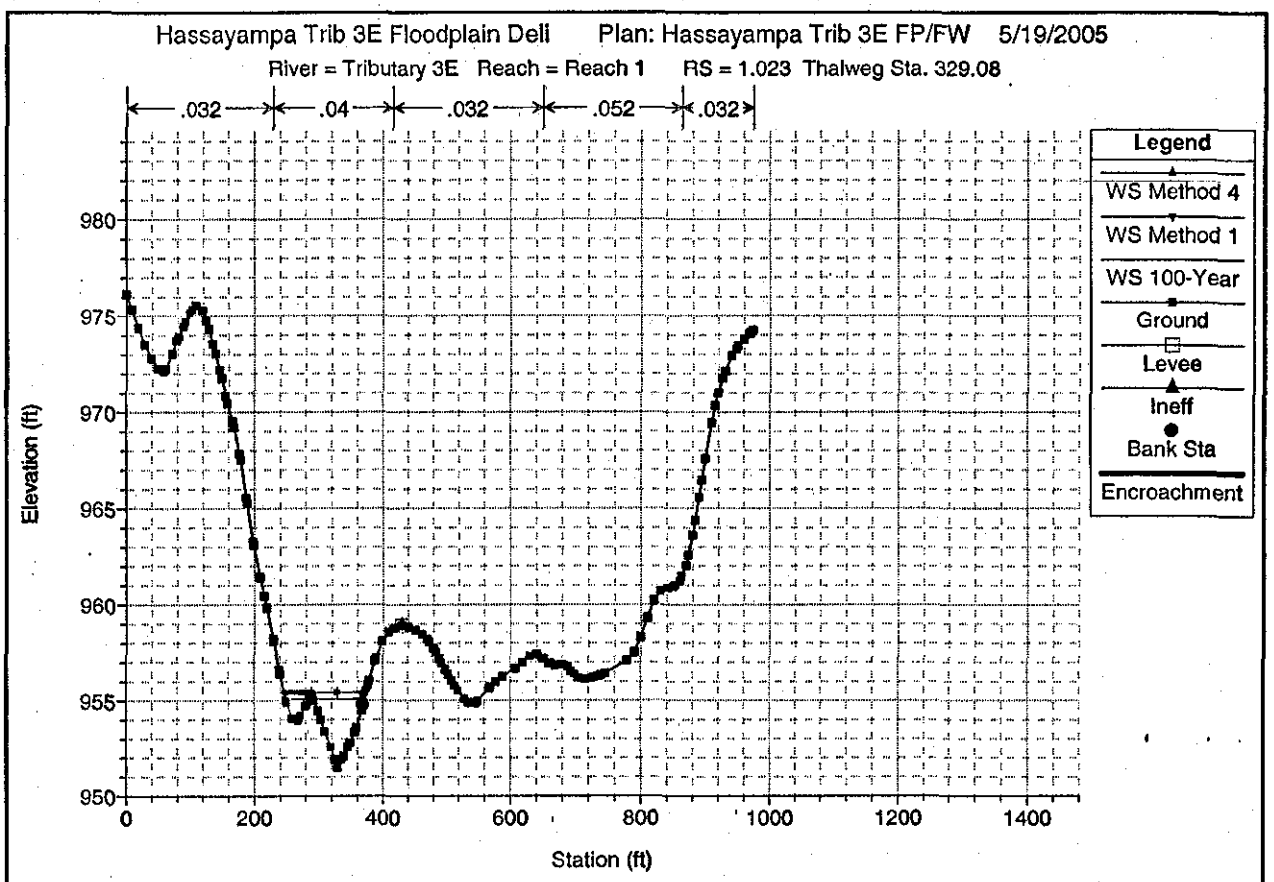


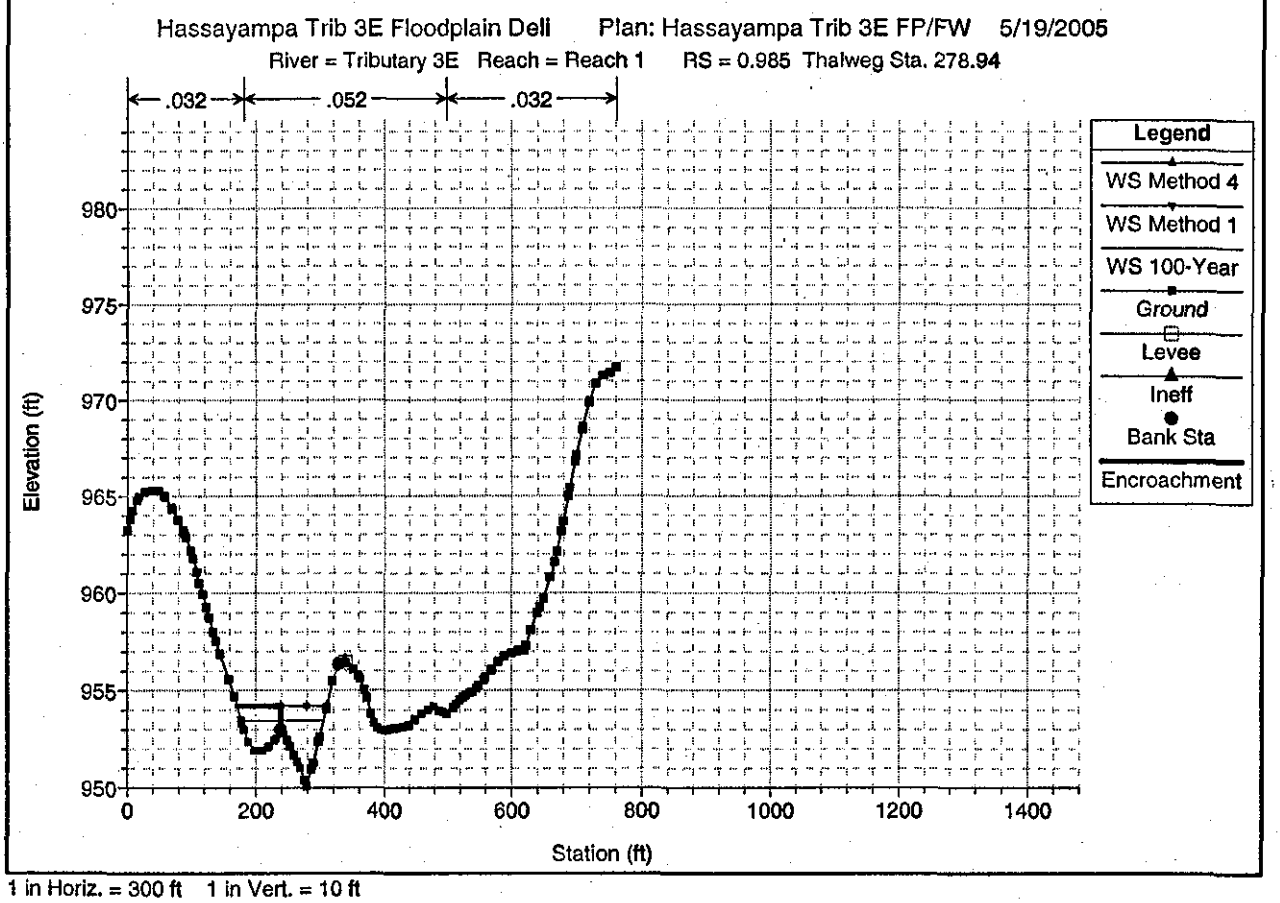
Hassayampa Trib 3E Floodplain Dell Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 1.061 Thalweg Sta. 493.44



1 in Horiz. = 300 ft 1 in Vert. = 10 ft

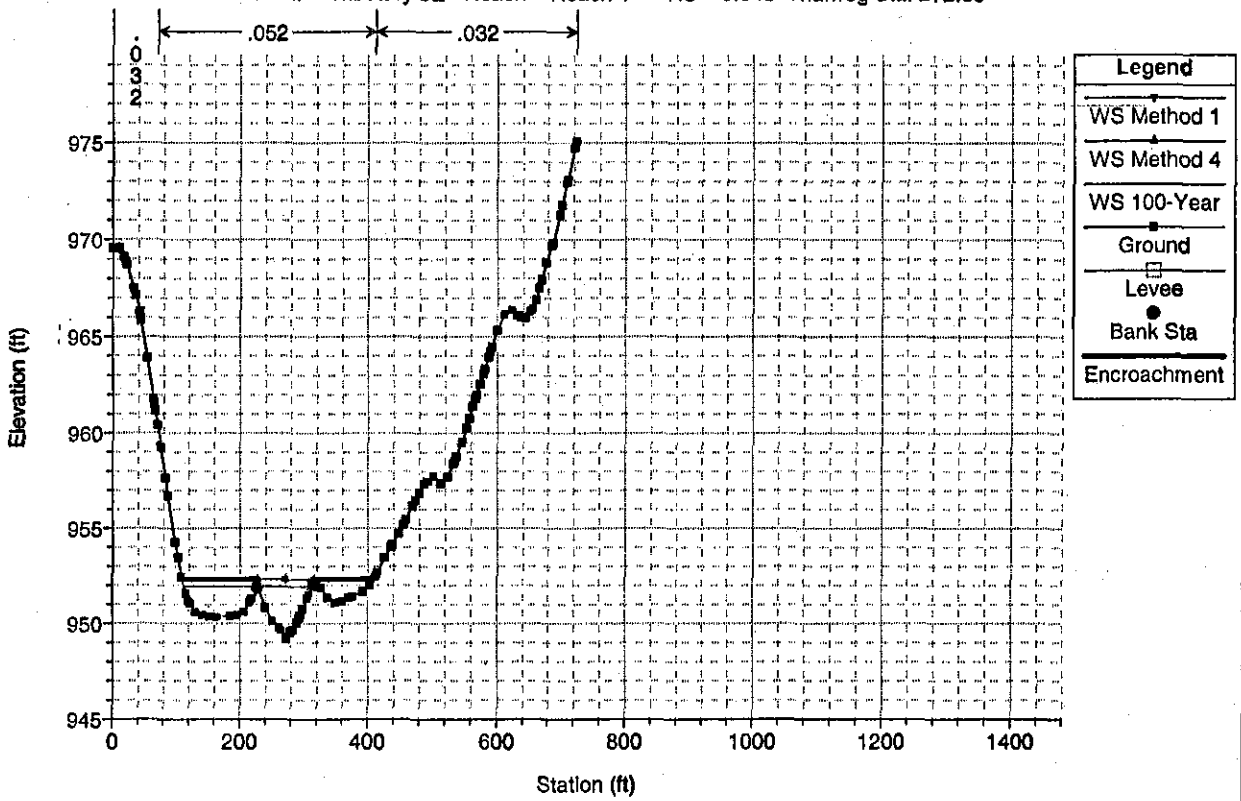




1 in Horiz. = 300 ft 1 in Vert. = 10 ft

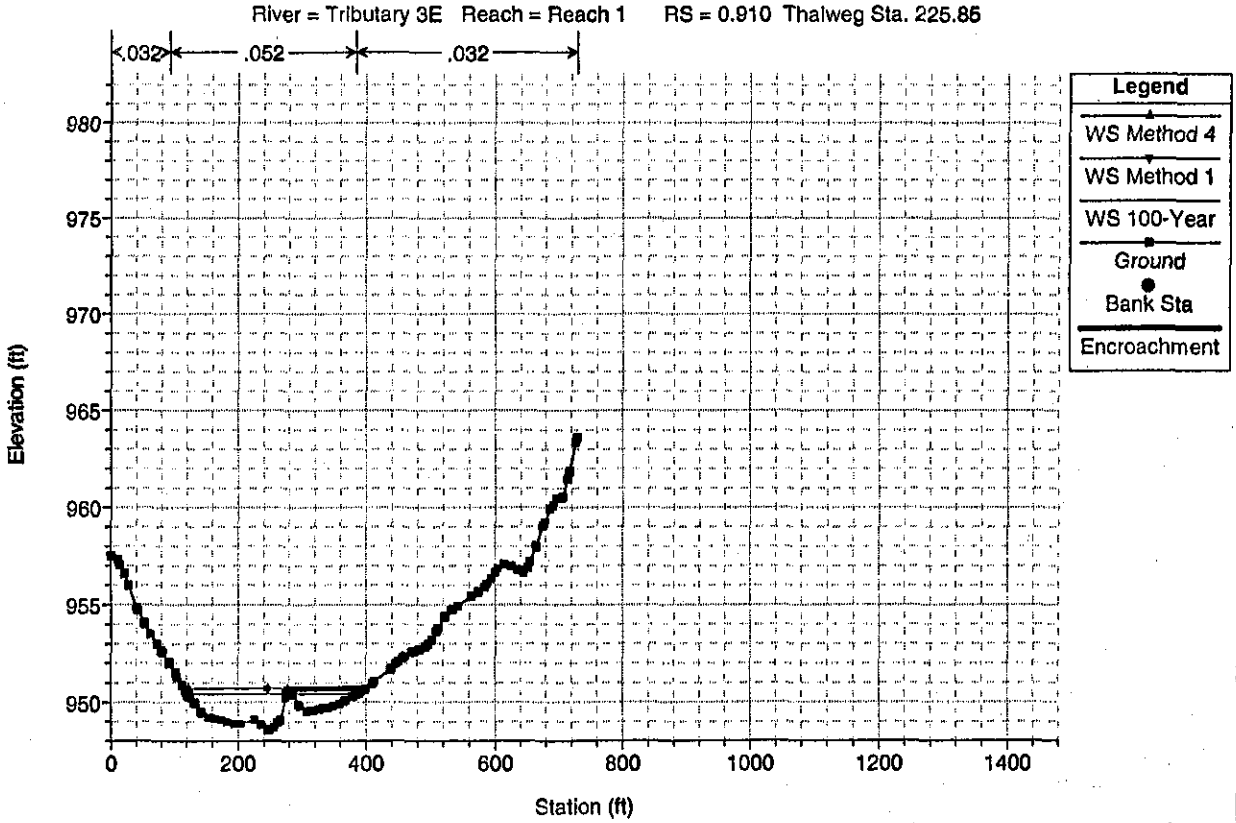
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 0.948 Thalweg Sta. 272.66

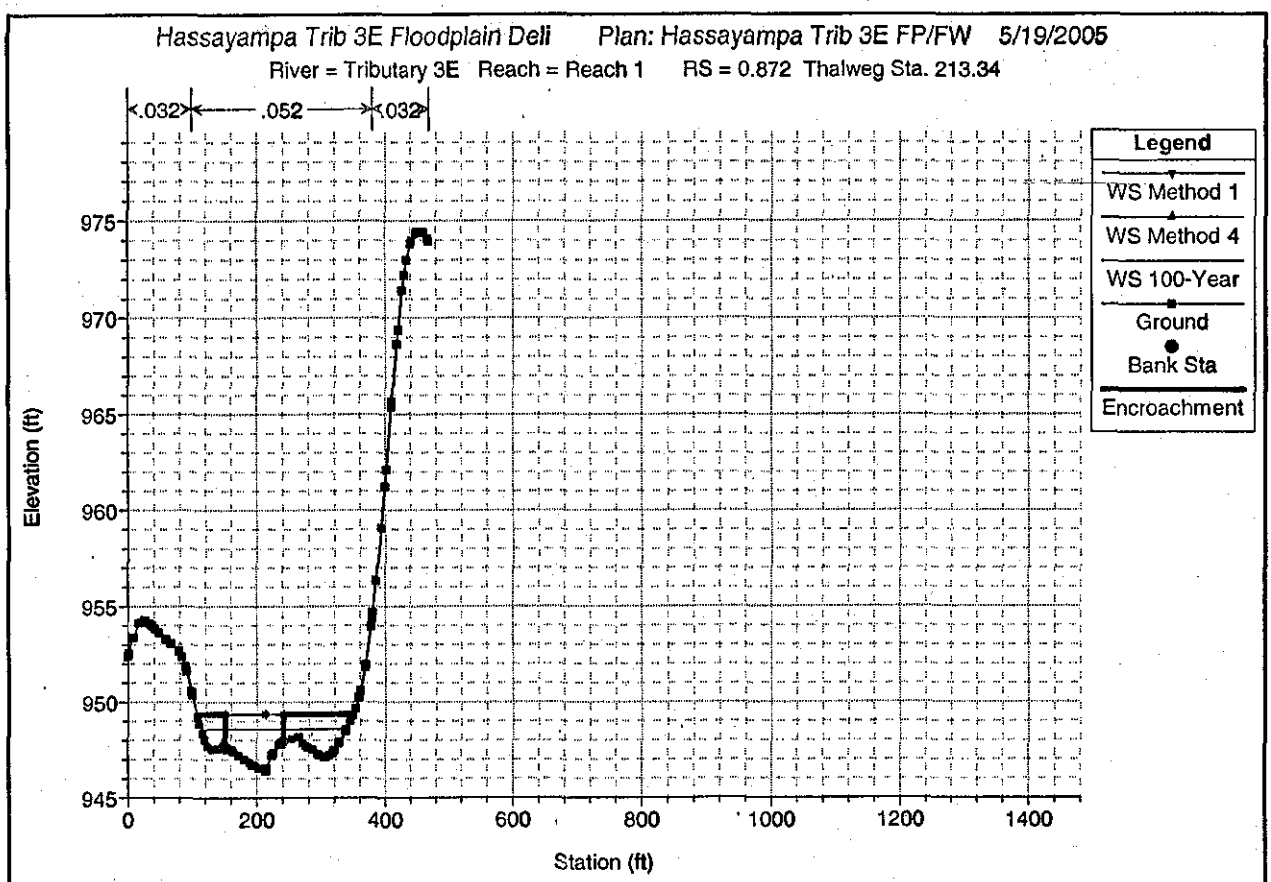


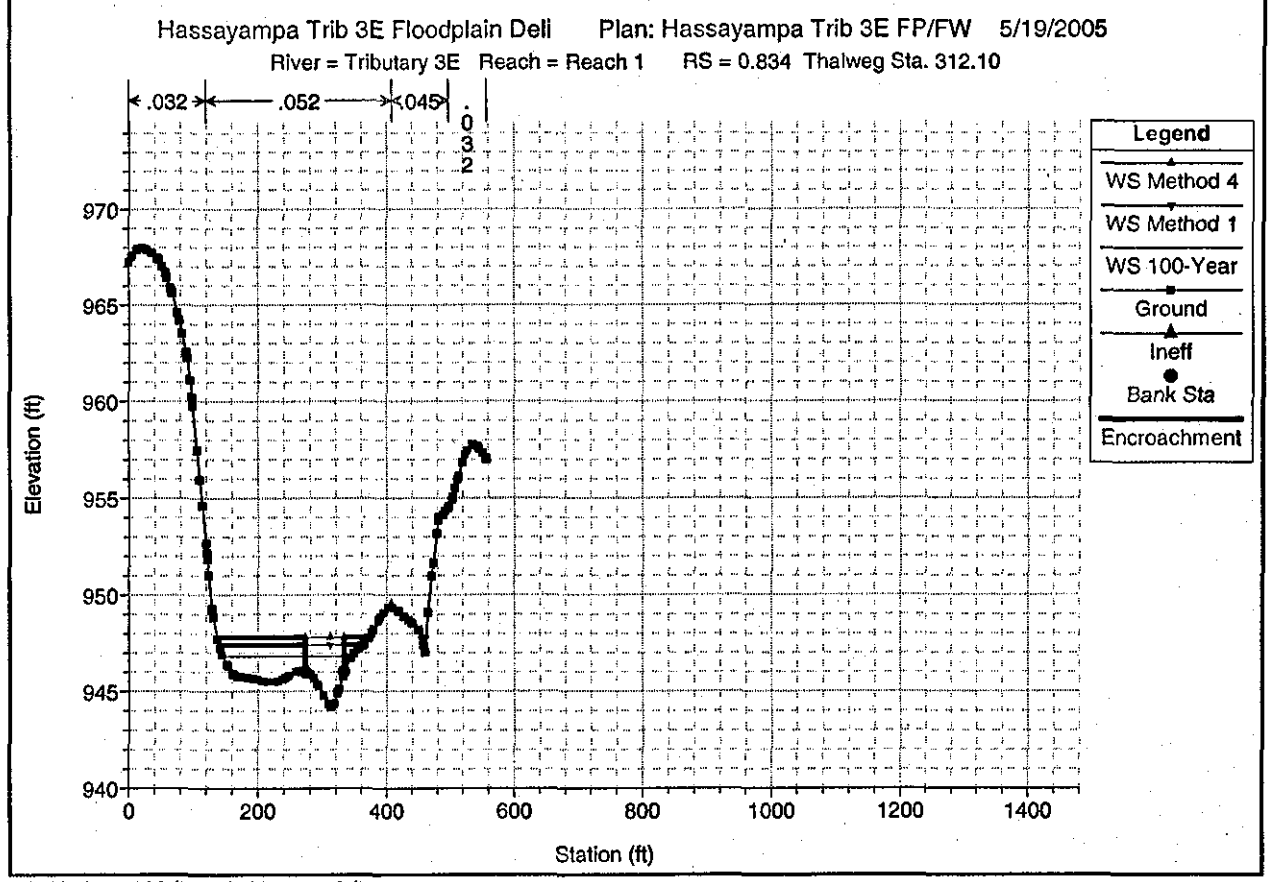
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 0.910 Thalweg Sta. 225.85

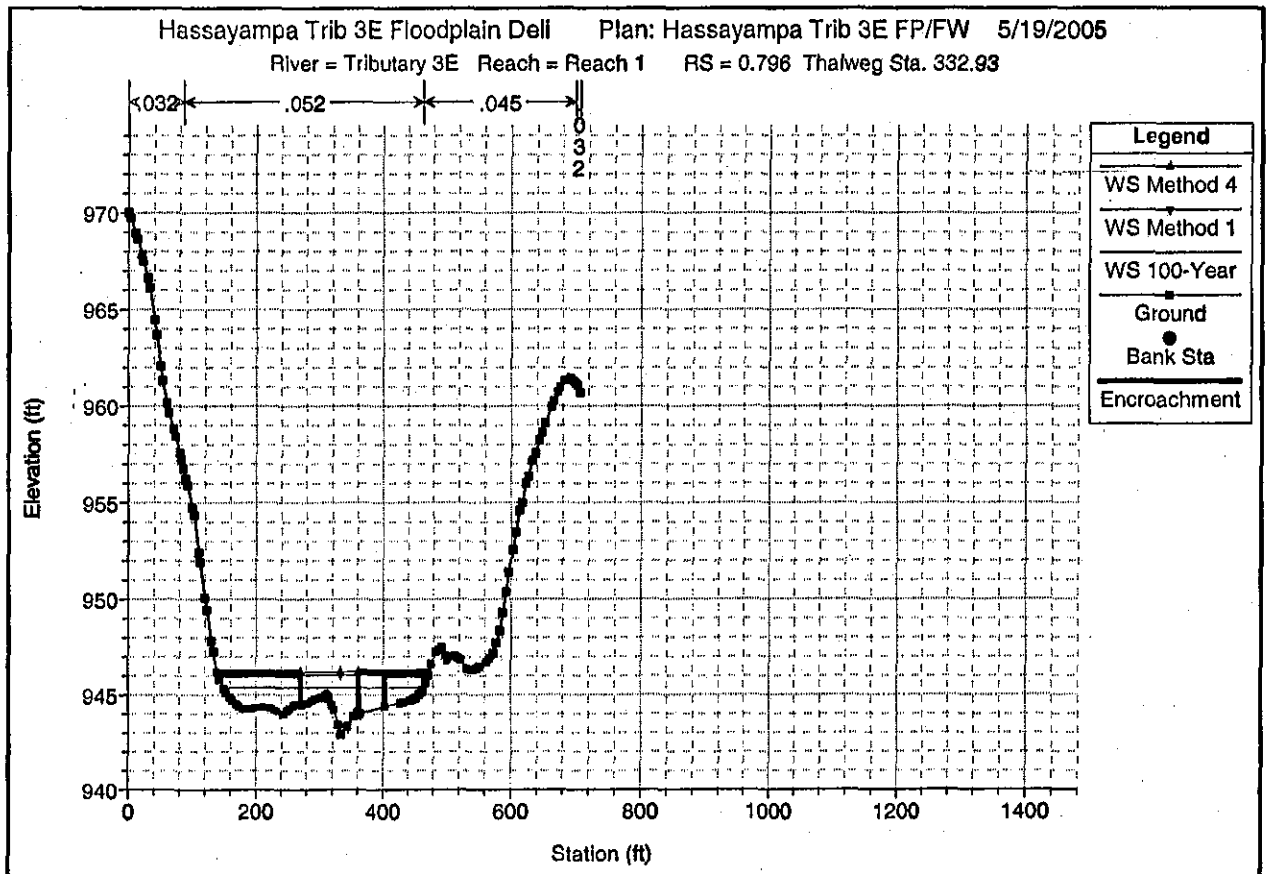


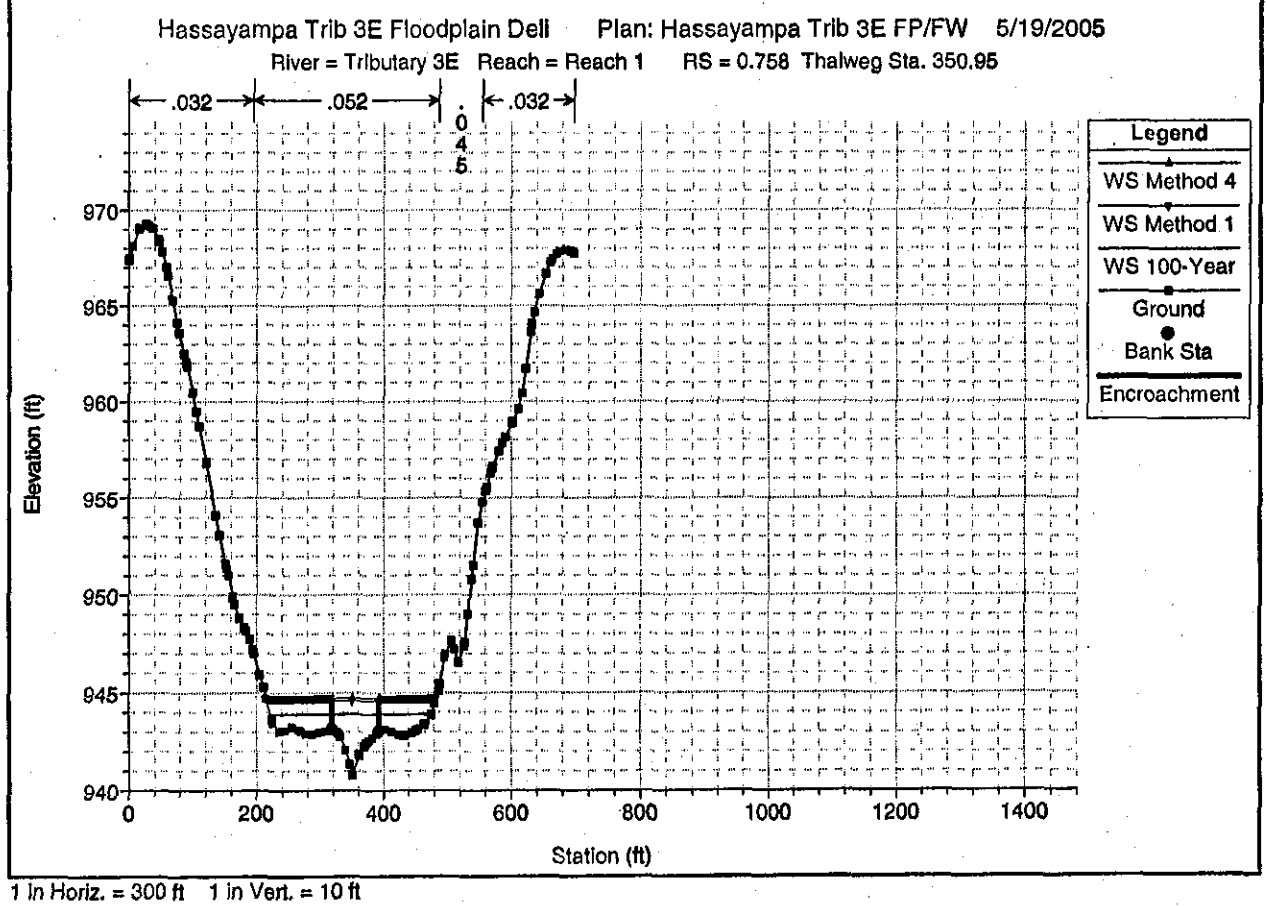
1 in Horiz. = 300 ft 1 in Vert. = 10 ft





1 in Horiz. = 300 ft 1 in Vert. = 10 ft

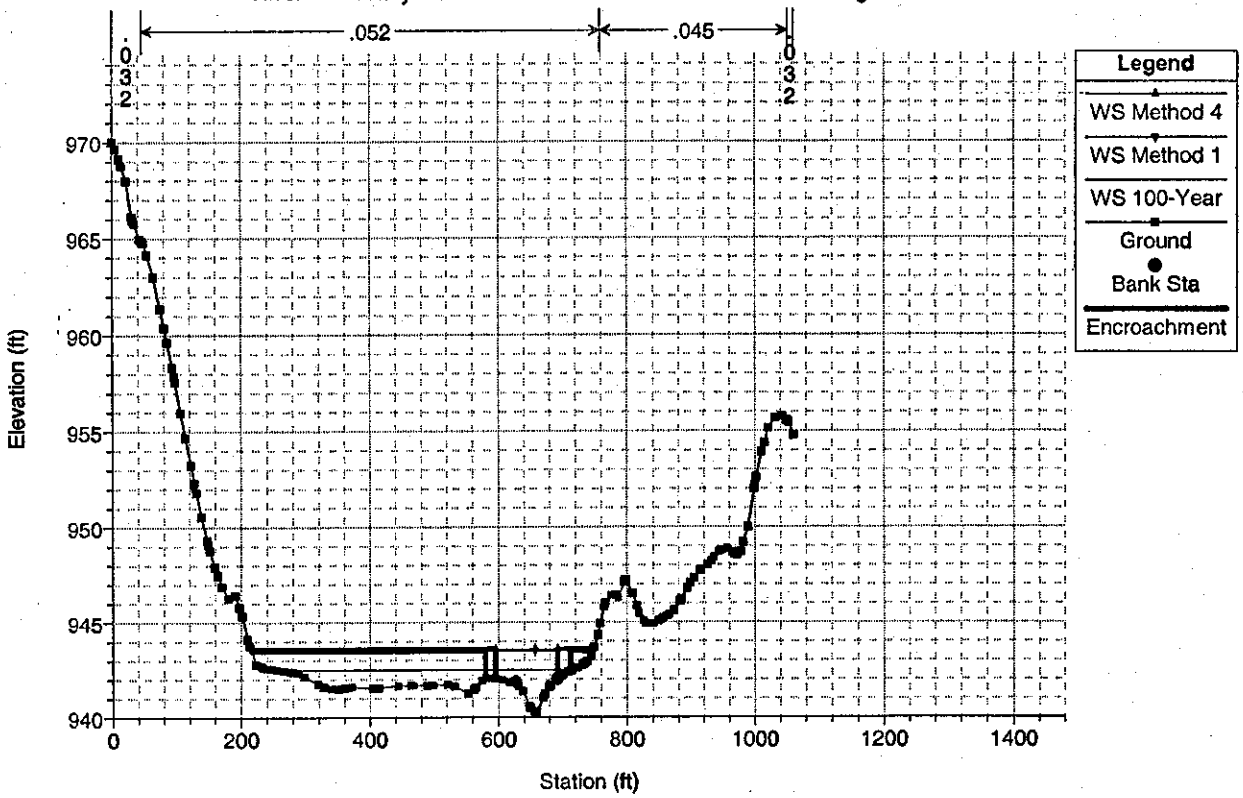




1 in Horiz. = 300 ft 1 in Vert. = 10 ft

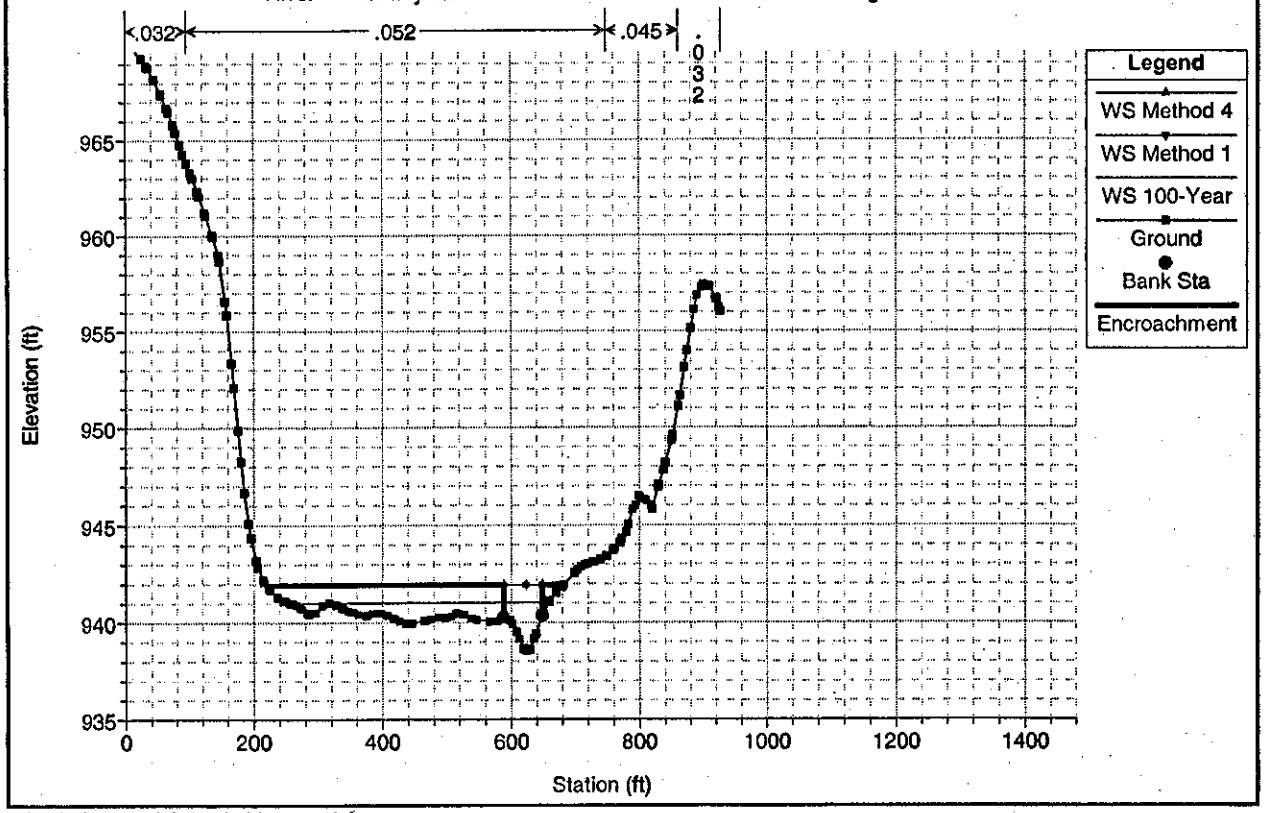
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 0.720 Thalweg Sta. 657.08

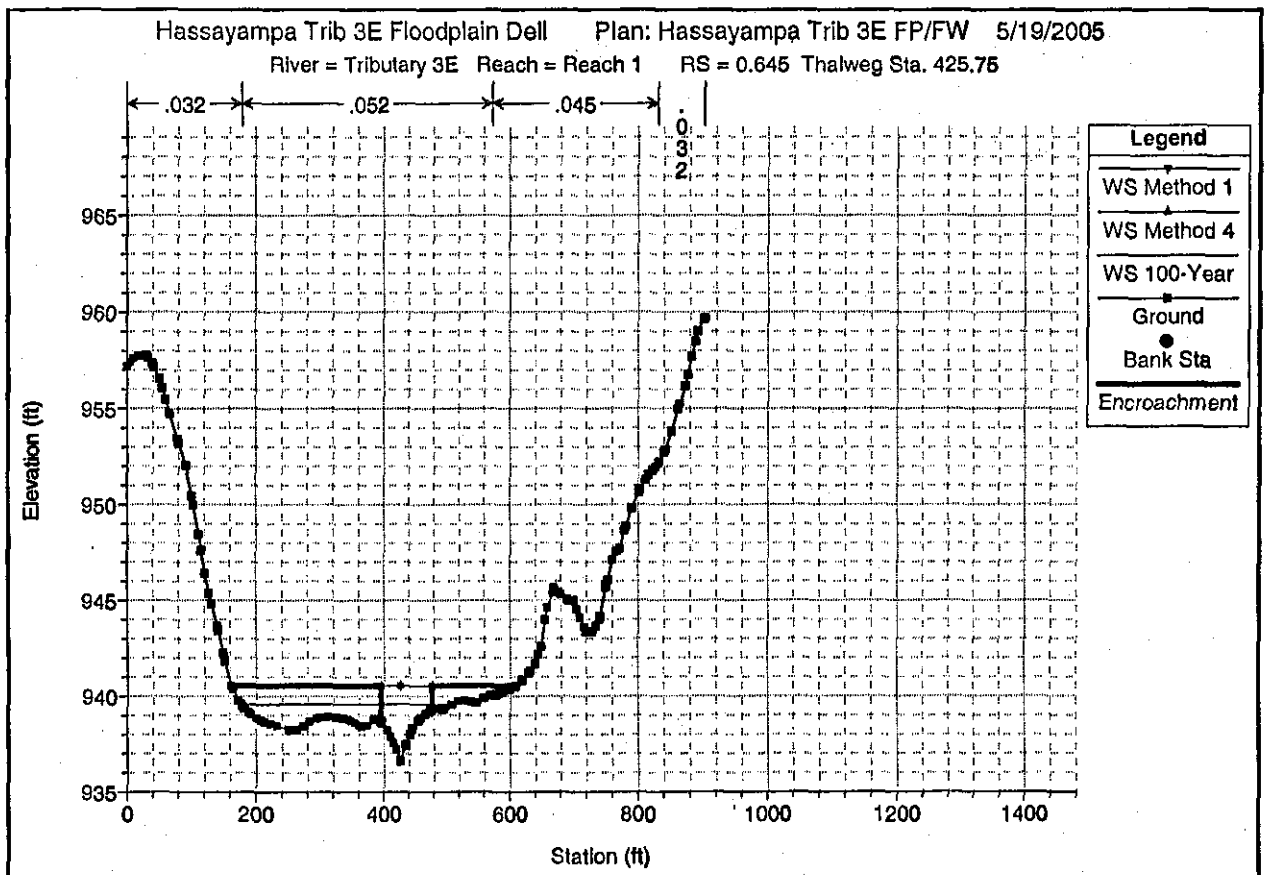


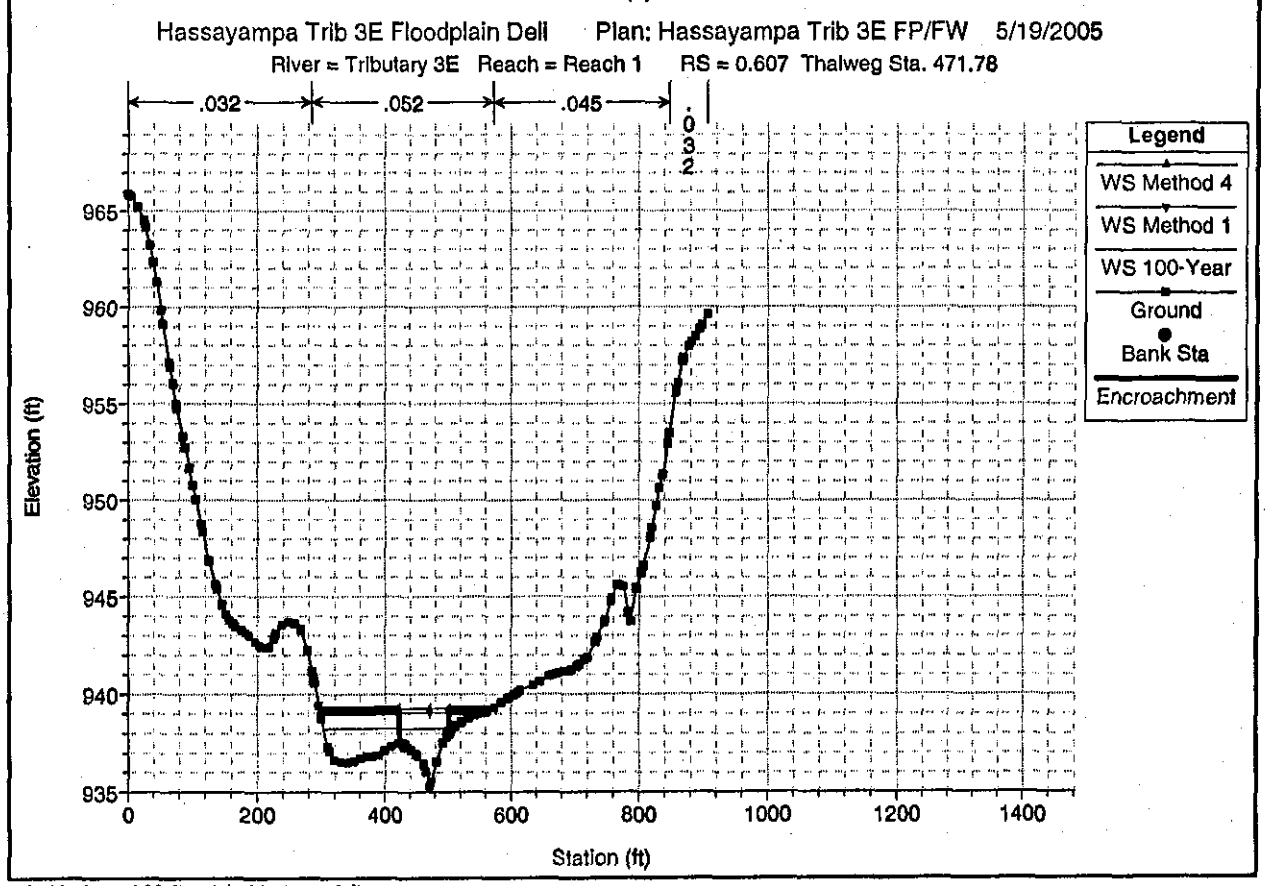
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 0.682 Thalweg Sta. 623.26

