PED Hydraulic Design of Tres Rios North Levee

Maricopa County

Volume I

Pre-Final Project Analysis
Final Report

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1. Introduction

1.1. Purpose

The purpose of this project is to provide a PED hydraulic design for the Tres Rios North Levee. The specific project reach is located along the Salt and Lower Gila Rivers in Phoenix, Arizona and extends from approximately the Agua Fria River confluence to 91st Avenue.

This report presents the results of the hydraulic and sediment transport, and scour analyses conducted for the design of the North Levee on the north bank of the Salt and Lower Gila Rivers.

1.2. Scope

The services performed and documented within this report include:

- **Field Reconnaissance & Data Collection.** Information on field reconnaissance and data collection is presented. Field investigation of the study reach was conducted to obtain required physical data and to identify specific features necessary for hydraulic analysis. The U.S. Army Corps of Engineers, Los Angeles District (COE) Project Hydraulic Engineer and representatives from the Maricopa County Flood Control District joined the Project Manager and hydraulic engineers from WEST Consultants, Inc. (WEST) for initial field reconnaissance.
- **Hydraulic Analysis.** Hydraulic analyses of existing and proposed conditions are presented. The existing conditions hydraulic model is compared with the model developed for WEST Consultants' 1999 Tres Rios Hydraulic and Sedimentation

Analysis. Hydraulic models for three distinct conditions have been developed. They are: the without project existing conditions, existing conditions with proposed levee and with-project conditions with proposed levee and ponds. The inundation boundaries associated with the different hydraulic conditions have been delineated. Sensitivity analyses with regard to Manning's roughness coefficients were also prepared.

- **Sediment Transport Analysis.** Sediment transport analyses of existing and proposed conditions on the project reach are presented. These include HEC-6T models for 105-year long-term simulations for existing and proposed conditions, with average bed elevation results plotted for each decadal sediment transport condition modeled as well as daily values for the two large flood events. Hydrology for the study was developed by the Los Angeles District and is contained in Appendix A. Sensitivity analyses (inflowing sediment load and sediment transport functions) were also performed for both the existing and proposed conditions. The impact of Manning's n values on long term scour and sedimentation was also evaluated.
- **Scour Analysis.** Levee toe-down depth calculations are presented. These scour calculations consider the probable 100-year flood event and 105-year long-term bed profile to determine the maximum toe-down depth. The sediment transport analysis for proposed conditions provides conservative channel bed material erosion for the proposed levee design.
- **Levee Height Analysis.** The most conservative hydraulic results (highest water surface elevations) were applied in determining the required minimum elevation

for the proposed North Levee. The hydraulic impacts of the addition of the North Levee were determined and are presented. In the development of a final levee height, freeboard allowance for a 100-year flood was determined using HEC-FDA and is presented herein.

1.3. Study Area

The approximately 8.7-mile long study reach comprising the Salt and Lower Gila Rivers is located in Phoenix, Arizona and extends approximately from the Agua Fria River confluence upstream to 91st Avenue (Figure 1-1). Approximately three miles below the upstream end of the project, the Salt River joins the Gila River. The Salt River is one of Gila River's two major tributaries in the study area. About 3.5 miles downstream of Salt-Gila confluence, the Agua Fria River, the second major tributary (not analyzed in this study), also joins the Gila River. In this study the Gila River above the Salt-Gila confluence is referred to as the Upper Gila while the Gila River below the confluence is referred to as the Lower Gila.

The Salt-Lower Gila system is heavily braided with sizeable in-channel mining pits primarily upstream of 91st Avenue. Two bridges, at 116th Avenue and Bullard Avenue, cross the Lower Gila River in the study reach. The 116th Avenue Bridge and the Bullard Avenue Bridge are located approximately 0.4 miles and 4.4 miles downstream from the Salt-Gila confluence, respectively. The existing Holly Acres Levee is located along the north bank of the Salt-Lower Gila system, extending from the Salt-Gila confluence downstream to El Mirage Road (Figure 1-2). The condition of the vegetation in the channel and floodplain has a high spatial variability, ranging from non-existent to very dense over very short distances. The vegetation in the Upper Gila reach is

particularly dense, which was reflected in high Manning's *n* values in the network hydraulic model. The Salt-Lower Gila system also shows evidence of very dense vegetation along the channels with flowing water. The Upper Gila River bed is relatively dry, whereas the braided Salt-Lower Gila system bed exhibits some areas with wetland and ponding conditions due to releases from water reclamation plants at 91st and 35th Avenues.

1.4. Authorization and Acknowledgements

This study was authorized under Contract Number DACW09-00D0021, Task Order No. 0009 for Hydraulic Engineering Services between the U.S. Army Corps of Engineers, Los Angeles District and WEST Consultants, Inc.

Dr. David T. Williams was the Principal-In-Charge, Mr. Dennis L. Richards was the Project Manager for WEST and Dr. Gary E. Freeman was the Project Hydraulic Engineer. Further assistance was provided by Dr. Selena M. Forman, Mr. James E. Heyen, Dr. Carlos Lopez-Sabater, Dr. Hari Sundararaghavan, Dr. Iftekhar Ahmed and Mr. Kurtis Baron.

Location of the Tres Rios PED Study Reach

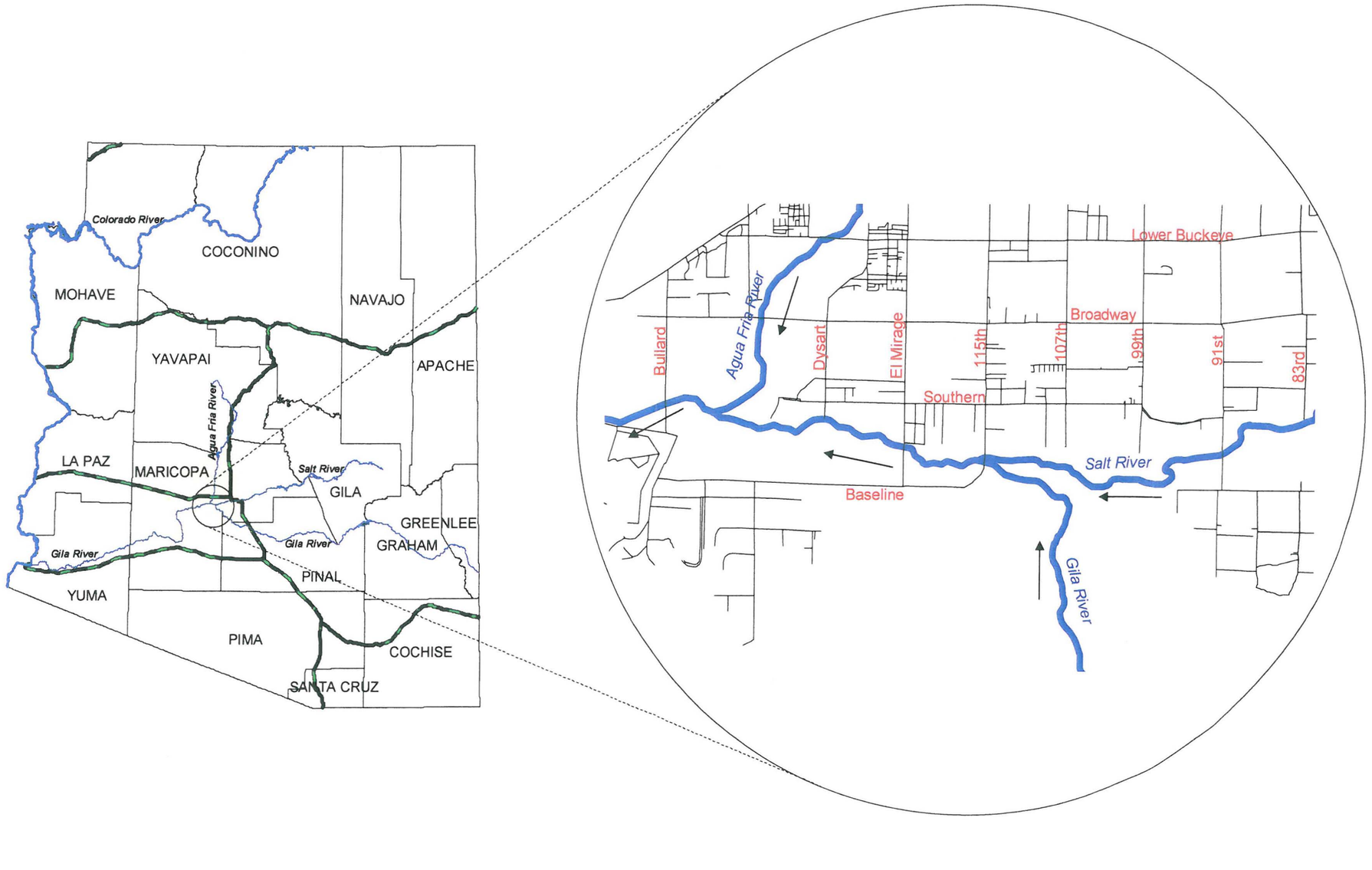

Figure 1-1. Location of the Study Area (Not to Scale)

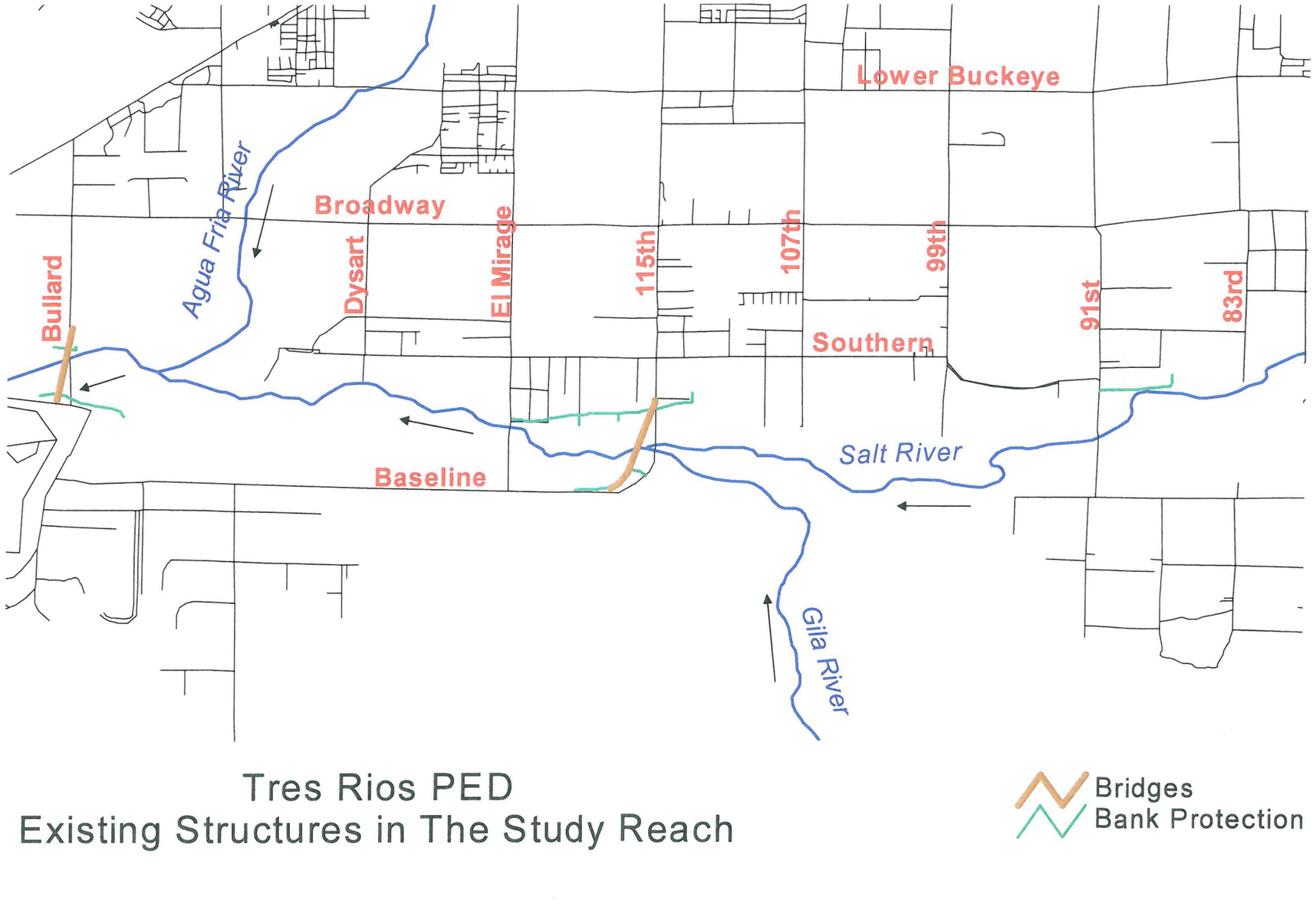

Figure 1-2. Location of Existing Structures and Levees (Not to Scale)

3.4. Investigation of Observed High Water Marks

The 1993 flood was recent enough that eyewitnesses were available to verify general high water marks. No surveyed high water marks were found and the best information available came from Adron Reichert, a retired architect living in the Holly Acres community. He indicated that the 1993 flood approached the top of the dikes just west of what is now the 116th Avenue Bridge. He indicated that the water was just about even with the top of the dikes at their lowest elevation (approximately midway between the levee and the tip of the dike). This observation, made during a coordination meeting caused concern regarding the water surface elevations predicted by the current models since all models had been predicting lower elevations for the 1993 flood – even assuming a 162,000 cfs peak flow.

As a result of the comments a more detailed analysis of the observations was begun. The details of the investigation and the preliminary results based on the one-dimensional modeling are contained in Appendix C. The investigation revealed that it appeared likely that the water surface elevations were near the tops of the dikes and that the water surface elevations along the upstream side of the dikes were about 1 ft higher than those being predicted in the HEC-RAS models (See Figure 3-14).

Mr. Harry Milllsaps, Hydraulic Engineer for the Gila River Indian Community also indicated that based on eyewitness accounts from the Indian Community that it appeared that the water surfaces predicted by the existing models may be about 1 ft lower than those observed on the south side of the river near 91st Avenue. This observation was based on the limits of the flooding as identified by Community residents. Some of these

differences, however, could be attributed to the two dimensional nature of the flow in the reach.

An additional complication arose in regards to the actual peak flow of the 1993 flood. Initial evaluation indicated a peak flow of 162,000 downstream at the Estrella Parkway Bridge. Based on gage data for the Salt River at Alma School Road (approximately 22 miles upstream from the study area) it appears that the peak flow for January 8th, 1993 should be on the order of 122,000 cfs. The downstream gage at Estrella Parkway measured a peak flow of 162,000 cfs on January 9th but no significant inflows occurred between the Alma School and Estrella Parkway gages.

An indirect measurement of flow on the Verde River near Scottsdale showed an estimated peak flow of 127,000 cfs on January 8th. At that time the daily average from Stewart Mountain Dam on the Salt River was 25,600 cfs which is higher than both the previous and following day. Since the value is a daily average it is reasonable to assume that the peak was somewhat higher than the 25,600 cfs daily average flow. If the peak was on the order of 35,000 cfs combined with a peak of 127,000 cfs (estimated) from the Verde River, the combined flow would be on the order of 162,000 cfs or equal to the 162,000 cfs measured at the Estrella Parkway gage. If the peak from the Salt were somewhat higher, the losses due to attenuation could be accounted for and a flow of 162,000 cfs was plausible for the 1993 flood on January 9th, 1993 in the project reach.

In order to match the observed high water mark using the HEC-RAS results it was necessary to raise the channel n values by 20% to achieve the observed water surface elevations. This was evaluated but given the areas of dense vegetation and open channels it is unlikely that the water surface elevation would be constant across the entire channel.

The cross channel differences are shown in the two-dimensional results in Figure 3-14 for the 162,000 cfs flow and can be seen when comparing thalweg water surface elevations and water surface elevations along the levee.

Further when inundation areas were compared with those observed during the 1993 flood, it became apparent that the flow could not have been 162,000 cfs since large breakouts upstream of the Holly Acres Levee did not occur. In order to match the observed inundation limits from an August 1994 Corps report entitled Damage Report State of Arizona, Floods of 1993 (Corps 1994) it was necessary to reduce flow in the HEC-RAS model to the 120,000-130,000 cfs range.

Based on further analysis, including evaluation of flood volumes, peaks, interviews with gaging personnel and other factors, it appears that the reported peak for

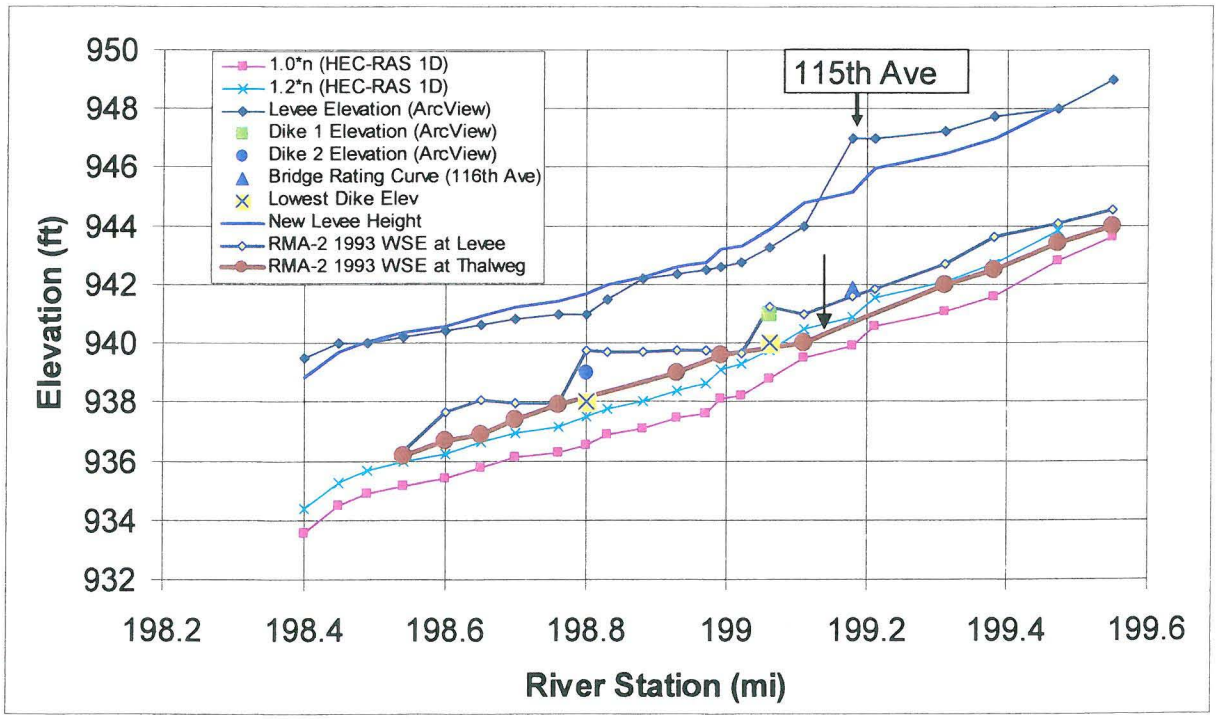

Figure 3-14. Comparison of Observed and Calculated Water Surface Elevations. 2D Elevations are for the 100 Year Flow Rather than the 1993 Flow.

the Estrella Parkway gage is too high and that the data for the gage at Alma School Road may be more accurate. (Personal Communication with Nick Adelmeyer, 2004)

3.5. Two-Dimensional Analysis of Water Surface Elevations

A two-dimensional model was developed for the study area to resolve uncertainty regarding water surface elevations and velocities that could be expected along the levee as well as to better clarify the observed water surface elevations. The two-dimensional model was based on the U.S. Army Corps of Engineers RMA-2 model using the SMS interface. The model was developed only for the with levee condition since it was to be used primarily to provide a better analysis of toe down requirements and protection needs for the levee. The two-dimensional model also provided a better means of evaluating water surface elevations near the dikes and along the existing Holly Acres Levee. The full report on the two-dimensional modeling is contained in Appendix E.

The two-dimensional model, using a flow of 162,000 cfs, provided water surface elevations through out the modeled area but indicated that a rise in water surface of approximately 1' occurred just upstream of the dikes. This accounted for the 1' difference between the HEC-RAS model results and the observations by Mr. Reichert that the water was at the tops of the dike stems at the peak of the flood. The two-dimensional water surface elevations at the dikes are shown in Figure 3-15 for the portion of the existing Holly Acres Levee near 115th Avenue.

Since a two-dimensional model was used to evaluate levee toe-down and protection it was also possible to use the two-dimensional model to more closely calibrate the flow to the 1993 observed high water marks. The plot of the water surface for flows of 120, 130, 140, 150, and 162 thousand cfs are shown in Figure 3-15. It can be noted

that in the two-dimensional model flow must be on the order of 120-130,000 cfs to avoid overtopping the dikes. This is in line with the gage data from the Alma School gage if one assumes little or no attenuation in the 22 mile reach. A flow of that distance in the very course alluvium with no attenuation is not too likely so it is possible that the flow was higher than that indicated by the Alma School gage but 130,000 cfs or less at the Holly Acres Levee dikes. Based on the analysis it was determined there was no necessity to raise the Manning's n values in the HEC-RAS model.

A more detailed discussion of the two-dimensional modeling follows and the full report is included in Appendix E. The best estimate of the 1993 peak flow based on the data available would be in the 120,000 - 130,000 cfs range.

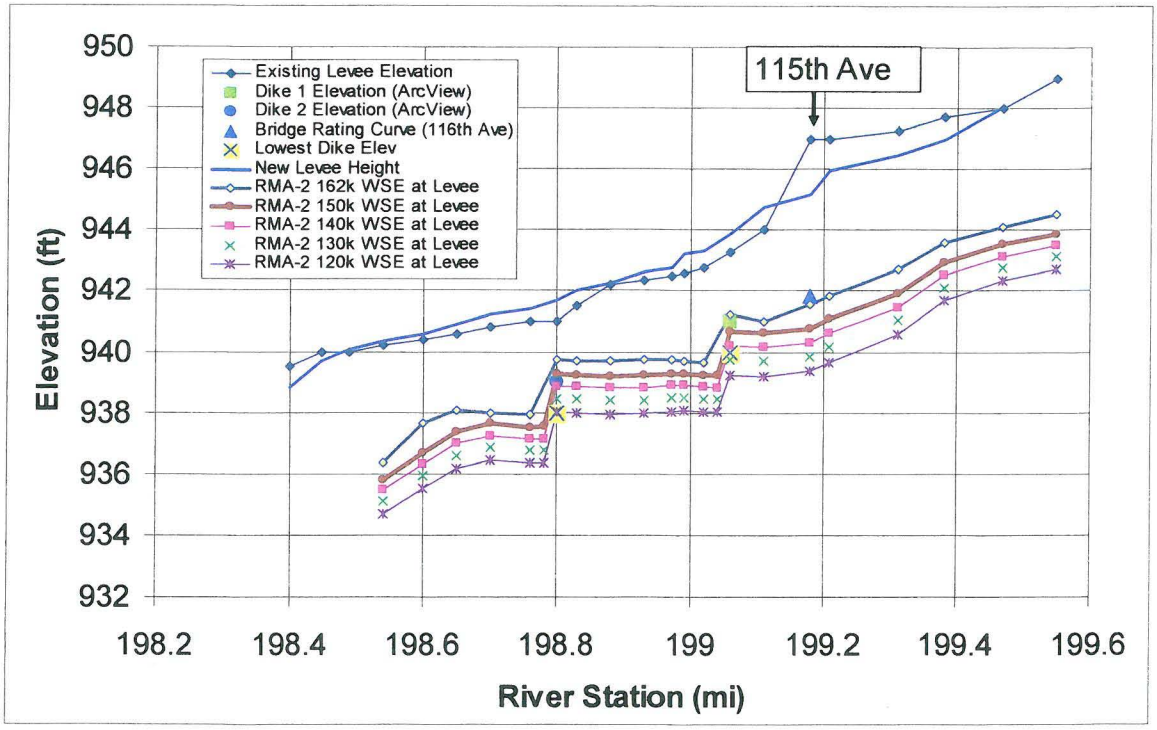

Figure 3-15. 1993 Water Surface Elevations from Two-dimensional RMA-2 for Holly Acres Levee Face and Dikes for Various Flow Rates.

4. Proposed Conditions Hydraulic Analysis

4.1. General

The objectives of the proposed conditions analyses were to generate accurate hydraulic models for both Conditions 2 and 3, delineate their corresponding flood inundation boundaries for the 100-year event, and produce input geometry for the sediment transport analysis. The existing condition hydraulic model was updated in the following manner for each condition:

Condition 2 – With-Levee Only Existing Conditions

The HEC-RAS network model for without project existing conditions was updated by adding the proposed levee along the north bank of the Salt-Lower Gila system. Location of the levee was provided by the U.S. Army Corps of Engineers, Los Angeles District. The addition of the levee affected the geometry of cross sections 196.81 on the Lower Gila through 202.32 on the Salt. Water surface elevation plots are shown in Figures 4-1 through 4-3. The levee alignment modeled is shown in Figure 4-4.

Ineffective flow areas were defined in the model in order to account for flow expansion due to the addition of the levee. Cross sections at which these areas were defined run from 196.14 to 196.75. Due to the elevation of the existing topography upstream of the levee, ineffective flow was not necessary to define any flow contraction.

The impact from the levee in the Salt-Lower Gila reach is not extremely significant due to its alignment with respect to the 100-year ineffective flow boundary. Between cross sections 200.31 and 202.32, the levee is placed in an area that is

designated as an ineffective flow area for the 100-year flood. The flow area for the 100-year flood is thus not reduced and the levee does not impact flood elevations on this portion of the Salt River. Between cross sections 196.81 and 200.31, the levee is aligned within the 100-year effective flow area and would block the water from inundating the areas behind the levee. However, under without levee condition there is a relatively low transport of water in the overbank area as compared to the main channel. Adding the levee along the reach would constrict the flows from the overbank areas, but would not cause significant change in water surface elevation with the levee creating only about a 0.3 foot rise in water surface elevation in this reach.

The hydraulic results and cross section plots are given in Appendix F. The original proposed levee alignment as modeled in this study is shown in Figure 4-4. Subsequent to the HEC-RAS modeling the levee alignment was changed to turn north at Dysart Road and parallel Southern until the levee neared the Buckeye Feeder canal.

An interim alternative was modeled in the two-dimensional model which turned north just east of the intersection of the Buckeye Feeder Canal and Southern Ave and ran north to the canal and then followed the canal back east to Dysart Rd. (See Figure 4-5)

The final levee alignment continues west along Southern and then continues along the south side of the feeder canal to the west until the canal makes a sudden 90 degree turn to the south at the Agua Fria River. This change resulted in a modified model with differing water surface elevations at the lower end of the levee. The original, RMA-2 and final levee alignments are shown in Figure 4-5. Plots in the main analysis sections of this report (Sections 4 and 5) show the original levee alignment. Plots and tables in Section 6 of the report were updated to detail the final levee alignment and elevations.

Tres Rios PED
Future Condition With Levee Water Surface Profiles
Lower Gila

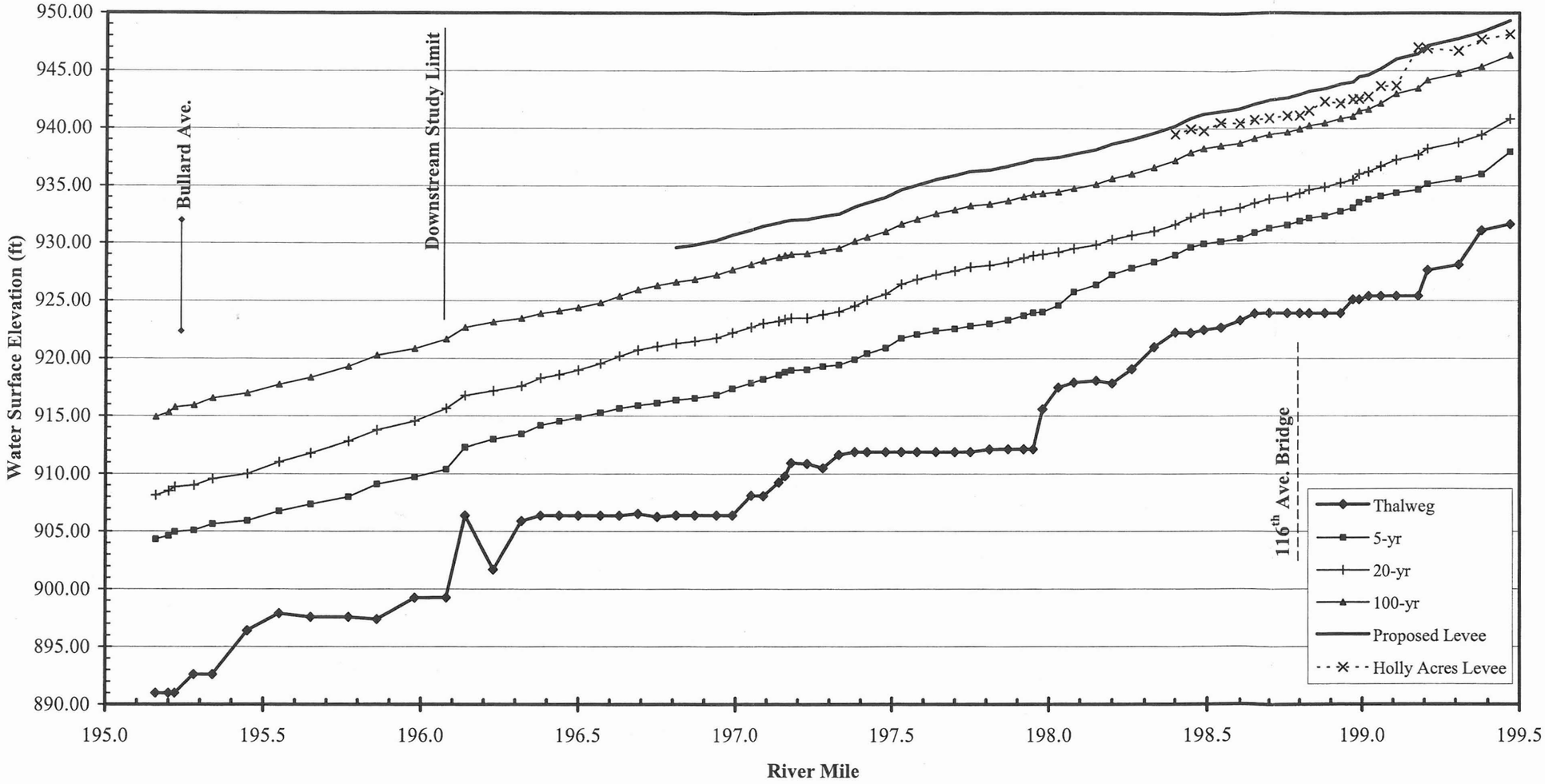

Figure 4-1. Future Condition With Levee – Water Surface Profiles – Lower Gila

Tres Rios PED
Future Condition With Levee Water Surface Profiles
Salt

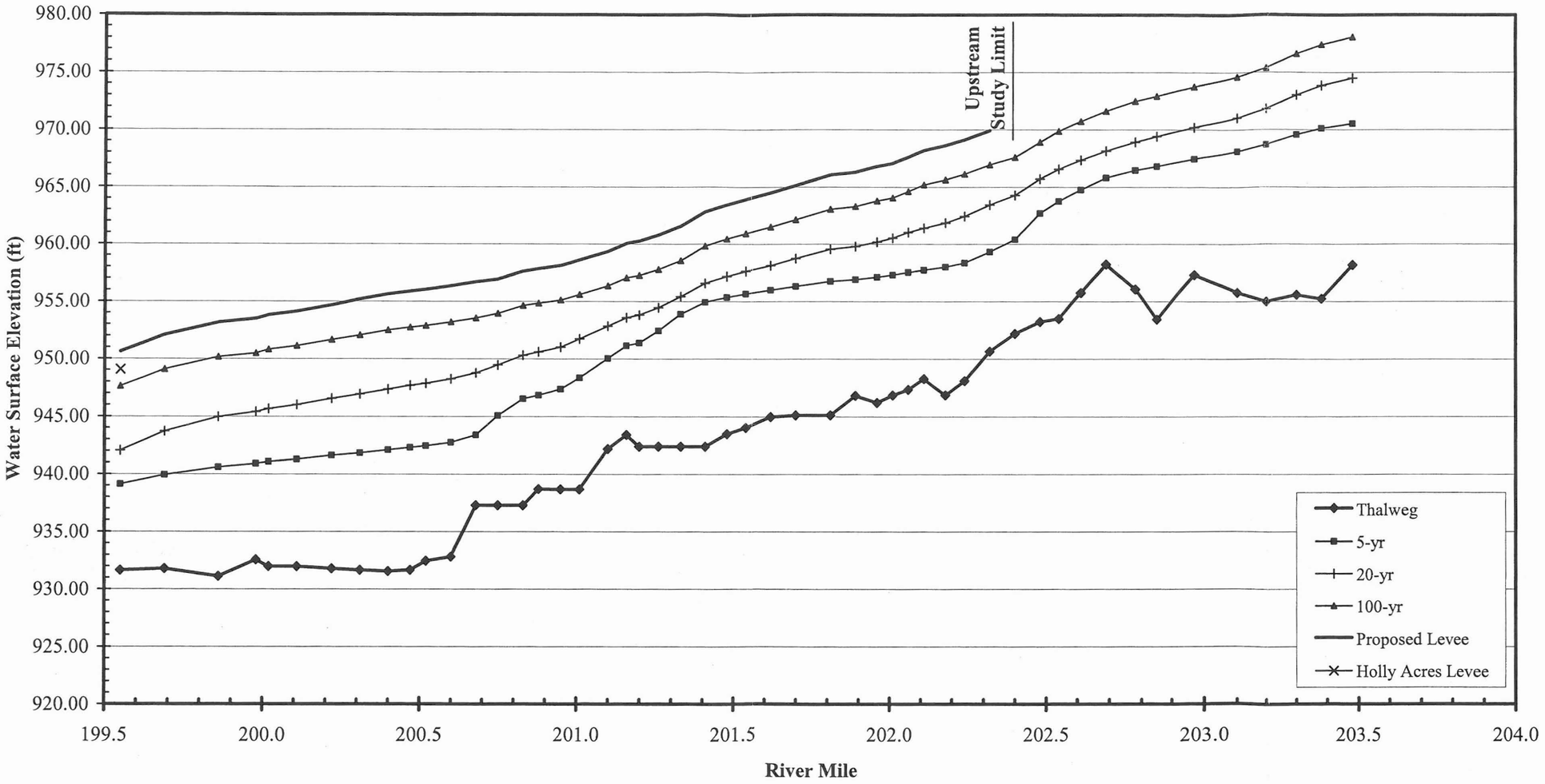

Figure 4-2. Future Condition With Levee Water Surface Profiles - Salt

Tres Rios PED
Future Condition With Levee Water Surface Profiles
Upper Gila

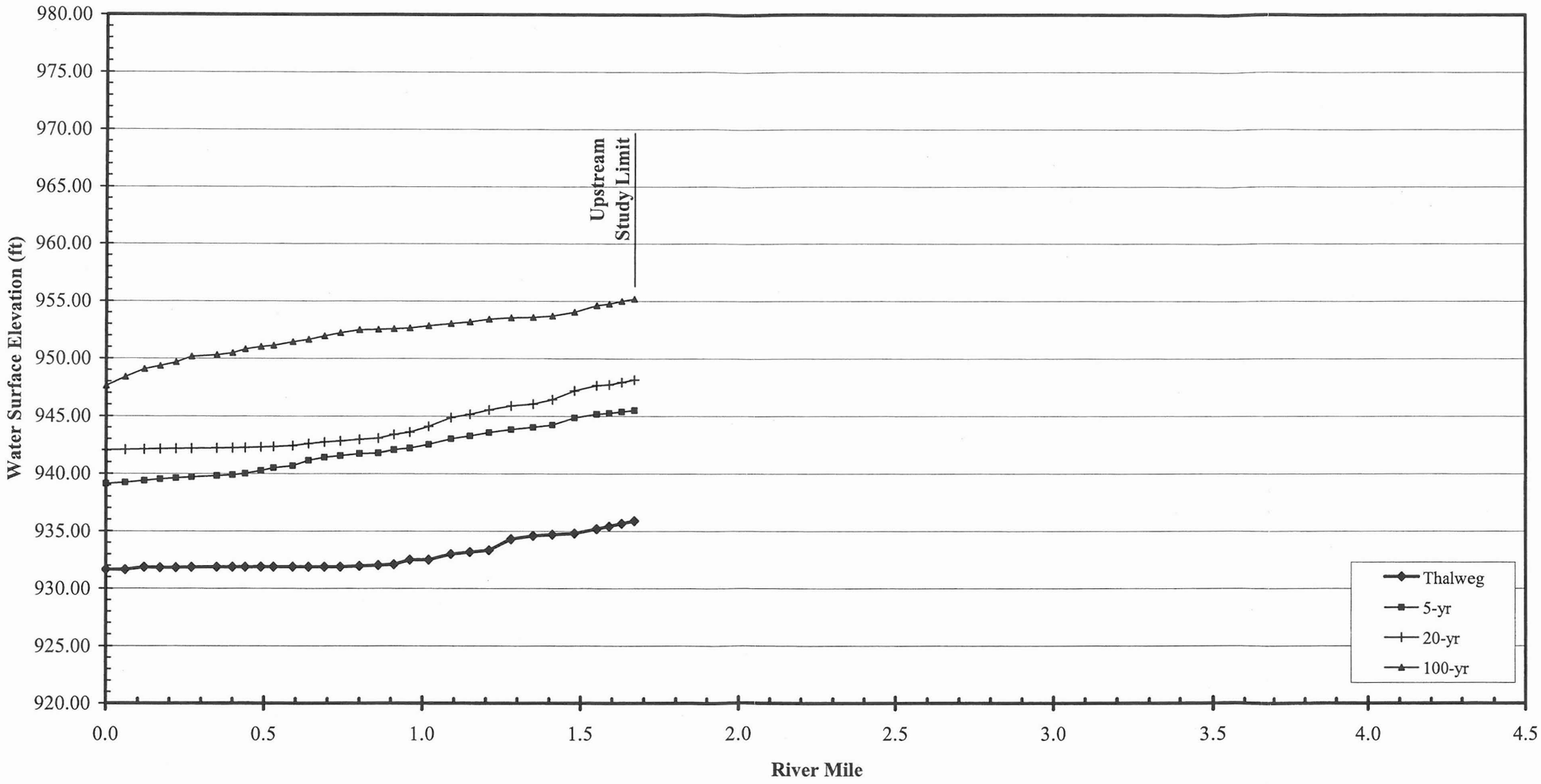

Figure 4-3. Future Condition With Levee Water Surface Profiles – Upper Gila

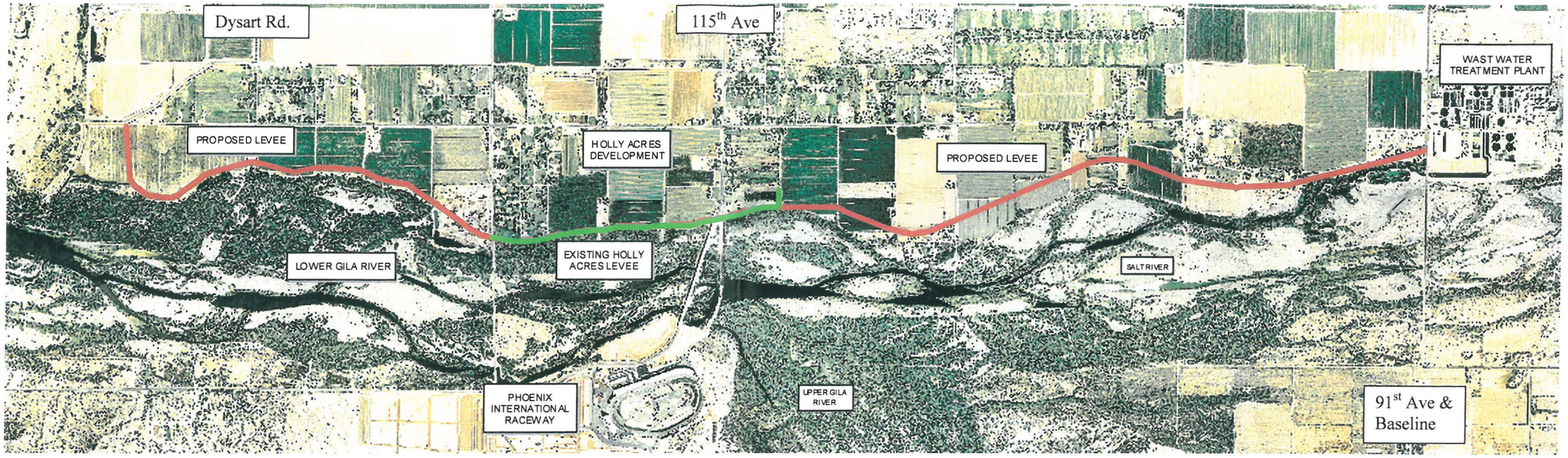

Figure 4-4. Proposed Levee Alignment

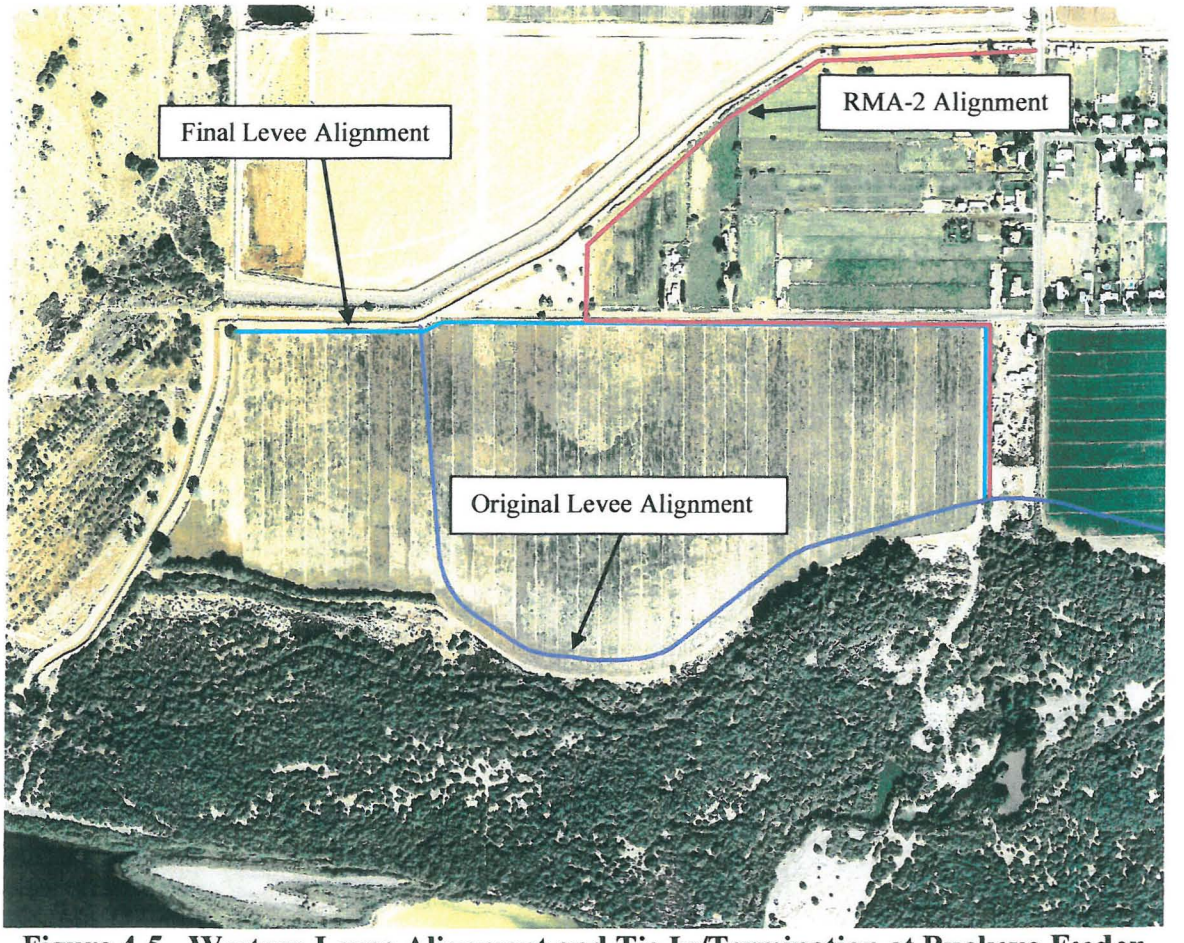

Figure 4-5. Western Levee Alignment and Tie In/Termination at Buckeye Feeder Canal.

Condition 3 – With Levee & Open Water Ponds Proposed Conditions

Proposed open water ponds were added to the with-levee existing conditions HEC-RAS network model. Side slopes and depth of ponds were based on information obtained from the "Tres Rios, Arizona Feasibility Study" (U.S. Army Corps of Engineers, 2000). Pond locations were modified slightly from those obtained from the Corps to remove ponds from the active channel in the HEC-RAS and HEC-6T models. The location of the ponds was shifted slightly away from the channels to keep the ponds at least 100 ft outside of the channel as defined by the bank stations specified in the HEC-RAS and HEC-6T models. This provided for increased model stability and reduced

problems with critical depths. Given the one-dimensional nature of the model, shifts in lateral location of the ponds will not impact flow conditions in the model.

Water surface elevation plots for individual model conditions are shown in Figures 4-6 through 4-8. Comparative plots of the 100-year water surface profile for all three of model conditions are presented in Figures 4-9 through 4-11. Detailed hydraulic results and cross section plots are given in Appendix G.

The comparative plots illustrate the relative effects of adding the levee and then the ponds. It can be seen that the addition of the levee alone has minimal effects on the water surface profile. As is evident in the inundation plots, the alignment of the entire proposed levee is in the right overbank, outside the main channel. Conveyance in this overbank area is quite low relative to the main channel. Additionally, in the Salt reach of the model, large portions of the proposed levee fall within ineffective flow areas. The combination of relatively low conveyance in the right overbank and the levee alignment partially outside the effective flow limits result in little impact to the water surface elevations when compared with existing conditions. The addition of the ponds to the model results in an overall lowering of the water surface profile. This occurs for two primary reasons. One, the addition of the ponds results in larger cross-sectional area with which to convey the flow, especially in the ponds with low invert elevations. And two, the ponds were assigned a Manning's *n* value which reflected an open water condition, which is significantly lower than the existing roughness at the pond locations.

4.1.1. Manning's *n* Adjustments for Open Water Pond Conditions

Manning's *n* values across the open-water proposed ponds were adjusted to 0.03, for open water pond areas. All other Manning's *n* values follow the list in Table 3-3.

Future work may consider additional adjustments for in-pond and pond border vegetation conditions. This work would be better performed using a two-dimensional model given the complexity of the confluence and the impacts of the marshes, ponds, and vegetative rings that will surround the open water ponds. It is recommended that a two-dimensional model of the confluence area be run to better ascertain the impacts of the ponds and resultant vegetation.

Tres Rios PED
Future Condition With Levee & Pond Water Surface Profiles
Lower Gila

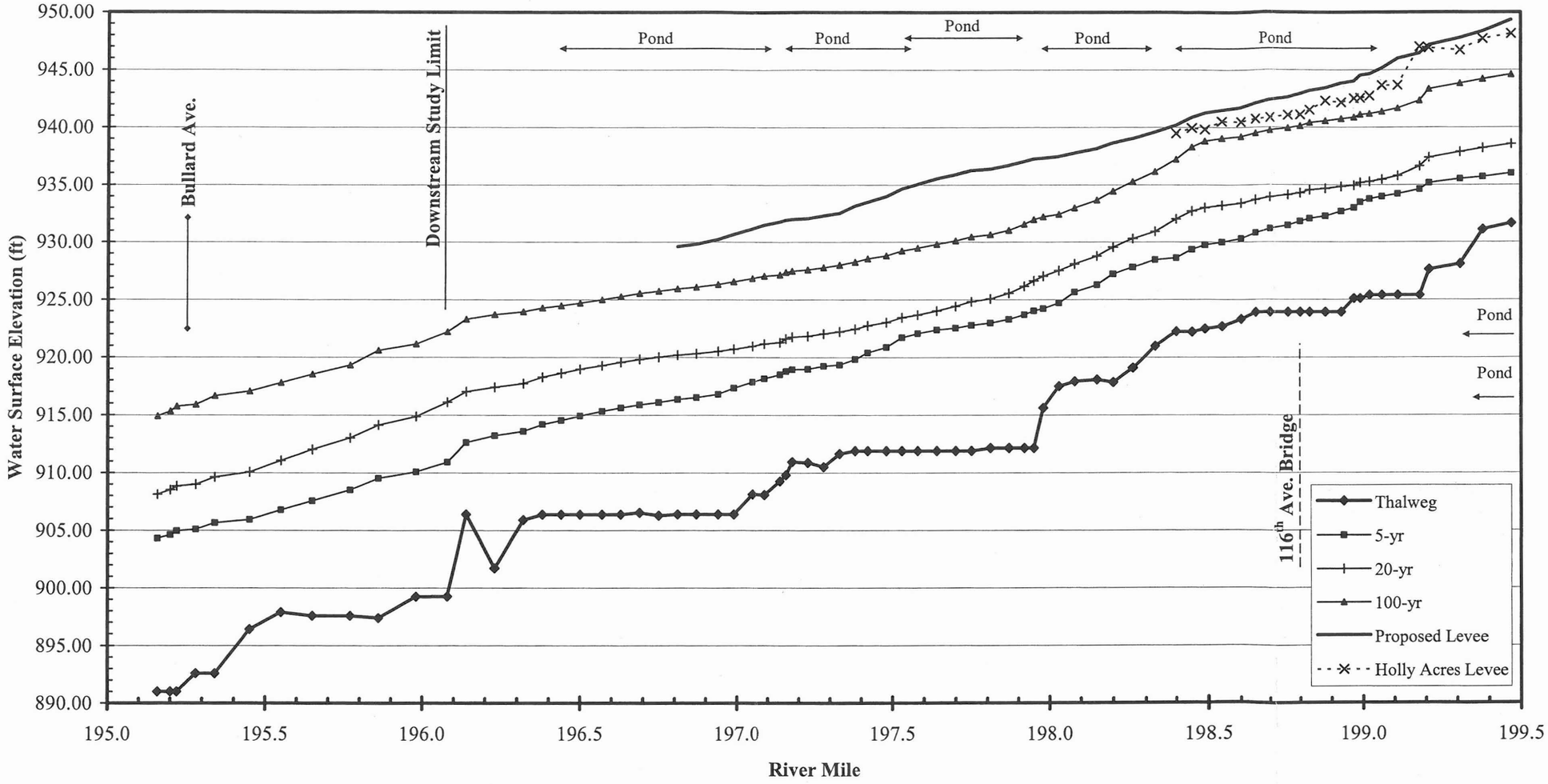

Figure 4-6. Future Condition With Levee & Pond Water Surface Profiles – Lower Gila

Tres Rios PED
Future Condition With Levee & Pond Water Surface Profiles
Salt

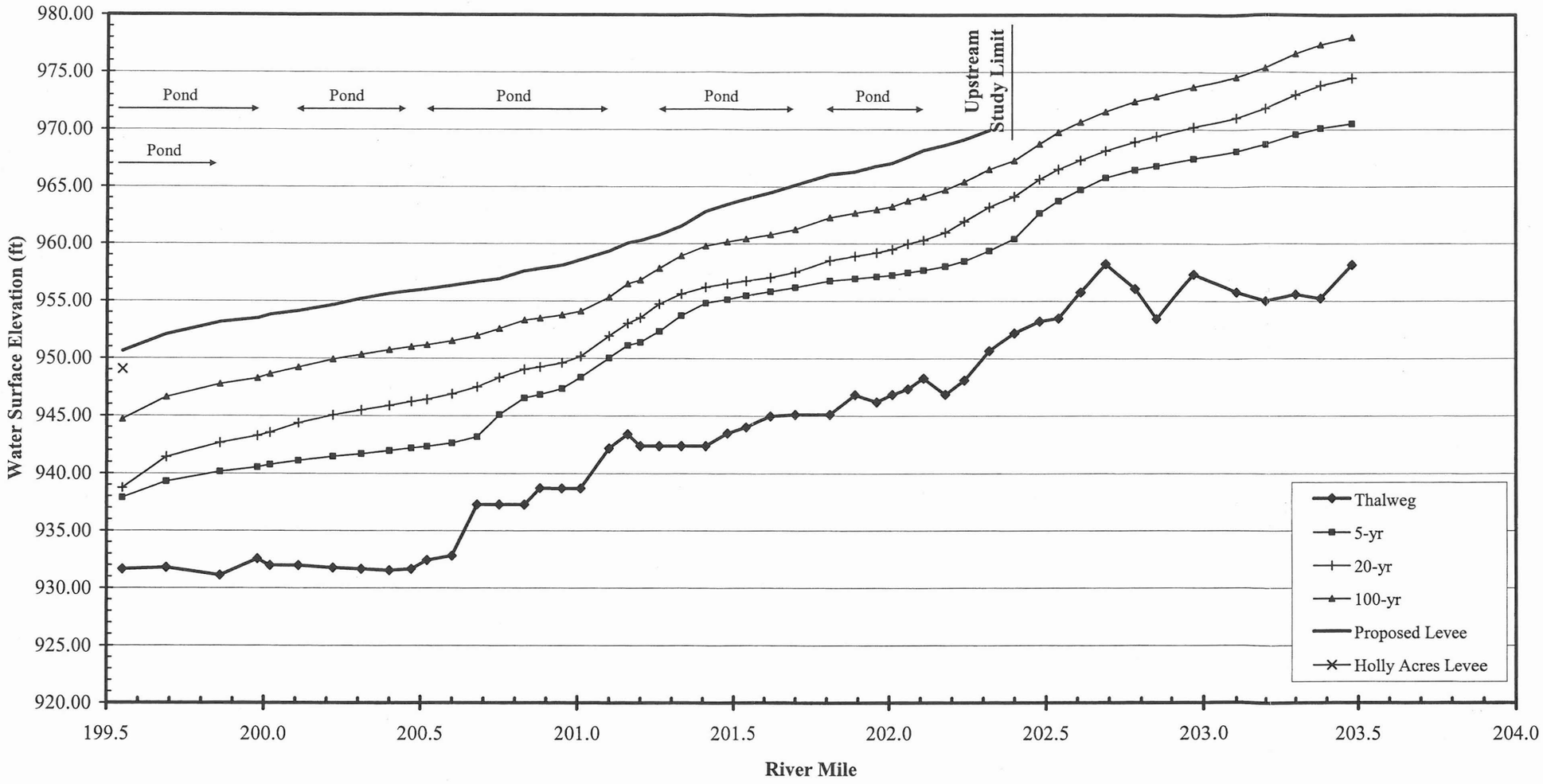

Figure 4-7. Future Condition With Levee & Pond Water Surface Profile - Salt

Tres Rios PED
Future Condition With Levee & Pond Water Surface Profiles
Upper Gila

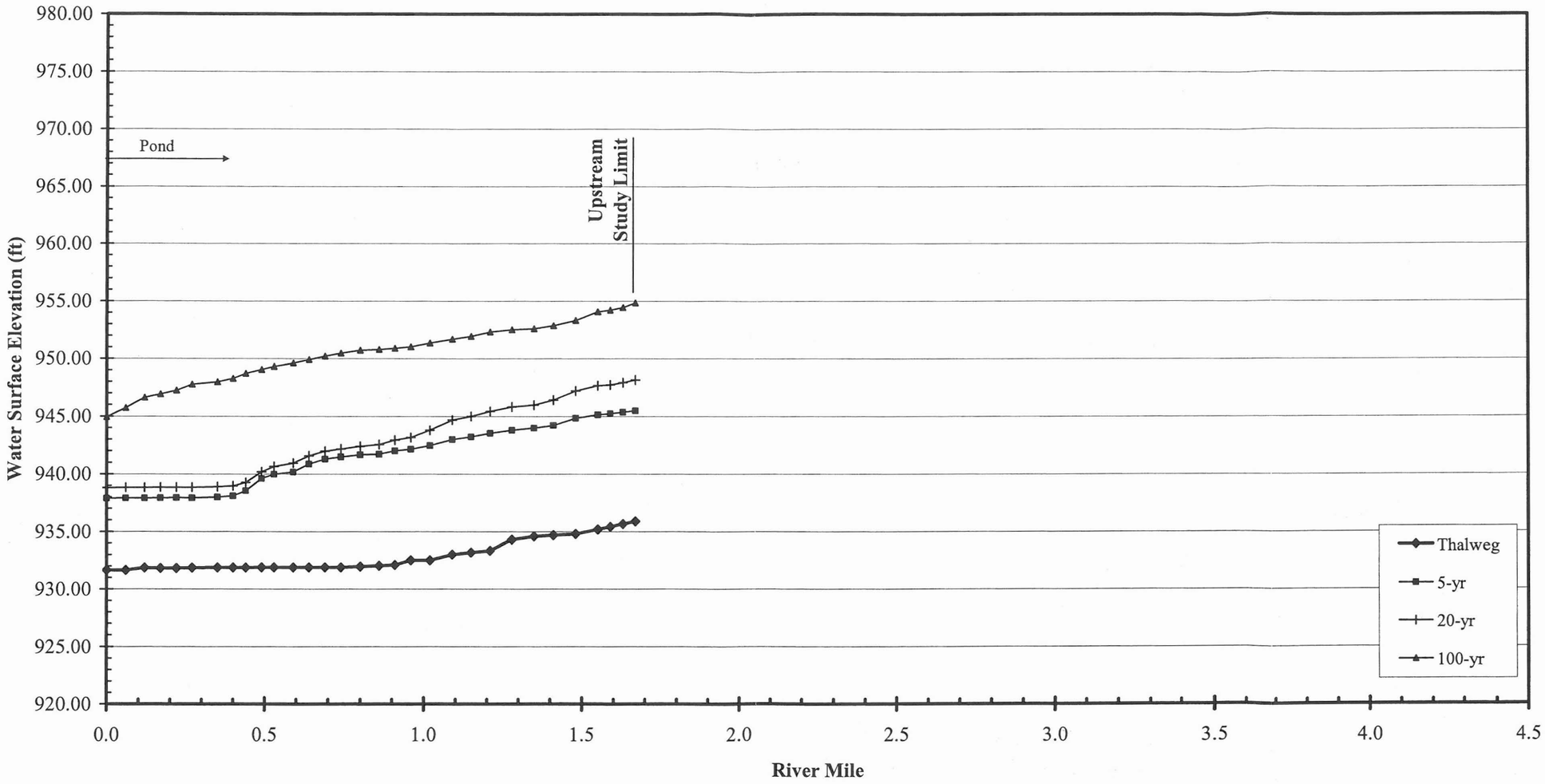

Figure 4-8. Future Condition With Levee & Pond Water Surface Profiles – Upper Gila

Tres Rios PED
100-year Water Surface Profiles, All Three Study Conditions
Lower Gila