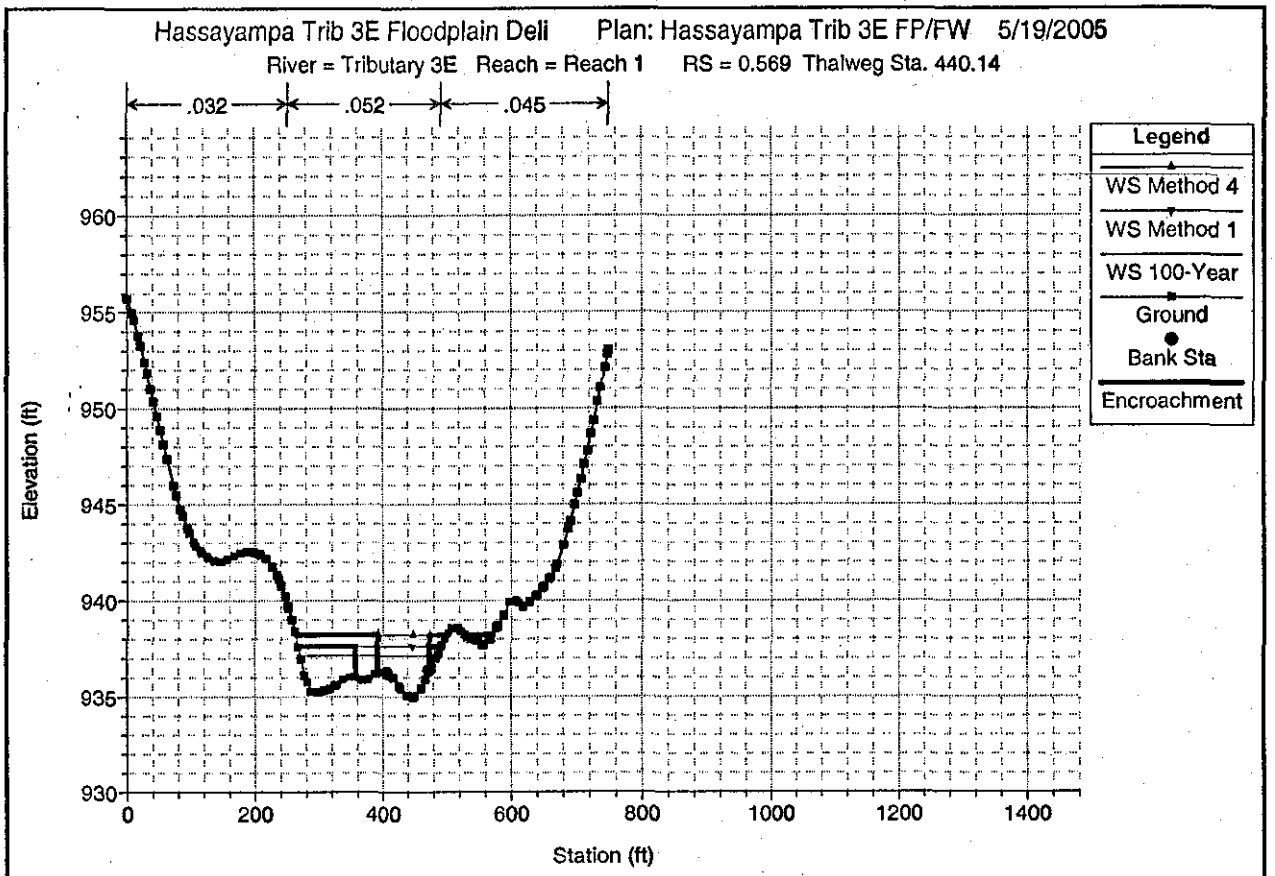


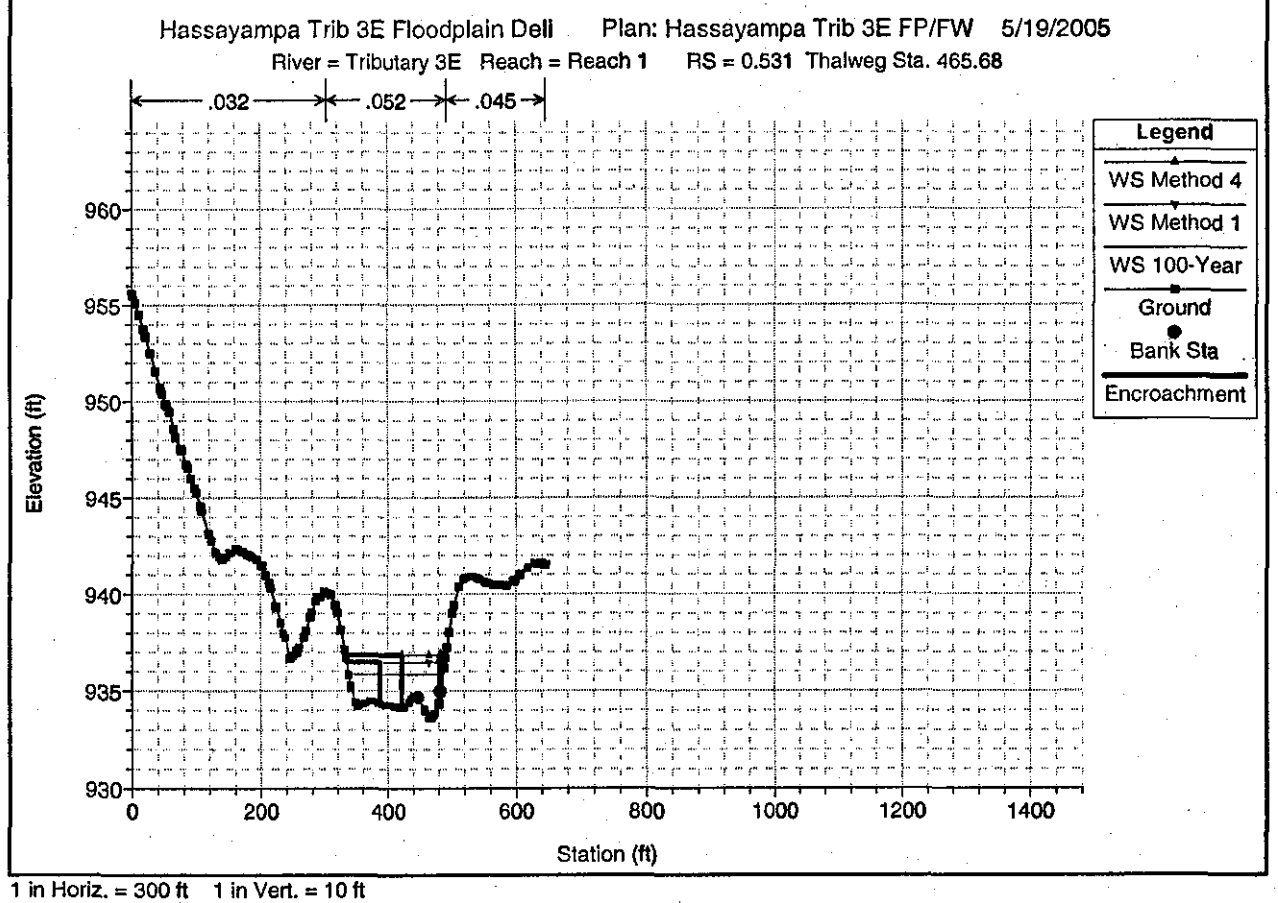
1 in Horiz. = 300 ft 1 in Vert. = 10 ft



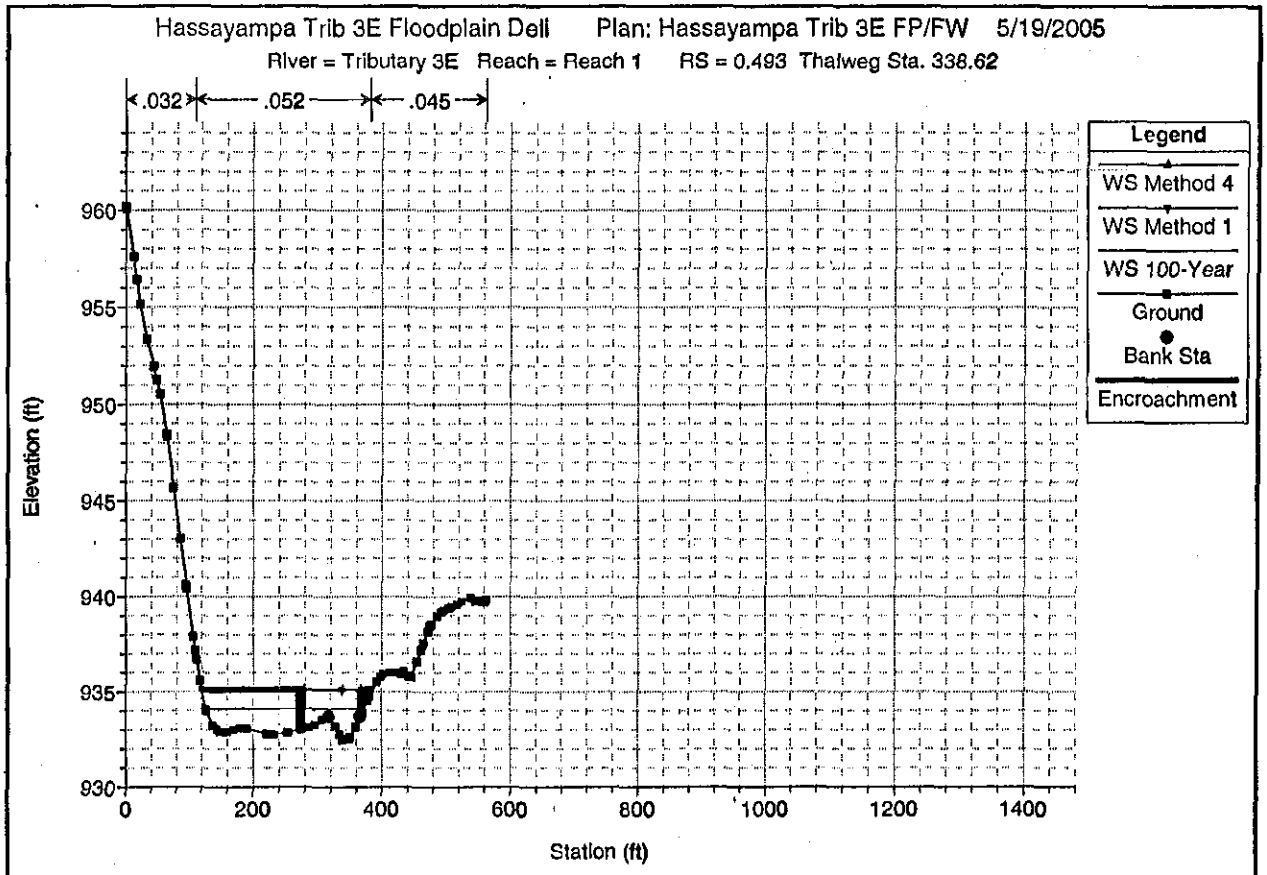


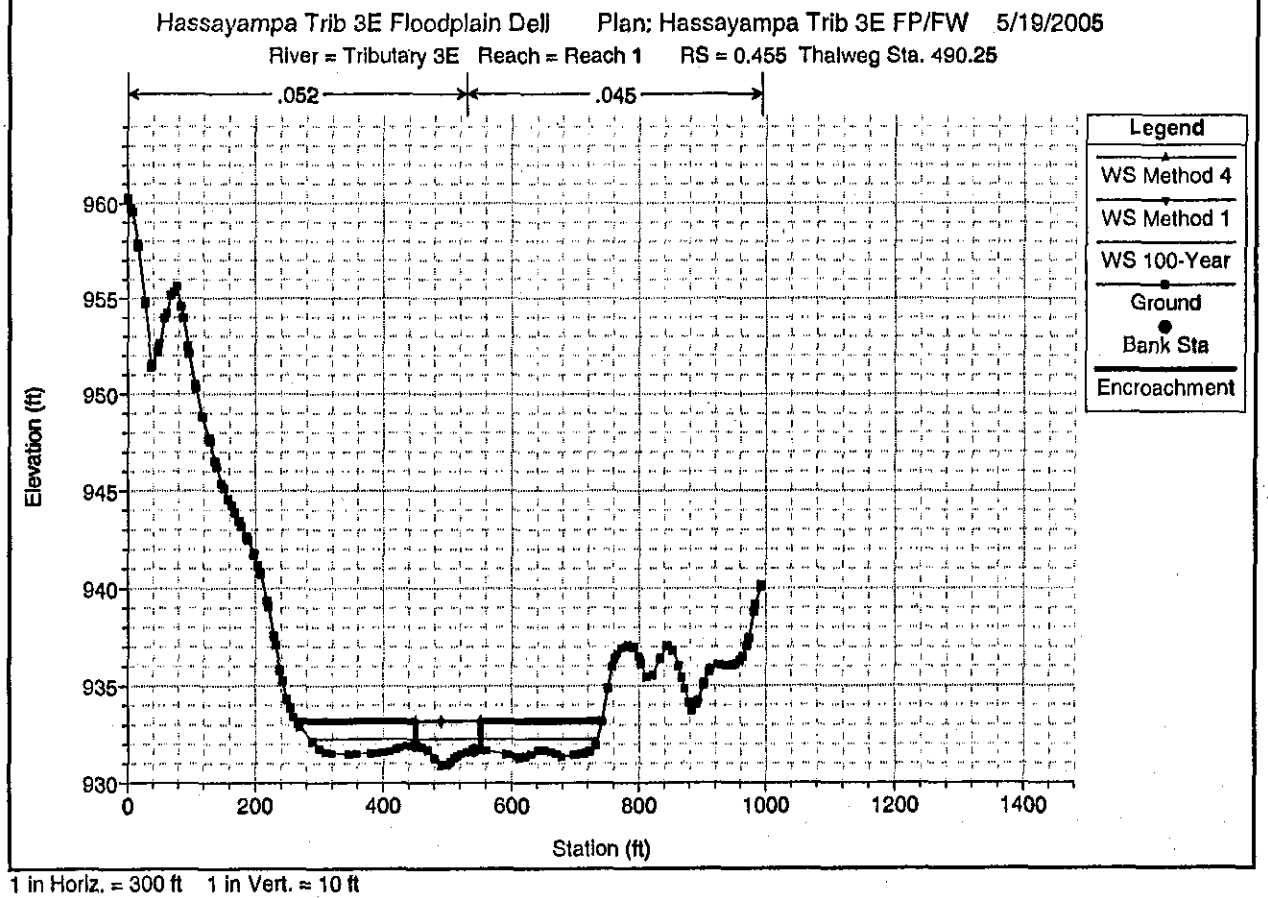
1 in Horiz. = 300 ft 1 in Vert. = 10 ft





1 in Horiz. = 300 ft 1 in Vert. = 10 ft

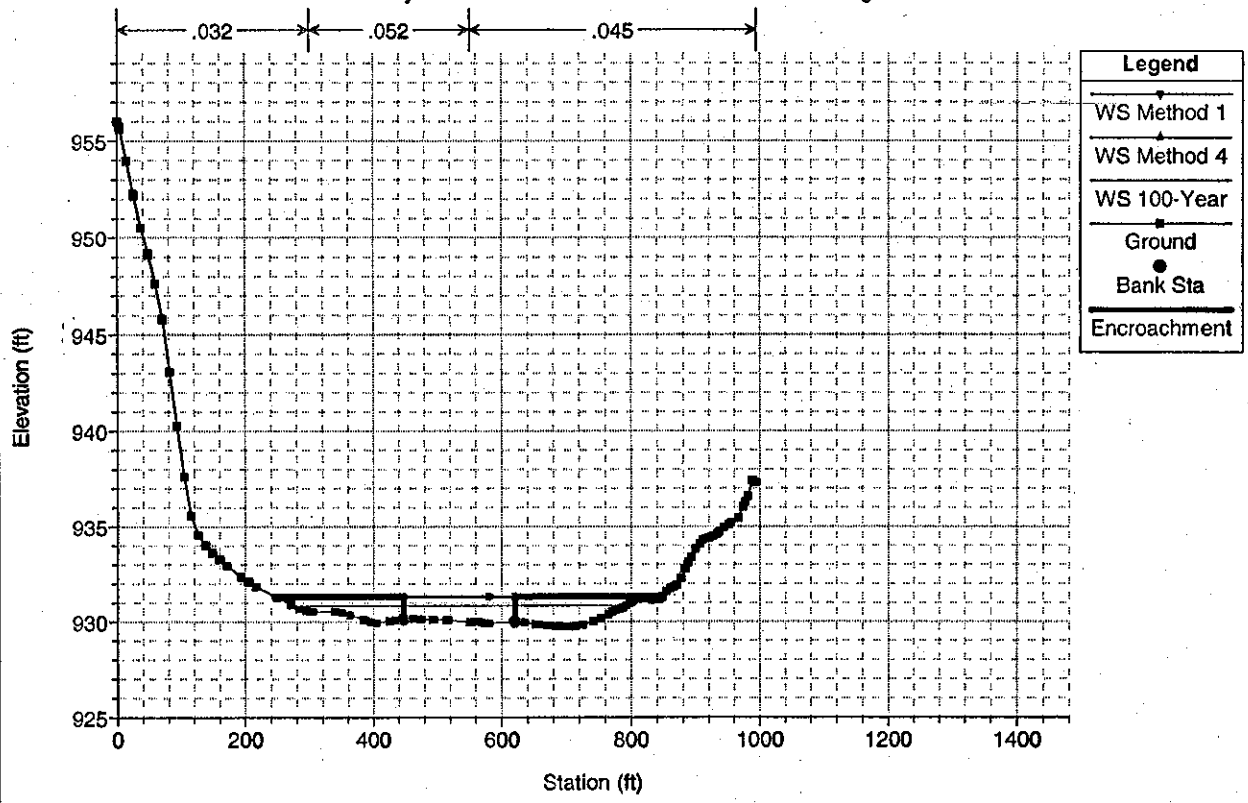




1 in Horiz. = 300 ft 1 in Vert. = 10 ft

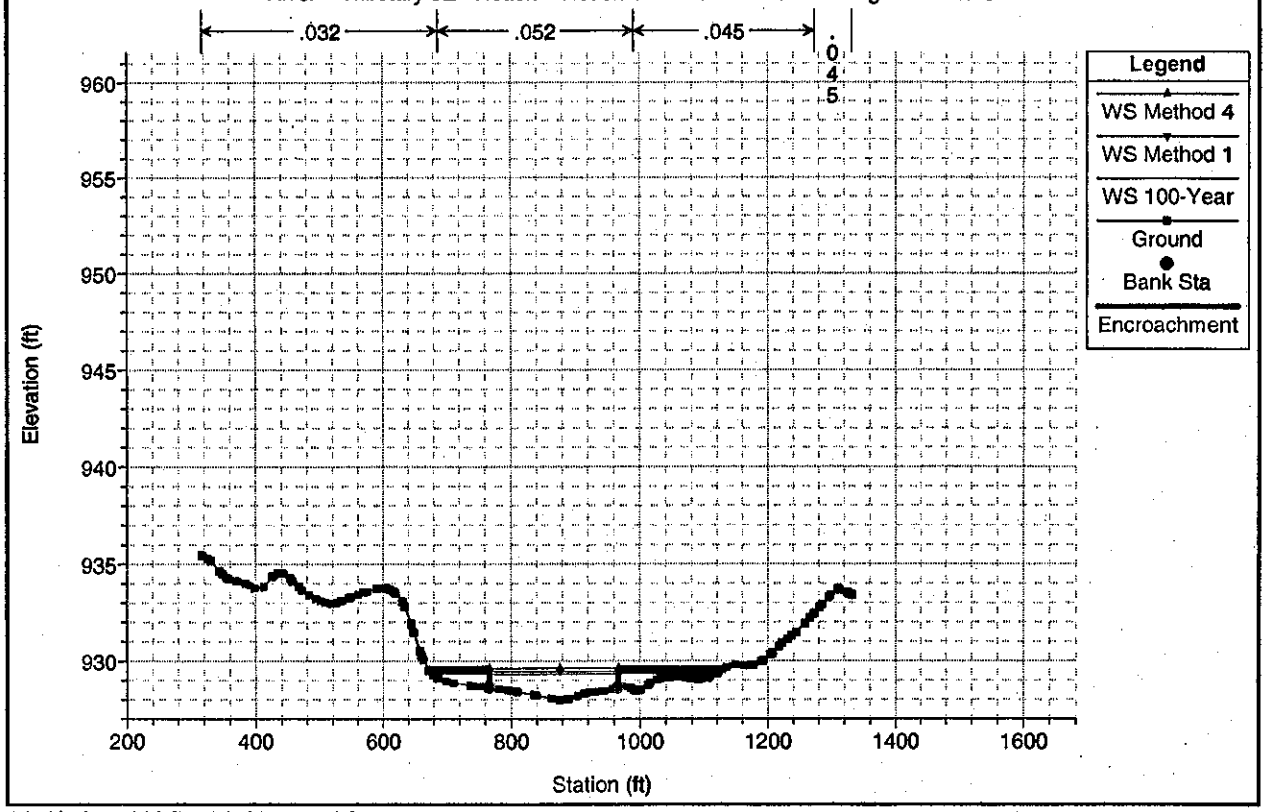
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 0.418 Thalweg Sta. 550.88



Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

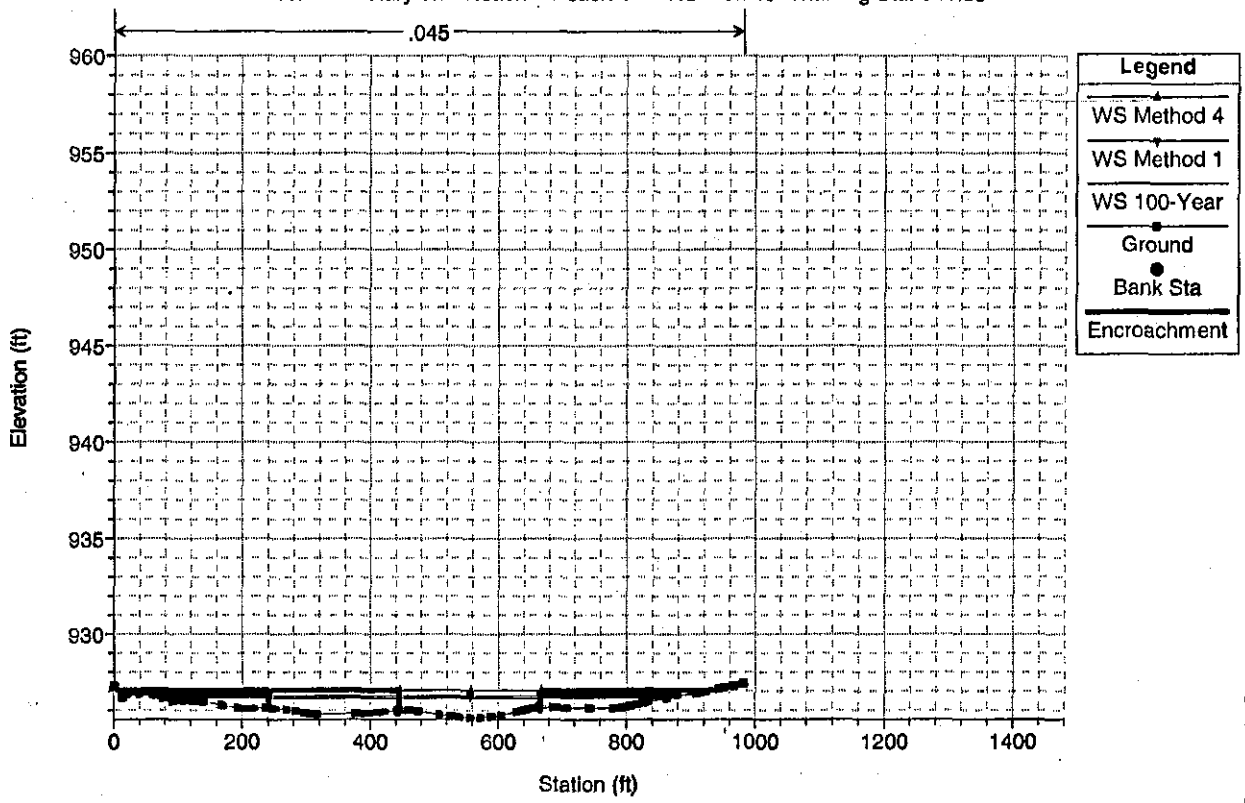
River = Tributary 3E Reach = Reach 1 RS = 0.379 Thalweg Sta. 440.15



1 in Horiz. = 300 ft 1 in Vert. = 10 ft

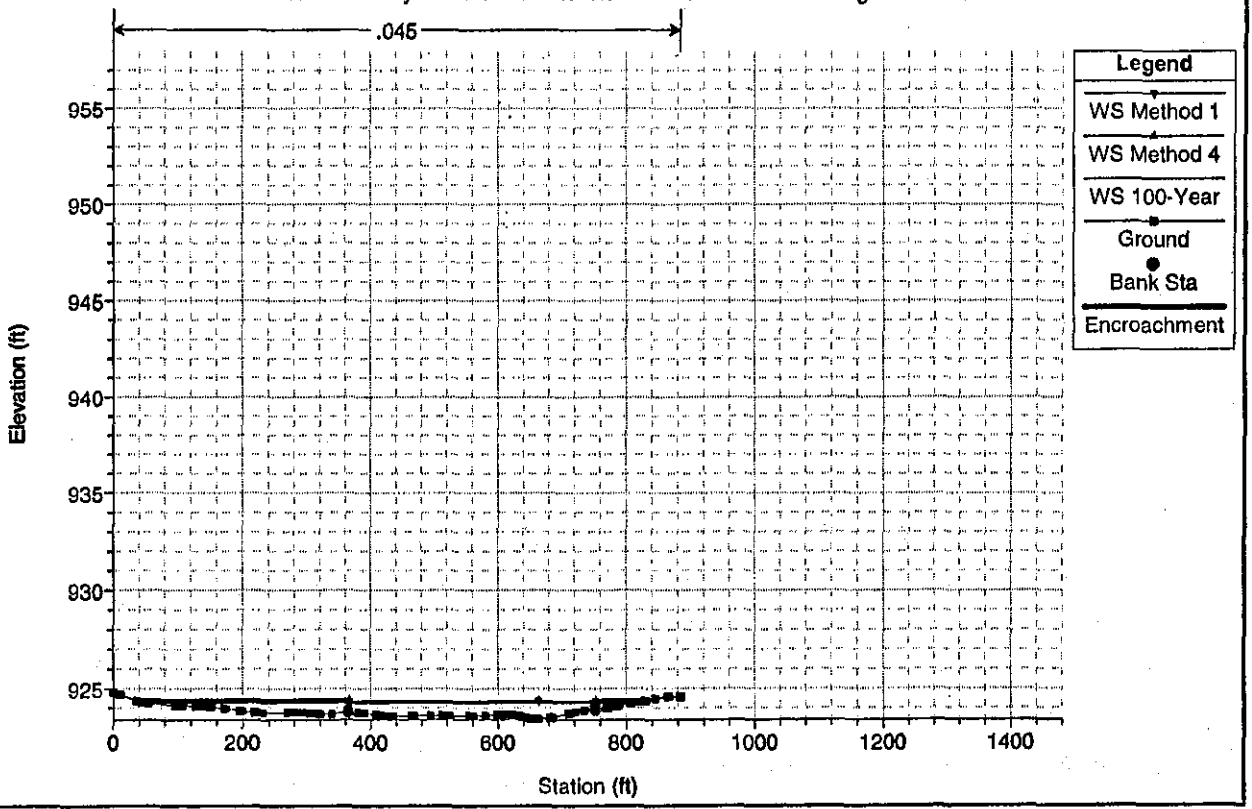
Hassayampa Trib 3E Floodplain Dell Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 0.299 Thalweg Sta. 541.55



Hassayampa Trib 3E Floodplain Dell Plan: Hassayampa Trib 3E FP/FW 5/19/2005

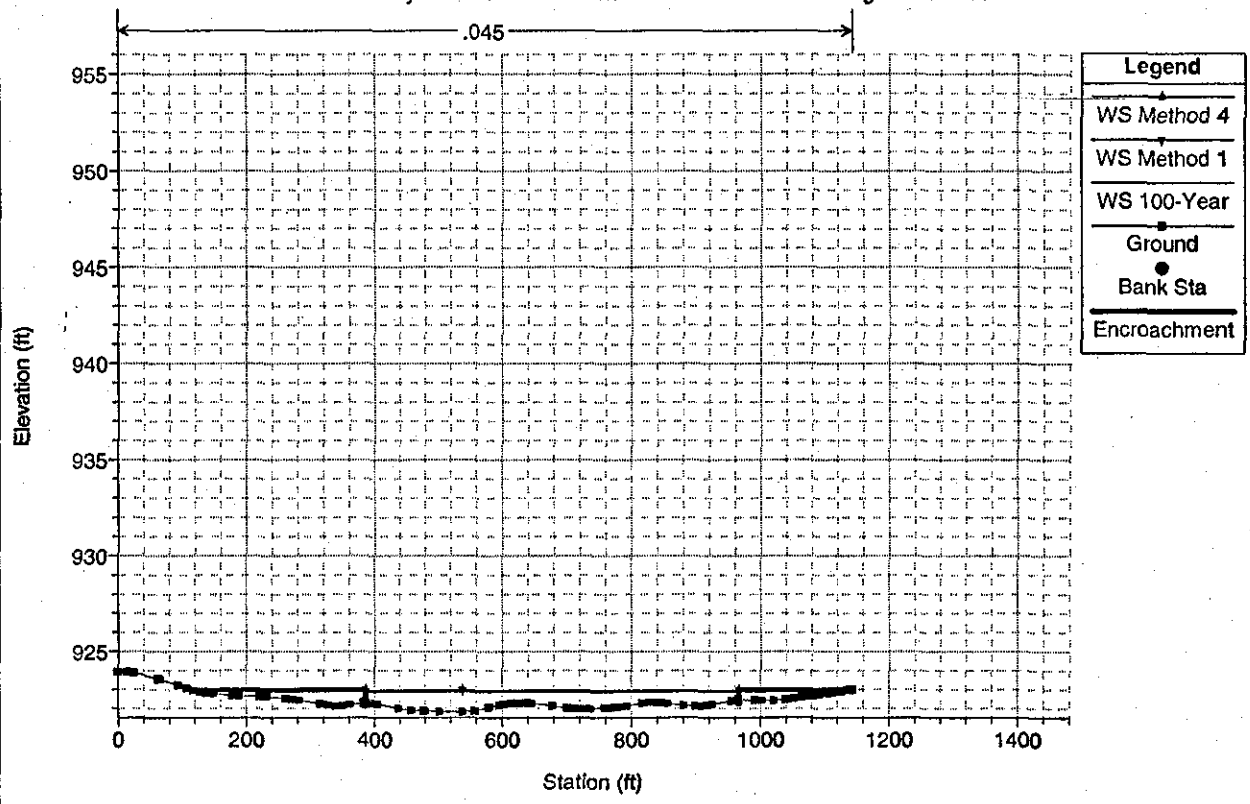
River = Tributary 3E Reach = Reach 1 RS = 0.229 Thalweg Sta. 555.98



1 in Horiz. = 300 ft 1 in Vert. = 10 ft

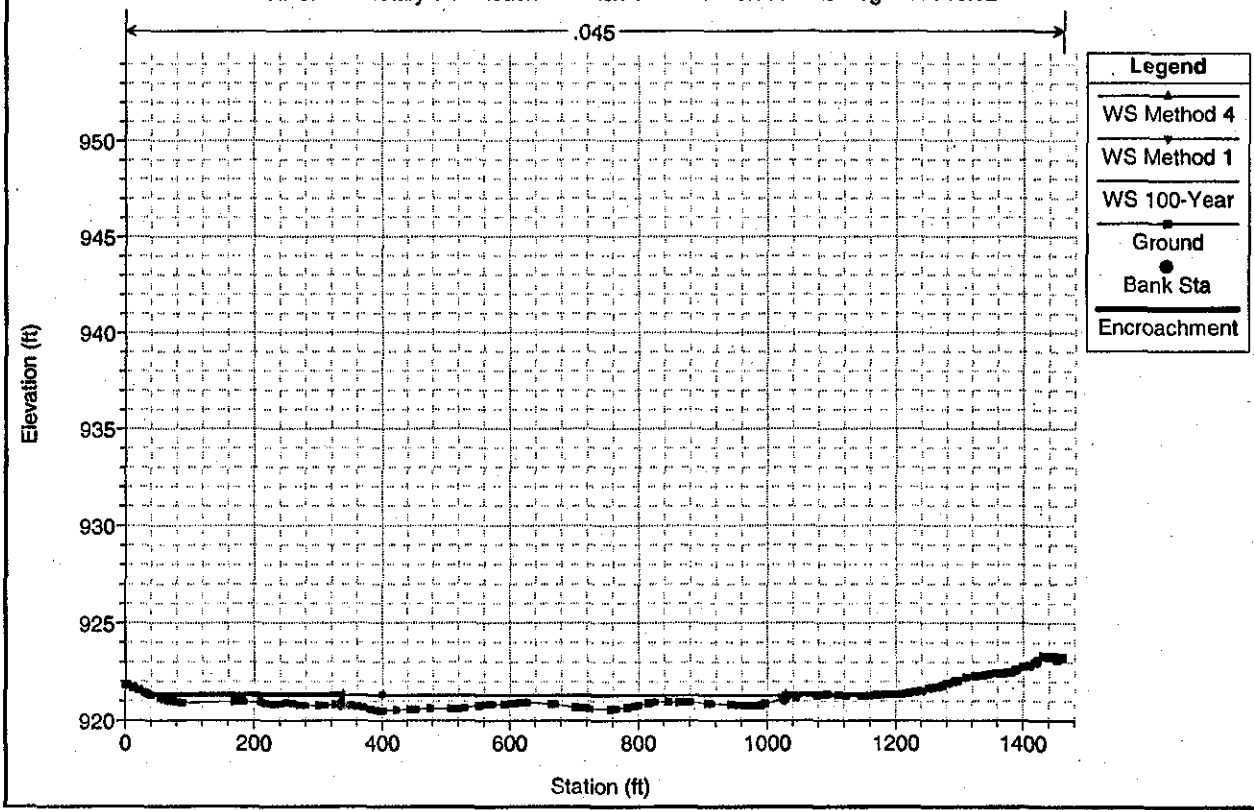
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 0.167 Thalweg Sta. 578.96



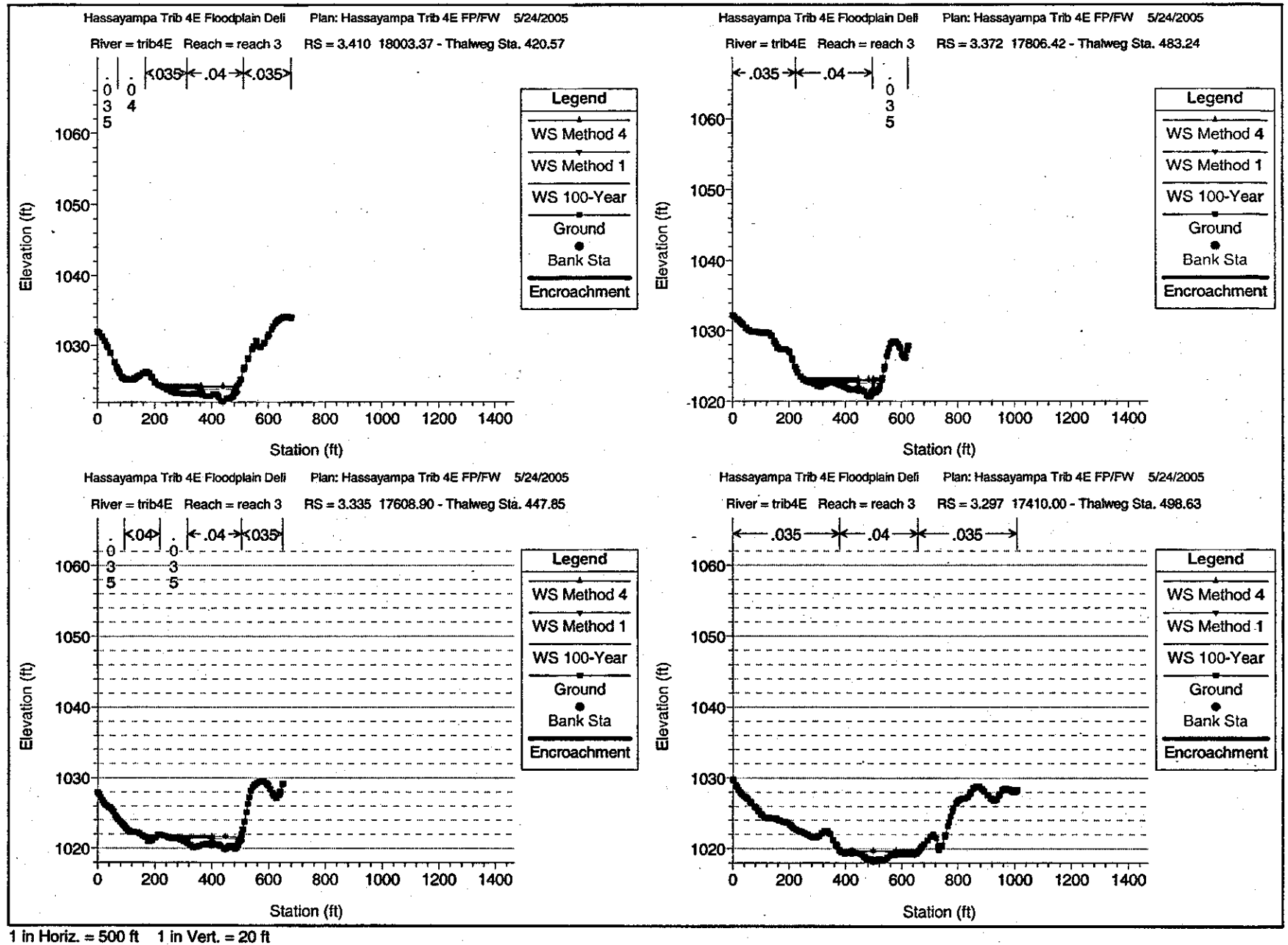
Hassayampa Trib 3E Floodplain Deli Plan: Hassayampa Trib 3E FP/FW 5/19/2005

River = Tributary 3E Reach = Reach 1 RS = 0.089 Thalweg Sta. 710.92



1 in Horiz. = 300 ft 1 in Vert. = 10 ft

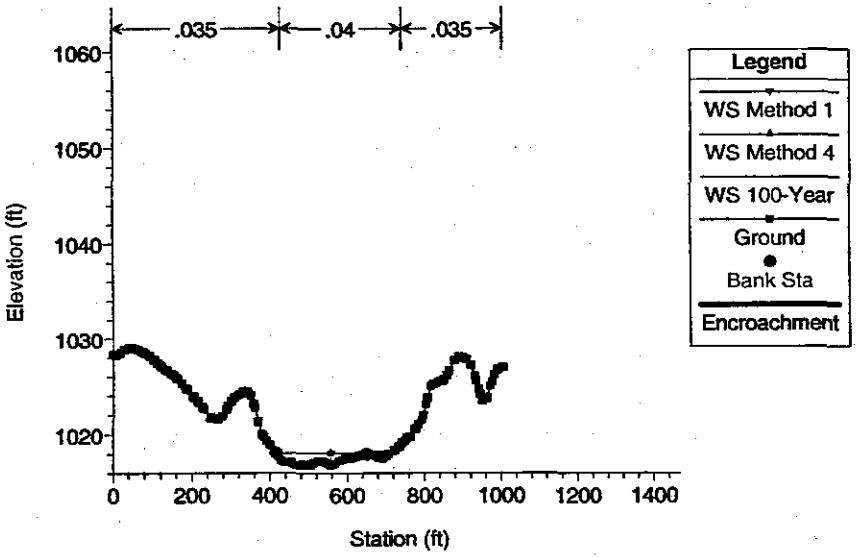
3.2.3 Tributary 4E – All Reaches



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

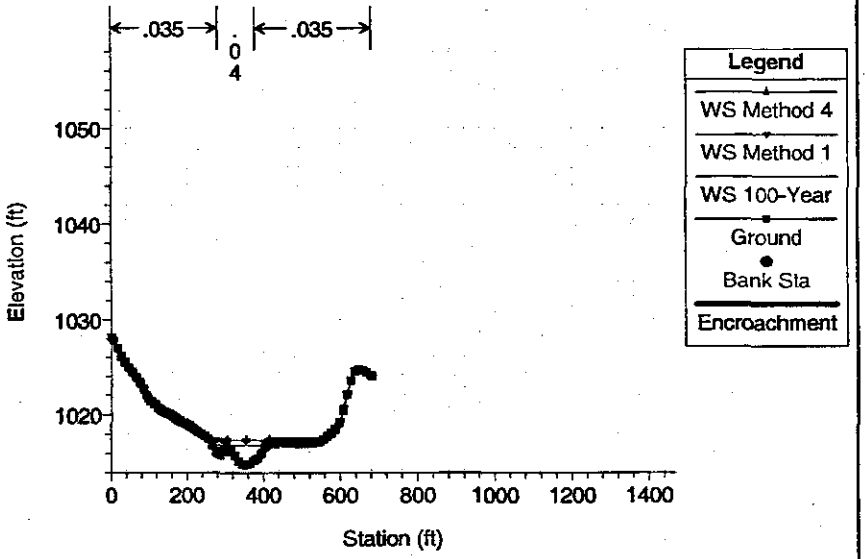
Hassayampa Trib 4E Floodplain Defl Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 3.260 17211.07 - Thalweg Sta. 497.10



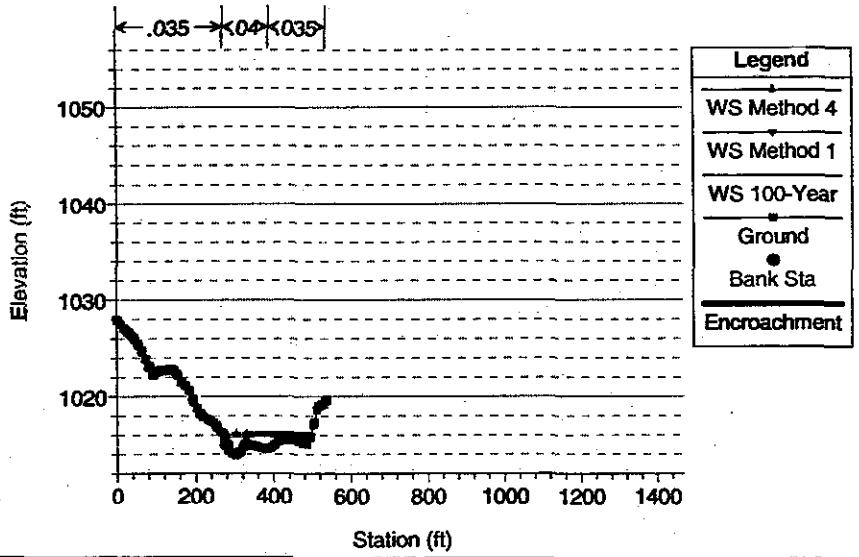
Hassayampa Trib 4E Floodplain Defl Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 3.222 17011.84 - Thalweg Sta. 344.62



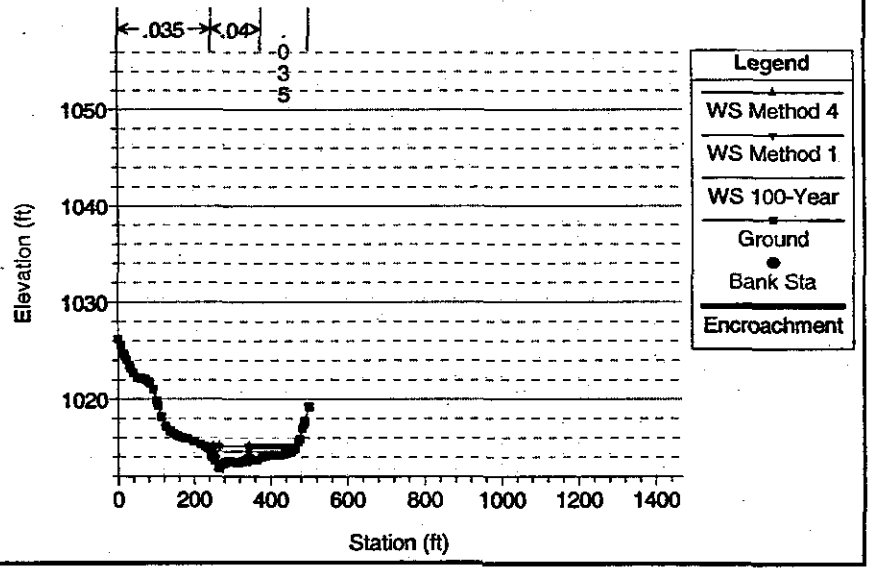
Hassayampa Trib 4E Floodplain Defl Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 3.184 16814.13 - Thalweg Sta. 303.73

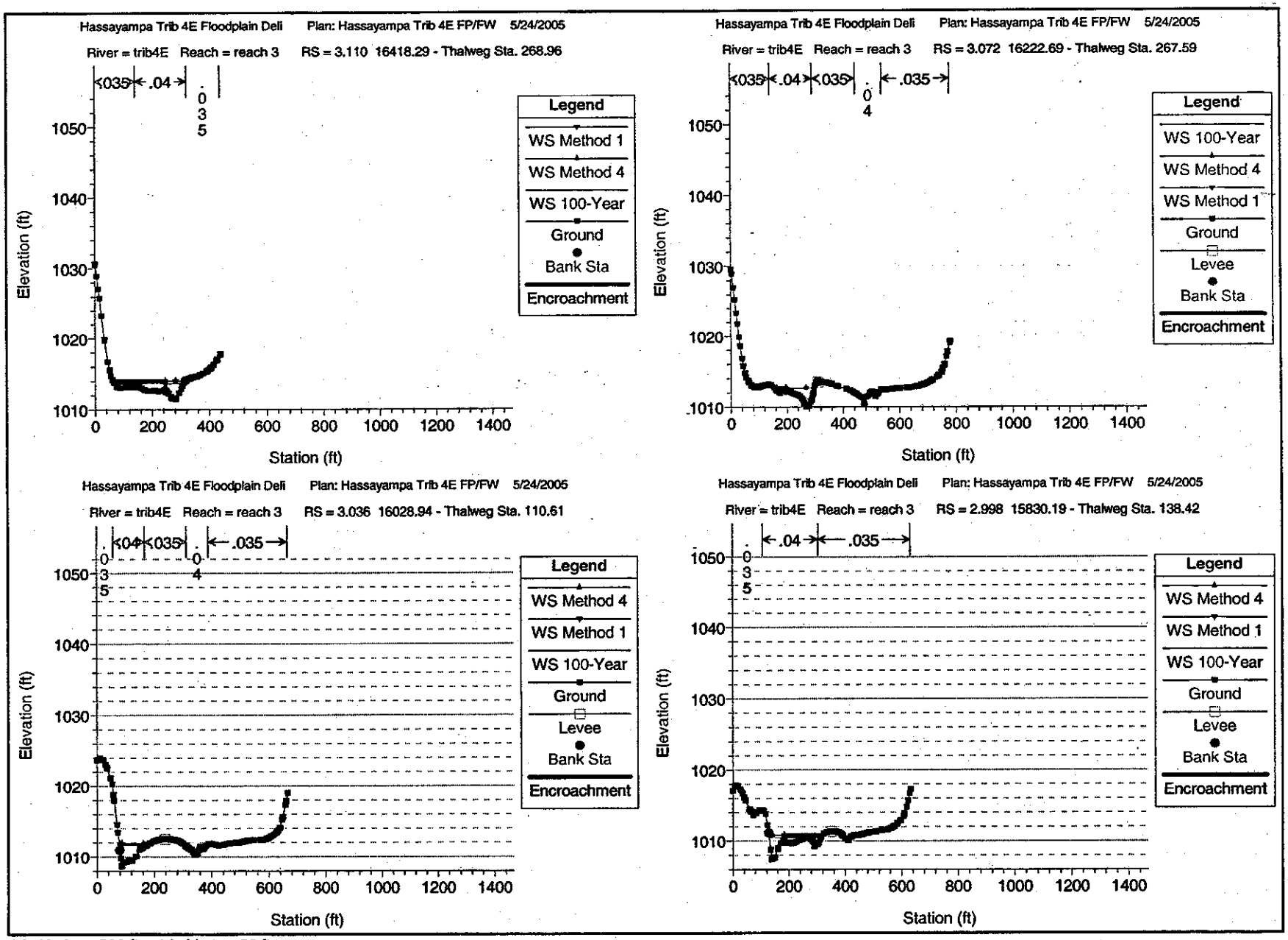


Hassayampa Trib 4E Floodplain Defl Plan: Hassayampa Trib 4E FP/FW 5/24/2005

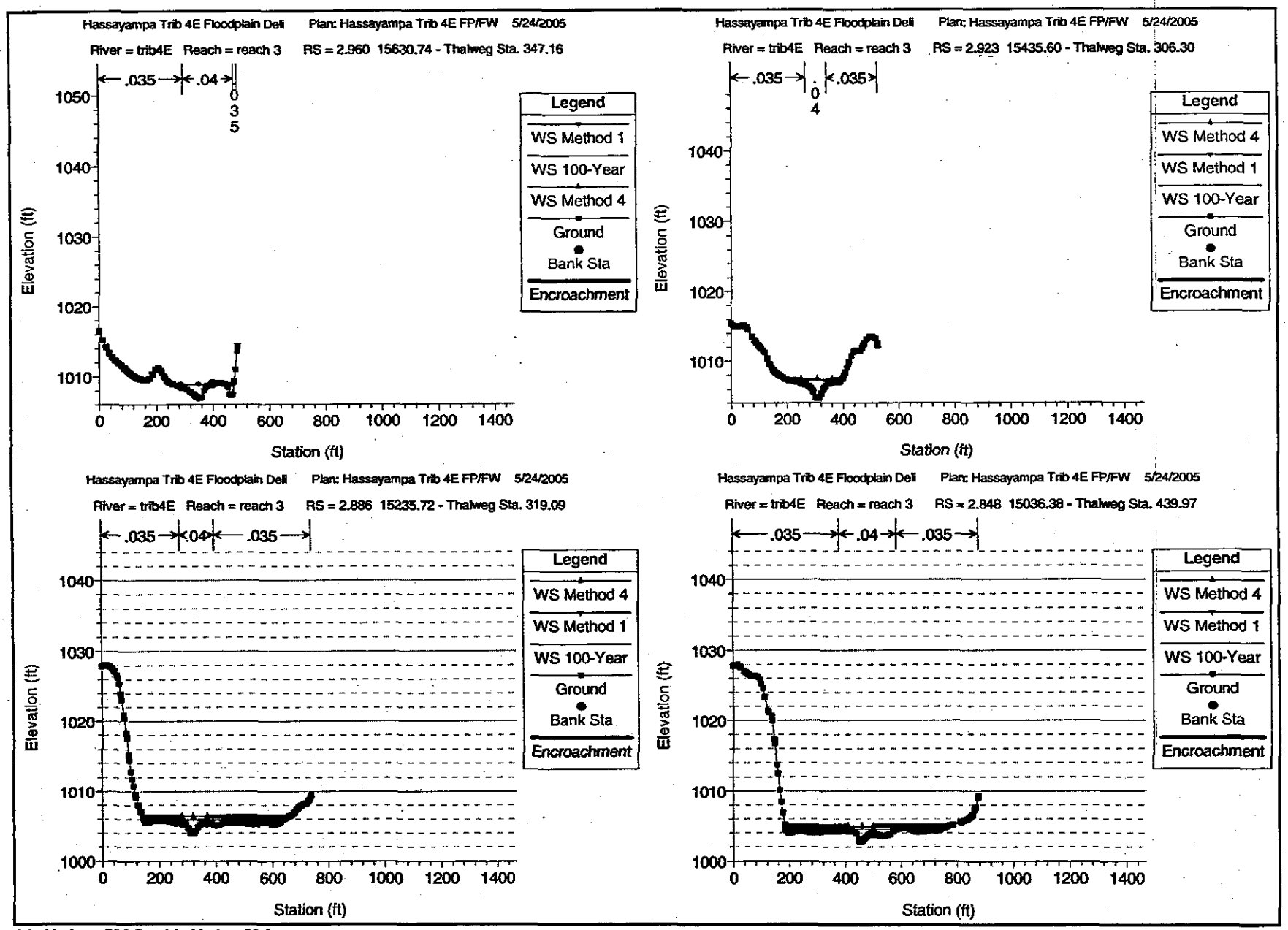
River = trib4E Reach = reach 3 RS = 3.147 16615.83 - Thalweg Sta. 266.01



1 in Horiz. = 500 ft 1 in Vert. = 20 ft



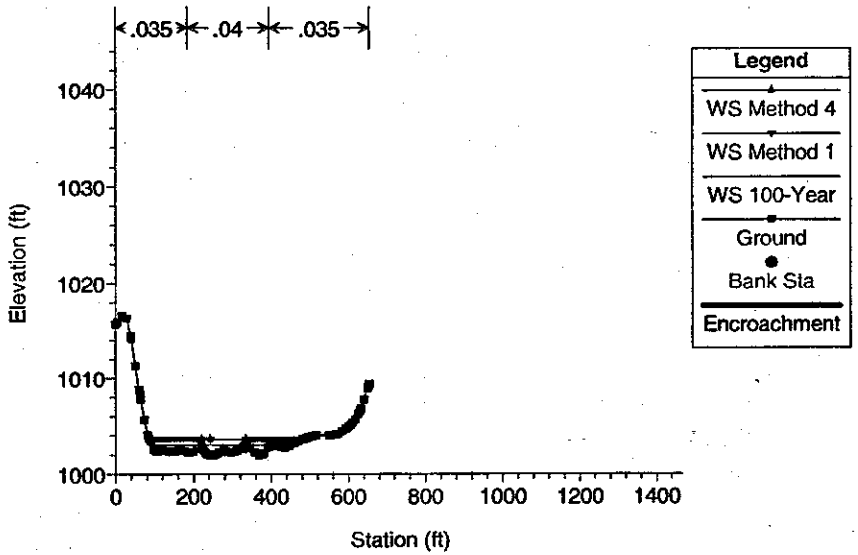
1 in Horiz. = 500 ft 1 in Vert. = 20 ft



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

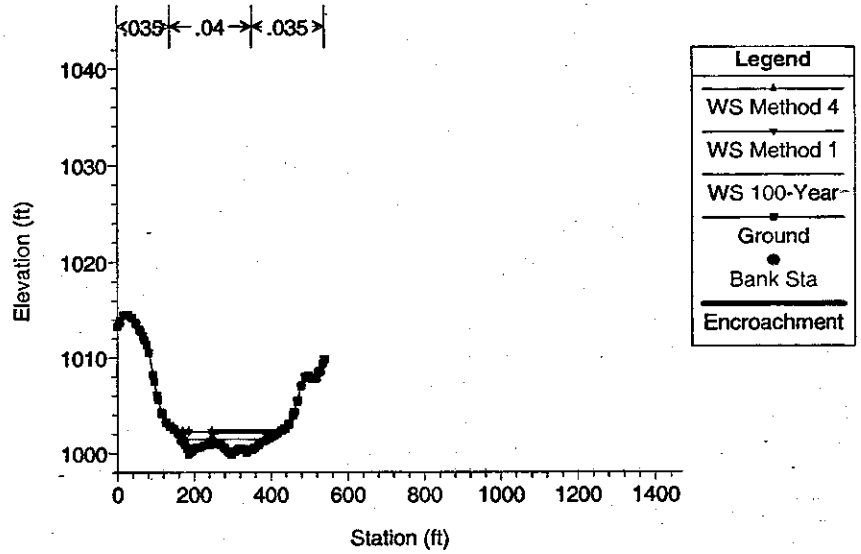
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.810 14836.72 - Thalweg Sta. 243.61



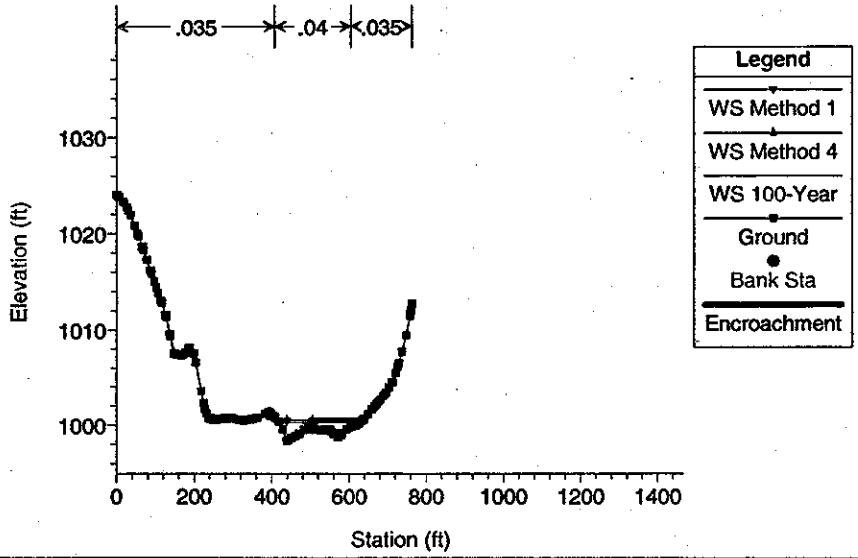
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.772 14638.14 - Thalweg Sta. 187.03



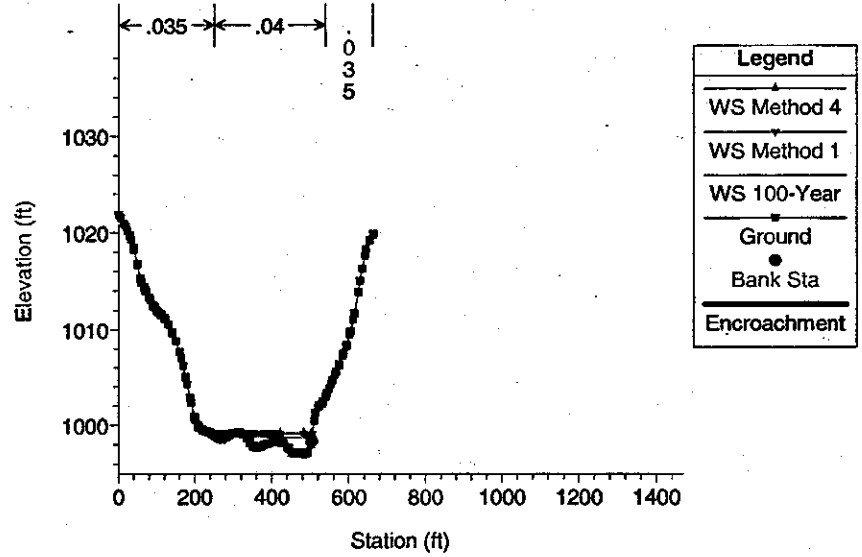
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.735 14438.48 - Thalweg Sta. 438.71



Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

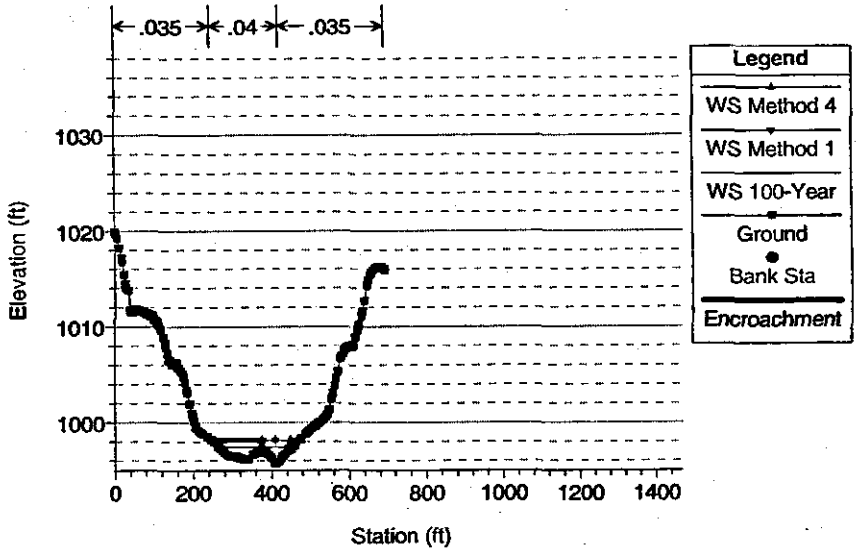
River = trib4E Reach = reach 3 RS = 2.697 14239.45 - Thalweg Sta. 451.90



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

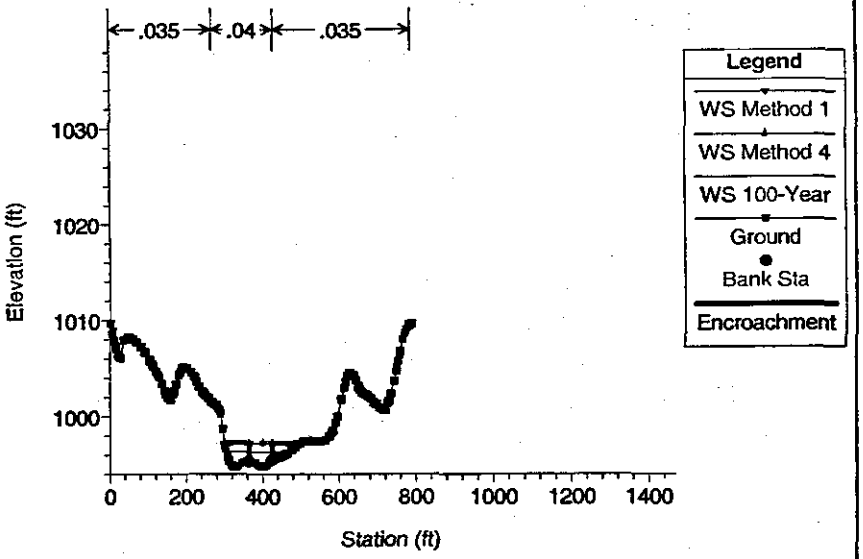
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.659 14041.64 - Thalweg Sta. 409.05



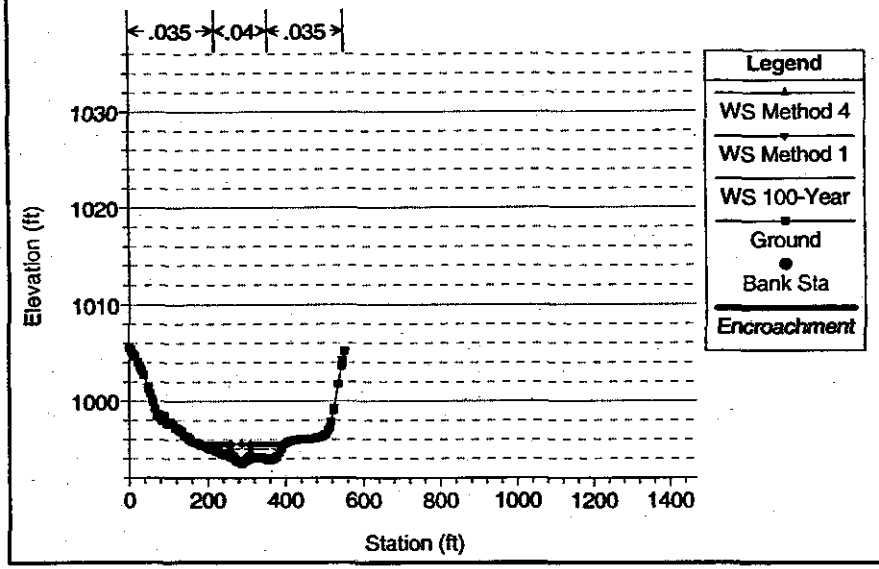
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.622 13841.65 - Thalweg Sta. 399.10



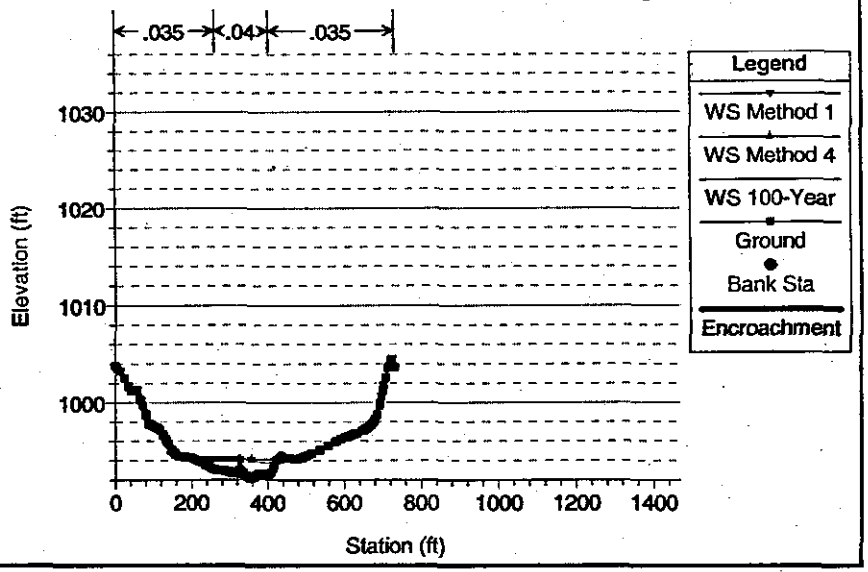
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.584 13641.88 - Thalweg Sta. 287.68

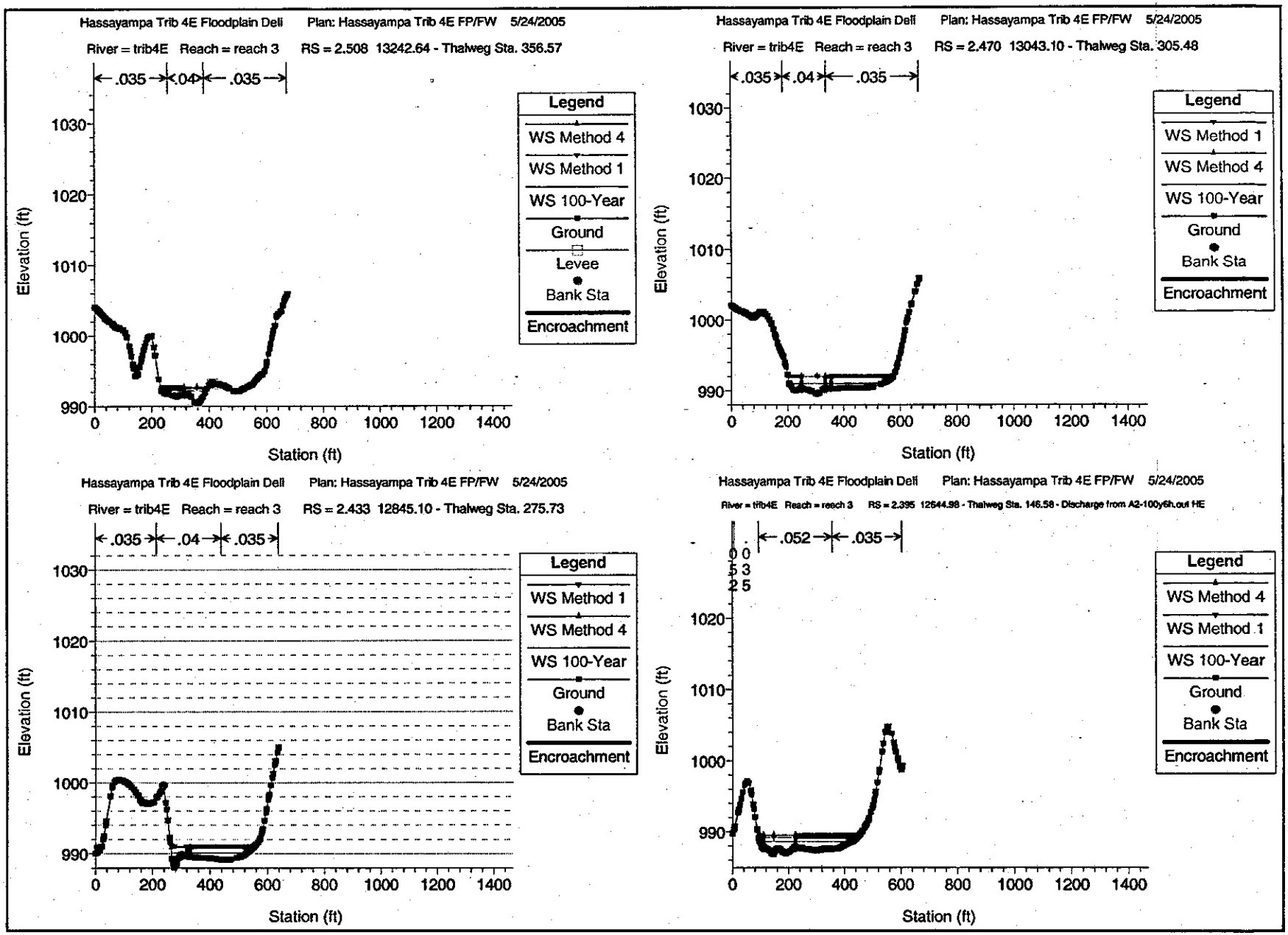


Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.546 13442.54 - Thalweg Sta. 356.59



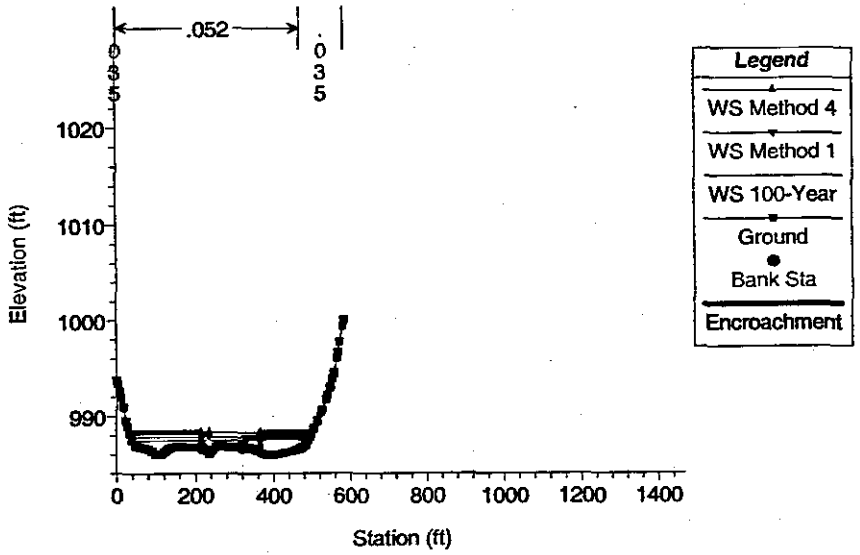
1 in Horiz. = 500 ft 1 in Vert. = 20 ft



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

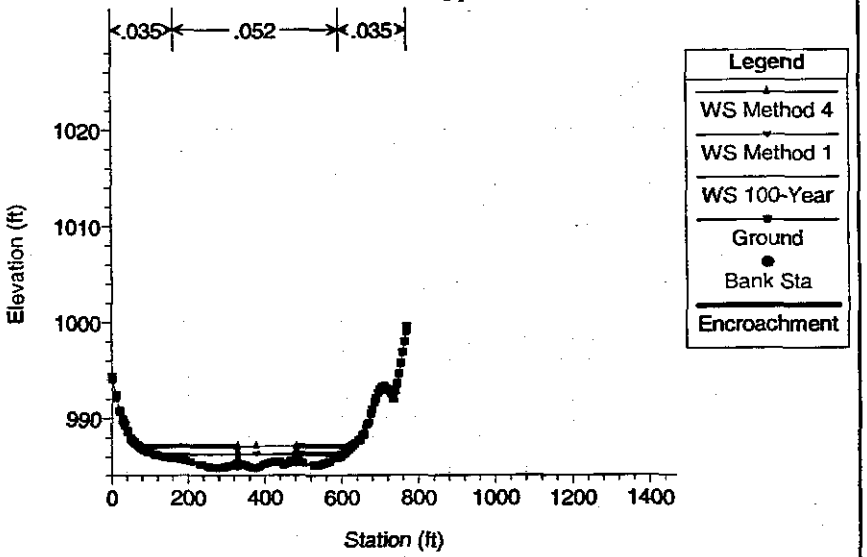
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.362 12472.32 - Thalweg Sta. 204.15



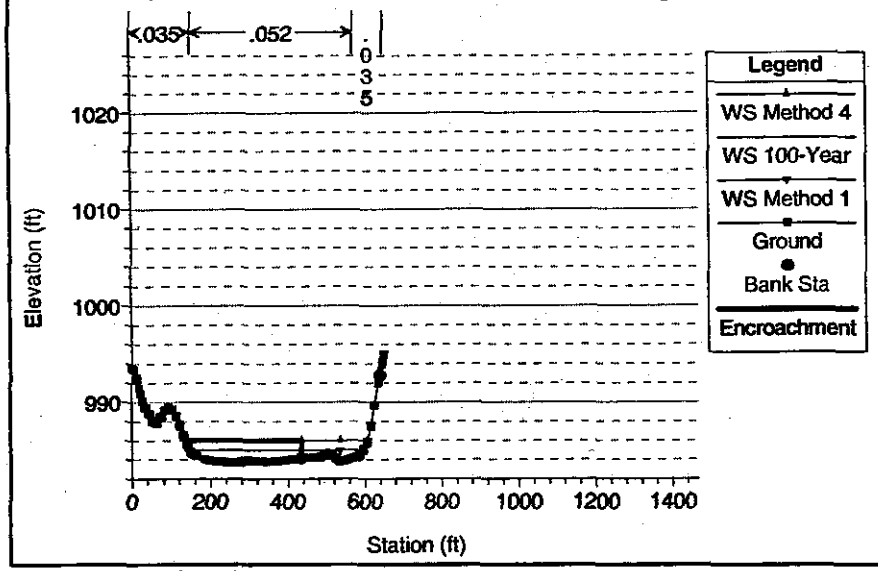
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.324 12272.40 - Thalweg Sta. 458.08



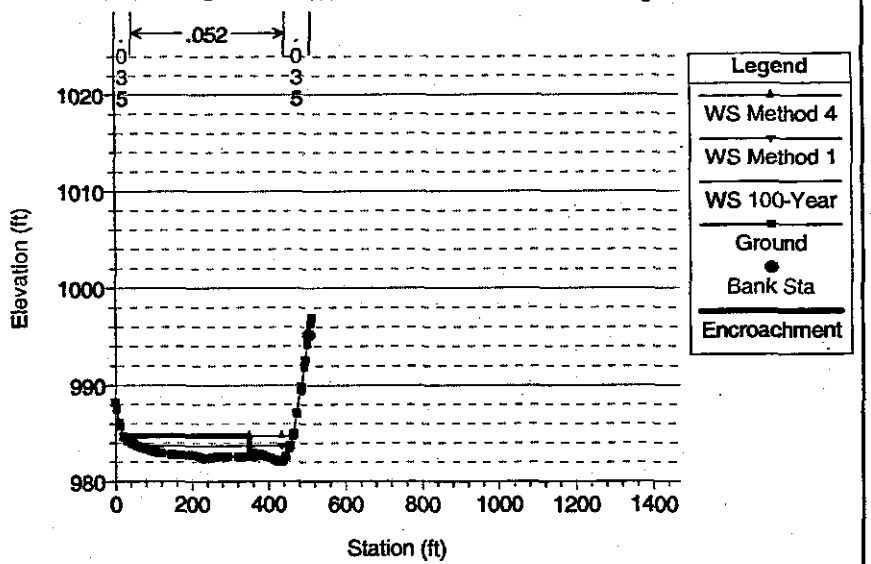
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.287 12072.82 - Thalweg Sta. 503.68

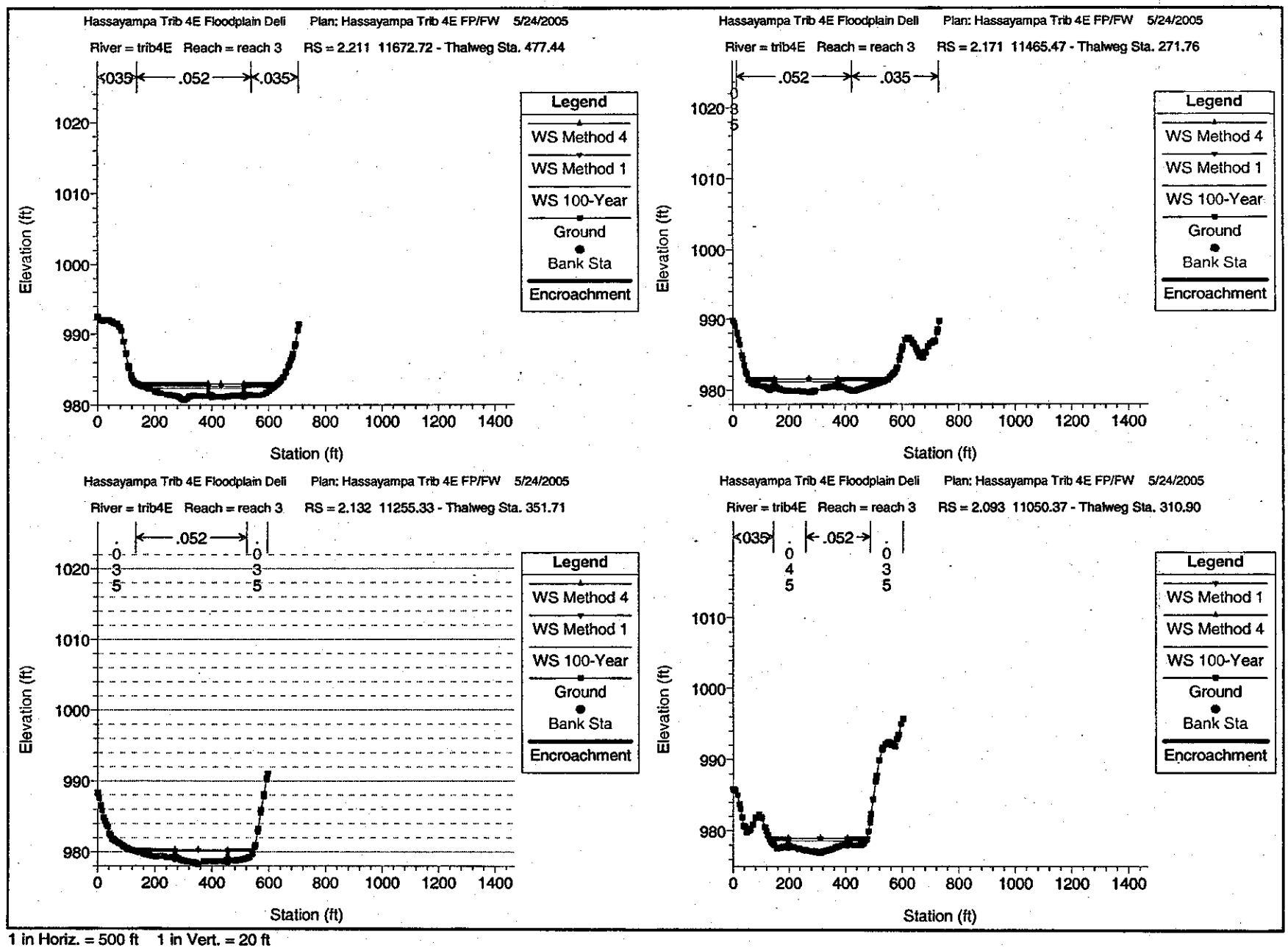


Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.249 11872.83 - Thalweg Sta. 393.83



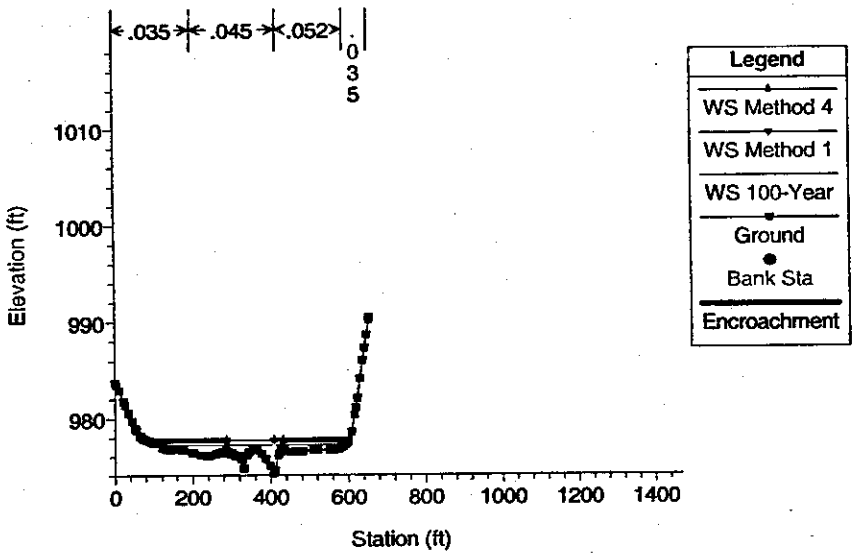
1 in Horiz. = 500 ft 1 in Vert. = 20 ft



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

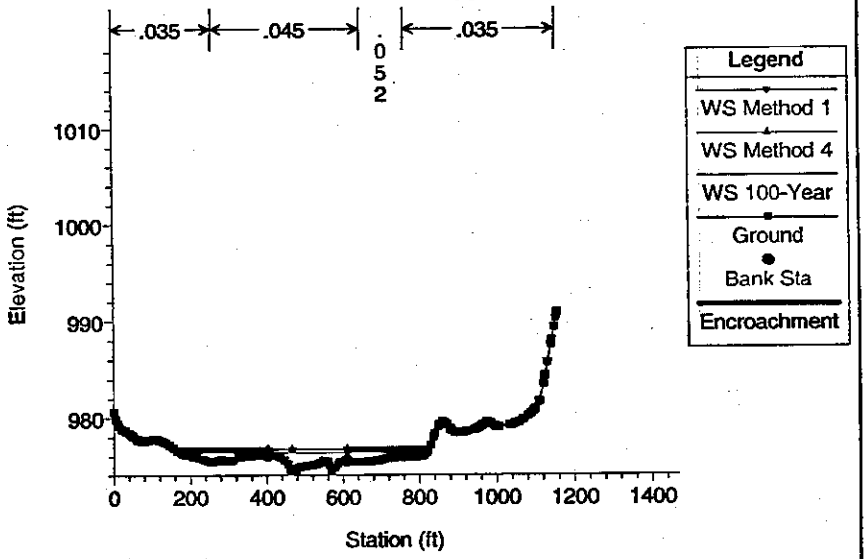
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.055 10850.66 - Thalweg Sta. 408.57



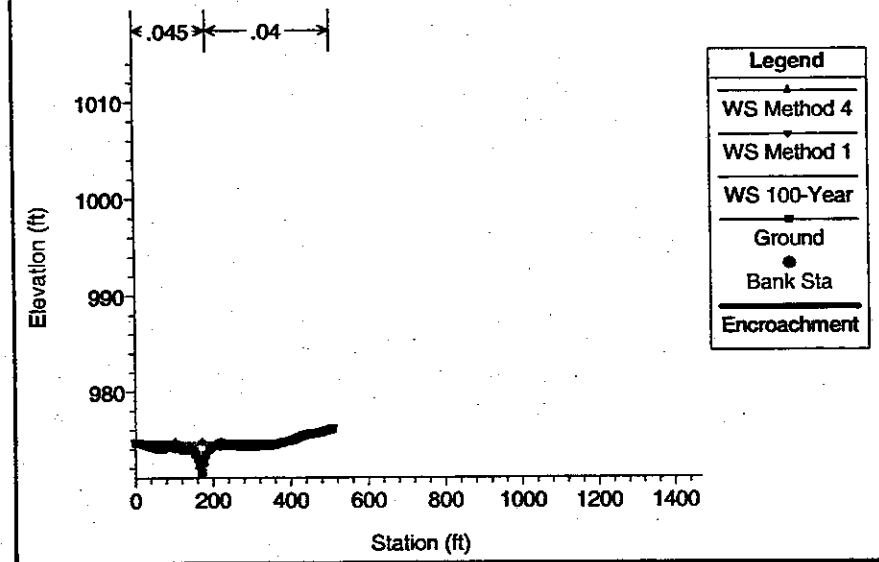
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 3 RS = 2.017 10651.27 - Thalweg Sta. 559.05



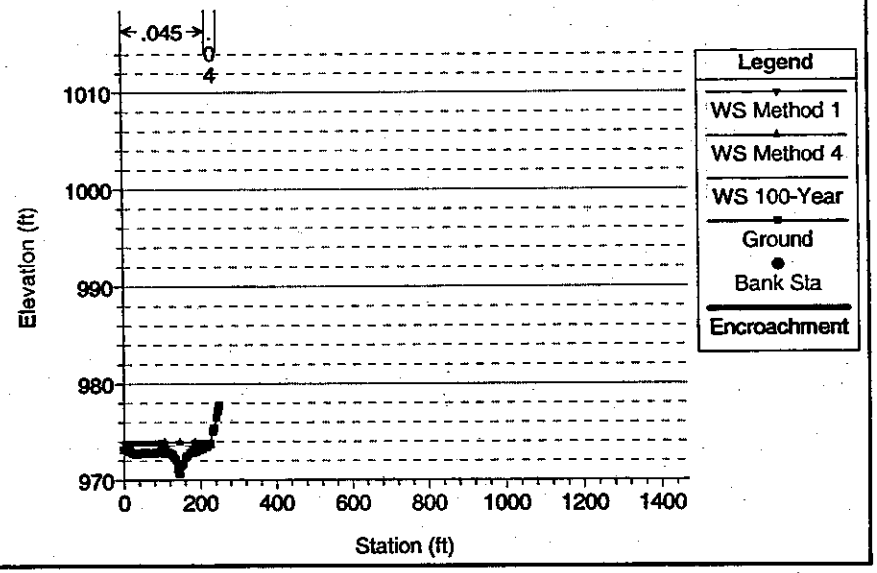
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 2 RS = 1.965 10372.84 - Thalweg Sta. 171.28 - Discharge Split from trib4E Rea

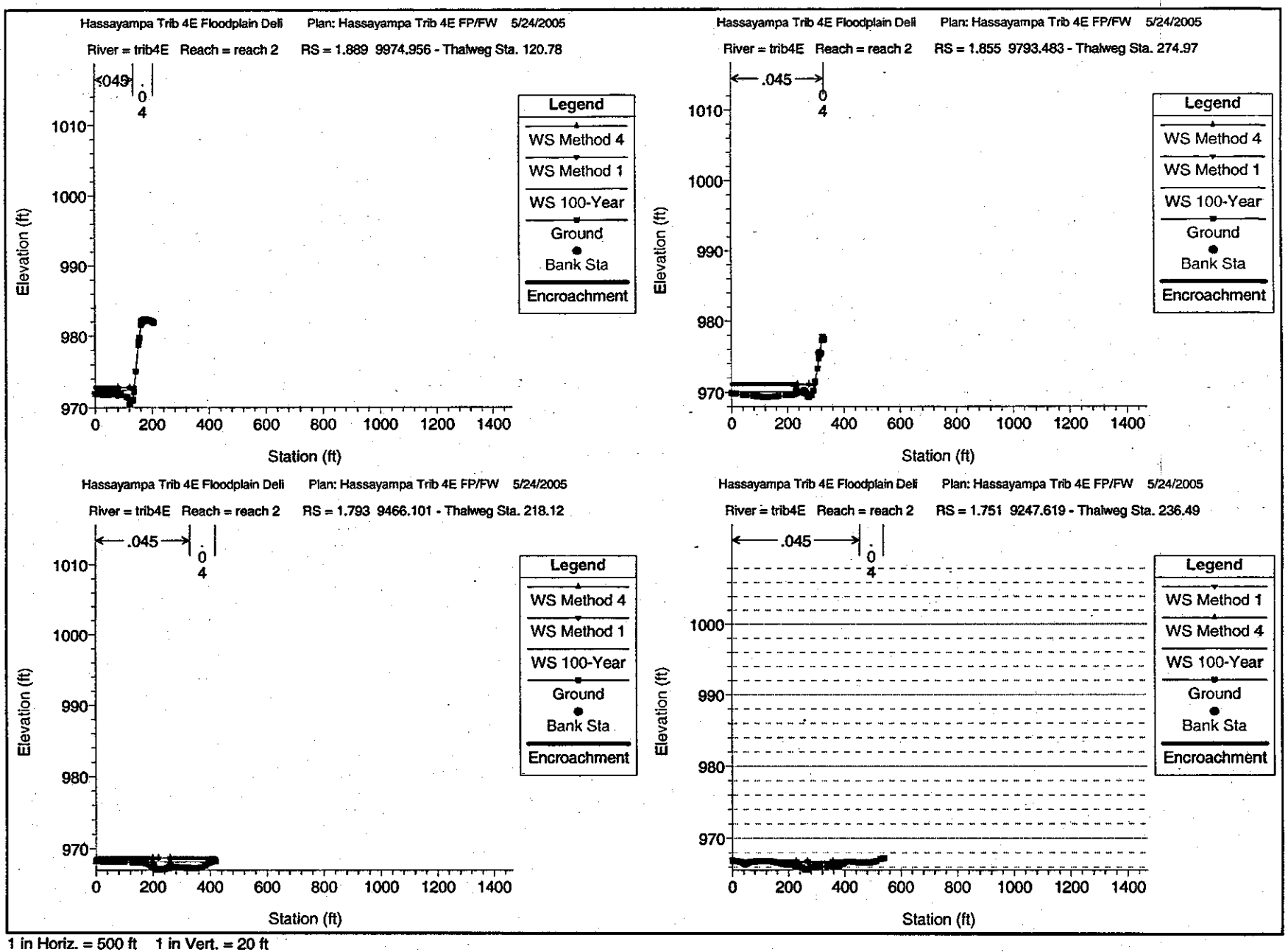


Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 2 RS = 1.927 10172.13 - Thalweg Sta. 144.84



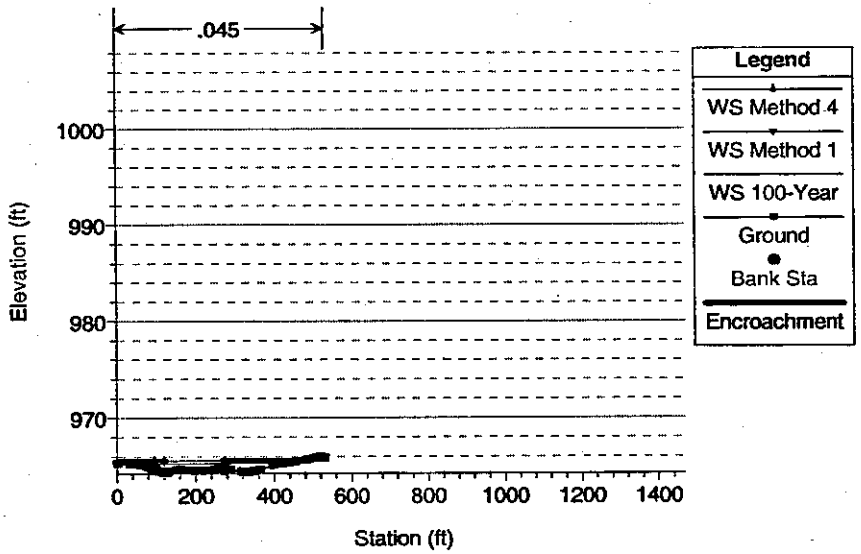
1 in Horiz. = 500 ft 1 in Vert. = 20 ft



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

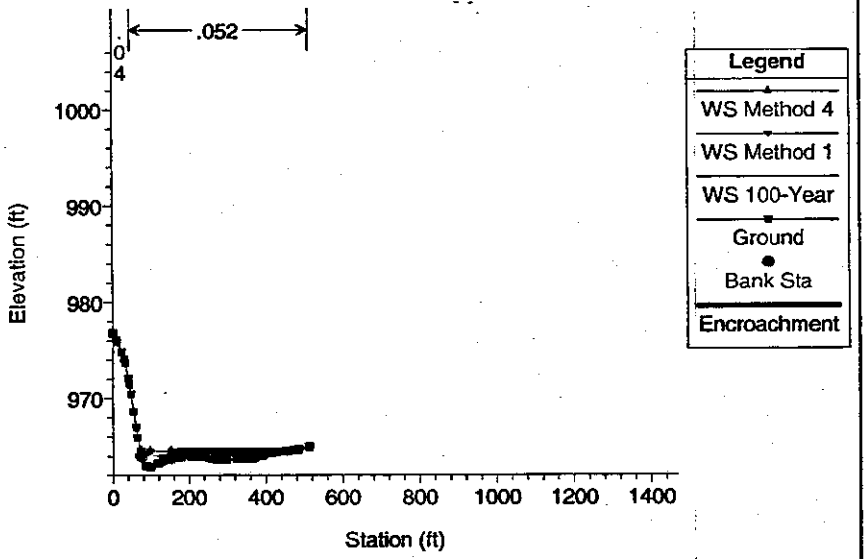
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 2 RS = 1.700 8976.824 - Thalweg Sta. 118.57



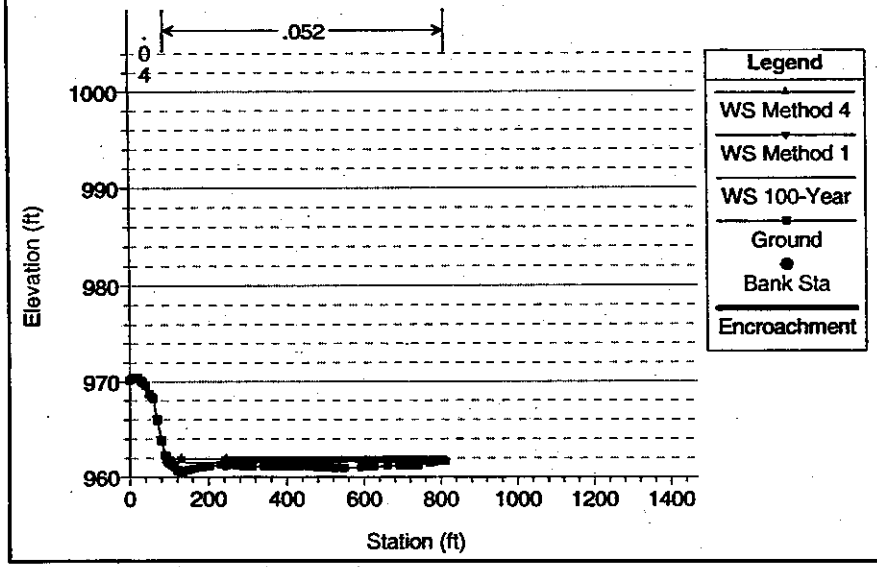
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 2 RS = 1.662 8777.831 - Thalweg Sta. 96.60



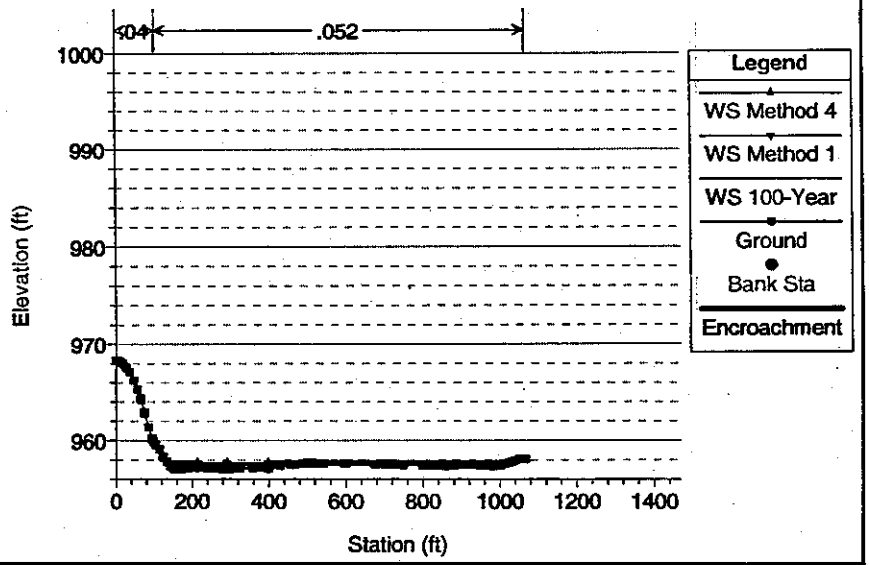
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 2 RS = 1.597 8430.189 - Thalweg Sta. 129.97

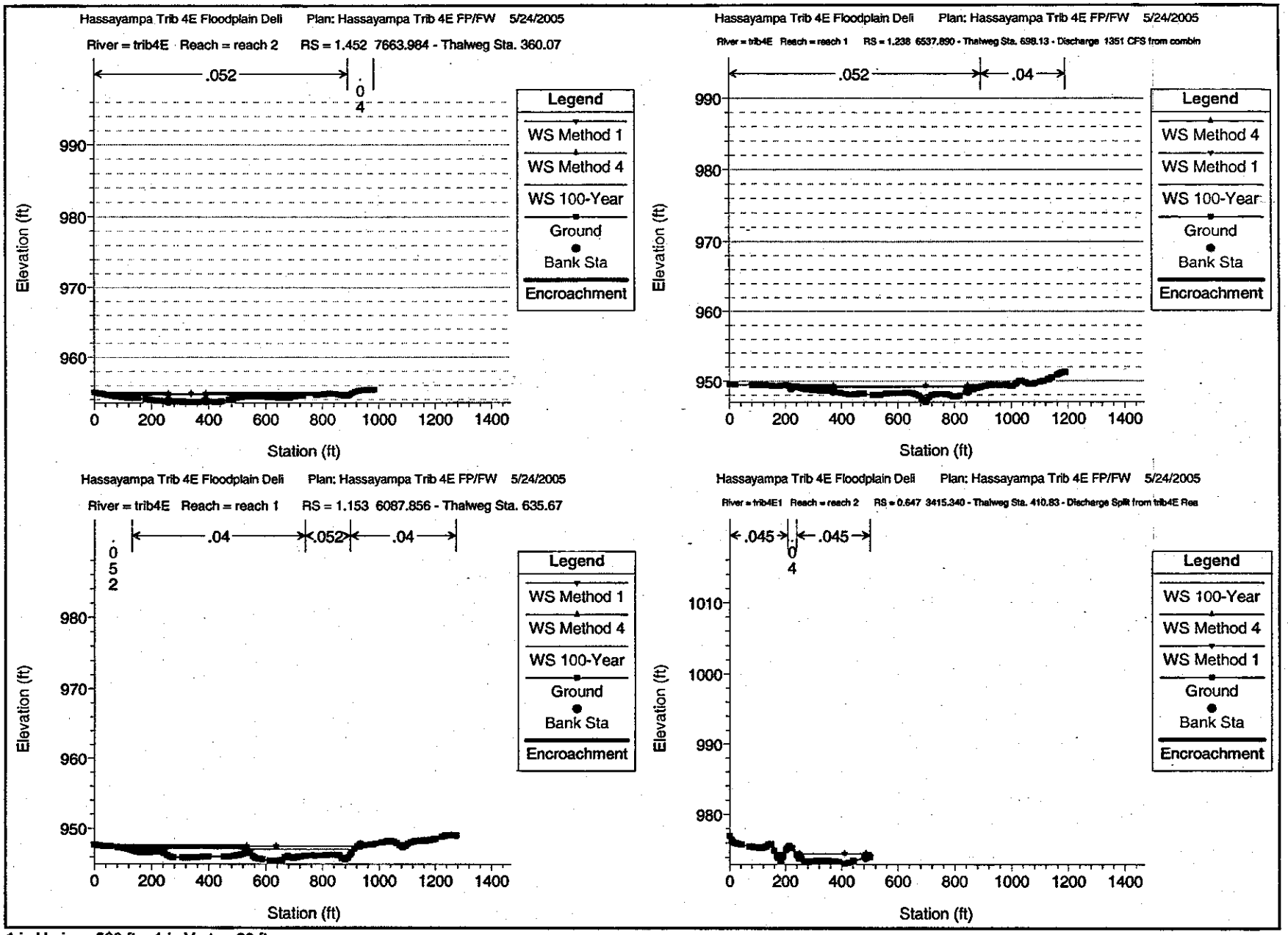


Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E Reach = reach 2 RS = 1.521 8033.430 - Thalweg Sta. 244.53



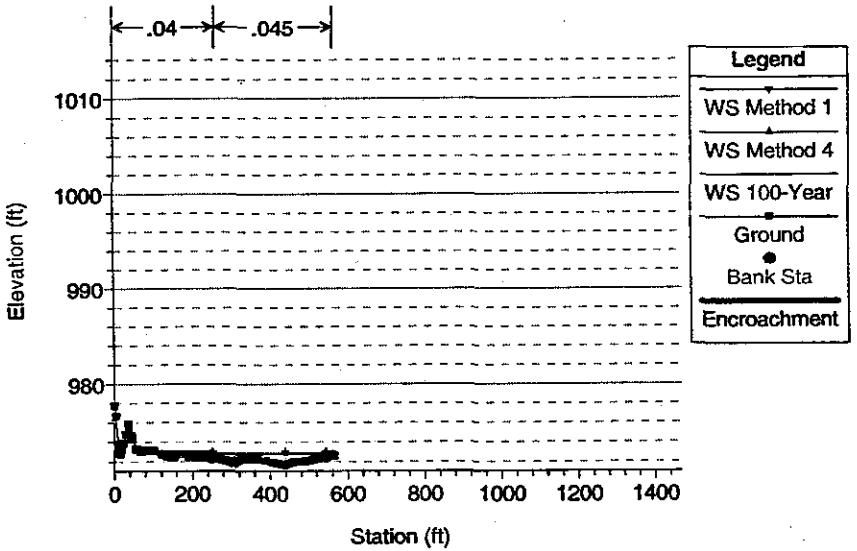
1 in Horiz. = 500 ft 1 in Vert. = 20 ft



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

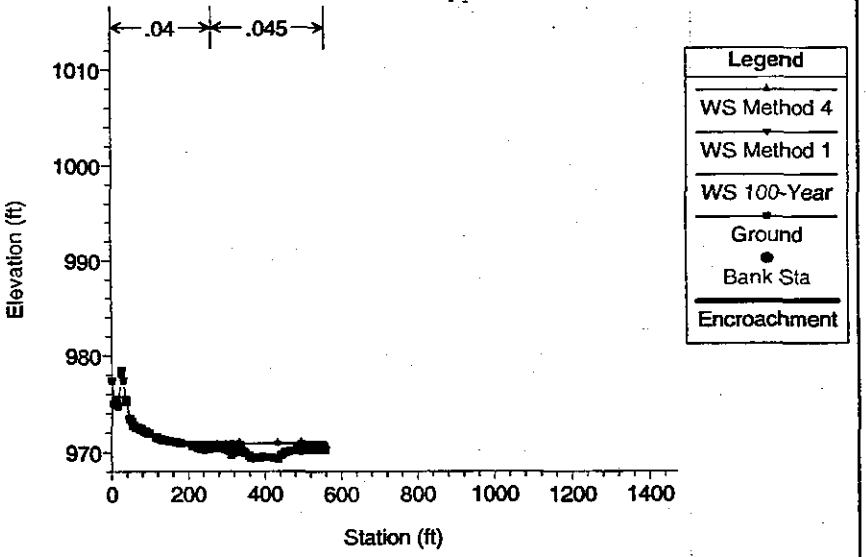
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E1 Reach = reach 2 RS = 0.606 3200.929 - Thalweg Sta. 407.95



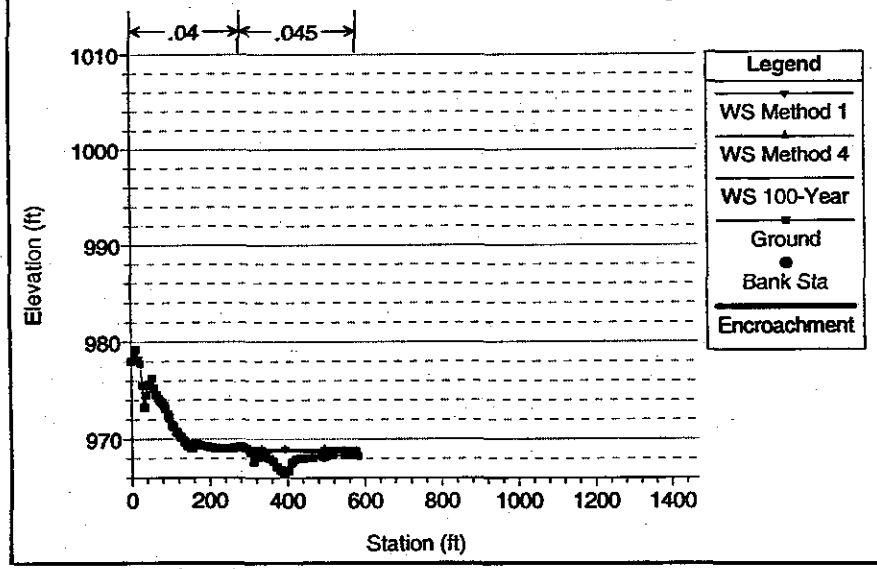
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E1 Reach = reach 2 RS = 0.562 2964.810 - Thalweg Sta. 392.96



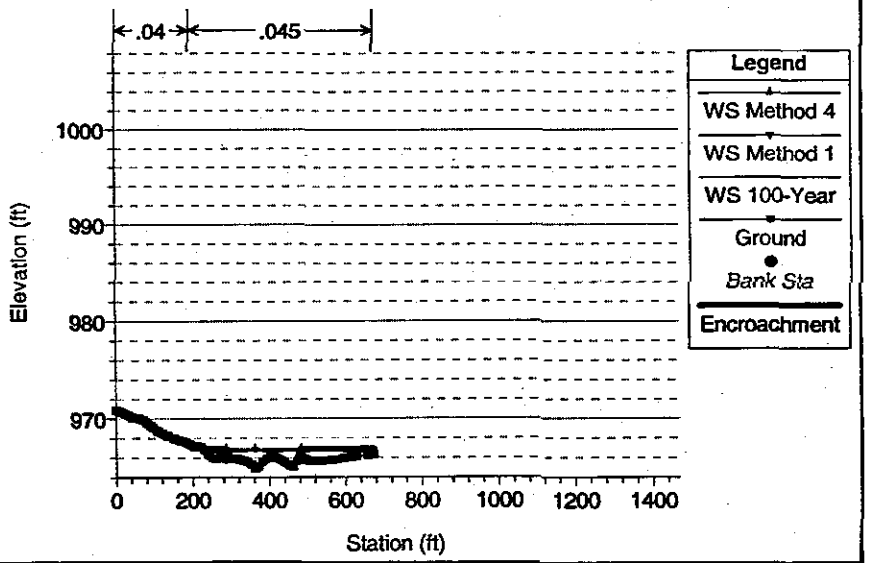
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E1 Reach = reach 2 RS = 0.513 2710.211 - Thalweg Sta. 383.20