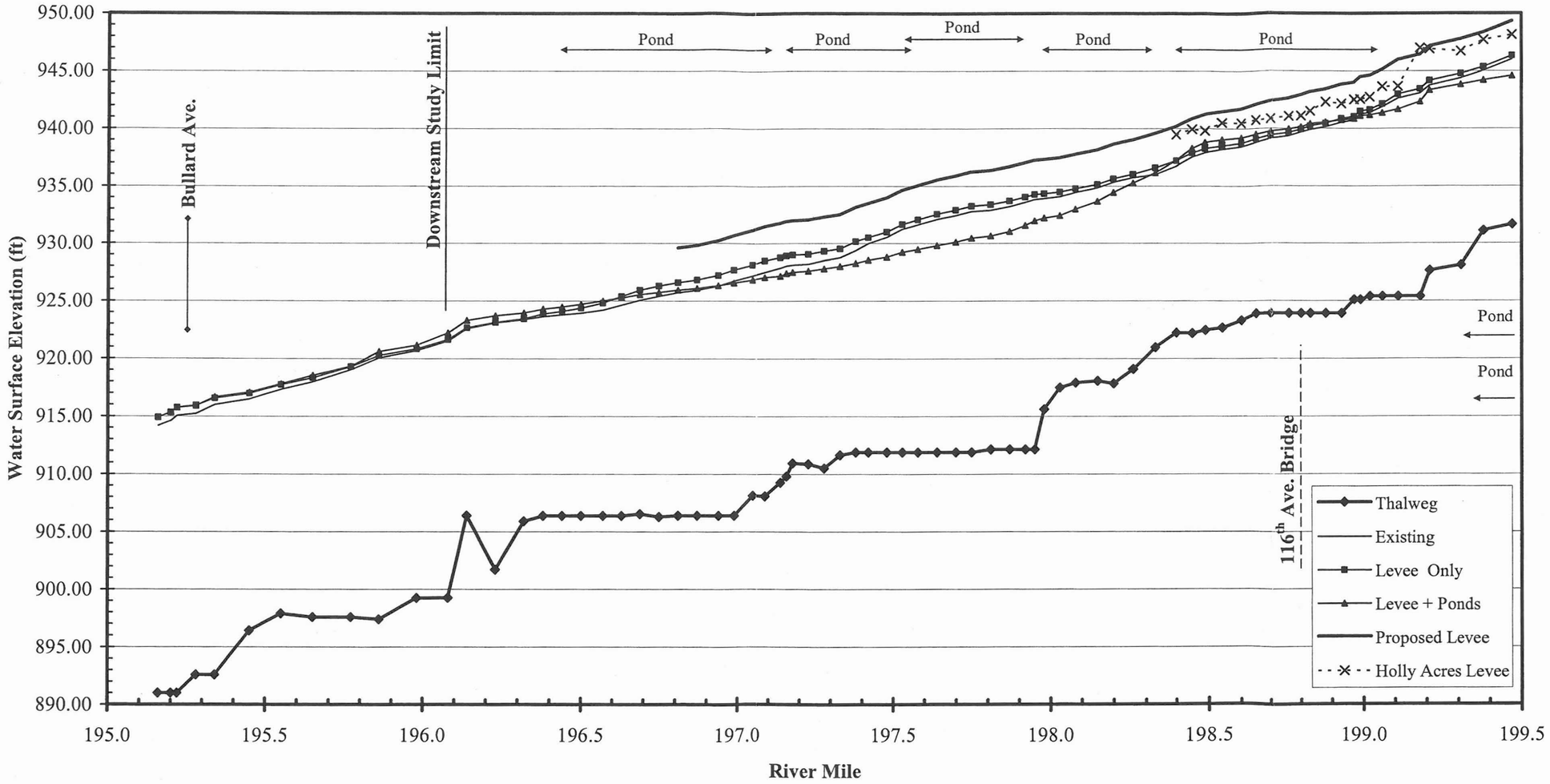

Figure 4-9. 100-year Water Surface Profiles, All Three Study Conditions – Lower Gila

Tres Rios PED
100-year Water Surface Profiles, All Three Study Conditions
Salt

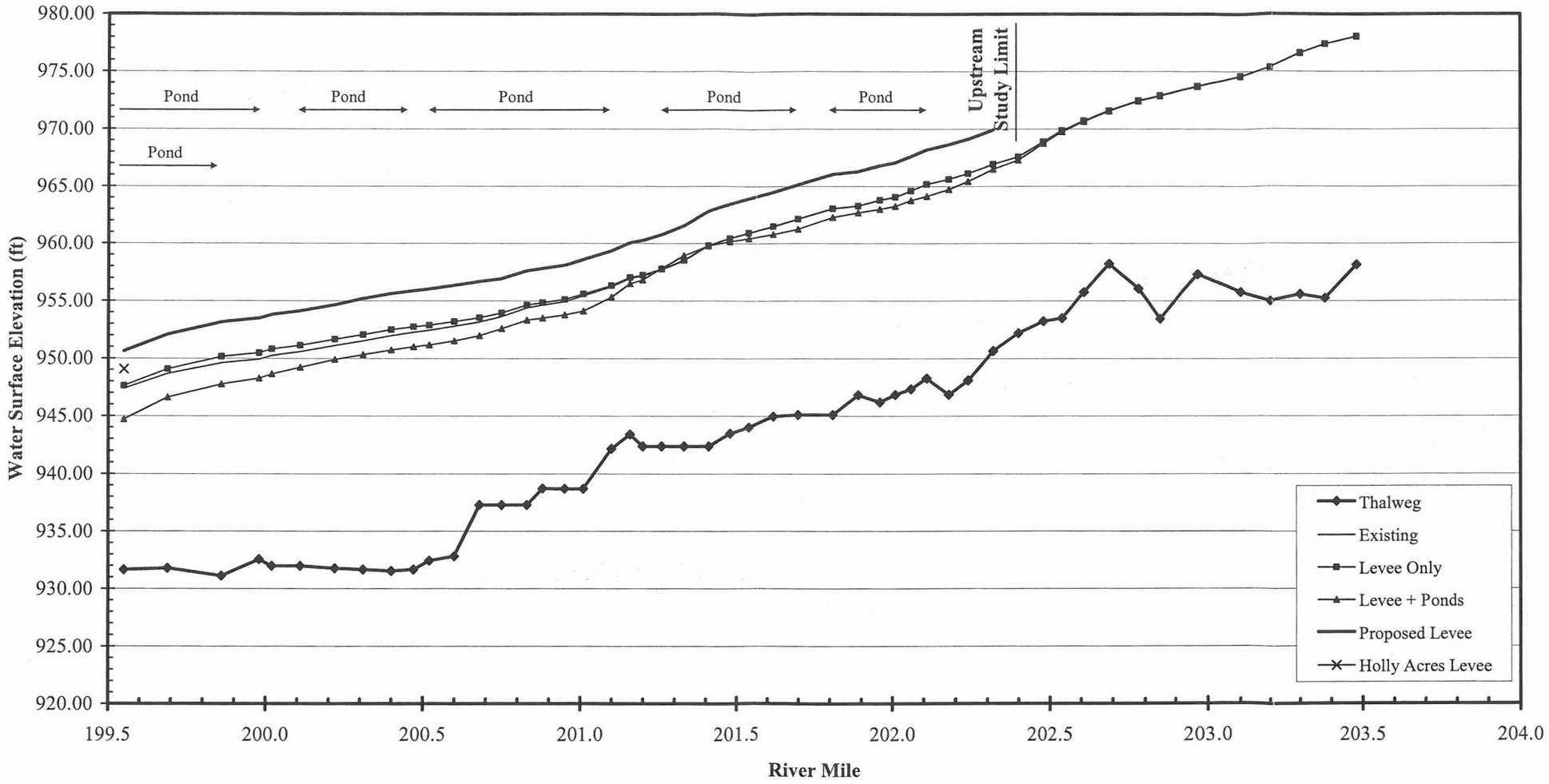

Figure 4-10. 100-year Water Surface Profiles, All Three Study Conditions – Salt

Tres Rios PED
100-year Water Surface Profiles, All Three Study Conditions
Upper Gila

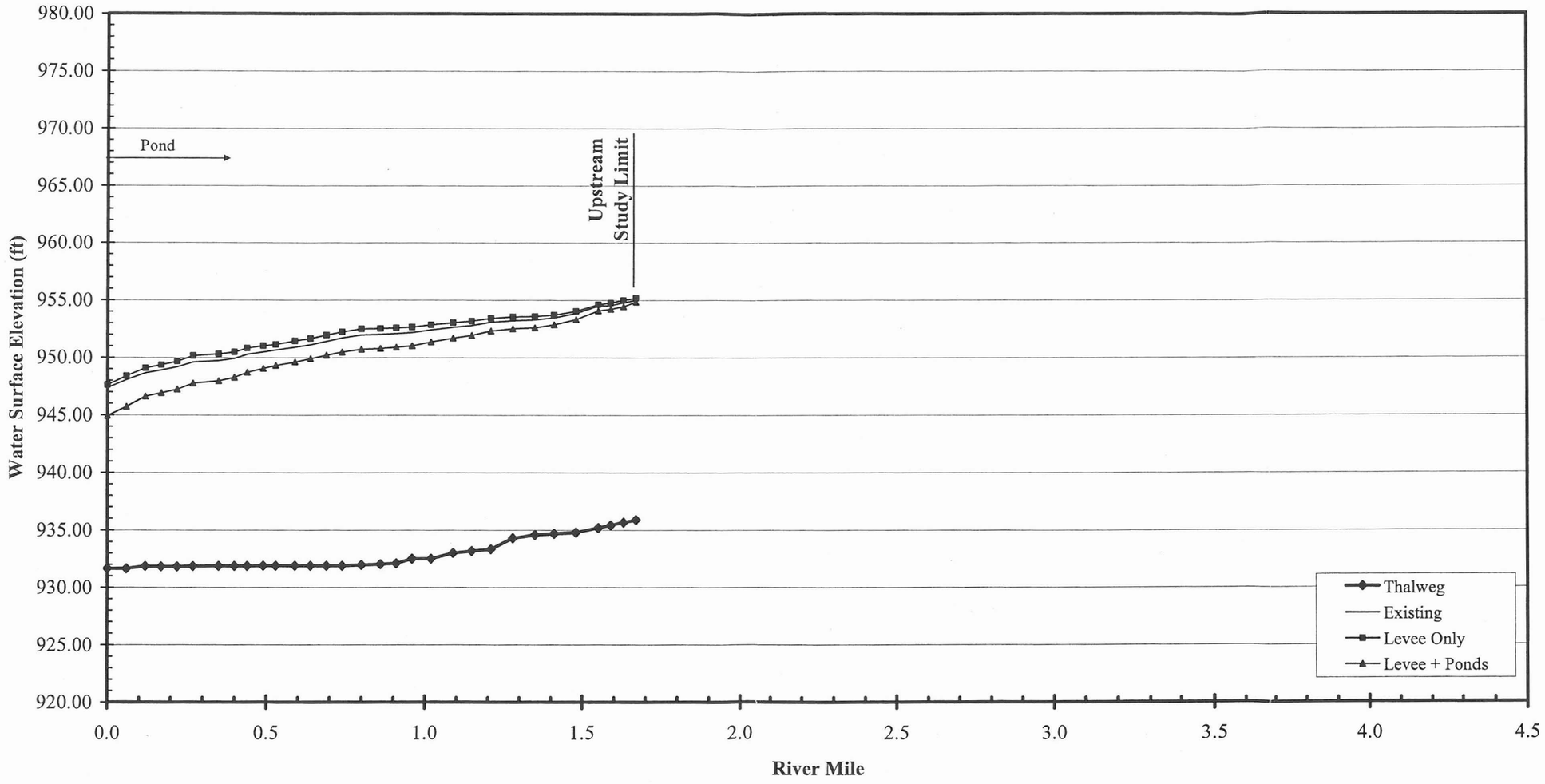

Figure 4-11. 100-year Water Surface Profiles, All Three Study Conditions – Upper Gila

4.1.2. Inundation Mapping

The existing and proposed (with-levee and with levee & open water ponds) conditions models were run for the 100-year flood event using the peak discharges from the "Tres Rios Feasibility Studies," (U.S. Army Corps of Engineers, 2000) as shown in Table 3-1.

The model results were exported from HEC-RAS into ArcView to delineate the 100-year inundation boundaries using the post-processor in HEC-GeoRAS. The resulting inundation boundaries were then inspected and edited using HEC-GeoRAS and AutoCAD to remove spurious data. Existing and proposed conditions floodplain delineations are shown in Appendix P.

The west end of the levee meets the existing Lower Buckeye Feeder Canal west of Dysart Road at the Southern Avenue alignment. During inundation mapping it was thought that this canal would contain the 100 year flood waters. The topography did not, however, contain enough of the canal to be certain as to whether the canal would contain the flood or not. During the November 6, 2002 field reconnaissance, the existing canal on the north bank in the downstream section of the Lower Gila was inspected and it was decided a survey would be required. The elevation data for the south bank of the canal north of approximately midway between Southern Avenue and the portion of the canal running due east (See Figure 4-5) was not included in the original survey and was obtained by survey subsequent to the site visit above. Subsequent review and analysis indicated that the canal was not high enough to provide freeboard for the 100 year flood. Various alternatives for a tie in were evaluated to view how to most efficiently tie the west end of the levee into high ground. This is discussed in more detail in Section 6 of

this report. Inundation mapping contained in Appendix P assumes the canal will protect against flows moving around the west end of the levee.

5. Sediment Transport Analysis

5.1. General

The objective of the sediment transport analyses was to evaluate baseline and future sediment conditions to identify the impacts of the preferred project alternative. A base conditions sediment transport model was developed and adjusted to insure hydraulic similarity between the sediment transport model and the HEC-RAS model. The HEC-6T model used the geometry from the existing conditions hydraulic model described in the previous sections as well as Manning's *n* values and other features. The sedimentation model was then adjusted as necessary to reproduce water surface elevations in the RAS model. This procedure was performed for each existing and plan condition modeled.

The bed material in the study reach is composed primarily of sand and gravel. Sand is the main transport size, but there is also a high percentage of gravel in the bed. Based on the analysis of the material the Toffaleti – Meyer-Peter Muller (TMPM) combination transport method was used in the sediment transport simulations. This method transports gravel as well as sand and is well suited for this type of a river system.

The computer program HEC-6T: "Sedimentation in Stream Networks", version 5.13 (2002), was used to conduct the numerical sediment transport modeling. Copeland's solution of the Exner equation (EXNER 7 HEC-6T option) is used in the sediment transport simulations to enable armoring to occur.

5.2. HEC-RAS Model Conversion

5.2.1 Model Geometry

The geometry of the HEC-RAS hydraulic model was converted into a text file with the format required by the HEC-6T program. Roughness coefficients (Manning's *n*) in the cross sections of the river models were varied with depth. After running the 5-, 20- and 100-year flood events in HEC-RAS, the profile output tables were used to extract conveyance weighted Manning's n values for the channel, the left and the right overbanks for the different discharges. The modified data was then entered into the HEC-6T input file using NV records. A default value of 0.04 was used to fill blanks when the conveyance in an overbank area was zero. The result was a configuration of roughness coefficients changing vertically by discharge rather than horizontally by distance as in the HEC-RAS models.

Conveyance limits defined in HEC-RAS using 5-year-discharge ineffective flow boundaries were coded in HEC-6T using XL records. The advantage of using XL record is that it allows deposition to occur in the ineffective flow areas. X3 records were used to set the encroachment limits or prevent flow into areas protected by natural or man-made levees. The upstream and downstream bridge cross sections from the HEC-RAS model were retained.

Using normal flow considerations, an elevation-discharge Rating Curve was developed at the downstream boundary of the Lower Gila River (cross section 195.16) for starting water surface elevations. The rating curve at this point was generated for discharges ranging from 0-225,000 cfs, at 7500 cfs increments for a bed slope of 0.002 ft/ft (Figure 5-1).

5.2.2. Fixed Bed Model Calibration

Initially, the HEC-6T model was calibrated with a fixed bed using the 5-, 20- and 100-year flows, and the resulting water surface profiles were compared to the HEC-RAS Existing Conditions (Condition 1) results. For the purpose of north levee design, an effort was made to keep the difference in water surface elevations within 0.1 ft. This was accomplished by setting the Manning's *n* equal to 5 in the overbank areas for the 5-year and 20-year flows (i.e. ineffective flow areas for low flows) and calculating the corresponding effective depth across the channels. Adjustments of Manning's *n* were performed for calibration purposes for all cross sections beginning with the downstream section in the Lower Gila reach. These adjustments were performed to reach agreement between the HEC-RAS and HEC-6T water surface elevations and channel velocities.

The hydraulic comparison results from this analysis are given in Appendix H.

5.3. Sediment Data

The decisive factor in selecting the proper sediment transport function was based on available bed gradation and maximum grain size. Initial data received from the U.S. Army Corps of Engineers Los Angeles District supported a maximum grain size diameter of 76mm. Bed material in the project location is comprised of sand and gravel, making it necessary to use an appropriate transport function. A combination of the Toffaleti and Meyer-Peter and Muller (TMPM) transport functions was used in the study. This combination accounts for sand and gravel, giving a higher, realistic measure of total sediment concentration (and thus total sediment load) and was compared with Yang's method for the study area. Based on field observations, to facilitate modeling and to

represent larger diameter cobbles noted in the bed, a maximum grain size of 300mm was used in the final sediment transport runs in HEC-6T.

5.3.1. Bed Sediment Characteristics

Data for the particle size distribution of the bed sediment is required to drive the sediment transport model. The Corps of Engineers and WEST personnel collected 22 surface samples (on September 4 and 16, 2002) along the Salt and Lower Gila reaches of the project area. Surface sample ID's are SS1, SS2, etc. September 4th sampling locations ranged from densely vegetated areas within the banks (i.e. SS1, SS5, SS6, and SS7), to channels completely denuded of vegetation and with an armored surface layer (i.e. SS2, SS3, SS4, SS8, SS9, and SS10). Out of the above mentioned samples, SS1, SS4, SS6, and SS7 were discarded for poor data (mostly sand). Sample SS10, was beyond the project boundary and was disregarded. Observations indicate areas of dense vegetation contain finer sediment beds, providing evidence of the ability of vegetation to prevent erosion and promote deposition by trapping fine particles.

Samplings of September 16th cover the entire Salt-Lower Gila reach and were identified as SS12, SS12A, SS13 through SS19, and SS21 through SS23; with SS19 missing. Due to reasons discussed above, samples SS12, SS16, and SS19 were also eliminated from the analyses.

Sediment samples were also collected from the upstream portion of Upper Gila at the Santa Cruz Road crossings of the Santa Cruz River and Gila River. This location is approximately 10 miles upstream of the Salt-Gila confluence. Ricker Atkinson McBee & Associates performed sieve analysis on these sediment samples and provided the sediment gradations. The data indicates that the sediment contains mostly fines. The

locations where samples were obtained are very densely vegetated with salt cedar and deposition of fines can be expected due to slowing of the flow as it moves through the vegetation. If the salt cedar vegetation is removed in the future, the fines will be carried by the flow resulting in a coarser sediment gradation in the Upper Gila. The samples were collected from areas where the bed surface had been removed to a depth of five feet or more and the material evidenced along the edges of the excavations indicated that the fines extended at least that far into the bed. Along the Santa Cruz River, however, cobbles up to 14 inches in diameter were noted in areas where sediment had been removed to depths of 8 to 10 feet. It is expected that the original bed material is similar to that found in the confluence area and downstream from the confluence. The fine material is estimated to be from 5 to 10 feet deep over the original bed material, however. Based on these observations the sediment gradation from the confluence was used for the Upper Gila and data from the samples obtained at the Santa Cruz Road crossings were disregarded in the modeling effort.

The size class of the material sampled on the Gila does, however, have major implications for maintenance of the ponds in the confluence area. Since the material is extremely fine it will likely have little commercial value and the removal of the material from the pond at the confluence will be expensive. Based on this and the fact that the pond will act as a sediment trap, it is recommended that the pond at the confluence be eliminated from the construction plans.

Available sediment gradation data is shown in Appendix J and sample locations are shown on the existing condition maps in Appendix P. At locations with high spatial variability of sediment characteristics, more than one sample was taken representing

different types of bed material along a cross section. In these cases, the resulting gradation from the samples was combined into a single averaged gradation curve for use in the HEC-6T model.

5.3.2. Inflowing Sediment Load

The sediment transport model cannot be directly calibrated to historical conditions because detailed historical bed elevation data are not readily available, and the bed elevation changes have been influenced by man-made changes to the Salt River. The HEC-6T model requires input of the bed material load at the upstream limit of the project reach for the entire range of discharges. For this purpose, the following estimates of inflowing sediment load were considered: 1) equilibrium sediment load from representative cross-sections near the upstream end of the Salt and Upper Gila model limits; 2) outgoing sediment load from the Rio Salado Oeste HEC-6T Model (WEST Consultants, 2002) as inflowing load at the upstream end of Salt River (Rio Salado Oeste is immediately upstream from Tres Rios); and 3) sediment inflow used in the Rio Salado Study as inflowing load at the upstream end of Salt River (WEST Consultants, 1999). The sediment loads were estimated for a range of discharges up to 200,000 cfs for the Salt and 100,000 cfs for the Upper Gila.

Although the upstream project limit in the Salt River is at River Station 203.48, the equilibrium load run was performed between River Stations 201.41– 202.11 to avoid influences from a gravel pit immediately upstream of 83rd Avenue. This process was repeated for a longer reach of the upstream cross sections of the Salt River to verify the stability in the corresponding bed-change elevation.

Initially, HEC-6T was run for three years using clear water inflow as the initial condition and the recirculation option ($RE record). The recirculation option instructs the program to use the sediment discharge at the downstream end of the reach as the sediment inflow at the upstream end for the following time step. When equilibrium is attained, sediment load entering the reach is about equal to the load leaving the reach. The estimated load from the initial run was input to a model with the recirculation option turned off, and simulation was performed over a period of two years. The initial estimates of sediment load and the gradation were adjusted until the changes in the bed elevations between the River Stations 201.41 and 202.11 were minimized.

The procedure described above was repeated for the Upper Gila River between River Stations 1.48 and 1.67.

The inflowing sediment loads generated using the Toffaleti – Meyer-Peter and Muller (TMPM) sediment transport function are shown in Figures 5-2. The gradation of the inflowing load from the equilibrium analysis is shown in Figures 5-3 and 5-4. In Figure 5-2, the largest inflow load representing the conservative scenario from the levee design point of view is provided by the outgoing sediment load from the Rio Oeste Model. Therefore, this sediment load was selected as the inflowing load at the upstream end of the Salt River which was entered into the HEC-6T input files using LQ, LT and LF records for long term sediment transport analyses. A sensitivity analysis to the inflowing sediment loads was performed and is presented in Section 5.5.

5.3.3. Movable Bed and Erosion Limits

In general, sediment dynamics tend to be more significant within the active channel, where the bed can either degrade or aggrade in response to erosion or

deposition. The overbank areas tend to be more stable and normally are free of erosion, but can experience deposition. HD records were used to specify a bed sediment depth of 25 feet for all cross sections. Movable bed limits were identified at the boundary of the main channel in HD records. The movable bed limits extend beyond the 5-year low flow channel (regime channel) and the defined bank stations. During high flows, significant deposition and scour was expected to occur within the movable bed limits but not expected to extend to the overbank areas.

Average bed elevations were generated using 50-year period-of-record flow within the movable bed limit bank limits. This allowed wetting of the movable bed cross sections and provide average elevation across the cross section.

5.4. Hydrologic Data

A 105-year (1889-1993) series of hydrographs at the Salt-Gila confluence consisting of historical flows was developed by WEST. These hydrographs were based on a series of hydrographs obtained from the U.S. Army Corps of Engineers. A 50 year series was available from the earlier WEST Tres Rios study and hydrographs for an additional 55 years were adapted for use in this study. The outstanding balance of fifty-five years of partial hydrographs was fully reconstituted by reconstructing each of the respective hydrograph's rising limbs and tails. The complete record was developed by inserting the historical Gila River period-of-record hydrographs at the appropriate time line locations for the Salt-Lower Gila River record.

The Salt inflow was obtained by routing the available hydrograph downstream of Granite Reef diversion dam. Modifications were made to the hydrographs by WEST as

described above in order to extend the data. Hydrograph ordinates were obtained at 6-hour intervals from the U.S. Army Corps of Engineers' DSS software.

Hourly hydrologic data for portions of the record for the Upper Gila were obtained from U.S. Army Corps of Engineers, Los Angeles District. Hydrographs for the available data were plotted at six hour intervals over the 105 year period and are shown in Appendix J.

The USGS historical record for the Gila River near the confluence extends only to 1940 and was estimated by various means for the period prior to 1940. The influence of the hydrograph is not, however, extremely significant in the comparisons between ending bed elevations. The flows were estimated by various means including using a percentage of flow on the Salt as was used on the feasibility study performed in 1999, repeating the 1940-1992 hydrograph, using a combination of the percentage of flow on the Salt with historical events on the Gila being estimated and patterned after the 1983 Gila River flood hydrograph.

5.5. Sensitivity Analysis

A sensitivity analysis was performed with the objective of exploring the sensitivity of the sediment transport model to variations in the parameters, in an attempt to determine the appropriateness of the selected values. Sensitivity runs were performed on the base conditions HEC-6T input file to determine the relative effect of inflowing sediment load, Gila River hydrograph, and Manning's *n* values. Results are given in Appendix K.

The Manning's *n* values were varied between 80 % and 120 % of the values used in the base conditions model. The results show that there is not a significant change in

the average bed elevations due to changes in the Manning's *n* values except at the upstream end of the Salt River and Upper Gila. At these locations, the higher values of Manning's *n* resulted in more deposition since higher values of Manning's *n* causes the flow to slow down.

The model sensitivity to changes in the inflowing load was investigated by considering 50 % and 150 % of the selected sediment load. Sediment simulations were performed for the different sediment inflow loads for 105 years and a comparison of the average bed elevations is presented in Appendix K. As anticipated, the results indicate that the erosion decreases with increasing sediment loads. The differences between the results obtained by using the different load curves are more significant near the upstream end of the Salt River with deposition in the first few cross sections. The model likely deposits in this reach due to the influence of the upstream gravel pit on the bed geometry under existing conditions. The deposition at the upstream portion of Upper Gila can be attributed to the fact that this area is densely vegetated with salt cedar resulting in the use of high Manning's *n* values. As a result, the flow is slowed down resulting in significant deposition. The differences in the average bed elevations tend to reduce significantly towards the downstream end of the Lower Gila. This indicates that the effect of the inflowing load does not influence the sedimentation near this region.

When the various estimates of the historical Gila hydrology were compared (see discussion in Section 5.4), the largest differences in bed elevation were noted when flows on the Gila were set to a percentage of the flow on the Salt for the period from 1889 to 1940. Even this impact accounted for only small changes – usually less than one foot - in the final bed elevations along the Salt and Gila Rivers. When the 1940 to 1992

hydrograph was used in place of flows from 1889 to 1939 (i.e. the 1940 to 1992 hydrograph was run twice end to end to simulate 105 years) there was no significant change in final bed elevations between the single record and the repeated record ending bed elevations. This indicates that the sediment model and river are fairly stable and changes in the inflowing hydrograph do not have major impacts on the sediment transport results.

5.6. Computation Options in HEC-6T

The supercritical option ($SCRT card) was turned off in the HEC-6T model to prevent supercritical velocities, which could produce unrealistic scour depths, from being used in the sediment transport calculations.

The $SMOOTH command was also used to prevent the cross section geometry from becoming irregular (i.e., having spurious spikes) during the simulation. The command instructs HEC-6T to test the slope across the movable bed versus the angle of repose for sand. An angle of repose is calculated between each set of coordinates using the initial cross section stations and elevations. The HEC-6T program assumes the bed material to be sand and assigns a value of 0.3 as the angle of repose. When the calculated values are larger than 0.3, the computed angle of repose is used to calculate the slope between cross section stations. This results in more uniform cross sections while not impacting the average bed elevations.

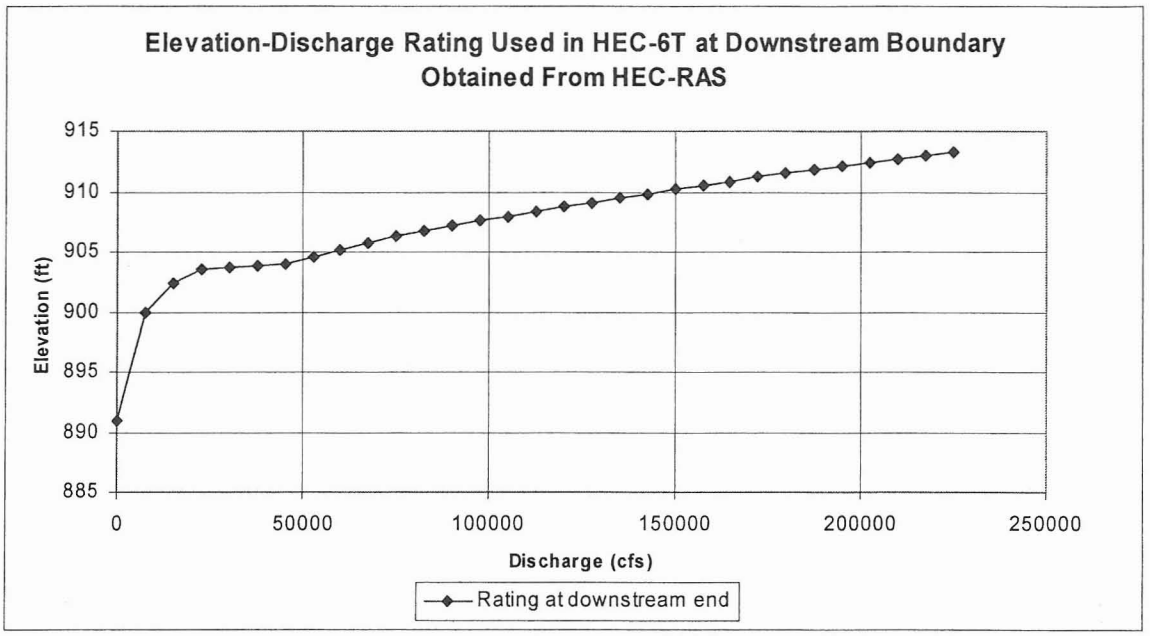

Figure 5-1. Downstream Boundary Condition

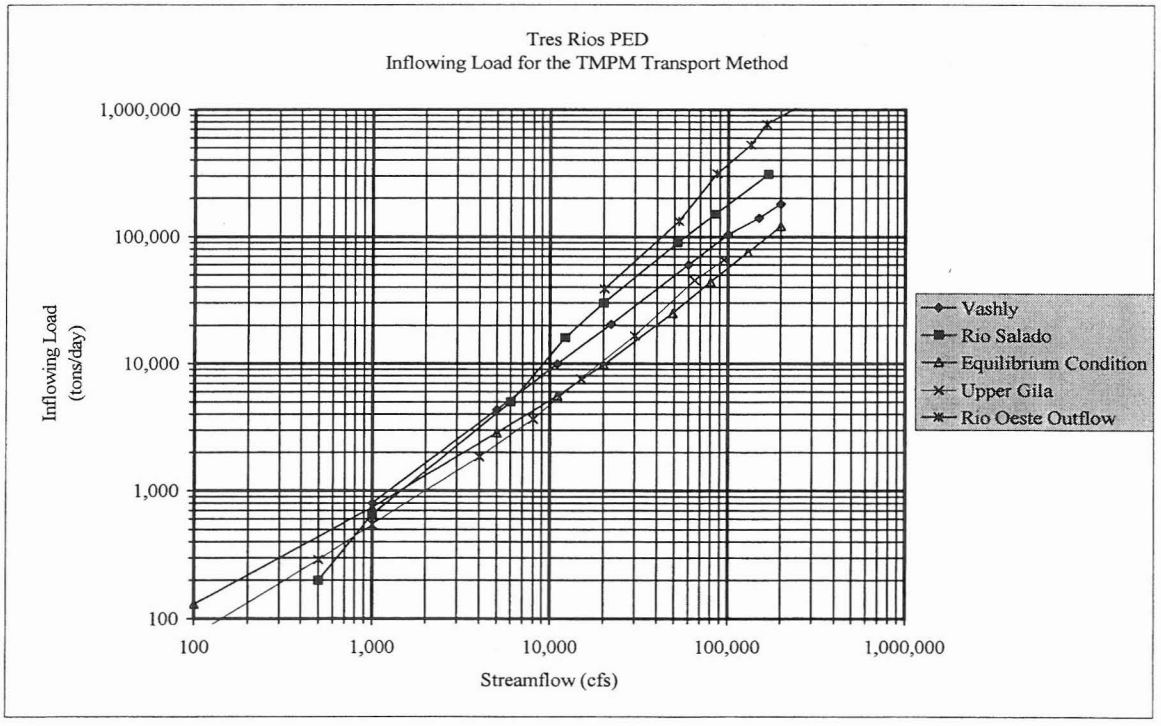

Figure 5-2. Salt River Equilibrium Sediment Loads

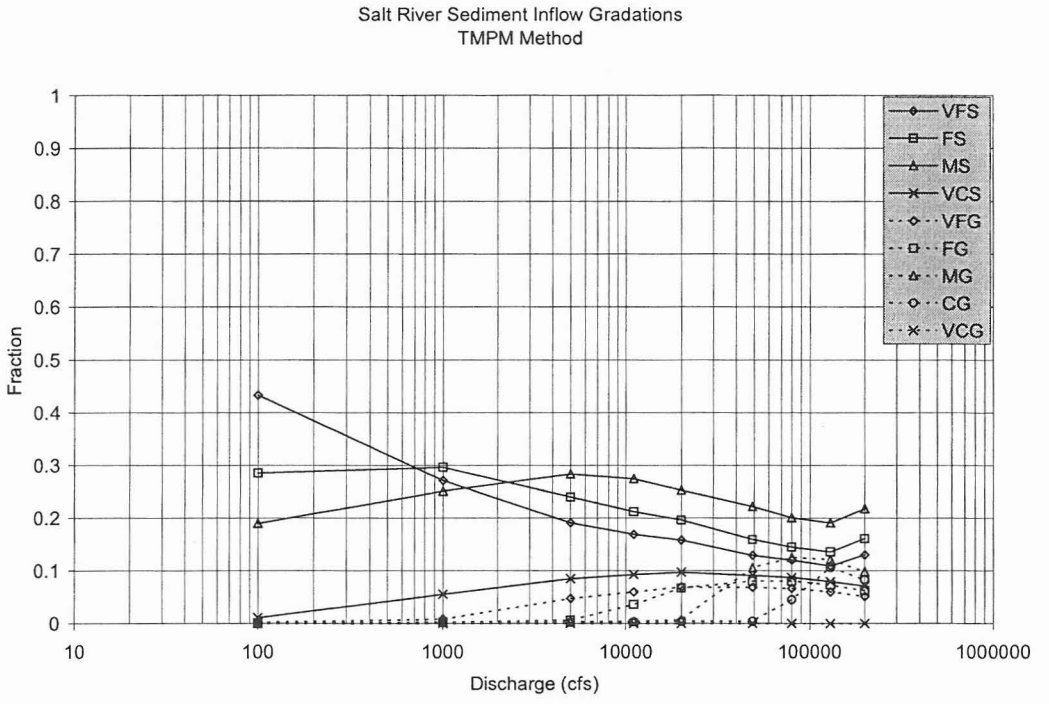

Figure 5-3. Salt River Sediment Inflow Gradations

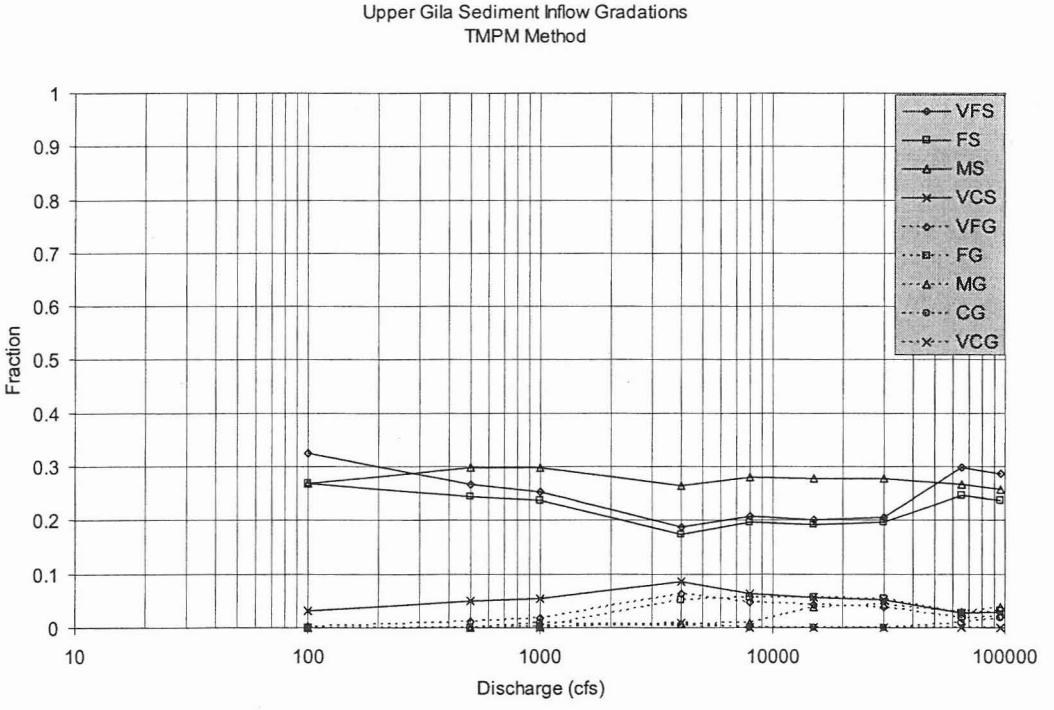

Figure 5-4. Upper Gila Sediment Inflow Gradation

5.7. Existing Conditions Sediment Results

The HEC-6T model simulation was performed for 105 years with two major events of 1891 and 1993. The results show an overall lowering of the average bed elevations indicating potential for erosion in most areas. The model responded to the 1891 event with deposition along the study reach during the first part of the flood hydrograph followed by erosion during the latter part. However, no significant change was noted for the 1993 major event, indicating a general stability of the reach in response to recent floods.

A notable sediment accumulation was seen on the high ground in the center of cross section 197.09 during the 1891 event. Since the high ground was approximately in the middle of the channel, the sediment brought in by the large event was deposited on top, and the model did not show any degradation of the deposited sediment for the subsequent runs through 1993. The final results showing accumulation at 197.09 may also be due to the way HEC-6T calculates average bed elevation using the cross-section data between the bank stations only and not considering any changes in the cross-section outside the bank stations. The effect of this was an average bed elevation for the noted cross section that does not show any temporal change. Other parts of the Salt-Lower Gila reaches did not show significant deviation from the expected results presented in this report, given the nature of the reaches, existing ponding conditions, and braiding. The Upper Gila being heavily vegetated, the long-term average bed elevation did not show significant variation.

5.8. Levee Only Sediment Results

The analysis of the Levee Only condition indicates that changes in bed elevations due to changes in flow conditions as the result of the levee are minimal. The comparison is shown in Figures 5-5 through 5-7. The only difference is noted at river mile 198.3 where two cross sections show a significant difference of 1.5 to 3.0 feet. This difference appears to be a model problem rather than a difference between the conditions modeled. Another model anomaly appears at cross section 197.09 as described above for the existing conditions.

5.9. Levee with Ponds Sediment Results

The sediment transport modeling for the future conditions with ponds was performed and the resulting changes in the average bed elevations are shown in Figures 5-8 through 5-10. In the Salt reach, the addition of ponds provides additional conveyance on the overbanks resulting in lower velocities within the channel. This results in an increase in the average bed elevations following deposition of sediments in this portion of the river. This deposition results in the depletion of the sediment load as the flow moves into the downstream portion. As a result of the upstream deposition, there is erosion in the Lower Gila as the flows tend to regain equilibrium by scouring to increase the sediment load that was lost due to deposition in Salt River portion of the model.

The location of the pond in the main channel of the Gila River immediately upstream of the 116th Avenue Bridge appears problematic from a sediment transport point of view. According to the sediment results, this pond will act as a sediment trap and retain nearly all sediment inflows from the Gila River during low flows. This could

lead to increased degradation downstream of the confluence. Additional modeling is needed, however, to evaluate the impacts of the ponds on channel stability. It is recommended that this pond be removed from the design for this reason as stated earlier in this report.

5.10. Post HEC-6T Inundation Mapping

Following sediment transport analysis, the resulting bed elevations were brought back into the HEC-RAS model and the HEC-RAS model rerun. The output from these runs can be seen in Appendix L. The inundation limits were then re-mapped using the same hydrology as the pre-sediment transport hydraulic modeling. The HEC-6T results were used to generate HEC-RAS models with geometry reflecting post-sediment transport conditions. These HEC-RAS models were then used to generate inundation mapping in the same manner as the pre-sediment transport results. Comparison plots showing inundation limits for both pre- and post-sediment transport conditions are shown in Appendix P.

Post-sediment transport inundation limits indicate that the lateral extent of inundation decreased in most locations throughout the study reach. These results are consistent with the overall trend of erosion and slight channel deepening indicated in the sediment transport analysis.

Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Existing vs Levee Only - Lower Gila

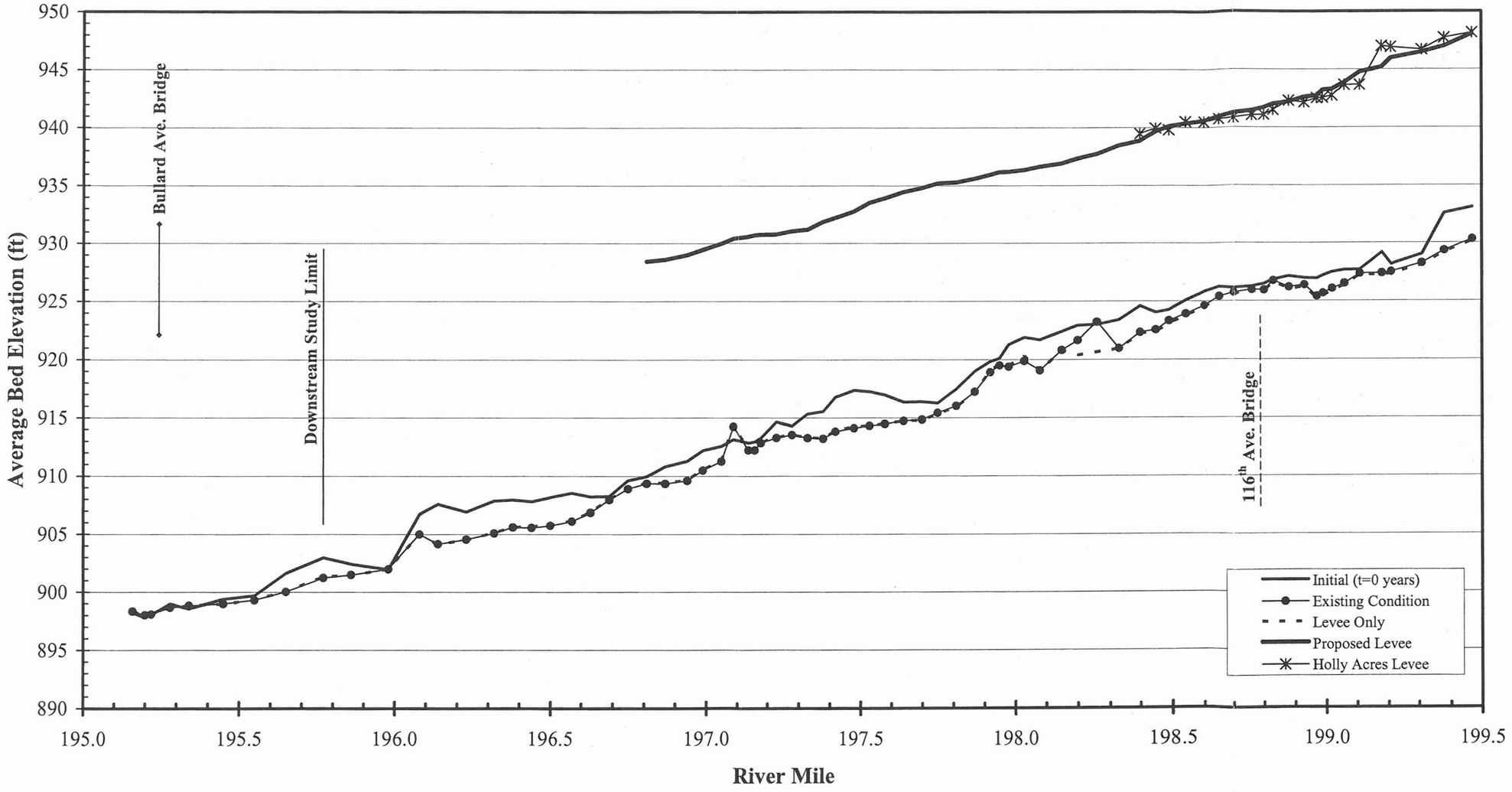

Figure 5-5. Average Bed Elevation Comparison After 105 Years – Existing vs. Levee Only – Lower Gila River

Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Existing vs Levee Only - Salt River

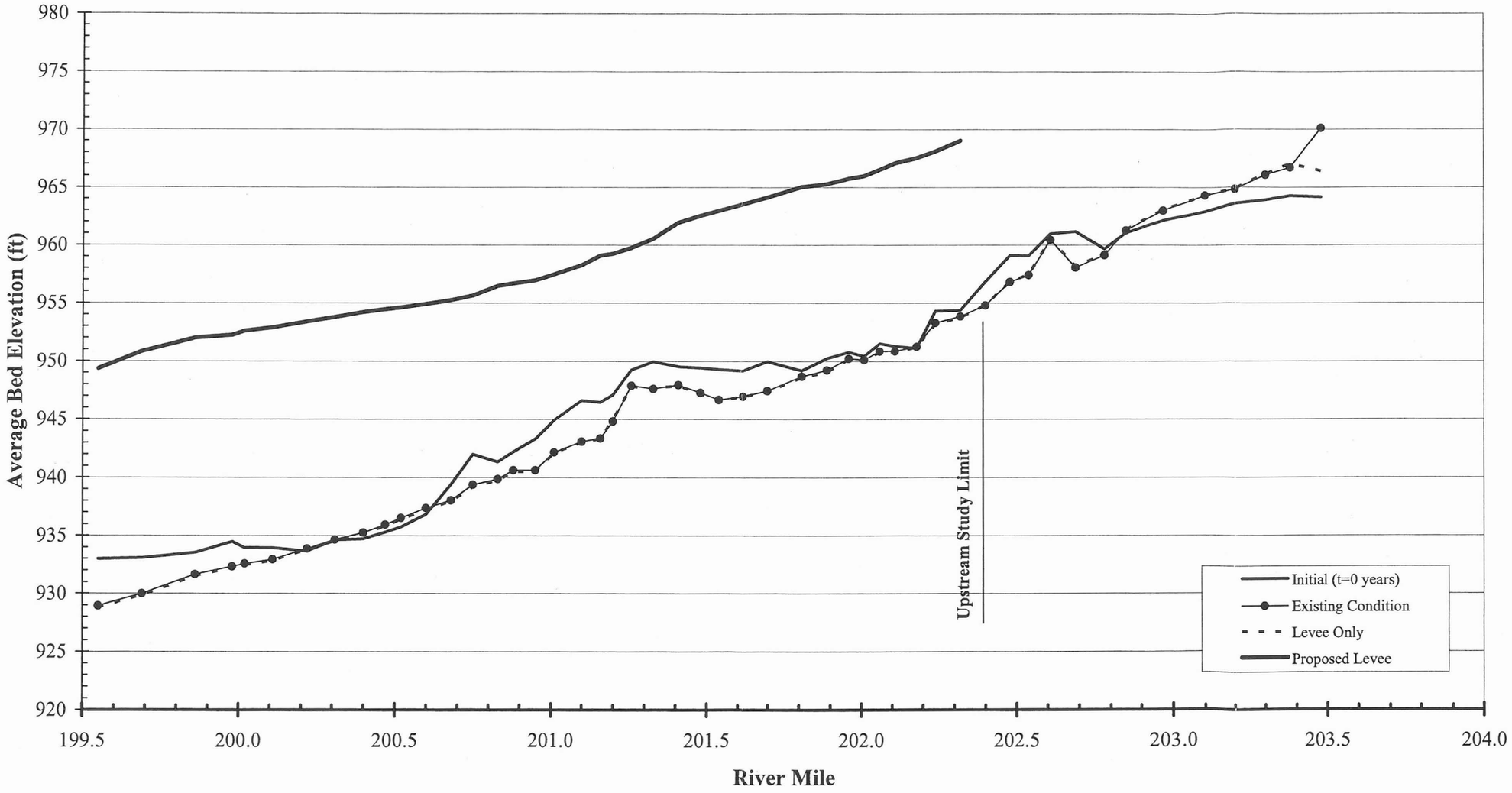

Figure 5-6. Average Bed Elevation Comparison After 105 Years – Existing vs. Levee Only – Salt River

Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Existing vs Levee Only - Upper Gila

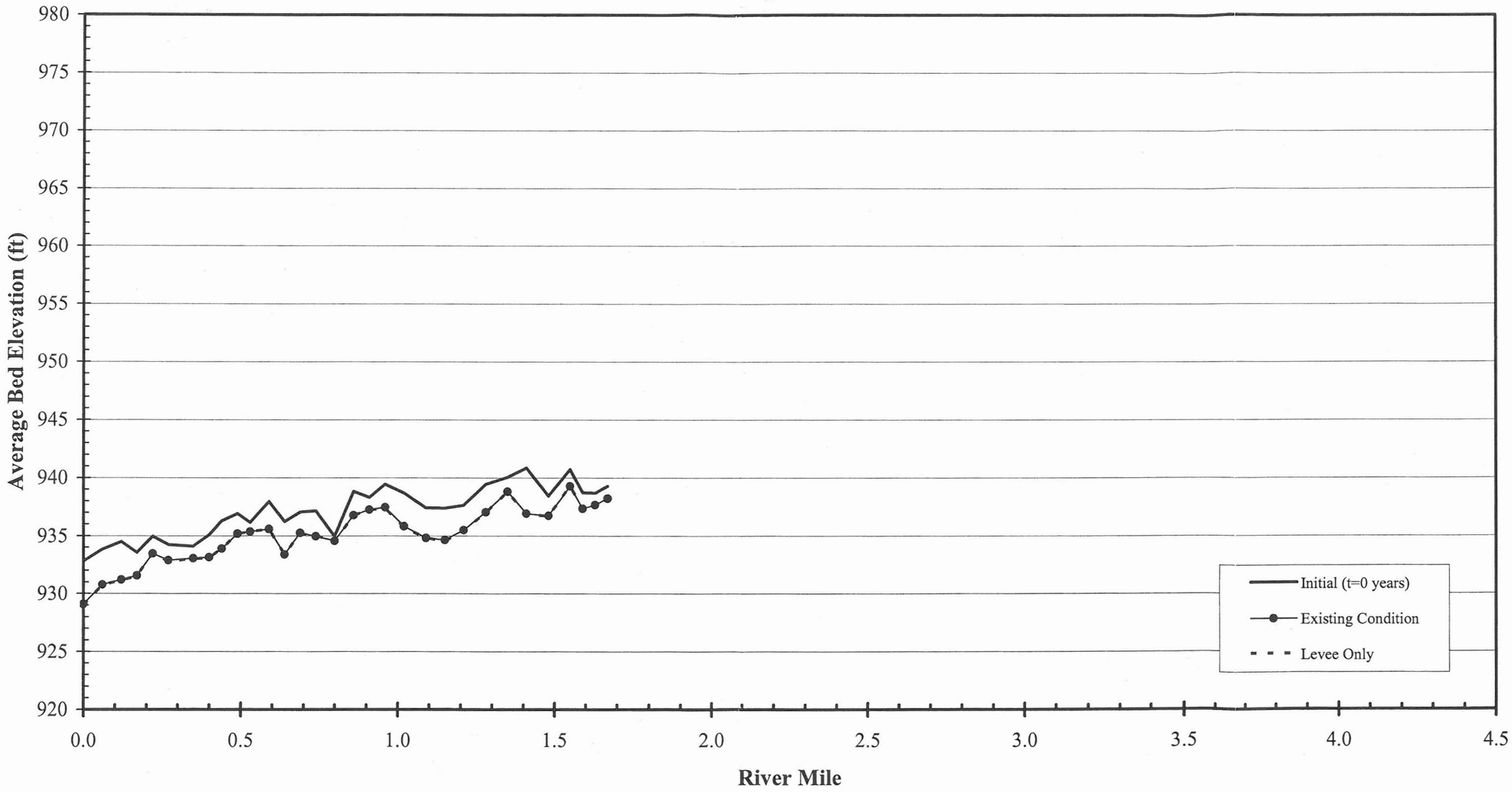

Figure 5-7. Average Bed Elevation Comparison After 105 Years – Existing vs. Levee Only – Upper Gila River

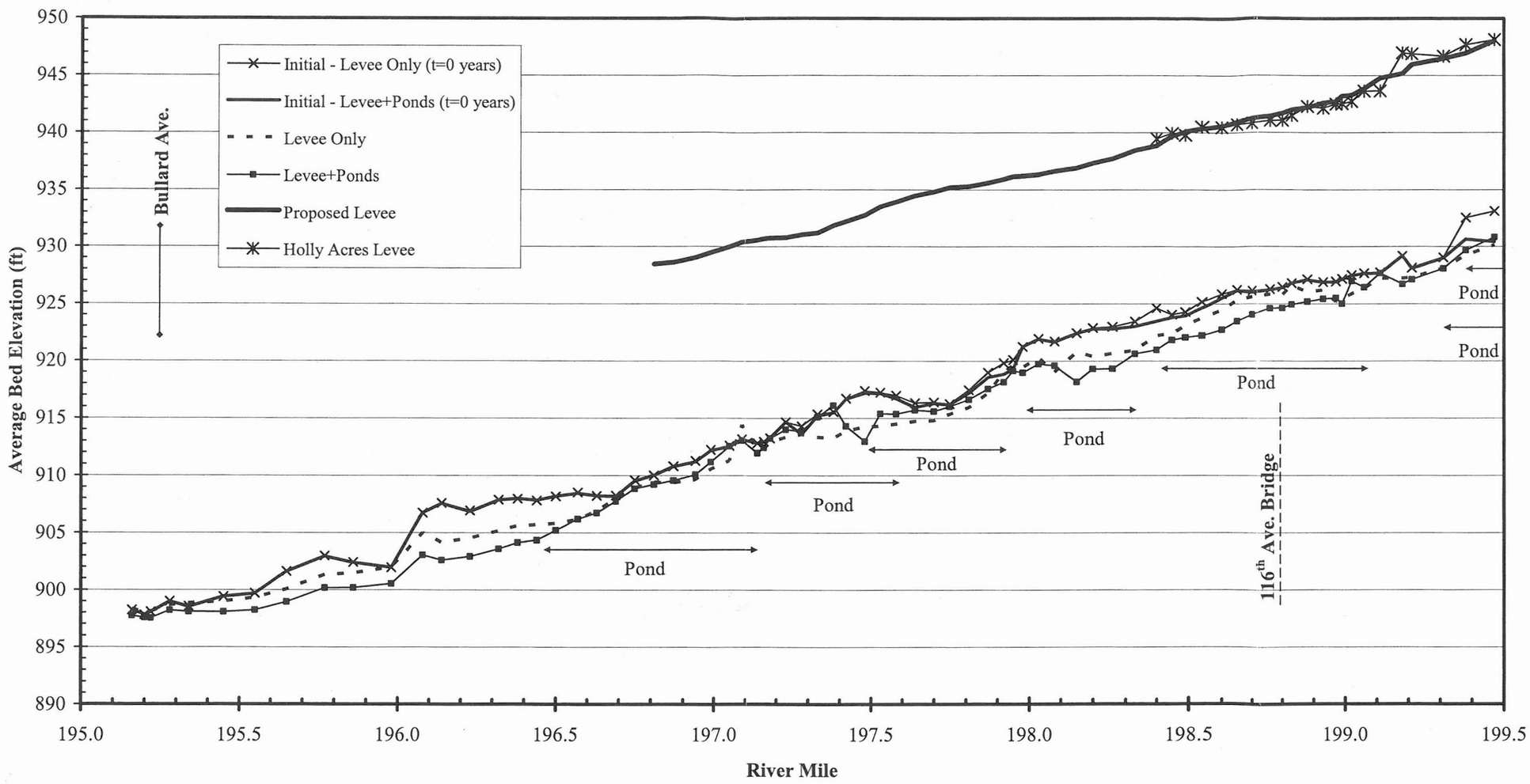

Figure 5-8. Average Bed Elevation Comparison After 105 Years – Levee Only vs. Levee with Ponds – Lower Gila River

Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Levee Only and Levee with Ponds - Salt River

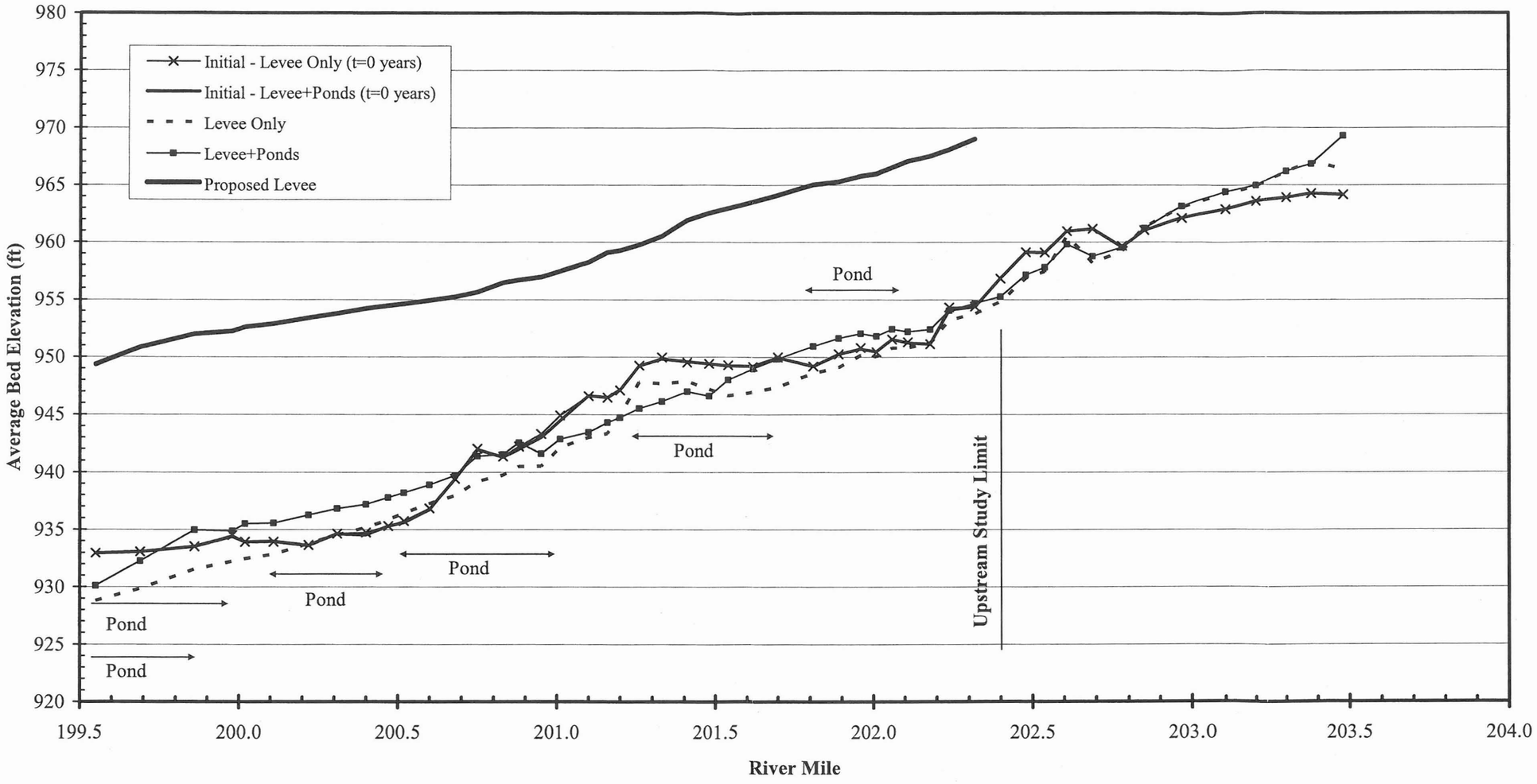

Figure 5-9. Average Bed Elevation Comparison After 105 Years – Levee Only vs. Levee with Ponds – Salt River

Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Levee Only and Levee with Ponds - Upper Gila

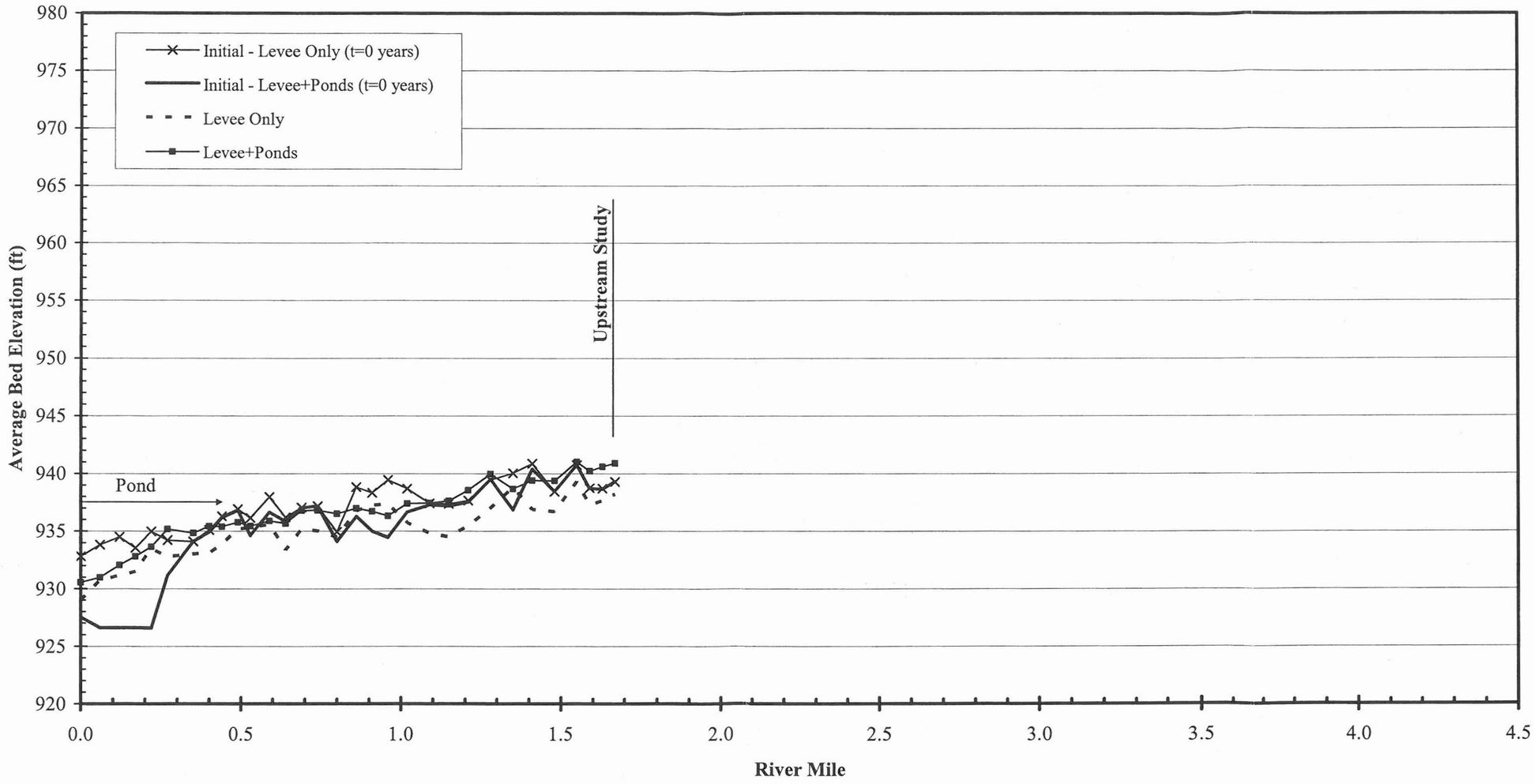

Figure 5-10. Average Bed Elevation Comparison After 105 Years – Levee Only vs. Levee with Ponds – Upper Gila River

6. Levee Height Analysis

6.1. General

Levee heights were analyzed for worst case conditions (highest water surface elevations) using HEC-RAS. The water surface elevations were determined using the existing conditions with the levee in place to determine impacts. Subsequent to the one-dimensional analysis a change was made to the levee tie-in at the west end of the project. This change is discussed below and results presented in Section 6 include the impacts of the levee realignment selected for final design (following the canal west to the Agua Fria River).

6.2. Western Levee Tie In

A careful analysis of the water surface elevations at the western end of the levee indicated that the levee could be flanked by floodwaters if the levee tied in to the Buckeye Feeder Canal where it intersects Southern Avenue. Since the portion of the canal west of Dysart and north of Southern had not been covered by aerial mapping it was surveyed to obtain the height of the canal bank and southern bank toe. Several options were investigated to protect the levee against flanking. These options included 1) turning the levee north at Dysart Road and continuing the levee north to the wastewater treatment plant, 2) turning the levee north just east of the intersection of Southern Avenue and the canal and following the canal back to the east to Dysart Road, and 3) extending the levee west to the point where the Buckeye Feeder Canal turns south at the edge of the Agua Fria River.

Modeling continued as various alignments were proposed resulting in differing alignments being incorporated into the various models. The HEC-RAS models described previously in this report all utilize the original levee alignment shown in Figure 4-5. The RMA-2 model utilized the alignment that followed the canal north and back east to Dysart. The final alignment selected by the Corps follows the south side of the canal west to the Agua Fria River. All of the alternatives were, however, modeled in with HEC-RAS subsequent to the main modeling described in Section 4 of this report. Water surface elevations for the modified "with levee" final alignment HEC-RAS model are shown in Table 6-1. Figure 6-1 shows the thalweg, water surface, existing ground, and levee elevation with 3 ft of freeboard above the 100-year water surface elevation. Figure 6-2 shows the results of the HEC-RAS and RMA-2 model water surface elevations along the levee. It can be noted that the RMA-2 elevations are significantly lower upstream and downstream of the Holly Acres levee. This is likely due to the scallops and widening that exist both upstream and downstream of the existing levee. Water surface elevations will be lower along the bank since the area is an expansion in the cross sectional area. This is necessary to get water to flow into the wider areas. The RMA-2 elevations were not used as a design elevations, however since the river could realign and/or debris jams could force the water into these areas causing higher water surface elevations.

While early evaluations used a freeboard height of 3.0 feet an analysis was performed using the Corps HEC-FDA software package to insure 95% reliability for the levee protection. The west end of the final levee alignment could be graded to tie in to the south bank of the Buckeye Feeder Canal near the waste structure. This could be done so as to not impact the canal or its operation.

Table 6-1. Levee Heights for Tres Rios North Levee. Section from 196.81 to 197.70 are revised below in Table 6-4.

X-Section	Thalweg Elevation (ft)	Existing Ground Elevation (ft)	Computed WSE (ft)		WSE Increase w/ Levee	3' Freeboard Elevation (ft)	FDA Elevation (ft)	Levee Elevation (ft)
			Existing	Future-Levee				
196.81	906.40	919.17	924.62	924.78	0.16	927.78	924.78	927.78
196.87	906.40	919.17	924.80	924.95	0.15	927.95	924.95	927.95
196.94	906.40	920.18	925.16	925.32	0.16	928.32	925.32	928.32
196.99	906.40	920.57	925.64	925.82	0.18	928.82	925.82	928.82
197.05	908.12	921.21	926.16	926.33	0.17	929.33	926.33	929.33
197.09	908.08	922.30	926.64	926.79	0.15	929.79	926.79	929.79
197.14	909.26	922.55	926.84	926.97	0.13	929.97	926.97	929.97
197.16	909.80	922.62	926.98	927.11	0.13	930.11	927.11	930.11
197.18	910.95	923.08	927.04	927.16	0.12	930.16	927.16	930.16
197.23	910.88	923.55	927.06	927.18	0.12	930.18	927.18	930.18
197.28	910.50	923.64	927.37	927.48	0.11	930.48	927.48	930.48
197.33	911.65	925.28	927.56	927.67	0.11	930.67	927.67	930.67
197.38	911.90	925.46	928.43	928.45	0.02	931.45	928.45	931.45
197.42	911.90	925.14	928.80	928.86	0.06	931.86	928.86	931.86
197.48	911.90	926.10	929.41	929.51	0.10	932.51	929.51	932.51
197.53	911.90	926.47	930.25	930.35	0.10	933.35	930.35	933.35
197.58	911.90	927.64	930.63	930.78	0.15	933.78	930.78	933.78
197.64	911.90	927.76	931.18	931.36	0.18	934.36	931.36	934.36
197.70	911.90	928.12	931.51	931.72	0.21	934.72	931.72	934.72
197.75	911.90	928.39	931.89	932.12	0.23	935.12	932.12	935.12
197.81	912.13	929.21	931.94	932.20	0.26	935.20	932.20	935.20
197.87	912.14	929.43	932.25	932.52	0.27	935.52	932.52	935.52
197.92	912.14	929.84	932.63	932.88	0.25	935.88	932.88	935.88
197.95	912.14	930.04	932.86	933.10	0.24	936.10	933.10	936.10
197.98	915.60	930.31	932.92	933.16	0.24	936.16	933.16	936.16
198.03	917.47	930.25	933.07	933.28	0.21	936.28	933.28	936.28
198.08	917.90	930.26	933.39	933.59	0.20	936.59	933.59	936.59
198.15	918.06	917.53	933.75	933.86	0.11	936.86	933.86	936.86
198.20	917.83	921.16	934.20	934.30	0.10	937.30	934.30	937.30
198.26	919.07	925.05	934.58	934.68	0.10	937.68	934.68	937.68
198.33	920.97	925.99	934.88	935.42	0.54	938.42	935.42	938.42
198.40	922.23	939.47	935.34	935.82	0.48	938.82	935.82	938.82
198.45	922.19	939.90	936.39	936.68	0.29	939.68	936.68	939.68
198.49	922.46	939.75	936.82	937.08	0.26	940.08	937.08	940.08
198.54	922.67	940.51	937.13	937.34	0.21	940.34	937.34	940.34
198.60	923.30	940.47	937.34	937.56	0.22	940.56	937.56	940.56
198.65	923.88	940.66	937.74	937.93	0.19	940.93	937.93	940.93
198.70	923.90	940.81	938.07	938.24	0.17	941.24	938.24	941.24
198.76	923.90	940.98	938.27	938.44	0.17	941.44	938.44	941.44
198.80	923.90	940.92	938.58	938.70	0.12	941.70	938.70	941.70
198.83	923.90	941.50	938.80	939.00	0.20	942.00	939.00	942.00
198.88	923.90	942.19	939.03	939.23	0.20	942.23	939.23	942.23
198.93	923.90	942.10	939.41	939.63	0.22	942.63	939.63	942.63
198.97	925.10	942.50	939.53	939.74	0.21	942.74	939.74	942.74
198.99	925.10	942.50	940.05	940.21	0.16	943.21	940.21	943.21
199.02	925.40	942.52	940.15	940.30	0.15	943.30	940.30	943.30
199.06	925.40	943.67	940.76	940.87	0.11	943.87	940.87	943.87
199.11	925.40	943.54	941.64	941.78	0.14	944.78	941.78	944.78
199.18	925.40	940.08	942.02	942.17	0.15	945.17	942.17	945.17
199.21	927.64	940.10	942.74	942.95	0.21	945.95	942.95	945.95
199.31	928.11	946.63	943.29	943.48	0.19	946.48	943.48	946.48
199.38	931.10	947.85	943.84	943.98	0.14	946.98	943.98	946.98
199.47	931.64	948.13	944.92	945.06	0.14	948.06	945.06	948.06
199.55	931.65	946.74	946.25	946.35	0.10	949.35	946.35	949.35
199.69	931.79	943.07	947.65	947.84	0.19	950.84	947.84	950.84
199.86	931.12	944.68	948.65	948.99	0.34	951.99	948.99	951.99
199.98	932.56	945.59	948.88	949.24	0.36	952.24	949.24	952.24

Table 6-1 Levee Heights for Tres Rios North Levee (Continued)

X-Section	Thalweg Elevation (ft)	Existing Ground Elevation (ft)	Computed WSE (ft)		WSE Increase w/ Levee	3' Freeboard Elevation (ft)	FDA Elevation (ft)	Levee Elevation (ft)
			Existing	Future-Levee				
200.02	931.98	945.44	949.25	949.60	0.35	952.60	949.60	952.60
200.11	931.98	945.83	949.53	949.88	0.35	952.88	949.88	952.88
200.22	931.78	945.58	950.04	950.39	0.35	953.39	950.39	953.39
200.31	931.67	948.57	950.40	950.77	0.37	953.77	950.77	953.77
200.40	931.55	949.27	950.87	951.21	0.34	954.21	951.21	954.21
200.47	931.67	949.80	951.15	951.46	0.31	954.46	951.46	954.46
200.52	932.45	949.94	951.31	951.61	0.30	954.61	951.61	954.61
200.60	932.82	950.99	951.65	951.92	0.27	954.92	951.92	954.92
200.68	937.28	951.95	952.00	952.23	0.23	955.23	952.23	955.23
200.75	937.28	953.06	952.46	952.65	0.19	955.65	952.65	955.65
200.83	937.28	954.58	953.35	953.48	0.13	956.48	953.48	956.48
200.88	938.71	955.25	953.58	953.70	0.12	956.70	953.70	956.70
200.95	938.69	955.44	953.85	953.96	0.11	956.96	953.96	956.96
201.01	938.69	957.13	954.39	954.48	0.09	957.48	954.48	957.48
201.10	942.17	957.14	955.20	955.25	0.05	958.25	955.25	958.25
201.16	943.39	957.06	956.06	956.09	0.03	959.09	956.09	959.09
201.20	942.38	957.56	956.24	956.27	0.03	959.27	956.27	959.27
201.26	942.38	957.39	956.73	956.76	0.03	959.76	956.76	959.76
201.33	942.38	957.75	957.54	957.55	0.01	960.55	957.55	960.55
201.41	942.38	958.55	958.92	958.93	0.01	961.93	958.93	961.93
201.48	943.46	958.96	959.52	959.53	0.01	962.53	959.53	962.53
201.54	944.01	959.68	959.97	959.97	0.00	962.97	959.97	962.97
201.62	944.97	959.61	960.53	960.53	0.00	963.53	960.53	963.53
201.70	945.11	961.14	961.13	961.13	0.00	964.13	961.13	964.13
201.81	945.11	960.48	962.08	962.08	0.00	965.08	962.08	965.08
201.89	946.82	972.40	962.26	962.26	0.00	965.26	962.26	965.26
201.96	946.20	971.38	962.73	962.73	0.00	965.73	962.73	965.73
202.01	946.85	973.02	962.96	962.96	0.00	965.96	962.96	965.96
202.06	947.33	970.80	963.52	963.52	0.00	966.52	963.52	966.52
202.11	948.26	972.68	964.08	964.08	0.00	967.08	964.08	967.08
202.18	946.86	980.21	964.52	964.53	0.01	967.53	964.53	967.53
202.24	948.09	974.61	965.09	965.09	0.00	968.09	965.09	968.09
202.32	950.65	969.25	966.02	966.02	0.00	969.02	966.02	969.02

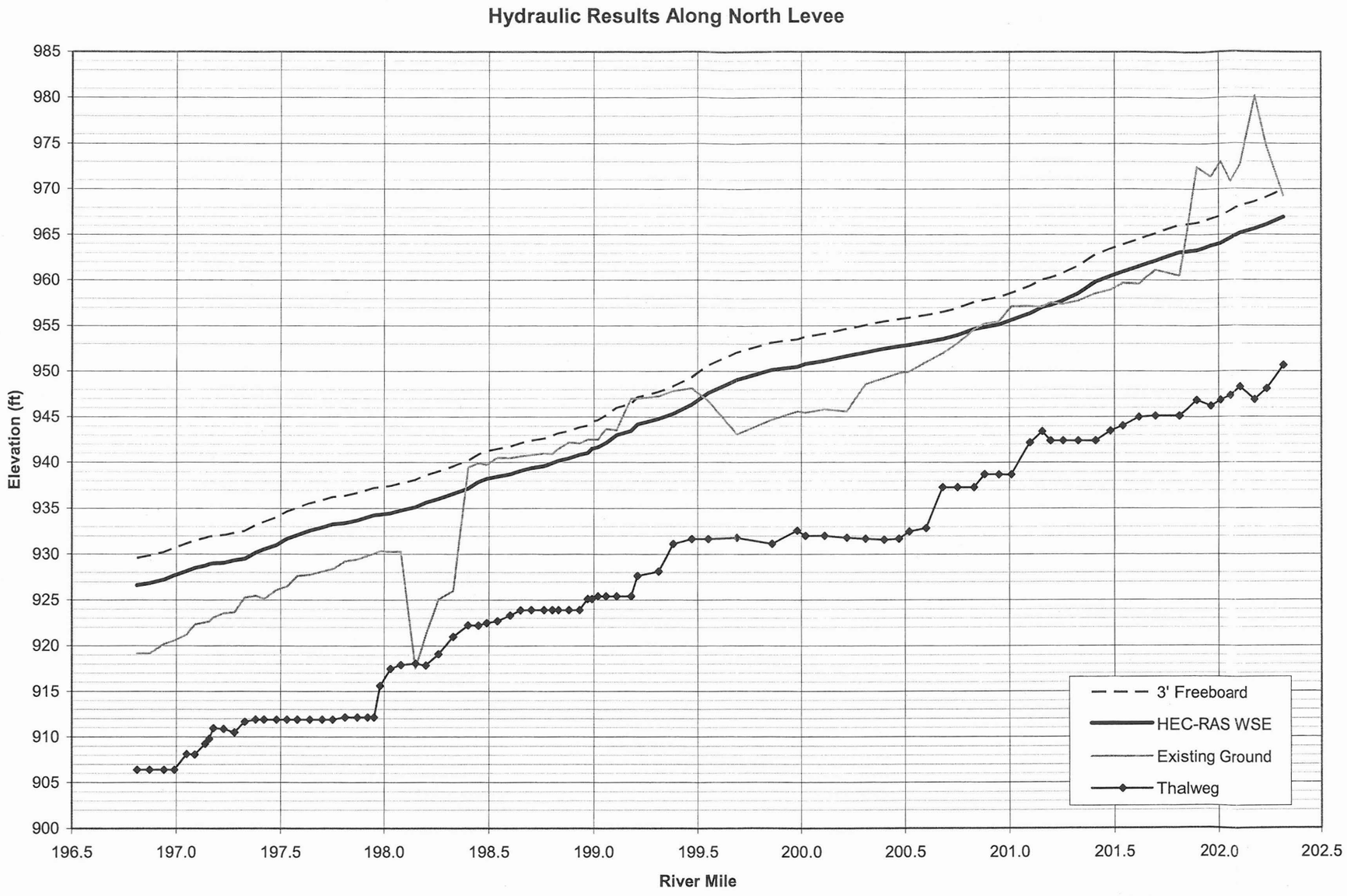

Figure 6-1. Water Surface Profile for Levee Location Including Thalweg & Existing Ground Elevations

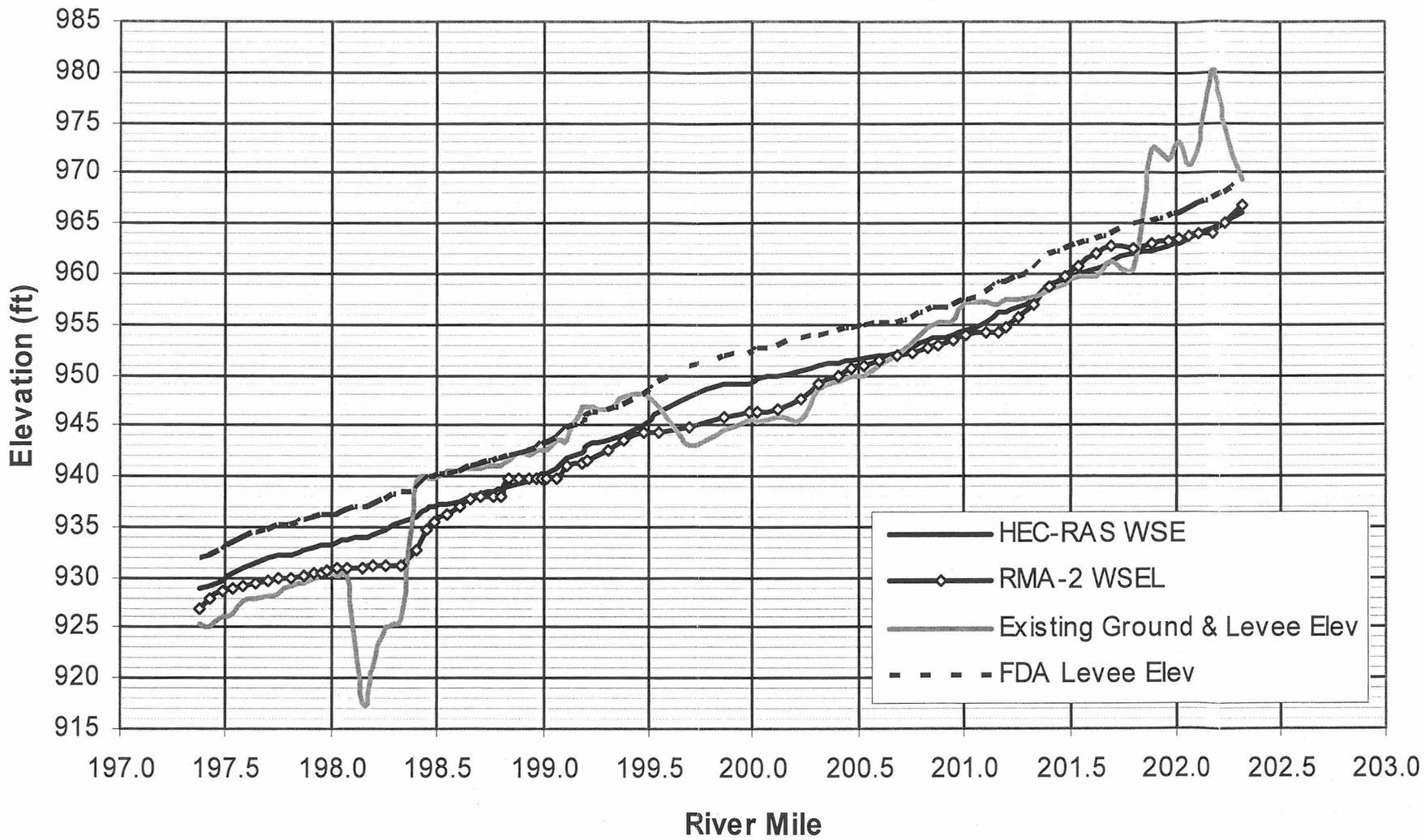

Figure 6-2. Existing Levee and Ground Elevations Compared with Levee and Predicted Water Surface Elevations.

6.3. Uncertainty Analyses

U.S. Army Corps of Engineers' Flood Damage Reduction Analysis software HEC-FDA was used to obtain necessary freeboard for the proposed levee at a minimum 95% reliability level, i.e., a non-exceedance probability of 0.95, for levee overtopping. Stage uncertainty was computed using the methodology described in "Risk-based Analysis for Flood Damage Reduction Studies," EM 1110-2-1619 (U.S. Army Corps of Engineers, 1996).

A rating curve was generated in HEC-RAS using 2-, 5-, 10-, 20-, 50-, 100-, 200-, and 500-year peak discharges. The inverse of the return-periods correspond to the exceedance probability. Initially, the Salt-Lower Gila study reach was divided into 29 sub-reaches with one index cross section for each sub-reach for freeboard analysis in HEC-FDA. Stage uncertainties were computed per Corps of Engineers' EM 1110-2-1619 at each of these index cross sections based on the 100-year water surface elevations. Standard deviation of total uncertainty was obtained from natural and model uncertainties. Natural uncertainty is given as a function of the maximum expected or observed stage range, contributing basin area, a bed identifier, and the 100-year peak discharge (U.S. Army Corps of Engineers, 1996):

$$S_{natural} = [0.07208 + 0.04936\, I_{bed} - 2.2626e^{-7}\, A_{basin} + 0.02164\, H_{range} + 1.4194e^{-5}\, Q_{100}]^2$$

where:

S = the standard deviation of uncertainty, m

H_{range} = the maximum expected or observed stage range, m

A_{basin} = contributing basin area, km^2

Q_{100} = 100-year discharge, cms

An average H_{range} was computed from HEC-RAS results by taking the difference between calculated water surface and thalweg elevations for the 500 year flood. An I_{bed} of 4 was used to represent sand bed. Model uncertainty was computed based on the Manning's n sensitivity analysis using HEC-RAS. Hydraulic sensitivity results were discussed earlier in this report (See Section 3). The range between the upper and lower limit water stages was used to estimate the standard deviation of stage uncertainty:

$$S_{model} = \frac{E_{mean}}{4}$$

where:

E_{mean} = mean stage difference between upper and lower limit water surface profiles.

It was observed from the sensitivity analyses that the water surface elevations did not vary much with change in Manning's n. Therefore, E_{mean} remained fairly constant. A model uncertainty (S_{model}) of 0.6 ft was obtained from this analysis.

The total stage uncertainty was estimated by

$$S_t = \sqrt{S_{natural}^2 + S_{model}^2}$$

Using a scatter plot in EM 1110-2-1619 (Figure 5-4, U.S. Army Corps of Engineers, 1996), the standard deviation of n value estimate was found to be approximately 0.065 for an average Manning's n value estimate of 0.12. The scatter plot was used as a guide to estimate the reasonable bounds on the Manning's n model parameter for the hydraulic sensitivity analysis. On the average, the total stage uncertainties (standard deviation error) were 0.88 ft and 0.95 ft for Salt and Lower Gila

reach index cross sections, respectively. Table 6-2 shows stage uncertainty analysis results for the index cross section within each damage reach.

As a second step in the levee freeboard determination, graphical exceedance probability functions were introduced in HEC-FDA for the Salt and Lower Gila reaches along the proposed levee. The graphical approach is typically applicable for regulated flows, which is true for the Salt inflows in this study. Total stage uncertainty was introduced in the stage discharge function option in HEC-FDA for every index cross section. The FDA model was run for 'with-levee' conditions by increasing the freeboard gradually until 95% or more reliability (non-exceedance probability of 0.95) was reached. The output from FDA is the conditional non-exceedance probability, i.e., the probability that the water surface elevation will not exceed the freeboard allowance given the 100-year event has occurred.

A 3 feet freeboard was sufficient to maintain the minimum 95% reliability for the 100-year event along the entire Salt-Lower Gila reach. Table 6-3 shows the HEC-FDA results for conditional non-exceedance probability by events. For lower Salt River damage reaches (Reaches 8 through 12), the non-exceedance probability varies from 65% to 70% for the 500 year flood while producing 95% or higher reliability for the 100-year flood. Minimum freeboard requirements by reach are shown in Table 6-4.

Table 6-2. Tres Rios PED Stage Uncertainty Analysis

River ID	Damage Reach	Cross Section Range	Index Sections	Q100 Yr Avg Hrange (ft)	Hrange (m)	Contributing Area		Q100 (cfs)	Q100 (cms)	Ibed	Snatural (m)	Snatural (ft)	Smodel (ft)	Stotal (ft)
						Abasin (mi^2)	Abasin (km^2)							
Lower Gila	29	197.05 - 196.87	196.99	20.00	6.10	7700	19943	227000	6428	4.0	0.238	0.78	0.6	1.00
Lower Gila	28	197.16 - 197.05	197.14	18.00	5.49	7700	19943	227000	6428	4.0	0.225	0.74	0.6	1.00
Lower Gila	27	197.28 - 197.16	197.23	17.00	5.18	7700	19943	227000	6428	4.0	0.219	0.72	0.6	1.00
Lower Gila	26	197.42 - 197.28	197.38	17.00	5.18	7700	19943	227000	6428	4.0	0.219	0.72	0.6	1.00
Lower Gila	25	197.58 - 197.42	197.53	18.61	5.67	7700	19943	227000	6428	4.0	0.229	0.75	0.6	1.00
Lower Gila	24	197.75 - 197.58	197.7	20.00	6.10	7700	19943	227000	6428	4.0	0.238	0.78	0.6	1.00
Lower Gila	23	197.92 -197.75	197.87	20.46	6.24	7700	19943	227000	6428	4.0	0.241	0.79	0.6	1.00
Lower Gila	22	198.03 - 197.92	197.98	17.61	5.37	7700	19943	227000	6428	4.0	0.223	0.73	0.6	1.00
Lower Gila	21	198.20 - 198.03	198.15	15.85	4.83	7700	19943	227000	6428	4.0	0.212	0.70	0.6	0.92
Lower Gila	20	198.40 - 198.20	198.33	14.48	4.41	7700	19943	227000	6428	4.0	0.204	0.67	0.6	0.90
Lower Gila	19	198.54 - 198.40	198.49	14.64	4.46	7700	19943	227000	6428	4.0	0.205	0.67	0.6	0.90
Lower Gila	18	198.70 - 198.54	198.65	14.00	4.27	7700	19943	227000	6428	4.0	0.201	0.66	0.6	0.89
Lower Gila	17	198.83 - 198.70	198.8	14.82	4.52	7700	19943	227000	6428	4.0	0.206	0.68	0.6	0.90
Lower Gila	16	198.97 - 198.83	198.93	15.74	4.80	7700	19943	227000	6428	4.0	0.211	0.69	0.6	0.92
Lower Gila	15	199.06 - 198.97	199.02	14.91	4.54	7700	19943	227000	6428	4.0	0.206	0.68	0.6	0.90
Lower Gila	14	199.21 - 199.06	199.18	16.78	5.11	7700	19943	227000	6428	4.0	0.218	0.71	0.6	0.93
Lower Gila	13	199.47 - 199.21	199.38	13.00	3.96	7700	19943	227000	6428	4.0	0.195	0.64	0.6	0.88
Salt	12	199.98 - 199.55	199.86	17.89	5.45	7700	19943	162000	4587	4.0	0.201	0.66	0.6	0.89
Salt	11	200.22 - 199.98	200.11	17.92	5.46	7700	19943	162000	4587	4.0	0.201	0.66	0.6	0.89
Salt	10	200.47 - 200.22	200.4	19.67	6.00	7700	19943	162000	4587	4.0	0.211	0.69	0.6	0.92
Salt	9	200.68 - 200.47	200.6	19.00	5.79	7700	19943	162000	4587	4.0	0.207	0.68	0.6	0.91
Salt	8	200.88 - 200.68	200.83	16.20	4.94	7700	19943	162000	4587	4.0	0.191	0.63	0.6	0.87
Salt	7	201.10 - 200.88	201.01	16.00	4.88	7700	19943	162000	4587	4.0	0.190	0.62	0.6	0.86
Salt	6	201.26 - 201.10	201.2	14.00	4.27	7700	19943	162000	4587	4.0	0.178	0.59	0.6	0.84
Salt	5	201.48 - 201.26	201.41	16.60	5.06	7700	19943	162000	4587	4.0	0.193	0.63	0.6	0.87
Salt	4	201.70 - 201.48	201.62	15.60	4.75	7700	19943	162000	4587	4.0	0.187	0.61	0.6	0.86
Salt	3	201.96 - 201.70	201.89	15.50	4.72	7700	19943	162000	4587	4.0	0.187	0.61	0.6	0.86
Salt	2	202.11 - 201.96	202.06	16.00	4.88	7700	19943	162000	4587	4.0	0.190	0.62	0.6	0.86
Salt	1	202.32 - 202.11	202.24	17.00	5.18	7700	19943	162000	4587	4.0	0.195	0.64	0.6	0.88

Table 6-3. Conditional Non-exceedance Probabilities

Tres Rios-levee at 100 yr 3' FB Project Performance
by Damage Reaches for the With Levee
(With Levee Condition) plan for Analysis Year 2002
(Stages in ft.)
Plan was calculated with Uncertainty

				Target Stage Annual Exceedance Probability			Long-Term Risk (years)			Conditional Non-Exceedance Probability by Events					
Stream Name	Stream Description	Damage Reach Name	Damage Reach Description	Target Stage	Median	Expected	10	25	50	10%	4%	2%	1%	0.40%	0.20%
Lower Gila	Lower Gila River	Reach 29	197.05 - 196.87	levee	0.0010	0.0030	0.0264	0.0647	0.1252	1.0000	1.0000	0.9963	0.9513	0.8230	0.7789
		Reach 28	197.16 - 197.05	levee	0.0010	0.0030	0.0261	0.0641	0.1240	1.0000	1.0000	0.9965	0.9523	0.8259	0.7821
		Reach 27	197.28 - 197.16	levee	0.0010	0.0030	0.0261	0.0640	0.1239	1.0000	1.0000	0.9966	0.9527	0.8261	0.7821
		Reach 26	197.42 - 197.28	levee	0.0010	0.0030	0.0263	0.0645	0.1249	1.0000	1.0000	0.9964	0.9518	0.8240	0.7790
		Reach 25	197.58 - 197.42	levee	0.0010	0.0030	0.0256	0.0628	0.1216	1.0000	1.0000	0.9964	0.9531	0.8354	0.7933
		Reach 24	197.75 - 197.58	levee	0.0010	0.0030	0.0262	0.0642	0.1242	1.0000	1.0000	0.9962	0.9513	0.8274	0.7846
		Reach 23	197.92 - 197.75	levee	0.0010	0.0030	0.0261	0.0641	0.1240	1.0000	1.0000	0.9963	0.9516	0.8277	0.7846
		Reach 22	198.03 - 197.92	levee	0.0010	0.0030	0.0260	0.0637	0.1233	1.0000	1.0000	0.9963	0.9522	0.8301	0.7877
		Reach 21	198.2 - 198.03	levee	0.0010	0.0030	0.0260	0.0638	0.1236	1.0000	1.0000	0.9964	0.9510	0.8300	0.7871
		Reach 20	198.4 - 198.2	levee	0.0010	0.0030	0.0261	0.0641	0.1241	1.0000	1.0000	0.9965	0.9515	0.8263	0.7818
		Reach 19	198.54 -198.40	levee	0.0010	0.0030	0.0261	0.0639	0.1237	1.0000	1.0000	0.9965	0.9520	0.8287	0.7845
		Reach 18	198.7 - 198.54	levee	0.0010	0.0030	0.0262	0.0643	0.1245	1.0000	1.0000	0.9965	0.9510	0.8260	0.7811
		Reach 17	198.83 - 198.7	levee	0.0010	0.0030	0.0264	0.0646	0.1251	1.0000	1.0000	0.9965	0.9508	0.8241	0.7785
		Reach 16	198.97 - 198.83	levee	0.0010	0.0030	0.0261	0.0640	0.1239	1.0000	1.0000	0.9966	0.9519	0.8270	0.7821
		Reach 15	199.06 - 198.97	levee	0.0010	0.0030	0.0260	0.0639	0.1236	1.0000	1.0000	0.9966	0.9516	0.8286	0.7843
		Reach 14	199.21 - 199.06	levee	0.0010	0.0030	0.0263	0.0645	0.1248	1.0000	1.0000	0.9968	0.9528	0.8227	0.7760
		Reach 13	199.47 - 199.21	levee	0.0010	0.0030	0.0261	0.0640	0.1239	1.0000	1.0000	0.9969	0.9539	0.8235	0.7761
Salt River	Salt River	Reach 12	199.98 - 199.55	levee	0.0010	0.0030	0.0321	0.0784	0.1507	1.0000	1.0000	0.9981	0.9529	0.7186	0.5855
		Reach 11	200.22 - 199.98	levee	0.0010	0.0030	0.0322	0.0785	0.1508	1.0000	1.0000	0.9983	0.9535	0.7175	0.5827
		Reach 10	200.47 - 200.22	levee	0.0010	0.0030	0.0330	0.0805	0.1545	1.0000	1.0000	0.9982	0.9520	0.7052	0.5608
		Reach 9	200.68 - 200.47	levee	0.0010	0.0030	0.0326	0.0796	0.1528	1.0000	1.0000	0.9982	0.9526	0.7112	0.5691
		Reach 8	200.88 - 200.68	levee	0.0010	0.0030	0.0329	0.0803	0.1542	1.0000	1.0000	0.9981	0.9507	0.7068	0.5675
		Reach 7	201.1 - 200.88	levee	0.0010	0.0030	0.0317	0.0773	0.1486	1.0000	1.0000	0.9981	0.9538	0.7258	0.5958
		Reach 6	201.26 - 201.1	levee	0.0010	0.0020	0.0313	0.0764	0.1470	1.0000	1.0000	0.9982	0.9541	0.7320	0.6075
		Reach 5	201.48 - 201.26	levee	0.0010	0.0020	0.0307	0.0751	0.1445	1.0000	1.0000	0.9982	0.9547	0.7414	0.6240
		Reach 4	201.7 - 201.48	levee	0.0010	0.0020	0.0313	0.0764	0.1469	1.0000	1.0000	0.9980	0.9527	0.7331	0.6146
		Reach 3	201.96 - 201.7	levee	0.0010	0.0020	0.0317	0.0775	0.1490	1.0000	1.0000	0.9979	0.9515	0.7269	0.6056
		Reach 2	202.11 - 201.96	levee	0.0010	0.0020	0.0313	0.0765	0.1471	1.0000	1.0000	0.9980	0.9527	0.7336	0.6135
		Reach 1	202.32 - 202.11	levee	0.0010	0.0020	0.0319	0.0779	0.1497	1.0000	1.0000	0.9979	0.9511	0.7252	0.6014

With Project Base Year Performance Target Criteria
Event Exceedance Probability = 0.01
Residual Damage = 5.00%

Table 6-4. Minimum Freeboard for 95% Reliability by Reach.

Damage Reach No.	Upstream Cross-section	Downstream Cross-section	Reference Cross-section	Levee Elevation	Water Surface Elevation	Minimum FDA Freeboard (ft)
1	202.32	202.11	202.24	968.6	966.12	2.48
2	202.11	201.96	202.06	966.79	964.6	2.19
3	201.96	201.7	201.89	965.54	963.29	2.25
4	201.7	201.48	201.62	964.15	961.5	2.65
5	201.48	201.26	201.41	962.5	959.81	2.69
6	201.26	201.1	201.2	959.77	957.26	2.51
7	201.1	200.88	201.01	957.98	955.61	2.37
8	200.88	200.68	200.83	956.98	954.62	2.36
9	200.68	200.47	200.6	955.92	953.19	2.73
10	200.47	200.22	200.4	955.21	952.48	2.73
11	200.22	199.98	200.11	953.38	951.12	2.26
12	199.98	199.55	199.86	952.49	950.16	2.33
13	199.47	199.21	199.38	948.05	945.35	2.7
14	199.21	199.06	199.18	946.05	943.45	2.6
15	199.06	198.97	199.02	944.1	941.64	2.46
16	198.97	198.83	198.93	943.35	940.85	2.5
17	198.83	198.7	198.8	942.4	939.92	2.48
18	198.7	198.54	198.65	941.55	939.1	2.45
19	198.54	198.4	198.49	940.7	938.24	2.46
20	198.4	198.2	198.33	939.1	936.59	2.51
21	198.2	198.03	198.15	937.55	935.14	2.41
22	198.03	197.92	197.98	936.78	934.32	2.46
23	197.92	197.75	197.87	936.15	933.69	2.46
24	197.75	197.58	197.7	935.35	932.9	2.45
25	197.58	197.42	197.53	934.1	931.66	2.44
26	197.42	197.28	197.38	932.7	930.16	2.54
27	197.28	197.16	197.23	931.6	929.06	2.54
28	197.16	197.05	197.14	931.3	928.77	2.53
29	197.05	196.87	196.99	930.2	927.68	2.52

6.4. Levee Impacts

The levee as designed does not impact the 91st Avenue Wastewater Treatment Plant. Any impacts are downstream of the plant. A review of the plant's levee indicated that it does not have a 3' minimum freeboard above the 100 year flood elevation for portions of its length.

The impact of the levee on the floodplain north of the Buckeye Feeder Canal varies with the location of the levee termination, the height of the canal bank, and the alignment of the levee. Depending on the location of the most downstream cross section impacted by the levee and the levee alignment the water surface elevation north of the canal will vary. Water can be expected to inundate the Buckeye Feeder Canal during a 100 year flood and flood the area to the north of the canal. The water surface elevation will vary depending on where the levee is terminated. The water surface elevations for the three levee alignments modeled are given in Table 6-5.

Table 6-5. Water Surface Elevations at West end of Levee for Studied Alignments.

Alternative	Ending Cross Section	Water Surface Elevation
Original Alignment	196.81	925.46
Two-Dimensional Alignment	196.94	925.32 (1-D) 924.24 (2-D)
Selected Alignment	196.63	923.58

The 116th Avenue Bridge soffit is very close to the elevation of the top of the existing Holly Acres Levee and concerns have been raised as to what measures would be necessary to raise the levee under the bridge. An analysis of this location, however, indicates that existing levee at the 116th Avenue Bridge is only slightly lower than the design elevation for the new levee. This is due to an increase in freeboard in the original Holly Acres Levee design immediately upstream of, and under, the bridge. The bridge opening is very wide, however, and was not observed to have an appreciable impact on the water surface at the bridge for the conditions modeled.

The final levee design immediately downstream of the bridge (cross section 199.18) is 945.17 ft while the existing levee elevation from the 1' topography is 947.00 feet leaving a surplus freeboard of 1.83 ft. On the upstream side of the bridge the levee elevation is 945.95 with an existing levee elevation of 947.00 leaving a levee surcharge of 1.05 ft to account for backwater at the bridge from debris. It thus appears that the existing levee will meet design criteria with out raising the existing levee under the 116th Avenue Bridge.

7. Toe-Down Depth

An estimate of local scour or toe-down depth along the proposed levee was needed so that levee protection can be placed sufficiently low in the streambed to prevent undermining damage from potential degradation. Several regime equations were tested and results compared. The equations used to obtain scour depths along the levee are briefly discussed below. The hydraulic calculations were performed for existing conditions with levee (Condition 2) and future conditions with levee and ponds (Condition 3). The average depths of scour obtained from the equations discussed below were added to the magnitude of predicted degradation to arrive at total required toe-depth. A 30% safety factor was added in the final toe-depth.

Neill (1973) described four methods for estimating general scour that are presented by Pemberton and Lara (1984) supplemented by the U.S. Bureau of Reclamation's procedure for application. Three of these methodologies, used in this study, are briefly described below with a brief discussion of results. Figure 7-1 shows the maximum recommended toe elevation along the proposed levee. The 105-year long-term HEC-6T thalweg represented the before-scour conditions. The recommended toe elevations were obtained by subtracting the scour depth from the 105-year HEC-6T thalweg results for the levee only case. The levee only case was the worst case scenario in local scour computations. The levee with ponds condition HEC-6T run shows deposition along the levee alignment and therefore did not represent the worst case scenario. Table 7-1 shows the maximum recommended toe elevations. A summary of toe-down computations is given in Appendix M.

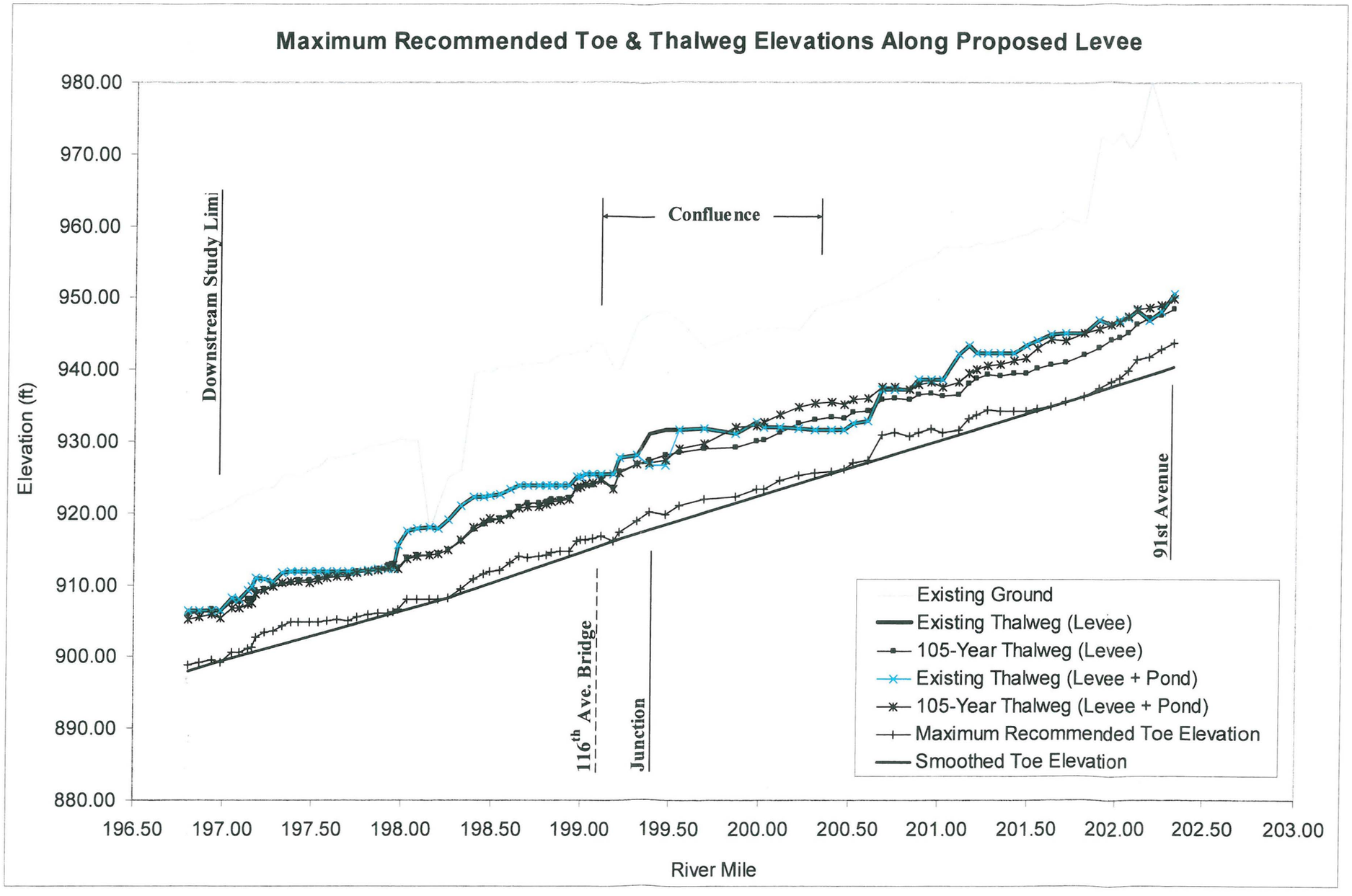

Figure 7-1. Maximum Recommended Toe Elevations

Table 7-1. Maximum Recommended Toe Elevations

		Levee		Levee + Pond			
		RAS	HEC-6T	RAS	HEC-6T		
Reach ID	X-Section	Thalweg Elevation	105-yr Thalweg	Thalweg Elevation	105-year Thalweg	Local Scour	Max Toe Elevation
	Along Levee	ft	ft	ft	ft	ft	ft
Lower Gila	196.81	906.40	905.86	906.40	905.21	6.4	898.76
Lower Gila	196.87	906.40	906.16	906.40	905.56	6.4	899.17
Lower Gila	196.94	906.40	906.51	906.40	905.92	6.3	899.58
Lower Gila	196.99	906.40	906.23	906.40	905.40	6.1	899.26
Lower Gila	197.05	908.12	907.68	908.12	906.78	6.1	900.63
Lower Gila	197.09	908.08	907.66	908.08	906.76	6.1	900.68
Lower Gila	197.14	909.26	908.05	909.26	907.31	6.1	901.20
Lower Gila	197.16	909.80	908.00	909.80	907.39	6.0	901.38
Lower Gila	197.18	910.95	909.17	910.95	908.63	6.0	902.67
Lower Gila	197.23	910.88	909.46	910.88	909.14	5.7	903.47
Lower Gila	197.28	910.50	909.68	910.50	909.82	6.0	903.67
Lower Gila	197.33	911.65	910.04	911.65	910.23	5.7	904.37
Lower Gila	197.38	911.90	910.32	911.90	910.53	5.5	904.83
Lower Gila	197.42	911.90	910.55	911.90	910.51	5.6	904.88
Lower Gila	197.48	911.90	910.66	911.90	910.36	5.6	904.79
Lower Gila	197.53	911.90	910.99	911.90	910.68	5.9	904.81
Lower Gila	197.58	911.90	911.24	911.90	910.97	6.0	905.02
Lower Gila	197.64	911.90	911.53	911.90	911.23	6.1	905.12
Lower Gila	197.70	911.90	911.39	911.90	911.15	6.1	905.09
Lower Gila	197.75	911.90	911.79	911.90	911.61	6.2	905.45
Lower Gila	197.81	912.13	911.95	912.13	911.80	5.9	905.89
Lower Gila	197.87	912.14	912.30	912.14	912.04	5.9	906.13
Lower Gila	197.92	912.14	912.71	912.14	912.39	6.1	906.08
Lower Gila	197.95	912.14	912.94	912.14	912.70	6.0	906.18
Lower Gila	197.98	915.60	912.45	915.60	912.18	5.6	906.58
Lower Gila	198.03	917.47	913.89	917.47	913.60	5.6	907.95
Lower Gila	198.08	917.90	914.15	917.90	913.97	6.0	907.96
Lower Gila	198.15	918.06	914.16	918.06	914.23	6.1	908.02
Lower Gila	198.20	917.83	914.33	917.83	914.32	6.4	907.93
Lower Gila	198.26	919.07	914.89	919.07	914.93	6.7	908.18
Lower Gila	198.33	920.97	916.08	920.97	916.27	6.6	909.47
Lower Gila	198.40	922.23	917.59	922.23	917.97	6.8	910.79
Lower Gila	198.45	922.19	918.41	922.19	918.70	7.0	911.44
Lower Gila	198.49	922.46	918.92	922.46	919.19	7.1	911.84
Lower Gila	198.54	922.67	919.24	922.67	919.10	7.0	912.09
Lower Gila	198.60	923.30	919.98	923.30	919.79	6.8	913.03
Lower Gila	198.65	923.88	920.92	923.88	920.68	6.7	913.93
Lower Gila	198.70	923.90	921.31	923.90	920.86	7.0	913.86
Lower Gila	198.76	923.90	921.35	923.90	920.93	7.0	913.91
Lower Gila	198.80	923.90	921.54	923.90	921.17	7.0	914.20
Lower Gila	198.83	923.90	921.82	923.90	921.51	7.0	914.52
Lower Gila	198.88	923.90	921.98	923.90	921.72	7.1	914.62
Lower Gila	198.93	923.90	922.16	923.90	921.85	7.2	914.67
Lower Gila	198.97	925.10	923.53	925.10	923.42	7.3	916.13
Lower Gila	198.99	925.10	923.75	925.10	923.65	7.4	916.22
Lower Gila	199.02	925.40	923.78	925.40	924.00	7.5	916.31
Lower Gila	199.06	925.40	923.91	925.40	924.18	7.5	916.41
Lower Gila	199.11	925.40	924.66	925.40	924.56	7.7	916.85
Lower Gila	199.18	925.40	923.54	925.40	923.31	7.2	916.08
Lower Gila	199.21	927.64	925.85	927.64	925.67	8.4	917.30
Lower Gila	199.31	928.11	926.88	928.11	926.88	7.9	918.98
Lower Gila	199.38	931.10	927.32	926.60	927.08	6.5	920.07
Lower Gila	199.47	931.64	928.01	926.60	927.43	6.8	919.76

Table 7-1. Maximum Recommended Toe Elevations (continued)

		Levee		Levee + Pond			
		RAS	HEC-6T	RAS	HEC-6T		
Reach ID	X-Section	Thalweg Elevation	105-yr Thalweg	Thalweg Elevation	105-year Thalweg	Local Scour	Max Toe Elevation
	Along Levee	ft	ft	ft	ft	ft	ft
Salt	199.55	931.65	928.39	931.65	928.88	7.3	921.08
Salt	199.69	931.79	928.93	931.79	929.72	7.0	921.89
Salt	199.86	931.12	929.06	931.12	931.93	6.8	922.23
Salt	199.98	932.56	930.07	932.56	932.20	6.8	923.29
Salt	200.02	931.98	930.17	931.98	932.66	6.9	923.23
Salt	200.11	931.98	931.27	931.98	933.77	6.8	924.49
Salt	200.22	931.78	932.55	931.78	934.84	6.5	925.26
Salt	200.31	931.67	933.02	931.67	935.27	6.0	925.68
Salt	200.40	931.55	933.42	931.55	935.40	5.8	925.78
Salt	200.47	931.67	933.16	931.67	935.15	5.6	926.07
Salt	200.52	932.45	934.02	932.45	935.86	5.5	927.00
Salt	200.60	932.82	934.31	932.82	935.95	5.4	927.41
Salt	200.68	937.28	935.81	937.28	937.64	4.9	930.90
Salt	200.75	937.28	935.93	937.28	937.58	4.7	931.21
Salt	200.83	937.28	935.83	937.28	937.28	5.1	930.73
Salt	200.88	938.71	936.46	938.71	937.96	5.2	931.24
Salt	200.95	938.69	936.74	938.69	938.27	5.0	931.76
Salt	201.01	938.69	936.27	938.69	937.63	5.1	931.20
Salt	201.10	942.17	936.48	942.17	938.19	4.9	931.59
Salt	201.16	943.39	938.14	943.39	939.50	5.1	933.09
Salt	201.20	942.38	938.76	942.38	940.03	5.0	933.78
Salt	201.26	942.38	939.32	942.38	940.51	4.8	934.48
Salt	201.33	942.38	939.15	942.38	940.70	5.0	934.14
Salt	201.41	942.38	939.42	942.38	941.20	5.2	934.26
Salt	201.48	943.46	939.53	943.46	941.70	5.4	934.17
Salt	201.54	944.01	940.13	944.01	943.10	5.6	934.57
Salt	201.62	944.97	940.67	944.97	944.31	5.7	935.01
Salt	201.70	945.11	941.17	945.11	944.15	5.6	935.61
Salt	201.81	945.11	942.07	945.11	945.11	5.8	936.26
Salt	201.89	946.82	943.02	946.82	945.73	5.6	937.39
Salt	201.96	946.20	944.02	946.20	946.22	5.7	938.33
Salt	202.01	946.85	944.39	946.85	946.62	5.7	938.74
Salt	202.06	947.33	945.19	947.33	947.51	5.3	939.84
Salt	202.11	948.26	946.46	948.26	948.45	5.1	941.38
Salt	202.18	946.86	947.24	946.86	948.72	5.1	941.77
Salt	202.24	948.09	947.66	948.09	949.00	4.7	942.94
Salt	202.32	950.65	948.51	950.65	949.91	4.8	943.68

Field Measurements of Scour Method

Based on field observation, Abbott (1963) analyzed U.S. Geological Survey discharge measurement notes from several streams in the Southwestern United States and developed an empirical enveloping observed scour at gaging stations. The relationship between scour depth and unit discharge is given as:

$$d_s = K\,(q)^{0.24}$$

where:

d_s = Depth of scour below streambed, ft

K = 2.45 English units (1.32 metric units)

q = Unit water discharge, cfs/ft

The above equation was used as a check on other methods applied in this study. For levee only existing condition (Condition 2), on the average, the scour depths computed by this method were 6 ft and 6.5 ft for the Salt and Lower Gila reaches, respectively. For levee with ponds condition (Condition 3) the average scour depths were 6 ft and 6.7 ft, respectively. The results suggest Abbott's method provides consistent scour depth measures along the study reach.

Regime Equations

The regime equations supported by field measurement methods (Pemberton and Lara, 1984) were used to calculate toe-down depth from the bed profile at the end of 105-year HEC-6T simulation. Regime equation under this approach as suggested by Neill (1973) is:

$$d_f = d_i\left(\frac{q_f}{q_i}\right)^m$$

where:

d_f = Scoured depth below design flood water level, ft

d_i = Average depth at bankfull discharge in incised reach, ft

q_f = Design flood discharge per unit width, cfs/ft

q_i = Bankfull discharge in incised reach per unit width, cfs/ft

m = Exponent varying from 0.67 for sand to 0.85 for coarse gravel

This method provided consistent scour-depth measures for the Salt and Lower Gila reaches. For levee only (Condition 2), the average scour depths were 4.7 ft and 5 ft, for the Salt and Lower Gila, respectively. For levee and ponds (Condition 3), the average scour depths were 4.8 ft, and 5.4 ft, respectively.

The method had been expanded for Bureau of Reclamation use to include the empirical regime equation by Lacey (1930) and the method of zero bed-sediment transport by Blench (1969) in the form of the Lacey equation:

$$d_m = 0.47(\frac{Q}{f})^{1/3}$$

where:

d_m = Mean depth at design discharge, ft

Q = Design discharge, cfs

f = Lacey's silt factor equals 1.76 $(D_m)^{1/2}$ where D_m equal mean grain size of bed material in millimeters.

Because of its dependency on design discharge and mean grain diameter, this method gave the same scour depths for Condition 2 and 3. The average scour depths were 3.4 ft and 4.1 ft, respectively.

The Blench equation for "zero bed factor" is:

$$d_{fo} = \frac{q_f^{2/3}}{F_{bo}^{1/3}}$$

where:

d_{fo} = Depth for zero bed sediment transport, ft

q_f = Design flood discharge per unit width, cfs/ft

F_{bo} = Blench's "zero bed factor," ft/s^2

The scour depths computed by this method were in the order of 5 ft and 6.5 ft for the Salt and Lower Gila reaches, respectively.

The scour depths (d_s), for the above regime equations, were computed by adjusting the maximum depths (d_f, d_m, and d_{fo}) by an empirical multiplying factor Z (Pemberton and Lara, 1984).