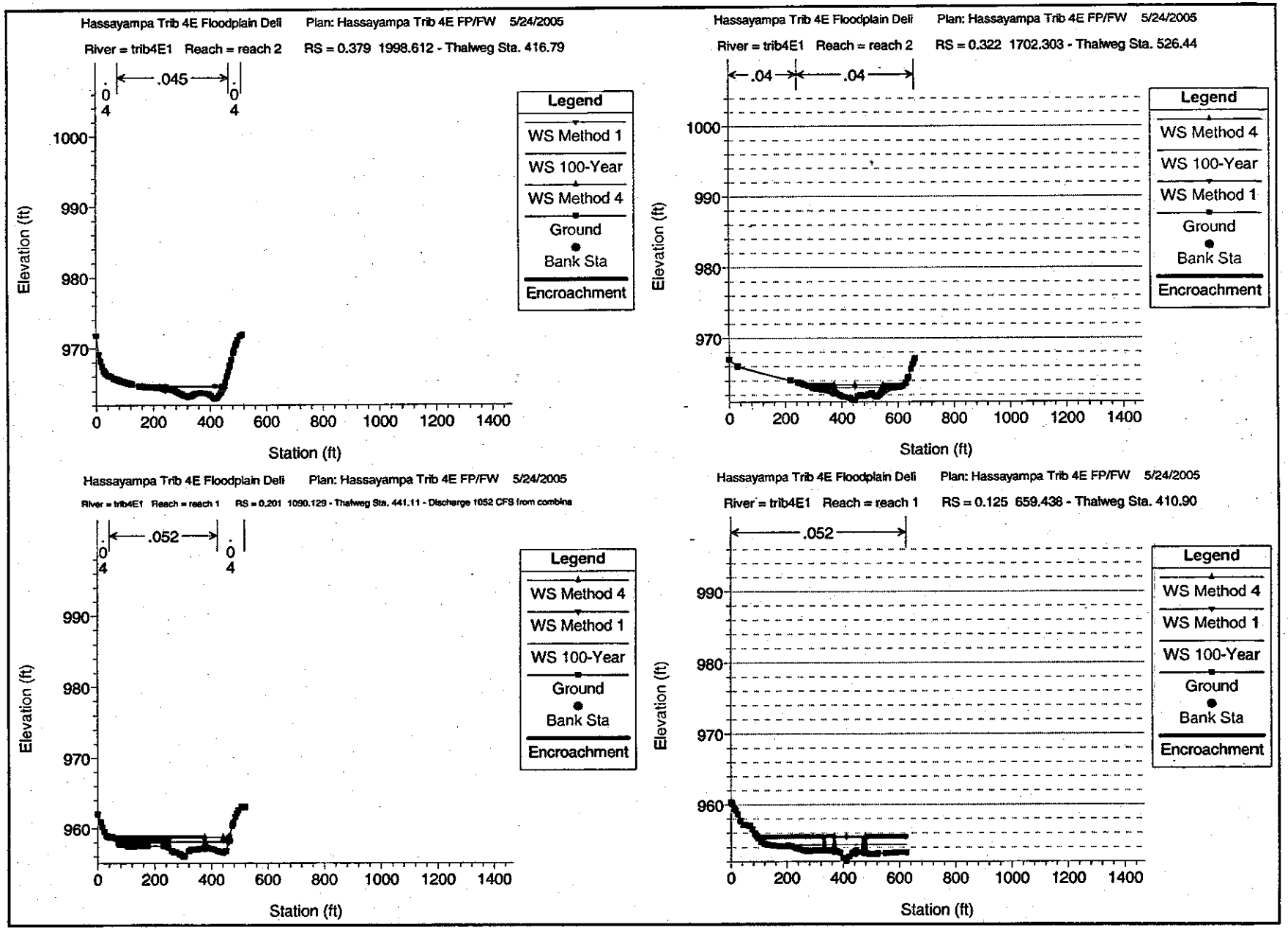


Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E1 Reach = reach 2 RS = 0.447 2358.414 - Thalweg Sta. 439.26



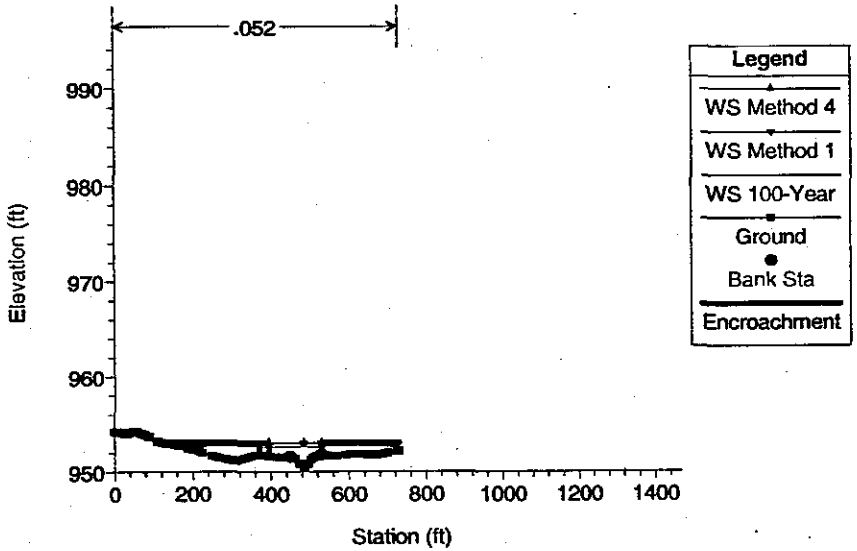
1 in Horiz. = 500 ft 1 in Vert. = 20 ft



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

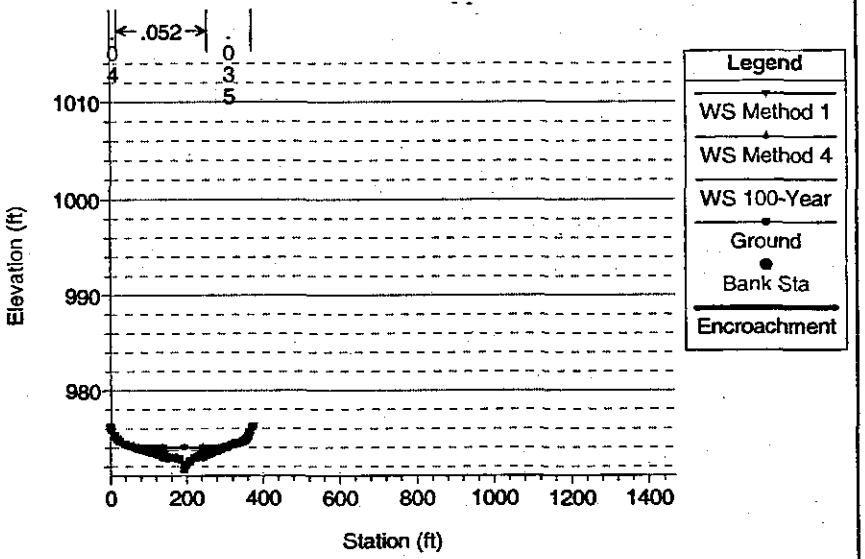
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E1 Reach = reach 1 RS = 0.065 342.611 - Thalweg Sta. 484.06



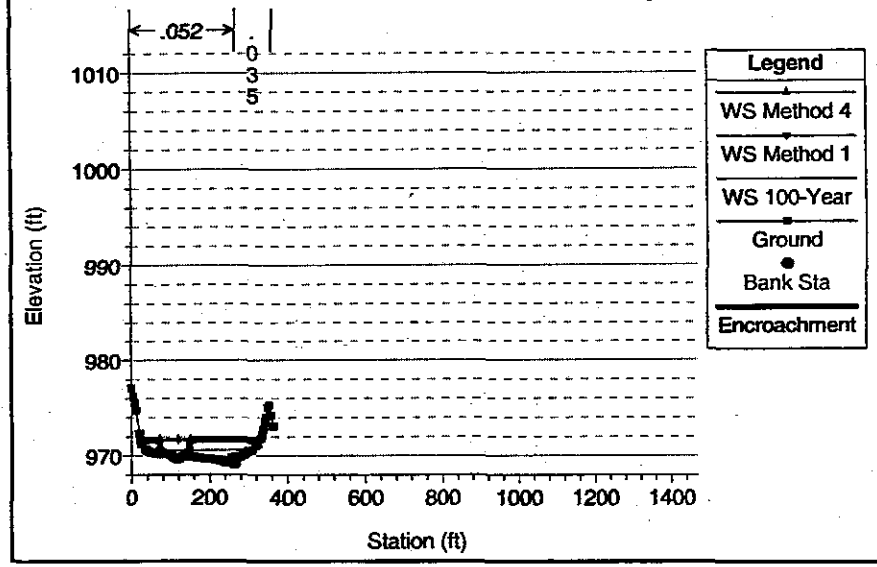
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E2 Reach = reach 1 RS = 0.281 Thalweg Sta. 193.66 - Discharge 422 from A2-100y6h.out HEC-1 Mod



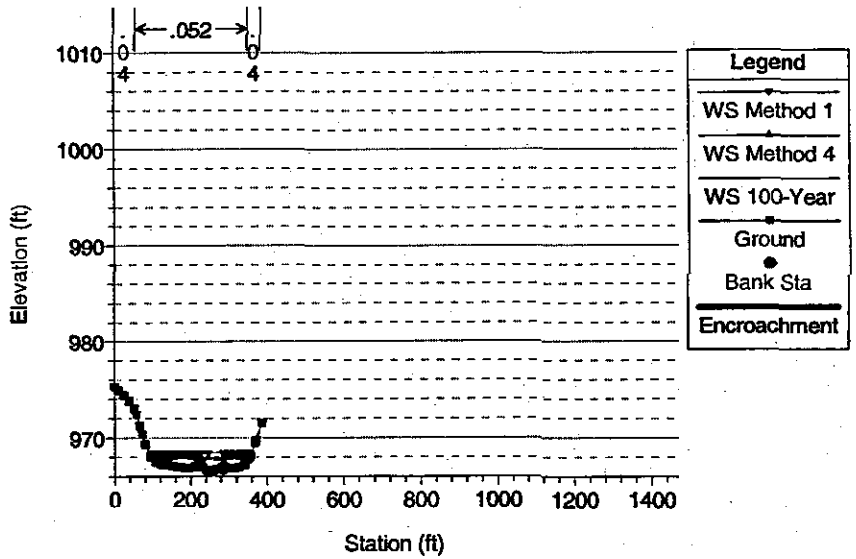
Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E2 Reach = reach 1 RS = 0.229 Thalweg Sta. 118.88



Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

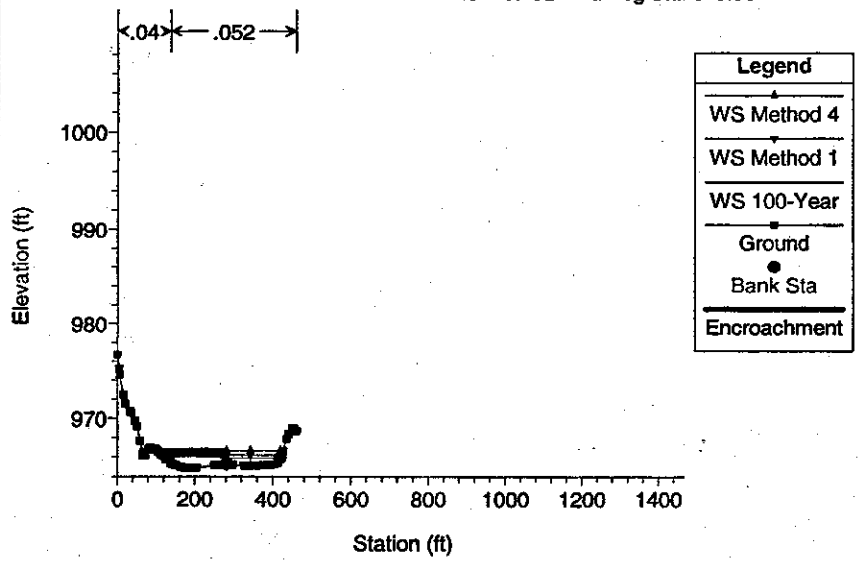
River = trib4E2 Reach = reach 1 RS = 0.172 Thalweg Sta. 245.62



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

Hassayampa Trib 4E Floodplain Deli Plan: Hassayampa Trib 4E FP/FW 5/24/2005

River = trib4E2 Reach = reach 1 RS = 0.132 Thalweg Sta. 343.06



1 in Horiz. = 500 ft 1 in Vert. = 20 ft

E.3 Expansion and Contraction Coefficients

E.3.1 Tributary 1E – All Reaches, Expansion and Contraction Coefficients

Expansion and contraction coefficients were 0.3 and 0.1, respectively, for the entire length of the Tributary 1E. The only exceptions were near the culverts modeled at Southern and Baseline Roads.

E.3.2 Tributary 3E – All Reaches, Expansion Contraction Coefficients

Expansion and contraction coefficients were 0.3 and 0.1, respectively, for the entire length of the Tributary 3E. The only exception was at the location of the in-line weir.

E.3.3 Tributary 4E – All Reaches, Expansion Contraction Coefficients

Expansion and contraction coefficients were 0.3 and 0.1, respectively, for the entire length of the Tributary 4E.

E.4 Analysis of Structures

E.4.1 Tributary 1E – All Reaches, Structures

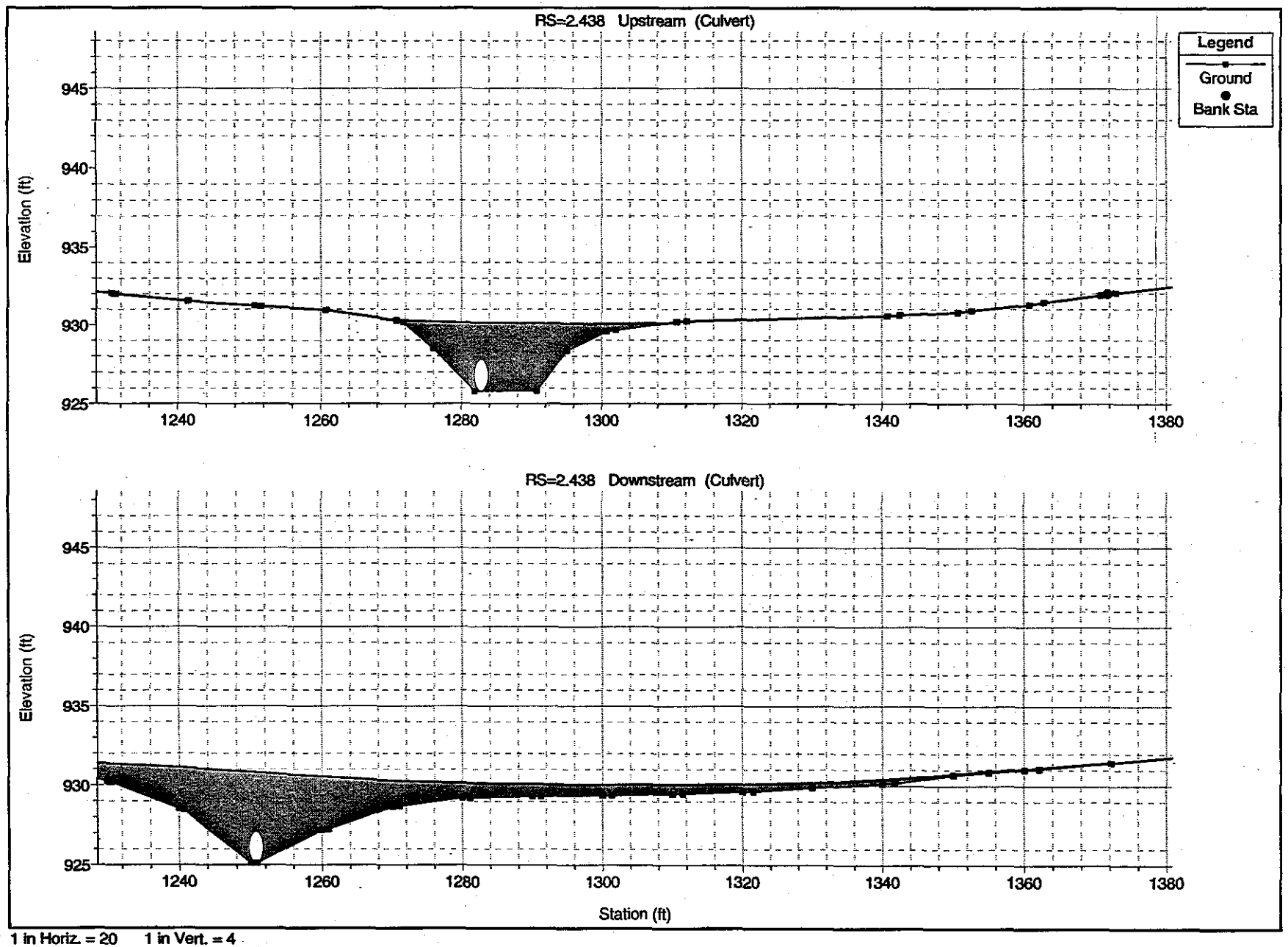
Station	Culvert Location
2.438	Southern Road
1.323	Baseline Road

E.4.2 Tributary 3E – All Reaches, Structures

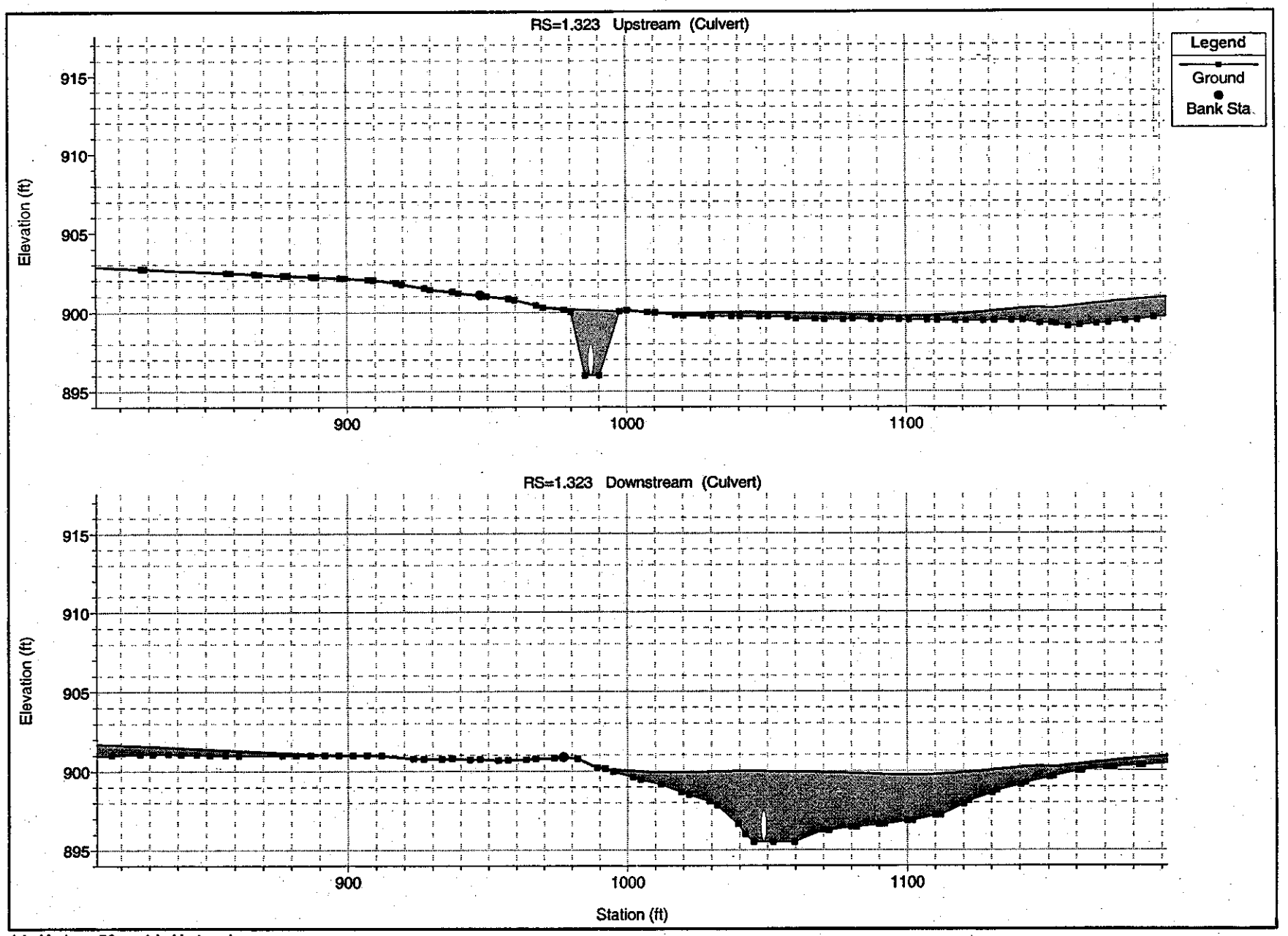
Station
1.359 – In-Line Weir

E.4.3 Tributary 4E – All Reaches, Structures

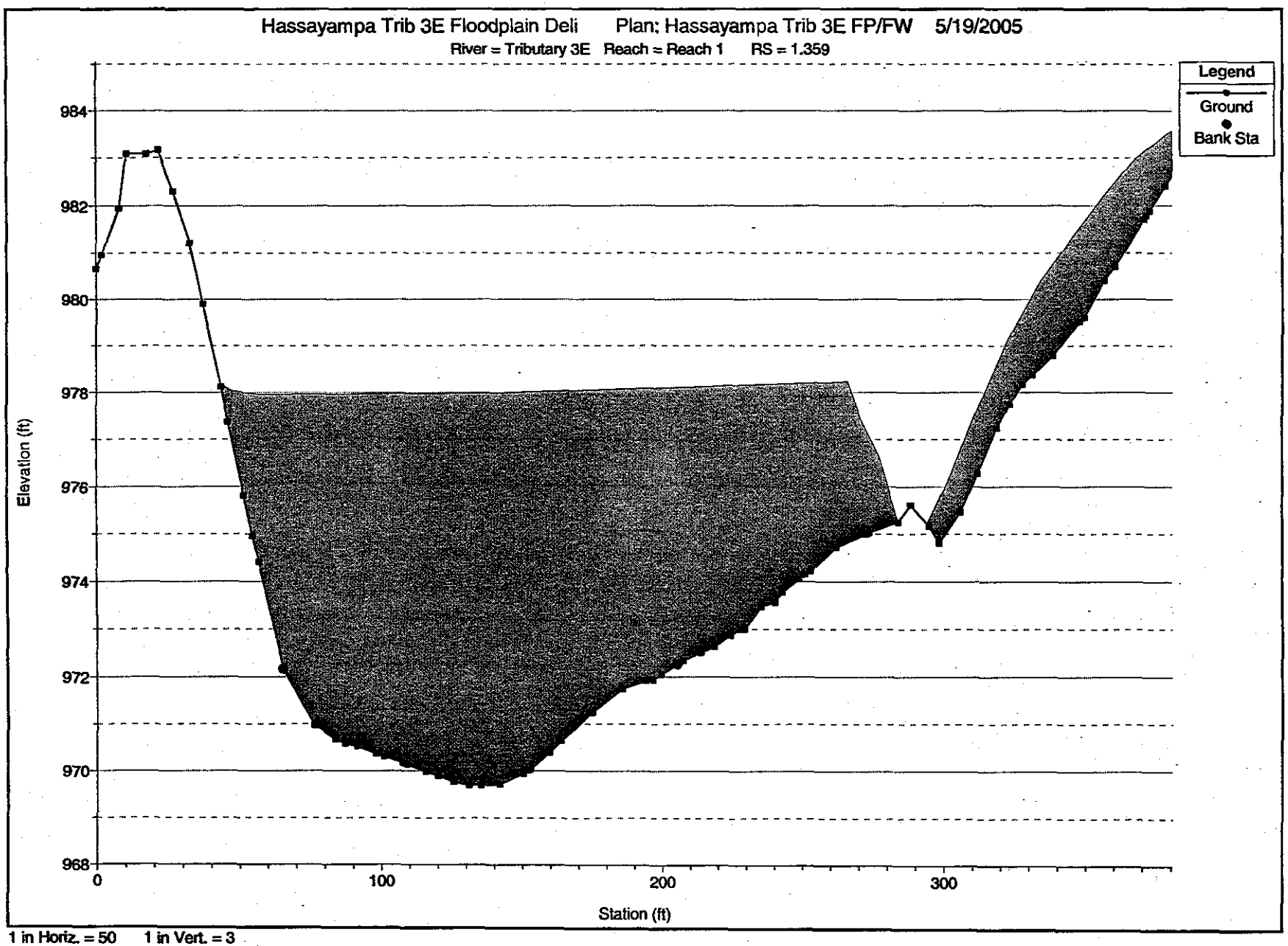
N/A



1 in Horiz. = 20 1 in Vert. = 4



1 in Horiz. = 50 1 in Vert. = 4



1 in Horiz. = 50 1 in Vert. = 3

E.5 Hydraulic Calculations

E.5.1 Water Surface Elevation HEC-RAS Output for Tributary 1E – All Reaches, Existing 100-Year, 6-Hour Event

HEC-RAS Plan: Trib 1E

River	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)	
Tributary 1E1	Reach 1	1.927	100-Year	772.00	1035.97	1038.19	1037.67	1038.34	0.007018	3.19	249.77	217.25	0.47
Tributary 1E1	Reach 1	1.927	Method 4	772.00	1035.97	1038.38	1037.66	1038.52	0.005302	3.00	257.17	158.73	0.42
Tributary 1E1	Reach 1	1.927	Method 1	772.00	1035.97	1038.38	1037.66	1038.52	0.005302	3.00	257.17	158.73	0.42
Tributary 1E1	Reach 1	1.889	100-Year	772.00	1034.64	1036.56		1036.79	0.008428	3.80	203.93	152.83	0.52
Tributary 1E1	Reach 1	1.889	Method 4	772.00	1034.64	1036.85		1037.14	0.008986	4.29	179.82	91.51	0.54
Tributary 1E1	Reach 1	1.889	Method 1	772.00	1034.64	1036.85		1037.14	0.008986	4.29	179.82	91.51	0.54
Tributary 1E1	Reach 1	1.851	100-Year	772.00	1033.18	1035.35		1035.49	0.004905	2.97	266.30	203.97	0.41
Tributary 1E1	Reach 1	1.851	Method 4	772.00	1033.18	1035.39		1035.58	0.006582	3.48	222.09	134.31	0.48
Tributary 1E1	Reach 1	1.851	Method 1	772.00	1033.18	1035.39		1035.58	0.006582	3.48	222.09	134.31	0.48
Tributary 1E1	Reach 1	1.813	100-Year	772.00	1032.16	1034.67		1034.76	0.002657	2.46	314.37	169.23	0.32
Tributary 1E1	Reach 1	1.813	Method 4	772.00	1032.16	1034.67		1034.76	0.002657	2.46	314.37	169.23	0.32
Tributary 1E1	Reach 1	1.813	Method 1	772.00	1032.16	1034.67		1034.76	0.002657	2.46	314.37	169.23	0.32
Tributary 1E1	Reach 1	1.775	100-Year	772.00	1031.21	1033.06	1033.06	1033.60	0.018468	5.92	130.32	120.80	1.01
Tributary 1E1	Reach 1	1.775	Method 4	772.00	1031.21	1033.06	1033.06	1033.60	0.018468	5.92	130.32	120.80	1.01
Tributary 1E1	Reach 1	1.775	Method 1	772.00	1031.21	1033.06	1033.06	1033.60	0.018468	5.92	130.32	120.80	1.01
Tributary 1E1	Reach 1	1.737	100-Year	772.00	1028.94	1031.16		1031.43	0.006285	4.23	182.45	112.69	0.59
Tributary 1E1	Reach 1	1.737	Method 4	772.00	1028.94	1031.16		1031.43	0.006285	4.23	182.45	112.69	0.59
Tributary 1E1	Reach 1	1.737	Method 1	772.00	1028.94	1031.16		1031.43	0.006285	4.23	182.45	112.69	0.59
Tributary 1E1	Reach 1	1.699	100-Year	772.00	1027.59	1029.70		1029.99	0.008415	4.35	177.34	135.97	0.67
Tributary 1E1	Reach 1	1.699	Method 4	772.00	1027.59	1029.70		1029.99	0.008415	4.35	177.34	135.97	0.67
Tributary 1E1	Reach 1	1.699	Method 1	772.00	1027.59	1029.70		1029.99	0.008415	4.35	177.34	135.97	0.67
Tributary 1E1	Reach 1	1.661	100-Year	772.00	1026.38	1028.62		1028.81	0.004187	3.56	217.14	140.63	0.50
Tributary 1E1	Reach 1	1.661	Method 4	772.00	1026.38	1028.62		1028.81	0.004187	3.56	217.14	140.63	0.50
Tributary 1E1	Reach 1	1.661	Method 1	772.00	1026.38	1028.62		1028.81	0.004187	3.56	217.14	140.63	0.50
Tributary 1E1	Reach 1	1.624	100-Year	772.00	1025.17	1027.32		1027.67	0.008005	4.74	162.75	107.61	0.68
Tributary 1E1	Reach 1	1.624	Method 4	772.00	1025.17	1027.32		1027.67	0.008005	4.74	162.75	107.61	0.68
Tributary 1E1	Reach 1	1.624	Method 1	772.00	1025.17	1027.32		1027.67	0.008005	4.74	162.75	107.61	0.68
Tributary 1E1	Reach 1	1.586	100-Year	772.00	1024.04	1026.20		1026.41	0.004786	3.65	211.68	144.40	0.53
Tributary 1E1	Reach 1	1.586	Method 4	772.00	1024.04	1026.20		1026.41	0.004786	3.65	211.68	144.40	0.53
Tributary 1E1	Reach 1	1.586	Method 1	772.00	1024.04	1026.20		1026.41	0.004786	3.65	211.68	144.40	0.53
Tributary 1E1	Reach 1	1.548	100-Year	772.00	1022.73	1024.88	1024.48	1025.19	0.007945	4.46	173.26	173.79	0.67
Tributary 1E1	Reach 1	1.548	Method 4	772.00	1022.73	1024.88	1024.48	1025.19	0.007947	4.46	173.24	126.17	0.67
Tributary 1E1	Reach 1	1.548	Method 1	772.00	1022.73	1024.88	1024.48	1025.19	0.007947	4.46	173.24	126.17	0.67

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E1	Reach 1	1.510	100-Year	772.00	1021.60	1023.57		1023.80	0.005876	3.87	199.52	144.28	0.58
Tributary 1E1	Reach 1	1.510	Method 4	772.00	1021.60	1023.57		1023.80	0.005876	3.87	199.52	144.28	0.58
Tributary 1E1	Reach 1	1.510	Method 1	772.00	1021.60	1023.57		1023.80	0.005876	3.87	199.52	144.28	0.58
Tributary 1E1	Reach 1	1.472	100-Year	772.00	1019.84	1022.10		1022.44	0.007882	4.67	165.42	111.82	0.68
Tributary 1E1	Reach 1	1.472	Method 4	772.00	1019.84	1022.10		1022.44	0.007882	4.67	165.42	111.82	0.68
Tributary 1E1	Reach 1	1.472	Method 1	772.00	1019.84	1022.10		1022.44	0.007882	4.67	165.42	111.82	0.68
Tributary 1E1	Reach 1	1.434	100-Year	772.00	1018.79	1020.99		1021.19	0.004821	3.60	214.67	146.71	0.52
Tributary 1E1	Reach 1	1.434	Method 4	772.00	1018.79	1020.99		1021.19	0.004821	3.60	214.67	146.71	0.52
Tributary 1E1	Reach 1	1.434	Method 1	772.00	1018.79	1020.99		1021.19	0.004821	3.60	214.67	146.71	0.52
Tributary 1E1	Reach 1	1.396	100-Year	772.00	1017.58	1019.98	1019.28	1020.21	0.004953	3.83	201.55	230.14	0.52
Tributary 1E1	Reach 1	1.396	Method 4	772.00	1017.58	1019.98	1019.28	1020.21	0.004953	3.83	201.55	120.02	0.52
Tributary 1E1	Reach 1	1.396	Method 1	772.00	1017.58	1019.98	1019.28	1020.21	0.004953	3.83	201.55	120.02	0.52
Tributary 1E1	Reach 1	1.358	100-Year	772.00	1016.31	1018.59		1018.95	0.008149	4.76	162.11	96.83	0.65
Tributary 1E1	Reach 1	1.358	Method 4	772.00	1016.31	1018.59		1018.95	0.008149	4.76	162.11	96.83	0.65
Tributary 1E1	Reach 1	1.358	Method 1	772.00	1016.31	1018.59		1018.95	0.008149	4.76	162.11	96.83	0.65
Tributary 1E1	Reach 1	1.321	100-Year	772.00	1014.92	1017.21		1017.44	0.006562	3.88	198.87	161.70	0.62
Tributary 1E1	Reach 1	1.321	Method 4	772.00	1014.92	1017.21		1017.44	0.006562	3.88	198.87	161.70	0.62
Tributary 1E1	Reach 1	1.321	Method 1	772.00	1014.92	1017.21		1017.44	0.006562	3.88	198.87	161.70	0.62
Tributary 1E1	Reach 1	1.283	100-Year	772.00	1013.95	1016.43		1016.59	0.002886	3.20	241.60	129.78	0.41
Tributary 1E1	Reach 1	1.283	Method 4	772.00	1013.95	1016.43		1016.59	0.002885	3.20	241.62	129.78	0.41
Tributary 1E1	Reach 1	1.283	Method 1	772.00	1013.95	1016.43		1016.59	0.002885	3.20	241.62	129.78	0.41
Tributary 1E1	Reach 1	1.245	100-Year	772.00	1013.40	1015.70		1015.90	0.004132	3.59	215.14	122.93	0.48
Tributary 1E1	Reach 1	1.245	Method 4	772.00	1013.40	1015.70		1015.90	0.004136	3.59	215.06	122.91	0.48
Tributary 1E1	Reach 1	1.245	Method 1	772.00	1013.40	1015.70		1015.90	0.004136	3.59	215.06	122.91	0.48
Tributary 1E1	Reach 1	1.207	100-Year	772.00	1012.55	1014.81		1015.02	0.004646	3.73	206.97	128.12	0.52
Tributary 1E1	Reach 1	1.207	Method 4	772.00	1012.55	1014.84		1015.05	0.004335	3.64	211.89	129.08	0.50
Tributary 1E1	Reach 1	1.207	Method 1	772.00	1012.55	1014.84		1015.05	0.004336	3.64	211.88	129.08	0.50
Tributary 1E1	Reach 1	1.169	100-Year	772.00	1011.55	1013.58		1013.79	0.008621	3.76	219.66	261.97	0.63
Tributary 1E1	Reach 1	1.169	Method 4	772.00	1011.55	1013.59		1013.82	0.009248	3.91	197.58	177.95	0.65
Tributary 1E1	Reach 1	1.169	Method 1	772.00	1011.55	1013.59		1013.82	0.009245	3.91	197.61	177.95	0.65
Tributary 1E1	Reach 1	1.131	100-Year	772.00	1010.41	1012.50		1012.63	0.003937	2.91	265.50	197.41	0.44
Tributary 1E1	Reach 1	1.131	Method 4	772.00	1010.41	1012.50		1012.63	0.003935	2.91	265.56	197.42	0.44

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E1	Reach 1	1.131	Method 1	772.00	1010.41	1012.50		1012.63	0.003937	2.91	265.50	197.41	0.44
Tributary 1E1	Reach 1	1.093	100-Year	772.00	1010.01	1011.56		1011.71	0.005367	3.09	250.13	213.77	0.50
Tributary 1E1	Reach 1	1.093	Method 4	772.00	1010.01	1011.56		1011.71	0.005383	3.09	249.89	213.75	0.50
Tributary 1E1	Reach 1	1.093	Method 1	772.00	1010.01	1011.56		1011.71	0.005367	3.09	250.13	213.77	0.50
Tributary 1E1	Reach 1	1.052	100-Year	772.00	1008.90	1010.36		1010.52	0.005836	3.18	242.65	211.09	0.52
Tributary 1E1	Reach 1	1.052	Method 4	772.00	1008.90	1010.36		1010.52	0.005788	3.17	243.27	211.14	0.52
Tributary 1E1	Reach 1	1.052	Method 1	772.00	1008.90	1010.36		1010.52	0.005836	3.18	242.65	211.09	0.52
Tributary 1E1	Reach 1	1.008	100-Year	772.00	1007.69	1009.35		1009.45	0.003584	2.52	306.54	272.67	0.42
Tributary 1E1	Reach 1	1.008	Method 4	772.00	1007.69	1009.34		1009.44	0.003666	2.54	304.38	272.32	0.42
Tributary 1E1	Reach 1	1.008	Method 1	772.00	1007.69	1009.35		1009.45	0.003584	2.52	306.54	272.67	0.42
Tributary 1E1	Reach 1	0.968	100-Year	772.00	1006.87	1008.35		1008.49	0.005985	3.05	253.18	231.60	0.51
Tributary 1E1	Reach 1	0.968	Method 4	772.00	1006.87	1008.38		1008.52	0.005438	2.96	261.07	232.72	0.49
Tributary 1E1	Reach 1	0.968	Method 1	772.00	1006.87	1008.35		1008.49	0.005985	3.05	253.18	231.60	0.51
Tributary 1E1	Reach 1	0.929	100-Year	772.00	1005.89	1007.33		1007.45	0.004262	2.86	282.06	296.77	0.47
Tributary 1E1	Reach 1	0.929	Method 4	772.00	1005.89	1007.35		1007.49	0.004624	3.01	256.81	220.33	0.49
Tributary 1E1	Reach 1	0.929	Method 1	772.00	1005.89	1007.33		1007.45	0.004262	2.86	282.06	296.77	0.47
Tributary 1E1	Reach 1	0.890	100-Year	772.00	1004.61	1006.39		1006.56	0.004397	3.24	237.95	182.46	0.50
Tributary 1E1	Reach 1	0.890	Method 4	772.00	1004.61	1006.39		1006.56	0.004397	3.24	237.95	182.46	0.50
Tributary 1E1	Reach 1	0.890	Method 1	772.00	1004.61	1006.39		1006.56	0.004397	3.24	237.95	182.46	0.50
Tributary 1E1	Reach 1	0.852	100-Year	772.00	1003.65	1005.46		1005.61	0.005092	3.13	246.43	219.06	0.52
Tributary 1E1	Reach 1	0.852	Method 4	772.00	1003.65	1005.46		1005.61	0.005092	3.13	246.43	219.06	0.52
Tributary 1E1	Reach 1	0.852	Method 1	772.00	1003.65	1005.46		1005.61	0.005092	3.13	246.43	219.06	0.52
Tributary 1E1	Reach 1	0.814	100-Year	772.00	1003.05	1004.45		1004.59	0.005025	2.98	258.84	235.12	0.50
Tributary 1E1	Reach 1	0.814	Method 4	772.00	1003.05	1004.45		1004.59	0.005025	2.98	258.84	235.12	0.50
Tributary 1E1	Reach 1	0.814	Method 1	772.00	1003.05	1004.45		1004.59	0.005025	2.98	258.84	235.12	0.50
Tributary 1E1	Reach 1	0.777	100-Year	772.00	1002.22	1003.81		1003.89	0.002462	2.30	336.38	276.34	0.37
Tributary 1E1	Reach 1	0.777	Method 4	772.00	1002.22	1003.81		1003.89	0.002462	2.30	336.38	276.34	0.37
Tributary 1E1	Reach 1	0.777	Method 1	772.00	1002.22	1003.81		1003.89	0.002462	2.30	336.38	276.34	0.37
Tributary 1E1	Reach 1	0.739	100-Year	772.00	1000.80	1003.04		1003.18	0.005513	3.00	257.31	163.79	0.42
Tributary 1E1	Reach 1	0.739	Method 4	772.00	1000.80	1003.04		1003.18	0.005513	3.00	257.31	163.79	0.42
Tributary 1E1	Reach 1	0.739	Method 1	772.00	1000.80	1003.04		1003.18	0.005513	3.00	257.31	163.79	0.42
Tributary 1E1	Reach 1	0.701	100-Year	772.00	1000.09	1002.01		1002.14	0.004934	2.89	266.75	170.46	0.41

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E1	Reach 1	0.701	Method 4	772.00	1000.09	1002.01		1002.14	0.004934	2.89	266.75	170.46	0.41
Tributary 1E1	Reach 1	0.701	Method 1	772.00	1000.09	1002.01		1002.14	0.004934	2.89	266.75	170.46	0.41
Tributary 1E1	Reach 1	0.663	100-Year	772.00	999.36	1001.16		1001.25	0.003909	2.52	305.85	234.89	0.39
Tributary 1E1	Reach 1	0.663	Method 4	772.00	999.36	1001.16		1001.25	0.003909	2.52	305.85	234.89	0.39
Tributary 1E1	Reach 1	0.663	Method 1	772.00	999.36	1001.16		1001.25	0.003909	2.52	305.85	234.89	0.39
Tributary 1E1	Reach 1	0.625	100-Year	772.00	997.84	1000.34	999.55	1000.46	0.003966	2.85	270.48	171.32	0.40
Tributary 1E1	Reach 1	0.625	Method 4	772.00	997.84	1000.34	999.55	1000.46	0.003966	2.85	270.48	171.32	0.40
Tributary 1E1	Reach 1	0.625	Method 1	772.00	997.84	1000.34	999.55	1000.46	0.003966	2.85	270.48	171.32	0.40
Tributary 1E1	Reach 1	0.587	100-Year	772.00	997.22	999.18	998.61	999.35	0.008267	3.32	232.56	234.70	0.49
Tributary 1E1	Reach 1	0.587	Method 4	772.00	997.22	999.18	998.61	999.35	0.008268	3.32	232.55	166.30	0.49
Tributary 1E1	Reach 1	0.587	Method 1	772.00	997.22	999.18	998.60	999.35	0.008267	3.32	232.56	166.30	0.49
Tributary 1E1	Reach 1	0.549	100-Year	772.00	996.07	997.78		997.92	0.006192	2.98	259.49	196.93	0.46
Tributary 1E1	Reach 1	0.549	Method 4	772.00	996.07	997.78		997.92	0.006191	2.97	259.50	196.93	0.46
Tributary 1E1	Reach 1	0.549	Method 1	772.00	996.07	997.78		997.92	0.006192	2.98	259.49	196.93	0.46
Tributary 1E1	Reach 1	0.511	100-Year	772.00	994.58	996.69		996.81	0.004973	2.74	281.93	194.89	0.40
Tributary 1E1	Reach 1	0.511	Method 4	772.00	994.58	996.69		996.81	0.004976	2.74	281.88	194.88	0.40
Tributary 1E1	Reach 1	0.511	Method 1	772.00	994.58	996.69		996.81	0.004973	2.74	281.93	194.89	0.40
Tributary 1E1	Reach 1	0.474	100-Year	772.00	993.80	995.53	994.97	995.66	0.006687	2.90	266.47	230.26	0.45
Tributary 1E1	Reach 1	0.474	Method 4	772.00	993.80	995.53	994.97	995.66	0.006669	2.89	266.69	211.08	0.45
Tributary 1E1	Reach 1	0.474	Method 1	772.00	993.80	995.53	994.97	995.66	0.006687	2.90	266.47	211.05	0.45
Tributary 1E1	Reach 1	0.436	100-Year	772.00	992.37	993.76		993.93	0.011617	3.39	227.97	208.39	0.57
Tributary 1E1	Reach 1	0.436	Method 4	772.00	992.37	993.75		993.93	0.011704	3.39	227.43	208.31	0.57
Tributary 1E1	Reach 1	0.436	Method 1	772.00	992.37	993.76		993.93	0.011617	3.39	227.97	208.39	0.57
Tributary 1E1	Reach 1	0.398	100-Year	772.00	990.83	992.37		992.46	0.004918	2.32	332.31	299.43	0.39
Tributary 1E1	Reach 1	0.398	Method 4	772.00	990.83	992.38		992.46	0.004892	2.32	332.86	299.61	0.39
Tributary 1E1	Reach 1	0.398	Method 1	772.00	990.83	992.37		992.46	0.004918	2.32	332.31	299.43	0.39
Tributary 1E1	Reach 1	0.359	100-Year	772.00	990.00	991.17		991.27	0.006832	2.60	297.63	342.56	0.48
Tributary 1E1	Reach 1	0.359	Method 4	772.00	990.00	991.17		991.28	0.006862	2.61	295.94	330.08	0.49
Tributary 1E1	Reach 1	0.359	Method 1	772.00	990.00	991.17		991.27	0.006832	2.60	297.63	342.56	0.48
Tributary 1E1	Reach 1	0.319	100-Year	772.00	988.16	989.93		990.06	0.004973	2.95	261.79	286.58	0.54
Tributary 1E1	Reach 1	0.319	Method 4	772.00	988.16	989.93		990.06	0.004972	2.95	261.81	286.58	0.54
Tributary 1E1	Reach 1	0.319	Method 1	772.00	988.16	989.93		990.06	0.004972	2.95	261.81	286.58	0.54

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E1	Reach 1	0.293	100-Year	772.00	987.23	989.30		989.45	0.003850	3.06	252.00	203.65	0.49
Tributary 1E1	Reach 1	0.293	Method 4	772.00	987.23	989.30		989.45	0.003860	3.07	251.78	203.61	0.49
Tributary 1E1	Reach 1	0.293	Method 1	772.00	987.23	989.30		989.45	0.003857	3.07	251.85	203.62	0.49
Tributary 1E1	Reach 1	0.254	100-Year	772.00	986.34	988.32		988.44	0.006233	2.83	272.88	214.35	0.44
Tributary 1E1	Reach 1	0.254	Method 4	772.00	986.34	988.33		988.45	0.006095	2.81	274.88	214.74	0.44
Tributary 1E1	Reach 1	0.254	Method 1	772.00	986.34	988.32		988.45	0.006138	2.81	274.25	214.62	0.44
Tributary 1E1	Reach 1	0.216	100-Year	772.00	985.47	987.40		987.49	0.003665	2.30	338.38	262.28	0.34
Tributary 1E1	Reach 1	0.216	Method 4	772.00	985.47	987.38		987.46	0.003967	2.36	327.61	241.29	0.36
Tributary 1E1	Reach 1	0.216	Method 1	772.00	985.47	987.37		987.46	0.003942	2.35	330.74	260.88	0.36
Tributary 1E1	Reach 1	0.178	100-Year	772.00	984.61	986.31		986.53	0.006348	3.80	203.22	172.39	0.62
Tributary 1E1	Reach 1	0.178	Method 4	772.00	984.61	986.48		986.65	0.004110	3.32	232.20	177.04	0.51
Tributary 1E1	Reach 1	0.178	Method 1	772.00	984.61	986.48		986.65	0.004110	3.32	232.20	177.04	0.51
Tributary 1E1	Reach 1	0.141	100-Year	772.00	983.80	985.41		985.54	0.003888	3.16	279.53	318.22	0.49
Tributary 1E1	Reach 1	0.141	Method 4	772.00	983.80	985.52		985.74	0.005285	3.84	200.95	142.69	0.57
Tributary 1E1	Reach 1	0.141	Method 1	772.00	983.80	985.52		985.74	0.005285	3.84	200.95	142.69	0.57
Tributary 1E1	Reach 1	0.102	100-Year	772.00	981.93	984.28		984.51	0.006541	3.91	197.70	168.96	0.63
Tributary 1E1	Reach 1	0.102	Method 4	772.00	981.93	984.23		984.49	0.007263	4.07	189.90	164.32	0.67
Tributary 1E1	Reach 1	0.102	Method 1	772.00	981.93	984.23		984.49	0.007264	4.07	189.89	164.32	0.67
Tributary 1E1	Reach 1	0.062	100-Year	772.00	979.57	983.01		983.27	0.005310	4.13	186.94	120.73	0.58
Tributary 1E1	Reach 1	0.062	Method 4	772.00	979.57	983.43		983.59	0.002629	3.20	241.13	134.62	0.42
Tributary 1E1	Reach 1	0.062	Method 1	772.00	979.57	983.43		983.59	0.002630	3.20	241.13	137.41	0.42
Tributary 1E	Reach 2	5.971	100-Year	713.00	1032.94	1035.10		1035.20	0.004045	2.64	292.80	360.79	0.47
Tributary 1E	Reach 2	5.971	Method 4	713.00	1032.94	1035.37		1035.49	0.003670	2.87	248.15	209.98	0.47
Tributary 1E	Reach 2	5.971	Method 1	713.00	1032.94	1035.37		1035.49	0.003666	2.87	248.25	210.00	0.47
Tributary 1E	Reach 2	5.933	100-Year	713.00	1032.43	1034.10		1034.23	0.005517	2.75	248.36	303.66	0.54
Tributary 1E	Reach 2	5.933	Method 4	713.00	1032.43	1034.49		1034.66	0.004778	3.25	219.64	187.99	0.53
Tributary 1E	Reach 2	5.933	Method 1	713.00	1032.43	1034.49		1034.65	0.004810	3.25	219.20	187.99	0.53
Tributary 1E	Reach 2	5.895	100-Year	713.00	1031.16	1032.90		1033.09	0.005866	3.72	210.76	238.83	0.59
Tributary 1E	Reach 2	5.895	Method 4	713.00	1031.16	1033.18		1033.49	0.006956	4.47	159.63	112.50	0.66
Tributary 1E	Reach 2	5.895	Method 1	713.00	1031.16	1033.18		1033.49	0.006956	4.47	159.63	112.50	0.66
Tributary 1E	Reach 2	5.857	100-Year	713.00	1030.17	1032.03		1032.15	0.003691	2.97	263.83	280.90	0.47
Tributary 1E	Reach 2	5.857	Method 4	713.00	1030.17	1032.15		1032.34	0.004588	3.47	205.24	154.40	0.53
Tributary 1E	Reach 2	5.857	Method 1	713.00	1030.17	1032.15		1032.34	0.004588	3.47	205.24	154.40	0.53