Competent or Limiting Velocity Control to Scour

This method (Neill, 1973) assumes that scour will occur in the channel cross section until the mean velocity is reduced to that (limiting velocity) where little or no movement of bed material is taking place. Neill derived empirical curves for competent or limiting velocity with sand or coarser bed materials. The scour depth or increase in area of scoured channel section with corresponding increase in depth for competent velocity, V_c, is determined by relationship of mean velocity, V_m, to Vc in the equation:

$$d_s = d_m(\frac{V_m}{V_c} - 1)$$

where:

d_s = Scour depth below streambed, ft

d_m = Mean depth, ft

This method consistently gave much higher (approximately +50-80%) estimates of scour depth compared with other methods described above (See Appendix M). Therefore, the scour depths generated by this method were discarded in final average toe-down calculations.

Adjustments and supporting empirical charts for application of these equations can be found in Pemberton and Lara (1984).

Other Supporting Method(s)

Blodgett (1986) derived a relationship between scour depth and bed material median diameter to estimate the probable maximum depth of scour due to natural scour and fill phenomenon in straight channels (as is the case in current study), and in channels having mild bends. The relationship is given in the following equation form:

$$d_s = 12 \text{ ft}, \qquad \text{for } D_{50} < 0.005 \text{ ft}$$

$$\text{or,} \quad d_s = 6.5\, D_{50}^{-0.11} \qquad \text{for } D_{50} > 0.005 \text{ ft}$$

where:

d_s = Estimated probable maximum depth of scour, ft

D_{50} = Median diameter of bed material, ft

This equation is considered less reliable as it is only dependent on mean grain diameter and not on any hydraulic parameters, such as velocity and/or discharge. Also, scour depths computed using Blodgett's method consistently gave much higher (approximately +50%) estimates when compared to other methods and was therefore discarded from the final average (See Appendix M).

Toe down can be reduced to local protection beyond 300' north along Dysart Rd.

8. Least Damage Levee Overtopping Location

A major component of levee design is to identify overtopping locations remote from major damage centers where a levee can be permitted to overtop to prevent catastrophic failure. Determining the likely locations and impact of levee overtopping is a particularly difficult task, because the hydraulics problem created by levee overtopping is a multi-dimensional, unsteady flow problem (U.S. Army Corps of Engineers, 1995). A one-dimensional model such as HEC-RAS cannot tackle the backwater effect in the interior (protected floodplain areas) of the levee. It is advantageous to identify an overtopping location downstream of existing mining pits (as an example) in close proximity of the levee. This enables backwater to fill the mining pit and reduce damage. Furthermore, information on the impact of the failure, including inundation area mapping, spatial distribution of infrastructure (schools, riverside water treatment plants, etc.) must be determined.

Knowing the limitation of a one-dimensional model in performing the aforementioned task, steps were taken in this study to locate a least damaging location for levee overtopping. From aerial photos and a survey of nearby infrastructure, it was determined that the most feasible location would be downstream of the existing mining pit located along the north bank downstream from the 116th Avenue Bridge. Cross sections 198.08 through 197.87 were considered to be the potential locations for this purpose. At these locations, however, the levee height would have to be reduced substantially to allow overtopping. From the data presented in Figure 8-1 it can be seen that large floods tend to rise to the level of the levee in the reach near 107th Avenue. The areas where the levee turns north at Dysart Road and freeboard is eliminated is also a

good area for overtopping. The area near Dysart could allow water to flood the protected area from the bottom resulting in lower velocities and damages. Once this filling took place the area near 107th Avenue could be allowed to overtop and allow some water to flow through the protected area. This would reduce pressure on the levee and reduce the risk of catastrophic failure. Under these conditions some levee surcharge may be required near 107th Avenue so as to protect the areas that are not to be allowed to overtop. Protection upstream of 107th Avenue could be reduced slightly and protected to allow water to overtop at a location that was designed rather than over a long section of levee. From Figure 8-1 it would appear that the levee as designed herein is capable of containing the 500 year flood from approximately 110th Avenue to Dysart Road.

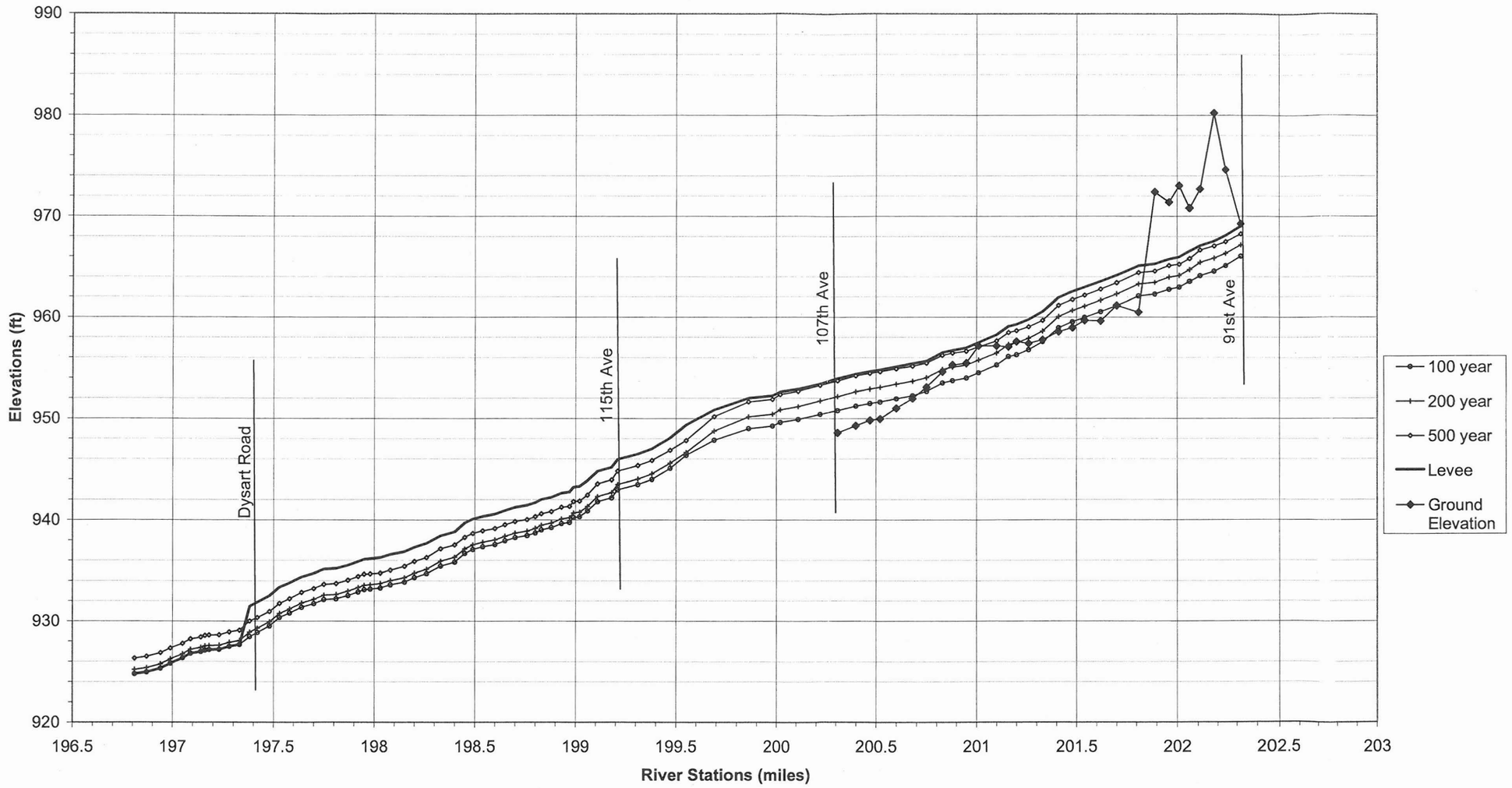

Figure 8-1. Levee Elevations Compared with Floods Larger than 100 Year Water Surface Elevations. Existing Ground Elevations are Shown Upstream from 107th Avenue.

9. Summary and Conclusions

Hydraulic, sedimentation and flood damage reduction modeling was performed for the PED Hydraulic Design of the Tres Rios North Levee. The study was completed according to the guidelines provided in the *Tres Rios, Arizona Feasibility Studies* (U.S. Army Corps of Engineers, 2000).

The hydraulic analyses indicates that the impact of the north levee is less than a one foot increase in water surface elevation and impacts are very limited along most of the proposed leveed reach. The levee impacts on long term bed elevations are also limited with very little change in bed elevation at the end of a 105 year simulation. The long-term sediment model indicates higher deposition for future levee and pond conditions compared with the levee only future condition. The pond at the confluence of the Salt and Gila Rivers was problematic as it acts as a sediment trap and in the long-term could cause reaches downstream of the confluence to degrade. This study suggests possible relocation or removal of the pond at the confluence to avoid possible future maintenance costs as well as problems related to downstream scour.

Uncertainty analysis on stage was performed according to the guidelines in the "Flood Damage Reduction Analysis" (U.S. Army Corps of Engineers, 1998) HEC-FDA manual. Hydraulic sensitivity analyses supported a foot of change in water surface elevations due to a 20% increase in Manning's *n* values. This led to a lower stage uncertainty than was initially expected for the Salt reach. The stage uncertainty for the Lower Gila reach was higher due to large flows and wider channels. The HEC-FDA model was run with 3-ft of freeboard for the proposed levee with a minimum 95% reliability as the set criterion. Results show that the reliability of the levee for the 500-

year event ranges from approximately 56% to 91%. The model gave results in excess of the 95% criterion for the 100-year event.

Toe-down calculations were completed per Pemberton and Lara (1984) for local scour ranging from 5 ft to 7 ft on the average, with 30% factor of safety. Long-term HEC-6T thalweg results were used to obtain the final recommended maximum toe elevations.

Overtopping locations were identified for the proposed levee. The recommended locations are near the downstream end of the north levee and just downstream of Dysart Road where the final levee alignment turns north and near 107th Avenue. These locations are remote from major damage centers which were identified based on information on nearby infrastructure and existing housing locations.

Two-dimensional model results indicated that commonly used Manning's n values are adequate for use in this reach of the Salt and Gila Rivers.

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2. Field Reconnaissance & Data Collection

2.1. Field Reconnaissance

Field reconnaissance was conducted on August 8, 2002, September 4, 2002, September 16, 2002, and November 6, 2002 to accomplish the following: (1) observe the general condition of the study reach; (2) identify and locate bridges, existing levees and other features of interest; (3) observe spatial vegetation patterns; (4) locate sediment sampling locations and collect samples, and (5) verify the study reach along the proposed levee based on WEST's 75% report. The participants of the field trips are listed below:

August 8, 2002: Mr. Dennis L. Richards (WEST), Dr. Hari Sundararaghavan (WEST), Dr. Iftekhar Ahmed (WEST), Mr. Glenn M. Mashburn (COE), Mr. Van G. Crisostomo (COE), Mr. William Hass (MCFCD), and Mr. Don Rerick (MCFCD).

September 4, 2002: Dr. Carlos Lopez-Sabater (WEST) and COE representatives for soil sampling.

September 16, 2002: Dr. Carlos Lopez-Sabater (WEST) and COE representatives for soil sampling.

November 6, 2002: Dr. Gary E. Freeman (WEST), Dr. Iftekhar Ahmed (WEST), Mr. Glenn M. Mashburn (COE), Mr. Van G. Crisostomo (COE), Mr. Rene A. Vermeeren (COE), and Mr. William Hass (MCFCD)

Field photographs and logs from August 8, 2002 are enclosed in Appendix B.

2.2. Data Collection

The U.S. Army Corps of Engineers, Los Angeles District, provided the following data:

- The 5-, 20-, and 100-year peak discharges for the most upstream sections of the Salt and Upper Gila Rivers within the study limits.
- The HEC-DSS files with 72 hour hydrographs for significant flood events for the Salt River above the confluence of Salt-Gila Rivers for the period of 1889 through 1993 (a 105-year period-of-record) and at the upstream section of the Upper Gila Rivers for the period of 1920 through 1993 (73-year period-of-record). The Salt River flows at the Salt-Gila confluence were previously routed by the Corps from discharges at the Granite Reef Diversion Dam. Flows measured by the USGS for the Gila River were used to fill in gaps in the Corps data and to provide average daily flows for periods that were not covered by the 72 hour long peak hydrographs.
- One-foot resolution digital topography and corresponding aerial photos for the study reach.
- Bed sediment gradation data.

An August 8, 2002 field reconnaissance confirmed two bridge crossings: the 116th Avenue Bridge downstream of the Salt-Gila confluence and the Bullard Avenue Bridge downstream of the confluence of the Agua Fria River. Both bridges are located in the portion of the model designated as the Lower Gila River. As-built plans describing the geometry of these structures were obtained from the Maricopa County Department of

Transportation. The existing Holly Acres Levee was identified along the north bank of the Salt-Lower Gila system from the Salt-Gila confluence to El Mirage Road. It was determined that the one-foot resolution topography was adequate to define this levee. Figure 1-2 shows the location of these structures as well as the existing levee.

3. Existing Conditions Hydraulic Analysis

3.1. General

The objectives of the analysis were to create an existing condition hydraulic model, delineate corresponding flood inundation boundaries for the 100-year event, and provide the initial geometry for the sediment transport analysis. Three sub-models were developed separately and then combined in HEC-RAS to generate one networked hydraulic model of the entire study reach. These sub-models were identified as: the Salt, the Upper Gila (above the confluence with the Salt), and the Lower Gila (below the confluence).

3.2. Peak Discharges

The peak discharges used in the hydraulic analysis of all the conditions modeled were developed by the U.S. Army Corps of Engineers and are listed in Table 3-1.

Table 3-1. Peak Discharge Values Used in Hydraulic Models

River ID	River Station (miles)	Discharge (cfs)			
		5-Year	20-Year	50-Year	100-Year
Lower Gila	199.47	23,500	92,000	185,000	227,000
Upper Gila	1.67	4,000	10,000	55,000	65,000
Salt	203.48	19,500	82,000	130,000	162,000

3.3. Existing Conditions Hydraulic Model

3.3.1. Hydrology

The hydrology provided consisted of primarily 72 hour duration hydrographs with values given every six hours. The 72 hour hydrographs were extended to provide smooth rising and falling limbs for the hydrographs. This had previously been done for flows from 1940 to 1993 on the Salt River and was performed for flood flows for the period from 1889 to 1940 as a part of this study.

Flows on the Gila River were more difficult to obtain and daily average values were used for periods when no six hour values were available on the Gila River for the period from 1940 to 1993. Peaks were estimated for the period from 1920 to 1940 by the Los Angeles District from records at Gillespie Dam. Values prior to 1920 were estimated such that peak flows were on the same order as floods in that period. The 1983 flood on the Gila River was used as a template for floods prior to 1940 when records were not available. Flood peaks prior to 1920 were estimated as 100,000 cubic feet per second (cfs), 80,000 cfs, and 60,000 cfs based on a series of discussions with Nick Adelmeyer of the Los Angeles District. Further discussion of the process and the data used were provided by Mr. Adelmeyer and are included in Appendix A.

For time periods when flow occurred on only one river or the other, flow was introduced into the dry river in the HEC-6T model to keep the model steady. The flow introduced was 100 cfs which was insufficient to move sediment in the model but provided sufficient flow to maintain model stability.

3.3.2. Model Development

The Scope of Work required hydraulic simulations of the study area for three distinct conditions. These are:

- Condition 1 A without (w/o) project or existing condition model;
- Condition 2 An existing conditions model with the proposed levee along the north side of the river from approximately 91st Avenue to a point between Dysart Road and the Agua Fria River; and
- Condition 3 A with-project design conditions model with the proposed North Levee with open water marshes and ponds.

A detailed description of Condition 1 is provided below and the descriptions for Conditions 2 & 3 are provided in the "Proposed Conditions Hydraulic Analysis" Section of this report.

No data concerning observed water surface elevation were found at the beginning of the study. An extensive search yielded no observed water surface elevations for any of the previous floods within the study reach. During the study a long time resident, Adron Reichert, indicated that he observed the 1993 flood and made some general observations regarding the height of the flooding in relation to the Holly Acres Levee and the Dikes that are located just downstream from what is now the 116th Avenue Bridge.

Mr. Reichert's observations raised some concern regarding the modeled water surface elevations but an investigation, including subsequent 2-D modeling, indicated that the modeled water surface elevations were accurate and matched well with the observations made by Mr. Reichert. A complete report and discussion of the observations and findings is included in Appendix C and more discussion follows.

Condition 1 – Without Project Existing Conditions

A geo-referenced, networked hydraulic model of the study reach was developed for Condition 1 using the Army Corps of Engineer's HEC-RAS, Version 3.0.1 dated March 2001, and the HEC-GeoRAS extension of ArcView 3.2a by Environmental Systems Research Institute, Inc. The datum of the mapping used was NGVD 1929.

In order to characterize the hydraulics in the Salt-Gila system, the study area was divided into three sub-models: the Salt, the Upper Gila and the Lower Gila. This allowed for identification of the physical flow separation point and backwater effects at the confluence of the Gila and the Salt Rivers. The three sub-models were then joined at the confluence and combined to create a single networked model in HEC-RAS.

The elevation dataset used to construct the model geometry was composed primarily of 1-foot vertical resolution topography, dated 2001, provided by the Los Angeles District, Army Corps of Engineers. Additional, limited portions of overbank geometry were cut from the topography used in the 1999 WEST analysis which supplemented areas where the 1-foot data did not completely contain the 100-year flow event. All topography was developed using photogrammetric methods and was resolved into State Plane coordinates, Arizona – Central, NAD 83 and NGVD 1929.

The study reach geometry was characterized in a series of steps. First, the elevation dataset was used to create a triangulated irregular network (TIN) using ArcView GIS's 3D Analyst extension. The TIN and original topographic mapping were used to identify the bank lines, stream centerline, and flow lines in the channel, left overbank and right overbank. Cross sections were then drawn perpendicular to the flow lines. Cross

sections were drawn starting approximately 800 feet downstream of the Bullard Avenue Bridge to ensure the downstream boundary condition would not impact results within the study reach. Cross sections in the area of the Salt-Gila confluence were initially drawn long enough to allow overlap of the two reaches. After initial model runs, the results were plotted in plan view and a determination was made as to the location of flow separation between the two reaches. This line of separation follows the natural high ground between the two channels. This line is illustrated on the flood inundation plots located in Appendix P. Cross sections where flows from the Salt and Upper Gila overlapped were then cut off at this flow separation line. This approach ensured that the two reaches of the hydraulic model where overlap is possible would not be modeled twice. Cross sections for which this technique was applied were numbered from 0.0 to 0.80 on the Upper Gila, and from 199.55 to 200.4 on the Salt. Ineffective flow was defined at the ends of these cross sections where the two flows would otherwise meet one another.

Existing condition water surface profiles are shown in Figures 3-1 through 3-3 on the following pages. Detailed hydraulic results for these profiles are presented in Appendix D. Also shown in Figures 3-1 through 3-3 is the Holly Acres Levee. This levee was constructed in 1983-84 by the Flood Control District of Maricopa County. It extends from 113th Avenue downstream to El Mirage Road. The location and elevation of this levee, as determined by the aerial mapping for this project, is included in the profile plots. Figures 3-1 through 3-3 also include the profile of the right bank stations along the Lower Gila and Salt reaches.

Several locations within the study reach illustrate a hydraulic phenomenon in which the water surface drops above local increases in invert elevation. This occurs as the flow accelerates over the high point. Simultaneously, the water surface decreases so that the flow maintains a conservation of energy. In the Lower Gila reach, these areas were identified at river miles 196.12, 197.33 and 198.03. The thalweg profile for the Salt reach also shows several locations with high invert elevations and corresponding changes in water surface elevations. These occur at river miles 200.68, 201.16, and 202.69.

Tres Rios PED
Existing Condition Water Surface Profiles
Lower Gila

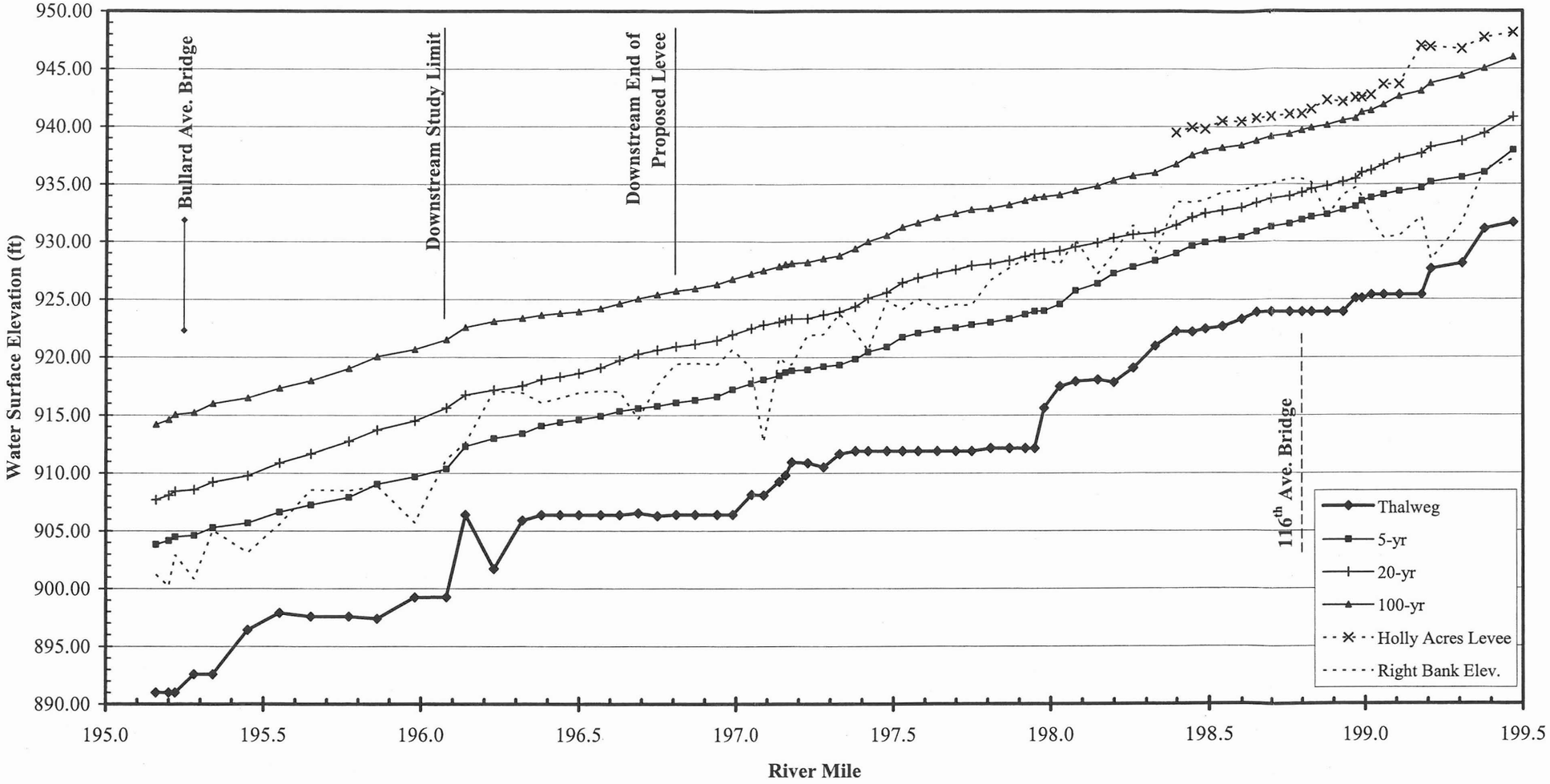

Figure 3-1. Existing Condition Water Surface Profiles – Lower Gila

Tres Rios PED
Existing Condition Water Surface Profiles
Salt

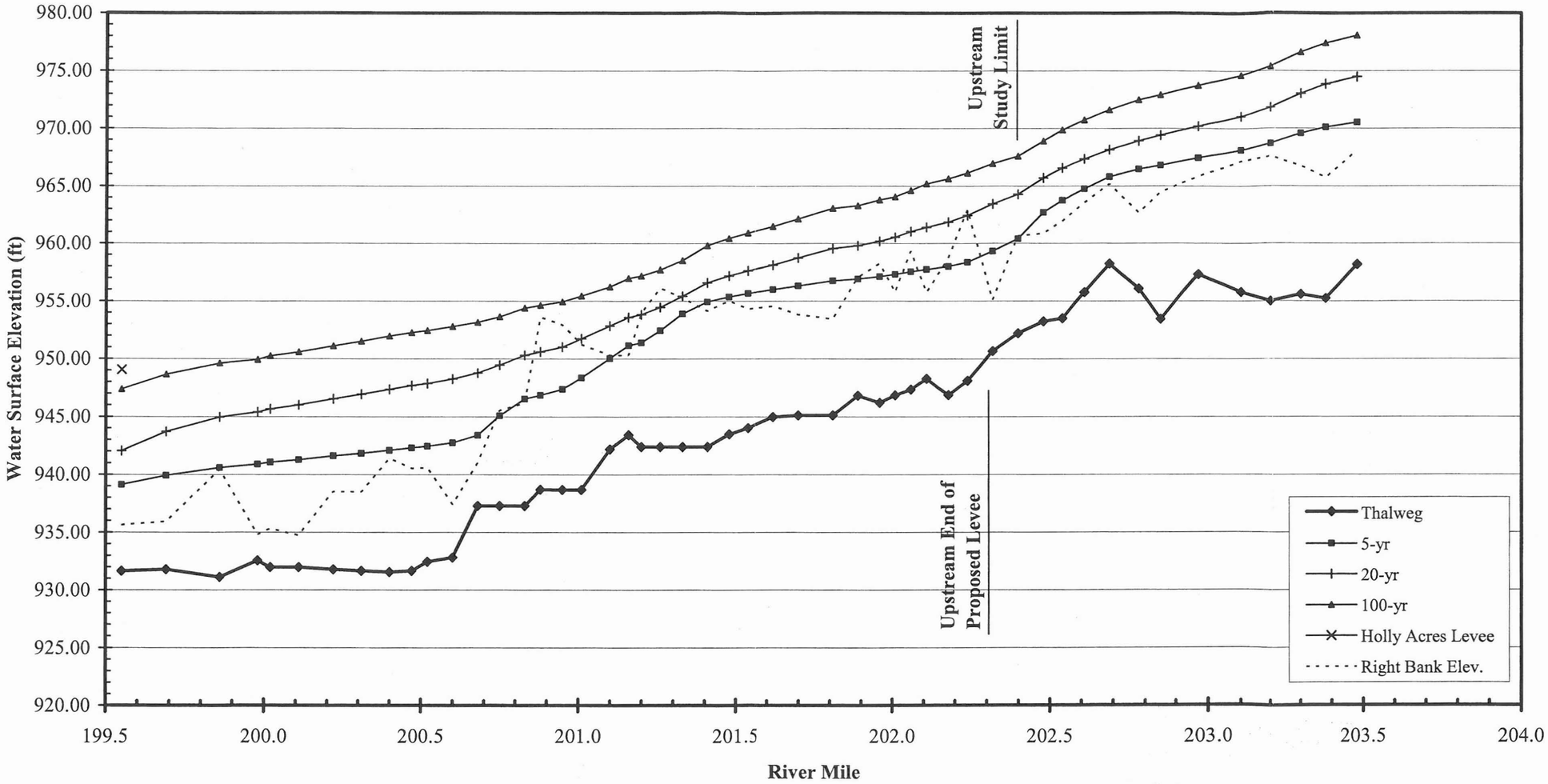

Figure 3-2. Existing Condition Water Surface Profiles - Salt

Tres Rios PED
Existing Condition Water Surface Profiles
Upper Gila

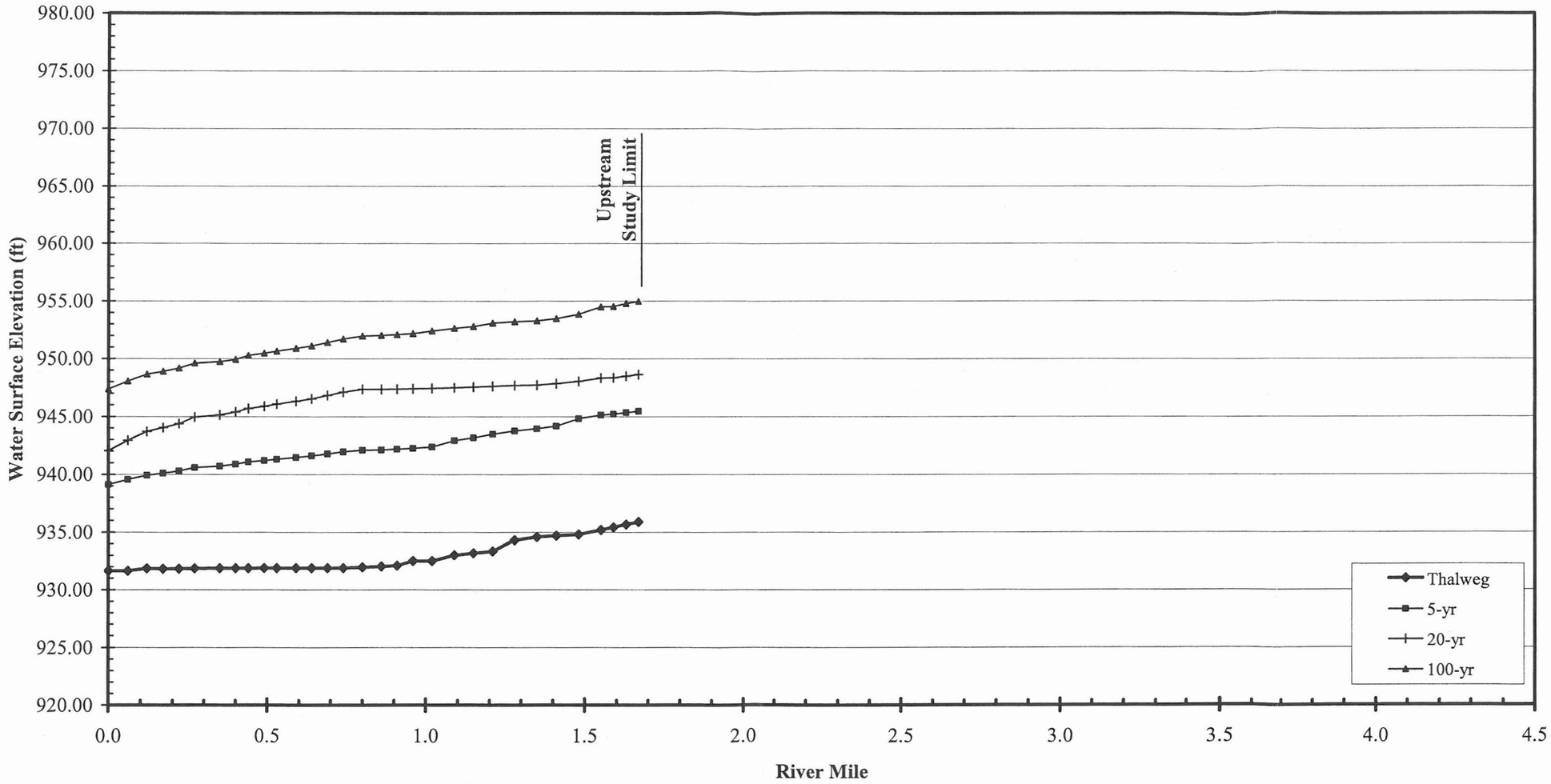

Figure 3-3. Existing Condition Water Surface Profiles – Upper Gila

The 116th Avenue Bridge and the Bullard Avenue Bridge geometries were obtained from the as-built plans (Maricopa County Department of Transportation) and incorporated into the HEC-RAS network model. Contraction and expansion loss coefficients were set to 0.3 and 0.5 respectively in the bridge bounding cross sections and the cross section immediately upstream of the bridge. The "highest energy answer" option in HEC-RAS bridge-modeling approach was selected from Energy, Momentum, and Yarnell methods for both bridges. The deck of the 116th Avenue Bridge is at a skew of 15 degrees with respect to the flow direction in the channel, as shown in Table 3-2. The deck geometry and the two bounding cross sections of the 116th Avenue Bridge were adjusted using the cosine of the skew angle to represent a structure orthogonal to the flow direction. Soffit and corresponding deck elevations were obtained at the north bank location of the bridges.

Table 3-2. Bridges in the Salt-Lower Gila Study Reach

Bridge	River Station (miles)	Skew Angle	Soffit Elevation (ft)	Deck Elevation (ft)
116th Avenue	199.21	15	966.28	974.07
Bullard Avenue	195.22	0	922.49	931.99

3.3.3. Low-Flow Regime Channel

Channel bank stations were identified based on a regime equation proposed by Blench (1970). In general, the channel-forming discharge for a river system such as the Salt-Gila is responsible for the bulk of sediment transport. For this study, the 5-year discharge was used as the channel-forming discharge and channel width (distance

between bank stations) was based on this value. The application of this modeling approach helps to maintain channel velocities which better ensure that sediment transport is maintained throughout the study reach.

Most regime formulations include three relations that yield values of the channel width, depth and slope as functions of the water discharge and bed material size. Some of the more refined equations also take into account bank cohesiveness, sediment discharge or concentration, and fluid viscosity. The regime equation used in this study is that of Blench (1970) where the channel width, w, is given by

$$w = \sqrt{\frac{F_b Q}{F_s}}$$

where F_b is the so-called bed factor and is defined as the product of g (gravitational acceleration) and the Froude number squared, $F_s = 0.10$ for friable banks, and Q is the water discharge (Vanoni, 1975). Based on average Froude number from initial HEC-RAS modeling results, the regime low-flow channel widths were calculated to be approximately 900 ft for the Lower Gila, 800 ft for the Salt and 400 ft for the Upper Gila. Results were verified using empirical charts in the U.S. Army Corps of Engineers' Engineer Manual "EM 1110-2-1418" (U.S. Army Corps of Engineers, 1994).

Ineffective flow areas in the HEC-RAS model were set at the regime bank stations to elevations high enough such that the 5-year discharge was completely contained within the channel, but low enough to allow the 20-year discharge to flow uncontained. The ineffective flow limits along the north bank were developed based on the 100-year event. All cross sections were inspected for ineffective flow areas. A maximum of 4:1 expansion was maintained in developing these areas, where necessary. The ineffective area heights were raised vertically sufficient to contain high flows.

3.3.4. Manning's *n* Estimation

Aerial photographs, provided by the Los Angeles District of the Army Corps of Engineers, were studied and used to delineate land use polygons in ArcView 3.2a. The study area was classified into thirteen land use types to define the existing vegetation conditions, and each type was assigned a Manning's *n* roughness coefficient. Initial Manning's *n* values were estimated based on "Estimated Manning's Roughness Coefficients for Stream Channels and Floodplains in Maricopa County, Arizona" (Thomsen and Hjalmarson, 1991), and the USGS "Guide for Selecting Manning's Roughness Coefficients for Natural Channel and Floodplains" (Arcement and Schneider, 1984).

The general procedure adopted in both references for determining n values is to first select a base value of n for the bed material, followed by selection of n-value adjustments for channel irregularities and alignment, obstructions, vegetation, and other factors. With no apparent change in channel alignment and no significant irregularities or obstructions, the primary factor in the estimation of Manning's n for the study area was vegetation.

For the majority of the study area, the above guidelines were sufficient to estimate Manning's *n* values. However, very dense vegetation at the edge of the main channel and in the overbanks of the Upper Gila and parts of Salt-Lower Gila system required further field reconnaissance, performed on September 16, 2002. Field observation supports vegetation height ranging from 10-15 feet in parts of the Upper Gila main channel and immediately upstream of the 116th Avenue Bridge (See Figures 3-4 through 3-7).

Field observations were used to re-estimate and verify the estimated Manning's *n* values for these densely vegetated areas using relationships developed by Freeman et al. (2000) in conjunction with the methods presented by Thomsen and Hjalmarson, (1991). The study by Freeman et al. concludes that the hydraulic roughness of a vegetated channel is a function of the stiffness of the plants growing in the channel, the depth, velocity, and hydraulic radius of the channel, plant density, and frontal area of the plant obstructing the flow. Studies show that the plant stiffness modulus may be predicted with good accuracy by using stem diameter and plant height in a non-linear relationship. Based on the relationships, the roughness is calculated directly with the depth of flow known. The hydraulic relationships support the calculation of Manning's n values for both submerged and partially submerged vegetation. The partially submerged case is controlling since the resistance increases with depth for partially submerged plants as the blockage area increases with depth until the plants are submerged. Research conducted in conjunction with the Freeman report found that the likelihood of a channel achieving tear-out velocity conditions during a flood event was very low..

While the research conducted during the study reported by Freeman involved smaller vegetation than the current study in the Salt and Gila Rivers, it was reported that the stiffness modulus used in the method could be scaled to account for plant size. The Freeman methodology was not used exclusively in this study since the research did not directly address 12 to 15 foot tall salt cedar found in the Salt and Gila Rivers. The method did use 12-15 foot tall willows and other vegetation to determine plant stiffness, however.

The calculations using Freeman's method suggested a high Manning's *n* value of approximately 0.2 for the areas containing dense bushy willow, mesquite, and salt cedar (all vegetation in full foliage). This corroborated similar n values in the Thomsen and Hjalmarson report for a reach of the Gila River west of Phoenix and indicates that the Freeman methodology may be extendable to larger vegetation. It should be noted that salt cedar was one of the plants evaluated in the flume during the Freeman study.

Near the Bullard Avenue Bridge and El Mirage Road, vegetation was classified as open (sparse) to dense shrublands (Figures 3-8 through 3-10). Corresponding Manning's *n* values were assigned as per Maricopa County methodologies based on Arcement and Schneider (1984). Table 3-3 lists the land use classes and representative roughness values. Additional site photos are included in Appendix B.

The lack of significant irregularity and obstruction in the study reach, based on the typical behavior of similar channels in Arizona, suggest significant change in vegetation condition is highly unlikely. However, addition of ponds and marshes is expected to have a long-term impact in the Manning's n values. Also, experience and research (Thomsen and Hjalmarson, 1991) suggest that the sparse shrublands are expected to grow over the years, thus requiring future field reconnaissance and possible adjustment to future computer models.

Table 3-3. Land Use and Representative Manning's *n* Values

Land Use	Description	Base *n* Value
Agricultural	Farmland	0.050
Channel - Dense vegetation	Dense bushy willow, mesquite, and salt cedar (all vegetation in full foliage)	0.200
Channel - Open vegetation	Sparse shrubs; 8-10-year-old willow or cottonwood trees intergrown with weeds and brush	0.040
Channel - Without vegetation	No significant vegetation in sight	0.030
Disturbed	Plowed farmlands	0.035
Levee	Existing levee	0.030
Mine	Mining Pits	0.040
Paved	Access ways	0.025
Residential - Low density	Lawns and turf grass	0.040
Shrubland - Dense	Moderate to dense brush	0.060
Shrubland - Open	Sparse brush	0.040
Urban / Industrial	Waste water treatment plant	0.045
Other	---	0.045

Figure 3-4. Typical Dense Vegetation Observed in the Upper Gila Main Channel

Figure 3-5. Upstream of 116th Avenue Bridge Near Salt-Gila Confluence

Figure 3-6. Upstream of 116th Avenue Bridge Salt River Channel Center

Figure 3-7. Upstream of 116th Avenue Bridge Near North Bank

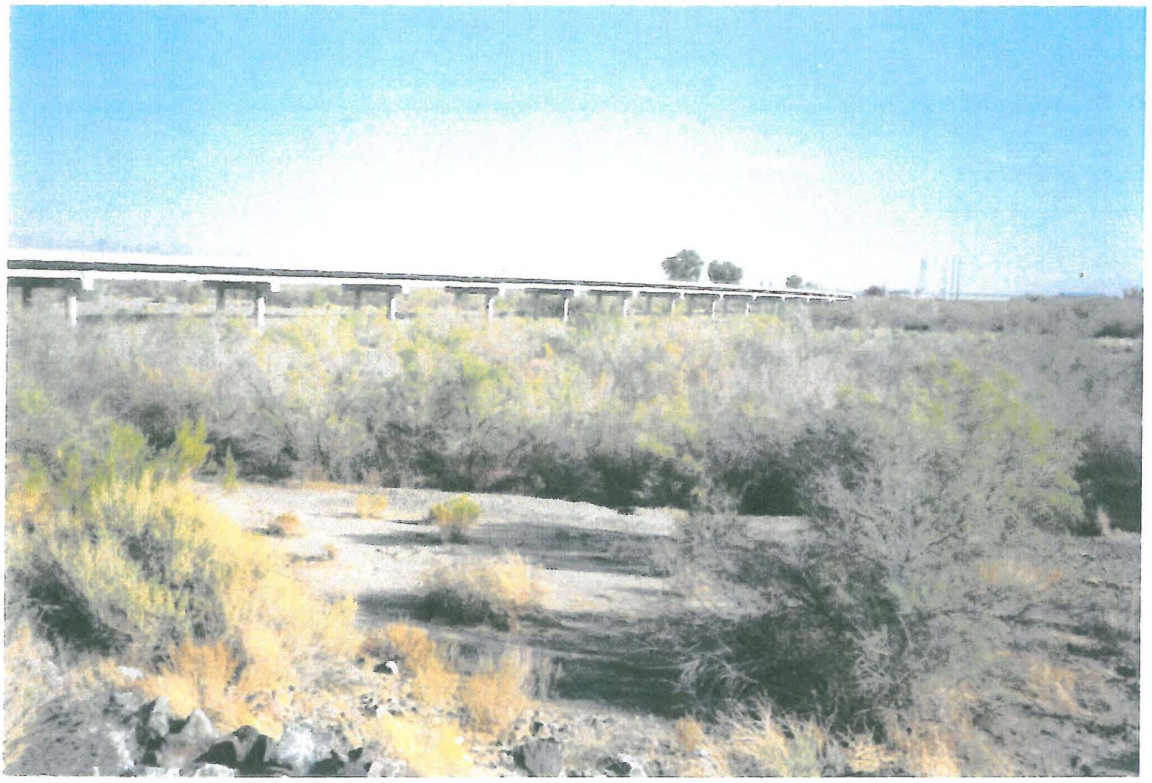

Figure 3-8. Upstream of Bullard Avenue from South Bank, Dense Shrubs

Figure 3-9. Upstream of El Mirage Road Looking South, Sparse Shrubs

Figure 3-10. Upstream of El Mirage Road – Shrub Detail, Tape Reads 12 feet

3.3.5. Sensitivity Analysis

Sensitivity of the model to changes in Manning's *n* values was analyzed for the existing conditions model by increasing and decreasing the Manning's *n* values ±10% and ±20%. Water surface elevations from the sensitivity analysis are shown in Figures 3-11 through 3-12. As expected, water surface elevation increased and decreased with increasing and decreasing Manning's *n* values, respectively. However, the shape of the water surface profile remained similar, representing a stable hydraulic model. The changes in water surface elevations were less than or equal to 1.25 ft for all three reaches for 20% changes in *n* values and 0.5 to 0.61 feet for changes of 10%. The average values by reach are shown in Table 3-4. This indicates that even though the *n* values may vary

slightly the modeled water surface elevation should not vary by large amounts due to errors in the estimation of the Manning's *n* values.

Table 3-4. Average Changes in Water Surface Elevation by Reach for Changes in Manning's *n* Values.

Reach	Uniform Percent Change in Manning's *n* at all X-Sections				
	-20%	-10%	Base	+10%	+20%
Lower Gila	-1.25	-0.61	na	0.58	1.15
Upper Gila	-1.12	-0.55	na	0.52	1.02
Salt	-1.03	-0.51	na	0.50	0.98

Tres Rios PED
Existing Condition Manning's n Sensitivity Analysis
Lower Gila

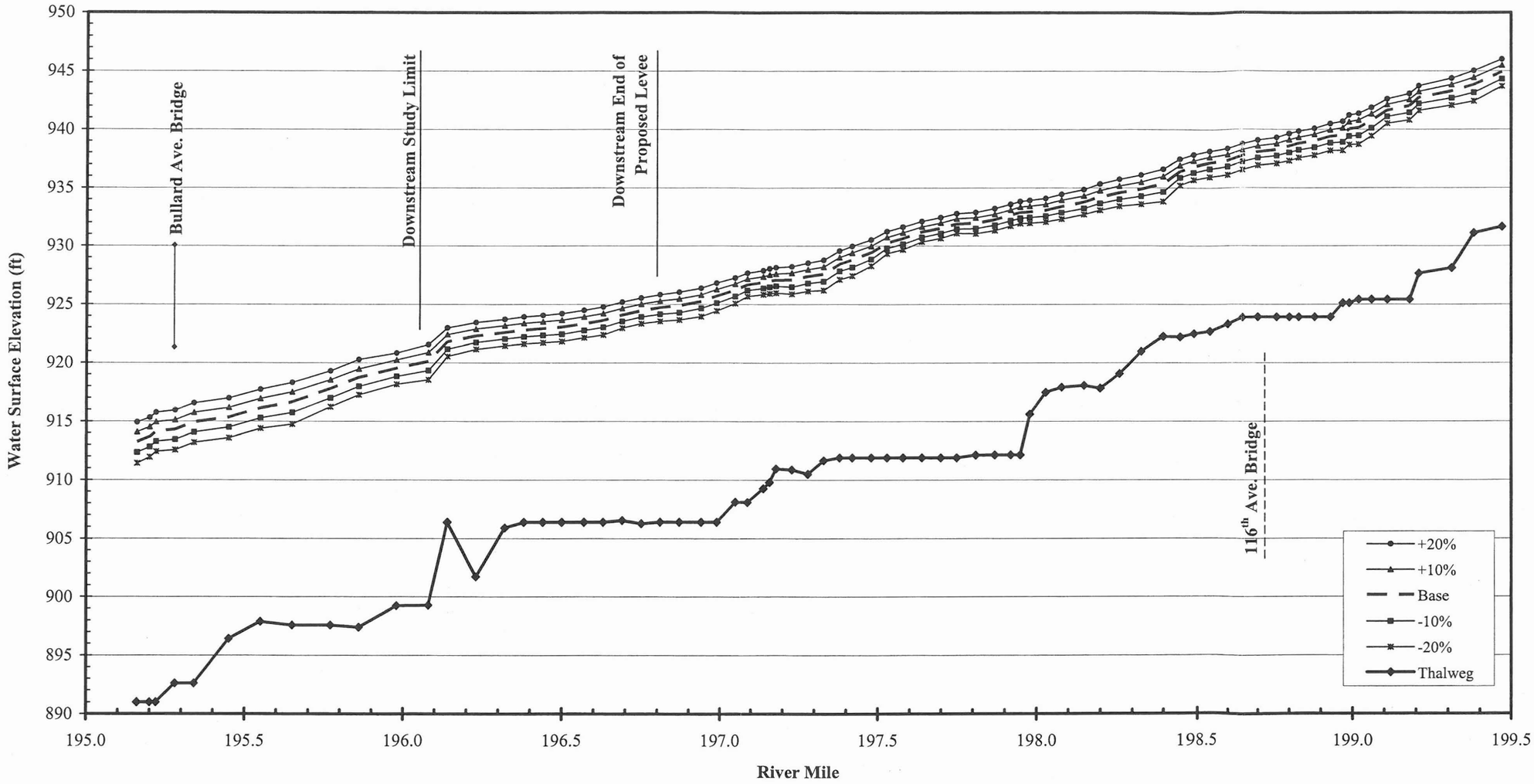

Figure 3-11. Existing Condition Manning's n Sensitivity Analysis – Lower Gila

Tres Rios PED
Existing Condition Manning's n Sensitivity Analysis
Salt

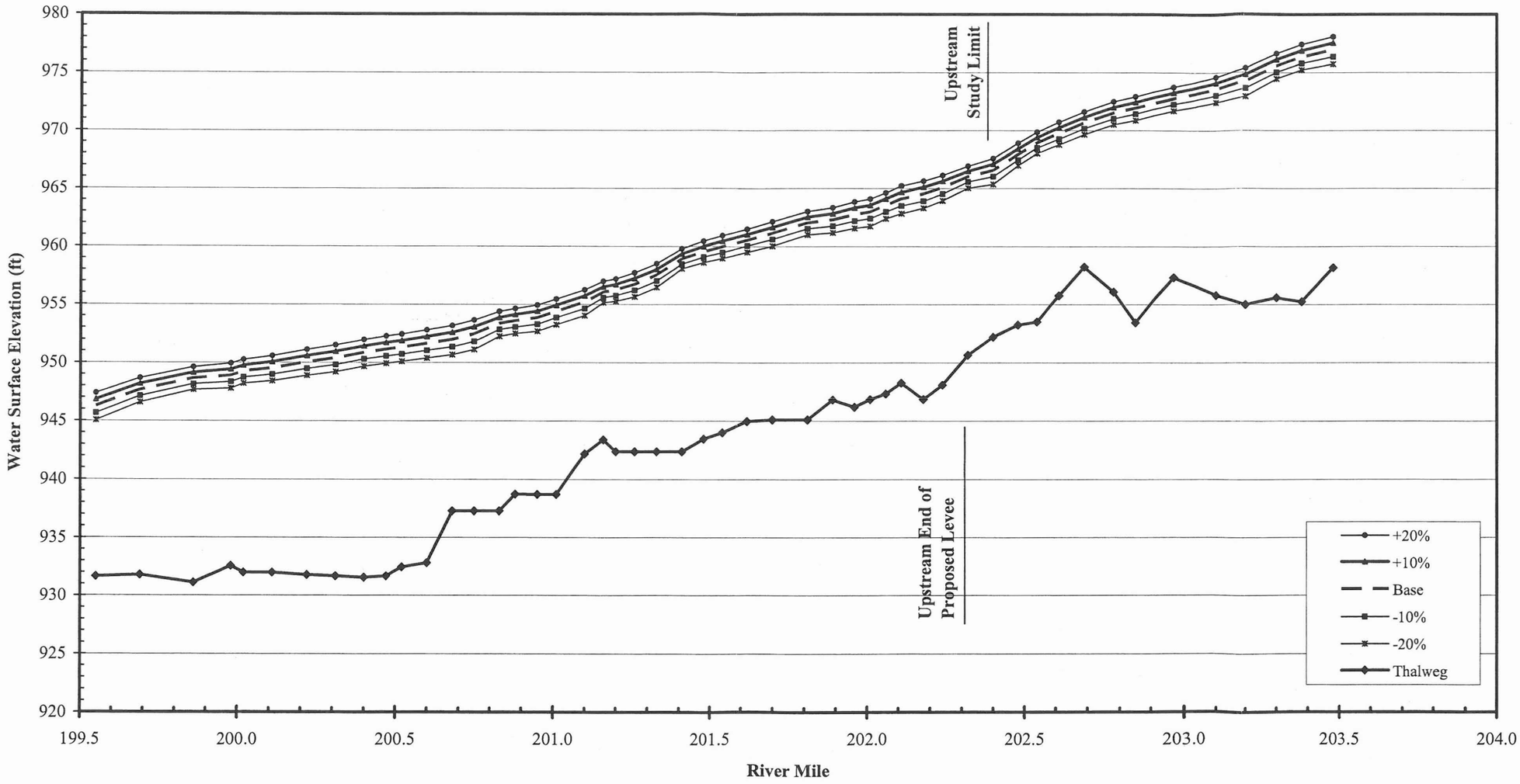

Figure 3-12. Existing Condition Manning's n Sensitivity Analysis - Salt

Tres Rios PED
Existing Condition Manning's n Sensitivity Analysis
Upper Gila

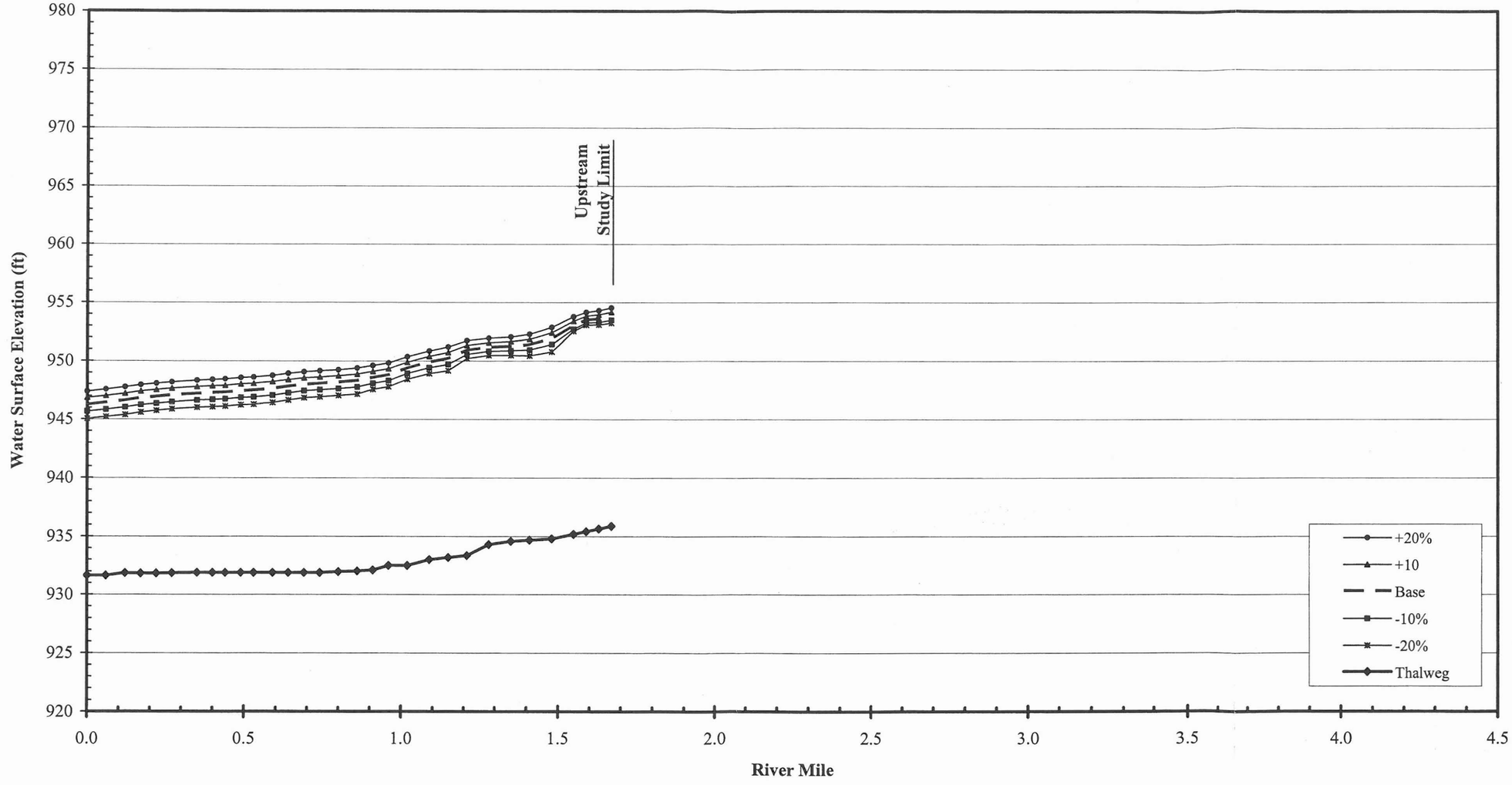

Figure 3-13. Existing Condition Manning's n Sensitivity Analysis – Upper Gila

APPENDIX A

Development of Hydrology for Sediment Analysis

PREFACE

As part of the Tres Rios PED Levee design, development of the long-term sedimentation rate and variation throughout the project reach and within cross-sections was required. The project reach extended west from the Salt River at 91st Avenue to the Gila River at Dysart Road. Streamflow data for the Salt River in the project reach had been developed by the U.S. Army Corps of Engineers (Los Angeles District) previously in order to develop a flood operation plan for Modified Theodore Roosevelt Dam. That data represents existing conditions hydrologic data for the Salt River, and is available for the period from 1889 – 1993. Hydrologic data for the Gila River in the project reach is not directly available for this time period; in addition some of the hydrologic data for the Gila River in the project reach does not represent existing conditions. This report presents the development of existing conditions surface water hydrology for the Gila River in the project reach (i.e. at/above the confluence with the Salt River), to be used for the sedimentation analysis of the Tres Rios project and subsequent levee design. Included in this report are estimated peak discharges for "significant" runoff events, and daily flows for the period pre-1941 when streamflow data for the project reach was not available. Data for the Salt River provided informally by the Hydrology and Hydraulic Engineering Section, Los Angeles District, has been documented in a previous report as noted herein, and has not been published within this report. The data for the Gila River produced during this study, with the exception of daily flows for the gaged period from 1941 – 1993, have been included in this report, and have been developed specifically for the sedimentation analysis and may/may not represent actual historic flow rates and volumes.

APPENDIX A

DEVELOPMENT OF HYDROLOGY FOR SEDIMENTATION ANALYSIS TRES RIOS PROJECT LEVEE DESIGN

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A-1. INTRODUCTION.

The information presented in this appendix was developed in order to provide sufficient streamflow information to enable quantification of the long-term rate, as well as ranges in variability, of sediment deposition or scour within the Tres Rios study reaches of the Salt and Gila Rivers. The resulting information will then be used to assess levee design criteria, including height and toe depth, required to ensure successful function of the project for flood control purposes. The study reaches include the Salt River from 91st Avenue to the Gila River confluence, and the Gila River from the confluence with the Salt River to Dysart Road (the existing Holly Acres Levee, beginning at 113th Avenue and continuing to El Mirage Road, will be raised). The levee alignment at Dysart Road will be extended north from the Gila River approximately 3500 ft. and be tied-back to existing topography.

The Salt River drains an effective area of nearly 13,000 square miles, of which approximately 12,500 square miles is controlled by the SRP system of dams and reservoirs. Runoff from the Gila River to the study area emanating upstream of the Salt River confluence (total contributing drainage area of 29,200 sq. mi.) is partially regulated by Coolidge Dam. The total drainage area controlled by Coolidge Dam is approximately 12,900 square miles. Hence, the total drainage area contributing to runoff in the study area downstream of the Salt-Gila confluence is approximately 42,900 square miles, of which approximately 60% (25,400 sq. mi.) is controlled.

A-2. DATA ACQUISITION AND DEVELOPMENT.

To assess the long-term rate and variability of sediment deposition or scour, streamflow data for the Salt River above the Gila River, and the Gila River above and below the Salt River confluence was required. Furthermore, the streamflow data must reflect *existing conditions*, i.e. with the Salt River Project (SRP) Dams[1] in-place and operated according to current practice, and Coolidge Dam in-place on the Gila River. Fortunately, the recent study[2] to develop the flood operation plan for "Modified Roosevelt" included simulation of the period-of-record (POR, viz.1889 - 1993) floods. Hence data, in the form of 6-hour computation-interval discharges, was available for specific time periods for many simulated runoff events in the Salt River above the Gila River confluence. In general this data was limited to the time period before and after the largest peak discharge for each simulated-spill year. Please refer to the following discussion (re: Salt River Discharges) for perspective on the data available. Monthly simulated-spill volumes below Granite Reef Diversion Dam are available for every month and year.

A-2.1. Salt River Discharges:

During most months of most years there is no flood runoff in the Salt River. Local inflows from the few tributaries (such as Indian Bend Wash), storm drains, tailwater drains (conveying irrigation returns), etc. do not contain sufficient volume to sustain flow through the broad Salt River channel. Almost the entire volume of runoff reaching the study area results from releases/spills from upstream SRP dams which are in excess of delivery system capacity and user demand. These flows, typically lasting for a week or more, spill across the Granite Reef diversion dam and continue downstream. During periods of sustained or high releases these spills reach Painted Rock Dam. Spills from the Salt River Dams occur almost always during the cold-weather months, and result from above normal precipitation, often accompanied by additional runoff from snowmelt or from snowmelt alone. The simulated flood history referred to above (1889- 1993) indicated spills would have occurred most frequently in the months of January through April, with the maximum spill threat in terms of volume occurring in January and February. Simulation of the POR did not result in any spill during the months of June through September; in addition there was only a single spill in October of negligible volume (3000 ac-ft) and only four spills in November, with the greatest spill (122,000 ac-ft) being *less than half* of the greatest spill from any of the other months from December through May. The simulated POR (1889 –1993, 105 years) resulted in a total of 105 months during which some spill would have occurred. The simulated spills ranged from 3000 ac-ft (October 1983) to nearly 2,000,000 ac-ft (February 1891), and averaged about 250,000 ac-ft per month per spill event. In other words, the "average" monthly spill was about a quarter-million ac-ft., while each simulated spill *occurred on average* about once per year. However, there were only 34 years during which

---

[1] This includes Modified Theodore Roosevelt Dam (Modified Roosevelt) on the Salt River as well as the three downstream Salt River Dams and the two Verde River Dams operated by the SRP.

[2] SECTION 7 STUDY FOR MODIFIED ROOSEVELT DAM, ARIZONA (THEODORE ROOSEVELT DAM), HYDROLOGIC EVALUATION OF WATER CONTROL PLANS, SALT RIVER PROJECT TO GILA RIVER AT GILLESPIE DAM, U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT, MARCH 1996.

a simulated spill actually occurred (about a 32% chance of a spill occurring in a given year, or a 3-year recurrence interval). Many of the years in which spills would have occurred resulted from extended periods of above-normal runoff, and produced spills that occurred intermittently or continuously during a period of several months. The simulated monthly spill history is displayed in the following graph (Fig. A-1). Maximum spill volumes for each month are depicted along with the number of spills, as well as a summary of the largest spill and the largest number of monthly spills in any year.

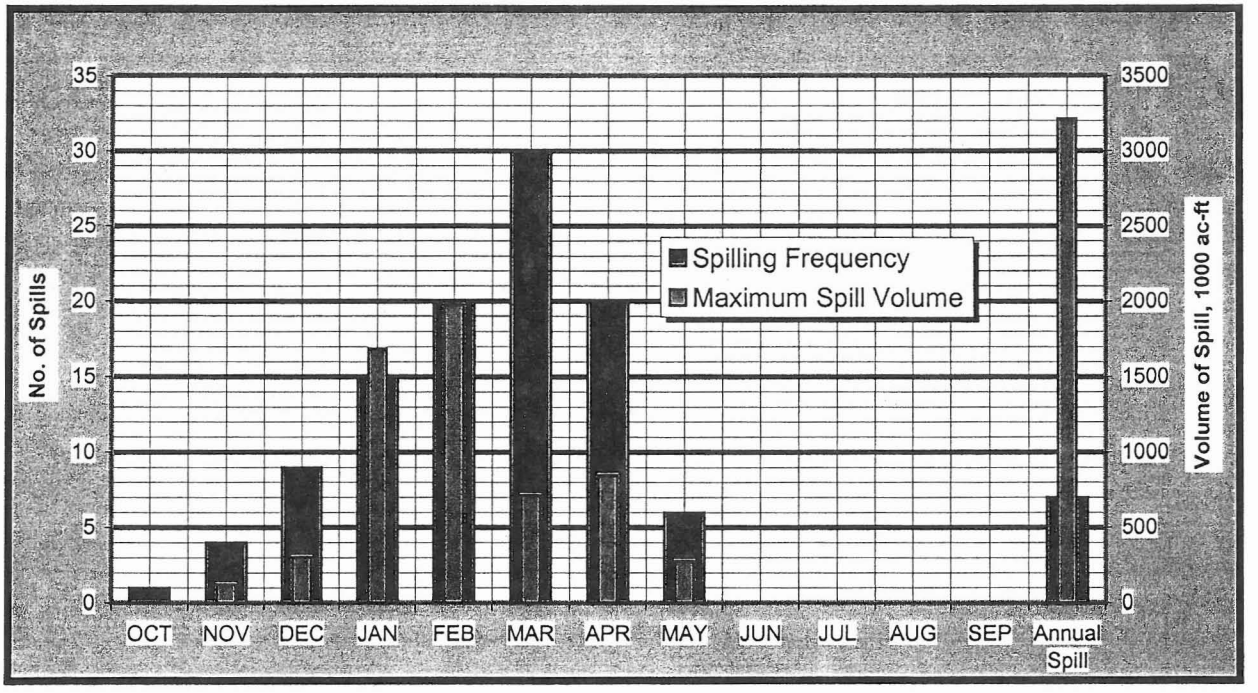

Figure A-1. Simulated Spill History, Salt River below Granite Reef Dam, 1889 – 1993

The largest spills for each year within the flood simulation period were routed from Granite Reef Dam to the confluence with the Gila River. That simulated flood history is summarized in the Table A-1, including peak flow rate, volume-duration values, and relative magnitude (rank) for each event. These results were based upon simulated flood hydrographs developed for each event and are well documented in the "Section 7" report[2] referenced previously. The flood hydrographs were written to a database during that study for further analysis (HEC-DSS, the Hydrologic Engineering Center Data Storage System, U.S. Army Corps of Engineers, Davis, CA.). These same flood hydrographs were subsequently used in this study as the basis for *existing conditions* flow data in the Salt River at the Gila River confluence. The peak discharges provided in the Table A-1 are presented graphically in Figure A-2, which shows the simulated maximum annual spill over Granite Reef Dam routed to the Gila River confluence, as well as the years *without any spill.*

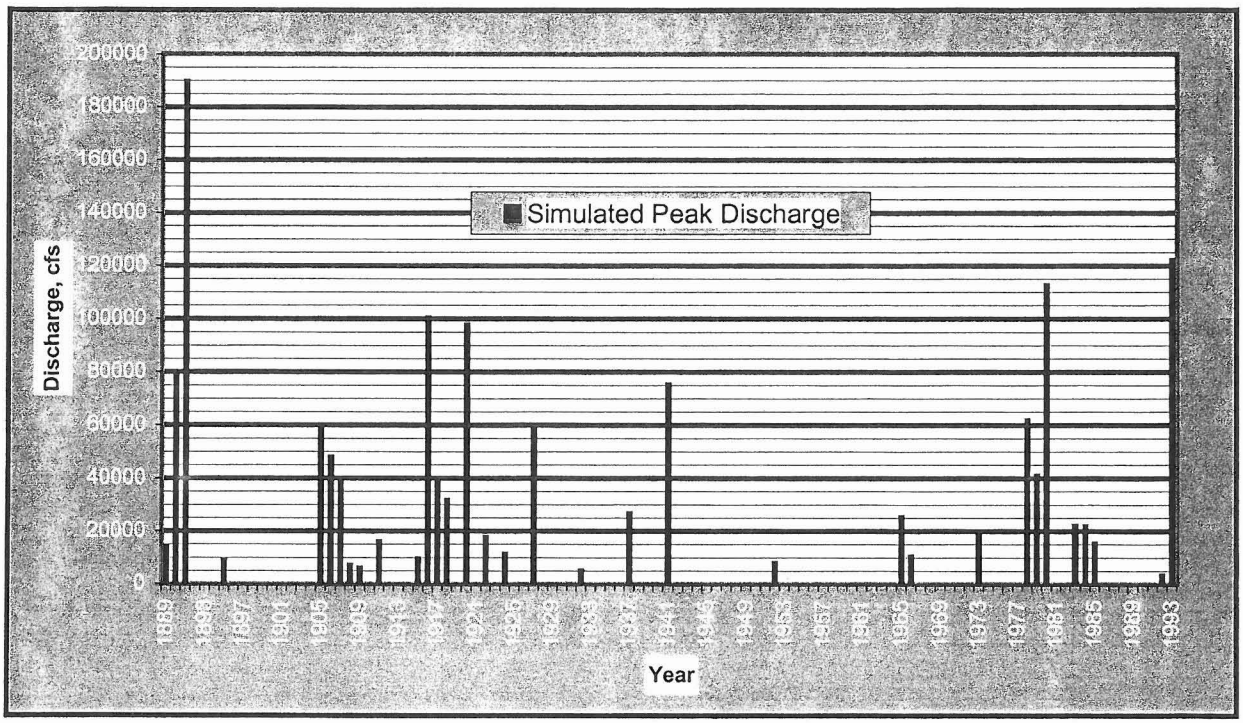

Figure A-2. Salt River at Gila River Confluence: Simulated Flood History, 1889 -1993

TABLE A-1. SIMULATED POR DISCHARGES AT GILA RIVER CONFLUENCE, 1889 - 1993

Date	Peak	Rank	1-day	Rank	2-day	Rank	3-day	Rank	5-day	Rank	10-day	Rank	Order	PP
Mar 1889	14497	24	13613	24	11947	24	10694	22	9991	22	5664	27	1	0.007
Feb 1890	78658	6	73088	6	59560	7	47124	8	29757	10	14890	12	2	0.016
Feb 1891	**190090**	**1**	**178255**	**1**	**155060**	**1**	**131818**	**1**	**101259**	**1**	**85493**	**1**	3	0.026
Mar 1895	9309	28	8692	28	7390	29	6393	30	5282	31	4345	31	4	0.035
Apr-05	60542	9	59176	8	54700	8	49099	7	37115	7	19463	8	5	0.045
Mar-06	48315	11	43725	11	37089	12	32087	12	23116	12	11696	14	6	0.054
Mar-07	38503	14	33750	14	27392	14	22932	14	18073	14	11150	17	7	0.064
Mar-08	7524	30	7480	30	7384	30	7203	28	7121	27	5244	28	8	0.073
Feb-09	6473	31	6281	31	6071	31	5908	31	5477	29	5208	29	9	0.083
Mar-11	16397	22	15020	23	12265	23	10552	23	7675	25	7013	23	10	0.092
Apr-15	9924	27	9714	27	9243	27	8895	27	8556	24	8367	21	11	0.102
Jan-16	100764	4	96146	4	89350	4	81567	2	66833	4	35713	4	12	0.111
Apr-17	39314	13	36841	13	32837	13	29142	13	20069	13	10667	18	13	0.120
Mar-18	32105	15	28493	15	21943	15	17639	17	13765	18	11581	15	14	0.130
Feb-20	97978	5	92885	5	83278	5	74121	5	58557	5	33410	5	15	0.139
Mar-22	18060	21	16062	21	13421	21	11354	21	7515	26	3764	32	16	0.149
Apr-24	11814	25	11413	25	10639	25	9957	25	8733	23	6999	24	17	0.158
Feb-27	58486	10	54350	10	47994	10	42617	9	32467	8	17205	10	18	0.168
Mar-32	5450	32	5363	32	5226	32	5119	32	4899	32	4706	30	19	0.177
Mar-37	27043	16	24097	16	20081	17	16652	19	12293	19	8039	22	20	0.187
Mar-41	75734	7	72948	7	66786	6	61134	6	43903	6	22150	6	21	0_196
Apr-52	8421	29	8352	29	7512	28	6650	29	5700	28	5915*	26	22	0.206
Dec-65	25659	17	21749	18	12869	22	8904	26	5346	30	5996**	25	23	0.215
Mar-66	10947	26	10842	26	10632	26	10474	24	9995	21	8561	20	24	0.225
Apr-73	19952	20	19630	20	18943	19	18236	16	17085	15	15445	11	25	0.234
Mar-78	62314	8	57916	9	50060	9	40210	10	30734	9	18116	9	26	0.244
Jan-79	41444	12	39525	12	37978	11	35819	11	28820	11	21103	7	27	0.253
Feb-80	113094	3	104779	3	90564	3	80575	4	73930	2	68566	2	28	0.263
Mar-83	22455	18	21833	17	20547	16	19251	15	16967	16	12938	13	29	0.272
Dec-83	22326	19	21368	19	19534	18	17541	18	14146	17	8741***	19	30	0.282
Mar-85	15800	23	15072	22	14282	20	13199	20	11879	20	11251	16	31	0.291
Mar-92	3716	33	3627	33	3390	33	3113	33	2597	33	2038	33	32	0.301
Jan-93	122443	2	110052	2	92908	2	80868	3	68662	3	52981	3	33	0.310

* Hydrograph for the period April 1952 only shows half cycle of the entire hydrograph. The period of March 1952 was assumed to be symmetrical with that of April to complete the cycle.

** Periods Dec 1965 and Jan 1966 were merged to obtain the 10-day duration.

*** Hydrograph for this period was extrapolated up to Jan 1984 (Ref. USGS Water Resources Data, AZ 1984)

A-2.2. Gila River Discharges:

Actual streamflow data representing *existing conditions* is available for the component of the inflow to the study reach emanating from the Gila River upstream of the Salt River confluence. Coolidge Dam was closed in 1929, hence all streamflow record since that time can be interpreted as representative of *existing conditions*. For purposes of this study, variability in the operation plan was not considered to have had substantial impact on downstream discharges. (Structural modifications in response to dam safety issues have been recently completed. However, the data developed for the sedimentation analysis did not extend past 1993, the last year of the SRP system simulation.) Two gages operated by the United States Geological Survey (USGS) provide direct information on Gila River inflows at the following locations, both of which are just upstream from the project reach:

- Gila River near Laveen, AZ (# 09479500), DA = 20,615 sq.mi.;
- Santa Cruz River near Laveen, AZ (#09480000), DA = 8581 sq.mi.

Since they are recording gages, both peak and daily flow data are available. Systematic record is available from 1940 to the present, but not for the period prior to 1940. To acquire data for the period (or periods) of time prior to 1941, an abbreviated process was developed. In addition, a process for estimation of peak flows for the period from 1941 – 1993 was also developed. These procedures are discussed in the following text.

A-2.2.a. 1941 – 1993.

Daily flows are directly available from the USGS database for the 2 gaging stations "near Laveen" (refer to USGS stations noted above). A simple "summation" of the corresponding daily flows provides the total daily inflow from the Gila River upstream of the Salt River confluence. As a consequence, that information, although used in the sediment transport analysis, will not be documented in this report.

To provide sufficient information for the study purpose, i.e. to quantify the variability of sedimentation and long-term trends, and to assess the impact on levee design criteria, the combined daily flows from the 2 component streamflow records were augmented by selecting events within this period that were "significant" in terms of magnitude. Analysis of the daily flow data resulted in an arbitrary selection of 11 flood events for more detailed consideration based upon a dual criteria – if the peak discharge in the Gila River exceeded 10,000 ft^3/s and/or if the peak discharge in the Santa Cruz River exceeded 5000 ft^3/s. Flood hydrographs for these 11 flood events were then developed at 1-hour computation intervals for 3-day time periods.

A-2.2.a.1 Development of Synthesized Flood Hydrographs. The HEC-1 Flood Hydrograph Package contains an automated procedure for *adjusting* an input or "pattern" flood hydrograph to conform to a set of instantaneous and volumetric discharge criteria. (The "HB-card" allows the user to input these criteria or boundary conditions for automatic processing; when linked to a set of initial conditions, i.e. a "pattern" input hydrograph – in this case the October 1983 flood was utilized - there is sufficient hydrologic information to compute hydrograph ordinates for each

event). Required input includes the computation interval (1-hour was selected) and duration of flow (72-hours was selected since the difference between the recession or rising limb discharge and the daily average for the preceding and following days was typically small), along with the aforementioned pattern hydrograph and boundary conditions. Use of the HEC-1 package allows easy graphical depiction of the resulting *Synthetic Flood Hydrograph* through use of the HEC-DSS (data storage system). *Synthetic Flood Hydrographs* for each of the runoff events described are provided in Exhibits A-23 through A-33; each synthetic flood hydrograph is compared to the "pattern hydrograph" for informational purposes.

A-2.2.a.1.1 *Initial Conditions* were established by developing a 3-day flood hydrograph for the Gila River above the Salt River confluence based upon measured streamflow during the October 1983 flood event. Recorded hydrographs for the USGS streamgages on the Gila River below Gillespie Dam (#09519500, DA = 49,650 mi^2) and the Salt River at 24th Street at Phoenix (#09512190, DA = 13,263 mi^2 – **Please note:** this includes some non-contributing area upstream of the Verde River dams and area cutoff due to Phoenix flood control projects.) were available in the publication FLOODS OF OCTOBER 1983 IN SOUTHEASTERN ARIZONA, USGS Water Resources Investigations Report 85-4225-C, dated March 1989 (Please refer to Fig.. A-3; data shown is at unequal time intervals as provided in the 1983 flood report). Since there was no record of significant inflow to the Gila River downstream of the Salt River confluence from sources other than the upstream Gila River, the additional runoff at the gage below the Gillespie Dam was assigned to the Gila River upstream of the Salt River. The Salt River flood hydrograph was "shifted" to account for translation due to flood routing and aligned with the downstream flood hydrograph (re: Fig.. A-3). The difference between the observed downstream flow and shifted upstream flow was computed and is also show in Figure A-3.

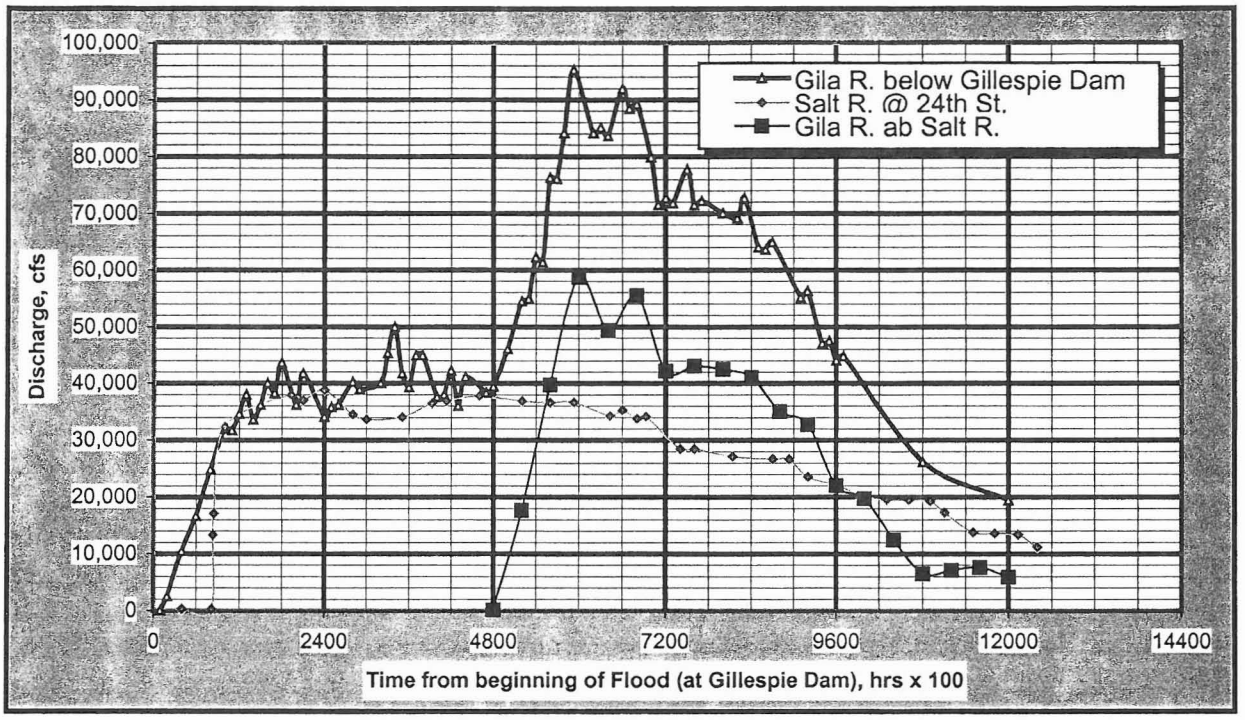

Figure A-3. PATTERN HYDROGRAPH DEVELOPMENT: Gila River above Salt River, October 1983 Flood

The resultant flood hydrograph for the Gila River above the Salt was developed in a "spreadsheet" environment, and 6-hour, equal time- interval ordinates were manually extracted from the hydrograph over a 72-hour period. Finally, the 6-hour values were enhanced through interpolation to produce a 72- hour "pattern hydrograph " with 1-hour time interval discharges. The "pattern hydrograph", i.e. the initial conditions is displayed graphically in Figure A-4, below.

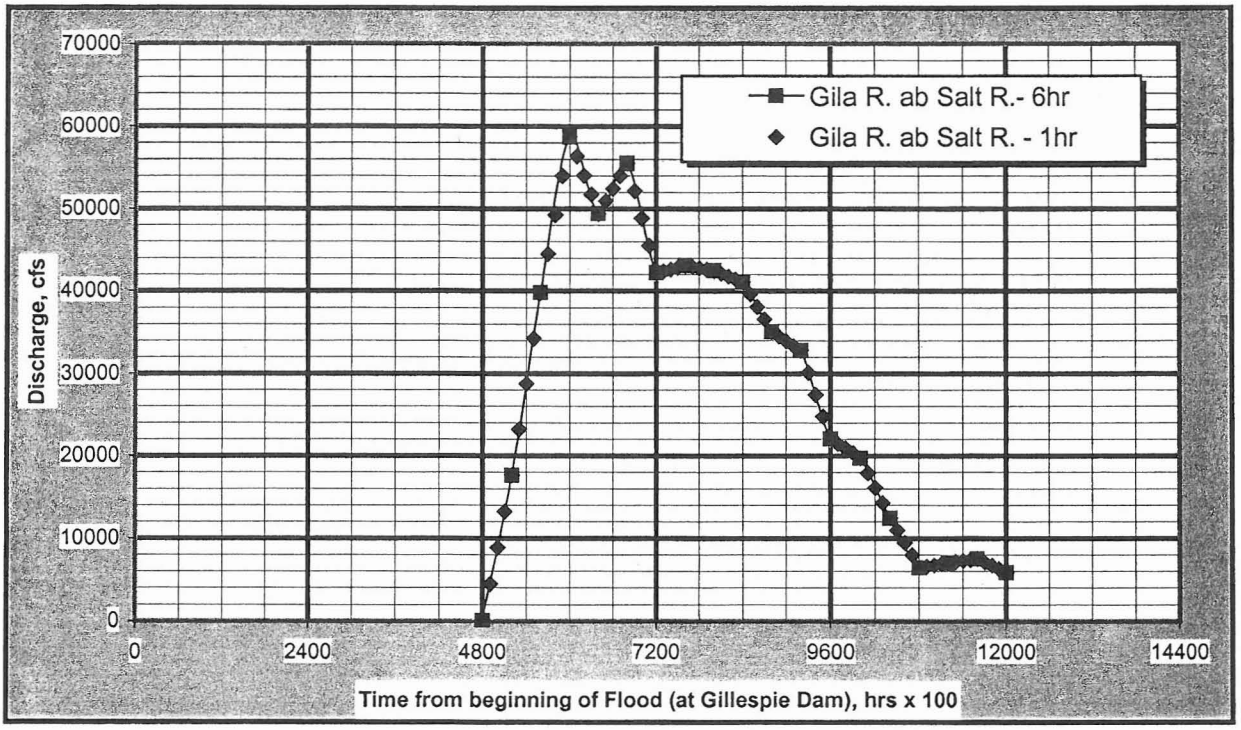

Figure A-4. PATTERN HYDROGRAPH: Gila River above Salt River, October 1983 Flood

A-2.2.a.1.2 *Boundary Conditions*. Coupled with the initial conditions, i.e. "pattern hydrograph", the boundary conditions enable development/modification of a flood hydrograph within the HEC-1 environment . Boundary conditions considered sufficient to adequately define flood hydrographs for sedimentation analysis were the peak, 1- and 3-day values. The information for selected flood events described earlier is provided in the following table. Peak discharges displayed in Table A-2 were estimated using an estimation process in lieu of actual data. This process is described below (**Note: there is no gage at the location of interest, the Gila River at the Salt River Confluence**):

- Since peak discharges are available for the 2 upstream component gages, for data above the base (refer to record for each gage), it is obvious that the peak discharge just below the confluence must be $\geq$ the greater of the 2 peak discharges. The peak may include contemporaneous runoff in the adjacent stream. In lieu of reconstructing flow data from recorded stage data, a reasonable shortcut is to assume that the peak discharge below the confluence of 2 streams may be approximated by combining the peak in one stream with the contemporaneous average daily flow in the other. To provide a better estimate, this approximation procedure is conducted in "both directions", i.e. using the peak in the Gila + 1-day in the Santa Cruz and comparing that to the sum of the peak in the Santa Cruz + 1-day in the Gila. The greater of these 2 summations is a good approximation of the peak flow downstream of the confluence of 2 streams. Table A-2 contains a summary of the peak, 1-, and 3-day values for the 11 selected events during the 1941 – 1993 period. The 1- and 3-day discharges are the

linear sum of the contemporaneous average daily flows for the period indicated. The peak flow is the greater value of the summation procedure just described.

TABLE A-2. GILA RIVER ABOVE CONFLUENCE WITH SALT RIVER
DRAINAGE AREA = 29,200 sq.mi.
(Discharges in ft^3/s)

1941 – 1993			
Date	Peak	1-Day	3-Day
2-Jan-41	13050	9850	5173
21-Sep-46	5330	5270	5008
28-Aug-51	5812	4142	3259
29-Sep-62	9200	5820	2844
26-Dec-65	13630	9770	5630
23-Dec-67	8580	6540	4379
13-Oct-77	8140	4720	2808
21-Dec-78	10860	9670	6426
22-Jan-79	8450	8020	5933
4-Oct-83	61000	46000	34500
21-Jan-93	44300	42760	37520
Winter	Computed as the > sum of single-station peak + coincident 1-day flow in other stream. (Gila/Santa Cruz Rivers near Laveen)	Computed as the sum of the coincident 1-day maximum average flows for selected flood event.	Computed as the sum of the coincident 3-day maximum average daily flows for selected flood event.
Summer			

- The data was separated according to season (warm vs. cold weather) to establish whether there was some persistent difference between peak and volume relationships due to nature of the storm type or antecedent moisture conditions in the basin and/or channel. Subsequently, the tabulated data for the 11 selected events was plotted in a log-log space with the 1-day flow as the independent variable and the peak and 3-day flow as independent variables (Please refer to Fig. A-5). *The purpose in portraying the information in this manner was to provide a means for estimating peak and 3-day discharges for events prior to 1941 for which only daily flow data is available. This transformation process will be discussed in more detail for the period 1921 – 1940 in a separate section within this report.*

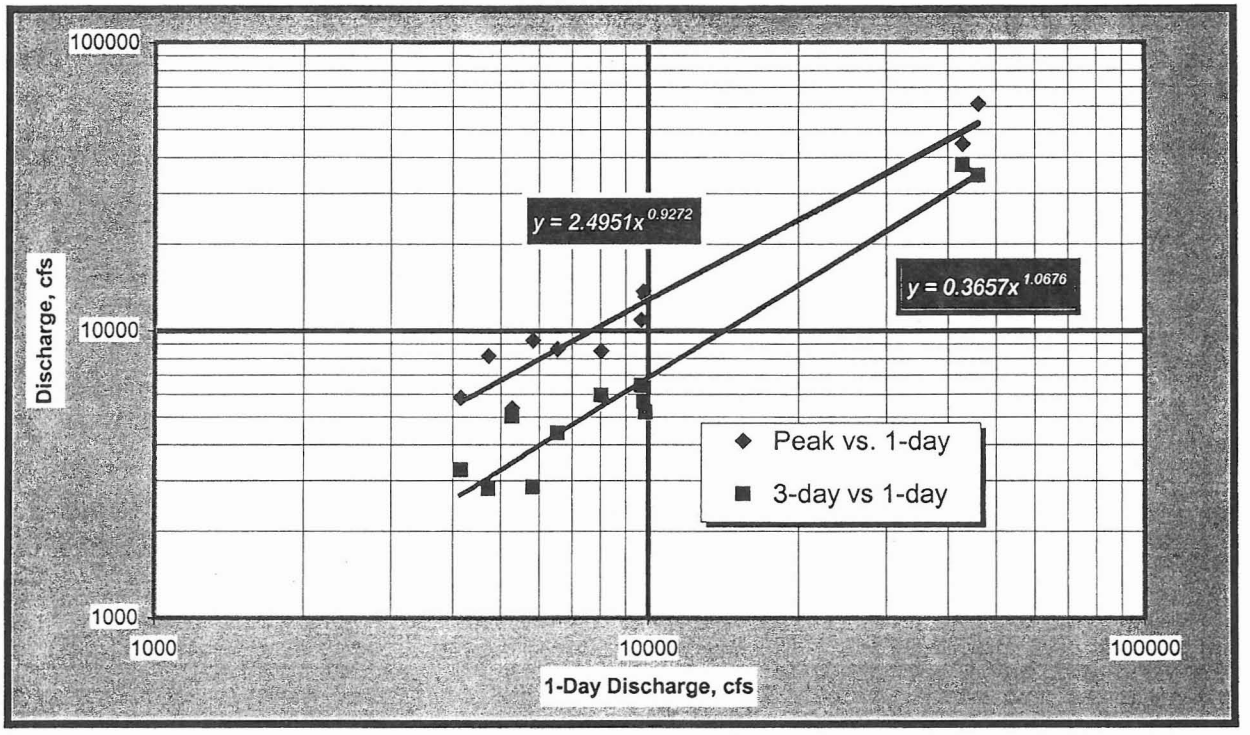

Figure A-5. Gila River above Salt River Confluence, Flow Regression Curves, 1940 – 1993. Drainage Area = 29,200 sq. mi.

A-2.2.b. 1921 – 1940.

The only streamflow record available for the Gila River in the vicinity of the project reach for the 1921 to 1940 time period is from the USGS gage on the Gila River below Gillespie Dam (#09519500, DA = 49,650 mi^2). Since the flow record at this gage includes contributions from the entire upstream watershed, it is not a valid reflection of streamflow in the Gila River above the Salt River confluence. The major sources of streamflow measured at this gage (Gila below Gillespie Dam) are the Salt River, the Gila River above the Salt River, the Agua Fria, Hassayampa Wash, and Centennial Wash. The initial portion of this time period (1921 – 1929) did not include either Coolidge Dam on the "upper" Gila River, nor the *existing* Salt River Project in its entirety.

In order to extend the length of streamflow record for the project reach to include this time period, attempts were made to correlate the streamflow data for the Gila below Gillespie with the Gila above the Salt for the overlapping period (1941 – 1993) when data was available. Initially, the streamflow data for the Gila River below Gillespie Dam was adjusted to *discount the runoff from the Salt River.* This approach was quite reasonable since the upstream data, which measured releases/spills from the SRP dams, and the downstream data reflected identical or contemporaneous basin conditions. Hence, differential runoff, i.e. the difference between the Gila River below Gillespie and upstream Salt River "spills" could be attributed to flows

emanating from the upstream Gila River (at the Salt River confluence) or the 3 major tributaries downstream of the confluence. However, there were numerous problems inherent in this data reduction procedure, a few of which are listed below:

- Due to "dry" antecedent channel conditions during some portions of the year, and for extended durations on occasion, the channel requires "wetting" before upstream floods reach the downstream gage. Dependent upon the magnitude and duration of the upstream "spill", the rate and volume of flow reaching the downstream gage is highly variable, hence it is difficult to determine how much measured runoff is from the SRP system and how much is from the Gila River and tributaries other than the Salt River.
- Oftentimes, the downstream flow (Gila River below Gillespie) is < the upstream flow (the Salt River "spills") in both peak and volume. There may be flow from the Gila, above the Salt, but it cannot be readily estimated if the incremental component[3] is already negative. This "type" of situation can be seen in the following diagram (Fig A-6), summarizing the *overlapping* flow record for the period 1941 – 1993 for the "combined" daily flow in the Gila River at the Salt River Confluence (the sum of the Gila and Santa Cruz River near Laveen daily discharges) versus the daily discharge in the Gila River below Gillespie Dam. The 45 degree line in the picture represents the case when upstream flow = downstream flow. Data to the right of the diagonal line map flows augmented by tributary runoff as they travel downstream; data to the left of the diagonal line map flows that diminish as they travel downstream. If the difference between observed downstream runoff and observed upstream runoff is negative (the latter case), then there is no easy direct mechanism for estimating tributary runoff.

Please note: average daily flows plotted in the diagram account for translation (i.e. travel time). However, data shown correlates discharge in a single direction only – upstream (Gila River at the Salt) to downstream (Gila River below Gillespie). The upstream sample presents the *maximum daily flow* associated with partial record peaks (flows above the base for both the Gila River and Santa Cruz River stations near Laveen), while the downstream sample presents the correlated discharge for the same event (including any gains from tributary inflow and any losses due to channel routing and percolation). As a consequence, the relationship always indicates a positive upstream flow since the sample included only upstream events of a prescribed magnitude or greater. Had the sample been selected in the other direction, i.e. using prescribed magnitude events at the downstream location correlated with associated upstream events, there might have been more low or zero flows in the upstream sample. Finally, for purposes of display, all zero flow events for the downstream station (Gila below Gillespie) were assigned a value of 1 for display purposes. *However, when the downstream flow was zero, the upstream flow computed from the hybrid regression curves was also set to zero (please refer to Exhibits A-1 through A-22, daily flows).*

[3] The calculated difference between Gila River below Gillespie Dam discharge and Salt River "spills".

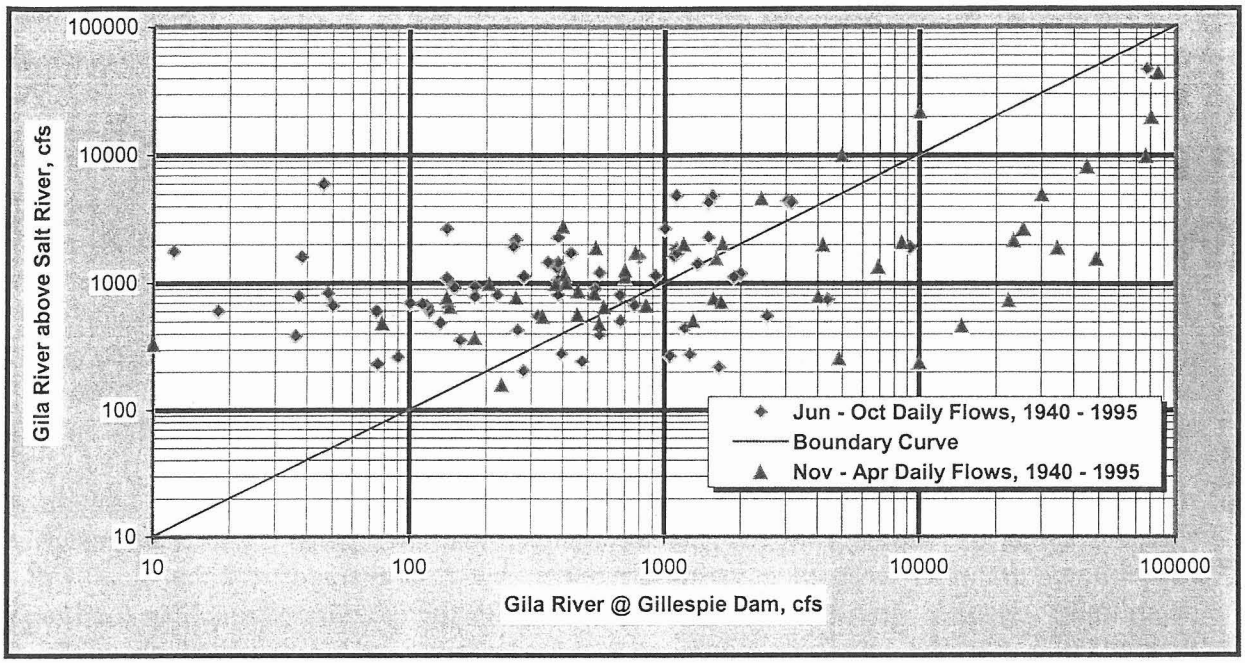

Figure A-6. DAILY FLOW COMPARISON: Gila River above Salt River Confluence vs Gila River below Gillespie Dam - Seasonal Series ("summer" vs. "winter")

Seasonality of flows was considered as a guide for making adjustments to the observed recorded flows. The *hypothesis* is that since there are no summer/warm weather "spills" from the SRP dams, and since summer events typically result from local thunderstorms and often are accompanied by "dry" channel conditions, summer flows from the upstream Gila would diminish as they traveled downstream. On the contrary, "spills" from SRP dams are almost always during the winter/cold weather (please refer to earlier discussion and graphic summary of monthly SRP "spills"). In addition, the nature of the meteorological events which occur during the winter include less intense precipitation but for longer durations, increased areal extent, often accompanied by melting snow. This type of precipitation creates greater volume flows and higher peaks in large basins, as well as "wet" channel conditions. Hence, it is more likely that winter storms will include tributary inflow from the larger basins. These characteristics are evidenced in Figure A-6. The winter daily flows (Nov – Apr in the diagram) dominate the right side of the chart, while summer daily flows dominate the left side, consistent with the hypothesis. Of course, there are exceptions, such as a winter runoff emanating from the upper Gila and/or tributaries when the SRP dams do not spill; or a general warm weather storm resulting from a dissipating tropical cyclone (typically occurring in late summer or early fall) which may encompass a large areal extent and include prolonged precipitation with periods of high intensity. Some of the summer data mapped onto the right side of the chart resulted from the latter type of meteorological event. To evaluate this approach, then, the following steps were taken:

- Segregation of data into 2 simplistic classes – summer and winter, using the boundaries mentioned above (summer: Jun – Oct, winter: Nov – Apr).

- Adjustment (reduction) of the observed flow in the Gila below Gillespie to account for winter "spills" from the SRP dams, and any other tributary inflow other than the upper Gila for all seasons (tributary inflow other than SRP "spills" is very difficult to find).
- Correlation analysis between upper Gila daily flows and "adjusted" Gila below Gillespie flows.

The results were inconclusive, but yielded a reasonable fit for summer data which was more reasonably predictable since the observed downstream flows were more likely to have resulted from the contemporaneous upper Gila contribution. The winter data proved extremely difficult to adjust, since the entire process, i.e. translation, attenuation, percolation, and tributary inflow often masked any/all contribution that might have emanated from the upper Gila. Eventually so many of the larger winter events were discarded[4] that the adjustment process was discontinued.

As a consequence the hypothesis was altered to include all of the winter events, including SRP "spills". Under this scenario the investigator assumed that large general winter storms affect the contributing drainage areas in a variable manner, but "on-average" can be dealt with in a deterministic manner. In other words, by observation of the quantity of runoff in the lower Gila (below Gillespie), the long-term component contributions can be estimated on an "average" basis. Large flows in the lower Gila will typically result from SRP "spills" in a directly variable manner, as well as include other tributary inflow[5]. The variability (the stochastic component of this process) will thus be included within the data sets. For analysis of long-term impact on sediment transport and event-to-event variability, a best-ft regression curve, constructed to fit the data, should provide a reasonable tool for recreation of the upper Gila River flows. It is understood that some of the flows will exceed the actual flow, while others will be less than actual. The purpose of this procedure is to provide a data set that reasonably captures the long-term runoff contributions from the upper Gila River to the project reach, and further, reflects the variability of flow over that time period (1921 –1940). The regression curve developed from the correlation analysis, includes seasonal aspects discussed above, and is a hybrid curve that knits together what can be conceptually referred to as summer and winter seasonal flows at their point of intersection (a daily flow in the lower Gila of approximately 4000 ft^3/s). Figure A-7 depicts the data set with the best-fit hybrid curve. This relationship was subsequently used to estimate daily flows for the period 1921 – 1940 for the Gila River above the Salt River confluence. The estimated daily flows are included in Exhibit A-34.

[4] *Discarded* in the sense that there was either zero or negative flow at the downstream location after reducing these flows to account for upstream SRP "spills". Hence there was no remnant flow attributable to the upper Gila River.
[5] Larger downstream flows will result from larger upstream spills; in a similar manner, larger downstream flows will generally include an increasing contribution from the upper Gila River and tributaries. Hence, based upon the sample of observations from the 1941 – 1993 record, it is reasonable to project a similar relationship for the earlier record set.

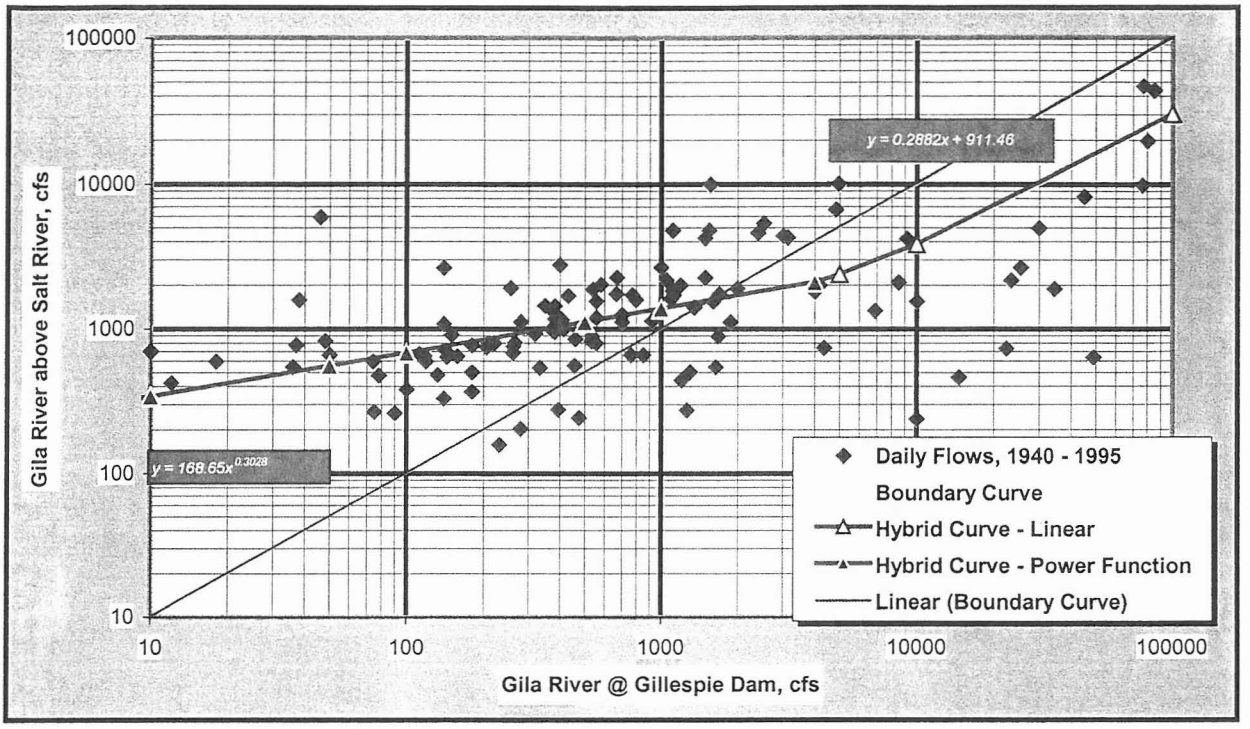

Figure A-7. DAILY FLOW COMPARISON: Gila River above Salt River Confluence vs Gila River below Gillespie Dam.

For informational purposes the average daily flow values for the period from 1921 –1940 and the period from 1941 – 1993 were computed from the recorded Gila River below Gillespie Dam streamflow data. The results indicate that the earlier 20-year period was "drier" than the subsequent 53-year period (395 ft^3/s versus 500 ft^3/s, respectively). However, the average of the estimated daily flows for the upstream location, Gila River at the Salt River Confluence, for the 1921 – 1940 period was considerably greater than the computed sum of the average ***measured flows*** *(Gila River near Laveen plus Santa Cruz River near Laveen (450 ft^3/s versus 80 ft^3/s). Hence, the obvious conclusion is that the upstream flows for the 1921 – 1940 period are exaggerated. An attempt was made to account for the absence of Coolidge Dam prior to 1929; however, the biggest flaw in the methodology was that the correlation between measured flows in the Gila River above the Salt River confluence and the Gila River below Gillespie Dam was "one-sided" (upstream to downstream). As a result, application of the regression relationships to the downstream flow always resulted in an upstream contribution. Figure A-8, which follows, summarizes this information in a graphical format.*

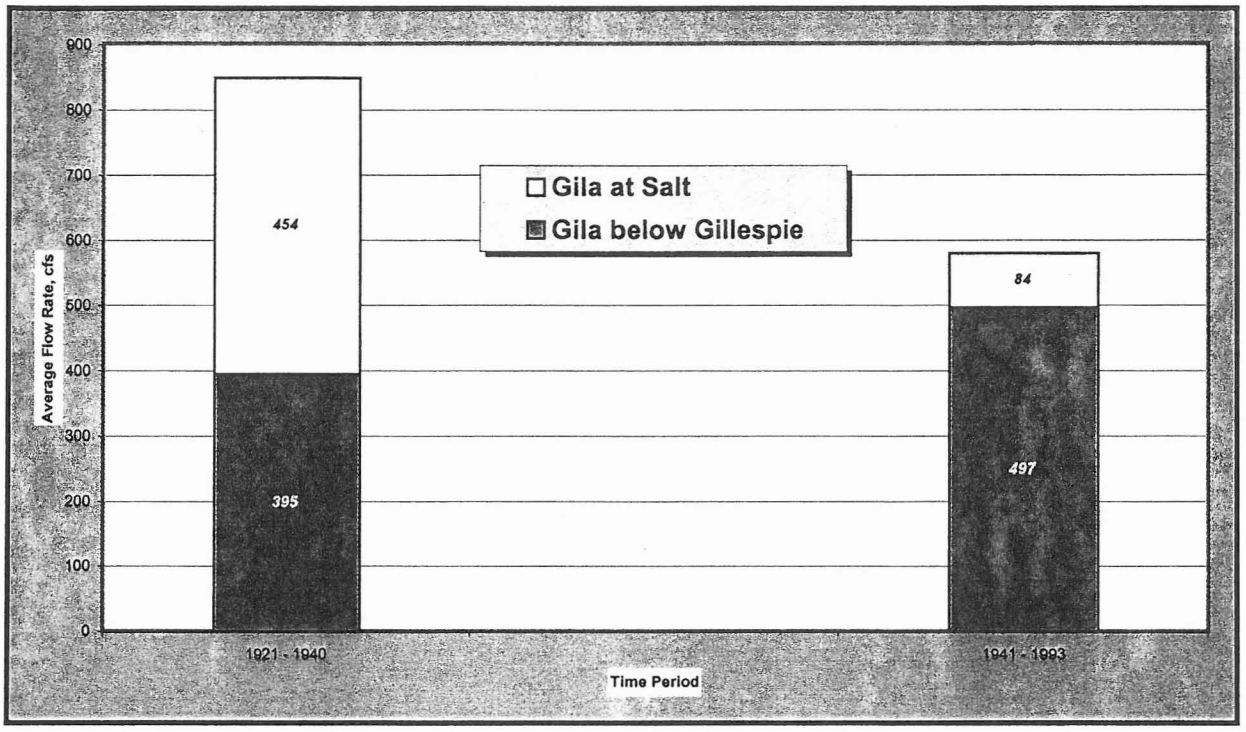

Figure A-8. Comparison of Average Flow, Gila River at Salt River Confluence and Gila River below Gillespie Dam: 1921 - 1940 versus 1941 - 1993

Finally, as was done for the upper Gila River inflow to the project reach for the 1941 – 1993 data set, significant hypothetical events were selected for more in-depth analysis within the sediment transport simulation model. Daily flows exceeding an arbitrary base were tabulated; subsequently, peak discharges were estimated using the previously described relationship for the upper Gila River inflow to the project that regressed peak discharges upon daily flow reach (Fig. A-5). Seventy-two hour duration, 1-hour computation interval hydrographs were developed for each event based upon the "pattern hydrograph" previously developed and "boundary conditions" computed for the selected events (peak discharges from the regression of peak on 1-day discharge, Fig. A-5; 1- and 3-day discharges from the regression of upper Gila River daily flows on lower Gila River daily flows, Fig. A-5, Table A-3). Table A-3, which follows, summarizes the boundary conditions. The simulated flood hydrographs for the 1921- 1940 period are displayed chronologically in Exhibits A-1 through A-22. Finally, the "fictional" flow data for the Gila River above the Salt River Confluence for the 1921-1940 period are included in Exhibit 34.

TABLE A-3. Gila River above Salt River Confluence, 1921-1940

(DA = 29,200 sq.mi.)

Source Data: Gila River below Gillespie Dam

Date	1-Day Q	Peak	3-Day Q	3-Day Q
21-Aug-21	5638			
22-Aug-21	8635	11138	6723	5827
23-Aug-21	5897			
28-Dec-21	3727			
29-Dec-21	4917	6607	3794	3194
30-Dec-21	2739			
3-Jan-22	3632			
4-Jan-22	10336	13158	5940	7061
5-Jan-22	3851			
11-Feb-22	2396			
12-Feb-22	4053	5524	3212	2599
13-Feb-22	3188			
17-Mar-22	7194	9403		
18-Mar-22	3727		4851	4795
19-Mar-22	3632			
3-Sep-22	4255	5778		
4-Sep-22	1739		2420	2737
5-Sep-22	1267			
7-Aug-23	1267			
8-Aug-23	4255	5778	2083	2737
9-Aug-23	728			
19-Sep-23	4485			
20-Sep-23	4687	6320	3910	3035
21-Sep-23	2557			
11-Nov-23	2906			
12-Nov-23	4687	6320	3303	3035
13-Nov-23	2315			
28-Dec-23	21085	25485		
29-Dec-23	7713		12170	15115
30-Dec-23	7713			

TABLE A-3. Gila River above Salt River Confluence, 1921-1940

(DA = 29,200 sq.mi.)

Source Data: Gila River below Gillespie Dam

Date	1-Day Q	Peak	3-Day Q	3-Day Q
19-Sep-25	3938			
20-Sep-25	4514	6104	3995	2916
21-Sep-25	3534			
7-Apr-26	6791			
8-Apr-26	8174	10585	7137	5496
9-Apr-26	6445			
28-Sep-26	3159			
29-Sep-26	4975		5052	4672
30-Sep-26	7021	9193		
17-Feb-27	15667			
18-Feb-27	18203	22238	15312	12920
19-Feb-27	12065			
13-Sep-27	7281	9508		
14-Sep-27	4226		4727	4857
15-Sep-27	2675			
6-Apr-29	5494	7323		
7-Apr-29	3295		3541	3596
8-Apr-29	1833			
9-Aug-30	2361			
10-Aug-30	4110	5596	2777	2638
11-Aug-30	1859			
15-Feb-31	4831			
16-Feb-31	5667	7537	5129	3717
17-Feb-31	4889			
11-Feb-32	9673			
12-Feb-32	10249	13055	8414	6997
13-Feb-32	5321			
9-Feb-37	7972	10342		
10-Feb-37	7742		6512	5351
11-Feb-37	3822			
19-Mar-37	5984	7927		
20-Mar-37	4543		4523	3940

TABLE A-3. Gila River above Salt River Confluence, 1921-1940

(DA = 29,200 sq.mi.)

Source Data: Gila River below Gillespie Dam

Date	1-Day Q	Peak	3-Day Q	3-Day Q
21-Mar-37	3041			
5-Mar-38	11229	14209		
6-Mar-38	8981		8030	7714
7-Mar-38	3880			

Computed using regression equation developed from 1940 -1993 data, $Q_{peak} = 2.4951Q1\text{-day}^{0.9272}$

Computed using regression equation developed from 1940 -1993 data, $Q_{peak} = 0.3657Q1\text{-day}^{1.0676}$

Computed using "fictional" flow data developed from 1921 -1940 data (see Gila River ab Salt); this data was used to develop discrete flood hydrographs.

Source Data: Gila River below Gillespie Dam Daily Flow Data, Regression Analysis - 1940 -1995

A-2.2.c. 1889 - 1921.

There is no streamflow record for the Gila River in the project vicinity for the period *prior* to 1921. However, during the analysis of Salt-Gila River historic flows, conducted for the development of the Flood Control Plan for operation of Modified Theodore Roosevelt Dam[6], estimates of *historic* peak discharges for the Gila River below the confluence with the Salt River were developed. These discharges, including the effects of the Modified Theodore Roosevelt Dam flood operation, are provided in the following (Table A-4):

TABLE A-4. Gila River Below Salt River Confluence
Simulated POR Discharges, 1889 – 1993
with and without (w/wo) Modified Theodore Roosevelt Dam
(Discharges in ft^3/s)

Date[a]	Peak Discharge w/Project	Rank	Plotting Position	Peak Discharge w/o Project[b,c]
Mar 1889	14,500	28	.263	32,300
Feb 1890	78,700	7	.064	122,900
Feb 1891	**235,000**	**1**	**.007**	**300,000**
Mar 1895	9300	34	.320	3800
Apr 1905	60,500	10	.092	103,800
Nov 1905	50,000[(1),(2),d]			160,000
Mar 1906	48,300	12	.111	
Mar 1907	38,500	15	.139	41,400
Feb 1908	7520	36	.339	30,600
Dec 1908	[(1)]			78,000
Feb 1909	6470	37	.348	NA
Mar 1911	16,400	25	.234	NA
Feb 1914	[(1)]			16,300
Jan 1915	[(1)]			22,200
Apr 1915	9920	33	.310	NA
Jan 1916	121,000	4	.035	150,000
Apr 1917	39,300	14	.130	47,300
Mar 1918	32,100	17	.158	28,500
Feb 1920	98,000	5	.045	126,300
Aug 1921	15,500[(1),(2)]	27	.253	15,500
Mar 1922	18,100	24	.225	24,700
Sep 1923	1800[(1),(2)]	53	.500	1800
Dec 1923	[(1)]			75,500

[6] SECTION 7 STUDY FOR MODIFIED ROOSEVELT DAM, ARIZONA (THEODORE ROOSEVELT DAM), HYDROLOGIC EVALUATION OF WATER CONTROL PLANS, SALT RIVER PROJECT TO GILA RIVER AT GILLESPIE DAM, U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT, MARCH 1996

Date[a]	Peak Discharge w/Project	Rank	Plotting Position	Peak Discharge w/o Project[b,c]
Apr 1924	11,800	29	.272	NA
Sep 1925	3600[(1),(2)]	47	.443	3600
Sep 1926	36,600[(1),(2)]	16	.149	36,600
Feb 1927	58,500	11	.102	74,400
Aug 1928	5400[(1),(2)]	41	.386	5400
Sep 1929	5400[(1),(2)]	40	.377	5400
Aug 1930	18,400[(1),(2)]	23	.215	18,400
Aug 1931	6400[(1),(2)]	38	.358	6400
Feb 1932	NA			81,000
Mar 1932	5450	39	.367	NA
Oct 1932	300[(1),(2)]	65	.614	300
Aug 1934	1400[(1),(2)]	55	.519	1400
Aug 1935	4800[(1),(2)]	44	.415	4800
Jul 1936	2600[(1),(2)]	48	.453	2600
Mar 1937	27,000	18	.168	43,100
Mar 1938	[(1)]			59,000
Sep 1939	900[(1),(2)]	58	.547	900
Aug 1940	11,100[(1),(2)]	30	.282	11,100
Mar 1941	75,700	8	.073	117,000
Apr 1942	[(1)]			3500
Aug 1943	1900[(1),(2)]	52	.491	1900
Aug 1945	5200[(1),(2)]	42	.396	5200
Sep 1946	500[(1),(2) (1),(2)]	60	.566	500
Aug 1947	2600[(1),(2)]	49	.462	2600
Oct 1949	200[(1),(2)]	69	.652	200
Aug 1951	2000[(1),(2)]	51	.481	2000
Apr 1952	8420	35	.329	6500
Aug 1954	800[(1),(2)]	59	.557	800
Aug 1955	2300[(1),(2)]	50	.472	2300
Apr 1965	4100			5200
Dec 1965	25,700	19	.177	40,800
Mar 1966	10,900	32	.301	NA
Dec 1967	[(1)]			20,600
Mar 1968	[(1)]			11,500
Apr 1969	[(1)]			3700
Sep 1970	1200[(1),(2)]	56	.528	1200
Aug 1971	200[(1),(2)]	68	.642	200
Mar 1973	NA			21,100
Apr 1973	20,000	22	.206	NA
Sep 1976	400[(1),(2)]	61	.576	400

Date[a]	Peak Discharge w/Project	Rank	Plotting Position	Peak Discharge w/o Project[b,c]
Mar 1978	62,300	9	.083	93,900
Dec 1978	NA			136,000
Jan 1979	41,400	13	.120	NA
Feb 1980	130,000	3	.026	194,000
Sep 1981	217[(1),(2)]	67	.633	217
Sep 1982	143[(1),(2)]	70	.661	143
Mar 1983	22,500	20	.187	NA
Oct 1983	95,200[(1),(2)]	6	.054	95,200
Sep 1984	3930[(1),(2)]	45	.424	3930
Mar 1985	15,800	26	.244	NA
Jul 1986	346	63	.595	NA
Jul 1987	346	64	.604	346
Sep 1988	1135[(1),(2)]	57	.538	1135
Oct 1989	370[(1),(2)]	62	.585	370
Aug 1990	1438[(1),(2)]	54	.509	1438
Sep 1991	270[(1),(2)]	66	.623	270
Mar 1992	3720	46	.434	NA
Aug 1992	11,100[(1),(2)]	31	.291	11,100
Jan 1993	150,000	2	.016	NA

[a] W/O Project Discharges for the Salt River above the Gila River unavailable after 1980, since no analysis of data post-1982 CAWCS Hydrology Report was done.
[b] Source: Table 3-6 of 1982 CAWCS Hydrology Report
[c] Tributary inflow to the Gila from sources other than Salt River derived from USGS Water Supply Papers for the period since 1980.
[d] Estimated value for the flow in the Gila River resulting from a "spill" from Coolidge Dam. The value for the March 1906 event was used instead, since it was more reliable, and nearly identical.
(1) No "spill" from SRP system w/ project
(2) Discharge resulted from tributary inflow to the Gila from source other than Salt River. Estimated based upon recorded discharges for the Gila River at Gillespie Dam.
NA = Not Applicable.
Indicates a significant runoff contribution from the Gila River at Salt River confluence prior to 1921.
Indicates the most significant historical runoff contribution from the Gila River at Salt River confluence prior to 1921.

No simulated flood hydrographs representative of the runoff conditions alluded to in Table A-4 had been generated. However, such hydrographs could be constructed for purposes of this sedimentation evaluation by simply applying the ratio of the peak w/project discharge to the "pattern" flood hydrograph or some other representative flood hydrograph. Further detailed development of simulated flood hydrographs for the upper Gila River (at the Salt confluence) for the period prior to 1921 is beyond the scope of this evaluation.