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 2	5.820	100-Year	713.00	1029.56	1030.83	1030.71	1031.04	0.010087	3.74	204.23	319.48	0.73
Tributary 1E	Reach 2	5.820	Method 4	713.00	1029.56	1030.91	1030.70	1031.12	0.008732	3.67	194.26	217.24	0.68
Tributary 1E	Reach 2	5.820	Method 1	713.00	1029.56	1030.91	1030.70	1031.12	0.008732	3.67	194.26	217.24	0.68
Tributary 1E	Reach 2	5.782	100-Year	713.00	1027.52	1028.96	1028.80	1029.17	0.008577	3.86	212.66	352.25	0.69
Tributary 1E	Reach 2	5.782	Method 4	713.00	1027.52	1029.02		1029.30	0.009405	4.19	169.97	165.13	0.73
Tributary 1E	Reach 2	5.782	Method 1	713.00	1027.52	1029.02		1029.30	0.009405	4.19	169.97	165.13	0.73
Tributary 1E	Reach 2	5.744	100-Year	713.00	1025.99	1027.80	1027.39	1027.97	0.004348	3.37	235.92	292.09	0.53
Tributary 1E	Reach 2	5.744	Method 4	713.00	1025.99	1027.91	1027.37	1028.08	0.004066	3.38	210.98	159.18	0.52
Tributary 1E	Reach 2	5.744	Method 1	713.00	1025.99	1027.91	1027.37	1028.08	0.004066	3.38	210.98	159.18	0.52
Tributary 1E	Reach 2	5.706	100-Year	713.00	1025.01	1026.57	1026.45	1026.80	0.008040	4.15	202.29	280.02	0.69
Tributary 1E	Reach 2	5.706	Method 4	713.00	1025.01	1027.03	1026.45	1027.24	0.004339	3.65	195.50	130.15	0.52
Tributary 1E	Reach 2	5.706	Method 1	713.00	1025.01	1027.03	1026.46	1027.24	0.004339	3.65	195.50	130.15	0.52
Tributary 1E	Reach 2	5.668	100-Year	713.00	1023.65	1025.77	1025.28	1025.87	0.002860	2.97	285.35	288.03	0.43
Tributary 1E	Reach 2	5.668	Method 4	713.00	1023.65	1026.38	1025.45	1026.57	0.002610	3.45	206.94	102.62	0.43
Tributary 1E	Reach 2	5.668	Method 1	713.00	1023.65	1026.38	1025.46	1026.57	0.002610	3.45	206.94	102.62	0.43
Tributary 1E	Reach 2	5.630	100-Year	713.00	1022.56	1024.55	1024.53	1024.87	0.010597	5.13	174.73	254.20	0.80
Tributary 1E	Reach 2	5.630	Method 4	713.00	1022.56	1024.76	1024.74	1025.46	0.015862	6.73	105.87	74.04	0.99
Tributary 1E	Reach 2	5.630	Method 1	713.00	1022.56	1024.76	1024.74	1025.46	0.015862	6.73	105.87	74.04	0.99
Tributary 1E	Reach 2	5.592	100-Year	713.00	1021.54	1023.45		1023.58	0.004010	3.21	253.52	301.32	0.50
Tributary 1E	Reach 2	5.592	Method 4	713.00	1021.54	1024.19		1024.35	0.002258	3.19	223.20	109.04	0.39
Tributary 1E	Reach 2	5.592	Method 1	713.00	1021.54	1024.19		1024.35	0.002258	3.19	223.20	109.04	0.39
Tributary 1E	Reach 2	5.554	100-Year	713.00	1020.54	1022.61		1022.75	0.004772	3.56	250.47	322.78	0.54
Tributary 1E	Reach 2	5.554	Method 4	713.00	1020.54	1023.38		1023.70	0.004630	4.58	155.55	76.30	0.57
Tributary 1E	Reach 2	5.554	Method 1	713.00	1020.54	1023.38		1023.70	0.004630	4.58	155.55	76.30	0.57
Tributary 1E	Reach 2	5.517	100-Year	713.00	1019.76	1021.52		1021.69	0.005838	3.72	222.04	270.85	0.59
Tributary 1E	Reach 2	5.517	Method 4	713.00	1019.76	1022.01		1022.44	0.008895	5.28	134.98	88.65	0.75
Tributary 1E	Reach 2	5.517	Method 1	713.00	1019.76	1022.01		1022.44	0.008895	5.28	134.98	88.65	0.75
Tributary 1E	Reach 2	5.479	100-Year	713.00	1018.43	1020.64		1020.76	0.003690	3.27	274.91	344.99	0.48
Tributary 1E	Reach 2	5.479	Method 4	713.00	1018.43	1021.12		1021.33	0.003430	3.70	192.47	104.43	0.48
Tributary 1E	Reach 2	5.479	Method 1	713.00	1018.43	1021.12		1021.33	0.003430	3.70	192.47	104.43	0.48
Tributary 1E	Reach 2	5.441	100-Year	713.00	1017.28	1019.48		1019.70	0.008417	4.17	197.31	253.67	0.70
Tributary 1E	Reach 2	5.441	Method 4	713.00	1017.28	1019.75		1020.16	0.011600	5.17	137.80	114.32	0.83

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 2	5.441	Method 1	713.00	1017.28	1019.75		1020.16	0.011600	5.17	137.80	114.32	0.83
Tributary 1E	Reach 2	5.403	100-Year	713.00	1016.02	1018.54		1018.65	0.003436	2.87	266.82	259.60	0.45
Tributary 1E	Reach 2	5.403	Method 4	713.00	1016.02	1019.16		1019.26	0.002016	2.53	281.30	182.47	0.36
Tributary 1E	Reach 2	5.403	Method 1	713.00	1016.02	1019.16		1019.26	0.002016	2.53	281.30	182.47	0.36
Tributary 1E	Reach 2	5.365	100-Year	713.00	1015.23	1017.42	1017.29	1017.66	0.007497	4.53	202.50	300.43	0.73
Tributary 1E	Reach 2	5.365	Method 4	713.00	1015.23	1018.31	1017.75	1018.66	0.004470	4.76	149.81	76.99	0.60
Tributary 1E	Reach 2	5.365	Method 1	713.00	1015.23	1018.31	1017.75	1018.66	0.004470	4.76	149.81	76.99	0.60
Tributary 1E	Reach 2	5.327	100-Year	713.00	1014.30	1016.26		1016.38	0.005178	3.17	270.31	363.67	0.54
Tributary 1E	Reach 2	5.327	Method 4	713.00	1014.30	1016.53	1016.49	1017.11	0.015872	6.12	116.44	94.07	0.97
Tributary 1E	Reach 2	5.327	Method 1	713.00	1014.30	1016.53	1016.49	1017.11	0.015872	6.12	116.44	94.07	0.97
Tributary 1E	Reach 2	5.289	100-Year	713.00	1013.20	1015.45		1015.56	0.003554	2.87	283.33	353.05	0.46
Tributary 1E	Reach 2	5.289	Method 4	713.00	1013.20	1015.56		1015.70	0.003461	3.00	237.69	179.89	0.46
Tributary 1E	Reach 2	5.289	Method 1	713.00	1013.20	1015.56		1015.70	0.003461	3.00	237.69	179.89	0.46
Tributary 1E	Reach 2	5.252	100-Year	713.00	1012.51	1014.58		1014.74	0.004876	3.40	242.07	323.37	0.54
Tributary 1E	Reach 2	5.252	Method 4	713.00	1012.51	1014.81		1014.97	0.003832	3.15	226.29	172.13	0.48
Tributary 1E	Reach 2	5.252	Method 1	713.00	1012.51	1014.82		1014.97	0.003829	3.15	226.34	172.13	0.48
Tributary 1E	Reach 2	5.214	100-Year	713.00	1011.42	1013.65		1013.79	0.004463	3.27	258.17	304.75	0.52
Tributary 1E	Reach 2	5.214	Method 4	713.00	1011.42	1013.85		1014.07	0.005336	3.78	188.58	139.90	0.57
Tributary 1E	Reach 2	5.214	Method 1	713.00	1011.42	1013.84		1014.07	0.005356	3.79	188.35	139.87	0.57
Tributary 1E	Reach 2	5.176	100-Year	713.00	1011.04	1012.75		1012.88	0.004224	3.11	251.54	260.90	0.51
Tributary 1E	Reach 2	5.176	Method 4	713.00	1011.04	1012.90		1013.08	0.004464	3.42	208.25	161.59	0.53
Tributary 1E	Reach 2	5.176	Method 1	713.00	1011.04	1012.90		1013.08	0.004420	3.41	208.91	161.69	0.53
Tributary 1E	Reach 2	5.138	100-Year	713.00	1010.12	1011.83	1011.49	1011.96	0.004829	3.03	249.84	305.36	0.52
Tributary 1E	Reach 2	5.138	Method 4	713.00	1010.12	1012.18	1011.59	1012.32	0.003158	2.96	240.70	171.75	0.44
Tributary 1E	Reach 2	5.138	Method 1	713.00	1010.12	1012.13	1011.59	1012.28	0.003591	3.08	231.55	171.75	0.47
Tributary 1E	Reach 2	5.100	100-Year	713.00	1009.25	1010.81		1010.95	0.005472	3.17	246.89	322.48	0.55
Tributary 1E	Reach 2	5.100	Method 4	713.00	1009.25	1010.84		1011.19	0.012076	4.78	149.18	142.59	0.82
Tributary 1E	Reach 2	5.100	Method 1	713.00	1009.25	1011.00		1011.27	0.007435	4.13	172.70	142.59	0.66
Tributary 1E	Reach 2	5.062	100-Year	713.00	1007.95	1009.52	1009.30	1009.68	0.007756	3.16	225.80	298.37	0.63
Tributary 1E	Reach 2	5.062	Method 4	713.00	1007.95	1009.95		1010.04	0.003005	2.44	292.37	272.45	0.41
Tributary 1E	Reach 2	5.062	Method 1	713.00	1007.95	1009.67	1009.38	1009.83	0.006671	3.22	221.13	246.55	0.60
Tributary 1E	Reach 2	5.024	100-Year	713.00	1006.80	1007.99		1008.17	0.006280	2.69	216.45	247.84	0.56

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 2	5.024	Method 4	713.00	1006.80	1009.10		1009.24	0.004975	3.14	232.29	221.45	0.53
Tributary 1E	Reach 2	5.024	Method 1	713.00	1006.80	1008.05		1008.29	0.007371	3.01	184.93	176.15	0.61
Tributary 1E	Reach 2	4.986	100-Year	713.00	1005.31	1006.59		1006.81	0.007432	3.37	188.20	180.56	0.63
Tributary 1E	Reach 2	4.986	Method 4	713.00	1005.31	1007.56		1007.98	0.007837	5.20	137.22	83.55	0.71
Tributary 1E	Reach 2	4.986	Method 1	713.00	1005.31	1006.59		1006.81	0.007442	3.38	188.10	180.51	0.63
Tributary 1E	Reach 2	4.949	100-Year	713.00	1003.97	1005.30	1004.94	1005.52	0.005812	2.98	195.27	186.25	0.56
Tributary 1E	Reach 2	4.949	Method 4	713.00	1003.97	1006.32	1005.83	1006.62	0.005687	4.56	168.28	129.55	0.61
Tributary 1E	Reach 2	4.949	Method 1	713.00	1003.97	1005.30	1004.94	1005.52	0.005784	2.98	195.60	168.41	0.56
Tributary 1E	Reach 2	4.911	100-Year	713.00	1002.62	1004.17		1004.35	0.006120	3.55	209.85	204.91	0.59
Tributary 1E	Reach 2	4.911	Method 4	713.00	1002.62	1005.46	1004.79	1005.62	0.004134	3.51	222.20	178.93	0.51
Tributary 1E	Reach 2	4.911	Method 1	713.00	1002.62	1004.17		1004.35	0.006213	3.57	208.72	204.45	0.60
Tributary 1E	Reach 2	4.873	100-Year	713.00	1001.14	1003.22		1003.37	0.004102	3.36	231.05	227.38	0.50
Tributary 1E	Reach 2	4.873	Method 4	713.00	1001.14	1003.39	1003.39	1004.11	0.016622	7.11	106.21	77.37	1.03
Tributary 1E	Reach 2	4.873	Method 1	713.00	1001.14	1003.41		1003.54	0.002859	2.96	248.52	174.57	0.43
Tributary 1E	Reach 2	4.835	100-Year	713.00	999.96	1002.39		1002.58	0.003678	3.64	220.29	211.90	0.49
Tributary 1E	Reach 2	4.835	Method 4	713.00	999.96	1002.99		1003.12	0.001589	2.89	246.79	108.18	0.34
Tributary 1E	Reach 2	4.835	Method 1	713.00	999.96	1002.99		1003.12	0.001589	2.89	246.79	108.18	0.34
Tributary 1E	Reach 2	4.797	100-Year	713.00	998.94	1001.78	1001.26	1001.91	0.002923	3.30	261.81	222.03	0.44
Tributary 1E	Reach 2	4.797	Method 4	713.00	998.94	1002.52	1001.26	1002.73	0.002289	3.64	195.90	79.89	0.41
Tributary 1E	Reach 2	4.797	Method 1	713.00	998.94	1002.52	1001.25	1002.73	0.002289	3.64	195.90	79.89	0.41
Tributary 1E	Reach 2	4.759	100-Year	713.00	998.24	1001.09		1001.26	0.003615	3.89	244.96	233.65	0.50
Tributary 1E	Reach 2	4.759	Method 4	713.00	998.24	1001.60		1002.02	0.005644	5.25	135.85	63.89	0.63
Tributary 1E	Reach 2	4.759	Method 1	713.00	998.24	1001.60		1002.02	0.005644	5.25	135.85	63.89	0.63
Tributary 1E	Reach 2	4.721	100-Year	713.00	997.08	1000.11	1000.11	1000.39	0.005165	4.74	225.40	384.78	0.60
Tributary 1E	Reach 2	4.721	Method 4	713.00	997.08	1000.30		1000.78	0.006679	5.54	128.66	63.30	0.69
Tributary 1E	Reach 2	4.721	Method 1	713.00	997.08	1000.30		1000.78	0.006679	5.54	128.66	63.30	0.69
Tributary 1E	Reach 2	4.683	100-Year	713.00	996.21	998.97		999.29	0.005732	4.80	175.91	188.15	0.63
Tributary 1E	Reach 2	4.683	Method 4	713.00	996.21	999.61		999.85	0.003030	3.90	182.68	84.28	0.47
Tributary 1E	Reach 2	4.683	Method 1	713.00	996.21	999.61		999.85	0.003030	3.90	182.68	84.28	0.47
Tributary 1E	Reach 2	4.646	100-Year	713.00	995.13	998.15	997.89	998.29	0.003953	3.70	287.94	422.70	0.51
Tributary 1E	Reach 2	4.646	Method 4	713.00	995.13	998.86		999.14	0.004142	4.22	168.80	87.46	0.54
Tributary 1E	Reach 2	4.646	Method 1	713.00	995.13	998.86		999.14	0.004142	4.22	168.80	87.46	0.54

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 2	4.569	100-Year	713.00	993.77	996.49		996.67	0.004291	3.98	234.16	257.91	0.53
Tributary 1E	Reach 2	4.569	Method 4	713.00	993.77	996.87		997.21	0.005456	4.69	152.11	82.36	0.61
Tributary 1E	Reach 2	4.569	Method 1	713.00	993.77	996.87		997.21	0.005456	4.69	152.11	82.36	0.61
Tributary 1E	Reach 2	4.506	100-Year	713.00	992.56	994.09	994.00	994.41	0.012787	4.50	158.74	200.88	0.87
Tributary 1E	Reach 2	4.506	Method 4	713.00	992.56	994.05	994.00	994.40	0.014990	4.74	150.28	189.38	0.94
Tributary 1E	Reach 2	4.506	Method 1	713.00	992.56	994.05	994.00	994.40	0.014990	4.74	150.28	189.38	0.94
Tributary 1E	Reach 2	4.450	100-Year	713.00	990.72	992.09		992.21	0.004541	2.84	262.04	313.11	0.51
Tributary 1E	Reach 2	4.450	Method 4	713.00	990.72	992.17		992.28	0.003934	2.75	259.33	255.57	0.48
Tributary 1E	Reach 2	4.450	Method 1	713.00	990.72	992.17		992.28	0.003934	2.75	259.33	255.57	0.48
Tributary 1E	Reach 2	4.410	100-Year	713.00	989.24	990.75		990.97	0.008235	3.83	199.07	244.71	0.68
Tributary 1E	Reach 2	4.410	Method 4	713.00	989.24	990.75		991.03	0.010099	4.24	168.23	169.81	0.75
Tributary 1E	Reach 2	4.410	Method 1	713.00	989.24	990.75		991.03	0.010099	4.24	168.23	169.81	0.75
Tributary 1E	Reach 2	4.372	100-Year	713.00	987.79	989.46		989.63	0.005434	3.33	218.83	223.29	0.56
Tributary 1E	Reach 2	4.372	Method 4	713.00	987.79	989.54		989.69	0.004531	3.14	227.12	197.17	0.52
Tributary 1E	Reach 2	4.372	Method 1	713.00	987.79	989.54		989.69	0.004531	3.14	227.12	197.17	0.52
Tributary 1E	Reach 2	4.334	100-Year	713.00	986.47	988.17		988.34	0.007577	3.45	217.25	269.63	0.64
Tributary 1E	Reach 2	4.334	Method 4	713.00	986.47	988.15		988.39	0.009951	3.92	181.84	204.01	0.73
Tributary 1E	Reach 2	4.334	Method 1	713.00	986.47	988.15		988.39	0.009951	3.92	181.84	204.01	0.73
Tributary 1E	Reach 2	4.296	100-Year	713.00	985.26	987.37		987.47	0.002707	2.60	290.27	343.26	0.41
Tributary 1E	Reach 2	4.296	Method 4	713.00	985.26	987.66		987.74	0.001440	2.17	328.25	208.45	0.31
Tributary 1E	Reach 2	4.296	Method 1	713.00	985.26	987.66		987.74	0.001440	2.17	328.25	208.45	0.31
Tributary 1E	Reach 2	4.259	100-Year	713.00	984.20	986.59		986.74	0.005015	3.47	247.91	314.23	0.55
Tributary 1E	Reach 2	4.259	Method 4	713.00	984.20	987.05		987.27	0.003956	3.77	189.28	110.93	0.51
Tributary 1E	Reach 2	4.259	Method 1	713.00	984.20	987.05		987.27	0.003956	3.77	189.28	110.93	0.51
Tributary 1E	Reach 2	4.221	100-Year	713.00	983.28	985.24	985.12	985.45	0.008607	3.98	208.78	301.29	0.70
Tributary 1E	Reach 2	4.221	Method 4	713.00	983.28	985.51	985.37	985.97	0.012088	5.45	130.82	101.93	0.85
Tributary 1E	Reach 2	4.221	Method 1	713.00	983.28	985.51	985.37	985.97	0.012088	5.45	130.82	101.93	0.85
Tributary 1E	Reach 2	4.183	100-Year	713.00	982.46	984.01		984.14	0.004908	3.08	259.90	340.88	0.53
Tributary 1E	Reach 2	4.183	Method 4	713.00	982.46	984.12		984.31	0.005556	3.49	204.52	175.80	0.57
Tributary 1E	Reach 2	4.183	Method 1	713.00	982.46	984.12		984.31	0.005556	3.49	204.52	175.80	0.57
Tributary 1E	Reach 2	4.145	100-Year	713.00	980.83	983.05		983.19	0.004615	3.22	248.64	321.29	0.57
Tributary 1E	Reach 2	4.145	Method 4	713.00	980.83	983.45		983.57	0.002499	2.82	253.16	182.54	0.42
Tributary 1E	Reach 2	4.145	Method 1	713.00	980.83	983.45		983.57	0.002499	2.82	253.15	182.54	0.42

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	4.072	100-Year	1485.00	977.71	981.98		982.14	0.002098	3.55	531.37	481.10	0.40
Tributary 1E	Reach 1	4.072	Method 4	1485.00	977.71	982.50		982.73	0.001927	3.81	389.27	129.98	0.39
Tributary 1E	Reach 1	4.072	Method 1	1485.00	977.71	982.50		982.73	0.001928	3.82	389.20	129.98	0.39
Tributary 1E	Reach 1	4.034	100-Year	1485.00	977.17	981.23		981.53	0.004660	4.88	372.21	331.69	0.58
Tributary 1E	Reach 1	4.034	Method 4	1485.00	977.17	981.65		982.11	0.005150	5.47	271.34	115.54	0.63
Tributary 1E	Reach 1	4.034	Method 1	1485.00	977.17	981.64		982.11	0.005157	5.48	271.22	115.50	0.63
Tributary 1E	Reach 1	3.996	100-Year	1485.00	976.75	980.19		980.48	0.005981	4.73	361.84	329.41	0.64
Tributary 1E	Reach 1	3.996	Method 4	1485.00	976.75	980.96		981.22	0.003409	4.09	362.82	170.46	0.49
Tributary 1E	Reach 1	3.996	Method 1	1485.00	976.75	980.95		981.21	0.003472	4.12	360.84	170.46	0.50
Tributary 1E	Reach 1	3.958	100-Year	1485.00	976.36	978.99		979.22	0.006410	4.24	396.52	407.59	0.67
Tributary 1E	Reach 1	3.958	Method 4	1485.00	976.36	979.18	979.18	979.93	0.014609	6.91	214.94	150.17	1.02
Tributary 1E	Reach 1	3.958	Method 1	1485.00	976.36	979.20	979.20	979.93	0.014029	6.82	217.78	150.17	1.00
Tributary 1E	Reach 1	3.920	100-Year	1485.00	974.65	977.90		978.17	0.004448	4.24	364.90	209.55	0.50
Tributary 1E	Reach 1	3.920	Method 4	1485.00	974.65	978.45		978.63	0.002435	3.45	430.28	166.18	0.38
Tributary 1E	Reach 1	3.920	Method 1	1485.00	974.65	978.09		978.34	0.003674	3.99	372.49	157.81	0.46
Tributary 1E	Reach 1	3.883	100-Year	1840.00	972.89	977.27		977.36	0.003354	2.48	796.86	389.62	0.26
Tributary 1E	Reach 1	3.883	Method 4	1840.00	972.89	978.10		978.18	0.001883	2.20	837.13	226.02	0.20
Tributary 1E	Reach 1	3.883	Method 1	1840.00	972.89	977.46		977.57	0.003560	2.66	692.97	226.02	0.27
Tributary 1E	Reach 1	3.845	100-Year	1840.00	973.18	976.45		976.53	0.005039	2.00	848.41	569.17	0.27
Tributary 1E	Reach 1	3.845	Method 4	1840.00	973.18	977.50		977.61	0.004666	2.62	703.58	257.09	0.28
Tributary 1E	Reach 1	3.845	Method 1	1840.00	973.18	976.54		976.63	0.006170	2.28	747.21	408.58	0.30
Tributary 1E	Reach 1	3.807	100-Year	1840.00	972.15	975.62		975.68	0.004391	1.99	941.09	580.19	0.25
Tributary 1E	Reach 1	3.807	Method 4	1840.00	972.15	976.59		976.69	0.004566	2.49	742.20	279.94	0.27
Tributary 1E	Reach 1	3.807	Method 1	1840.00	972.15	975.63		975.70	0.004414	2.00	923.65	487.12	0.25
Tributary 1E	Reach 1	3.769	100-Year	1840.00	970.60	974.96		975.02	0.003160	2.17	1003.88	485.93	0.23
Tributary 1E	Reach 1	3.769	Method 4	1840.00	970.60	975.74		975.86	0.003944	2.82	685.39	216.16	0.27
Tributary 1E	Reach 1	3.769	Method 1	1840.00	970.60	974.97		975.03	0.003202	2.18	976.66	446.53	0.23
Tributary 1E	Reach 1	3.731	100-Year	1840.00	969.91	974.45		974.50	0.002401	2.06	1078.19	490.00	0.20
Tributary 1E	Reach 1	3.731	Method 4	1840.00	969.91	975.00		975.12	0.003494	2.73	674.40	179.01	0.25
Tributary 1E	Reach 1	3.731	Method 1	1840.00	969.91	974.45		974.50	0.002401	2.06	1078.22	490.00	0.20
Tributary 1E	Reach 1	3.692	100-Year	1840.00	968.51	973.46		973.62	0.008883	3.55	642.66	433.02	0.38
Tributary 1E	Reach 1	3.692	Method 4	1840.00	968.51	973.62		973.89	0.011640	4.18	440.07	152.17	0.43

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	3.692	Method 1	1840.00	968.51	973.46		973.62	0.008877	3.55	642.85	433.04	0.38
Tributary 1E	Reach 1	3.653	100-Year	1840.00	967.70	971.62		971.77	0.008967	3.05	602.96	279.19	0.37
Tributary 1E	Reach 1	3.653	Method 4	1840.00	967.70	971.62		971.77	0.008954	3.05	603.27	279.27	0.37
Tributary 1E	Reach 1	3.653	Method 1	1840.00	967.70	971.63		971.77	0.008940	3.05	603.62	279.35	0.37
Tributary 1E	Reach 1	3.614	100-Year	1840.00	965.95	969.91		970.03	0.008034	2.81	654.65	315.88	0.34
Tributary 1E	Reach 1	3.614	Method 4	1840.00	965.95	969.87		969.99	0.008489	2.87	641.45	312.84	0.35
Tributary 1E	Reach 1	3.614	Method 1	1840.00	965.95	969.89		970.02	0.008219	2.83	649.16	314.62	0.35
Tributary 1E	Reach 1	3.576	100-Year	1840.00	965.03	968.20		968.34	0.008864	2.96	630.86	353.04	0.36
Tributary 1E	Reach 1	3.576	Method 4	1840.00	965.03	968.72		968.81	0.004256	2.37	775.27	297.66	0.26
Tributary 1E	Reach 1	3.576	Method 1	1840.00	965.03	968.27		968.39	0.007931	2.86	655.31	362.00	0.34
Tributary 1E	Reach 1	3.538	100-Year	1840.00	964.98	967.77		967.83	0.001097	1.05	1190.56	504.35	0.13
Tributary 1E	Reach 1	3.538	Method 4	1840.00	964.98	968.16		968.21	0.002143	1.62	1079.97	422.36	0.18
Tributary 1E	Reach 1	3.538	Method 1	1840.00	964.98	967.90		967.95	0.000936	1.00	1257.94	509.03	0.12
Tributary 1E	Reach 1	3.500	100-Year	1840.00	964.98	967.32	966.21	967.40	0.005747	2.18	845.37	657.40	0.28
Tributary 1E	Reach 1	3.500	Method 4	1840.00	964.98	967.60	966.21	967.66	0.003614	1.88	976.60	471.70	0.23
Tributary 1E	Reach 1	3.500	Method 1	1840.00	964.98	967.55	966.22	967.61	0.003913	1.93	952.59	470.52	0.24
Tributary 1E	Reach 1	3.462	100-Year	1840.00	964.39	965.81		965.94	0.007291	1.74	752.49	682.14	0.29
Tributary 1E	Reach 1	3.462	Method 4	1840.00	964.39	966.51		966.61	0.008266	2.57	716.75	402.92	0.34
Tributary 1E	Reach 1	3.462	Method 1	1840.00	964.39	966.37		966.46	0.008743	2.50	746.97	468.23	0.34
Tributary 1E	Reach 1	3.425	100-Year	1840.00	962.84	964.66		964.73	0.004649	1.76	908.40	673.91	0.25
Tributary 1E	Reach 1	3.425	Method 4	1840.00	962.84	965.17		965.25	0.005649	2.34	787.98	402.14	0.29
Tributary 1E	Reach 1	3.425	Method 1	1840.00	962.84	965.09		965.15	0.004941	2.13	888.09	490.71	0.27
Tributary 1E	Reach 1	3.387	100-Year	1840.00	961.58	963.67		963.74	0.005836	1.93	896.10	746.89	0.28
Tributary 1E	Reach 1	3.387	Method 4	1840.00	961.58	963.86		963.95	0.007685	2.39	771.48	476.11	0.33
Tributary 1E	Reach 1	3.387	Method 1	1840.00	961.58	963.86		963.95	0.007685	2.39	771.48	476.11	0.33
Tributary 1E	Reach 1	3.349	100-Year	1840.00	958.53	961.87		961.99	0.013483	2.81	689.57	674.94	0.42
Tributary 1E	Reach 1	3.349	Method 4	1840.00	958.53	962.02		962.14	0.010796	2.69	684.54	442.26	0.38
Tributary 1E	Reach 1	3.349	Method 1	1840.00	958.53	962.02		962.14	0.010796	2.69	684.54	442.26	0.38
Tributary 1E	Reach 1	3.311	100-Year	1840.00	956.92	960.40		960.47	0.004758	2.20	868.20	571.03	0.27
Tributary 1E	Reach 1	3.311	Method 4	1840.00	956.92	960.90		960.97	0.003571	2.16	850.89	329.79	0.24
Tributary 1E	Reach 1	3.311	Method 1	1840.00	956.92	960.90		960.97	0.003571	2.16	850.89	329.79	0.24
Tributary 1E	Reach 1	3.273	100-Year	1840.00	956.99	959.61		959.68	0.003350	2.04	879.55	739.89	0.29

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	3.273	Method 4	1840.00	956.99	960.33		960.41	0.002283	2.18	842.68	384.28	0.26
Tributary 1E	Reach 1	3.273	Method 1	1840.00	956.99	960.33		960.41	0.002283	2.18	842.68	384.28	0.26
Tributary 1E	Reach 1	3.235	100-Year	1840.00	957.19	958.92		958.97	0.003603	1.71	982.62	1113.78	0.28
Tributary 1E	Reach 1	3.235	Method 4	1840.00	957.19	959.72		959.82	0.003910	2.58	713.73	359.01	0.32
Tributary 1E	Reach 1	3.235	Method 1	1840.00	957.19	959.72		959.82	0.003909	2.58	713.79	359.01	0.32
Tributary 1E	Reach 1	3.197	100-Year	1840.00	957.09	957.98	957.74	958.08	0.005325	1.67	786.93	1123.88	0.41
Tributary 1E	Reach 1	3.197	Method 4	1840.00	957.09	958.86	958.23	958.97	0.004647	2.73	675.09	495.02	0.41
Tributary 1E	Reach 1	3.197	Method 1	1840.00	957.09	958.85		958.97	0.004672	2.73	673.94	495.02	0.41
Tributary 1E	Reach 1	3.122	100-Year	1840.00	954.55	955.54	955.26	955.68	0.008032	1.69	696.04	890.96	0.34
Tributary 1E	Reach 1	3.122	Method 4	1840.00	954.55	956.42	955.66	956.55	0.008245	2.83	649.46	407.26	0.40
Tributary 1E	Reach 1	3.122	Method 1	1840.00	954.55	956.43	955.66	956.55	0.008097	2.82	653.01	407.41	0.39
Tributary 1E	Reach 1	3.084	100-Year	1840.00	953.01	954.13	953.70	954.24	0.004393	1.38	725.79	776.25	0.30
Tributary 1E	Reach 1	3.084	Method 4	1840.00	953.01	955.06	954.37	955.20	0.005025	2.23	683.18	484.82	0.35
Tributary 1E	Reach 1	3.084	Method 1	1840.00	953.01	955.04	954.38	955.18	0.005271	2.26	672.08	483.92	0.35
Tributary 1E	Reach 1	3.046	100-Year	1840.00	951.29	952.60		952.78	0.009127	1.54	587.60	712.53	0.37
Tributary 1E	Reach 1	3.046	Method 4	1840.00	951.29	953.76	953.13	953.95	0.006544	2.79	559.69	335.94	0.38
Tributary 1E	Reach 1	3.046	Method 1	1840.00	951.29	953.29	953.02	953.54	0.010936	2.86	528.90	485.19	0.46
Tributary 1E	Reach 1	2.972	100-Year	1840.00	947.98	951.20	950.49	951.26	0.003099	1.83	946.78	980.19	0.27
Tributary 1E	Reach 1	2.972	Method 4	1840.00	947.98	951.91	950.50	952.02	0.004347	2.64	696.87	331.24	0.32
Tributary 1E	Reach 1	2.972	Method 1	1840.00	947.98	951.67	950.59	951.75	0.002987	2.06	850.12	501.60	0.26
Tributary 1E	Reach 1	2.935	100-Year	1840.00	947.76	950.40	949.88	950.50	0.006366	2.58	729.21	762.44	0.39
Tributary 1E	Reach 1	2.935	Method 4	1840.00	947.76	950.67	949.94	950.84	0.008427	3.27	562.07	354.77	0.46
Tributary 1E	Reach 1	2.935	Method 1	1840.00	947.76	950.67	949.94	950.84	0.008429	3.27	562.03	354.76	0.46
Tributary 1E	Reach 1	2.897	100-Year	1840.00	945.11	948.35	948.05	948.51	0.014688	3.27	582.82	675.34	0.54
Tributary 1E	Reach 1	2.897	Method 4	1840.00	945.11	948.51		948.70	0.013910	3.49	527.15	401.08	0.54
Tributary 1E	Reach 1	2.897	Method 1	1840.00	945.11	948.51		948.70	0.013906	3.49	527.49	403.57	0.54
Tributary 1E	Reach 1	2.852	100-Year	1840.00	942.97	946.83		946.91	0.003628	2.32	834.64	567.42	0.28
Tributary 1E	Reach 1	2.852	Method 4	1840.00	942.97	946.96		947.06	0.004001	2.53	728.67	326.73	0.30
Tributary 1E	Reach 1	2.852	Method 1	1840.00	942.97	946.96		947.06	0.003997	2.52	728.87	326.74	0.30
Tributary 1E	Reach 1	2.814	100-Year	1840.00	940.58	944.72	944.09	945.28	0.027753	6.11	316.04	271.60	0.75
Tributary 1E	Reach 1	2.814	Method 4	1840.00	940.58	944.75		945.33	0.027739	6.14	299.46	144.34	0.75
Tributary 1E	Reach 1	2.814	Method 1	1840.00	940.58	944.74		945.33	0.027962	6.16	298.62	144.32	0.75

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	2.776	100-Year	1840.00	935.88	942.83		943.05	0.005601	3.72	494.84	131.63	0.34
Tributary 1E	Reach 1	2.776	Method 4	1840.00	935.88	943.10		943.29	0.004847	3.46	531.31	141.13	0.31
Tributary 1E	Reach 1	2.776	Method 1	1840.00	935.88	943.07		943.26	0.004931	3.49	526.55	139.77	0.32
Tributary 1E	Reach 1	2.738	100-Year	1840.00	935.33	942.13		942.23	0.002883	2.64	696.71	221.98	0.26
Tributary 1E	Reach 1	2.738	Method 4	1840.00	935.33	942.54		942.63	0.002204	2.31	795.83	253.83	0.23
Tributary 1E	Reach 1	2.738	Method 1	1840.00	935.33	942.50		942.58	0.002261	2.35	783.89	249.19	0.23
Tributary 1E	Reach 1	2.700	100-Year	1840.00	933.97	941.48		941.61	0.003361	2.92	649.27	350.39	0.29
Tributary 1E	Reach 1	2.700	Method 4	1840.00	933.97	942.09		942.18	0.002260	2.43	758.18	229.26	0.24
Tributary 1E	Reach 1	2.700	Method 1	1840.00	933.97	942.02		942.11	0.002431	2.48	741.66	229.26	0.24
Tributary 1E	Reach 1	2.662	100-Year	1840.00	932.70	940.42		940.63	0.007733	3.98	550.02	489.89	0.39
Tributary 1E	Reach 1	2.662	Method 4	1840.00	932.70	941.24		941.48	0.005759	3.94	467.12	113.66	0.34
Tributary 1E	Reach 1	2.662	Method 1	1840.00	932.70	941.39		941.53	0.003426	3.15	617.53	199.61	0.27
Tributary 1E	Reach 1	2.624	100-Year	1840.00	932.37	939.14		939.27	0.005768	3.37	645.08	535.60	0.33
Tributary 1E	Reach 1	2.624	Method 4	1840.00	932.37	940.12		940.29	0.005918	3.35	559.12	301.87	0.36
Tributary 1E	Reach 1	2.624	Method 1	1840.00	932.37	940.13		940.42	0.010146	4.39	428.22	231.45	0.47
Tributary 1E	Reach 1	2.587	100-Year	1840.00	931.08	938.30		938.40	0.003566	2.72	763.08	504.93	0.26
Tributary 1E	Reach 1	2.587	Method 4	1840.00	931.08	939.31		939.44	0.003155	2.83	649.30	176.52	0.26
Tributary 1E	Reach 1	2.587	Method 1	1840.00	931.08	939.30		939.40	0.002812	2.68	724.32	302.35	0.25
Tributary 1E	Reach 1	2.549	100-Year	1840.00	930.62	937.24		937.40	0.008210	3.34	580.37	513.14	0.38
Tributary 1E	Reach 1	2.549	Method 4	1840.00	930.62	938.09		938.37	0.010935	4.53	457.42	297.18	0.45
Tributary 1E	Reach 1	2.549	Method 1	1840.00	930.62	938.08		938.38	0.011745	4.71	440.19	285.85	0.47
Tributary 1E	Reach 1	2.511	100-Year	1840.00	929.60	935.96		936.10	0.005151	3.16	635.36	494.75	0.31
Tributary 1E	Reach 1	2.511	Method 4	1840.00	929.60	936.56		936.78	0.005869	3.74	492.24	133.12	0.34
Tributary 1E	Reach 1	2.511	Method 1	1840.00	929.60	936.55		936.76	0.005736	3.71	507.41	172.18	0.34
Tributary 1E	Reach 1	2.473	100-Year	1840.00	928.97	934.20		934.49	0.013925	4.55	434.70	295.52	0.50
Tributary 1E	Reach 1	2.473	Method 4	1840.00	928.97	934.77		935.12	0.012376	4.73	389.42	129.93	0.48
Tributary 1E	Reach 1	2.473	Method 1	1840.00	928.97	934.81		935.15	0.012014	4.68	393.43	130.34	0.47
Tributary 1E	Reach 1	2.445	100-Year	1840.00	925.80	933.32	931.82	933.40	0.003699	2.49	820.00	616.99	0.27
Tributary 1E	Reach 1	2.445	Method 4	1840.00	925.80	933.51	931.81	933.70	0.007032	3.57	524.33	216.60	0.38
Tributary 1E	Reach 1	2.445	Method 1	1840.00	925.80	933.56	931.81	933.76	0.006935	3.56	517.13	188.39	0.38
Tributary 1E	Reach 1	2.438		Culvert									
Tributary 1E	Reach 1	2.432	100-Year	1840.00	925.10	933.32	930.89	933.34	0.000511	1.39	1636.96	1039.46	0.14

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	2.432	Method 4	1840.00	925.10	933.47	930.89	933.54	0.001220	2.21	863.80	314.15	0.22
Tributary 1E	Reach 1	2.432	Method 1	1840.00	925.10	933.52	930.89	933.62	0.001575	2.53	727.46	220.01	0.25
Tributary 1E	Reach 1	2.397	100-Year	1840.00	925.18	932.67	930.56	933.03	0.005332	4.85	379.33	642.78	0.47
Tributary 1E	Reach 1	2.397	Method 4	1840.00	925.18	932.69	930.56	933.05	0.005243	4.82	382.05	116.57	0.47
Tributary 1E	Reach 1	2.397	Method 1	1840.00	925.18	932.69	930.55	933.05	0.005243	4.82	382.05	116.57	0.47
Tributary 1E	Reach 1	2.359	100-Year	1840.00	924.16	931.69	930.02	932.00	0.004852	4.49	414.72	748.59	0.47
Tributary 1E	Reach 1	2.359	Method 4	1840.00	924.16	931.74	930.02	932.04	0.004714	4.43	415.67	147.99	0.47
Tributary 1E	Reach 1	2.359	Method 1	1840.00	924.16	931.74	930.01	932.04	0.004714	4.43	415.67	147.99	0.47
Tributary 1E	Reach 1	2.321	100-Year	1840.00	923.10	930.85	928.56	931.14	0.003760	4.31	426.86	973.81	0.43
Tributary 1E	Reach 1	2.321	Method 4	1840.00	923.10	930.95	928.56	931.22	0.003487	4.17	440.86	147.14	0.42
Tributary 1E	Reach 1	2.321	Method 1	1840.00	923.10	930.95	928.56	931.22	0.003487	4.17	440.86	147.14	0.42
Tributary 1E	Reach 1	2.283	100-Year	1840.00	922.06	929.19	928.14	929.89	0.011304	6.72	273.88	658.79	0.67
Tributary 1E	Reach 1	2.283	Method 4	1840.00	922.06	929.75	928.14	930.23	0.007179	5.59	329.40	111.27	0.57
Tributary 1E	Reach 1	2.283	Method 1	1840.00	922.06	929.75	928.14	930.23	0.007179	5.59	329.40	111.27	0.57
Tributary 1E	Reach 1	2.245	100-Year	1840.00	920.80	927.63	926.41	928.41	0.011248	7.10	259.21	803.70	0.65
Tributary 1E	Reach 1	2.245	Method 4	1840.00	920.80	928.21	926.41	928.78	0.007307	6.06	303.56	86.41	0.57
Tributary 1E	Reach 1	2.245	Method 1	1840.00	920.80	928.21	926.40	928.78	0.007307	6.06	303.56	86.41	0.57
Tributary 1E	Reach 1	2.208	100-Year	1840.00	919.91	926.26	925.17	926.54	0.006930	4.69	449.93	713.98	0.49
Tributary 1E	Reach 1	2.208	Method 4	1840.00	919.91	926.30	925.17	926.91	0.012245	6.29	292.75	103.11	0.66
Tributary 1E	Reach 1	2.208	Method 1	1840.00	919.91	926.30	925.17	926.91	0.012245	6.29	292.75	103.11	0.66
Tributary 1E	Reach 1	2.170	100-Year	1840.00	919.28	925.15	923.97	925.36	0.004651	3.79	503.45	740.65	0.42
Tributary 1E	Reach 1	2.170	Method 4	1840.00	919.28	925.41	923.97	925.60	0.003505	3.48	528.00	191.41	0.37
Tributary 1E	Reach 1	2.170	Method 1	1840.00	919.28	925.41	923.97	925.59	0.003512	3.49	527.69	191.40	0.37
Tributary 1E	Reach 1	2.132	100-Year	1840.00	919.47	923.88	923.39	924.14	0.008530	4.37	477.61	956.86	0.57
Tributary 1E	Reach 1	2.132	Method 4	1840.00	919.47	924.53	923.45	924.77	0.004861	3.95	465.67	193.61	0.45
Tributary 1E	Reach 1	2.132	Method 1	1840.00	919.47	924.52	923.45	924.76	0.004909	3.96	464.22	193.56	0.45
Tributary 1E	Reach 1	2.094	100-Year	1840.00	918.12	922.92	922.54	923.02	0.003654	2.59	745.11	1053.56	0.34
Tributary 1E	Reach 1	2.094	Method 4	1840.00	918.12	923.13	922.55	923.44	0.009461	4.47	411.40	204.17	0.56
Tributary 1E	Reach 1	2.094	Method 1	1840.00	918.12	923.19	922.42	923.48	0.008640	4.35	422.83	204.56	0.53
Tributary 1E	Reach 1	2.056	100-Year	1840.00	917.85	921.31	920.89	921.69	0.013244	4.90	375.19	729.60	0.66
Tributary 1E	Reach 1	2.056	Method 4	1840.00	917.85	922.02	920.89	922.20	0.004172	3.42	538.24	235.37	0.40
Tributary 1E	Reach 1	2.056	Method 1	1840.00	917.85	921.73	920.88	921.96	0.006597	3.92	469.39	233.91	0.49

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	2.018	100-Year	1840.00	917.34	919.37	919.30	919.78	0.021439	5.41	358.08	350.53	0.85
Tributary 1E	Reach 1	2.018	Method 4	1840.00	917.34	920.06	919.79	920.66	0.017057	6.25	294.37	157.43	0.81
Tributary 1E	Reach 1	2.018	Method 1	1840.00	917.34	919.38	919.30	919.79	0.020733	5.35	361.84	350.84	0.83
Tributary 1E	Reach 1	1.980	100-Year	1840.00	915.76	917.83		918.01	0.004499	1.44	569.32	469.94	0.25
Tributary 1E	Reach 1	1.980	Method 4	1840.00	915.76	918.87		919.02	0.004200	1.72	625.77	371.51	0.25
Tributary 1E	Reach 1	1.980	Method 1	1840.00	915.76	917.83		918.01	0.004569	1.45	556.30	394.41	0.25
Tributary 1E	Reach 1	1.942	100-Year	1840.00	913.68	916.70		916.87	0.007411	2.47	573.85	550.57	0.34
Tributary 1E	Reach 1	1.942	Method 4	1840.00	913.68	917.73		917.96	0.006996	2.62	514.87	335.99	0.34
Tributary 1E	Reach 1	1.942	Method 1	1840.00	913.68	916.72		916.88	0.007190	2.44	576.21	525.70	0.33
Tributary 1E	Reach 1	1.905	100-Year	1840.00	912.11	915.80		915.89	0.003937	2.31	810.52	681.26	0.26
Tributary 1E	Reach 1	1.905	Method 4	1840.00	912.11	916.85		917.00	0.003790	2.85	602.80	205.50	0.27
Tributary 1E	Reach 1	1.905	Method 1	1840.00	912.11	915.81		915.90	0.004055	2.33	776.76	612.37	0.27
Tributary 1E	Reach 1	1.867	100-Year	1840.00	910.82	915.01		915.12	0.005276	2.88	689.15	562.66	0.31
Tributary 1E	Reach 1	1.867	Method 4	1840.00	910.82	916.00		916.19	0.005447	3.55	527.52	203.62	0.33
Tributary 1E	Reach 1	1.867	Method 1	1840.00	910.82	915.00		915.12	0.005294	2.88	688.33	562.37	0.31
Tributary 1E	Reach 1	1.829	100-Year	1840.00	909.80	914.16		914.25	0.003606	2.48	754.73	504.11	0.26
Tributary 1E	Reach 1	1.829	Method 4	1840.00	909.80	915.13		915.27	0.003786	3.05	609.49	227.10	0.27
Tributary 1E	Reach 1	1.829	Method 1	1840.00	909.80	914.18		914.27	0.003435	2.44	765.81	504.42	0.25
Tributary 1E	Reach 1	1.791	100-Year	1840.00	909.24	913.29		913.44	0.004456	2.59	627.80	399.23	0.28
Tributary 1E	Reach 1	1.791	Method 4	1840.00	909.24	914.25		914.41	0.004829	3.26	566.94	239.56	0.31
Tributary 1E	Reach 1	1.791	Method 1	1840.00	909.24	913.35		913.49	0.004272	2.54	614.67	353.00	0.28
Tributary 1E	Reach 1	1.753	100-Year	1840.00	907.65	912.60		912.69	0.002776	2.19	772.82	380.82	0.23
Tributary 1E	Reach 1	1.753	Method 4	1840.00	907.65	913.46		913.59	0.003252	2.80	644.27	205.70	0.26
Tributary 1E	Reach 1	1.753	Method 1	1840.00	907.65	912.69		912.79	0.002577	2.14	752.04	325.30	0.22
Tributary 1E	Reach 1	1.715	100-Year	1840.00	908.98	911.67		911.87	0.005038	4.06	566.39	331.97	0.53
Tributary 1E	Reach 1	1.715	Method 4	1840.00	908.98	912.51		912.81	0.004272	4.38	419.91	199.18	0.53
Tributary 1E	Reach 1	1.715	Method 1	1840.00	908.98	911.72		911.95	0.005780	4.40	519.60	286.05	0.57
Tributary 1E	Reach 1	1.677	100-Year	1840.00	908.63	910.61		910.80	0.005213	2.77	549.26	396.65	0.45
Tributary 1E	Reach 1	1.677	Method 4	1840.00	908.63	911.70		911.88	0.004572	3.52	548.12	306.14	0.44
Tributary 1E	Reach 1	1.677	Method 1	1840.00	908.63	910.61		910.80	0.005206	2.77	549.50	396.70	0.45
Tributary 1E	Reach 1	1.640	100-Year	1840.00	907.51	910.03		910.18	0.004027	1.67	659.27	423.56	0.25
Tributary 1E	Reach 1	1.640	Method 4	1840.00	907.51	910.96		911.13	0.004449	2.43	609.80	263.47	0.28
Tributary 1E	Reach 1	1.640	Method 1	1840.00	907.51	910.03		910.18	0.004003	1.67	660.54	423.59	0.24

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	1.602	100-Year	1840.00	905.46	908.48		908.66	0.008391	3.02	542.77	362.14	0.37
Tributary 1E	Reach 1	1.602	Method 4	1840.00	905.46	909.46		909.70	0.008713	3.97	461.04	161.46	0.40
Tributary 1E	Reach 1	1.602	Method 1	1840.00	905.46	908.46		908.65	0.008622	3.05	538.37	361.95	0.38
Tributary 1E	Reach 1	1.564	100-Year	1840.00	903.79	907.29		907.42	0.004557	2.47	654.01	374.75	0.30
Tributary 1E	Reach 1	1.564	Method 4	1840.00	903.79	908.28		908.43	0.004642	3.17	594.44	200.75	0.32
Tributary 1E	Reach 1	1.564	Method 1	1840.00	903.79	907.38		907.50	0.003906	2.34	684.67	355.94	0.28
Tributary 1E	Reach 1	1.526	100-Year	1840.00	903.14	906.38		906.50	0.004362	2.36	693.54	412.04	0.28
Tributary 1E	Reach 1	1.526	Method 4	1840.00	903.14	907.35		907.50	0.004582	3.03	589.50	192.35	0.30
Tributary 1E	Reach 1	1.526	Method 1	1840.00	903.14	906.39		906.55	0.005443	2.62	588.38	290.27	0.31
Tributary 1E	Reach 1	1.488	100-Year	1840.00	902.09	905.47		905.55	0.002909	1.95	807.84	406.74	0.23
Tributary 1E	Reach 1	1.488	Method 4	1840.00	902.09	906.56		906.69	0.002685	2.40	664.80	198.25	0.23
Tributary 1E	Reach 1	1.488	Method 1	1840.00	902.09	905.43		905.52	0.002828	1.89	773.94	332.80	0.22
Tributary 1E	Reach 1	1.450	100-Year	1840.00	901.42	904.87		904.98	0.005242	2.12	703.61	379.08	0.29
Tributary 1E	Reach 1	1.450	Method 4	1840.00	901.42	905.85		906.06	0.005364	2.89	544.85	216.67	0.31
Tributary 1E	Reach 1	1.450	Method 1	1840.00	901.42	904.84		904.96	0.005186	2.10	693.81	365.49	0.29
Tributary 1E	Reach 1	1.412	100-Year	1840.00	901.99	903.21		903.36	0.008912	1.53	614.41	351.93	0.32
Tributary 1E	Reach 1	1.412	Method 4	1840.00	901.99	903.92		904.20	0.013344	2.69	461.88	230.28	0.43
Tributary 1E	Reach 1	1.412	Method 1	1840.00	901.99	903.25		903.39	0.008427	1.52	628.12	356.29	0.32
Tributary 1E	Reach 1	1.374	100-Year	1840.00	899.69	902.66		902.71	0.001972	1.31	1048.44	480.59	0.18
Tributary 1E	Reach 1	1.374	Method 4	1840.00	899.69	902.95		903.05	0.003677	1.89	722.66	253.47	0.24
Tributary 1E	Reach 1	1.374	Method 1	1840.00	899.69	902.70		902.75	0.001972	1.32	1008.04	368.07	0.18
Tributary 1E	Reach 1	1.330	100-Year	1840.00	896.00	901.90	900.66	902.01	0.006090	2.71	715.60	425.18	0.32
Tributary 1E	Reach 1	1.330	Method 4	1840.00	896.00	901.95	900.66	902.06	0.006065	2.73	673.90	300.01	0.32
Tributary 1E	Reach 1	1.330	Method 1	1840.00	896.00	901.95	900.66	902.06	0.006057	2.73	674.17	300.01	0.32
Tributary 1E	Reach 1	1.323		Culvert									
Tributary 1E	Reach 1	1.312	100-Year	1840.00	895.50	900.91		901.05	0.005055	3.02	661.89	525.37	0.33
Tributary 1E	Reach 1	1.312	Method 4	1840.00	895.50	901.40		901.52	0.003255	2.71	678.52	223.94	0.27
Tributary 1E	Reach 1	1.312	Method 1	1840.00	895.50	901.48		901.59	0.002993	2.65	695.26	223.95	0.26
Tributary 1E	Reach 1	1.223	100-Year	1840.00	894.87	898.35		898.46	0.004631	2.45	691.30	606.21	0.32
Tributary 1E	Reach 1	1.223	Method 4	1840.00	894.87	899.25		899.43	0.005501	3.33	542.03	274.40	0.38
Tributary 1E	Reach 1	1.223	Method 1	1840.00	894.87	899.31		899.51	0.006141	3.58	507.75	242.82	0.41