EXHIBITS

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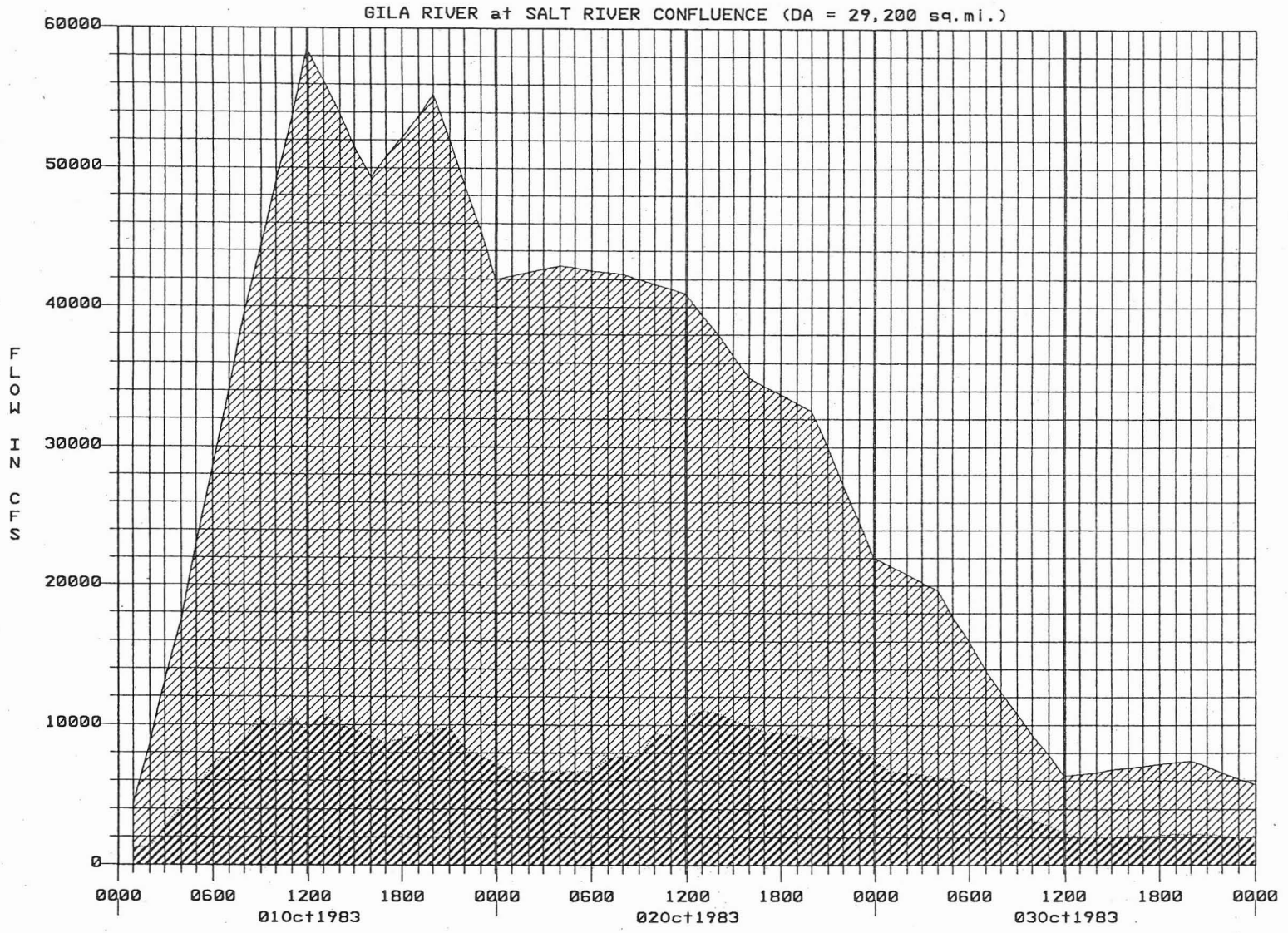

ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 21-23AUG1921 FLOW

EXHIBIT A-1

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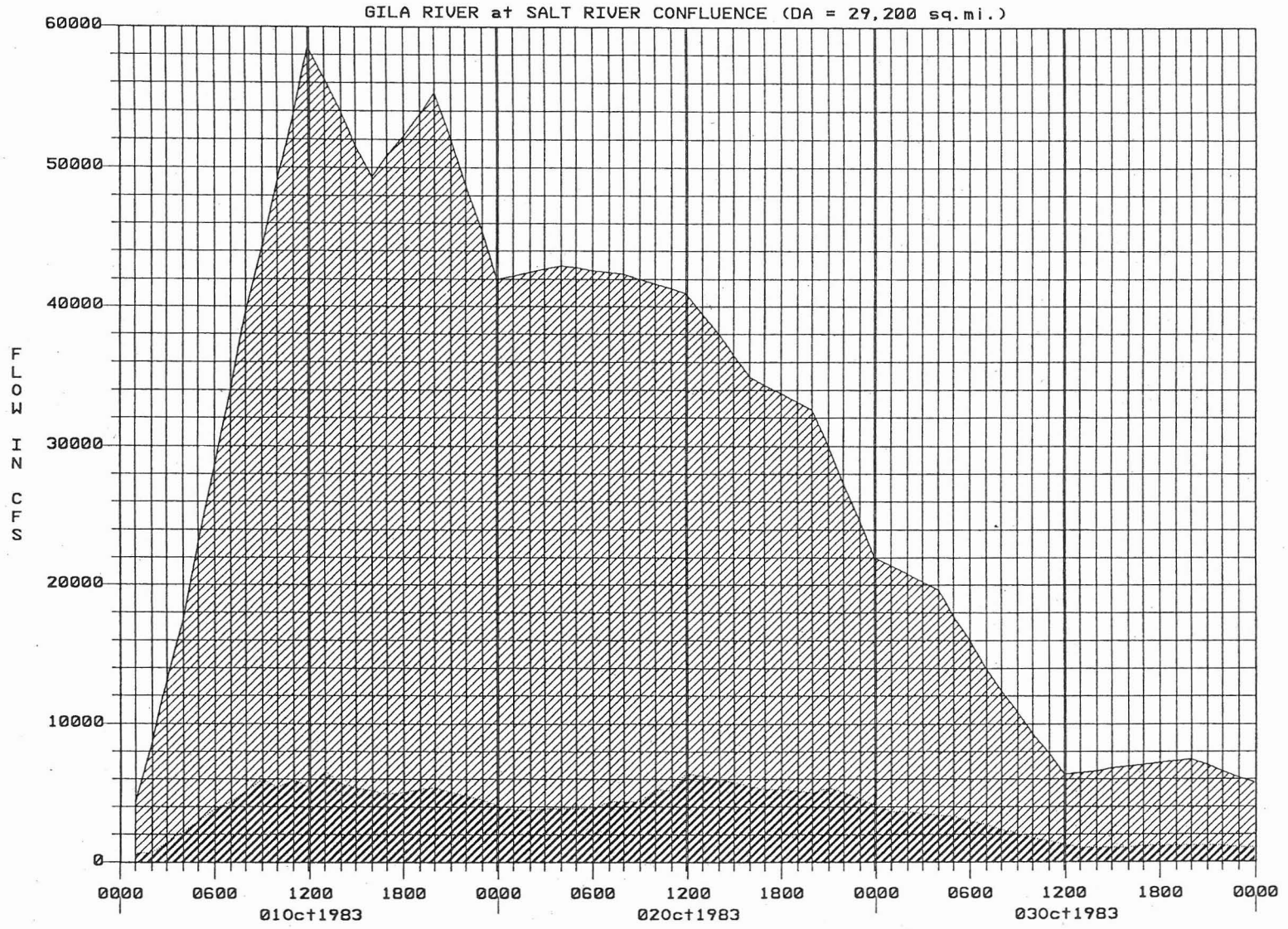

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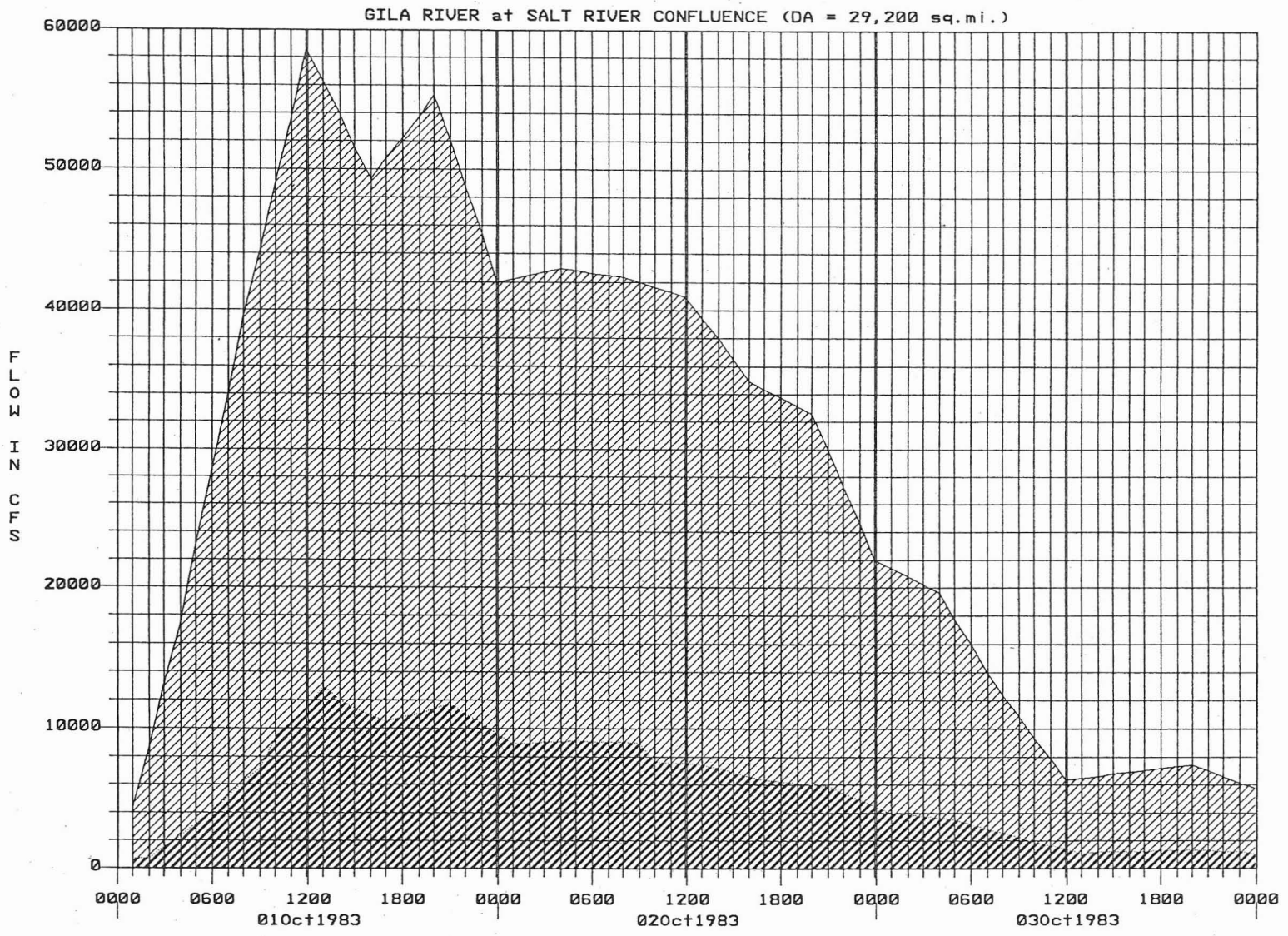

ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 3-5JAN1922 FLOW

EXHIBIT A-3

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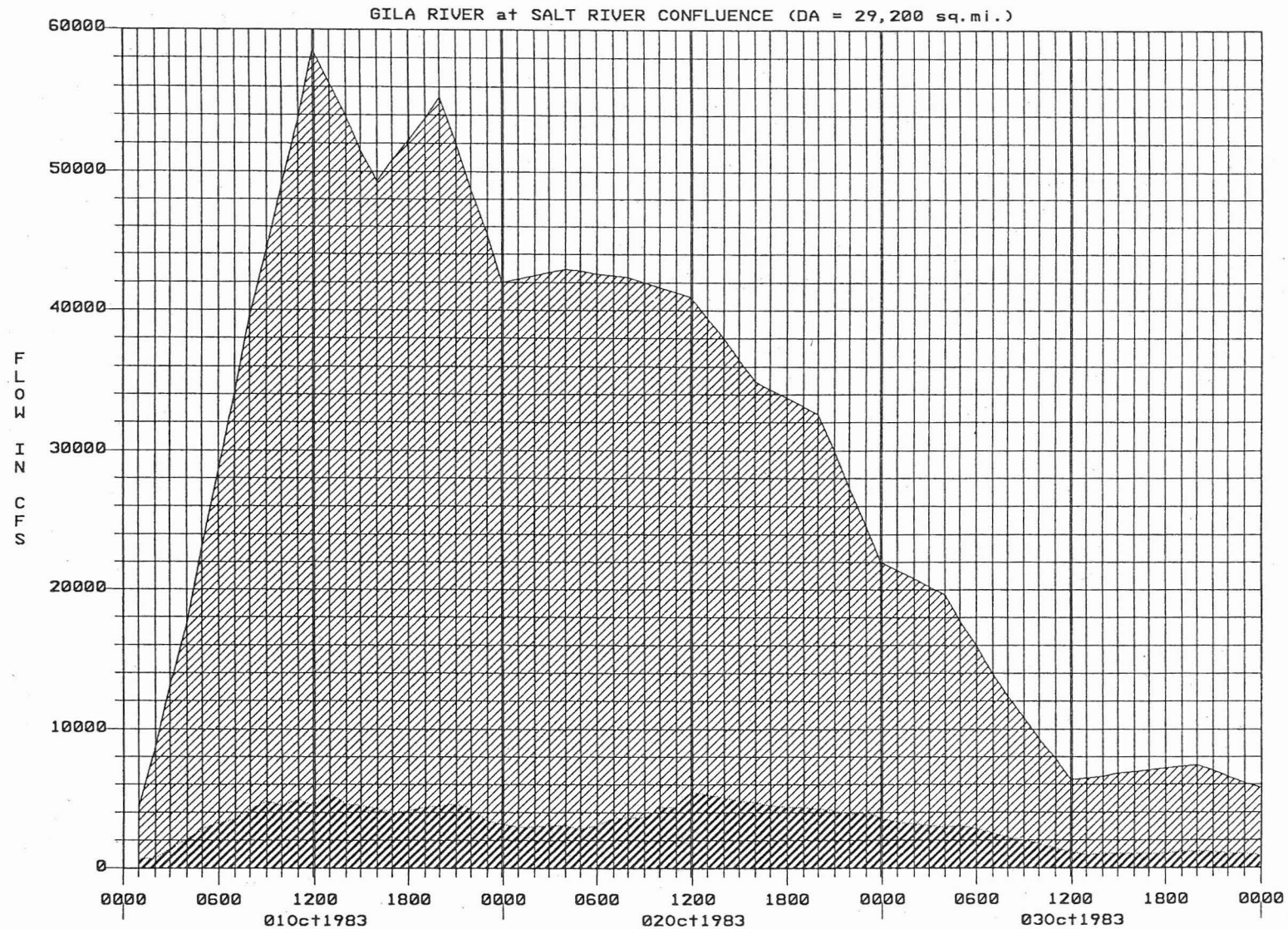

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ABOVE SALT R. 11-13FEB1922 FLOW

EXHIBIT A-4

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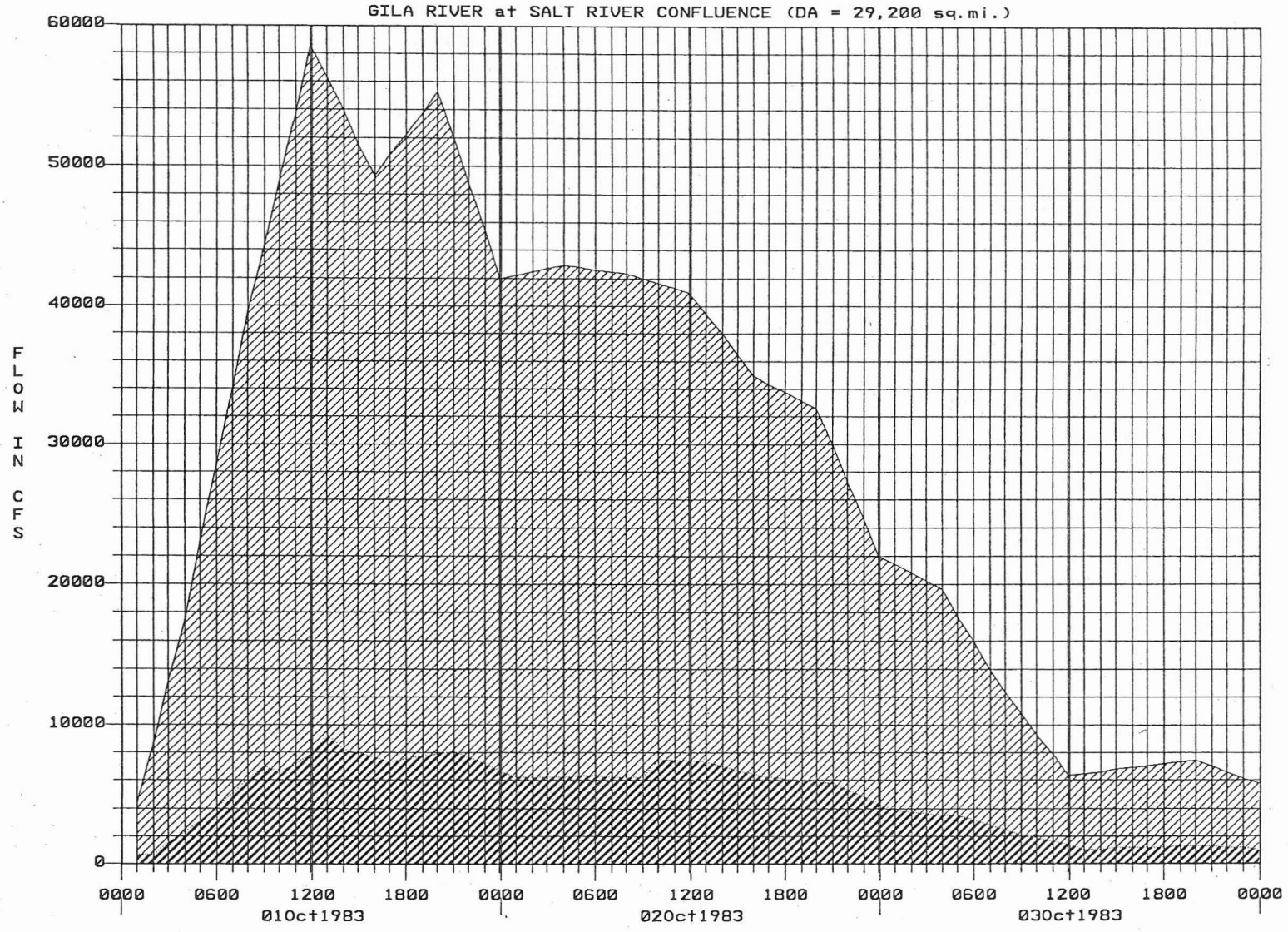

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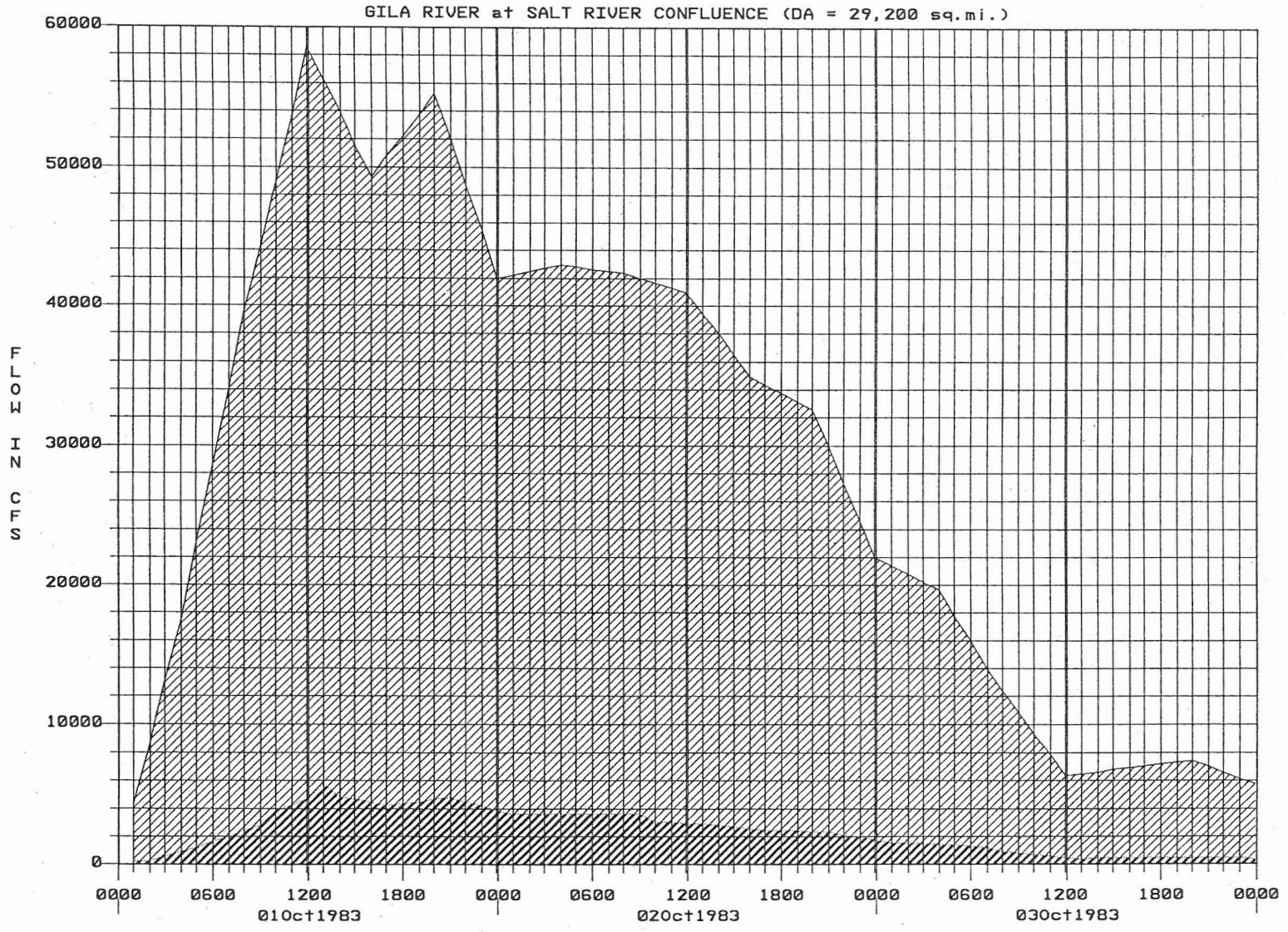
ABOVE SALT R. 17-19MAR1922 FLOW

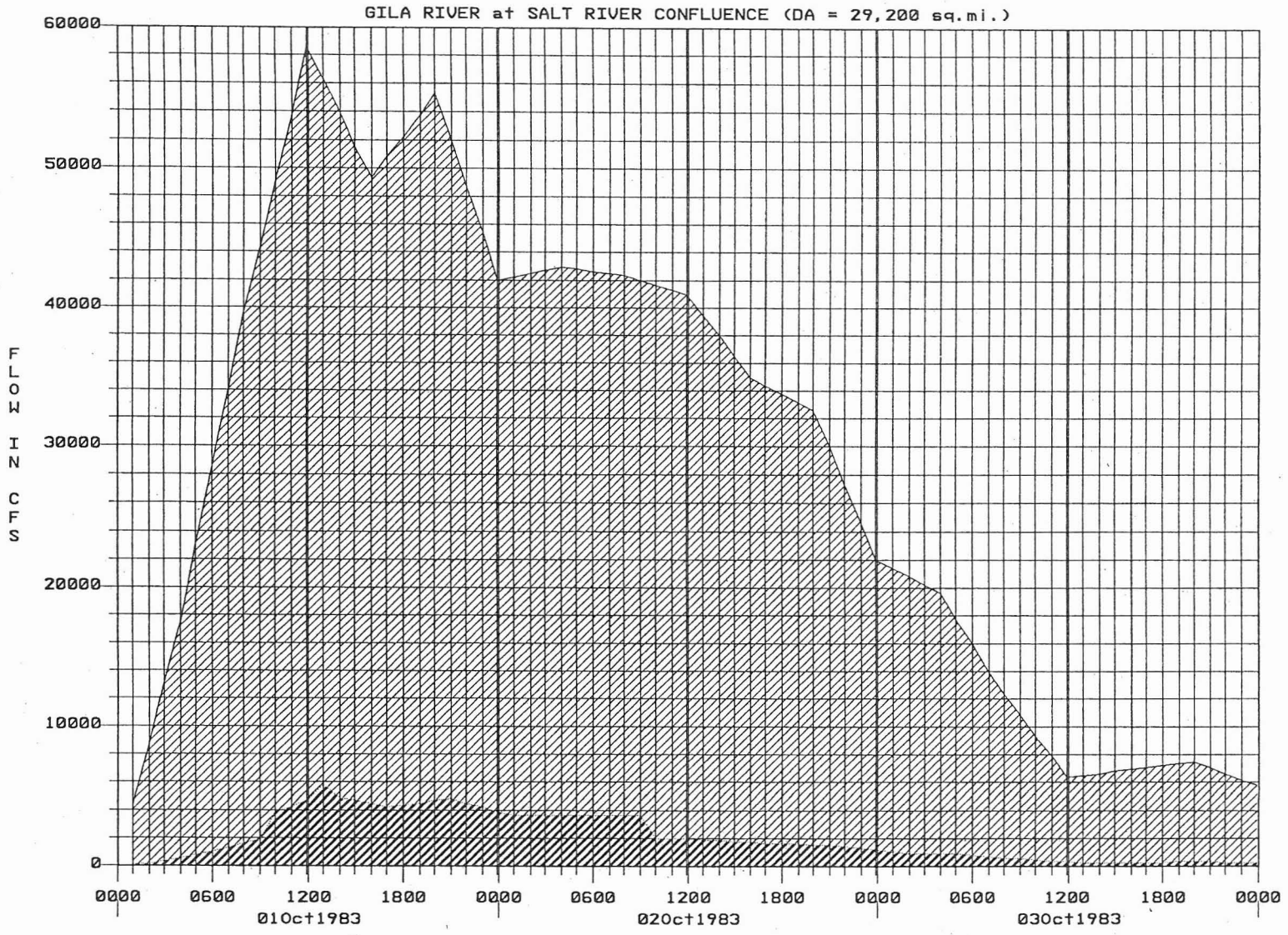
EXHIBIT A-5



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 3-5SEP1922 FLOW

EXHIBIT A-6

21NOV02 :18:16
POR_G. ..DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 7-9AUG1923 FLOW

EXHIBIT A-7

21NOV02 :17:11
POR_(DSS

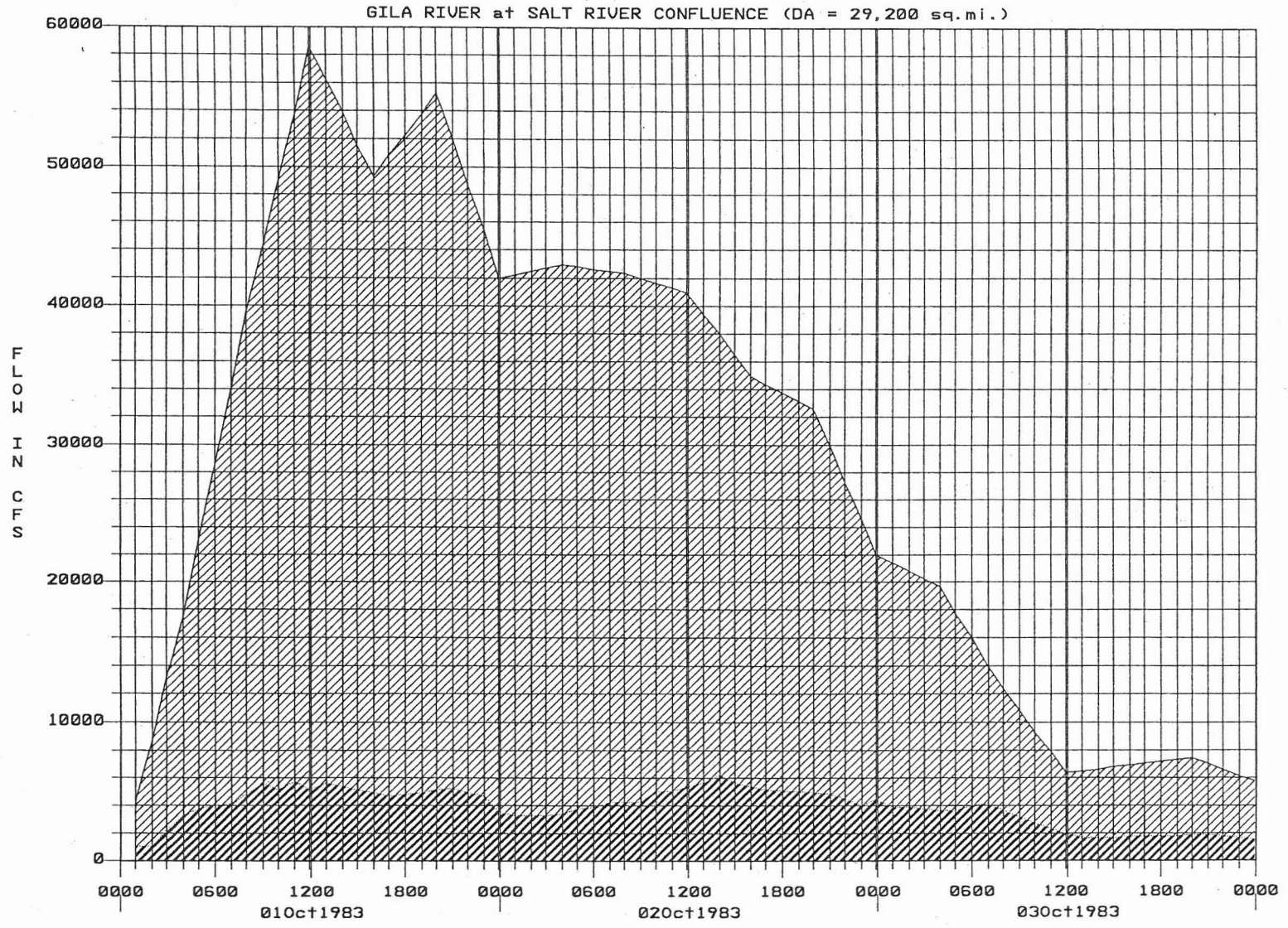
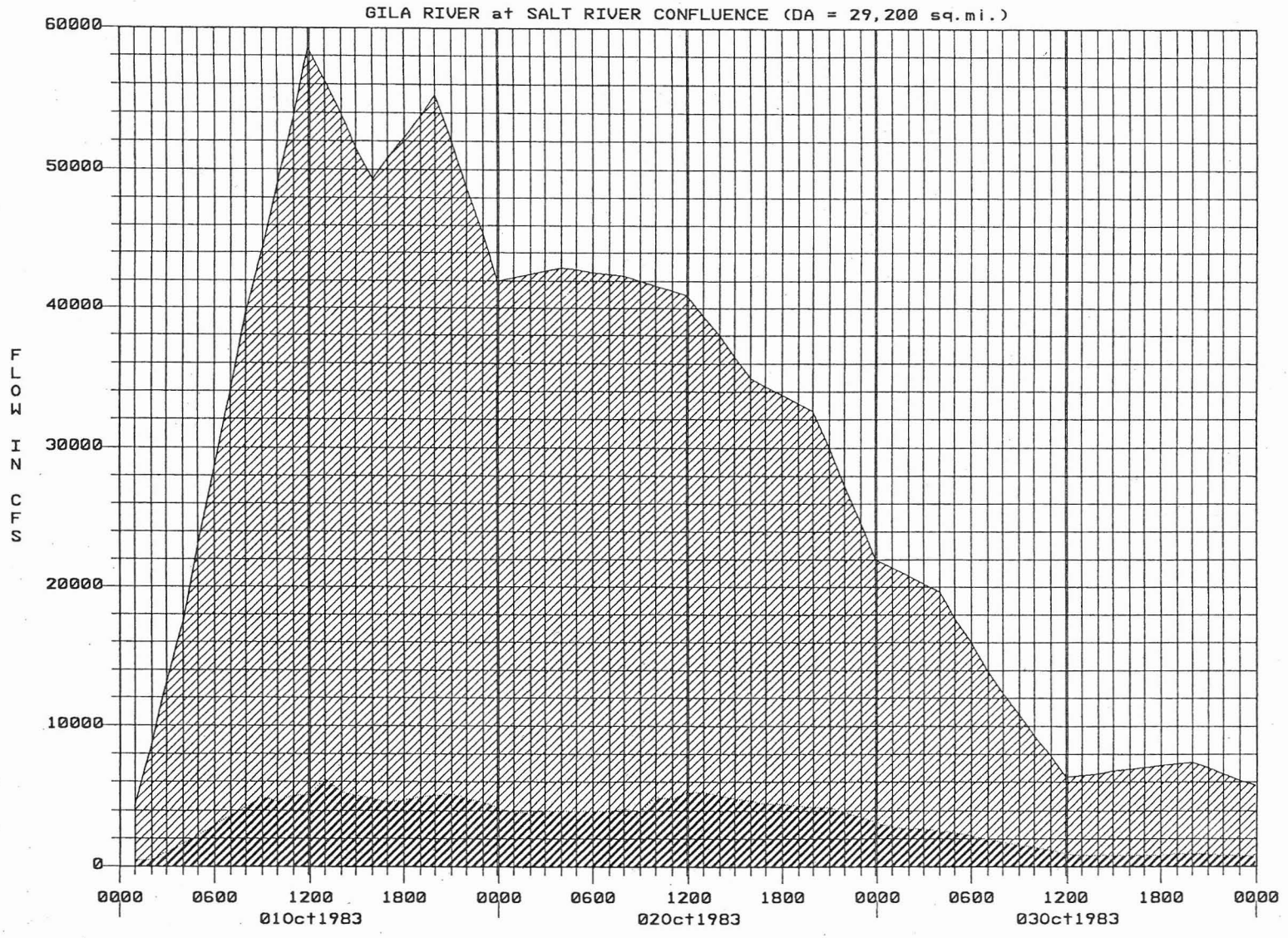


EXHIBIT A-8

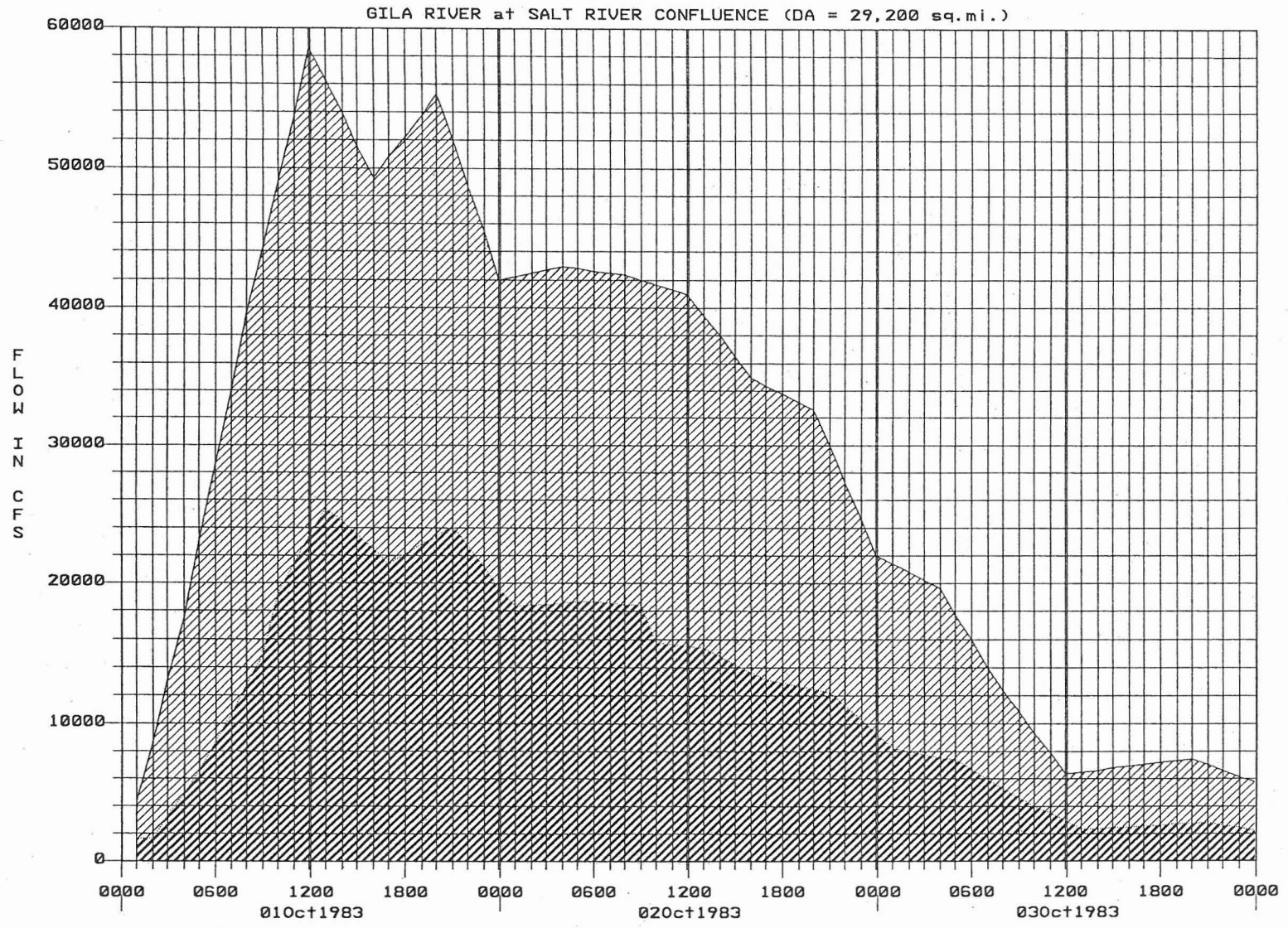
21NOV02]:16:35
POR_6 _.DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 11-13NOV1923 FLOW

EXHIBIT A-9

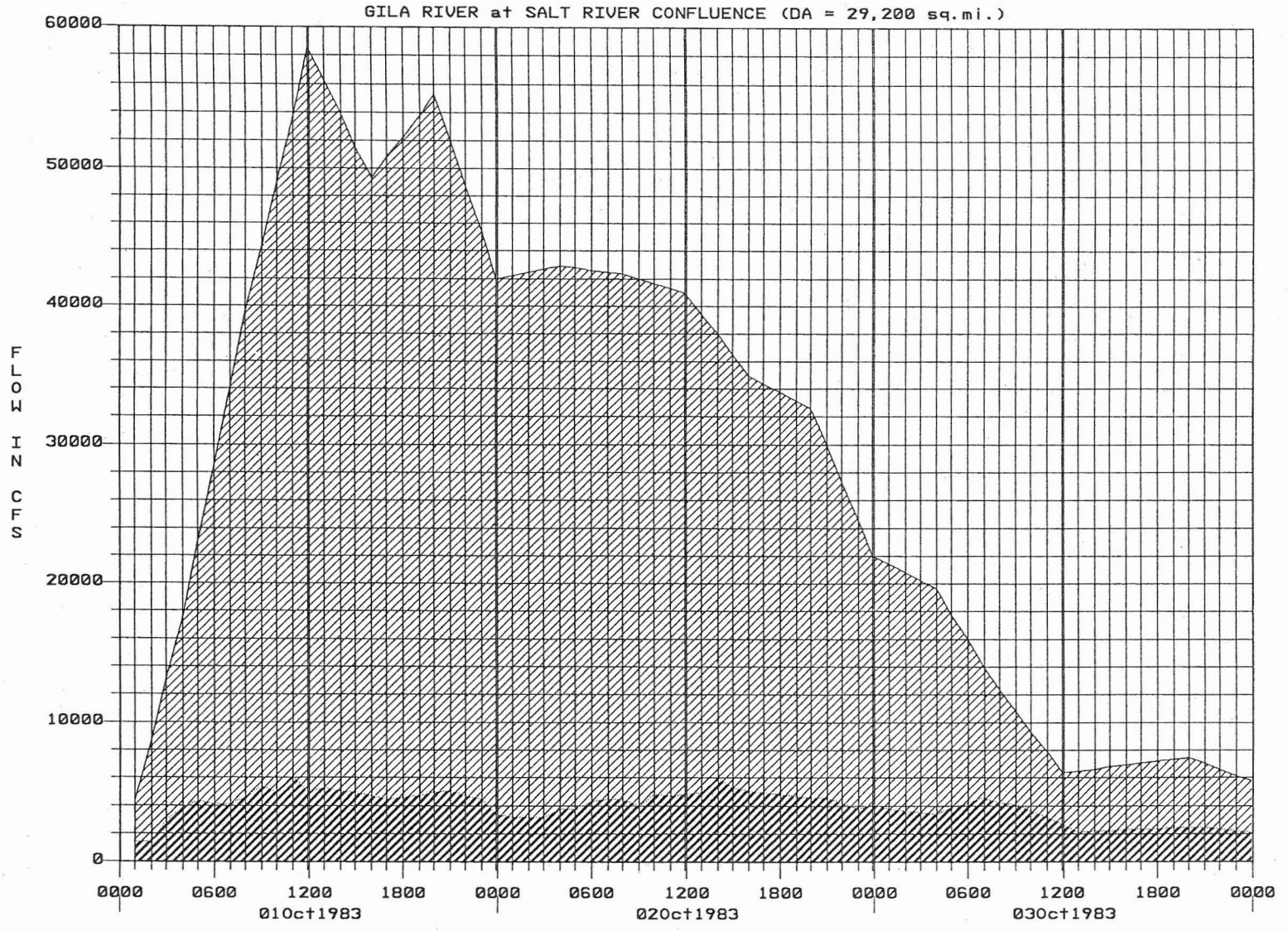
21NOV02 :17:34
POR_[ ].DSS



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 28-30DEC1923 FLOW

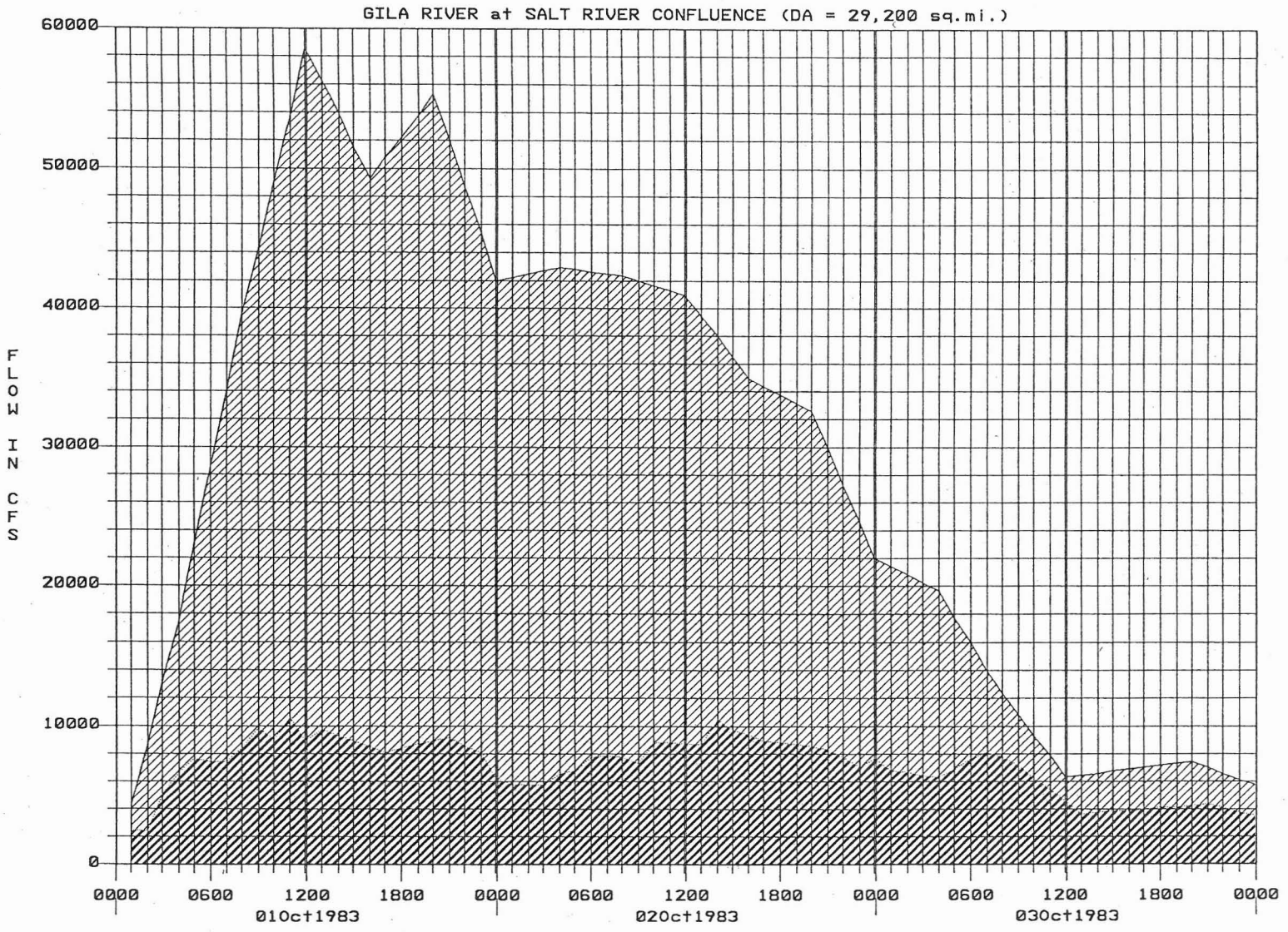
EXHIBIT A-10

21NOV02):17:17
POR_6 ..DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 19-21SEP1925 FLOW

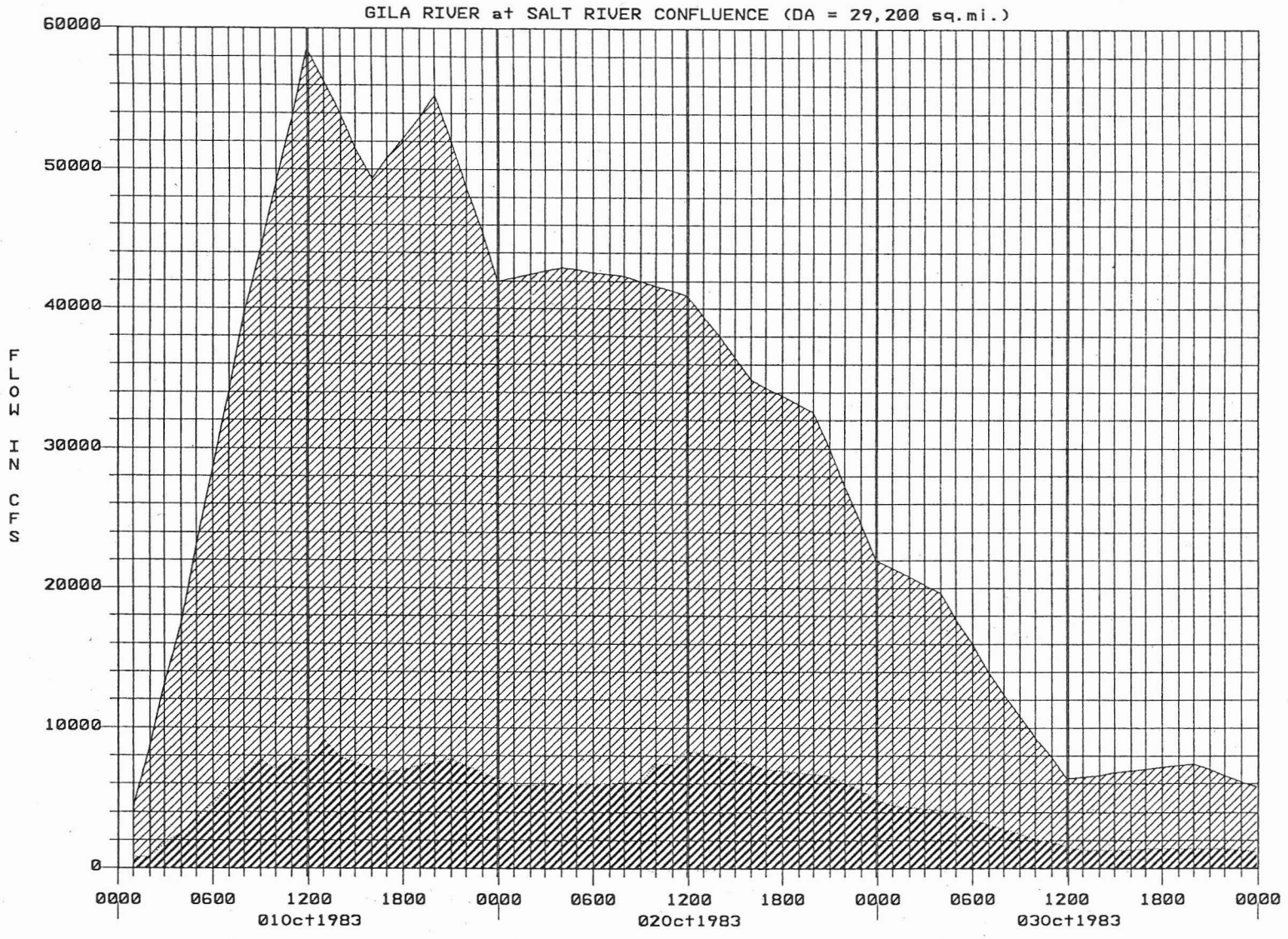
EXHIBIT A-11



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 7-9APR1926 FLOW

EXHIBIT A-12

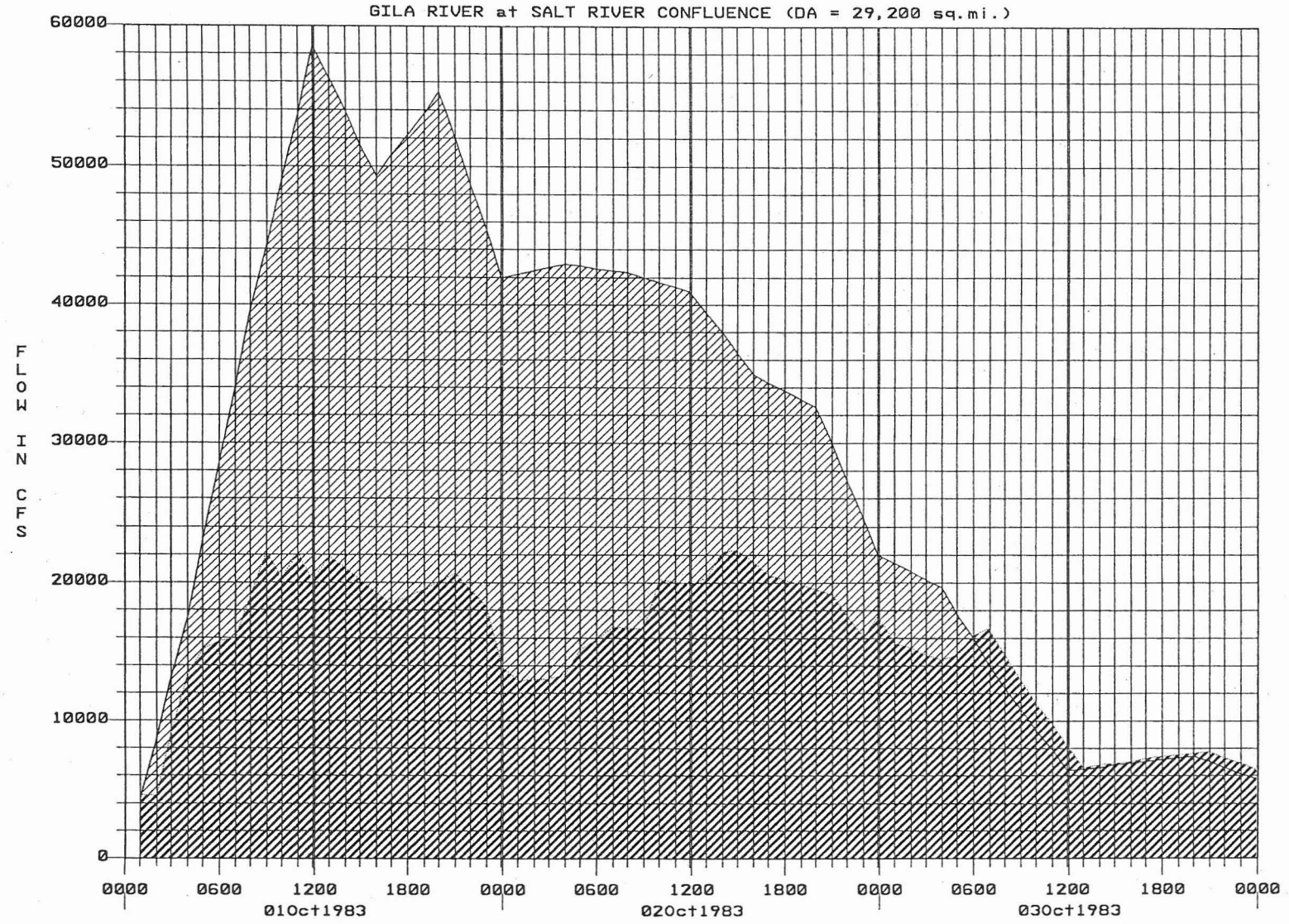
21NOV02 :17:40
POR_G. .DSS



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 28-30SEP1926 FLOW

EXHIBIT A-13

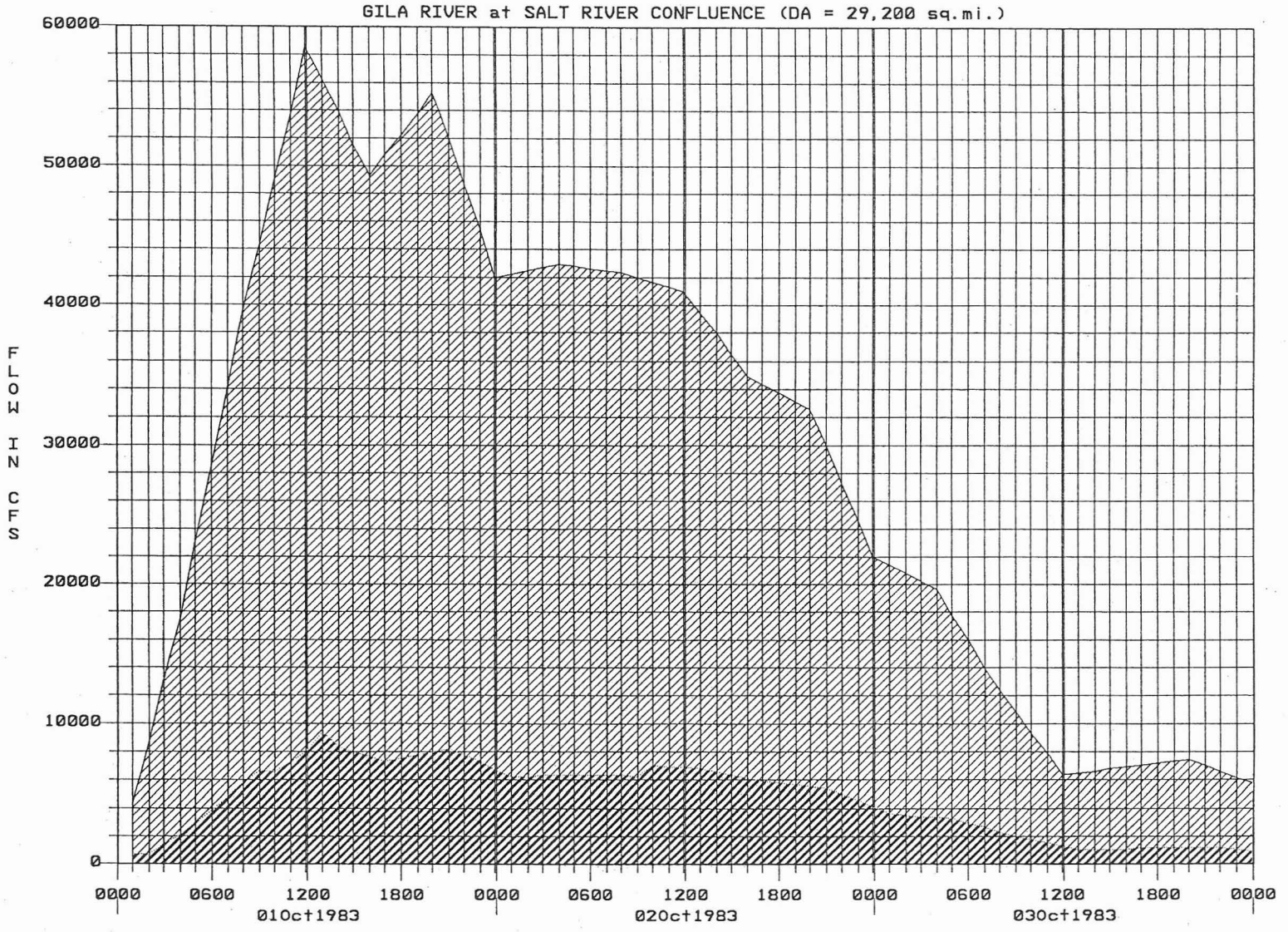
21NOV0? :16:53
POR_ .DSS



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 17-19FEB1927 FLOW

EXHIBIT A-14

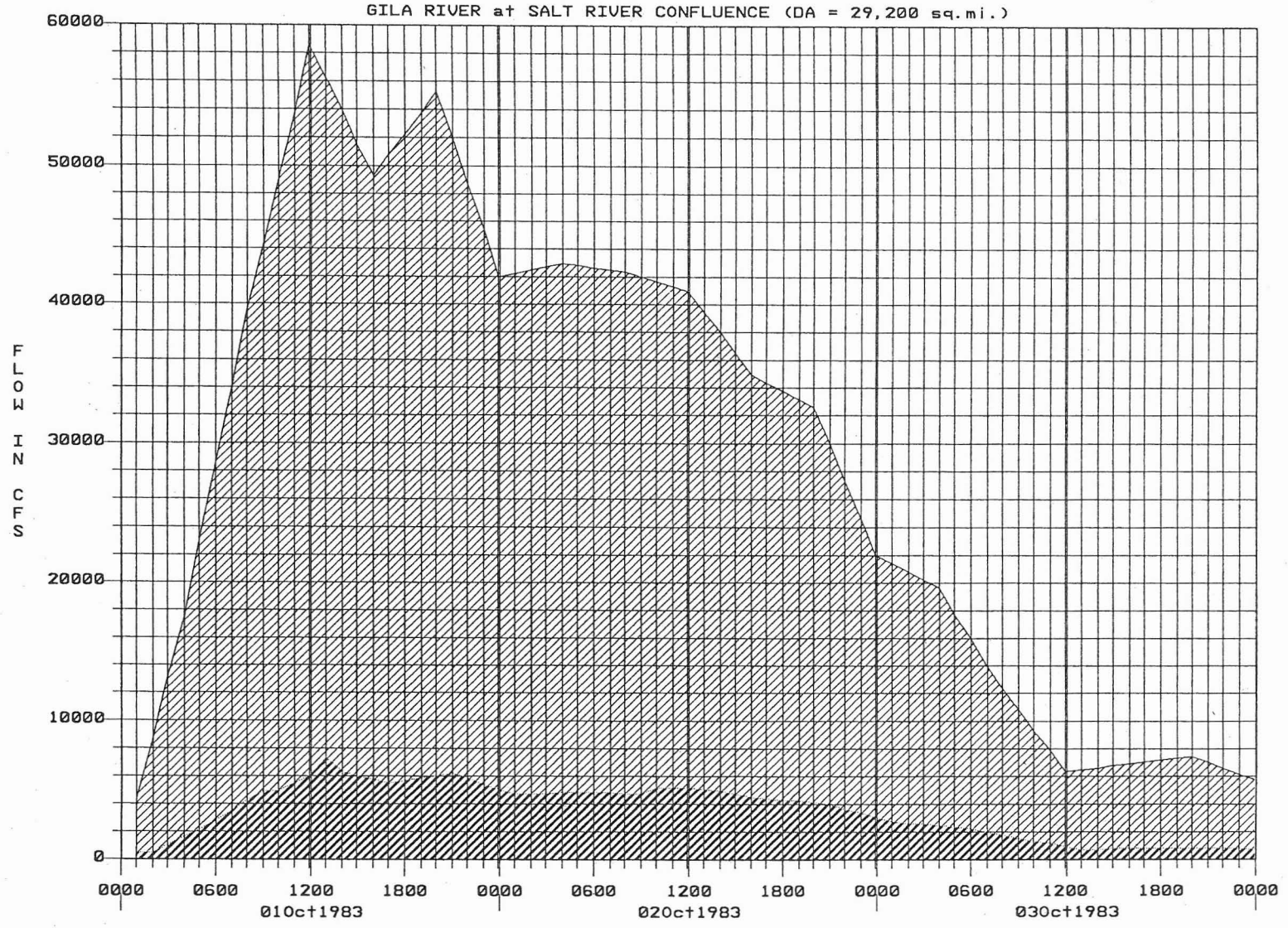
21NOV02):16:41
POR_G. ..DSS



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 13-15SEP1927 FLOW

EXHIBIT A-15

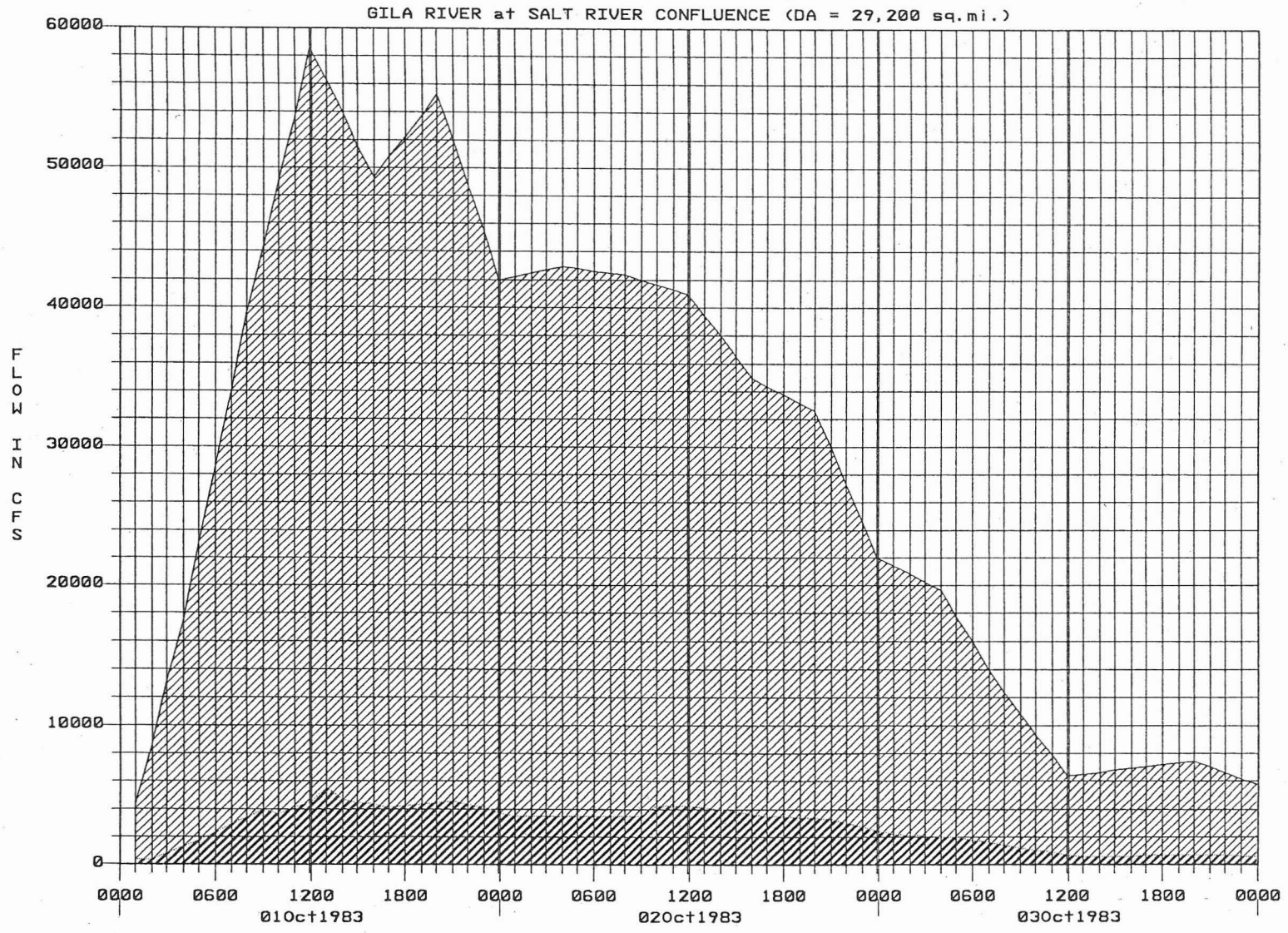
21NOV02 :18:04
POR_(DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 6-8APR1929 FLOW

EXHIBIT A-16

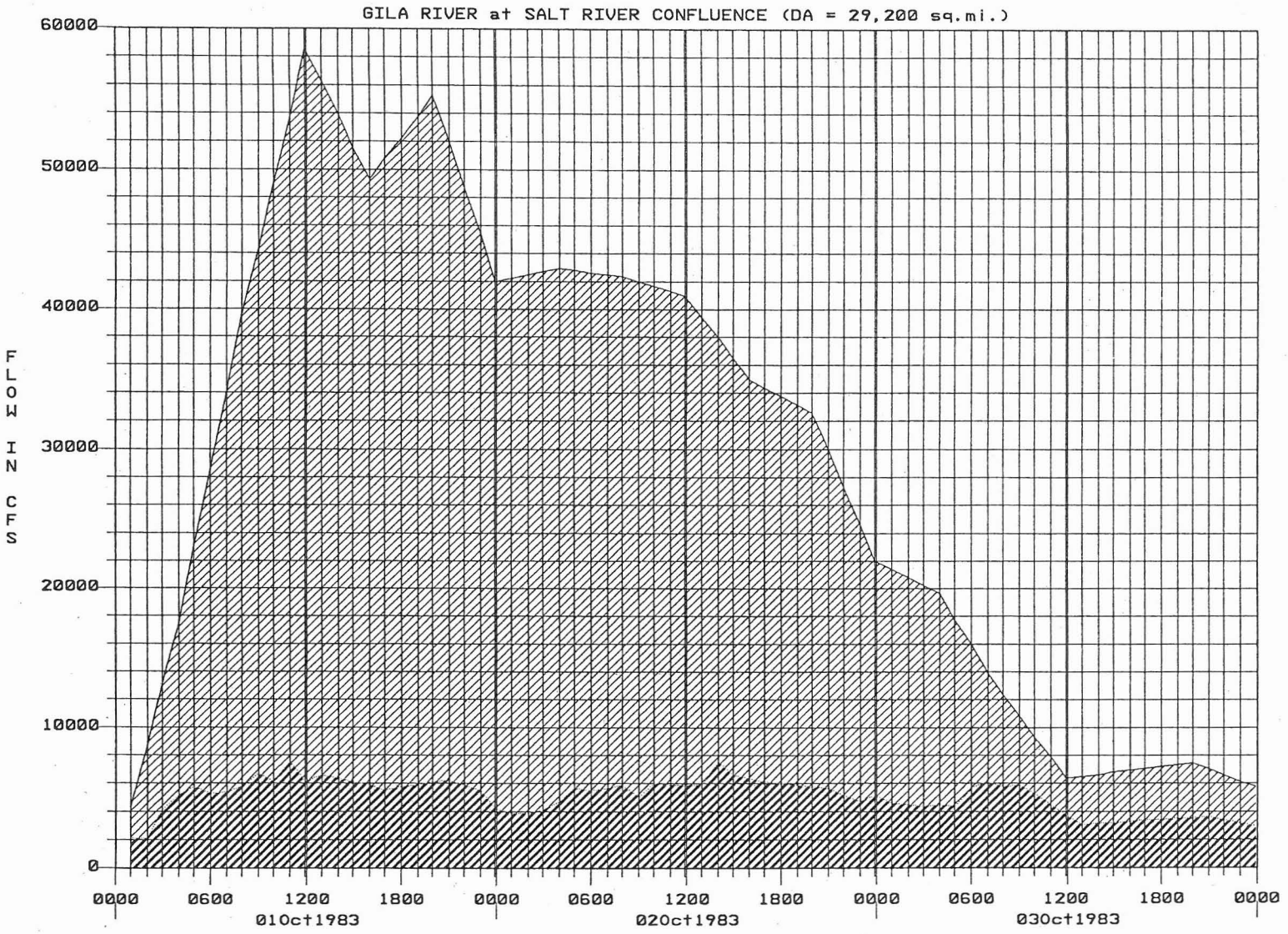
21NOV02 :18:22
POR_G..DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 9-11AUG1930 FLOW

EXHIBIT A-17

21NOV07 :16:47
POR_ .DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 15-17FEB1931 FLOW

EXHIBIT A-18

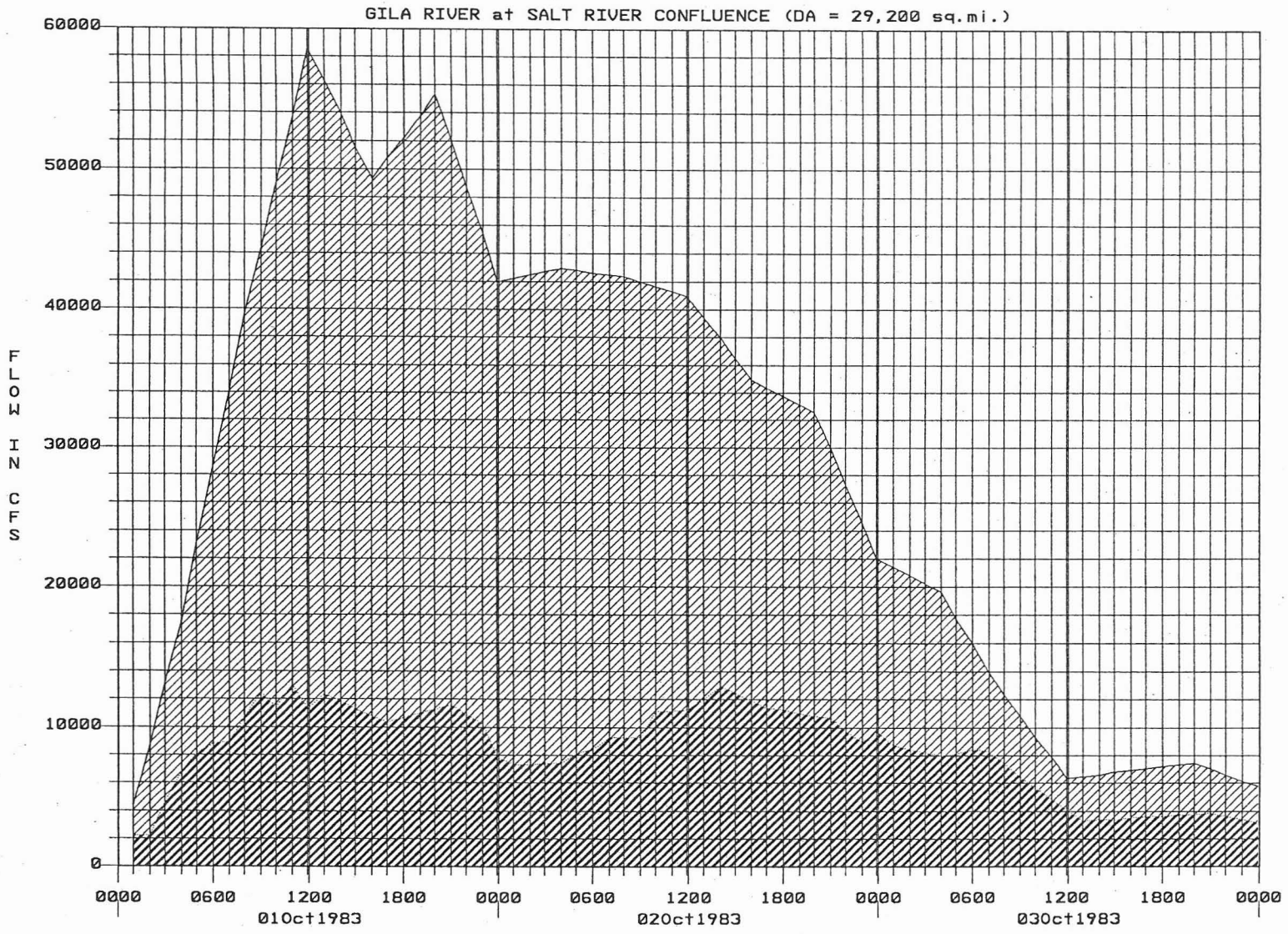
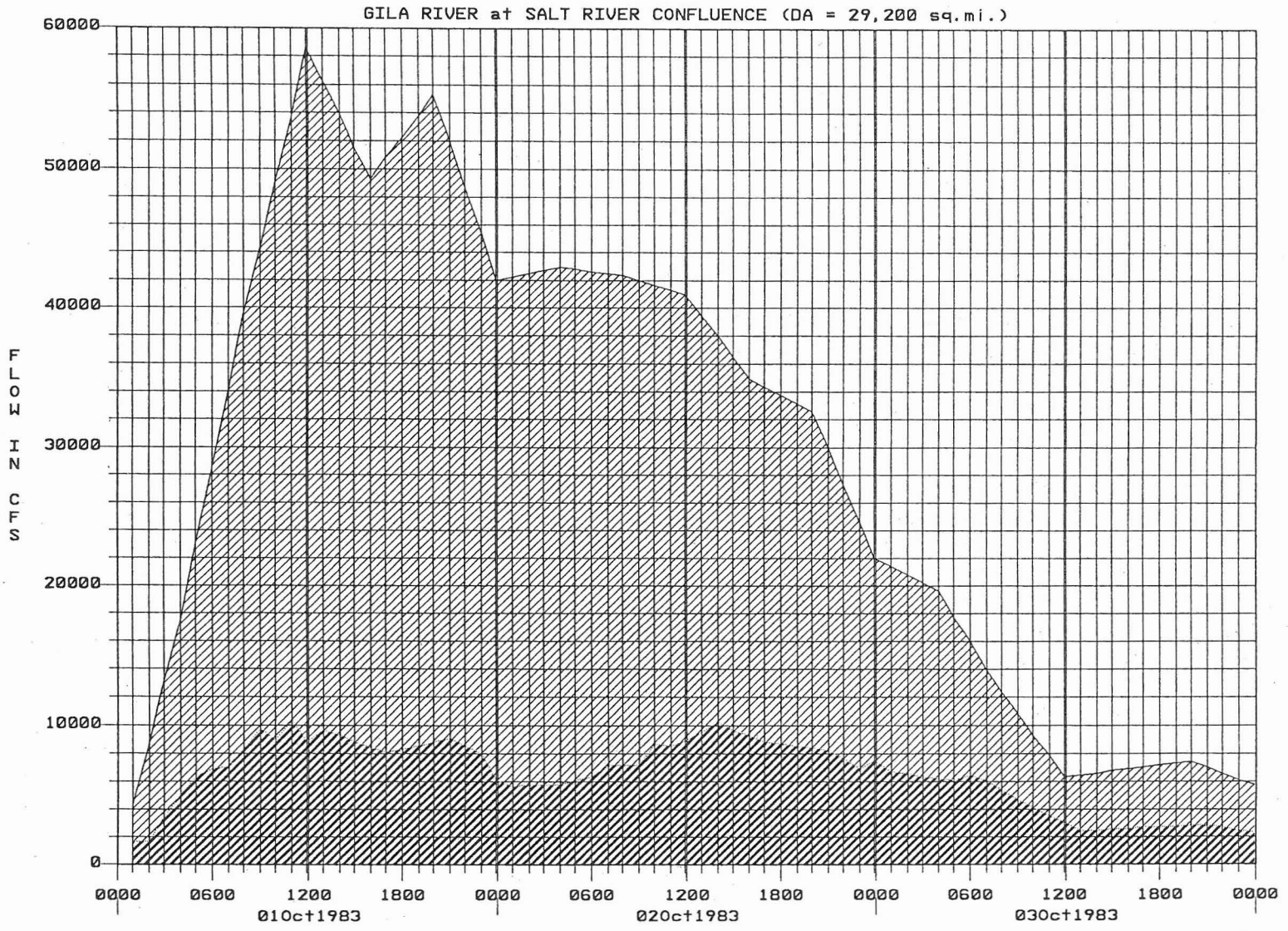

GILA RIVER at SALT RIVER CONFLUENCE (DA = 29,200 sq.mi.)
FLOW IN CFS
60000
50000
40000
30000
20000
10000
0
0000
0600
1200
1800
0000
0600
1200
1800
0000
0600
1200
1800
0000
010ct1983
020ct1983
030ct1983
ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 11-13FEB1932 FLOW

EXHIBIT A-19

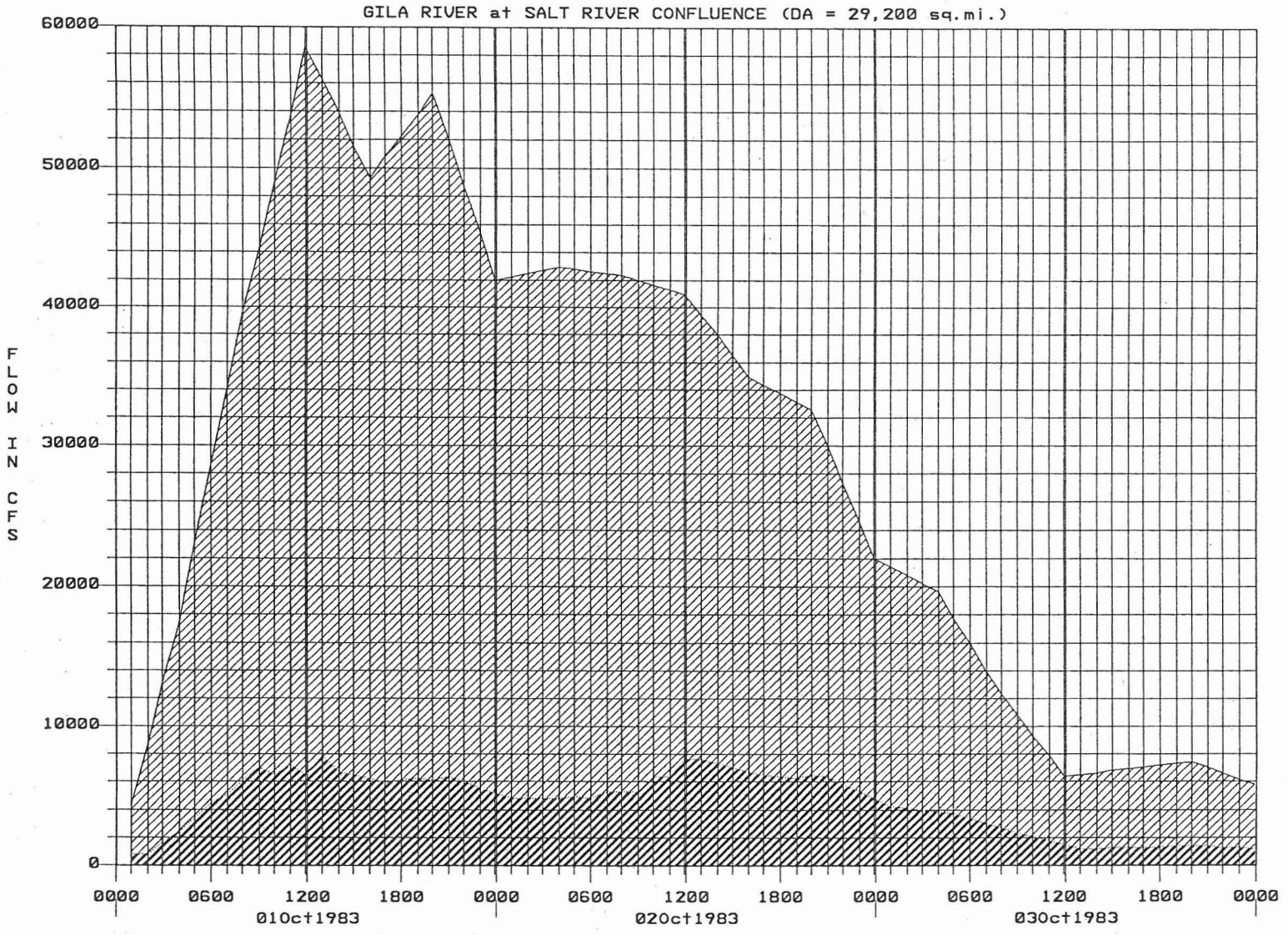
21NOV07 9:18:28
POR_ .DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 9-11FEB1937 FLOW

EXHIBIT A-20

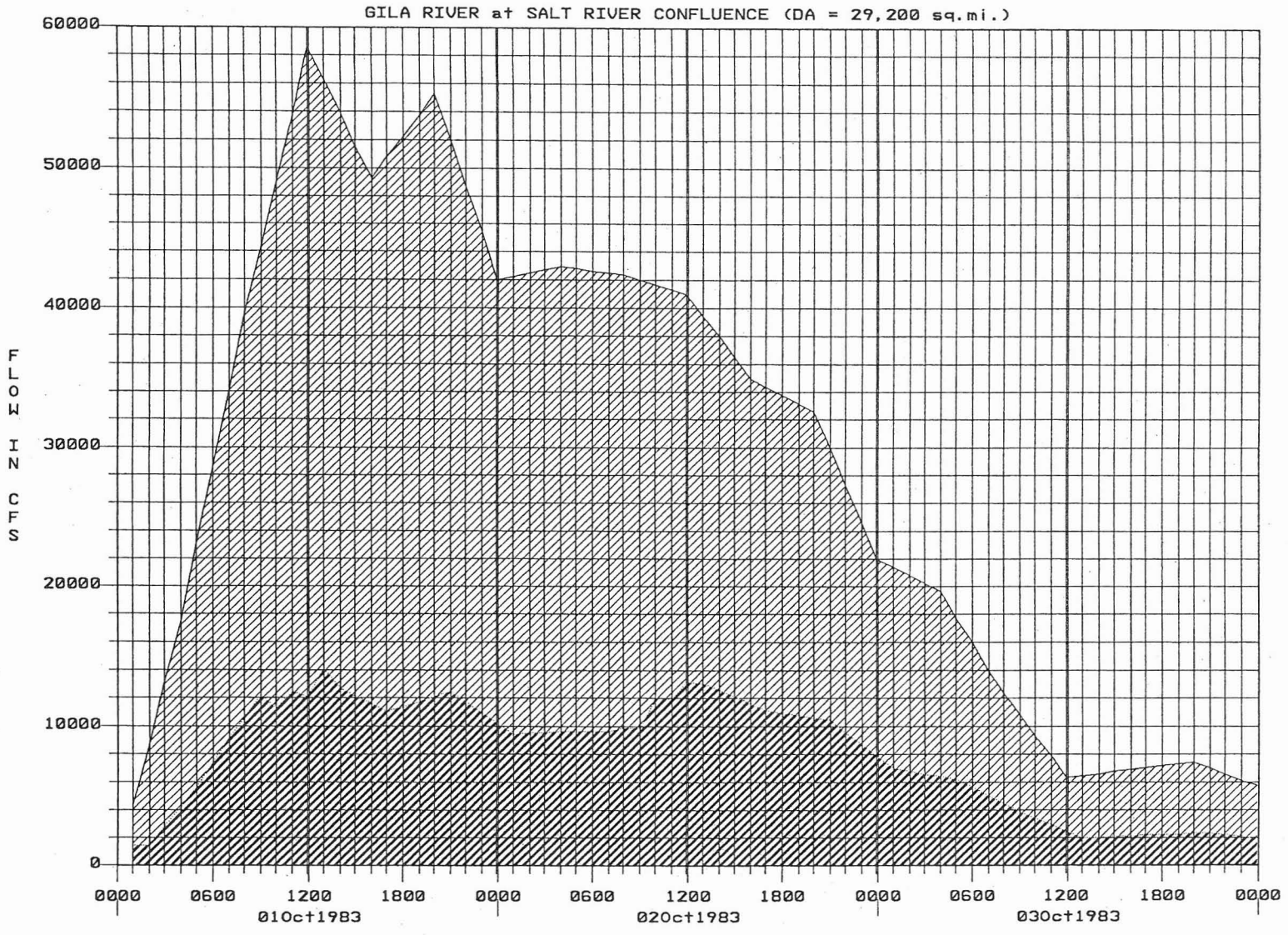
21NOV02 :17:05
POR_G .DSS



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 19-21MAR1937 FLOW

EXHIBIT A-21

21NOV0 3:17:58
POR_ ..DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 5-7MAR1938 FLOW

EXHIBIT A-22

21NOV02 :00:21
POR_G .DSS

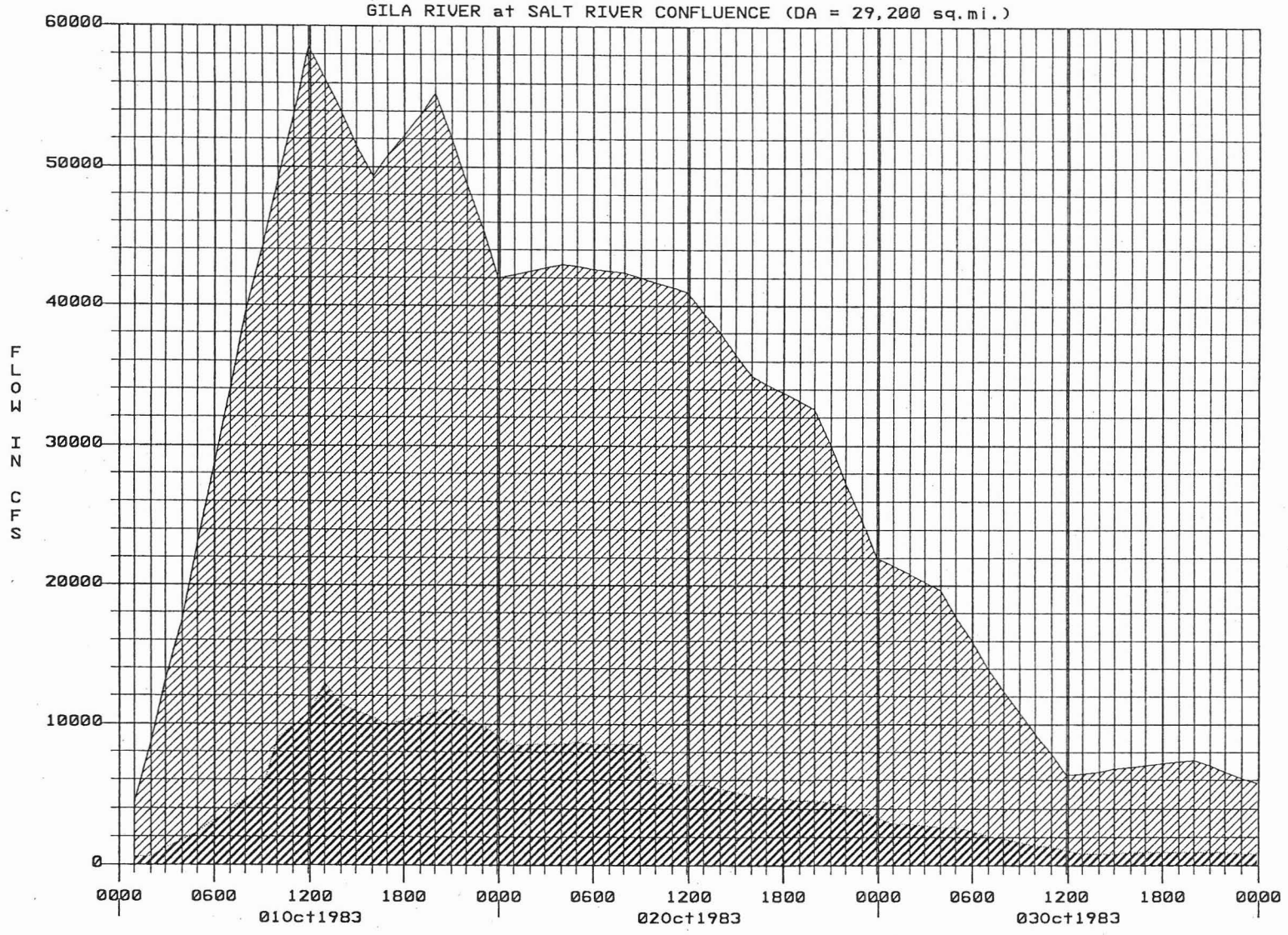
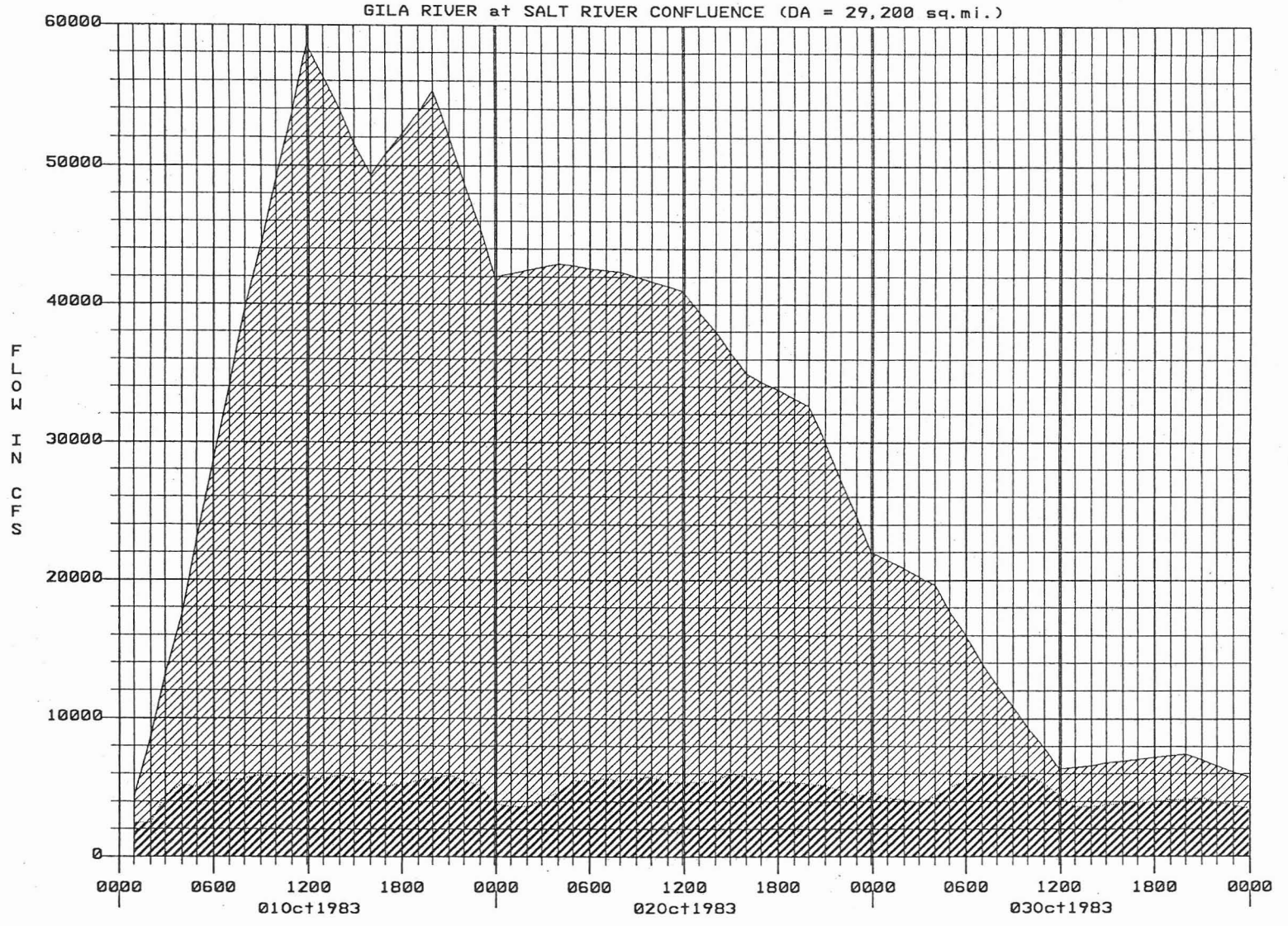


EXHIBIT A-23

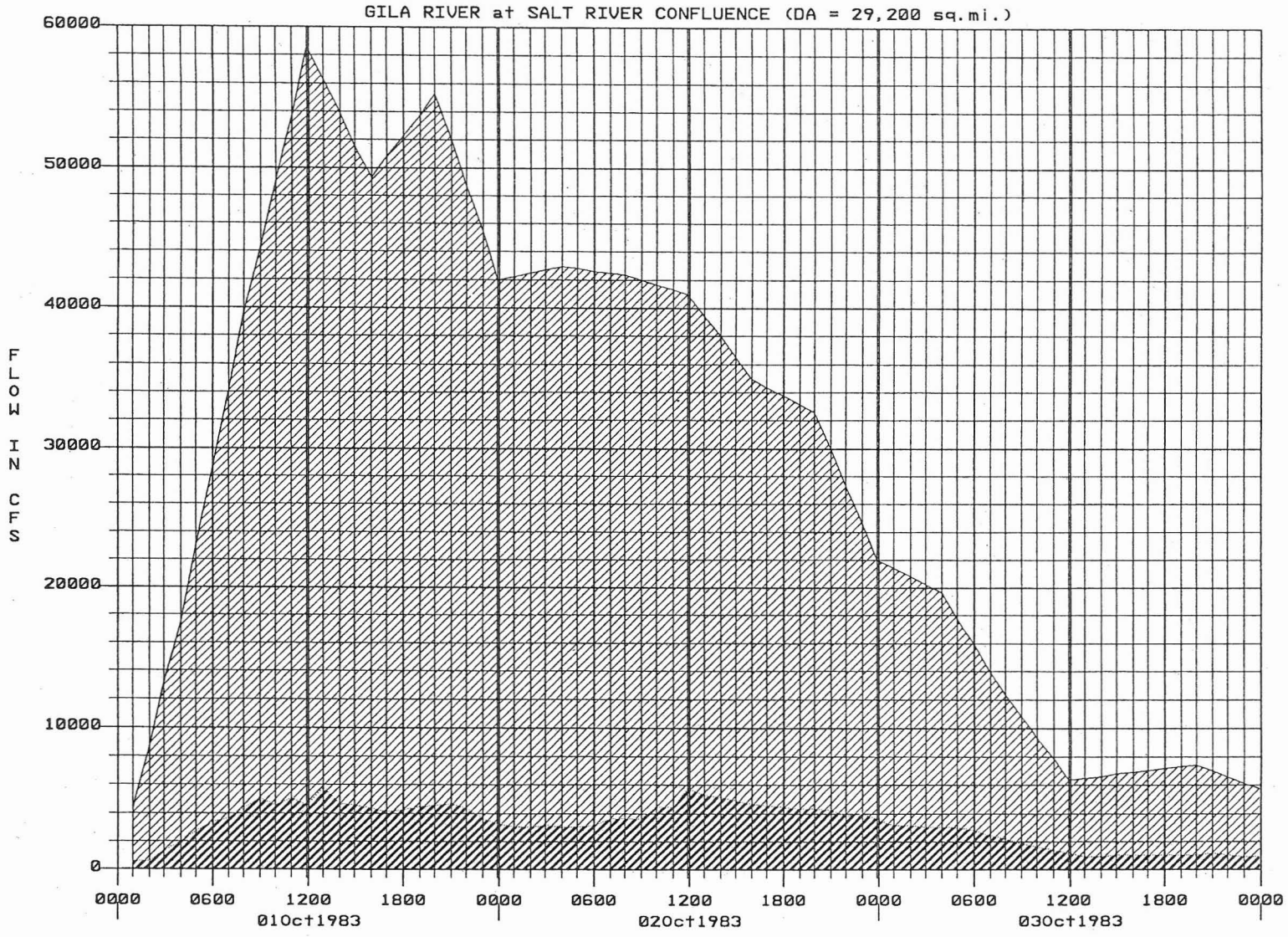
21NOV02 :00:36
POR_(DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 19-21SEP1946 FLOW

EXHIBIT A-24

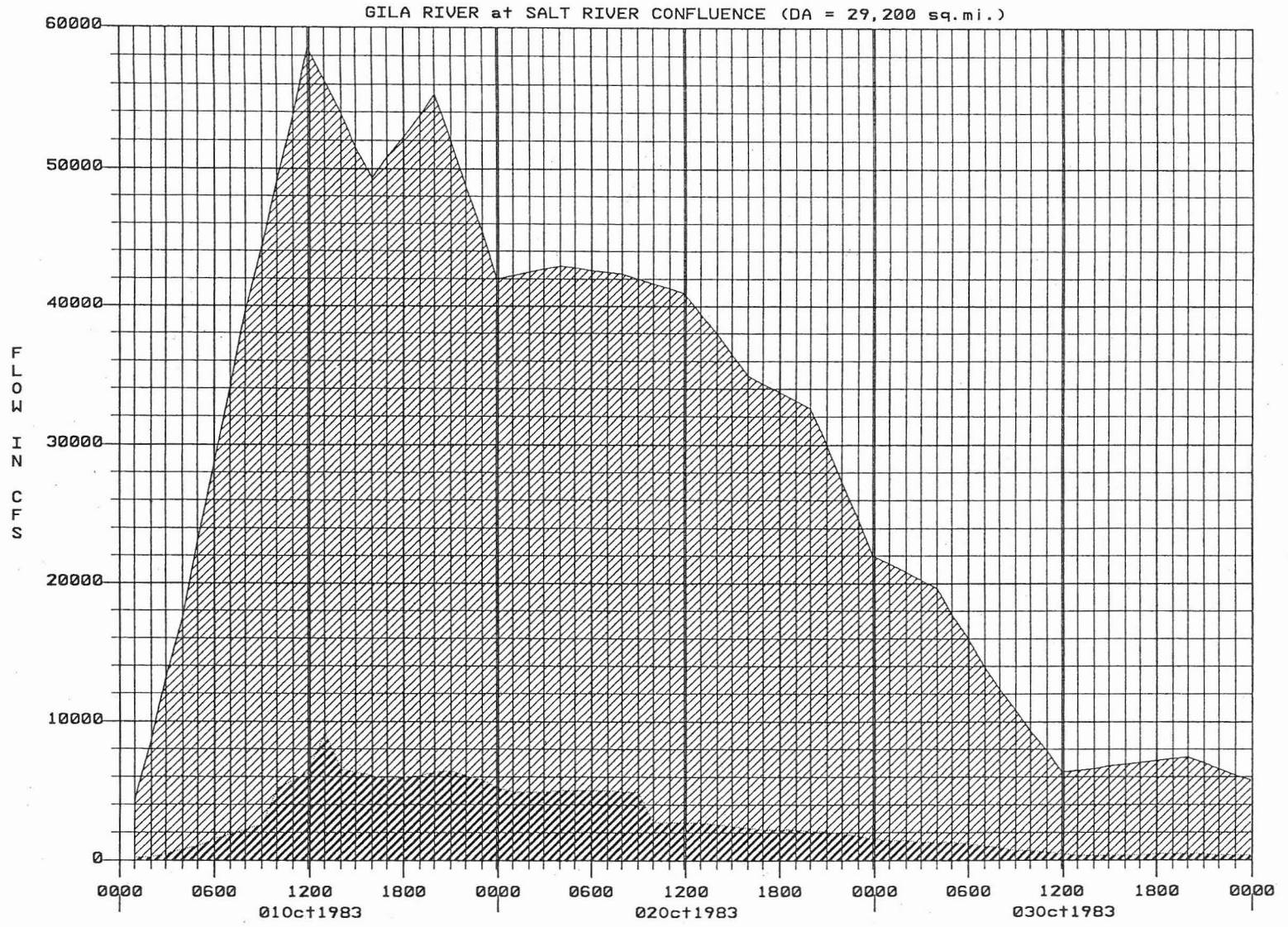
21NOV02 :01:20
POR_GI DSS



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 28-30AUG1951 FLOW

EXHIBIT A-25

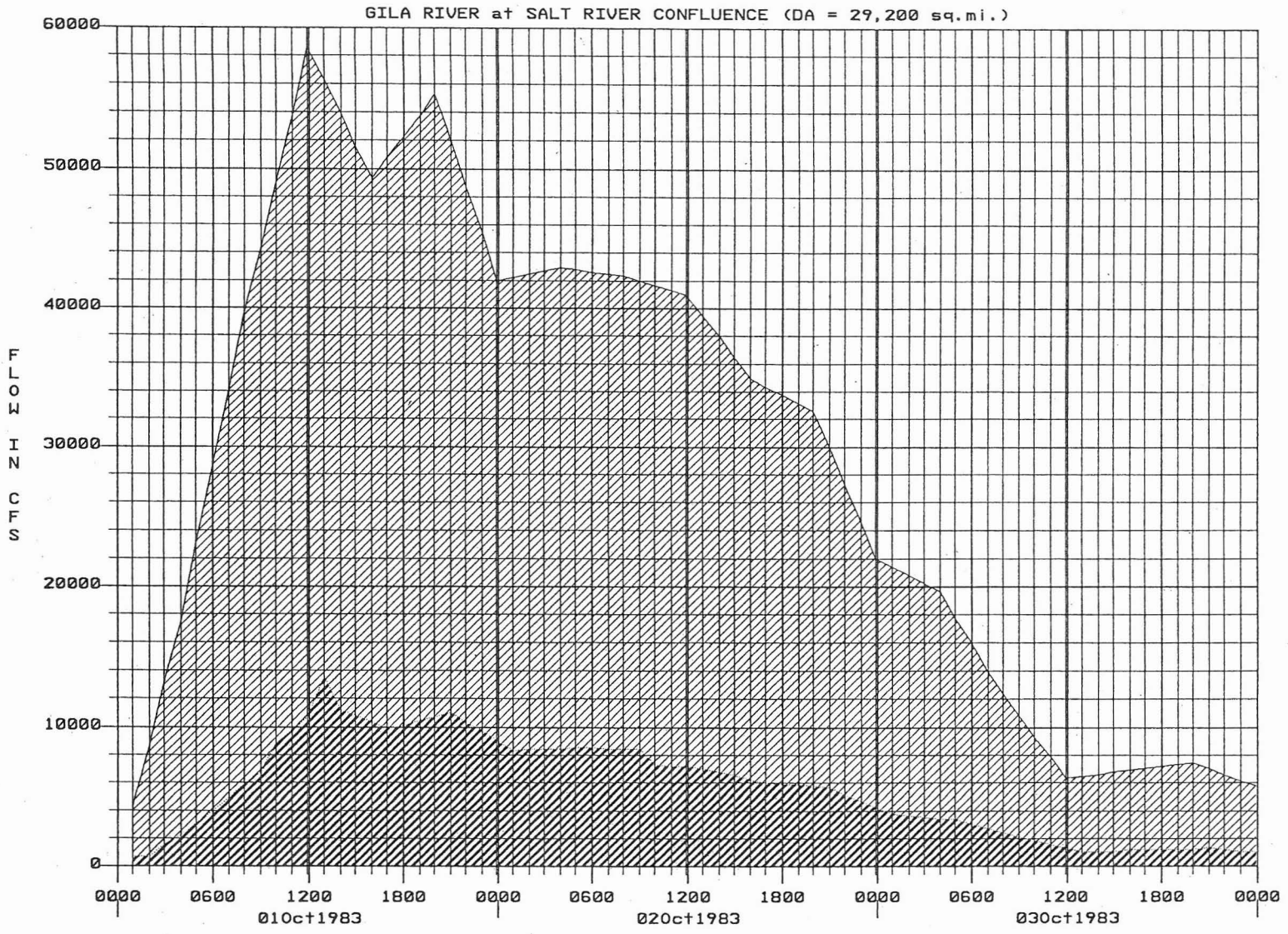
21NOV02 :01:27
POR_6 DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 29SEP-1OCT1962 FLOW

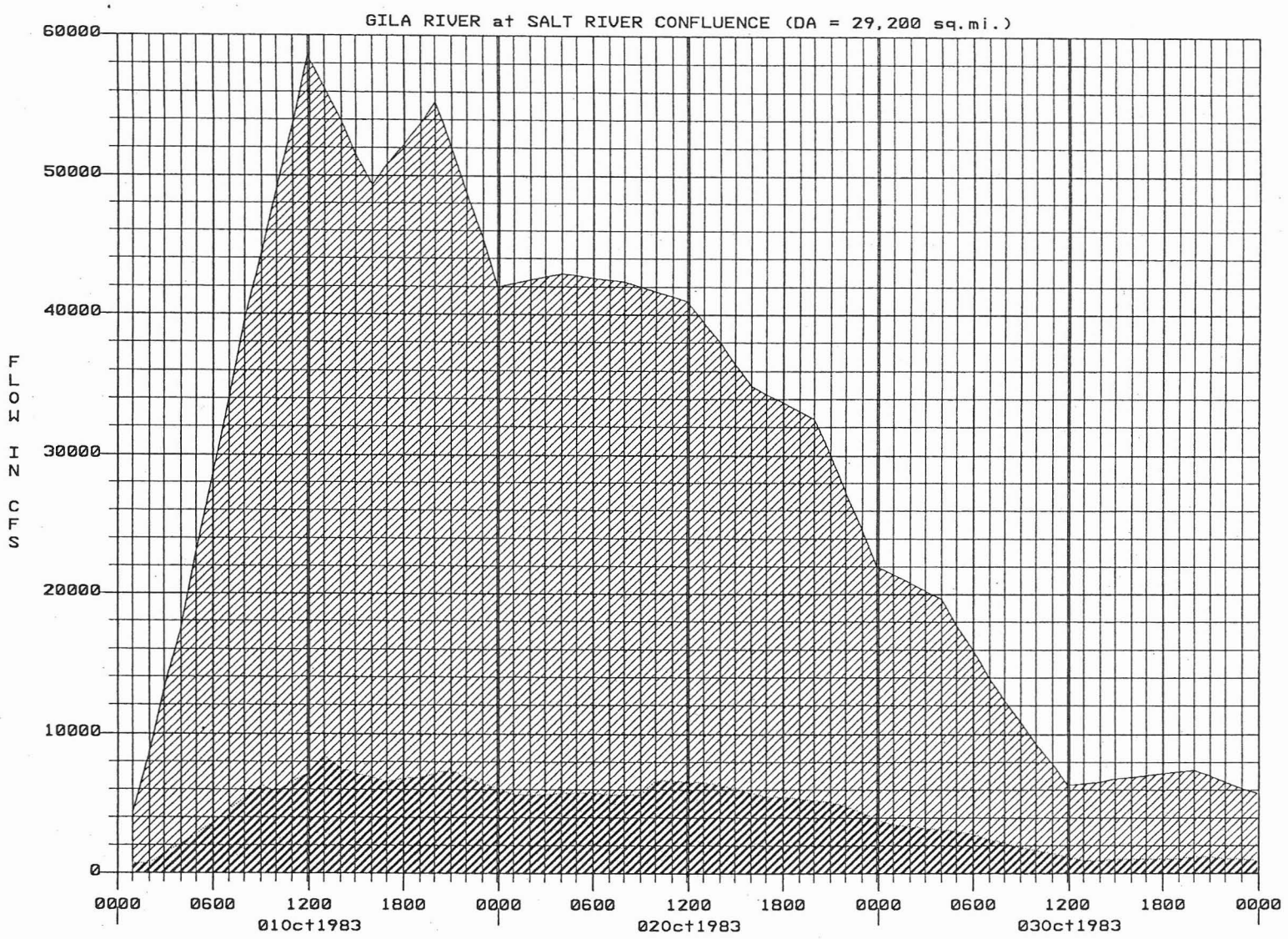
EXHIBIT A-26

21NOV02 01:12
POR_GR. .DSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 25-27DEC1965 FLOW