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	1.185	100-Year	1840.00	891.67	897.21	896.22	897.38	0.005917	3.18	567.20	353.05	0.36
Tributary 1E	Reach 1	1.185	Method 4	1840.00	891.67	897.75	896.37	898.04	0.008630	4.34	423.57	141.44	0.44
Tributary 1E	Reach 1	1.185	Method 1	1840.00	891.67	897.84	896.37	898.12	0.007817	4.22	436.50	141.44	0.42
Tributary 1E	Reach 1	1.147	100-Year	1840.00	891.54	894.77		895.26	0.022071	5.82	334.93	214.41	0.66
Tributary 1E	Reach 1	1.147	Method 4	1840.00	891.54	895.70		896.07	0.011339	4.87	377.78	126.80	0.50
Tributary 1E	Reach 1	1.147	Method 1	1840.00	891.54	895.06		895.64	0.021739	6.11	300.92	115.77	0.67
Tributary 1E	Reach 1	1.109	100-Year	1840.00	890.15	894.38		894.50	0.001209	2.84	747.76	272.92	0.27
Tributary 1E	Reach 1	1.109	Method 4	1840.00	890.15	895.59		895.68	0.000579	2.36	780.01	165.48	0.19
Tributary 1E	Reach 1	1.109	Method 1	1840.00	890.15	894.82		894.95	0.001040	2.82	653.47	165.48	0.25
Tributary 1E	Reach 1	1.072	100-Year	1840.00	889.38	893.22	893.22	893.79	0.018717	7.01	330.06	264.53	0.79
Tributary 1E	Reach 1	1.072	Method 4	1840.00	889.38	893.71	893.71	895.18	0.029858	9.76	188.62	64.95	1.01
Tributary 1E	Reach 1	1.072	Method 1	1840.00	889.38	893.47	893.47	894.30	0.021682	7.98	270.90	149.08	0.86
Tributary 1E	Reach 1	1.035	100-Year	1840.00	887.45	892.14	890.56	892.27	0.002160	2.91	666.15	326.15	0.31
Tributary 1E	Reach 1	1.035	Method 4	1840.00	887.45	893.03	890.56	893.11	0.000927	2.28	805.92	224.70	0.21
Tributary 1E	Reach 1	1.035	Method 1	1840.00	887.45	892.15	890.56	892.29	0.002349	3.03	608.22	224.70	0.32
Tributary 1E	Reach 1	.997	100-Year	1840.00	886.60	891.52	890.79	891.69	0.003880	3.66	559.16	342.95	0.40
Tributary 1E	Reach 1	.997	Method 4	1840.00	886.60	892.42	891.07	892.74	0.004386	4.60	409.25	125.39	0.43
Tributary 1E	Reach 1	.997	Method 1	1840.00	886.60	891.52	890.79	891.69	0.003880	3.66	559.16	307.31	0.40
Tributary 1E	Reach 1	.959	100-Year	1840.00	886.08	890.65	889.91	890.87	0.004712	4.09	518.53	500.32	0.43
Tributary 1E	Reach 1	.959	Method 4	1840.00	886.08	890.96	890.02	891.50	0.009038	5.94	309.53	98.19	0.59
Tributary 1E	Reach 1	.959	Method 1	1840.00	886.08	890.65	889.91	890.87	0.004712	4.09	518.53	315.14	0.43
Tributary 1E	Reach 1	.921	100-Year	1840.00	883.54	888.92	888.35	889.41	0.012084	5.69	336.46	354.97	0.64
Tributary 1E	Reach 1	.921	Method 4	1840.00	883.54	889.71	888.27	890.02	0.005644	4.52	407.48	131.63	0.45
Tributary 1E	Reach 1	.921	Method 1	1840.00	883.54	888.92	888.35	889.41	0.012084	5.69	336.46	175.26	0.64
Tributary 1E	Reach 1	.883	100-Year	1840.00	883.53	888.61	886.40	888.69	0.001439	2.02	816.89	758.51	0.22
Tributary 1E	Reach 1	.883	Method 4	1840.00	883.53	889.26	886.88	889.36	0.001959	2.52	707.51	234.58	0.26
Tributary 1E	Reach 1	.883	Method 1	1840.00	883.53	888.61	886.40	888.69	0.001438	2.02	816.91	290.25	0.22
Tributary 1E	Reach 1	.845	100-Year	1840.00	882.26	887.76	886.70	888.11	0.007126	5.08	416.19	970.10	0.51
Tributary 1E	Reach 1	.845	Method 4	1840.00	882.26	888.22	886.47	888.65	0.007193	5.22	352.22	110.06	0.51
Tributary 1E	Reach 1	.845	Method 1	1840.00	882.26	887.76	886.70	888.11	0.007124	5.07	416.24	252.78	0.51
Tributary 1E	Reach 1	.807	100-Year	1840.00	881.36	886.49	885.43	886.79	0.005942	4.71	453.12	800.78	0.47
Tributary 1E	Reach 1	.807	Method 4	1840.00	881.36	886.50	885.36	887.02	0.009161	5.83	315.68	100.12	0.58
Tributary 1E	Reach 1	.807	Method 1	1840.00	881.36	886.49	885.43	886.79	0.005957	4.72	452.66	233.79	0.47

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	.770	100-Year	1840.00	879.87	885.68	883.60	885.93	0.003181	3.99	461.50	1071.84	0.37
Tributary 1E	Reach 1	.770	Method 4	1840.00	879.87	885.69	883.60	885.93	0.003164	3.98	462.32	126.42	0.37
Tributary 1E	Reach 1	.770	Method 1	1840.00	879.87	885.68	883.61	885.93	0.003193	3.99	460.90	126.29	0.37
Tributary 1E	Reach 1	.732	100-Year	1840.00	879.39	885.14	882.88	885.35	0.002565	3.66	502.44	1417.21	0.33
Tributary 1E	Reach 1	.732	Method 4	1840.00	879.39	885.15	882.88	885.36	0.002543	3.65	503.87	132.82	0.33
Tributary 1E	Reach 1	.732	Method 1	1840.00	879.39	885.13	882.88	885.34	0.002581	3.67	501.42	132.64	0.33
Tributary 1E	Reach 1	.695	100-Year	1840.00	879.28	884.29	882.70	884.63	0.005403	4.74	388.53	2101.77	0.45
Tributary 1E	Reach 1	.695	Method 4	1840.00	879.28	884.31	882.70	884.65	0.005284	4.70	391.47	114.20	0.45
Tributary 1E	Reach 1	.695	Method 1	1840.00	879.28	884.27	882.70	884.62	0.005488	4.76	386.51	113.82	0.46
Tributary 1E	Reach 1	.656	100-Year	1840.00	877.73	882.15	881.54	882.88	0.014638	6.84	269.18	1985.71	0.72
Tributary 1E	Reach 1	.656	Method 4	1840.00	877.73	883.08	881.54	883.47	0.006178	5.06	363.44	108.77	0.49
Tributary 1E	Reach 1	.656	Method 1	1840.00	877.73	882.28	881.52	882.94	0.012855	6.54	281.41	227.25	0.68
Tributary 1E	Reach 1	.618	100-Year	1840.00	876.82	880.99	880.54	881.15	0.004775	3.98	666.44	2226.17	0.42
Tributary 1E	Reach 1	.618	Method 4	1840.00	876.82	882.11	880.54	882.43	0.004260	4.64	400.82	117.24	0.42
Tributary 1E	Reach 1	.618	Method 1	1840.00	876.82	881.01	880.55	881.25	0.005197	4.18	481.83	284.61	0.44
Tributary 1E	Reach 1	.580	100-Year	1840.00	876.54	879.43	879.25	879.74	0.011433	5.08	424.39	962.57	0.62
Tributary 1E	Reach 1	.580	Method 4	1840.00	876.54	880.39	879.87	881.06	0.012142	6.59	278.24	108.76	0.69
Tributary 1E	Reach 1	.580	Method 1	1840.00	876.54	879.44	879.25	879.77	0.011625	5.12	404.07	362.90	0.63
Tributary 1E	Reach 1	.542	100-Year	1840.00	875.92	878.35	878.35	878.43	0.004090	2.68	846.28	1841.36	0.36
Tributary 1E	Reach 1	.542	Method 4	1840.00	875.92	879.29	878.36	879.61	0.004413	3.68	425.77	164.77	0.41
Tributary 1E	Reach 1	.542	Method 1	1840.00	875.92	878.41	878.35	878.54	0.003688	2.60	636.03	469.68	0.35
Tributary 1E	Reach 1	.494	100-Year	1840.00	875.29	877.59		877.63	0.002597	2.19	1119.25	1678.23	0.28
Tributary 1E	Reach 1	.494	Method 4	1840.00	875.29	878.62		878.79	0.002503	2.80	566.27	218.67	0.30
Tributary 1E	Reach 1	.494	Method 1	1840.00	875.29	877.94		878.01	0.001497	1.85	833.13	459.29	0.22
Tributary 1E	Reach 1	.418	100-Year	1840.00	872.76	876.37	876.17	876.46	0.003696	3.29	909.83	1438.42	0.36
Tributary 1E	Reach 1	.418	Method 4	1840.00	872.76	877.35		877.61	0.003765	3.91	457.79	172.75	0.38
Tributary 1E	Reach 1	.418	Method 1	1840.00	872.76	877.03		877.20	0.003242	3.47	556.99	286.07	0.35
Tributary 1E	Reach 1	.342	100-Year	1840.00	870.90	874.92	874.67	875.03	0.003412	3.29	818.07	1223.42	0.35
Tributary 1E	Reach 1	.342	Method 4	1840.00	870.90	875.92	874.43	876.17	0.003413	3.93	465.93	146.70	0.37
Tributary 1E	Reach 1	.342	Method 1	1840.00	870.90	875.42	874.49	875.68	0.004455	4.14	456.84	188.35	0.41
Tributary 1E	Reach 1	.266	100-Year	1840.00	870.13	873.68	873.14	873.76	0.002925	2.88	854.23	1117.04	0.33
Tributary 1E	Reach 1	.266	Method 4	1840.00	870.13	874.68	873.14	874.90	0.002917	3.48	496.99	163.81	0.34

HEC-RAS Plan: Trib 1E (Continued)

River	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)	
Tributary 1E	Reach 1	.266	Method 1	1840.00	870.13	874.34	873.01	874.48	0.002042	2.75	618.15	243.98	0.28
Tributary 1E	Reach 1	.190	100-Year	1840.00	867.74	872.24	871.80	872.40	0.004007	3.69	598.58	676.93	0.39
Tributary 1E	Reach 1	.190	Method 4	1840.00	867.74	873.24	871.70	873.54	0.004000	4.39	421.10	124.25	0.40
Tributary 1E	Reach 1	.190	Method 1	1840.00	867.74	873.08	871.75	873.36	0.004005	4.28	433.49	140.55	0.40

E.5.2 Water Surface Elevation HEC-RAS Output for Tributary 3E – All Reaches, Existing 100-Year, 6-Hour Event

HEC-RAS Plan: H Trib 3E River: Tributary 3E Reach: Reach 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	1.553	100-Year	758.00	975.75	980.26		980.55	0.004300	4.33	175.07	61.04	0.45
Reach 1	1.553	Method 4	758.00	975.75	980.26		980.55	0.004300	4.33	175.07	61.04	0.45
Reach 1	1.553	Method 1	758.00	975.75	980.26		980.55	0.004300	4.33	175.07	61.04	0.45
Reach 1	1.515	100-Year	758.00	975.25	978.87	978.15	979.38	0.008237	5.72	132.47	166.36	0.65
Reach 1	1.515	Method 4	758.00	975.25	978.88	978.15	979.38	0.008130	5.70	133.09	55.12	0.65
Reach 1	1.515	Method 1	758.00	975.25	978.87	978.16	979.38	0.008237	5.72	132.47	55.03	0.65
Reach 1	1.478	100-Year	758.00	974.47	978.71	976.45	978.78	0.001093	2.10	361.17	171.00	0.23
Reach 1	1.478	Method 4	758.00	974.47	978.72	976.45	978.79	0.001075	2.09	363.27	135.29	0.22
Reach 1	1.478	Method 1	758.00	974.47	978.71	976.44	978.78	0.001093	2.10	361.17	134.94	0.23
Reach 1	1.440	100-Year	758.00	972.65	978.71	974.05	978.72	0.000082	0.83	916.39	269.12	0.07
Reach 1	1.440	Method 4	758.00	972.65	978.72	974.05	978.73	0.000082	0.82	919.47	199.27	0.07
Reach 1	1.440	Method 1	758.00	972.65	978.71	974.06	978.72	0.000082	0.83	916.39	198.98	0.07
Reach 1	1.421	100-Year	758.00	971.21	978.70		978.71	0.000041	0.76	1079.68	188.72	0.05
Reach 1	1.421	Method 4	758.00	971.21	978.71		978.72	0.000070	0.93	816.49	121.45	0.06
Reach 1	1.421	Method 1	758.00	971.21	978.70		978.71	0.000041	0.76	1079.68	188.72	0.05
Reach 1	1.402	100-Year	758.00	971.23	978.69		978.71	0.000059	1.13	869.63	305.76	0.08
Reach 1	1.402	Method 4	758.00	971.23	978.68		978.71	0.000108	1.48	524.94	96.95	0.11
Reach 1	1.402	Method 1	758.00	971.23	978.69		978.71	0.000059	1.13	869.63	305.76	0.08
Reach 1	1.378	100-Year	758.00	969.69	978.69	971.48	978.70	0.000012	0.52	1702.80	295.77	0.03
Reach 1	1.378	Method 4	758.00	969.69	978.69	971.48	978.70	0.000012	0.52	1702.80	295.77	0.03
Reach 1	1.378	Method 1	758.00	969.69	978.69	971.48	978.70	0.000012	0.52	1702.80	295.77	0.03
Reach 1	1.359		Inl Struct									
Reach 1	1.326	100-Year	758.00	964.75	967.85		968.02	0.003915	3.41	231.39	160.13	0.45
Reach 1	1.326	Method 4	758.00	964.75	967.72		967.94	0.005031	3.75	202.32	119.05	0.51
Reach 1	1.326	Method 1	758.00	964.75	968.08		968.23	0.003044	3.06	247.48	134.93	0.40
Reach 1	1.288	100-Year	758.00	963.35	965.76	965.74	966.37	0.021149	6.26	121.03	96.54	0.99
Reach 1	1.288	Method 4	758.00	963.35	966.06		966.46	0.010968	5.03	150.68	102.01	0.73
Reach 1	1.288	Method 1	758.00	963.35	966.06	966.01	966.81	0.018848	6.92	109.59	68.76	0.97

HEC-RAS Plan: H Trib 3E River: Tributary 3E Reach: Reach 1 (Continued)

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	1.250	100-Year	758.00	960.53	964.36		964.57	0.004428	4.05	219.06	150.03	0.49
Reach 1	1.250	Method 4	758.00	960.53	964.82		965.12	0.004308	4.42	171.34	66.85	0.49
Reach 1	1.250	Method 1	758.00	960.53	964.79		965.10	0.004299	4.46	170.87	67.64	0.49
Reach 1	1.213	100-Year	758.00	959.99	962.50	962.44	962.99	0.016935	5.96	138.71	119.94	0.90
Reach 1	1.213	Method 4	758.00	959.99	962.70	962.70	963.43	0.021681	6.84	110.77	78.92	1.02
Reach 1	1.213	Method 1	758.00	959.99	962.72	962.72	963.43	0.021017	6.78	111.84	79.37	1.00
Reach 1	1.175	100-Year	758.00	957.50	960.29		960.49	0.008858	3.86	217.90	227.90	0.63
Reach 1	1.175	Method 4	758.00	957.50	960.93		961.18	0.005275	3.96	191.47	106.14	0.52
Reach 1	1.175	Method 1	758.00	957.50	960.93		961.18	0.005275	3.96	191.47	106.14	0.52
Reach 1	1.137	100-Year	758.00	956.46	958.91		959.08	0.005667	3.73	240.21	226.38	0.53
Reach 1	1.137	Method 4	758.00	956.46	959.76		960.11	0.005376	4.70	161.19	67.29	0.54
Reach 1	1.137	Method 1	758.00	956.46	959.76		960.10	0.005390	4.71	161.06	67.29	0.54
Reach 1	1.099	100-Year	758.00	955.19	957.42		957.71	0.009189	4.88	189.32	174.24	0.68
Reach 1	1.099	Method 4	758.00	955.19	957.94		958.57	0.011492	6.36	119.25	56.21	0.77
Reach 1	1.099	Method 1	758.00	955.19	957.94		958.57	0.011374	6.34	119.64	56.21	0.77
Reach 1	1.061	100-Year	758.00	952.35	956.25		956.45	0.004442	3.92	226.35	166.48	0.49
Reach 1	1.061	Method 4	758.00	952.35	956.42		956.80	0.006503	4.94	153.41	70.46	0.59
Reach 1	1.061	Method 1	758.00	952.35	956.42		956.80	0.006576	4.96	152.88	70.46	0.59
Reach 1	1.023	100-Year	758.00	951.49	955.09	954.50	955.40	0.006243	4.60	178.06	118.04	0.58
Reach 1	1.023	Method 4	758.00	951.49	955.43	954.45	955.71	0.004431	4.21	180.03	79.87	0.49
Reach 1	1.023	Method 1	758.00	951.49	955.43	954.45	955.70	0.004368	4.20	181.59	85.00	0.49
Reach 1	0.985	100-Year	758.00	950.08	953.47	953.06	953.74	0.011327	4.44	186.72	127.29	0.59
Reach 1	0.985	Method 4	758.00	950.08	954.22	953.29	954.53	0.008179	4.52	167.83	71.04	0.52
Reach 1	0.985	Method 1	758.00	950.08	954.21	953.29	954.53	0.008185	4.52	167.79	71.04	0.52
Reach 1	0.948	100-Year	758.00	949.22	951.95	951.27	952.07	0.005850	2.92	278.38	201.69	0.41
Reach 1	0.948	Method 4	758.00	949.22	952.33	951.72	952.65	0.010994	4.56	166.20	87.58	0.58
Reach 1	0.948	Method 1	758.00	949.22	952.33	951.70	952.66	0.010957	4.56	166.38	87.58	0.58
Reach 1	0.910	100-Year	758.00	948.55	950.44		950.60	0.009743	3.33	252.16	259.77	0.52
Reach 1	0.910	Method 4	758.00	948.55	950.72		950.87	0.007003	3.18	238.59	155.10	0.45

HEC-RAS Plan: H Trib 3E River: Tributary 3E Reach: Reach 1 (Continued)

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	0.910	Method 1	758.00	948.55	950.71		950.87	0.007051	3.18	238.10	155.10	0.45
Reach 1	0.872	100-Year	758.00	946.40	948.60		948.75	0.008590	3.47	254.02	225.11	0.50
Reach 1	0.872	Method 4	758.00	946.40	949.34		949.56	0.006133	3.75	202.21	90.04	0.44
Reach 1	0.872	Method 1	758.00	946.40	949.39		949.60	0.005742	3.67	206.32	90.04	0.43
Reach 1	0.834	100-Year	758.00	944.20	946.84	946.43	947.01	0.008834	3.80	238.78	199.90	0.52
Reach 1	0.834	Method 4	758.00	944.20	947.82	946.84	948.16	0.007954	4.70	161.21	60.60	0.51
Reach 1	0.834	Method 1	758.00	944.20	947.41	946.84	947.89	0.013501	5.54	136.86	60.60	0.65
Reach 1	0.796	100-Year	758.00	942.92	945.39		945.48	0.006229	3.09	321.46	316.96	0.43
Reach 1	0.796	Method 4	758.00	942.92	946.21		946.50	0.008350	4.58	182.06	90.40	0.52
Reach 1	0.796	Method 1	758.00	942.92	946.03		946.20	0.005317	3.57	240.33	131.34	0.42
Reach 1	0.758	100-Year	758.00	940.79	943.89		944.04	0.008282	3.62	264.67	254.69	0.50
Reach 1	0.758	Method 4	758.00	940.79	944.75		945.02	0.006505	4.12	183.86	73.30	0.46
Reach 1	0.758	Method 1	758.00	940.79	944.59		944.89	0.008108	4.41	171.81	73.30	0.51
Reach 1	0.720	100-Year	758.00	940.27	942.50		942.57	0.006367	2.78	366.30	458.71	0.42
Reach 1	0.720	Method 4	758.00	940.27	943.59		943.80	0.005594	3.81	211.71	97.01	0.43
Reach 1	0.720	Method 1	758.00	940.27	943.49		943.65	0.004626	3.42	249.74	132.80	0.39
Reach 1	0.682	100-Year	758.00	938.56	941.04	940.75	941.16	0.008217	3.55	313.83	404.29	0.49
Reach 1	0.682	Method 4	758.00	938.56	941.95		942.34	0.009696	5.02	151.14	60.11	0.56
Reach 1	0.682	Method 1	758.00	938.56	941.94		942.34	0.009724	5.02	151.01	60.11	0.56
Reach 1	0.645	100-Year	758.00	936.61	939.58		939.68	0.006585	2.94	314.41	330.92	0.43
Reach 1	0.645	Method 4	758.00	936.61	940.54		940.77	0.006120	3.90	194.41	81.19	0.44
Reach 1	0.645	Method 1	758.00	936.61	940.55		940.78	0.006011	3.88	195.49	81.19	0.44
Reach 1	0.607	100-Year	758.00	935.34	938.26		938.38	0.006360	2.93	271.44	205.38	0.43
Reach 1	0.607	Method 4	758.00	935.34	939.28		939.53	0.006249	4.08	189.37	78.15	0.46
Reach 1	0.607	Method 1	758.00	935.34	939.04		939.35	0.008690	4.51	171.52	78.66	0.53
Reach 1	0.569	100-Year	758.00	934.96	937.15		937.26	0.005166	2.83	293.59	215.46	0.39
Reach 1	0.569	Method 4	758.00	934.96	938.22		938.43	0.004820	3.76	208.50	81.59	0.40
Reach 1	0.569	Method 1	758.00	934.96	937.63		937.83	0.006524	3.74	217.38	116.31	0.45

HEC-RAS Plan: H Trib 3E River: Tributary 3E Reach: Reach 1 (Continued)

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	0.531	100-Year	758.00	933.64	935.87		936.05	0.007727	3.72	226.37	149.78	0.49
Reach 1	0.531	Method 4	758.00	933.64	936.87		937.21	0.008033	4.90	162.15	61.47	0.52
Reach 1	0.531	Method 1	758.00	933.64	936.48		936.67	0.005443	3.68	215.08	95.99	0.42
Reach 1	0.493	100-Year	758.00	932.49	934.11		934.25	0.009937	3.07	256.47	246.19	0.51
Reach 1	0.493	Method 4	758.00	932.49	935.15		935.44	0.009481	4.55	175.87	88.43	0.55
Reach 1	0.493	Method 1	758.00	932.49	935.10		935.34	0.007983	4.19	193.52	100.26	0.51
Reach 1	0.455	100-Year	758.00	930.91	932.28		932.37	0.009027	2.49	322.07	449.19	0.47
Reach 1	0.455	Method 4	758.00	930.91	933.23		933.51	0.009962	4.25	179.10	100.84	0.56
Reach 1	0.455	Method 1	758.00	930.91	933.17		933.47	0.011242	4.41	172.65	100.84	0.59
Reach 1	0.418	100-Year	758.00	929.91	930.86	930.48	930.92	0.005956	2.07	377.21	520.12	0.40
Reach 1	0.418	Method 4	758.00	929.91	931.29		931.48	0.010053	3.52	215.38	173.01	0.56
Reach 1	0.418	Method 1	758.00	929.91	931.37		931.54	0.008087	3.29	230.08	173.01	0.50
Reach 1	0.379	100-Year	758.00	927.99	929.33		929.44	0.009624	2.84	305.64	441.89	0.50
Reach 1	0.379	Method 4	758.00	927.99	929.63	929.07	929.76	0.007123	2.88	263.25	199.78	0.44
Reach 1	0.379	Method 1	758.00	927.99	929.46		929.63	0.011088	3.29	230.37	199.78	0.54
Reach 1	0.299	100-Year	758.00	925.61	926.64		926.68	0.004516	1.94	466.88	787.26	0.38
Reach 1	0.299	Method 4	758.00	925.61	927.06	926.53	927.18	0.005344	2.77	274.07	221.50	0.44
Reach 1	0.299	Method 1	758.00	925.61	926.75		926.81	0.004283	2.05	379.11	425.34	0.38
Reach 1	0.229	100-Year	758.00	923.45	924.26	924.07	924.33	0.009689	2.36	362.55	766.13	0.53
Reach 1	0.229	Method 4	758.00	923.45	924.37	924.13	924.48	0.010184	2.69	281.89	387.86	0.56
Reach 1	0.229	Method 1	758.00	923.45	924.37	924.13	924.48	0.010181	2.69	281.91	387.86	0.56
Reach 1	0.167	100-Year	758.00	921.81	922.87		922.90	0.002469	1.39	604.98	994.45	0.28
Reach 1	0.167	Method 4	758.00	921.81	922.96	922.47	923.00	0.002498	1.50	504.91	580.67	0.28
Reach 1	0.167	Method 1	758.00	921.81	922.96	922.47	923.00	0.002498	1.50	504.88	580.67	0.28
Reach 1	0.089	100-Year	758.00	920.48	921.26	921.06	921.31	0.007004	1.75	455.86	1028.84	0.43
Reach 1	0.089	Method 4	758.00	920.48	921.33	921.09	921.39	0.007006	1.91	396.96	690.50	0.44
Reach 1	0.089	Method 1	758.00	920.48	921.33	921.09	921.39	0.007008	1.91	396.92	690.50	0.44

E.5.3 Water Surface Elevation HEC-RAS Output for Tributary 4E – All Reaches, Existing 100-Year, 6-Hour Event

HEC-RAS Plan: Hassayampa T

River	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)	
trib4E2	reach 1	0.281	100-Year	422.00	971.63	973.68	973.52	973.88	0.017748	3.71	125.98	192.62	0.67
trib4E2	reach 1	0.281	Method 4	422.00	971.63	973.89	973.51	974.07	0.011601	3.40	124.21	105.53	0.55
trib4E2	reach 1	0.281	Method 1	422.00	971.63	974.04		974.18	0.007850	3.02	139.80	105.53	0.46
trib4E2	reach 1	0.229	100-Year	422.00	969.61	970.53	970.19	970.62	0.008436	1.78	183.90	266.91	0.42
trib4E2	reach 1	0.229	Method 4	422.00	969.61	971.73	970.94	971.88	0.005772	3.12	136.76	77.62	0.41
trib4E2	reach 1	0.229	Method 1	422.00	969.61	971.52		971.74	0.010080	3.79	112.45	72.72	0.54
trib4E2	reach 1	0.172	100-Year	422.00	966.48	967.65	967.40	967.75	0.010938	2.88	174.32	247.12	0.52
trib4E2	reach 1	0.172	Method 4	422.00	966.48	967.93	967.85	968.43	0.031897	5.70	74.09	60.92	0.91
trib4E2	reach 1	0.172	Method 1	422.00	966.48	968.43		968.68	0.010263	4.03	104.78	60.92	0.54
trib4E2	reach 1	0.132	100-Year	422.00	965.09	965.88	965.52	965.94	0.006175	1.77	223.27	297.99	0.37
trib4E2	reach 1	0.132	Method 4	422.00	965.09	966.65	965.84	966.72	0.003253	2.08	202.92	138.61	0.30
trib4E2	reach 1	0.132	Method 1	422.00	965.09	966.17	965.84	966.32	0.011871	3.07	137.25	138.61	0.54
trib4E1	reach 2	0.647	100-Year	630.00	973.09	974.47		974.56	0.005597	2.47	264.61	293.89	0.44
trib4E1	reach 2	0.647	Method 4	630.00	973.09	974.46		974.57	0.006572	2.67	236.29	236.75	0.47
trib4E1	reach 2	0.647	Method 1	630.00	973.09	974.45		974.56	0.006829	2.70	233.57	236.75	0.48
trib4E1	reach 2	0.606	100-Year	630.00	971.61	972.72	972.58	972.84	0.012751	2.86	235.46	438.99	0.62
trib4E1	reach 2	0.606	Method 4	630.00	971.61	972.86	972.57	972.97	0.008477	2.65	237.69	293.17	0.52
trib4E1	reach 2	0.606	Method 1	630.00	971.61	972.88	972.57	972.98	0.007968	2.60	242.17	293.17	0.50
trib4E1	reach 2	0.562	100-Year	630.00	969.27	970.77	970.46	970.87	0.005892	2.68	273.75	366.51	0.45
trib4E1	reach 2	0.562	Method 4	630.00	969.27	970.88	970.46	971.05	0.007782	3.27	192.69	160.73	0.53
trib4E1	reach 2	0.562	Method 1	630.00	969.27	970.85	970.46	971.02	0.008619	3.37	186.85	160.73	0.55
trib4E1	reach 2	0.513	100-Year	630.00	966.45	968.63	968.46	968.80	0.011695	3.47	201.68	278.83	0.62
trib4E1	reach 2	0.513	Method 4	630.00	966.45	968.85		969.02	0.008223	3.32	189.86	161.47	0.54
trib4E1	reach 2	0.513	Method 1	630.00	966.45	968.91		969.07	0.006855	3.14	200.58	161.47	0.50
trib4E1	reach 2	0.447	100-Year	630.00	964.82	966.57		966.63	0.003728	1.98	353.84	440.59	0.35
trib4E1	reach 2	0.447	Method 4	630.00	964.82	966.88		966.98	0.004208	2.51	250.87	195.71	0.39
trib4E1	reach 2	0.447	Method 1	630.00	964.82	966.78		966.90	0.005512	2.72	231.27	195.71	0.44
trib4E1	reach 2	0.379	100-Year	630.00	962.81	964.65	964.25	964.78	0.006903	2.85	232.27	291.16	0.49
trib4E1	reach 2	0.379	Method 4	630.00	962.81	964.54		964.71	0.010394	3.25	193.66	203.43	0.59
trib4E1	reach 2	0.379	Method 1	630.00	962.81	964.72	964.25	964.84	0.005920	2.75	229.45	203.43	0.46

HEC-RAS Plan: Hassayampa T (Continued)

River	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)	
trib4E1	reach 2	0.322	100-Year	630.00	961.19	963.01	962.56	963.13	0.004488	2.82	245.54	299.74	0.45
trib4E1	reach 2	0.322	Method 4	630.00	961.19	963.35	962.54	963.44	0.002260	2.34	268.80	173.75	0.33
trib4E1	reach 2	0.322	Method 1	630.00	961.19	962.99	962.54	963.13	0.005532	3.07	205.15	173.75	0.50
trib4E1	reach 1	0.201	100-Year	1052.00	956.47	957.94	957.69	958.11	0.013666	4.07	329.79	386.18	0.70
trib4E1	reach 1	0.201	Method 4	1052.00	956.47	958.74	958.60	959.47	0.019251	6.84	155.13	84.58	0.89
trib4E1	reach 1	0.201	Method 1	1052.00	956.47	958.11	957.67	958.32	0.010358	3.85	282.67	211.74	0.62
trib4E1	reach 1	0.125	100-Year	1052.00	952.05	954.34		954.44	0.006502	2.94	445.18	485.31	0.43
trib4E1	reach 1	0.125	Method 4	1052.00	952.05	955.54		955.75	0.005107	3.83	283.46	111.75	0.42
trib4E1	reach 1	0.125	Method 1	1052.00	952.05	955.34		955.53	0.005028	3.68	306.95	138.00	0.41
trib4E1	reach 1	0.065	100-Year	1052.00	950.40	952.61		952.67	0.004799	2.52	533.79	557.76	0.37
trib4E1	reach 1	0.065	Method 4	1052.00	950.40	953.07		953.39	0.011726	4.70	235.81	134.81	0.60
trib4E1	reach 1	0.065	Method 1	1052.00	950.40	952.99		953.26	0.010772	4.38	257.95	159.62	0.57
trib4E	reach 3	3.710	100-Year	500.00	1031.71	1033.74		1034.00	0.012721	4.22	129.10	191.77	0.74
trib4E	reach 3	3.710	Method 4	500.00	1031.71	1033.75		1034.06	0.014181	4.47	111.84	109.71	0.78
trib4E	reach 3	3.710	Method 1	500.00	1031.71	1033.75		1034.05	0.013852	4.42	117.18	143.21	0.77
trib4E	reach 3	3.673	100-Year	500.00	1030.46	1032.50		1032.61	0.004177	2.59	193.27	180.92	0.44
trib4E	reach 3	3.673	Method 4	500.00	1030.46	1032.50		1032.61	0.004150	2.58	193.61	179.00	0.44
trib4E	reach 3	3.673	Method 1	500.00	1030.46	1032.50		1032.61	0.004172	2.59	193.34	180.94	0.44
trib4E	reach 3	3.635	100-Year	500.00	1029.27	1031.41		1031.57	0.006707	3.17	159.64	166.69	0.55
trib4E	reach 3	3.635	Method 4	500.00	1029.27	1031.42		1031.57	0.006685	3.17	157.62	151.00	0.55
trib4E	reach 3	3.635	Method 1	500.00	1029.27	1031.41		1031.56	0.006733	3.18	159.41	164.48	0.55
trib4E	reach 3	3.602	100-Year	500.00	1028.19	1030.41		1030.55	0.005022	3.04	164.49	148.67	0.51
trib4E	reach 3	3.602	Method 4	500.00	1028.19	1030.40		1030.54	0.005202	3.08	162.55	148.33	0.52
trib4E	reach 3	3.602	Method 1	500.00	1028.19	1030.41		1030.56	0.004960	3.03	165.18	148.79	0.51
trib4E	reach 3	3.560	100-Year	500.00	1027.40	1028.83		1029.02	0.010273	3.46	144.77	186.50	0.68
trib4E	reach 3	3.560	Method 4	500.00	1027.40	1028.85		1029.03	0.009558	3.38	147.86	179.56	0.66
trib4E	reach 3	3.560	Method 1	500.00	1027.40	1028.83		1029.02	0.010575	3.49	143.12	178.55	0.69
trib4E	reach 3	3.522	100-Year	500.00	1026.00	1027.45		1027.56	0.005353	2.58	194.09	224.15	0.49
trib4E	reach 3	3.522	Method 4	500.00	1026.00	1027.43		1027.54	0.005916	2.66	188.08	223.18	0.51
trib4E	reach 3	3.522	Method 1	500.00	1026.00	1027.46		1027.56	0.005175	2.55	196.17	224.48	0.48

HEC-RAS Plan: Hassayampa T (Continued)

River	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)	
trib4E	reach 3	3.485	100-Year	500.00	1024.81	1026.37		1026.50	0.005377	2.85	175.18	171.24	0.50
trib4E	reach 3	3.485	Method 4	500.00	1024.81	1026.46		1026.56	0.004176	2.63	189.93	173.48	0.44
trib4E	reach 3	3.485	Method 1	500.00	1024.81	1026.34		1026.47	0.005950	2.95	169.62	170.39	0.52
trib4E	reach 3	3.448	100-Year	500.00	1023.74	1025.10	1024.84	1025.25	0.007633	3.22	166.27	199.75	0.57
trib4E	reach 3	3.448	Method 4	500.00	1023.74	1025.18		1025.39	0.008929	3.65	137.05	128.08	0.62
trib4E	reach 3	3.448	Method 1	500.00	1023.74	1025.16		1025.29	0.006036	2.98	179.13	200.98	0.51
trib4E	reach 3	3.410	100-Year	500.00	1022.07	1023.80		1023.91	0.005714	2.90	193.00	246.49	0.50
trib4E	reach 3	3.410	Method 4	500.00	1022.07	1024.28		1024.39	0.003031	2.69	185.87	121.16	0.38
trib4E	reach 3	3.410	Method 1	500.00	1022.07	1024.07		1024.22	0.004820	3.09	163.53	129.87	0.47
trib4E	reach 3	3.372	100-Year	500.00	1020.62	1022.53	1022.27	1022.71	0.007123	3.86	163.29	218.23	0.58
trib4E	reach 3	3.372	Method 4	500.00	1020.62	1023.04		1023.43	0.008414	5.05	99.07	53.04	0.65
trib4E	reach 3	3.372	Method 1	500.00	1020.62	1022.87		1023.11	0.006164	4.09	125.37	82.87	0.55
trib4E	reach 3	3.335	100-Year	500.00	1019.84	1021.26		1021.37	0.006163	2.92	185.53	241.73	0.51
trib4E	reach 3	3.335	Method 4	500.00	1019.84	1021.56		1021.79	0.007754	3.87	129.26	98.93	0.60
trib4E	reach 3	3.335	Method 1	500.00	1019.84	1021.56		1021.79	0.007702	3.86	130.23	103.75	0.60
trib4E	reach 3	3.297	100-Year	500.00	1018.17	1019.57	1019.45	1019.74	0.011710	3.45	161.39	277.44	0.68
trib4E	reach 3	3.297	Method 4	500.00	1018.17	1019.63	1019.45	1019.85	0.012697	3.75	133.23	156.31	0.72
trib4E	reach 3	3.297	Method 1	500.00	1018.17	1019.63	1019.45	1019.85	0.012772	3.76	132.99	156.31	0.72
trib4E	reach 3	3.260	100-Year	500.00	1016.76	1018.04	1017.69	1018.13	0.005691	2.49	209.54	292.65	0.48
trib4E	reach 3	3.260	Method 4	500.00	1016.76	1018.05		1018.15	0.005870	2.55	195.72	234.33	0.49
trib4E	reach 3	3.260	Method 1	500.00	1016.76	1018.05		1018.15	0.005837	2.55	196.07	234.35	0.49
trib4E	reach 3	3.222	100-Year	500.00	1014.76	1016.81		1016.98	0.005663	3.45	154.18	140.14	0.54
trib4E	reach 3	3.222	Method 4	500.00	1014.76	1017.36		1017.47	0.002260	2.65	188.55	109.45	0.36
trib4E	reach 3	3.222	Method 1	500.00	1014.76	1017.32		1017.44	0.002406	2.70	184.92	109.45	0.37
trib4E	reach 3	3.184	100-Year	500.00	1013.87	1015.73		1015.86	0.005412	3.42	181.85	222.19	0.51
trib4E	reach 3	3.184	Method 4	500.00	1013.87	1016.07		1016.57	0.011626	5.65	88.53	50.57	0.75
trib4E	reach 3	3.184	Method 1	500.00	1013.87	1016.03		1016.51	0.011478	5.61	91.70	61.13	0.76
trib4E	reach 3	3.147	100-Year	500.00	1012.79	1014.56		1014.71	0.007190	3.43	165.14	211.23	0.57
trib4E	reach 3	3.147	Method 4	500.00	1012.79	1015.11		1015.26	0.003713	3.16	158.44	93.73	0.43
trib4E	reach 3	3.147	Method 1	500.00	1012.79	1015.10		1015.24	0.003559	3.10	166.04	115.91	0.42

HEC-RAS Plan: Hassayampa T (Continued)

River	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)	
trib4E	reach 3	3.110	100-Year	500.00	1011.46	1013.60		1013.70	0.003790	2.90	212.45	239.45	0.43
trib4E	reach 3	3.110	Method 4	500.00	1011.46	1014.00		1014.28	0.006792	4.23	118.13	71.16	0.58
trib4E	reach 3	3.110	Method 1	500.00	1011.46	1014.01		1014.29	0.006722	4.22	118.58	71.29	0.58
trib4E	reach 3	3.072	100-Year	500.00	1010.07	1012.63	1012.29	1012.82	0.006485	3.57	149.39	141.20	0.56
trib4E	reach 3	3.072	Method 4	500.00	1010.07	1012.63	1012.26	1012.86	0.007594	3.85	129.73	101.29	0.60
trib4E	reach 3	3.072	Method 1	500.00	1010.07	1012.61	1012.25	1012.85	0.008001	3.92	127.67	101.18	0.61
trib4E	reach 3	3.036	100-Year	500.00	1008.67	1011.55	1010.76	1011.75	0.004693	3.61	139.98	95.52	0.49
trib4E	reach 3	3.036	Method 4	500.00	1008.67	1011.83	1010.76	1011.98	0.002931	3.12	160.31	81.12	0.39
trib4E	reach 3	3.036	Method 1	500.00	1008.67	1011.81	1010.76	1011.96	0.002866	3.10	166.06	106.13	0.39
trib4E	reach 3	2.998	100-Year	500.00	1007.39	1010.44	1010.16	1010.66	0.006479	4.21	152.73	174.51	0.57
trib4E	reach 3	2.998	Method 4	500.00	1007.39	1010.81	1010.15	1011.14	0.006217	4.60	108.72	53.61	0.57
trib4E	reach 3	2.998	Method 1	500.00	1007.39	1010.74	1010.15	1011.09	0.006943	4.76	104.96	53.41	0.60
trib4E	reach 3	2.960	100-Year	500.00	1006.84	1008.89	1008.55	1009.09	0.009434	3.71	140.48	165.05	0.65
trib4E	reach 3	2.960	Method 4	500.00	1006.84	1008.80	1008.69	1009.19	0.017394	5.00	100.03	101.58	0.89
trib4E	reach 3	2.960	Method 1	500.00	1006.84	1008.91	1008.71	1009.21	0.013430	4.44	115.63	136.95	0.78
trib4E	reach 3	2.923	100-Year	500.00	1004.64	1007.14		1007.39	0.007983	4.04	131.08	179.37	0.68
trib4E	reach 3	2.923	Method 4	500.00	1004.64	1007.39		1007.57	0.004567	3.37	148.48	110.15	0.51
trib4E	reach 3	2.923	Method 1	500.00	1004.64	1007.26		1007.48	0.006154	3.72	134.35	110.15	0.59
trib4E	reach 3	2.886	100-Year	500.00	1003.88	1005.77	1005.65	1005.87	0.006940	2.99	220.16	484.69	0.54
trib4E	reach 3	2.886	Method 4	500.00	1003.88	1006.39		1006.59	0.005298	3.59	139.12	88.73	0.51
trib4E	reach 3	2.886	Method 1	500.00	1003.88	1005.94		1006.10	0.007774	3.51	157.88	184.75	0.59
trib4E	reach 3	2.848	100-Year	500.00	1002.84	1004.51		1004.58	0.006326	2.64	237.95	508.96	0.51
trib4E	reach 3	2.848	Method 4	500.00	1002.84	1005.00		1005.26	0.008620	4.12	121.36	91.14	0.63
trib4E	reach 3	2.848	Method 1	500.00	1002.84	1004.79		1004.90	0.005012	2.83	186.96	198.70	0.47
trib4E	reach 3	2.810	100-Year	500.00	1001.91	1002.99	1002.81	1003.10	0.009052	2.72	192.10	355.67	0.58
trib4E	reach 3	2.810	Method 4	500.00	1001.91	1003.59		1003.78	0.006337	3.45	144.94	113.32	0.54
trib4E	reach 3	2.810	Method 1	500.00	1001.91	1003.57		1003.77	0.006658	3.50	142.79	113.32	0.55
trib4E	reach 3	2.772	100-Year	500.00	999.87	1001.42		1001.54	0.006241	2.52	184.88	221.42	0.50
trib4E	reach 3	2.772	Method 4	500.00	999.87	1002.24		1002.50	0.006510	4.05	123.46	76.42	0.56
trib4E	reach 3	2.772	Method 1	500.00	999.87	1002.22		1002.47	0.006360	4.01	128.76	92.74	0.56

HEC-RAS Plan: Hassayampa T (Continued)

River	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)	
trib4E	reach 3	2.735	100-Year	500.00	998.33	1000.19		1000.32	0.006883	3.09	174.35	207.11	0.54
trib4E	reach 3	2.735	Method 4	500.00	998.33	1000.46		1000.78	0.011725	4.56	109.72	90.10	0.73
trib4E	reach 3	2.735	Method 1	500.00	998.33	1000.47		1000.79	0.011403	4.51	110.78	90.38	0.72
trib4E	reach 3	2.697	100-Year	500.00	997.02	998.69		998.86	0.006978	3.60	161.25	191.56	0.57
trib4E	reach 3	2.697	Method 4	500.00	997.02	999.17		999.37	0.004570	3.56	140.51	81.44	0.48
trib4E	reach 3	2.697	Method 1	500.00	997.02	999.12		999.33	0.004926	3.65	137.58	83.98	0.50
trib4E	reach 3	2.659	100-Year	500.00	995.66	997.43		997.56	0.006322	3.14	172.87	190.26	0.55
trib4E	reach 3	2.659	Method 4	500.00	995.66	998.10		998.36	0.005641	4.08	122.68	72.55	0.55
trib4E	reach 3	2.659	Method 1	500.00	995.66	998.09		998.32	0.005231	3.93	132.95	95.83	0.54
trib4E	reach 3	2.622	100-Year	500.00	994.72	996.29		996.43	0.005125	3.12	170.65	163.30	0.49
trib4E	reach 3	2.622	Method 4	500.00	994.72	997.17		997.40	0.004098	3.82	130.98	60.67	0.46
trib4E	reach 3	2.622	Method 1	500.00	994.72	997.19		997.41	0.003997	3.79	131.99	60.67	0.45
trib4E	reach 3	2.584	100-Year	500.00	993.44	994.95		995.13	0.008526	3.70	150.07	181.62	0.62
trib4E	reach 3	2.584	Method 4	500.00	993.44	995.48		996.01	0.013514	5.83	85.73	51.92	0.80
trib4E	reach 3	2.584	Method 1	500.00	993.44	995.43		995.99	0.014893	6.01	83.21	51.92	0.84
trib4E	reach 3	2.546	100-Year	500.00	992.17	993.80		993.91	0.004335	2.86	192.69	198.68	0.46
trib4E	reach 3	2.546	Method 4	500.00	992.17	994.06		994.26	0.005584	3.60	139.07	98.97	0.53
trib4E	reach 3	2.546	Method 1	500.00	992.17	994.13		994.31	0.004851	3.43	145.98	101.67	0.50
trib4E	reach 3	2.508	100-Year	500.00	990.44	992.18	992.12	992.47	0.014334	4.64	121.44	154.16	0.81
trib4E	reach 3	2.508	Method 4	500.00	990.44	992.69	992.26	992.96	0.007517	4.24	118.02	83.00	0.63
trib4E	reach 3	2.508	Method 1	500.00	990.44	992.50	992.26	992.87	0.011643	4.88	102.50	80.28	0.76
trib4E	reach 3	2.470	100-Year	500.00	989.54	991.02		991.08	0.003780	2.37	244.54	332.02	0.41
trib4E	reach 3	2.470	Method 4	500.00	989.54	991.98		992.11	0.002564	2.92	171.01	84.78	0.36
trib4E	reach 3	2.470	Method 1	500.00	989.54	992.01		992.09	0.001613	2.37	211.75	106.13	0.29
trib4E	reach 3	2.433	100-Year	500.00	988.08	990.08		990.18	0.006083	3.04	197.14	265.80	0.51
trib4E	reach 3	2.433	Method 4	500.00	988.08	990.84		991.22	0.009529	5.26	103.26	67.14	0.70
trib4E	reach 3	2.433	Method 1	500.00	988.08	990.98		991.42	0.009618	5.53	95.94	55.71	0.71
trib4E	reach 3	2.395	100-Year	929.00	986.85	988.60		988.73	0.007884	2.97	335.71	332.73	0.46
trib4E	reach 3	2.395	Method 4	929.00	986.85	989.53		989.74	0.006149	3.70	251.05	114.64	0.44
trib4E	reach 3	2.395	Method 1	929.00	986.85	989.19		989.45	0.009530	4.17	228.64	131.88	0.54

HEC-RAS Plan: Hassayampa T (Continued)

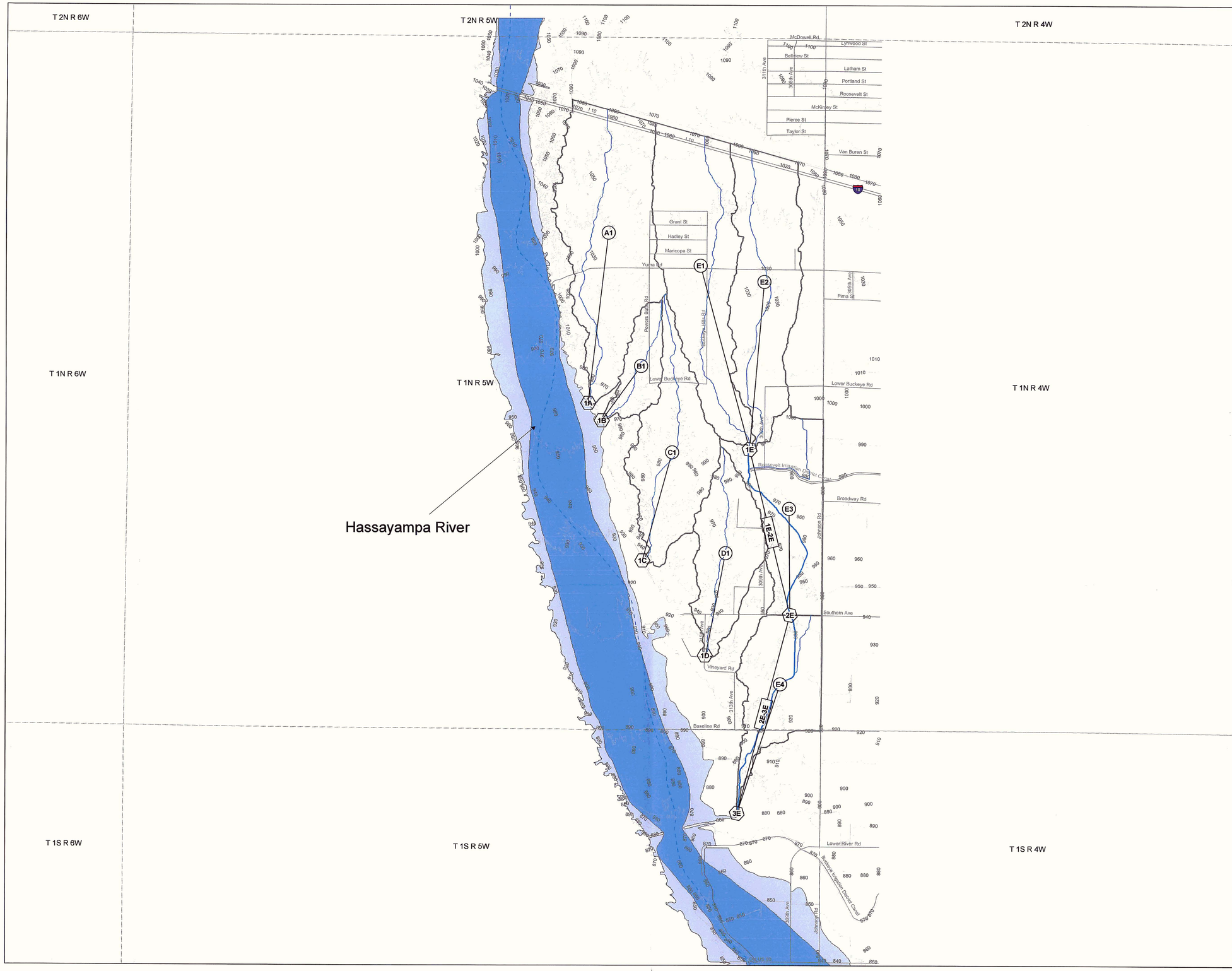
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
trib4E	reach 3	2.362	100-Year	929.00	985.99	987.47		987.55	0.006391	1.97	415.84	450.38	0.39
trib4E	reach 3	2.362	Method 4	929.00	985.99	988.35		988.55	0.008051	3.62	257.81	151.89	0.49
trib4E	reach 3	2.362	Method 1	929.00	985.99	987.83		987.95	0.007381	2.71	341.91	292.83	0.44
trib4E	reach 3	2.324	100-Year	929.00	984.67	986.17		986.25	0.006229	2.26	425.87	488.46	0.40
trib4E	reach 3	2.324	Method 4	929.00	984.67	987.05		987.21	0.005694	3.23	287.50	153.27	0.42
trib4E	reach 3	2.324	Method 1	929.00	984.67	986.26		986.36	0.007357	2.59	363.56	374.10	0.44
trib4E	reach 3	2.287	100-Year	929.00	983.74	984.94		985.01	0.005687	1.90	429.82	447.52	0.38
trib4E	reach 3	2.287	Method 4	929.00	983.74	985.96		986.12	0.005229	3.14	295.60	171.88	0.42
trib4E	reach 3	2.287	Method 1	929.00	983.74	984.93		985.00	0.005907	1.92	424.85	447.29	0.39
trib4E	reach 3	2.249	100-Year	929.00	981.96	983.63		983.72	0.007351	2.77	381.29	394.14	0.46
trib4E	reach 3	2.249	Method 4	929.00	981.96	984.69		984.93	0.006689	4.02	235.15	114.02	0.49
trib4E	reach 3	2.249	Method 1	929.00	981.96	983.66		983.75	0.006664	2.68	393.65	396.61	0.44
trib4E	reach 3	2.211	100-Year	929.00	981.09	982.32		982.40	0.005743	2.31	415.92	433.44	0.39
trib4E	reach 3	2.211	Method 4	929.00	981.09	982.95		983.24	0.010965	4.29	218.06	125.06	0.57
trib4E	reach 3	2.211	Method 1	929.00	981.09	982.59		982.66	0.004404	2.33	428.53	351.17	0.35
trib4E	reach 3	2.171	100-Year	929.00	979.71	981.12		981.20	0.005846	2.31	416.59	467.28	0.39
trib4E	reach 3	2.171	Method 4	929.00	979.71	981.54		981.66	0.005313	2.72	341.02	225.90	0.39
trib4E	reach 3	2.171	Method 1	929.00	979.71	981.54		981.66	0.005313	2.72	341.02	225.90	0.39
trib4E	reach 3	2.132	100-Year	929.00	978.23	979.99		980.08	0.005128	2.49	413.99	404.82	0.38
trib4E	reach 3	2.132	Method 4	929.00	978.23	980.22		980.38	0.007013	3.21	289.85	184.40	0.45
trib4E	reach 3	2.132	Method 1	929.00	978.23	980.22		980.38	0.007013	3.21	289.85	184.40	0.45
trib4E	reach 3	2.093	100-Year	929.00	976.84	978.55	978.22	978.69	0.009474	3.14	314.25	332.82	0.52
trib4E	reach 3	2.093	Method 4	929.00	976.84	978.91		979.05	0.005975	2.98	311.52	209.63	0.43
trib4E	reach 3	2.093	Method 1	929.00	976.84	978.91		979.05	0.005973	2.98	311.54	209.63	0.43
trib4E	reach 3	2.055	100-Year	929.00	974.12	977.20		977.30	0.005147	2.83	403.32	479.48	0.44
trib4E	reach 3	2.055	Method 4	929.00	974.12	977.70		977.90	0.005462	3.57	259.88	143.73	0.47
trib4E	reach 3	2.055	Method 1	929.00	974.12	977.70		977.90	0.005472	3.58	259.74	143.73	0.47
trib4E	reach 3	2.017	100-Year	929.00	974.39	976.34		976.40	0.004042	2.26	491.25	645.96	0.38
trib4E	reach 3	2.017	Method 4	929.00	974.39	976.69	976.04	976.83	0.005110	3.04	305.95	207.73	0.44
trib4E	reach 3	2.017	Method 1	929.00	974.39	976.70	976.04	976.84	0.005057	3.03	306.91	207.73	0.44

HEC-RAS Plan: Hassayampa T (Continued)

River	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)	
trib4E	reach 2	1.965	100-Year	299.00	971.56	974.41		974.54	0.010062	3.00	122.66	325.01	0.62
trib4E	reach 2	1.965	Method 4	299.00	971.56	974.65		974.76	0.006073	2.67	111.94	117.97	0.48
trib4E	reach 2	1.965	Method 1	299.00	971.56	974.65		974.76	0.006092	2.67	111.83	117.97	0.48
trib4E	reach 2	1.927	100-Year	299.00	970.67	973.53		973.58	0.002629	1.96	182.58	217.42	0.31
trib4E	reach 2	1.927	Method 4	299.00	970.67	973.87		973.95	0.002830	2.36	126.95	79.74	0.33
trib4E	reach 2	1.927	Method 1	299.00	970.67	973.87		973.96	0.002814	2.35	127.16	79.74	0.33
trib4E	reach 2	1.889	100-Year	299.00	970.51	972.39	972.27	972.57	0.012799	3.72	95.26	135.68	0.66
trib4E	reach 2	1.889	Method 4	299.00	970.51	972.83		973.05	0.008343	3.75	79.77	56.59	0.56
trib4E	reach 2	1.889	Method 1	299.00	970.51	972.77		973.01	0.009653	3.92	76.24	56.41	0.59
trib4E	reach 2	1.855	100-Year	299.00	969.32	970.06	969.89	970.13	0.012005	2.05	136.30	288.73	0.55
trib4E	reach 2	1.855	Method 4	299.00	969.32	971.12	970.76	971.35	0.010166	4.00	77.86	61.78	0.61
trib4E	reach 2	1.855	Method 1	299.00	969.32	971.03	970.65	971.23	0.009378	3.71	83.92	70.15	0.58
trib4E	reach 2	1.793	100-Year	299.00	967.04	968.14		968.19	0.003879	1.97	176.65	311.00	0.36
trib4E	reach 2	1.793	Method 4	299.00	967.04	968.66	968.10	968.83	0.006389	3.32	90.15	61.60	0.48
trib4E	reach 2	1.793	Method 1	299.00	967.04	968.66	968.10	968.83	0.006412	3.32	90.05	61.60	0.48
trib4E	reach 2	1.751	100-Year	299.00	965.65	966.60	966.50	966.72	0.016461	3.00	114.20	303.58	0.68
trib4E	reach 2	1.751	Method 4	299.00	965.65	966.75		966.90	0.012994	3.08	97.05	130.01	0.63
trib4E	reach 2	1.751	Method 1	299.00	965.65	966.75		966.90	0.012892	3.07	97.28	130.01	0.63
trib4E	reach 2	1.700	100-Year	299.00	964.32	965.24		965.27	0.002895	1.45	227.71	394.36	0.30
trib4E	reach 2	1.700	Method 4	299.00	964.32	965.52		965.57	0.002499	1.66	180.40	177.55	0.29
trib4E	reach 2	1.700	Method 1	299.00	964.32	965.52		965.56	0.002517	1.66	180.01	177.55	0.29
trib4E	reach 2	1.662	100-Year	299.00	962.84	964.08	964.00	964.18	0.015167	2.97	135.29	323.21	0.59
trib4E	reach 2	1.662	Method 4	299.00	962.84	964.54	964.07	964.69	0.009229	3.13	95.66	77.35	0.50
trib4E	reach 2	1.662	Method 1	299.00	962.84	964.53	964.07	964.68	0.009228	3.13	96.07	80.50	0.50
trib4E	reach 2	1.597	100-Year	299.00	960.53	961.46	961.21	961.48	0.004194	1.19	284.48	671.18	0.29
trib4E	reach 2	1.597	Method 4	299.00	960.53	961.89	961.46	961.97	0.006595	2.21	135.09	144.07	0.40
trib4E	reach 2	1.597	Method 1	299.00	960.53	961.89	961.46	961.97	0.006581	2.21	135.63	148.53	0.40
trib4E	reach 2	1.521	100-Year	299.00	956.99	957.43	957.43	957.55	0.040869	2.86	118.01	539.16	0.85
trib4E	reach 2	1.521	Method 4	299.00	956.99	957.67	957.52	957.79	0.019342	2.77	107.81	184.01	0.64
trib4E	reach 2	1.521	Method 1	299.00	956.99	957.67	957.52	957.79	0.019422	2.78	107.67	184.01	0.64

HEC-RAS Plan: Hassayampa T (Continued)

River	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)	
trib4E	reach 2	1.452	100-Year	299.00	953.59	954.64	954.05	954.65	0.001292	1.01	409.28	784.92	0.18
trib4E	reach 2	1.452	Method 4	299.00	953.59	954.80	954.20	954.86	0.004241	2.01	148.71	130.28	0.33
trib4E	reach 2	1.452	Method 1	299.00	953.59	954.80	954.20	954.86	0.004229	2.01	148.84	130.28	0.33
trib4E	reach 1	1.238	100-Year	1351.00	947.00	949.08	948.69	949.18	0.008583	2.66	536.32	645.30	0.47
trib4E	reach 1	1.238	Method 4	1351.00	947.00	949.26		949.35	0.005525	2.38	566.53	474.59	0.38
trib4E	reach 1	1.238	Method 1	1351.00	947.00	949.26		949.35	0.005530	2.39	566.36	474.59	0.38
trib4E	reach 1	1.153	100-Year	1351.00	945.45	947.05	946.51	947.10	0.002955	1.96	723.05	788.10	0.34
trib4E	reach 1	1.153	Method 4	1351.00	945.45	947.48	946.73	947.57	0.002960	2.41	560.26	389.74	0.35
trib4E	reach 1	1.153	Method 1	1351.00	945.45	947.48	946.73	947.57	0.002957	2.41	560.45	389.75	0.35



Flood Control District of Maricopa County

BUCKEYE/SUN VALLEY
AREA DRAINAGE MASTER STUDY
FCD CONTRACT NO. 2002C027

Area 2 Figure 4-1
Existing & Future Conditions Schematic Map

LEGEND

- E1 Sub-basin ID
- 1E Concentration/Combining Point
- 1E-2E Routing Channel ID
- Sub-basin Boundary
- Routing Channel
- Lag Time Path
- Road
- Contour

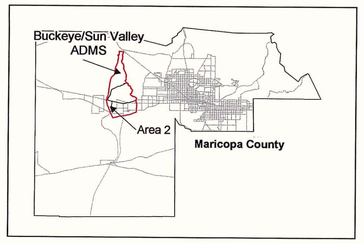
FEMA Floodplain Zone

- AE
- FW

NOTES

Registered Professional Engineer (Civil) CERTIFICATE NO. 32681 STEVEN L. ROBERTS Date Signed 2-1-06 ARIZONA, U.S.A.

INDEX MAP



0 2,000 4,000 6,000 Feet

1 inch equals 2,000 feet
Contour Interval = 10 Feet

Horizontal Coordinate System:
NAD 1983 State Plane Arizona Central
Vertical Coordinate System:
NAVD 1988

N

PBSJ
7310 N. 16th Street, Suite 310
Phoenix, Arizona 85020
(602) 943-1003

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 1 OF 1

BUCKEYE/SUN VALLEY
AREA DRAINAGE MASTER STUDY
FCD CONTRACT NO. 2002C027

Area 2 Figure 4-2
Routing Map

LEGEND

- (1A) Concentration/Combining Point
- A1 Sub-basin Boundary
- Routing Channel
- Lag Time Path
- Road
- Contour
- Township-Range

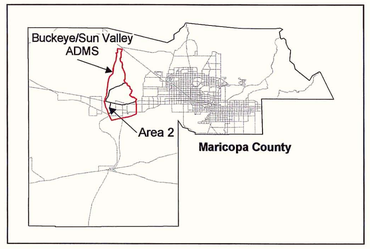
FEMA Floodplain Zone

- AE
- FW

NOTES

Registered Professional Engineer (Civil) CERTIFICATE NO. 42861 STEPHEN C. ROWLEY Date Signed 2-1-05 ARIZONA U.S.A.

INDEX MAP



0 1,000 2,000 4,000 6,000 Feet

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1 inch equals 2,000 feet
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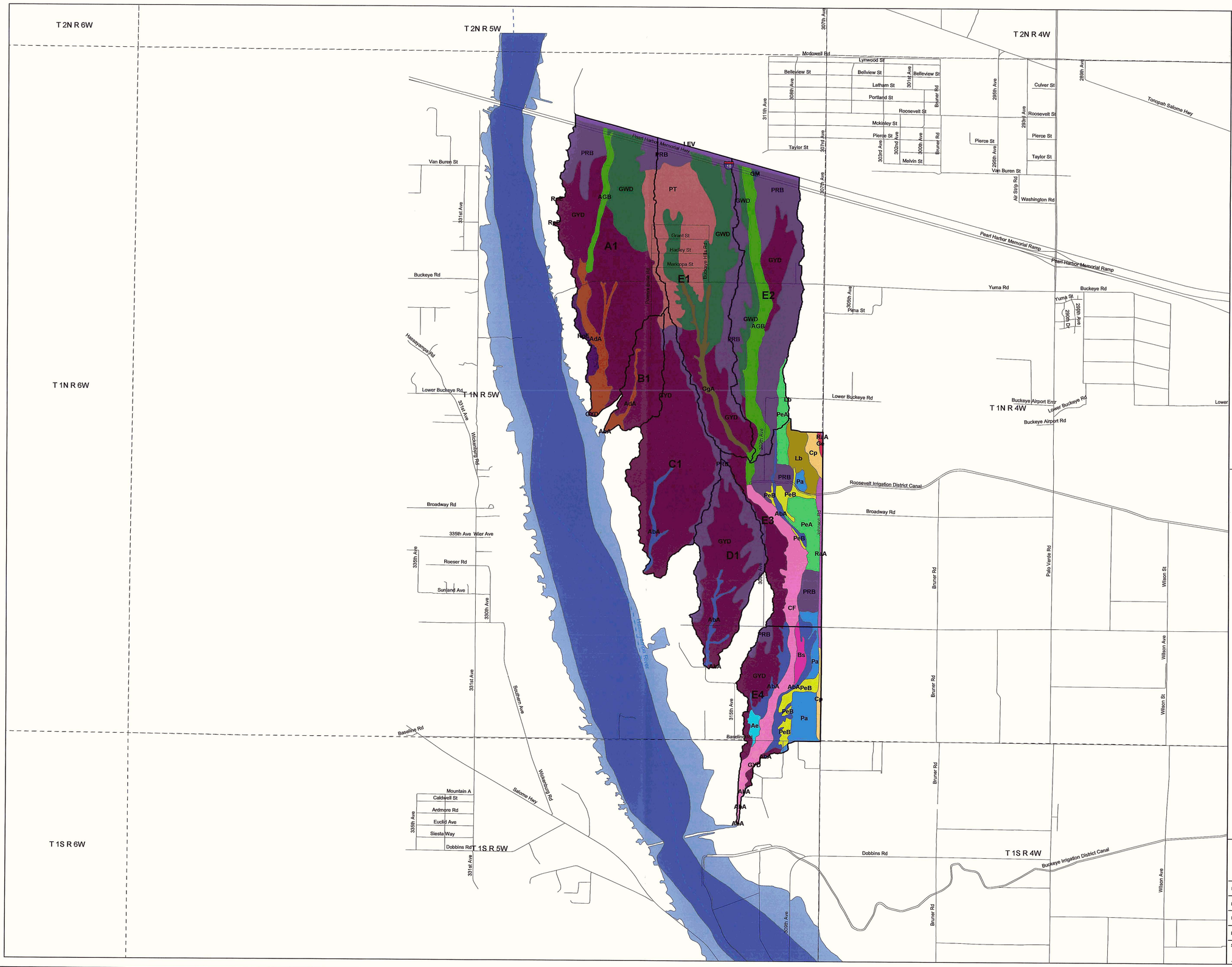
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 1 OF 1



Flood Control District of Maricopa County

BUCKEYE/SUN VALLEY AREA DRAINAGE MASTER STUDY
FCD CONTRACT NO. 2002C027

Figure 4-3
Area 2 Soil Map

LEGEND

- A1 Sub-basin Boundary
- Township-Range
- Roads

Soil Type

AGB	CF	Ge	PT
AbA	Cp	GgA	Pa
AdA	GM	LEV	PeA
Ae	GWD	Lb	PeB
Bs	GYD	PRB	RaA
			RpE

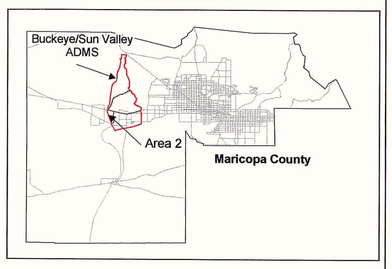
FEMA Floodplain Zone

- AE
- FW

NOTES

Registered Professional Engineer (Civil) CERTIFICATE NO. 42661 STEVEN L. ROGERS Date Signed 3-1-06 ARIZONA U.S.A.

INDEX MAP



0 2,000 4,000 6,000 Feet

1 inch equals 2,000 feet

Contour Interval = 10 Feet

Horizontal Coordinate System:
NAD 1983 State Plane Arizona Central
Vertical Coordinate System:
NAVD 1988

N

PBSJ
7310 N. 16th Street, Suite 310
Phoenix, Arizona 85020
(602) 943-1003

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SUBMITTED BY: DATE:

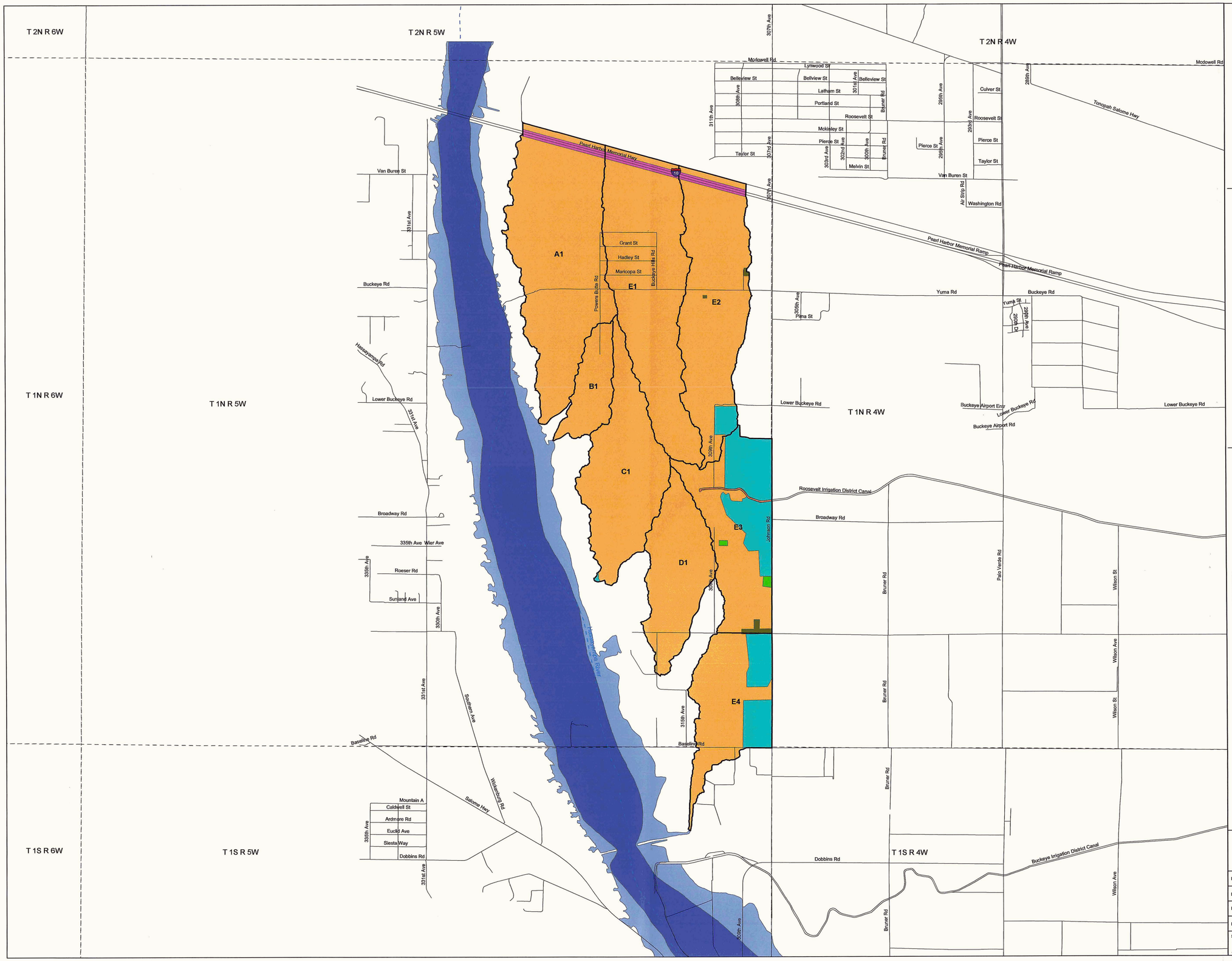
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 1 OF 1



BUCKEYE/SUN VALLEY AREA DRAINAGE MASTER STUDY
FCD. CONTRACT NO. 2002C027

Figure 4-4A
Area 2 Existing Conditions Land Use Map

LEGEND

- A1 — Sub-basin Boundary
- Roads
- Township-Range

Land Use Code

- Agriculture
- Large Lot Residential - Single Family
- Transportation
- Vacant
- Very Small Lot Residential - Single Family
- Water

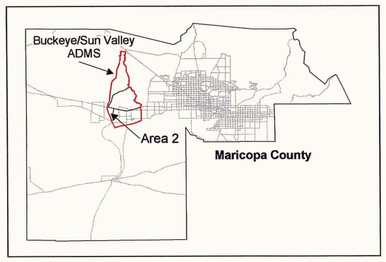
FEMA Floodplain Zone

- AE
- FW

NOTES

Registered Professional Engineer (Civil) CERTIFICATE NO. 42984 STEPHEN J. LEWIS ARIZONA U.S.A. Expires 2-1-06

INDEX MAP



N

0 2,000 4,000 6,000 Feet

1 inch equals 2,000 feet
Contour Interval = 10 Feet
Horizontal Coordinate System:
NAD 1983 State Plane Arizona Central
Vertical Coordinate System:
NAVD 1988

PBSJ
7310 N. 16th Street, Suite 310
Phoenix, Arizona 85020
(602) 943-1003

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SUBMITTED BY: DATE:

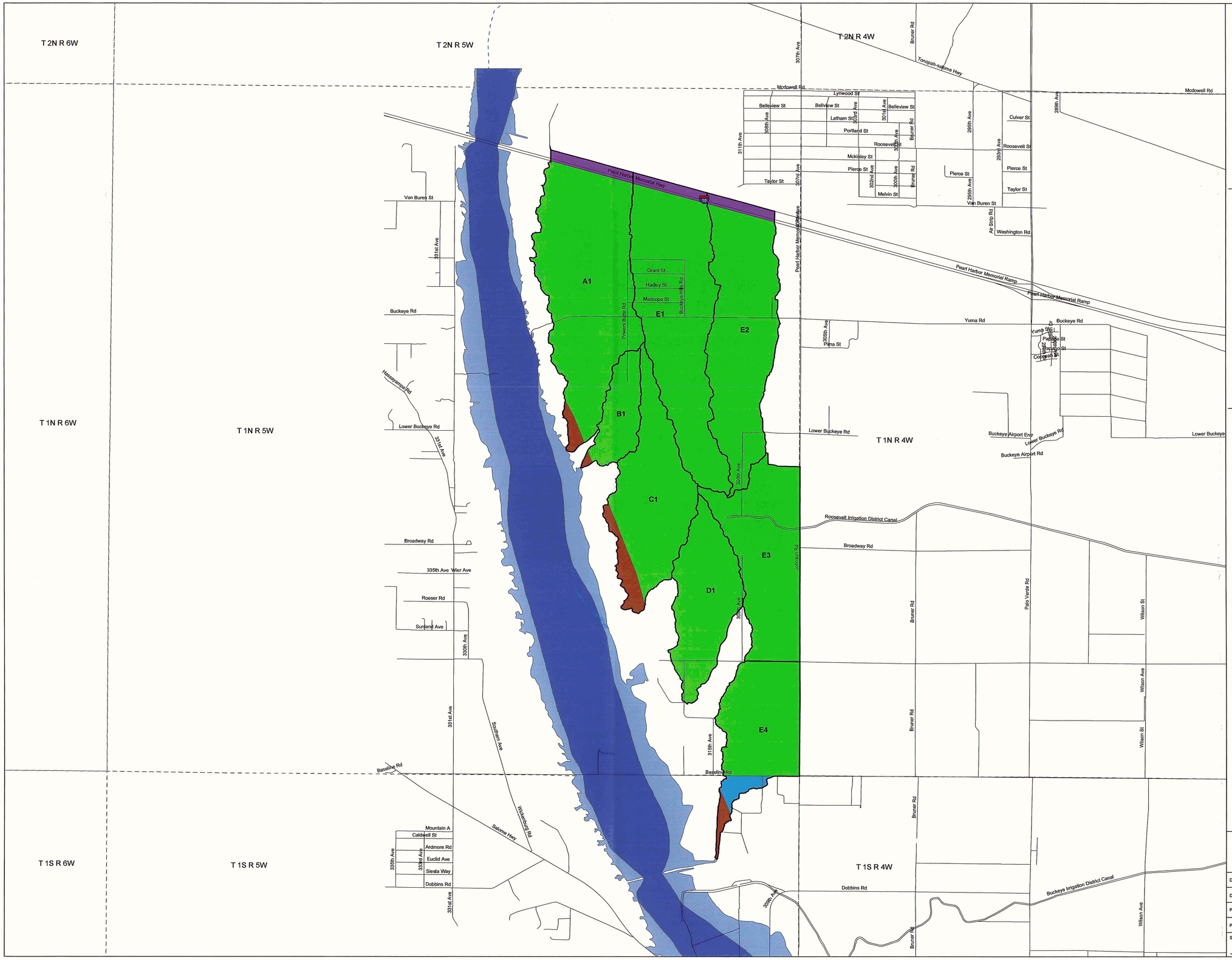
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 1 OF 1



BUCKEYE/SUN VALLEY AREA DRAINAGE MASTER STUDY
FCD CONTRACT NO. 2002C027

Figure 4-4B
Area 2 Future Conditions Land Use Map

LEGEND

- A1 Sub-basin Boundary
- Roads
- Township-Range

Land Use Code

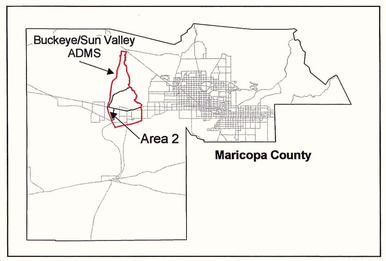
- Active Open Space
- Neighborhood Commercial
- Rural Residential
- Transportation

FEMA Floodplain Zone

- AE
- FW

NOTES

INDEX MAP



N

0 2,000 4,000 6,000 Feet

1 inch equals 2,000 feet
Contour Interval = 10 Feet

Horizontal Coordinate System:
NAD 1983 State Plane Arizona Central
Vertical Coordinate System:
NAVD 1988

PBSJ
7310 N. 16th Street, Suite 310
Phoenix, Arizona 85020
(602) 943-1003

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 1 OF 1

Flood Control District of Maricopa County

BUCKEYE/SUN VALLEY
AREA DRAINAGE MASTER STUDY
FCD CONTRACT NO. 2002C027

Figure 4-5A
Area 2 Existing Conditions Flow Map

LEGEND

- A1 Sub-basin Boundary
- 1A Concentration Point w/ Existing 100-year 6-hour Combined Peak Flows
- Existing 100-year 6-hour Routed Peak Flow
- Existing 100-year 6-hour Sub-basin Peak Flow
- Lag Time Path
- Routing Channel
- Roads
- Contour
- Township-Range

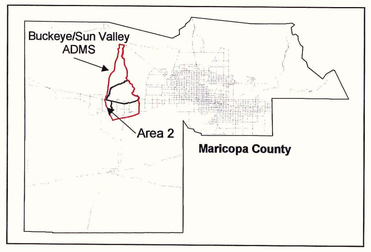
FEMA Floodplain Zone

- AE
- FW

NOTES

Registered Professional Engineer (Civil) CERTIFICATE NO. 32161 Stephen J. Rogers Date Signed 2-1-05 ARIZONA, U.S.A.

INDEX MAP



0 2,000 4,000 6,000 Feet

1 inch equals 2,000 feet
Contour Interval = 10 Feet

Horizontal Coordinate System:
NAD 1983 State Plane Arizona Central
Vertical Coordinate System:
NAVD 1988

N

PBSJ
7310 N. 16th Street, Suite 310
Phoenix, Arizona 85020
(602) 943-1003

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04
SUBMITTED BY:		DATE:

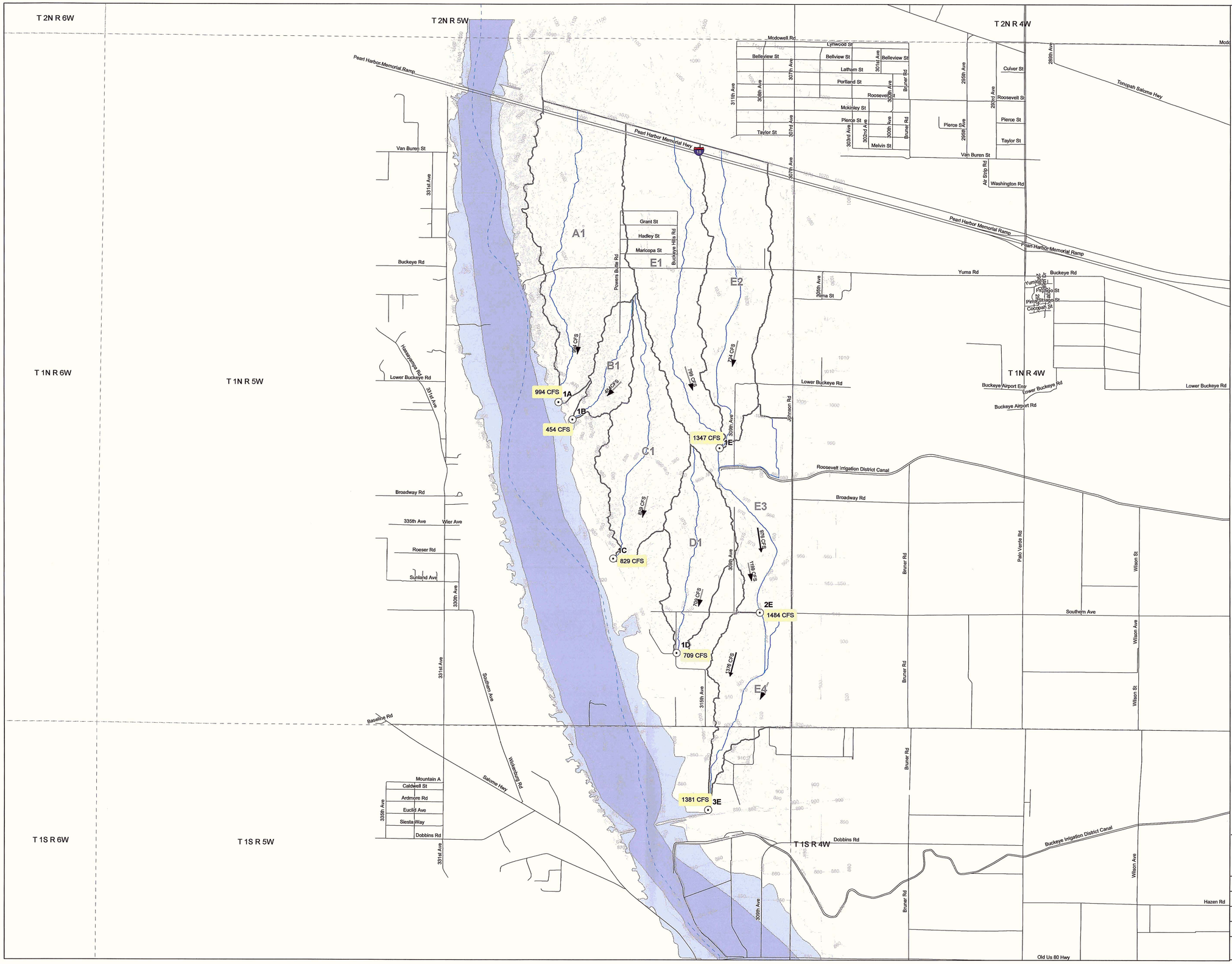
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 1 OF 1



BUCKEYE/SUN VALLEY
AREA DRAINAGE MASTER STUDY
FCD CONTRACT NO. 2002C027

Figure 4-5B
Area 2 Future Conditions Flow Map

LEGEND

- A1 Sub-basin Boundary
- 1A Concentration Point w/ Future 100-year 6-hour Combined Peak Flows
- Future 100-year 6-hour Routed Peak Flow
- Future 100-year 6-hour Sub-basin Peak Flow
- Lag Time Path
- Routing Channel
- Roads
- Contour
- Township-Range

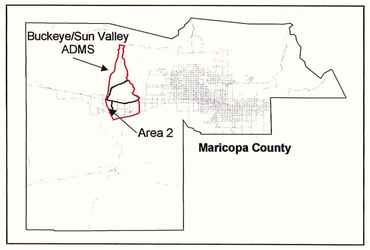
FEMA Floodplain Zone

- AE
- FW

NOTES

Registered Professional Engineer (Civil) CERTIFICATE NO. 42661 Stephen J. Roberts Date Signed 1-13-05 ARIZONA U.S.A.

INDEX MAP



0 2,000 4,000 6,000 Feet

1 inch equals 2,000 feet
Contour Interval = 10 Feet

Horizontal Coordinate System:
NAD 1983 State Plane Arizona Central
Vertical Coordinate System:
NAVD 1988

N

PBSJ
7310 N. 16th Street, Suite 310
Phoenix, Arizona 85020
(602) 943-1003

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SUBMITTED BY: DATE:

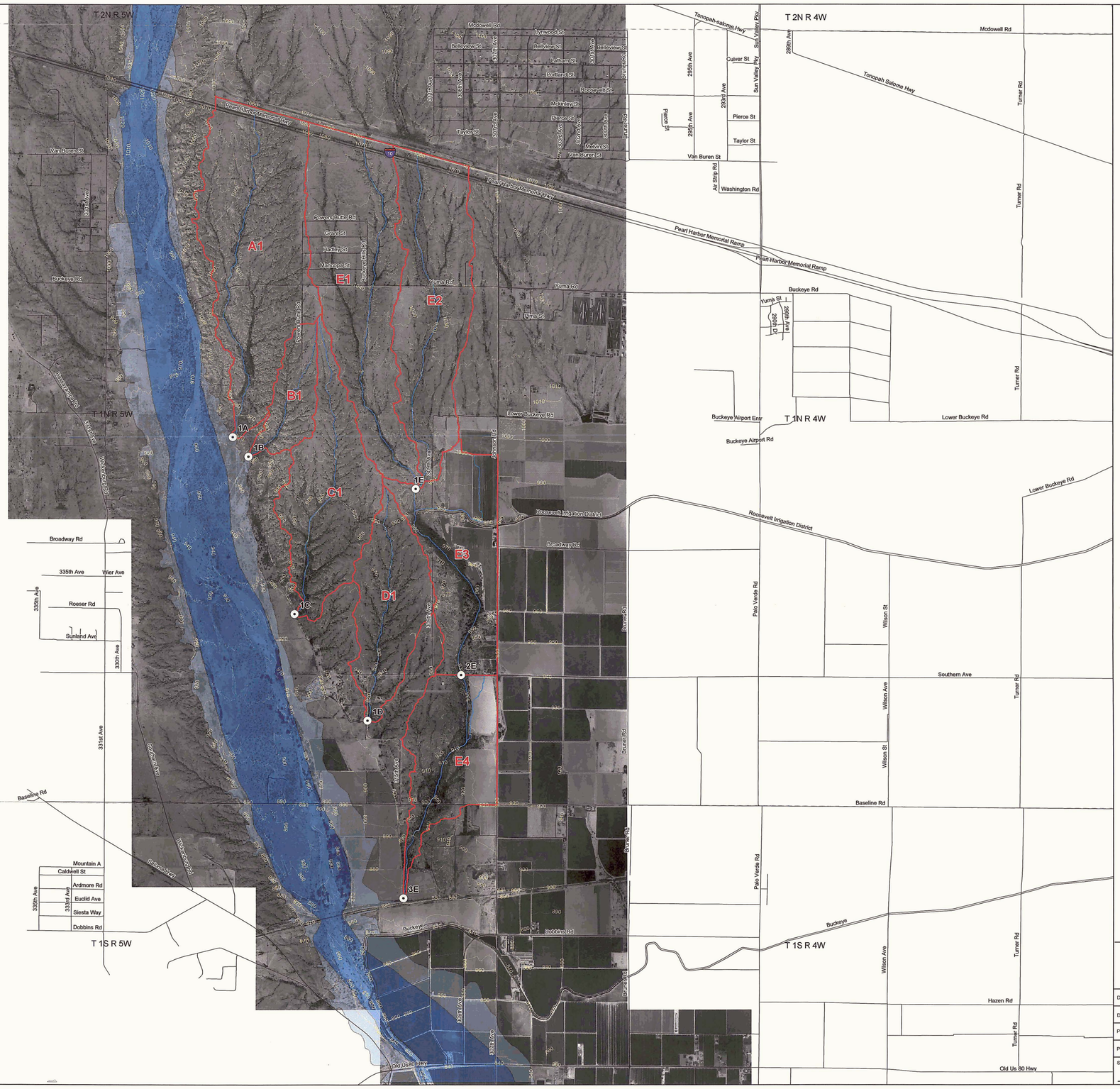
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 1 OF 1



BUCKEYE/SUN VALLEY
AREA DRAINAGE MASTER STUDY
FCD CONTRACT NO. 2002C027

Figure 4-6
Area 2 Watershed Workmap

LEGEND

- 1A Concentration/Combining Point
- A1 Sub-basin Boundary
- Contour
- Roads
- Township-Range

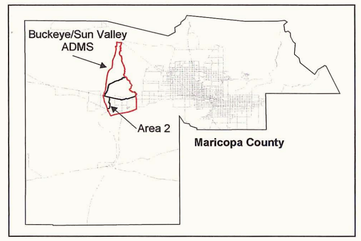
FEMA Floodplain Zone

- AE
- FW

NOTES

Registered Professional Engineer (Civil) CERTIFICATE NO. 29268 ARIZONA U.S.A.

INDEX MAP



0 2,000 4,000 6,000 Feet

1 inch equals 2,000 feet

Horizontal Coordinate System:
NAD 1983 State Plane Arizona Central
Vertical Coordinate System:
NAVD 1988

Contours intervals at 10 feet

N

PBSJ
7310 N. 16th Street, Suite 310
Phoenix, Arizona 85020
(602) 943-1003

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

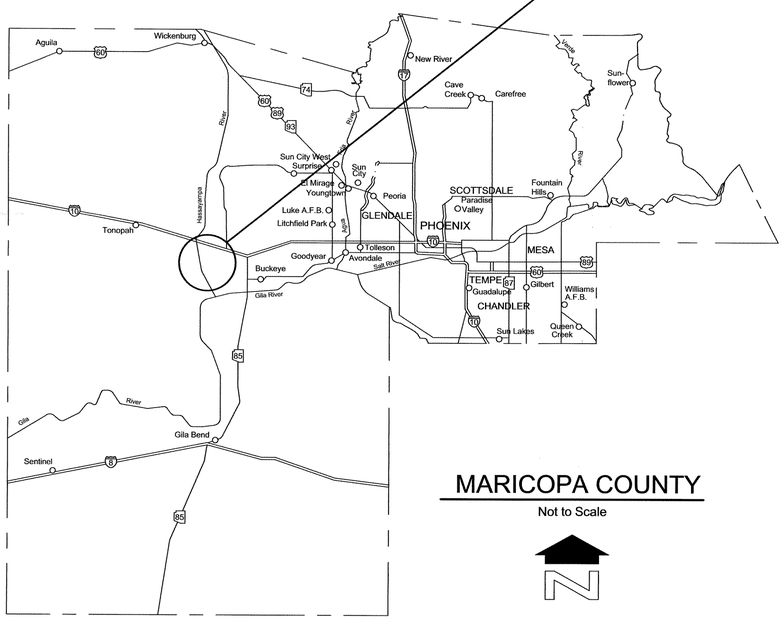
SHEET 1 OF 1

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

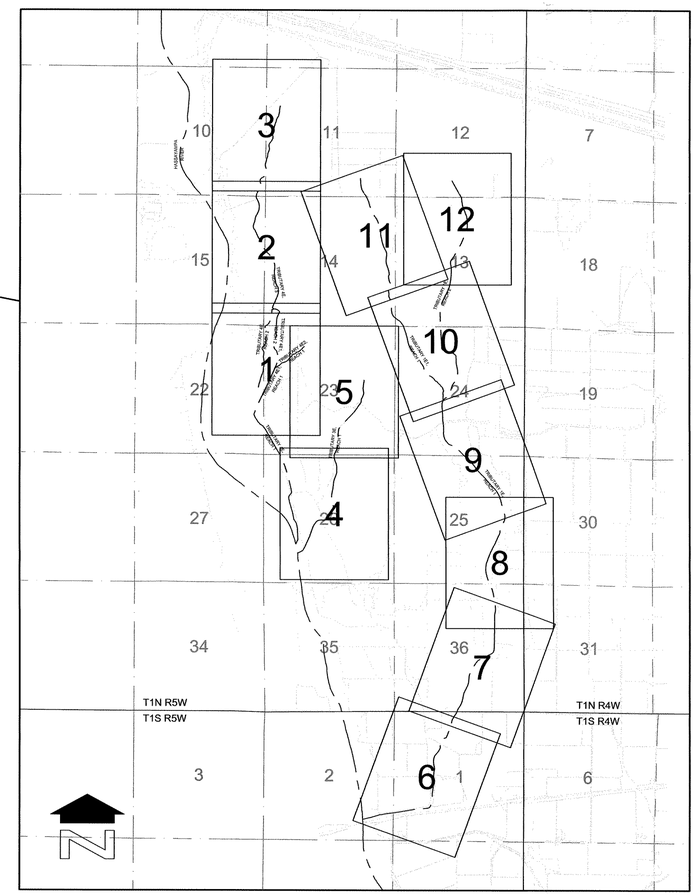
F.C.D. CONTRACT NO. 2002C027

PROJECT LOCATION



MARICOPA COUNTY

Not to Scale



SHEET INDEX MAP

Not to Scale

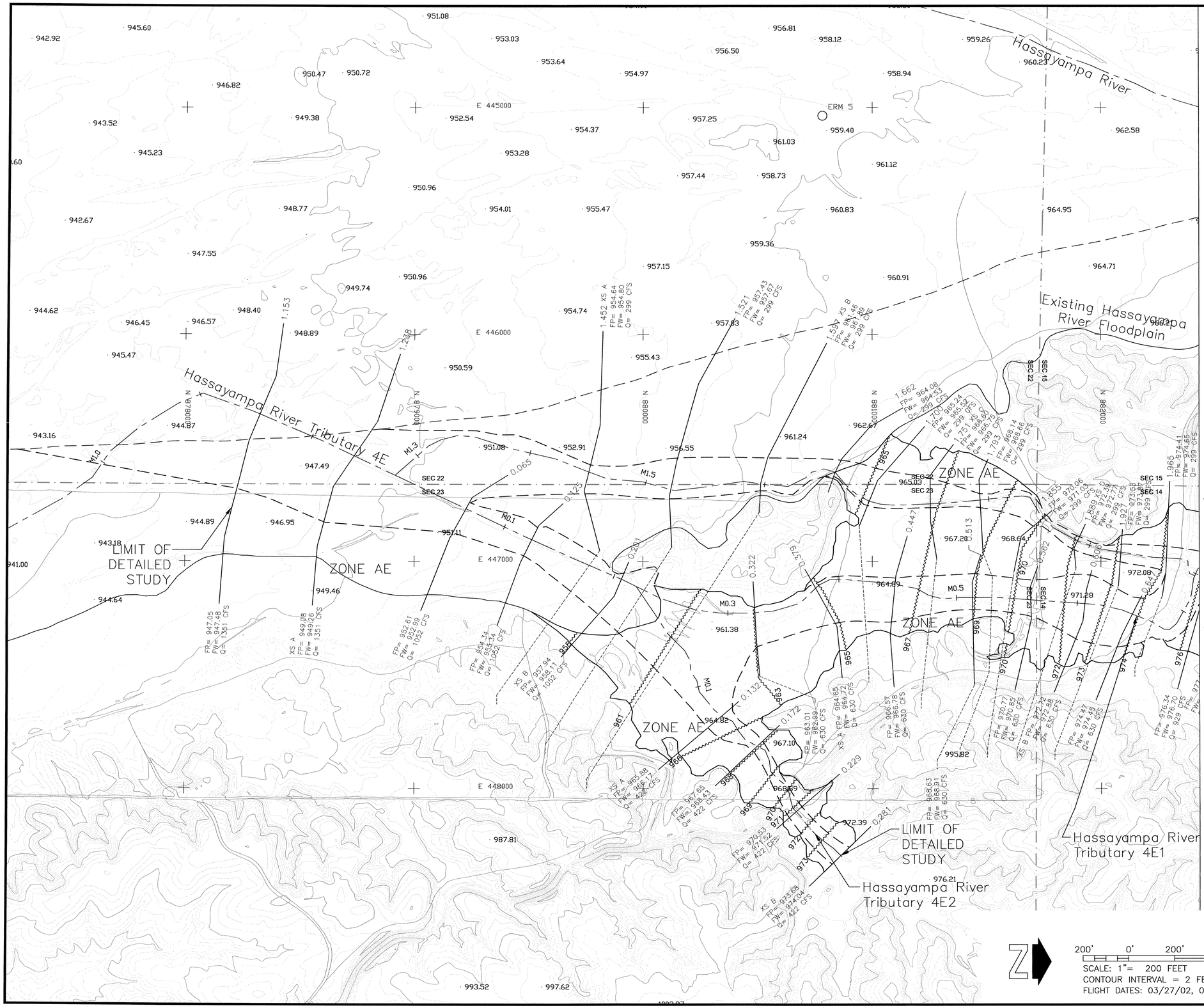
FLIGHT DATES: 03/27/02, 04/08/02

Registered Professional Engineer (Civil) CERTIFICATE NO. 42661 STEPHEN W. ROGERS Date Signed 2-12-04 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

COVER SHEET



LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 — FP= 1888.74 — FW= 1889.54 — Q = CFS
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

FEMA CROSS SECTION DESIGNATION — CROSS SECTION RIVER MILE DESIGNATION — FLOODPLAIN WATER SURFACE ELEVATION — ENCROACHED WATER SURFACE ELEVATION — 100 YEAR DISCHARGE

ELEVATION REFERENCE MARKS

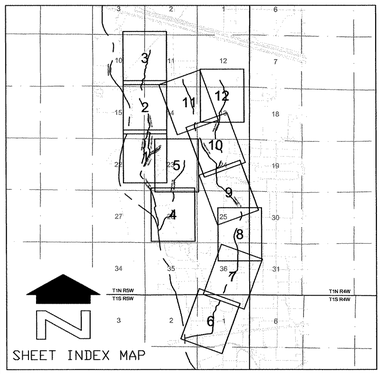
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
5	960.06	SET FCDMC BRASS CAP IN 8 CONC. COLLAR, 0.5 ABOVE GROUND. STATION IS LOCATED APPROXIMATELY 0.3 MILE SOUTH OF THE LOWER BUCKEYE ROAD ALIGNMENT, 2.2 MILES WEST OF JOHNSON ROAD AND 300 MORE OR LESS EAST OF THE EAST BANK, HASSAYAMPA RIVER. ATV AND FOOT TRAVEL REQUIRED. N: 880782 E: 445036

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGVD29 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42881 STEPHEN M. ROGERS Expires 3-31-05 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

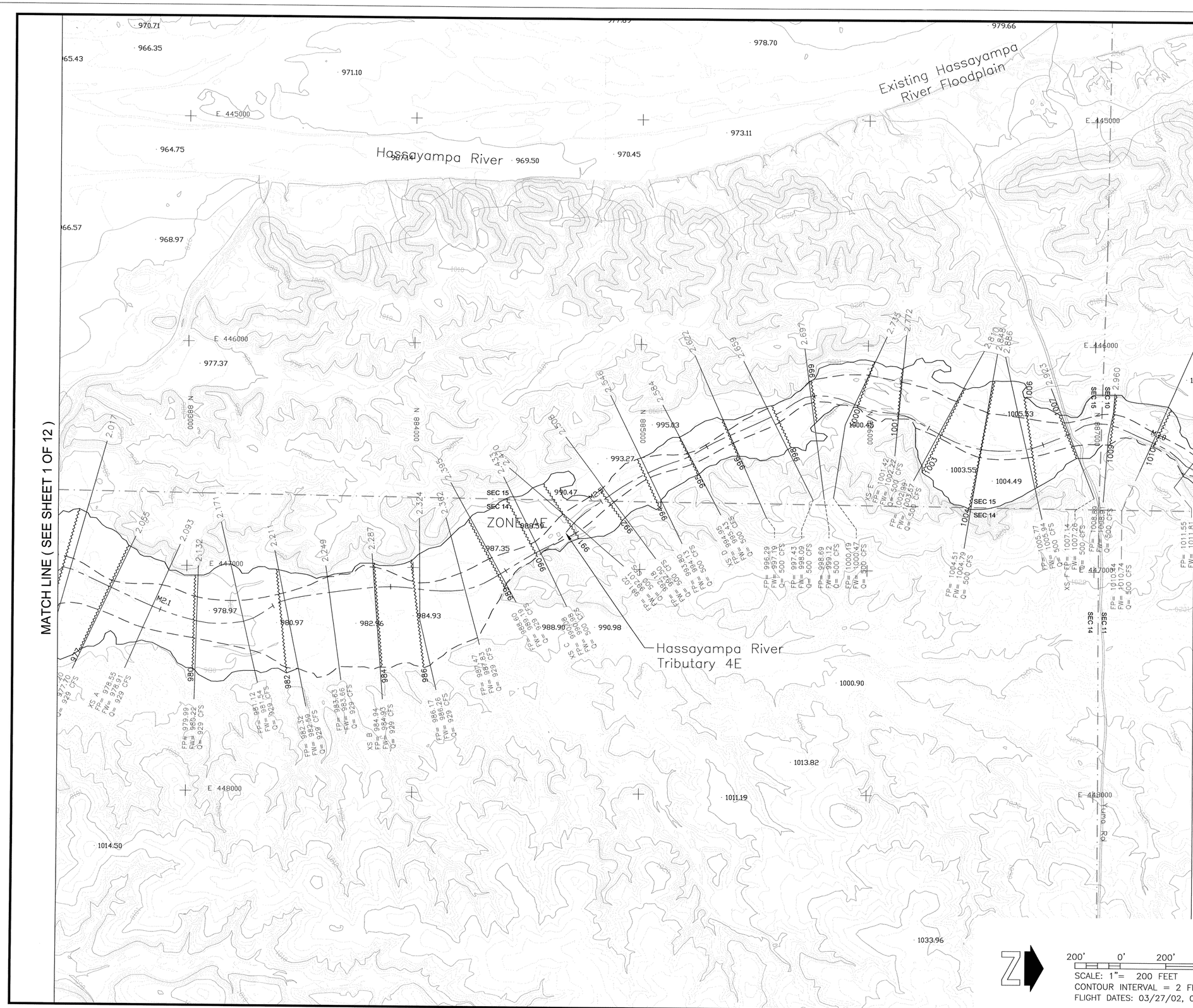
SHEET 01 OF 12

200' 0' 200' 400'

SCALE: 1"= 200 FEET
CONTOUR INTERVAL = 2 FEET
FLIGHT DATES: 03/27/02, 04/08/02

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.



LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 FP= 1888.74 FW= 1889.54 Q = CFS
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

FEMA CROSS SECTION DESIGNATION — CROSS SECTION DESIGNATION — FLOODPLAIN WATER SURFACE ELEVATION — ENCROACHED WATER SURFACE ELEVATION — 100 YEAR DISCHARGE

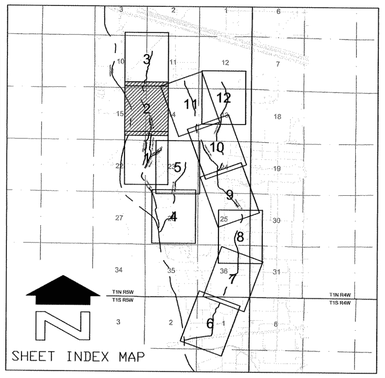
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
6	983.43	SET FCDMC BRASS CAP IN 8 CONC. COLLAR, 0.3 ABOVE GROUND. FROM INTERSECTION OF YUMA ROAD & JOHNSON ROAD, DRIVE 2.3 MILES WEST ALONG YUMA ROAD TO ITS TERMINUS AT EAST BANK OF HASSAYAMPA RIVER, THENCE WALK 0.3 MILE SOUTHERLY ALONG EAST BANK OF RIVER TO STATION, LOCATED 50 MORE OR LESS EAST OF BANK. N: 885639 E: 445134
24	1021.34	SET FCDMC BRASS CAP IN 8 CONCRETE COLLAR, 0.5 ABOVE GROUND. FROM INTERSECTION OF JOHNSON ROAD AND YUMA ROAD, DRIVE WEST 2.0 MILES ON YUMA ROAD (DIRT) TO STATION ON RIGHT. STATION IS APPROXIMATELY 110 FEET NORTH OF YUMA ROAD AND 100 FEET NORTH OF GLO BRASS CAP ATOP GALVANIZED POST (STAMPED: T-1-N, R-5-W, SECTION CORNERS NUMBERED CLOCKWISE FROM UPPER LEFT: 10, 11, 14, 15. N: 887148 E: 446756

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE
2- NGVD29 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42881 STEPHEN W. ROGERS Date Signed 9-4-04 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

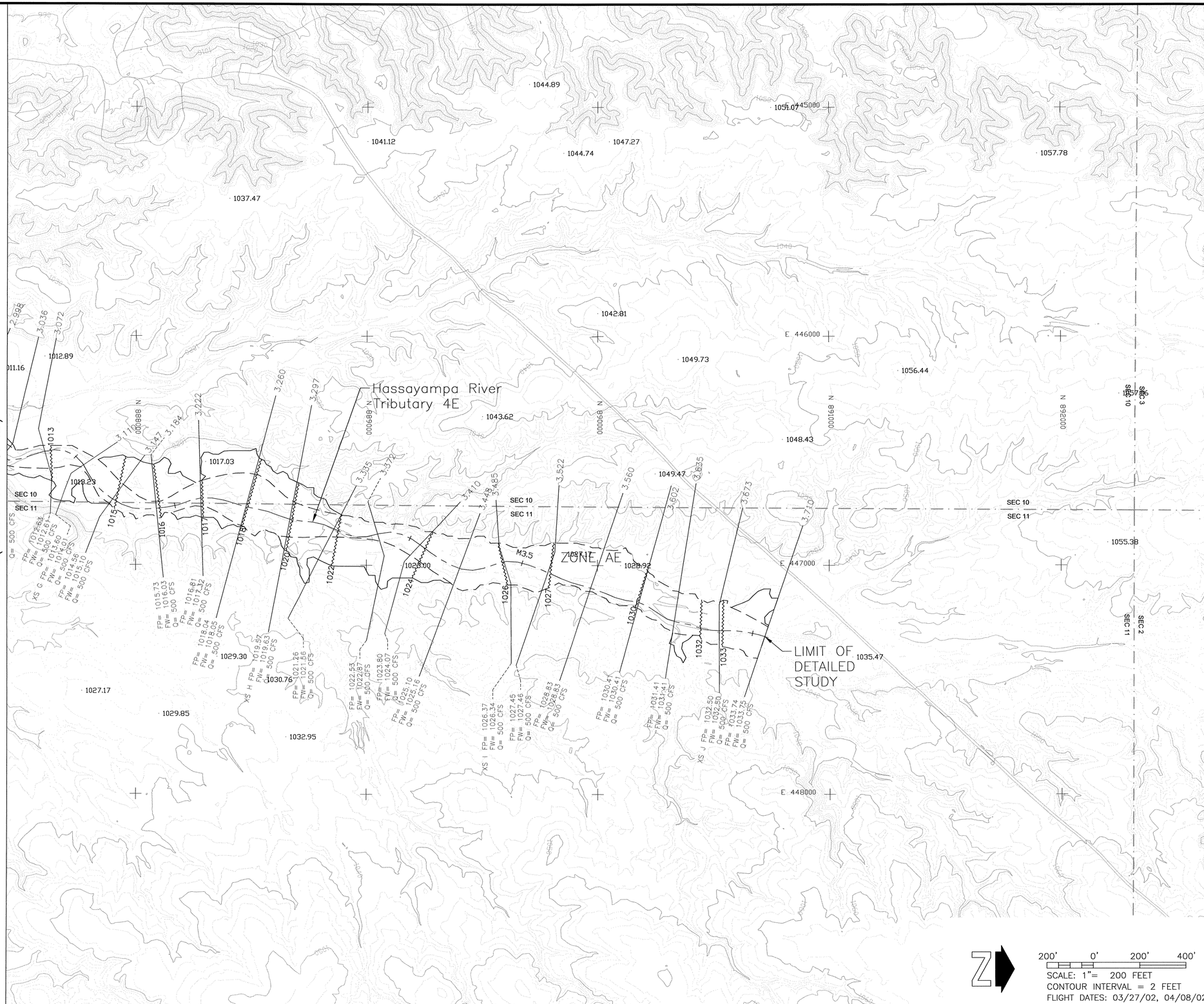
	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 02 OF 12

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.

MATCH LINE (SEE SHEET 2 OF 12)



LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 — FP= 1888.74 (FLOODPLAIN WATER SURFACE ELEVATION); FW= 1889.54 (ENCROACHED WATER SURFACE ELEVATION); Q = CFS (100 YEAR DISCHARGE); FEMA CROSS SECTION DESIGNATION; CROSS SECTION RIVER MILE DESIGNATION
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

ELEVATION REFERENCE MARKS

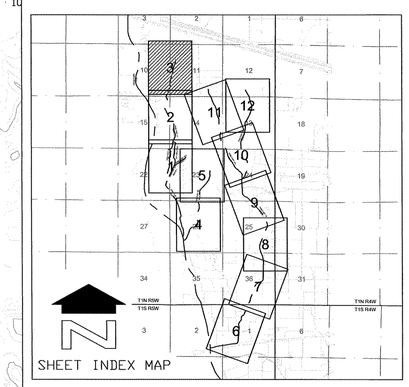
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
7	1044.94	SET FCDMC BRASS CAP IN 8 CONC. COLLAR, 0.5 ABOVE GROUND. FROM INTERSECTION OF INTERSTATE HIGHWAY 10 & JOHNSON ROAD OVERPASS BRIDGE DRIVE WNW ALONG A DIRT TRAIL PARALLELING THE SOUTH ROW FENCE OF INTERSTATE HWY 10 FOR APPROXIMATELY 1.0 MILE TO AN ANGLE POINT, THENCE CONTINUE WESTERLY ALONG SAID TRAIL FOR 0.6 MILE TO A 3-COLUMN SRP POWER TOWER TRANSMISSION LINE (NE-SW), THENCE BEAR SW ALONG DIRT SERVICE TRAIL FOR 0.8 MILE TO POWER TOWER #142 (WESTERLY MOST OF 3 TOWERS), THENCE WALK 800, MORE OR LESS, SOUTHWESTERLY TO STATION ON RIDGELINE OVERLOOKING HASSAYAMPA RIVER BASIN. N: 889746 E: 444878

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGVD29 = NAVD88 - 2.09 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

200' 0' 200' 400'

SCALE: 1"= 200 FEET

CONTOUR INTERVAL = 2 FEET

FLIGHT DATES: 03/27/02, 04/08/02

Registered Professional Engineer (Civil) CERTIFICATE NO. 12001 STEPHEN W. ROGERS Date Signed 2-10-04 ARIZONA U.S.A.

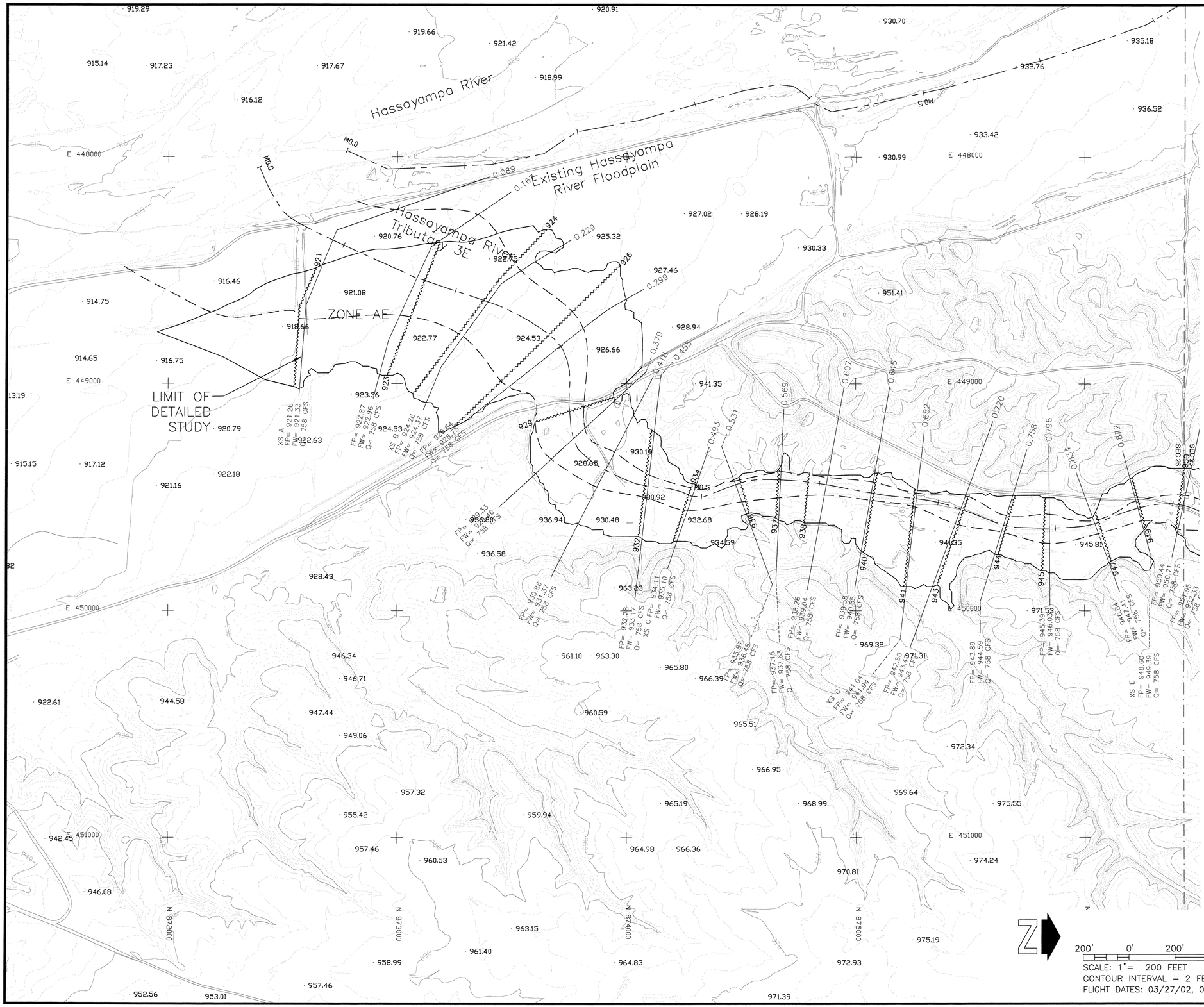
PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-3003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 03 OF 12

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.



LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 — FP= 1888.74 (FLOODPLAIN WATER SURFACE ELEVATION); FW= 1889.54 (ENCROACHED WATER SURFACE ELEVATION); Q = CFS (100 YEAR DISCHARGE); FEMA CROSS SECTION DESIGNATION; CROSS SECTION DESIGNATION
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

ELEVATION REFERENCE MARKS

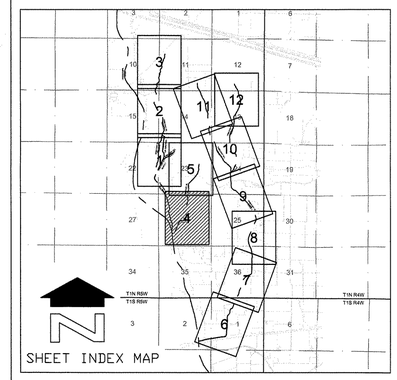
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
4	929.02	SET FCDMC BRASS CAP IN 8" CONC. COLLAR, 0.4' ABOVE GROUND. FROM INTERSECTION OF 315TH AVENUE & SOUTHERN AVENUE, DRIVE 0.6 MILE WEST ALONG SOUTHERN AVENUE (GRAVEL TRAIL), THENCE TURN NORTHERLY ALONG DIRT FARM DRIVE THAT PARALLELS EAST BANK OF HASSAYAMPA RIVER AND TRAVEL 0.6 MILE TO STATION ON LEFT ATOP EARTHEN BERM. N: 874159 E: 447906

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGVD88 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42081 STEPHEN W. ROGERS Date Signed 2-1-06 ARIZONA U.S.A.

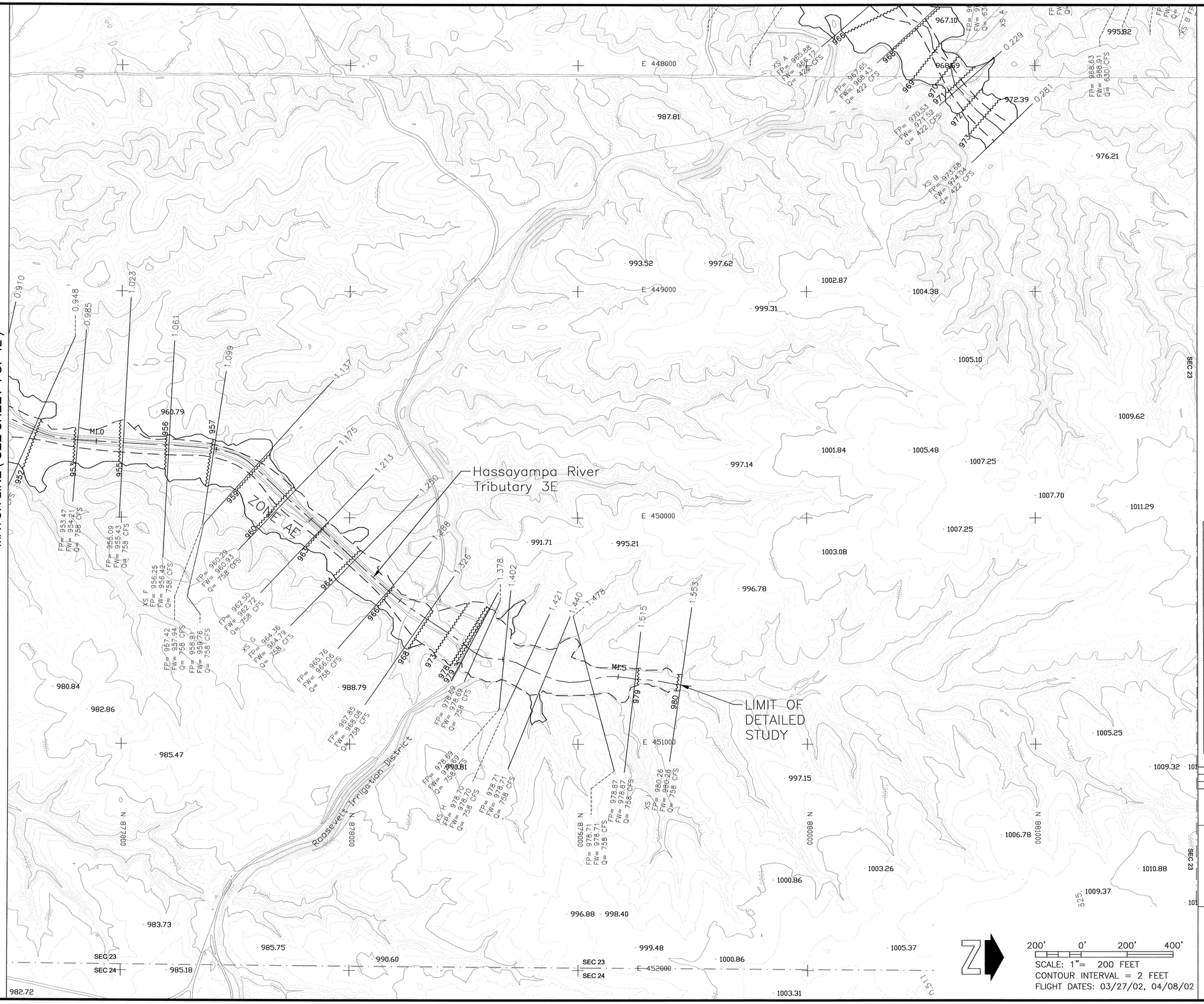
PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1203
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 04 OF 12

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.



THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.

LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 — FP= 1888.74 (FLOODPLAIN WATER SURFACE ELEVATION); FW= 1889.54 (ENCROACHED WATER SURFACE ELEVATION); Q = CFS (100 YEAR DISCHARGE); ETAMA CROSS SECTION DESIGNATION; CROSS SECTION WITH MILE DESIGNATION
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

ELEVATION REFERENCE MARKS

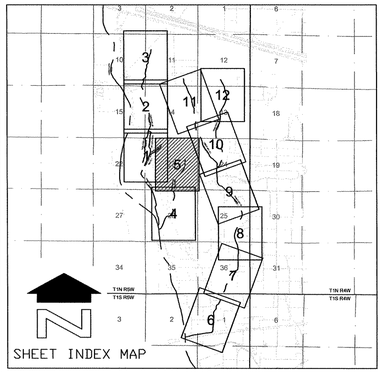
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
19	963.62	Set FCDMC brass cap in 8 concrete collar, 0.6 above ground. From intersection of Johnson Road and Roosevelt Canal, drive 1.5 miles along north bank service road to earthen dam. Travel across dam then turn south along gravel road and go 0.2 mile to station atop embankment, 25 feet right of road. N: 877787 E: 449916

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGDV29 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42811 STEPHEN W. ROGERS Date Signed 2-1-04 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 05 OF 12

200' 0' 200' 400'

SCALE: 1"= 200 FEET
CONTOUR INTERVAL = 2 FEET
FLIGHT DATES: 03/27/02, 04/08/02

LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 — FP= 1888.74 (FLOODPLAIN WATER SURFACE ELEVATION); FW= 1889.54 (ENCROACHED WATER SURFACE ELEVATION); Q = CFS (100 YEAR DISCHARGE); FEMA CROSS SECTION DESIGNATION; CROSS SECTION RIVER MILE DESIGNATION
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

ELEVATION REFERENCE MARKS

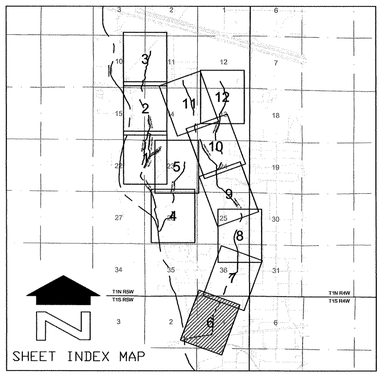
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
9	902.78	SET FCDMC BRASS CAP IN 8 CONCRETE COLLAR, 0.5 ABOVE GROUND. FROM INTERSECTION OF JOHNSON ROAD & BASELINE ROAD, DRIVE 0.25 MILE WEST ON BASELINE ROAD TO DIRT DRIVE HEADING SOUTH. TRAVEL 0.3 MILE SOUTH THROUGH HOUSING SUBDIVISION TO DIRT ROAD HEADING WEST, CONTINUE WESTERLY 0.2 MILE TO STATION AT SE CORNER OF DIRT ROADS BEARING E, S & NW. N: 864100 E: 454632

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGVD29 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42861 STEPHEN W. ROBINS Date Signed 2-12-04 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 06 OF 12

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.

MATCH LINE (SEE SHEET 6 OF 12)

MATCH LINE (SEE SHEET 8 OF 12)

LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 — M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 — FP= 1888.74 (FLOODPLAIN WATER SURFACE ELEVATION); FW= 1889.54 (ENCROACHED WATER SURFACE ELEVATION); Q = CFS (100 YEAR DISCHARGE); FEMA CROSS SECTION DESIGNATION; CROSS SECTION BASE MILE DESIGNATION
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

ELEVATION REFERENCE MARKS

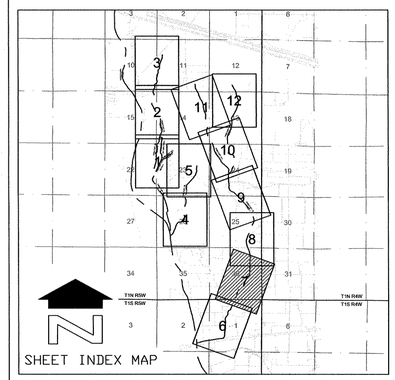
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
10	933.43	SET FCDMC BRASS CAP IN 8 CONCRETE COLLAR, 1.0 ABOVE GROUND. FROM INTERSECTION OF BASELINE ROAD & 313TH AVENUE, TRAVEL 0.5 MILE NORTH ON 313TH AVENUE (GRAVEL), THENCE CONTINUE NORTHERLY ALONG DIRT TRAIL APPROXIMATELY 200 FEET, THENCE TURN EASTERLY, WALK OR 4WD APPROXIMATELY 800 FEET TO STATION OVERLOOKING N-S WASH. N: 869087 E: 453923

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- THE AVERAGE CONVERSION FACTOR FROM NGVD 1929 TO NAVD 1988 IS 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42661 STEPHEN W. ROGERS Date Signed 2-7-03 ARIZONA, U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 07 OF 12

200' 0' 200' 400'

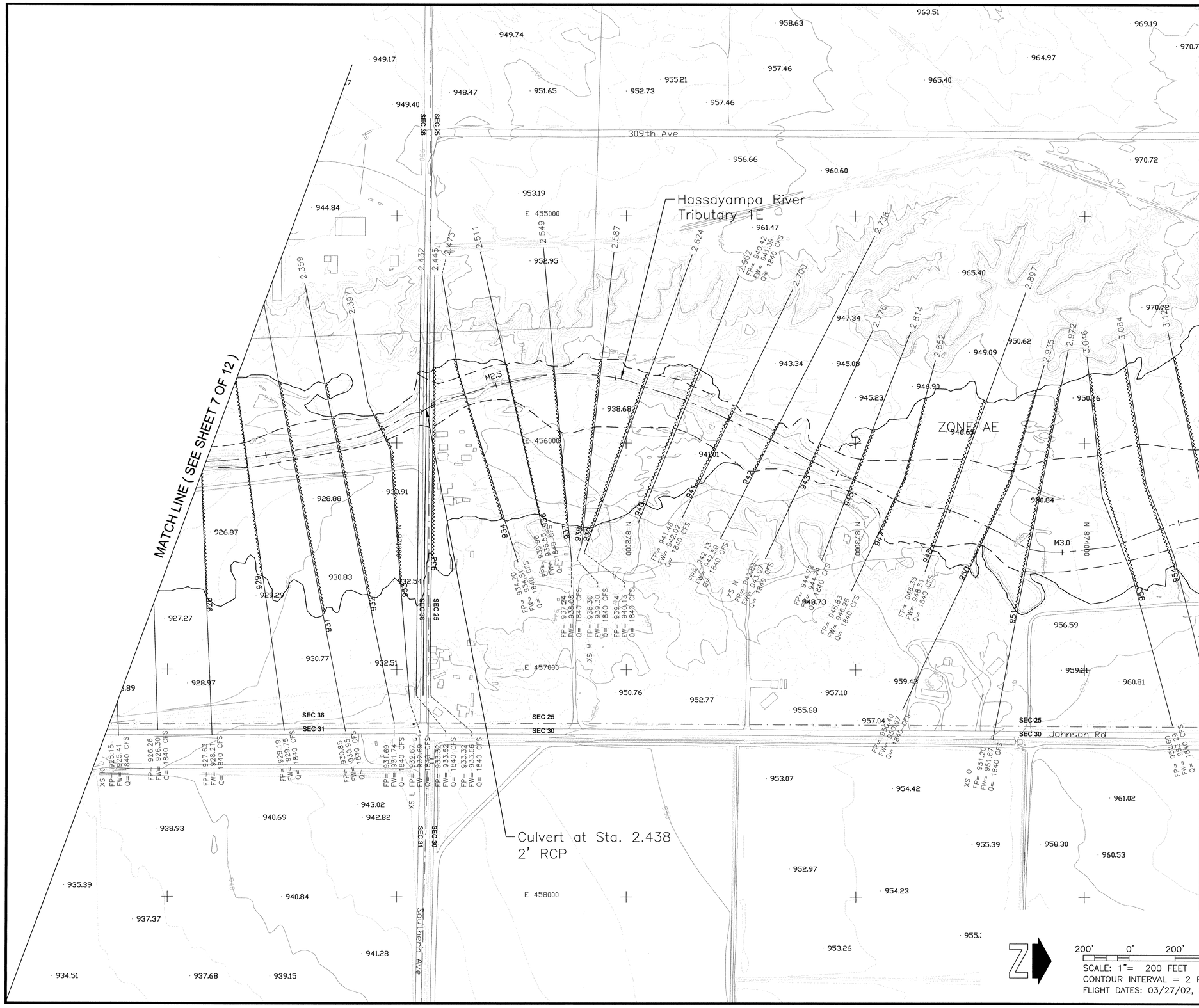
SCALE: 1"= 200 FEET

CONTOUR INTERVAL = 2 FEET

FLIGHT DATES: 03/27/02, 04/08/02

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.



THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.

LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 FP= 1888.74 FW= 1889.54 Q = CFS
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

FEMA CROSS SECTION DESIGNATION — CROSS SECTION STATION MILE DESIGNATION — FLOODPLAIN WATER SURFACE ELEVATION — ENCROACHED WATER SURFACE ELEVATION — 100 YEAR DISCHARGE

ELEVATION REFERENCE MARKS

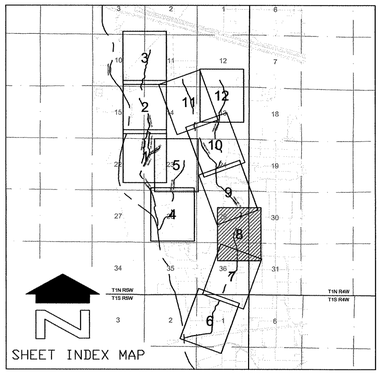
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
12	954.49	SET FCDMC BRASS CAP IN 8 CONCRETE COLLAR, 0.2 ABOVE GROUND. LOCATED 75 FEET OF JOHNSON ROAD AND 0.25 MILE NORTH OF SOUTHERN AVENUE WITH FARM DRIVES N, S & E. GUARDED BY CARSON-ITE WITNESS POST (TYPICAL FOR ALL FCDMC BENCH MARKS). N: 872513 E: 457349

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGVD29 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

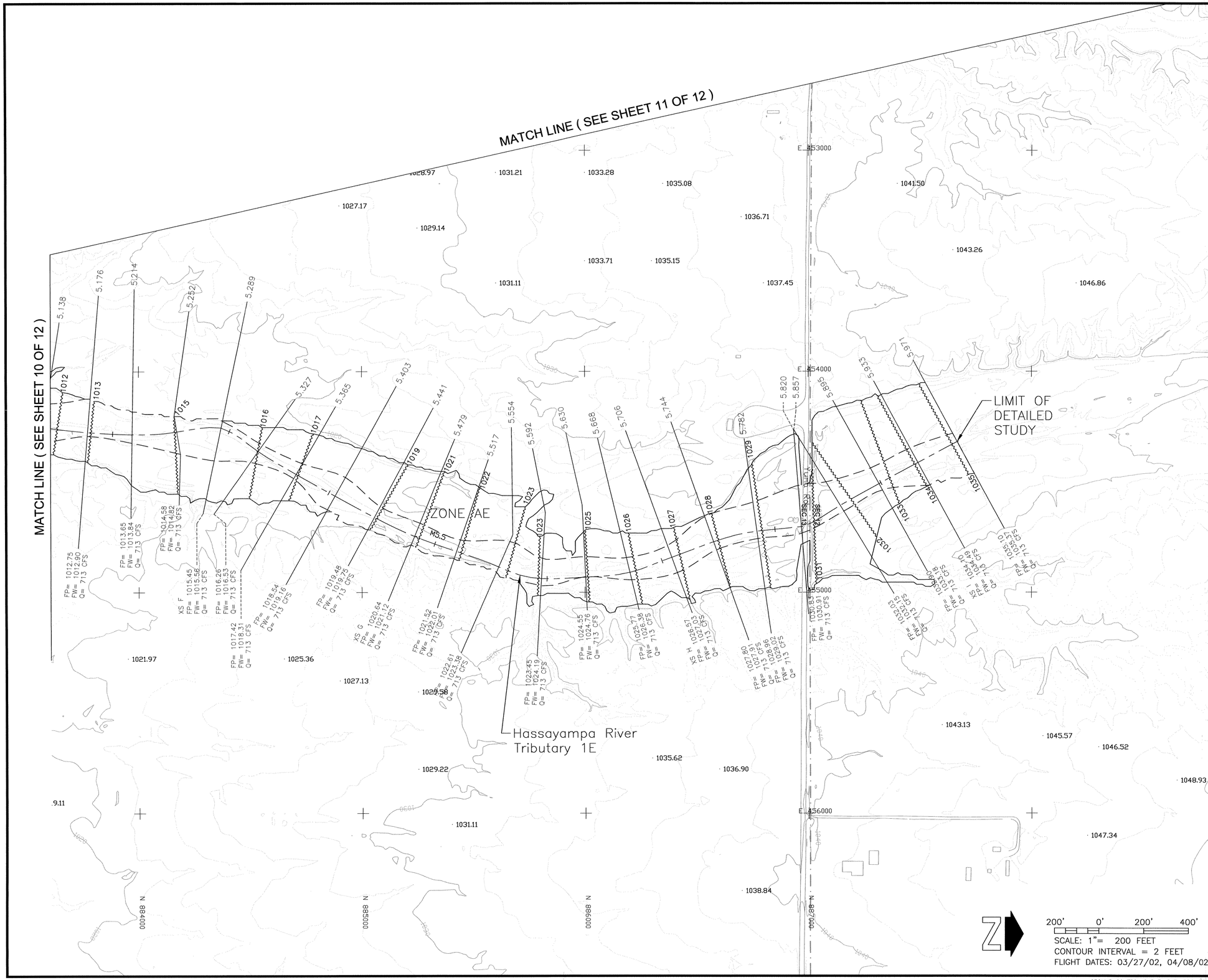
F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42881 STEPHEN W. ROGERS Date Signed 2-1-05 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-3003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 08 OF 12



LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 — FP= 1888.74 (FLOODPLAIN WATER SURFACE ELEVATION); FW= 1889.54 (ENCROACHED WATER SURFACE ELEVATION); Q = CFS (100 YEAR DISCHARGE); FEMA CROSS SECTION DESIGNATION; CROSS SECTION RIVER MILE DESIGNATION
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

ELEVATION REFERENCE MARKS

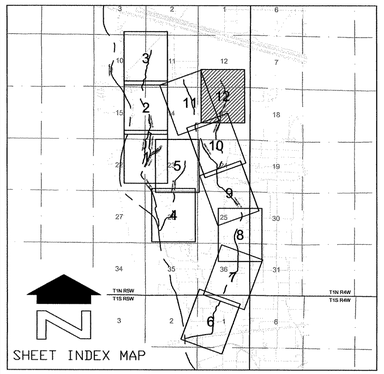
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
14	1020.68	SET FCDMC BRASS CAP IN 8 CONCRETE COLLAR, 0.3 ABOVE GROUND. FROM INTERSECTION OF JOHNSON ROAD & LOWER BUCKEYE ROAD, TRAVEL 0.5 MILE WEST ON LOWER BUCKEYE ROAD (DIRT) TO B.W.F. HEADING NORTH. DRIVE DIRT TRAIL ALONG WEST SIDE OF FENCE FOR 0.5 MILE TO STATION, LOCATED 20 FEET WEST OF FENCE AND 150 SOUTH OF AN INTERSECTION OF B.W.F.S RUNNING N, S, E & W. N: 884199 E: 454659

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGVD29 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42801 STEPHEN W. ROHERS Date Signed 2-7-05 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 12 OF 12

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.

LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	(A) 0.10 — FIRM CROSS SECTION DESIGNATION; CROSS SECTION RIVER MILE DESIGNATION; FP= 1888.74 FLOODPLAIN WATER SURFACE ELEVATION; FW= 1889.54 ENCROACHED WATER SURFACE ELEVATION; Q = CFS 100 YEAR DISCHARGE
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

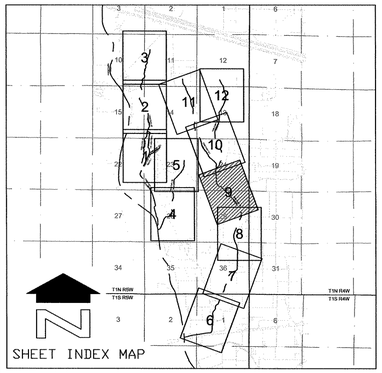
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGVD29 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

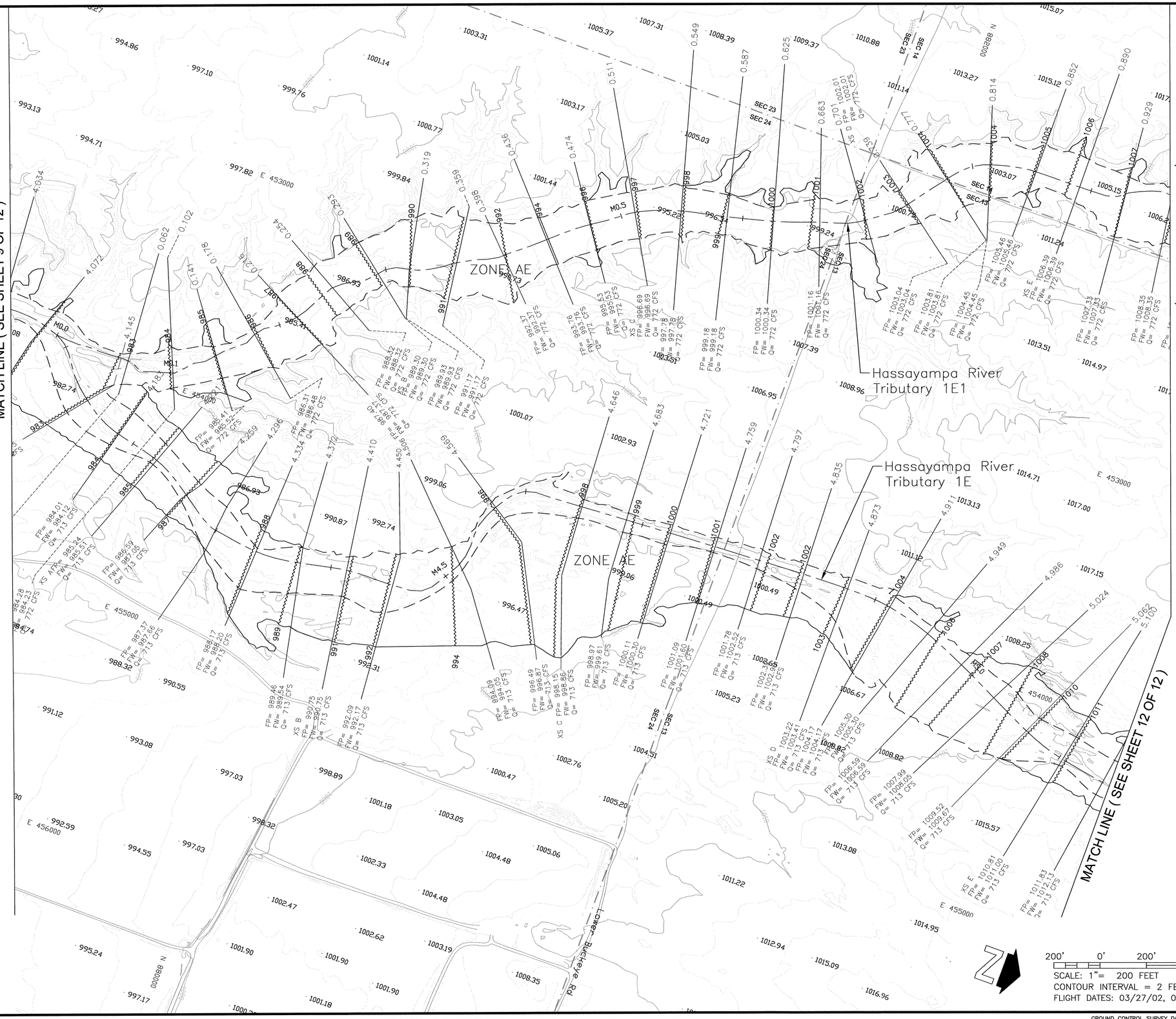
F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42881 STEPHEN W. ROGERS Date Signed 2-7-05 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 09 OF 12



LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 — FP= 1888.74 (FLOODPLAIN WATER SURFACE ELEVATION); FW= 1889.54 (ENCROACHED WATER SURFACE ELEVATION); Q = CFS (100 YEAR DISCHARGE); FEMA CROSS SECTION DESIGNATION; CROSS SECTION RIVER MILE DESIGNATION
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

ELEVATION REFERENCE MARKS

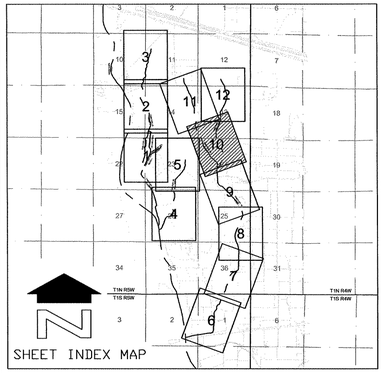
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
13	999.29	SET FCDMC BRASS CAP IN 8 CONCRETE COLLAR, 0.2 ABOVE GROUND. FROM INTERSECTION OF JOHNSON ROAD & LOWER BUCKEYE ROAD, TRAVEL 0.5 MILE WEST ON LOWER BUCKEYE ROAD (DIRT) TO B.W.F. HEADING SOUTH. TRAVEL DIRT TRAIL ON WEST SIDE OF FENCE APPROXIMATELY 700 FEET TO STATION, 30 FEET WEST OF FENCE. N 880983 E 454630

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGVD29 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

200' 0' 200' 400'

SCALE: 1"= 200 FEET

CONTOUR INTERVAL = 2 FEET

FLIGHT DATES: 03/27/02, 04/08/02

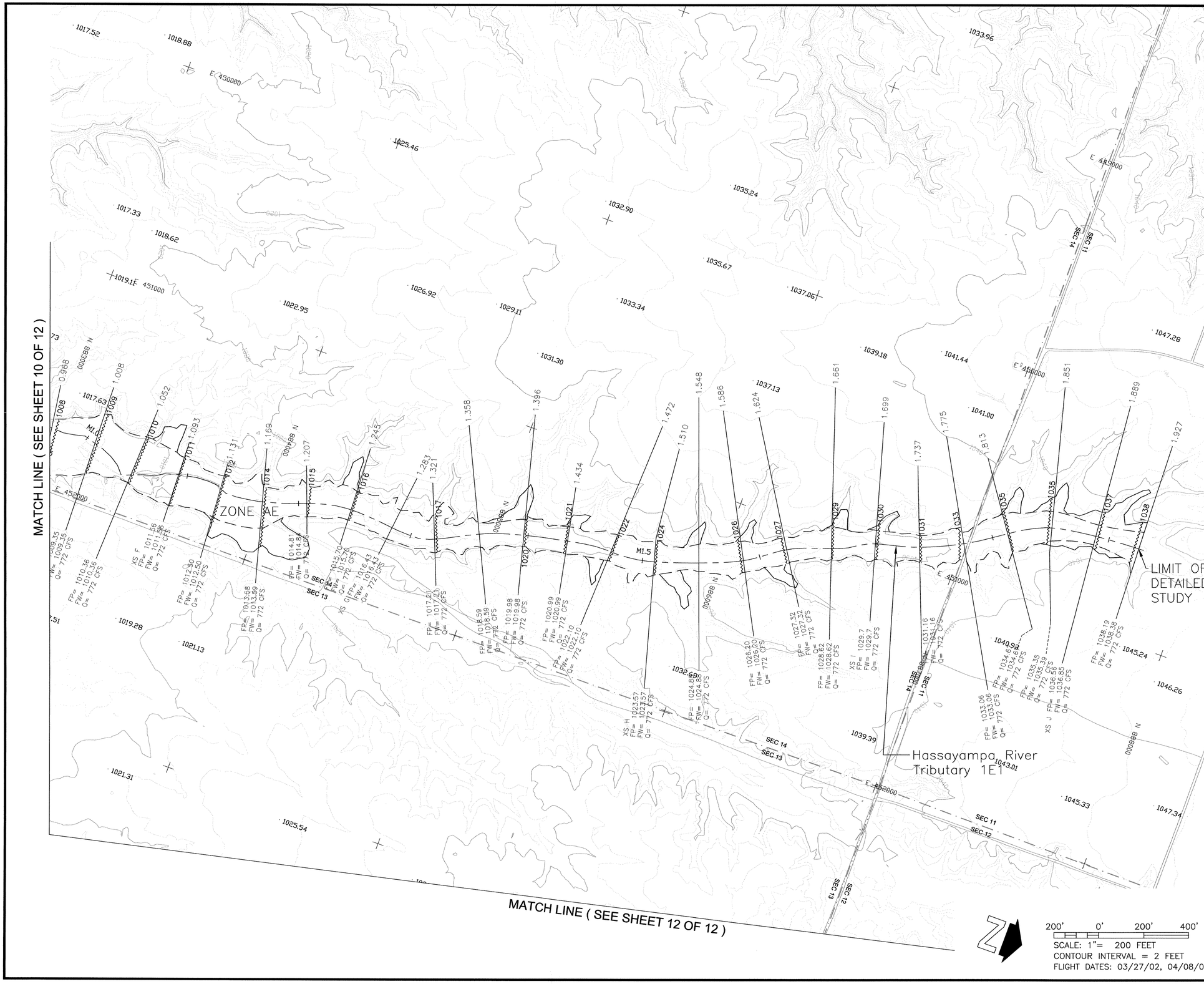
Registered Professional Engineer (Civil) CERTIFICATE NO. 42661 STEPHEN W. RODGERS Date Signed 2-7-03 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.



LEGEND

100-YR FLOODPLAIN BOUNDARY	
FLOODWAY BOUNDARY	
HYDRAULIC BASE LINE WITH RIVER MILE	M12.0 M13.0
EROSION SETBACK (WHEN APPLICABLE)	
CROSS SECTION	A 0.10 — FP= 1888.74 (FLOODPLAIN WATER SURFACE ELEVATION); FW= 1889.54 (ENCROACHED WATER SURFACE ELEVATION); Q = CFS (100 YEAR DISCHARGE); FEMA CROSS SECTION DESIGNATION; CROSS SECTION RIVER MILE DESIGNATION
ELEVATION REFERENCE MARK	ERM XXX
BASE FLOOD ELEVATIONS	1221
ZONE DESIGNATIONS	ZONE AE
SECTION LINE	Section Boundary

ELEVATION REFERENCE MARKS

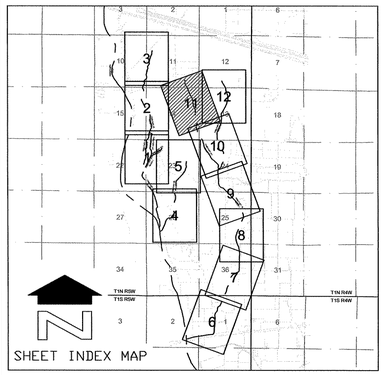
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1988.

I.D. #	ELEV. (FT)	DESCRIPTION/LOCATION
18	1029.11	SET FCDMC BRASS CAP IN 8" CONCRETE COLLAR, 0.2' ABOVE GROUND. FROM INTERSECTION OF JOHNSON ROAD & YUMA ROAD, DRIVE 1.5 MILES WEST ON YUMA ROAD (DIRT), TURN SOUTH ALONG EAST SIDE OF N-S B.W.F. AND TRAVEL 0.5 MILE TO STATION LOCATED 500 FEET, MORE OR LESS EAST OF B.W.F. N: 884464 E: 449906
28	1041.07	SET FCDMC BRASS CAP IN 8" CONCRETE COLLAR, 0.8' ABOVE GROUND. STATION IS LOCATED 1.2 MILES WEST OF JOHNSON ROAD AND APPROXIMATELY 65 FEET NORTH OF YUMA ROAD (DIRT). GUARDED BY TYPICAL CARSONITE WITNESS POST. N: 887077 E: 451227

NOTES

1- THE HYDRAULIC BASE LINE IS CROSS SECTION STATION 10,000 UNLESS NOTED OTHERWISE

2- NGVD29 = NAVD88 - 2.08 FEET



NO.	REVISION	BY	DATE
2			
1			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HASSAYAMPA RIVER EAST TRIBUTARIES

F.C.D. CONTRACT NO. 2002C027

Registered Professional Engineer (Civil) CERTIFICATE NO. 42881 STEPHEN W. ROGERS Date Signed 2-1-05 ARIZONA U.S.A.

PBSJ
7310 N. 16th St., Suite 310
Phoenix, Arizona 85020
Phone: (602) 943-1003
Fax: (602) 943-1303

	BY	DATE
DESIGN	JSL	10/04
DESIGN CHK.	WC	10/04
PLANS	JSL	10/04
PLANS CHK.	WC	10/04

SHEET 11 OF 12

THE BASEMAP WAS PREPARED BY KENNEY AERIAL MAPPING, INC. USING PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS FOR 1"= 200' HORIZONTAL SCALE AND 2' CONTOUR INTERVALS.

GROUND CONTROL SURVEY DATA PROVIDED BY PROJECT ENGINEERING CONSULTANTS, LTD. & HUITT-ZOLLARS, INC.