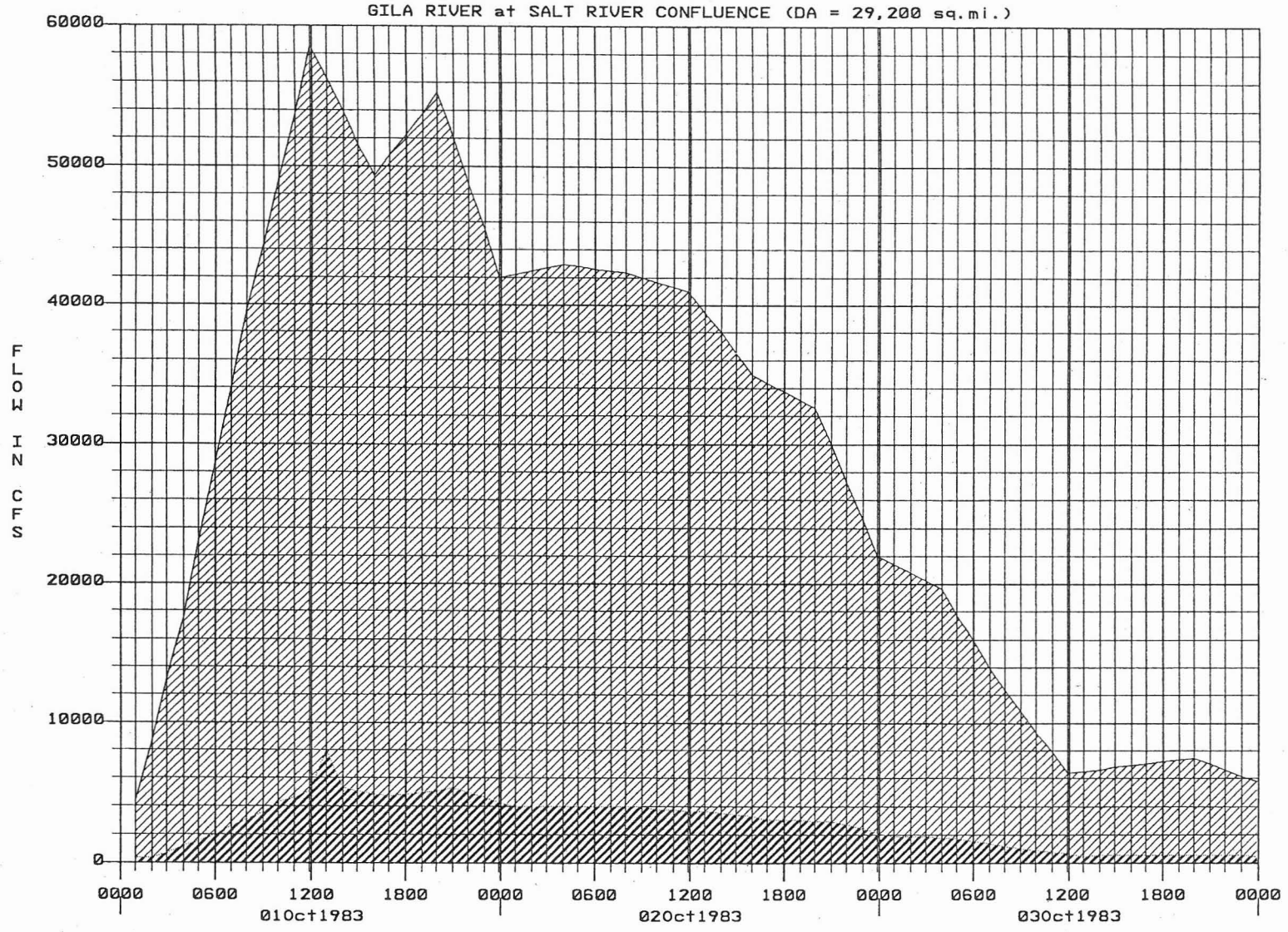
EXHIBIT A-27



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 22-24DEC1967 FLOW

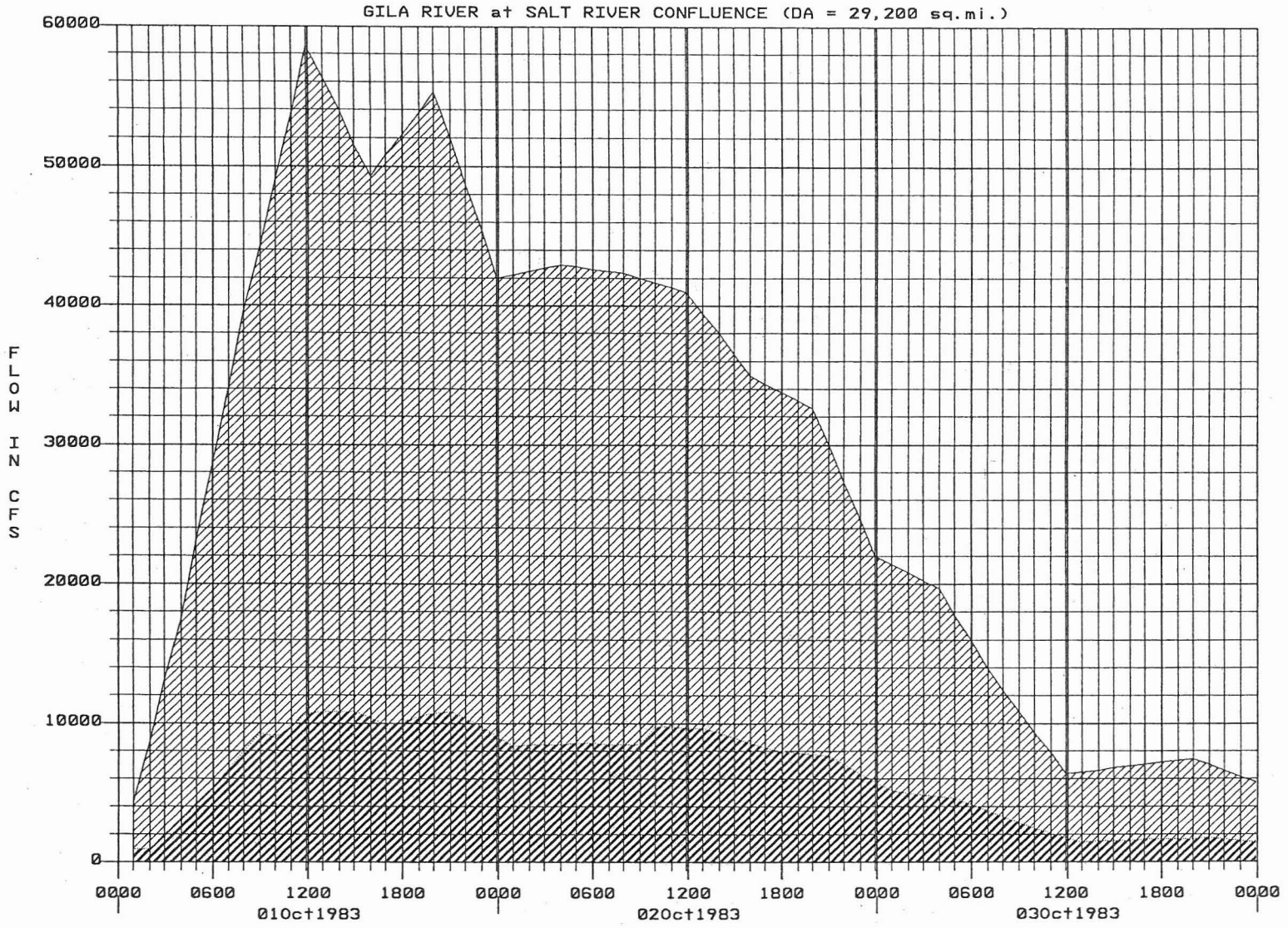
EXHIBIT A-28

21NOV02 00:28
POR_GR. DSS



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 12-140CT1977 FLOW

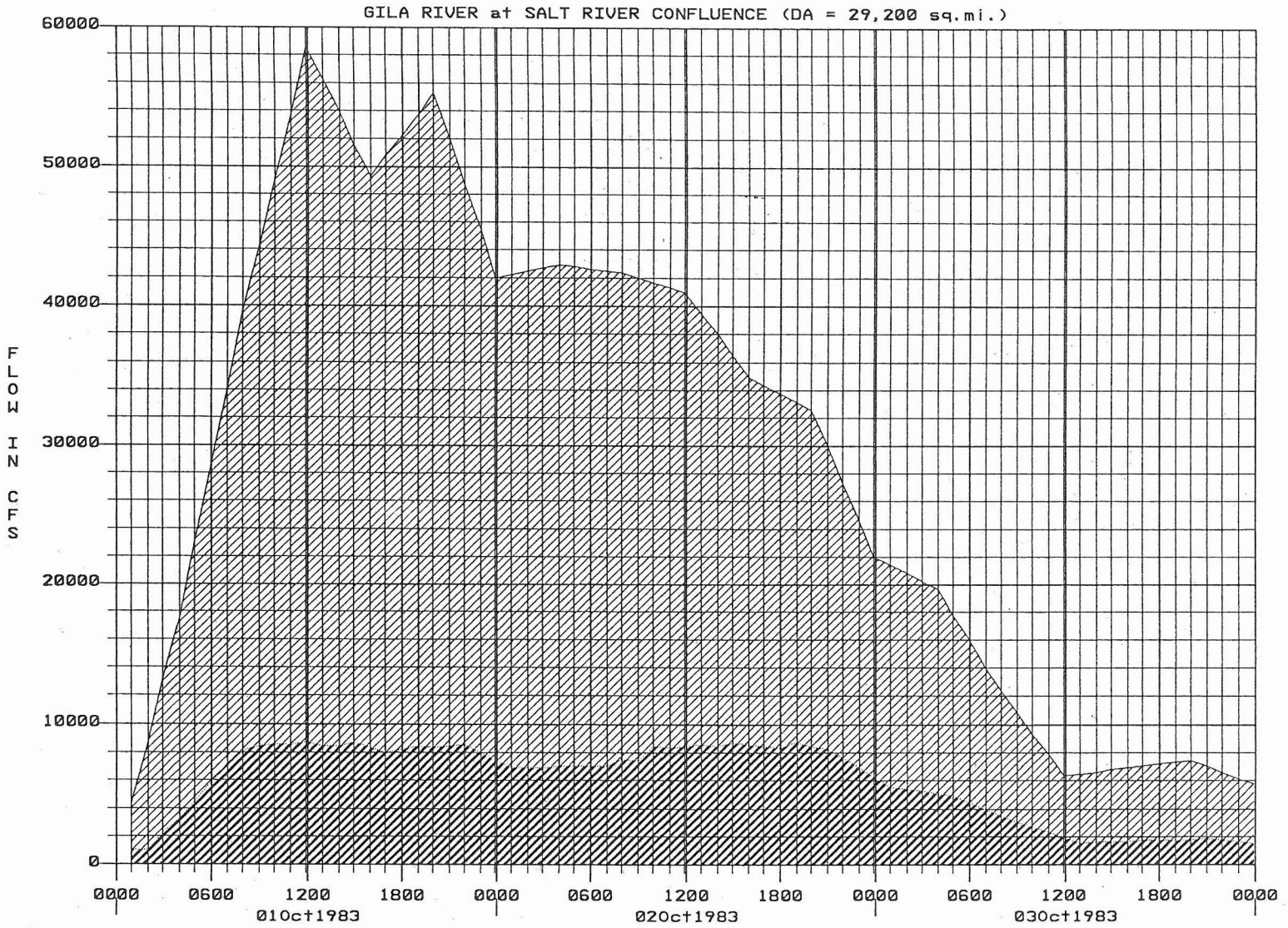
EXHIBIT A-29



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 21-23DEC1978 FLOW

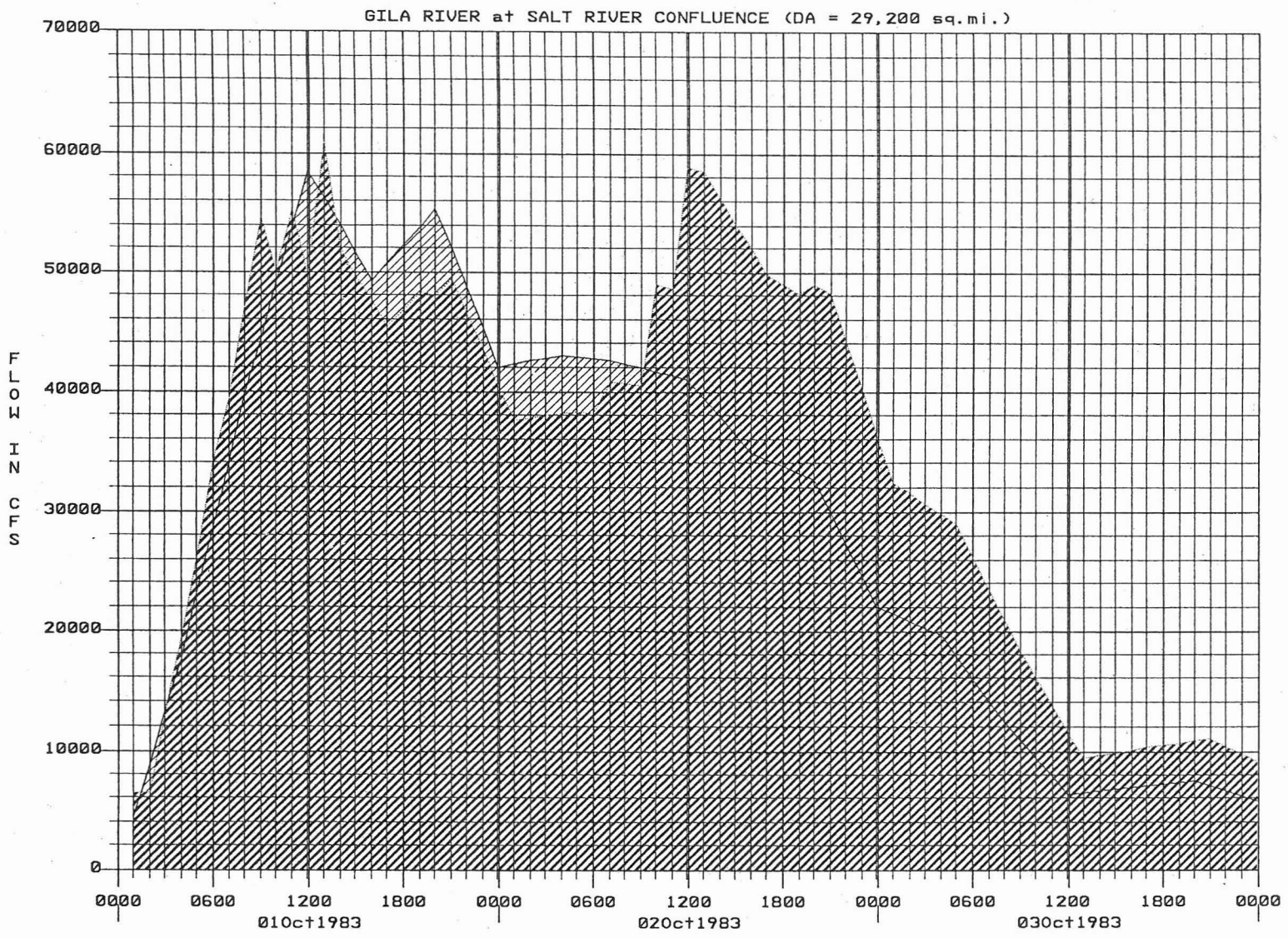
EXHIBIT A-30

21NOV02 00:43
POR_GRI JSS



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 20-22JAN1979 FLOW

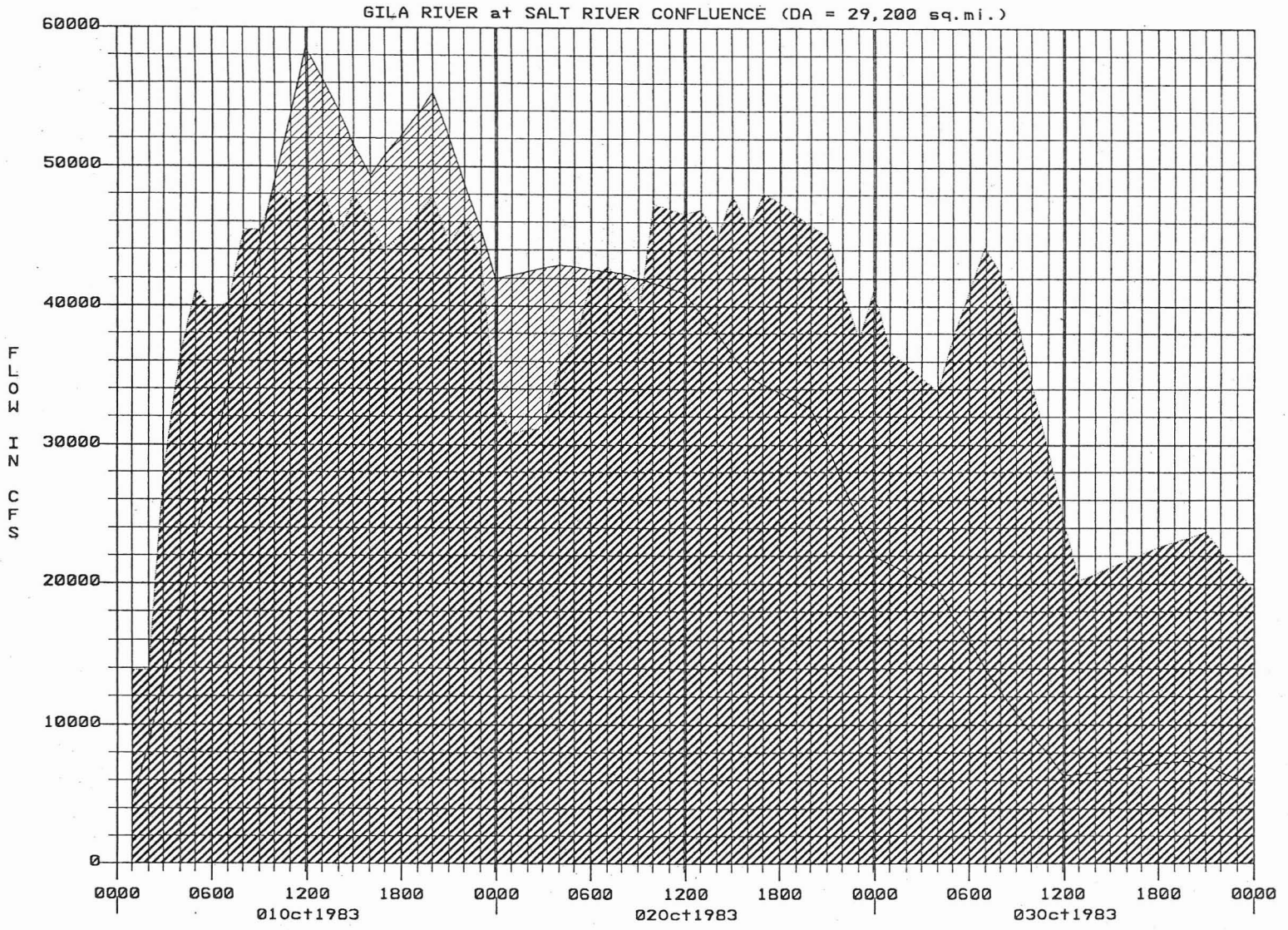
EXHIBIT A-31



ABOVE SALT R. 4-60CT1983 (PATTERN) FLOW
ABOVE SALT R. 4-60CT1983 FLOW

EXHIBIT A-32

21NOV02 00:50
POR_GR. JSS



ABOVE SALT R. 4-6OCT1983 (PATTERN) FLOW
ABOVE SALT R. 20-22JAN1993 FLOW

EXHIBIT A-33

GILA RIVER BELOW GILLESPIE DAM, 1921 - 1931, AVERAGE DAILY FLOWS CORRELATED WITH GILA RIVER ABOVE SALT RIVER

Month/ Day	GRbIGl 1921	GRabS Computed 1-Day Q	GRbIGl 1922	GRabS Computed 1-Day Q	GRbIGl 1923	GRabS Computed 1-Day Q	GRbIGl 1924	GRabS Computed 1-Day Q	GRbIGl 1925	GRabS Computed 1-Day Q	GRbIGl 1926	GRabS Computed 1-Day Q	GRbIGl 1927	GRabS Computed 1-Day Q	GRbIGl 1928	GRabS Computed 1-Day Q	GRbIGl 1929	GRabS Computed 1-Day Q	GRbIGl 1930	GRabS Computed 1-Day Q	GRbIGl 1931	GRabS Computed 1-Day Q
1-Jan		NR	1360	1499	260	908	23600	7713	400	1035	120	719	1550	1560	150	769	170	799	0	0	0	0
2-Jan		NR	1360	1499	260	908	15500	5379	340	985	120	719	1500	1544	269	918	150	769	0	0	0	0
3-Jan		NR	9440	3632	260	908	10500	3938	315	963	135	745	1400	1512	235	881	150	769	0	0	2	208
4-Jan		NR	32700	10336	260	908	9060	3523	315	963	195	833	1080	1398	170	799	130	736	0	0	0	0
5-Jan		NR	10200	3851	260	908	4350	2165	370	1011	240	887	1000	1366	130	736	110	700	0	0	4	257
6-Jan		NR	7520	3079	260	908	4350	2165	370	1011	480	1080	960	1349	90	659	75	623	0	0	0	0
7-Jan		NR	5150	2396	260	908	3870	2058	340	985	370	1011	1000	1366	75	623	75	623	0	0	0	0
8-Jan		NR	4000	2064	215	858	3260	1953	315	963	370	1011	960	1349	75	623	60	583	0	0	0	0
9-Jan		NR	2970	1899	215	858	2550	1813	290	939	340	985	840	1296	90	659	60	583	0	0	0	0
10-Jan		NR	2440	1789	215	858	2450	1792	265	914	315	963	840	1296	75	623	45	534	0	0	0	0
11-Jan		NR	2000	1685	215	858	1930	1667	240	887	315	963	765	1259	60	583	45	534	12	358	0	0
12-Jan		NR	2000	1685	215	858	1750	1618	340	985	290	939	765	1259	45	534	45	534	142	756	0	0
13-Jan		NR	2000	1685	215	858	1570	1568	400	1035	290	939	590	1164	18	405	25	447	246	893	0	0
14-Jan		NR	1140	1421	215	858	1570	1566	400	1035	265	914	500	1107	0	0	139	751	385	1023	0	0
15-Jan		NR	1140	1421	215	858	1390	1509	400	1035	240	887	440	1065	34	491	19	411	310	958	0	0
16-Jan		NR	1140	1421	215	858	1570	1566	400	1035	215	858	410	1043	130	736	0	0	170	799	4	257
17-Jan		NR	780	1267	215	858	1300	1479	400	1035	215	858	360	1002	60	583	75	623	150	769	1	169
18-Jan		NR	780	1267	215	858	1100	1406	340	985	240	887	260	908	30	472	130	736	170	799	0	0
19-Jan		NR	780	1267	215	858	1100	1406	340	985	215	858	260	908	30	472	150	769	170	799	0	0
20-Jan		NR	700	1226	215	858	1020	1374	400	1035	195	833	235	881	30	472	130	736	150	769	0	0
21-Jan		NR	700	1226	215	858	1020	1374	400	1035	175	806	235	881	45	534	150	769	310	958	0	0
22-Jan		NR	620	1182	215	858	1020	1374	400	1035	175	806	210	851	60	583	150	769	252	900	0	0
23-Jan		NR	620	1182	215	858	1020	1374	370	1011	175	806	235	881	90	659	150	769	170	799	0	0
24-Jan		NR	620	1182	215	858	1020	1374	370	1011	155	777	210	851	30	472	150	769	130	736	0	0
25-Jan		NR	620	1182	215	858	940	1340	315	963	175	806	170	799	45	534	150	769	90	659	0	0
26-Jan		NR	545	1136	215	858	940	1340	215	858	155	777	110	700	60	583	130	736	90	659	0	0
27-Jan		NR	545	1136	260	908	715	1234	155	777	135	745	75	623	75	623	150	769	75	623	0	0
28-Jan		NR	545	1136	260	908	715	1234	120	719	120	719	60	583	60	583	150	769	60	583	0	0
29-Jan		NR	475	1090	215	858	715	1234	90	659	120	719	60	583	69	608	110	700	45	534	0	0
30-Jan		NR	475	1090	215	858	645	1196	105	690	135	745	60	583	145	761	75	623	30	472	0	0
31-Jan		NR	780	1267	215	858	645	1196	105	690	120	719	75	623	60	583	60	583	15	383	0	0
1-Feb		NR	4590	2234	260	908	575	1155	105	690	155	777	60	583	15	383	30	472	0	0	0	0
2-Feb		NR	4000	2064	260	908	575	1155	120	719	155	777	40	515	15	383	17	398	0	0	0	0
3-Feb		NR	2670	1839	260	908	575	1155	120	719	135	745	30	472	15	383	150	769	0	0	0	0
4-Feb		NR	1560	1563	260	908	505	1111	120	719	120	719	30	472	10	339	130	736	0	0	0	0
5-Feb		NR	1140	1421	475	1090	505	1111	120	719	120	719	30	472	75	623	53	561	0	0	135	745
6-Feb		NR	780	1267	620	1182	440	1065	120	719	120	719	66	600	7270	3007	0	0	0	0	207	848
7-Feb		NR	780	1267	620	1182	440	1065	135	745	105	690	126	729	4220	2128	0	0	0	0	158	781
8-Feb		NR	780	1267	545	1136	440	1065	155	777	120	719	20	418	2250	1746	0	0	0	0	123	724
9-Feb		NR	780	1267	260	908	440	1065	195	833	81	638	3	235	1550	1560	0	0	0	0	26	452
10-Feb		NR	1140	1421	315	963	440	1065	175	806	45	534	4	257	1200	1443	34	491	0	0	60	583
11-Feb		NR	5150	2396	315	963	440	1065	195	833	45	534	49	548	960	1349	75	623	0	0	20	418
12-Feb		NR	10900	4053	315	963	440	1065	195	833	53	561	170	799	800	1277	75	623	0	0	76	626
13-Feb		NR	7900	3188	545	1136	440	1065	195	833	60	583	285	934	765	1259	30	472	0	0	914	1329
14-Feb		NR	5150	2396	545	1136	505	1111	195	833	90	659	730	1242	660	1204	0	0	0	0	7850	3174
15-Feb		NR	3480	1992	475	1090	380	1019	175	806	105	690	7410	3047	560	1146	0	0	0	0	13600	4831
16-Feb		NR	2440	1789	405	1039	380	1019	175	806	75	623	23700	7742	590	1164	0	0	0	0	16500	5667
17-Feb		NR	1560	1563	405	1039	380	1019	155	777	75	623	51200	15667	660	1204	0	0	0	0	13800	4889
18-Feb		NR	1140	1421	405	1039	380	1019	155	777	60	583	60000	18203	730	1242	0	0	0	0	6360	2744
19-Feb		NR	1140	1421	405	1039	380	1019	155	777	45	534	38700	12065	695	1223	0	0	0	0	3330	1966
20-Feb		NR	780	1267	620	1182	290	939	120	719	35	495	20200	6733	660	1204	0	0	0	0	1860	1648
21-Feb		NR	1560	1563	620	1182	290	939	105	690	33	486	10900	4053	500	1107	0	0	0	0	1320	1486
22-Feb		NR	2440	1789	405	1039	290	939	120	719	32	482	7780	3154	335	981	0	0	0	0	1010	1370
23-Feb		NR	4000	2064	315	963	290	939	120	719	15	383	6440	2767	235	881	0	0	0	0	856	1303
24-Feb		NR	3480	1992	315	963	190	826	135	745	36	499	5970	2632	210	851	0	0	0	0	840	1296
25-Feb		NR	2440	1789	315	963	190	826	120	719	35	495	5460	2485	170	799	20	418	0	0	625	1185
26-Feb		NR	2000	1685	475	1090	190	826	105	690	20	418	5060	2370	150	769	8	317	0	0	500	1107
27-Feb		NR	1780	1626	545	1136	190	826	105	690	37	503	4200	2122	150	769	0	0	69	0	385	1023
28-Feb		NR	1560	1563	545	1136	190	826	120	719	45	534	4770	2286	110	700	0	0	31	477	360	1002
							50	551							75	623						
1-Mar		NR	1140	1421	475	1090	440	1065	105	690	45	534	4490	2205	45	534	0	0	38	507	335	981
2-Mar		NR	955	1347	475	1090	440	1065	105	690	45	534	4430	2188	4	257	0	0	130	736	260	908
3-Mar		NR	780	1267	315	963	440	1065	90	659	32	482	2900	1885	20	418	0	0	150	769	235	881
4-Mar		NR	780	1267	315	963	440	1065	90	659	27	458	2290	1755	45	534	0	0	45	534	190	826
5-Mar		NR	780	1267	2220	1739	190	826	60	583	36	499	2000	1685	110	700	0	0	5	275	130	736
6-Mar		NR	780	1267	3480	1992	50	551	25	447	32	482	2000	1685	170	799	0	0	0	0	110	700
7-Mar		NR	780	1267	955	1347	50	551	25	447	62	588	1700	1604	170	799	0	0	0	0	90	659
8-Mar		NR	780	1267	1040	1382	50	551	45	534	70	610	1320	1486	130	736	0	0	0	0	90	659
9-Mar		NR	620	1182	955	1347	50	551	155	777	60	583	1000	1366	30	472	0	0	0	0	75	623
10-Mar		NR	620	1182	865	1307	50	551	90	659	60	583	840	1296	0	0	0	0	0	0	45	534
11-Mar		NR	475	1090	865	1307	50	551	75	623	60	583	695	1223	0	0	0	0	0	0	45	534
12-Mar		NR	475	1090	1560	1563	50	551	45	534	35	495	2780	1861	0	0	0	0	48	538	30	472
13-Mar		NR	475	1090	1450	1528	50	551	45	534	32	482	3700	2030	0	0	630	1187	90	659	15	383
14-Mar		NR	475	1090	1140	1421	50	551	45	534	1	169	2950	1895	0	0	448	1071	60	583	2	208
15-Mar		NR	475	1090	1040	1382	50	551	45	534	0	0	2250	1746	0	0	143	758	0	0	0	0
16-Mar		NR	620	1182	865	1307	50	551	90	659	0	0	2350	1769	0	0	60	583	32	482	0	0
17-Mar		NR	21800	7194	780	1267	50	551	60	583	0	0	2700	1845	0	0	45	534	285	934	0	0
18-Mar		NR	9770	3727	700	1226	50	551	45	534	0	0	1550	1560	0	0	45	534	824	1288	52	558
19-Mar		NR	9440	3632	620	1182	50	551	45	534	0	0	1040	1382	119	717	4	257	2700	1845	150	769
20-Mar		NR	9440	3632	475	1090	50	551	45	534	0	0	695	1223	11	349	0	0	1950	1672	89	657
21-Mar		NR	6340	2739	315	963	50	551	35	495	0	0	560	1146	0	0	0	0	746	1250	90	659
22-Mar		NR	5150	2396	315	963	50	551	45	534	0	0	500	1107	0	0	0	0	385	1023	84	594
23-Mar		NR	4590	2234	315	963	50	551	75	623	0	0	410	1043	0	0	0	0	260	908	0	0
24-Mar		NR	4590	2234	315	963	50	551	45	534	0	0	335	981	0	0	0	0	588	1163	0	0
25-Mar		NR	4000	2078	260	908	50	551	35	495	0	0	260	908	0	0	0	0	931	1337	0	0
26-Mar		NR	4590	2234	215	858	50	551	25	447	0	0	210	851	0	0	0	0	321	968	0	0
27-Mar		NR	5150	2396	170	799	50	551	35	495	0	0	206	846	0	0	0	0	116	711	0	0
28-Mar		NR	4590	2234	80	636	50	551	35	495	0	0	274	923	0	0	0	0	30	472	0	0
29-Mar		NR	4590	2234	80	636	95	670	35	495	106	692	75	623	0	0	0	0	0	0	0	0
30-Mar		NR	2970	1899	80	636	190	826	60	583	1000	1366	45	534	0	0	0	0	0	0	0	0
31-Mar		NR	2000	1685	0	0	190	826	45	534	2030	1692	30	472	0	0	0	0	0	0	0	0

GILA RIVER BELOW GILLESPIE DAM, 1932 - 1940, AVERAGE DAILY FLOWS CORRELATED WITH GILA RIVER ABOVE SALT RIVER

Month/ Day	GRblGl 1932	GRabS Computed 1-Day Q	GRblGl 1933	GRabS Computed 1-Day Q	GRblGl 1934	GRabS Computed 1-Day Q	GRblGl 1935	GRabS Computed 1-Day Q	GRblGl 1936	GRabS Computed 1-Day Q	GRblGl 1937	GRabS Computed 1-Day Q	GRblGl 1938	GRabS Computed 1-Day Q	GRblGl 1939	GRabS Computed 1-Day Q	GRblGl 1940	GRabS Computed 1-Day Q
1-Jan	600	1170	170	799	0	0	350	994	40	515	696	1224	0	0	0	0	0	0
2-Jan	450	1072	90	659	0	0	80	636	69	608	654	1201	0	0	0	0	0	0
3-Jan	245	892	90	659	0	0	39	511	40	515	344	989	0	0	0	0	0	0
4-Jan	195	833	75	623	0	0	12	358	29	468	215	858	0	0	0	0	0	0
5-Jan	150	769	60	583	0	0	12	358	29	468	135	745	0	0	0	0	0	0
6-Jan	90	659	45	534	0	0	172	802	40	515	100	680	0	0	0	0	0	0
7-Jan	75	623	60	583	0	0	229	874	40	515	199	838	0	0	52	558	0	0
8-Jan	75	623	45	534	0	0	110	700	40	515	265	914	0	0	0	0	0	0
9-Jan	75	623	15	383	0	0	470	1087	29	468	320	967	0	0	0	0	0	0
10-Jan	60	583	10	339	0	0	168	796	53	561	599	1169	0	0	0	0	0	0
11-Jan	60	583	0	0	0	0	120	719	53	561	331	977	0	0	0	0	0	0
12-Jan	41	519	0	0	0	0	200	839	20	418	210	851	0	0	0	0	0	0
13-Jan	60	583	0	0	0	0	200	839	34	491	188	823	0	0	0	0	0	0
14-Jan	75	623	0	0	0	0	394	1030	87	652	188	823	7	304	0	0	0	0
15-Jan	60	583	0	0	0	0	756	1255	87	652	154	775	0	0	0	0	0	0
16-Jan	60	583	0	0	0	0	260	908	46	538	130	736	0	0	0	0	0	0
17-Jan	75	623	13	367	0	0	200	839	1	169	121	721	0	0	0	0	0	0
18-Jan	60	583	60	583	0	0	547	1138	0	0	117	713	0	0	0	0	0	0
19-Jan	45	534	90	659	0	0	980	1357	0	0	105	690	0	0	0	0	0	0
20-Jan	35	495	90	659	0	0	459	1079	0	0	103	686	0	0	0	0	0	0
21-Jan	14	375	212	854	0	0	283	932	0	0	107	694	0	0	0	0	0	0
22-Jan	10	339	820	1286	0	0	174	804	0	0	107	694	0	0	0	0	0	0
23-Jan	7	304	464	1082	0	0	140	753	0	0	118	715	0	0	0	0	0	0
24-Jan	11	349	295	944	0	0	120	719	0	0	122	722	100	680	0	0	0	0
25-Jan	45	534	220	864	0	0	100	680	0	0	123	724	120	719	0	0	0	0
26-Jan	35	495	170	799	0	0	80	636	2	208	100	680	0	0	0	0	0	0
27-Jan	35	495	150	769	0	0	65	597	3	235	102	684	0	0	0	0	0	0
28-Jan	26	452	150	769	0	0	50	551	3	235	108	696	0	0	0	0	0	0
29-Jan	50	551	130	736	0	0	65	597	28	463	62	588	0	0	0	0	0	0
30-Jan	75	623	130	736	0	0	65	597	87	652	31	477	0	0	0	0	0	0
31-Jan	60	583	170	799	0	0	50	551	87	652	39	511	0	0	0	0	0	0
1-Feb	60	583	379	1018	0	0	3	235	106	692	53	561	0	0	0	0	0	0
2-Feb	38	507	345	990	0	0	0	0	87	652	23	436	0	0	0	0	0	0
3-Feb	7	304	220	864	0	0	0	0	53	561	20	418	0	0	0	0	0	0
4-Feb	18	405	150	769	0	0	0	0	53	561	20	418	0	0	0	0	0	0
5-Feb	12	358	150	769	0	0	3	235	55	568	20	418	0	0	0	0	0	0
6-Feb	0	0	150	769	0	0	100	680	116	711	20	418	0	0	0	0	0	0
7-Feb	0	0	150	769	0	0	145	761	126	729	195	833	0	0	0	0	0	0
8-Feb	0	0	90	659	0	0	734	1244	106	692	2170	1727	0	0	0	0	0	0
9-Feb	0	0	90	659	0	0	4500	2208	53	561	24500	7972	0	0	0	0	0	0
10-Feb	5020	2358	75	623	0	0	6280	2721	53	561	23700	7742	0	0	0	0	0	0
11-Feb	30400	9673	75	623	0	0	4300	2151	40	515	10100	3822	0	0	0	0	0	0
12-Feb	32400	10249	75	623	0	0	2160	1724	53	561	4650	2223	0	0	0	0	0	0
13-Feb	15300	5321	75	623	0	0	1310	1482	78	631	1960	1674	0	0	0	0	0	0
14-Feb	6020	2646	60	583	0	0	898	1322	69	608	1160	1429	0	0	0	0	0	0
15-Feb	5080	2376	35	495	0	0	630	1187	78	631	1060	1390	0	0	0	0	0	0
16-Feb	4940	2335	35	495	0	0	851	1301	126	729	1580	1569	0	0	0	0	0	0
17-Feb	4710	2269	15	383	0	0	2020	1690	211	853	14400	5062	0	0	0	0	0	0
18-Feb	3950	2070	15	383	0	0	1180	1436	513	1116	12200	4428	0	0	0	0	0	0
19-Feb	6390	2753	15	383	0	0	660	1204	394	1030	7720	3136	0	0	0	0	0	0
20-Feb	8910	3479	10	339	0	0	375	1015	305	953	4840	2306	0	0	0	0	0	0
21-Feb	7230	2995	5	275	0	0	275	924	234	880	3300	1961	0	0	0	0	0	0
22-Feb	5090	2378	10	339	0	0	226	869	189	825	2530	1809	0	0	0	0	0	0
23-Feb	4120	2099	10	339	0	0	182	815	148	763	1530	1553	0	0	0	0	0	0
24-Feb	3530	2001	10	339	0	0	140	753	148	763	955	1347	0	0	0	0	0	0
25-Feb	3200	1942	15	383	0	0	120	719	126	729	571	1153	0	0	0	0	0	0
26-Feb	2490	1800	45	534	0	0	120	719	386	1024	332	978	0	0	0	0	0	0
27-Feb	2490	1800	35	495	0	0	120	719	1220	1451	439	1064	0	0	0	0	0	0
28-Feb	2720	1849	25	447	0	0	100	680	274	923	440	1065	0	0	0	0	0	0
	3160	1935							126	729							0	0
1-Mar	3750	2038	15	383	0	0	100	680	126	729	411	1043	0	0	0	0	0	0
2-Mar	4210	2125	15	383	0	0	100	680	87	652	314	962	16	390	0	0	0	0
3-Mar	6380	2750	5	275	0	0	180	813	69	608	266	915	1640	1587	0	0	0	0
4-Mar	5240	2422	0	0	0	0	160	784	40	515	203	843	3950	2070	0	0	0	0
5-Mar	3480	1992	0	0	5	275	781	1267	29	468	203	843	35800	11229	0	0	0	0
6-Mar	2180	1729	8	317	12	358	1840	1643	9	328	125	728	28000	8981	0	0	0	0
7-Mar	1410	1516	0	0	0	0	1110	1410	0	0	107	694	10300	3880	0	0	0	0
8-Mar	960	1349	0	0	0	0	482	1095	0	0	91	661	4580	2231	0	0	0	0
9-Mar	690	1221	0	0	0	0	229	874	0	0	91	661	2740	1853	0	0	0	0
10-Mar	1060	1390	0	0	0	0	217	860	0	0	78	631	1510	1547	0	0	0	0
11-Mar	1800	1632	0	0	0	0	200	839	0	0	46	538	916	1330	0	0	0	0
12-Mar	1640	1587	0	0	0	0	288	937	0	0	52	558	619	1181	0	0	0	0
13-Mar	1260	1465	0	0	0	0	425	1054	0	0	140	753	455	1076	0	0	0	0
14-Mar	1020	1374	0	0	0	0	510	1114	0	0	503	1109	355	998	0	0	0	0
15-Mar	750	1252	0	0	0	0	480	1094	17	398	1760	1821	907	1326	0	0	0	0
16-Mar	510	1114	0	0	0	0	1090	1402	62	588	3290	1959	910	1327	0	0	52	558
17-Mar	345	990	0	0	0	0	3340	1968	0	0	2960	1897	480	1094	0	0	0	0
18-Mar	320	967	0	0	0	0	3260	1953	0	0	6500	2785	280	929	0	0	0	0
19-Mar	298	947	0	0	0	0	1520	1550	0	0	17600	5984	180	813	0	0	0	0
20-Mar	643	1195	0	0	0	0	810	1281	0	0	12600	4543	160	784	0	0	0	0
21-Mar	1290	1475	0	0	0	0	425	1054	0	0	7390	3041	120	719	0	0	0	0
22-Mar	2750	1855	0	0	0	0	300	949	0	0	4320	2156	80	636	0	0	0	0
23-Mar	1590	1572	0	0	0	0	225	869	0	0	2600	1824	80	636	0	0	0	0
24-Mar	799	1276	0	0	0	0	160	784	0	0	1620	1581	80	636	0	0	0	0
25-Mar	464	1082	0	0	0	0	120	719	0	0	1130	1417	50	551	0	0	0	0
26-Mar	270	919	0	0	0	0	100	680	0	0	880	1314	38	507	0	0	0	0
27-Mar	220	864	0	0	0	0	80	636	0	0	715	1234	80	636	0	0	0	0
28-Mar	579	1158	0	0	0	0	65	597	0	0	538	1132	100	680	0	0	0	0
29-Mar	630	1187	0	0	0	0	65	597	0	0	454	1075	38	507	0	0	0	0
30-Mar	345	990	0	0	0	0	65	597	0	0	337	983	28	463	0	0	0	0
31-Mar	195	833	0	0	0	0	50	551	0	0	311	959	20	418	0	0	0	0

GILA RIVER BELOW GILLESPIE DAM, 1921 - 1931, AVERAGE DAILY FLOWS CORRELATED WITH GILA RIVER ABOVE SALT RIVER

Month/ Day	GRbIGI 1921	GRabS Computed 1-Day Q	GRbIGI 1922	GRabS Computed 1-Day Q	GRbIGI 1923	GRabS Computed 1-Day Q	GRbIGI 1924	GRabS Computed 1-Day Q	GRbIGI 1925	GRabS Computed 1-Day Q	GRbIGI 1926	GRabS Computed 1-Day Q	GRbIGI 1927	GRabS Computed 1-Day Q	GRbIGI 1928	GRabS Computed 1-Day Q	GRbIGI 1929	GRabS Computed 1-Day Q	GRbIGI 1930	GRabS Computed 1-Day Q	GRbIGI 1931	GRabS Computed 1-Day Q
1-Apr		NR	2000	1685	0	0	190	826	35	495	3860	2059	0	0	0		0	0	0	0	0	0
2-Apr		NR	1360	1499	170	799	190	826	25	447	3140	1931	0	0	62	588	0	0	0	0	0	0
3-Apr		NR	1360	1499	215	858	290	939	25	447	2150	1722	0	0	0	0	0	0	0	0	0	0
4-Apr		NR	1360	1499	125	728	575	1155	25	447	1700	1604	0	0	0	0	0	0	0	0	0	0
5-Apr		NR	1140	1421	170	799	860	1305	35	495	1470	1535	0	0	0	0	0	0	0	0	0	0
6-Apr		NR	865	1307	125	728	785	1269	120	719	6690	2840	0	0	0	0	15900	5494	0	0	0	0
7-Apr		NR	955	1347	80	636	785	1269	60	583	20400	6791	0	0	0	0	8270	3295	0	0	0	0
8-Apr		NR	955	1347	0	0	1100	1406	35	495	25200	8174	0	0	0	0	2640	1833	0	0	0	0
9-Apr		NR	1040	1382	0	0	1020	1374	25	447	19200	6445	0	0	0	0	1320	1486	0	0	0	0
10-Apr		NR	780	1267	0	0	2750	1855	25	447	14400	5062	0	0	0	0	654	1201	0	0	0	0
11-Apr		NR	780	1267	0	0	2300	1758	25	447	14400	5062	0	0	0	0	410	1043	0	0	0	0
12-Apr		NR	780	1267	0	0	2020	1690	25	447	8470	3353	0	0	0	0	285	934	0	0	0	0
13-Apr		NR	620	1182	0	0	2110	1712	35	495	7000	2929	0	0	0	0	170	799	0	0	0	0
14-Apr		NR	475	1090	0	0	2110	1712	35	495	5840	2537	0	0	0	0	90	659	0	0	0	0
15-Apr		NR	405	1039	0	0	1930	1667	25	447	4300	2151	0	0	0	0	45	534	0	0	0	0
16-Apr		NR	215	858	0	0	1570	1566	25	447	3460	1989	9	328	0	0	9	328	0	0	0	0
17-Apr		NR	215	858	0	0	1300	1479	25	447	3000	1905	170	799	0	0	0	0	0	0	0	0
18-Apr		NR	215	858	0	0	1390	1509	25	447	2400	1780	282	931	0	0	0	0	0	0	0	0
19-Apr		NR	215	858	0	0	1220	1451	25	447	1950	1672	360	1002	0	0	0	0	0	0	0	0
20-Apr		NR	170	799	0	0	1020	1374	75	623	2200	1734	310	958	0	0	0	0	0	0	0	0
21-Apr		NR	170	799	0	0	1020	1374	45	534	3580	2010	260	908	0	0	0	0	0	0	0	0
22-Apr		NR	170	799	0	0	940	1340	60	583	3880	2059	92	663	0	0	0	0	0	0	0	0
23-Apr		NR	170	799	0	0	860	1305	60	583	2500	1803	28	463	0	0	0	0	0	0	0	0
24-Apr		NR	170	799	0	0	645	1196	35	495	1650	1589	0	0	0	0	0	0	0	0	0	0
25-Apr		NR	170	799	0	0	575	1155	60	583	1200	1443	0	0	0	0	0	0	0	0	0	0
26-Apr		NR	170	799	0	0	505	1111	60	583	920	1332	0	0	0	0	0	0	0	0	0	0
27-Apr		NR	125	728	0	0	190	826	60	583	730	1242	0	0	0	0	0	0	0	0	0	0
28-Apr		NR	125	728	0	0	140	753	25	447	530	1127	0	0	0	0	0	0	0	0	0	0
29-Apr		NR	125	728	0	0	95	670	25	447	494	1103	0	0	0	0	0	0	0	0	0	0
30-Apr		NR	125	728	0	0	50	551	35	495	494	1103	0	0	0	0	0	0	0	0	0	0
1-May		NR	125	728	0	0	50	551	25	447	500	1107	0	0	0	0	0	0	0	0	0	0
2-May		NR	125	728	0	0	50	551	25	447	560	1146	0	0	0	0	0	0	0	0	0	0
3-May		NR	215	858	0	0	50	551	60	583	851	1301	0	0	0	0	0	0	0	0	0	0
4-May		NR	215	858	0	0	50	551	120	719	880	1314	0	0	0	0	0	0	0	0	0	0
5-May		NR	215	858	0	0	50	551	45	534	800	1277	0	0	0	0	0	0	0	0	0	0
6-May		NR	170	799	0	0	50	551	12	358	695	1223	0	0	0	0	0	0	35	495	0	0
7-May		NR	170	799	0	0	50	551	0	0	680	1204	0	0	0	0	0	0	0	0	0	0
8-May		NR	170	799	0	0	50	551	8	317	645	1196	0	0	0	0	0	0	0	0	0	0
9-May		NR	170	799	0	0	50	551	35	495	560	1146	0	0	0	0	0	0	0	0	0	0
10-May		NR	125	728	0	0	50	551	35	495	590	1164	0	0	0	0	0	0	0	0	0	0
11-May		NR	170	799	0	0	50	551	35	495	590	1164	0	0	0	0	0	0	0	0	0	0
12-May		NR	215	858	0	0	50	551	35	495	573	1154	0	0	0	0	0	0	0	0	0	0
13-May		NR	170	799	0	0	50	551	35	495	540	1133	0	0	0	0	0	0	0	0	0	0
14-May		NR	170	799	0	0	50	551	35	495	560	1146	0	0	0	0	0	0	0	0	0	0
15-May		NR	315	963	0	0	50	551	45	534	470	1087	0	0	0	0	0	0	0	0	0	0
16-May		NR	315	963	0	0	50	551	45	534	385	1023	0	0	0	0	0	0	0	0	0	0
17-May		NR	215	858	0	0	50	551	35	495	310	958	0	0	0	0	0	0	0	0	0	0
18-May		NR	170	799	0	0	50	551	35	495	102	684	0	0	0	0	0	0	0	0	0	0
19-May		NR	125	728	0	0	50	551	35	495	0	0	0	0	0	0	0	0	0	0	0	0
20-May		NR	125	728	0	0	50	551	35	495	0	0	0	0	0	0	0	0	0	0	0	0
21-May		NR	125	728	0	0	0	0	25	447	0	0	0	0	0	0	0	0	0	0	0	0
22-May		NR	170	799	0	0	0	0	25	447	0	0	0	0	0	0	0	0	0	0	0	0
23-May		NR	125	728	0	0	0	0	25	447	0	0	0	0	0	0	0	0	0	0	0	0
24-May		NR	125	728	0	0	0	0	25	447	0	0	0	0	0	0	0	0	0	0	0	0
25-May		NR	125	728	0	0	0	0	25	447	0	0	0	0	0	0	0	0	0	0	0	0
26-May		NR	125	728	0	0	0	0	25	447	0	0	0	0	0	0	0	0	0	0	0	0
27-May		NR	125	728	0	0	0	0	25	447	0	0	0	0	0	0	0	0	0	0	0	0
28-May		NR	125	728	0	0	0	0	25	447	0	0	0	0	0	0	0	0	0	0	0	0
29-May		NR	100	680	0	0	0	0	25	447	0	0	0	0	0	0	0	0	0	0	0	0
30-May		NR	405	1039	0	0	0	0	35	495	0	0	0	0	0	0	0	0	0	0	0	0
31-May		NR	260	908	0	0	0	0	45	534	0	0	0	0	0	0	0	0	0	0	0	0
1-Jun		NR	260	908	0	0	0	0	45	534	0	0	0	0	0	0	0	0	0	0	0	0
2-Jun		NR	170	799	0	0	0	0	60	583	0	0	0	0	0	0	0	0	0	0	0	0
3-Jun		NR	125	728	0	0	0	0	60	583	0	0	0	0	0	0	0	0	0	0	0	0
4-Jun		NR	125	728	0	0	0	0	35	495	0	0	0	0	0	0	0	0	0	0	0	0
5-Jun		NR	125	728	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Jun		NR	125	728	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Jun		NR	125	728	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Jun		NR	125	728	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Jun		NR	125	728	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Jun		NR	80	636	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Jun		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

GILA RIVER BELOW GILLESPIE DAM, 1932 - 1940, AVERAGE DAILY FLOWS CORRELATED WITH GILA RIVER ABOVE SALT RIVER

Month/ Day	GRbIGl 1932	GRabS Computed 1-Day Q	GRbIGl 1933	GRabS Computed 1-Day Q	GRbIGl 1934	GRabS Computed 1-Day Q	GRbIGl 1935	GRabS Computed 1-Day Q	GRbIGl 1936	GRabS Computed 1-Day Q	GRbIGl 1937	GRabS Computed 1-Day Q	GRbIGl 1938	GRabS Computed 1-Day Q	GRbIGl 1939	GRabS Computed 1-Day Q	GRbIGl 1940	GRabS Computed 1-Day Q
1-Apr	130	736	0	0	0	0	50	551	0	0	239	885	14	375	0	0	0	0
2-Apr	75	623	0	0	0	0	37	503	0	0	172	802	20	418	0	0	0	0
3-Apr	60	583	0	0	0	0	37	503	0	0	172	802	14	375	0	0	0	0
4-Apr	60	583	0	0	0	0	18	405	0	0	172	802	9	328	0	0	0	0
5-Apr	25	447	0	0	0	0	12	358	0	0	387	1025	5	275	0	0	0	0
6-Apr	10	339	0	0	0	0	12	358	0	0	667	1208	0	0	0	0	0	0
7-Apr	0	0	0	0	0	0	8	317	0	0	436	1062	0	0	0	0	0	0
8-Apr	0	0	0	0	0	0	12	358	0	0	270	919	0	0	0	0	0	0
9-Apr	0	0	0	0	0	0	8	317	0	0	165	791	0	0	0	0	0	0
10-Apr	27	458	0	0	0	0	2	208	0	0	147	764	0	0	0	0	0	0
11-Apr	75	623	0	0	0	0	480	1094	0	0	120	719	0	0	0	0	0	0
12-Apr	15	383	0	0	0	0	834	1293	0	0	78	631	0	0	0	0	0	0
13-Apr	2	208	0	0	0	0	191	827	0	0	65	597	0	0	0	0	0	0
14-Apr	0	0	0	0	0	0	80	636	0	0	28	463	0	0	0	0	0	0
15-Apr	0	0	0	0	0	0	44	530	0	0	25	447	0	0	0	0	0	0
16-Apr	0	0	0	0	0	0	18	405	0	0	20	418	0	0	0	0	0	0
17-Apr	0	0	0	0	0	0	12	358	0	0	15	383	0	0	0	0	0	0
18-Apr	0	0	0	0	0	0	2	208	0	0	10	339	0	0	0	0	0	0
19-Apr	0	0	0	0	0	0	0	0	0	0	10	339	0	0	0	0	0	0
20-Apr	0	0	0	0	0	0	0	0	0	0	10	339	0	0	0	0	0	0
21-Apr	0	0	0	0	0	0	0	0	0	0	10	339	0	0	0	0	0	0
22-Apr	15	383	0	0	0	0	0	0	0	0	4	257	0	0	0	0	0	0
23-Apr	23	436	0	0	0	0	0	0	0	0	4	257	0	0	0	0	0	0
24-Apr	0	0	0	0	0	0	0	0	0	0	4	257	0	0	0	0	0	0
25-Apr	0	0	0	0	0	0	0	0	0	0	4	257	0	0	0	0	0	0
26-Apr	1	169	0	0	0	0	0	0	0	0	3	235	0	0	0	0	0	0
27-Apr	0	0	0	0	0	0	0	0	0	0	3	235	0	0	0	0	0	0
28-Apr	0	0	0	0	0	0	0	0	0	0	3	235	0	0	0	0	0	0
29-Apr	0	0	0	0	0	0	0	0	0	0	2	208	0	0	0	0	0	0
30-Apr	0	0	0	0	0	0	0	0	0	0	2	208	0	0	0	0	0	0
1-May	0	0	0	0	0	0	0	0	0	0	2	208	0	0	0	0	0	0
2-May	0	0	0	0	0	0	0	0	0	0	2	208	0	0	0	0	0	0
3-May	0	0	0	0	0	0	0	0	0	0	2	208	0	0	0	0	0	0
4-May	0	0	0	0	0	0	0	0	0	0	2	208	0	0	0	0	0	0
5-May	0	0	0	0	0	0	0	0	0	0	1	169	0	0	0	0	0	0
6-May	0	0	0	0	0	0	0	0	0	0	1	169	0	0	0	0	0	0
7-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-May	17	398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Jun	0	0	0	0	0	0	0	0	4	257	0	0	0	0	0	0	0	0
21-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Jun	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

GILA RIVER BELOW GILLESPIE DAM, 1921 - 1931, AVERAGE DAILY FLOWS CORRELATED WITH GILA RIVER ABOVE SALT RIVER

Month/ Day	GRbIGI 1921	GRabS Computed 1-Day Q	GRbIGI 1922	GRabS Computed 1-Day Q	GRbIGI 1923	GRabS Computed 1-Day Q	GRbIGI 1924	GRabS Computed 1-Day Q	GRbIGI 1925	GRabS Computed 1-Day Q	GRbIGI 1926	GRabS Computed 1-Day Q	GRbIGI 1927	GRabS Computed 1-Day Q	GRbIGI 1928	GRabS Computed 1-Day Q	GRbIGI 1929	GRabS Computed 1-Day Q	GRbIGI 1930	GRabS Computed 1-Day Q	GRbIGI 1931	GRabS Computed 1-Day Q
1-Jul		NR	315	963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Jul		NR	260	908	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Jul		NR	260	908	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-Jul		NR	260	908	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Jul		NR	315	963	0	0	0	0	0	0	0	0	28	463	0	0	0	0	0	0	0	0
6-Jul		NR	260	908	0	0	0	0	0	0	0	0	16	390	0	0	0	0	0	0	0	0
7-Jul		NR	215	858	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Jul		NR	215	858	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Jul		NR	215	858	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Jul		NR	260	908	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Jul		NR	215	858	0	0	0	0	0	0	0	0	122	722	0	0	0	0	0	0	0	0
12-Jul		NR	215	858	0	0	0	0	0	0	0	0	51	555	0	0	0	0	86	650	0	0
13-Jul		NR	260	908	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	290	0	0
14-Jul		NR	215	858	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Jul		NR	80	636	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Jul		NR	0	0	1220	1451	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Jul		NR	0	0	2000	1685	0	0	0	0	240	887	0	0	0	0	0	0	0	0	0	0
18-Jul		NR	0	0	780	1267	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jul		NR	475	1090	215	858	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Jul		NR	315	963	80	636	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Jul		NR	620	1182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Jul		NR	475	1090	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	339	0	0
23-Jul		NR	315	963	158	781	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Jul		NR	215	858	955	1347	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jul		NR	170	799	3480	1992	0	0	0	0	0	0	0	0	0	0	0	0	92	663	0	0
26-Jul		NR	260	908	1560	1563	0	0	0	0	0	0	0	0	0	0	0	0	50	551	0	0
27-Jul		NR	315	963	1140	1421	0	0	0	0	1800	1632	0	0	0	0	0	0	0	0	0	0
28-Jul		NR	315	963	475	1090	0	0	0	0	1540	1557	0	0	0	0	0	0	0	0	0	0
29-Jul		NR	315	963	315	963	0	0	0	0	440	1065	0	0	0	0	0	0	64	594	0	0
30-Jul		NR	215	858	170	799	0	0	0	0	322	969	0	0	0	0	0	0	93	665	0	0
31-Jul		NR	315	963	260	908	0	0	0	0	125	728	0	0	0	0	0	0	215	858	0	0
1-Aug		NR	405	1039	215	858	0	0	0	0	63	591	0	0	0	0	741	1247	81	638	0	0
2-Aug		NR	475	1090	125	728	0	0	0	0	41	519	0	0	0	0	258	906	0	0	0	0
3-Aug		NR	620	1182	215	858	0	0	0	0	0	0	0	0	1420	1519	351	995	0	0	0	0
4-Aug	4590	2234	620	1182	315	963	0	0	13	367	0	0	0	0	1310	1482	7	304	0	0	0	0
5-Aug	4590	2234	315	963	80	636	0	0	155	777	0	0	0	0	1240	1458	20	418	0	0	748	1250
6-Aug	4590	2234	315	963	80	636	0	0	0	0	0	0	0	0	500	1107	0	0	0	0	2660	1837
7-Aug	4590	2234	215	858	780	1267	0	0	60	583	158	778	0	0	210	851	0	0	0	0	1850	1645
8-Aug	4000	2064	215	858	11600	4255	0	0	60	583	43	527	0	0	36	499	0	0	1510	1547	983	1359
9-Aug	2970	1899	215	858	125	728	0	0	327	974	160	784	0	0	0	0	54	564	5030	2361	1510	1547
10-Aug	2970	1899	215	858	865	1307	0	0	495	1104	65	597	0	0	0	0	314	962	11100	4110	3380	1975
11-Aug	4590	2234	215	858	1140	1421	0	0	120	719	0	0	0	0	0	0	410	1043	2770	1859	4450	2194
12-Aug	4590	2234	215	858	4590	2234	0	0	4	257	0	0	0	0	0	0	372	1012	1400	1512	5780	2577
13-Aug	3480	1992	215	858	5430	2476	0	0	0	0	0	0	0	0	0	0	53	561	1160	1429	2610	1826
14-Aug	2000	1685	215	858	5150	2396	0	0	0	0	0	0	0	0	0	0	275	924	754	1254	1260	1465
15-Aug	1560	1563	215	858	5710	2557	0	0	0	0	0	0	0	0	0	0	200	839	489	1100	556	1143
16-Aug	2000	1685	215	858	5710	2557	0	0	0	0	0	0	0	0	0	0	28	463	376	1016	328	975
17-Aug	1560	1563	215	858	4320	2156	0	0	0	0	0	0	0	0	0	0	500	1107	234	880	260	908
18-Aug	2440	1789	215	858	5990	2638	0	0	0	0	0	0	0	0	0	0	1120	1413	208	849	190	826
19-Aug	1780	1626	215	858	5430	2476	0	0	0	0	0	0	0	0	0	0	398	1033	110	700	110	700
20-Aug	4590	2234	215	858	4320	2156	0	0	0	0	0	0	0	0	0	0	165	791	21	424	346	990
21-Aug	16400	5638	215	858	3740	2036	0	0	0	0	0	0	6	290	0	0	170	799	0	0	12	358
22-Aug	26800	8635	215	858	3480	1992	0	0	0	0	0	0	45	534	303	951	170	799	0	0	0	0
23-Aug	17300	5897	215	858	2970	1899	0	0	0	0	0	0	46	538	0	0	150	769	0	0	0	0
24-Aug	14800	5177	215	858	2000	1685	0	0	0	0	0	0	49	548	0	0	190	826	0	0	0	0
25-Aug	8200	3275	215	858	1780	1626	0	0	0	0	0	0	0	0	0	0	150	769	0	0	0	0
26-Aug	5150	2396	215	858	1780	1626	0	0	0	0	0	0	0	0	0	0	130	736	0	0	0	0
27-Aug	5710	2557	215	858	1780	1626	0	0	98	676	0	0	0	0	329	975	110	700	0	0	0	0
28-Aug	4590	2234	215	858	1780	1626	0	0	155	777	0	0	0	0	105	690	130	736	0	0	0	0
29-Aug	4000	2078	215	858	2000	1685	0	0	55	568	0	0	0	0	733	1243	110	700	0	0	0	0
30-Aug	3480	1992	215	858	2000	1685	0	0	195	833	0	0	0	0	1400	1512	110	700	0	0	0	0
31-Aug	2970	1899	215	858	1140	1421	0	0	315	963	0	0	71	613	635	1190	90	659	0	0	4730	2275
1-Sep	2000	1685	125	728	1140	1421	0	0	210	851	0	0	210	851	141	755	80	636	0	0	3500	1996
2-Sep	2000	1685	125	728	5150	2396	0	0	1360	1499	0	0	2	208	0	0	12	358	0	0	1120	1413
3-Sep	1780	1626	11600	4255	1560	1563	0	0	1110	1410	0	0	0	0	0	0	0	0	0	0	515	1117
4-Sep	2000	1685	2220	1739	1780	1626	0	0	3810	2048	0	0	0	0	0	0	0	0	0	0	285	934
5-Sep	2000	1685	780	1267	1360	1499	0	0	6720	2848	0	0	0	0	0	0	1810	1635	0	0	285	934
6-Sep	1780	1626	315	963	955	1347	0	0	8180	3269	0	0	0	0	0	0	2130	1717	0	0	190	826
7-Sep	1780	1626	315	963	475	1090	0	0	3520	1999	64	594	0	0	0	0	1360	1499	0	0	48	545
8-Sep	1140	1421	475	1090	215	858	0	0	1880	1653	381	1020	0	0	0	0	468	1085	89	657	0	0
9-Sep	955	1347	260	908	215	858	0	0	1060	1390	2420	1785	4	257	0	0	304	952	162	787	0	0
10-Sep	955	1347	260	908	2000	1685	0	0	635	1190	2700	1845	0	0	0	0	214	856	380	1019	0	0
11-Sep	780	1267	260	908	1140	1421	0	0	400	1035	2350	1769	0	0	0	0	199	838	246	893	0	0
12-Sep	620	1182	260	908	1140	1421	0	0	340	985	1320	1486	0	0	0	0	0	0	130	736	0	0
13-Sep	475	1090	260	908	780	1267	0	0	290	939	170	799	22100	7281	0	0	0	0	75	623	0	0
14-Sep	475	1090	260	908	2330	1765	0	0	155	777	335	981	11500	4226	0	0	0	0	75	623	0	0
15-Sep	475	1090	315	963	1560	1563	0	0	14	375	235	881	6120	2675	0	0	0	0	75	623	0	0
16-Sep	315	963	315	963	475	1090	0	0	0	0	170	799	3010	1907	0	0	0	0	75	623	0	0
17-Sep	315	963	215	858	215	858	0	0	96	672	75	623	1620	1581	0	0	0	0	45	534	0	0
18-Sep	315	963	125	728	215	858	0	0	7620	3108	0	0	1750	1618	0	0	0	0	45	534	0	0
19-Sep	315	963	80	636	12400	4485	0	0	10500	3938	0	0	1450	1528	0	0	0	0	15	383	0	0
20-Sep	215	858	80	636	13100	4687	0	0	12500	4514	0	0	1200	1443	0	0	0	0	0	0	0	0
21-Sep	215	858	80	636	5710	2557	0	0	9100	3534	0	0	1000	1366	0	0	0	0	0	0	333	979
22-Sep	215	858	315	963	2440	1789	0	0	2980	1901	0	0	840	1296	0	0	0	0	0	0	160	784
23-Sep	215	858	315	963	1560	1563	0	0	1920	1664	0	0	920	1332	0	0	0	0	0	0	8	317
24-Sep	215	858	315	963	955	1347	0	0	1420	1519	0	0	880	1314	0	0	13	367	0	0	0	0
25-Sep	215	858	315	963	865	1307	0	0	1060	1390	0	0	625	1185	0	0	869	1309	0	0	0	0
26-Sep	125	728	315	963	865	1307	0	0	840	1296	20	418	440	1065	0	0	2630	1830	0	0	0	0
27-Sep	125	728	315	963	475	1090	0	0	670	1210	4650	2252	293	942	0	0	742	1248	0	0	0	0
28-Sep	125	728	260	908	620	1182	0	0	600	1170	7800	3159	190	826	0	0	607	1174	0	0	0	0
29-Sep	125	728	260	908	475	1090	0	0	340	985	14100	4975	130	736	0	0	1320	1486	0	0	0	0
30-Sep	125	728	260	908	475	1090	0	0	215	858	21200	7021	75	623	0	0	632	1189	0	0	0	0

GILA RIVER BELOW GILLESPIE DAM, 1932 - 1940, AVERAGE DAILY FLOWS CORRELATED WITH GILA RIVER ABOVE SALT RIVER

Month/ Day	GRblGl 1932	GRabS Computed 1-Day Q	GRblGl 1933	GRabS Computed 1-Day Q	GRblGl 1934	GRabS Computed 1-Day Q	GRblGl 1935	GRabS Computed 1-Day Q	GRblGl 1936	GRabS Computed 1-Day Q	GRblGl 1937	GRabS Computed 1-Day Q	GRblGl 1938	GRabS Computed 1-Day Q	GRblGl 1939	GRabS Computed 1-Day Q	GRblGl 1940	GRabS Computed 1-Day Q
1-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Jul	0	0	0	0	0	0	0	0	162	787	0	0	0	0	0	0	0	0
27-Jul	0	0	0	0	0	0	0	0	450	1072	0	0	0	0	0	0	0	0
28-Jul	0	0	0	0	0	0	0	0	954	1346	0	0	0	0	0	0	0	0
29-Jul	0	0	0	0	0	0	0	0	2390	1778	0	0	0	0	0	0	0	0
30-Jul	0	0	0	0	0	0	0	0	798	1276	0	0	0	0	0	0	0	0
31-Jul	0	0	0	0	0	0	0	0	317	965	0	0	0	0	0	0	0	0
1-Aug	15	383	0	0	0	0	0	0	125	728	0	0	0	0	0	0	0	0
2-Aug	395	1031	0	0	0	0	0	0	126	729	0	0	0	0	0	0	0	0
3-Aug	110	700	0	0	0	0	0	0	19	411	0	0	0	0	0	0	0	0
4-Aug	2	208	0	0	0	0	0	0	127	731	0	0	0	0	0	0	0	0
5-Aug	0	0	0	0	0	0	0	0	75	623	0	0	0	0	10	339	0	0
6-Aug	0	0	0	0	52	558	0	0	0	0	0	0	0	0	337	983	0	0
7-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	430	0	0
8-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1880	1653	0	0
9-Aug	0	0	0	0	0	0	0	0	98	676	0	0	0	0	1990	1682	0	0
10-Aug	0	0	0	0	0	0	0	0	0	0	0	0	121	721	1880	1653	0	0
11-Aug	0	0	0	0	0	0	0	0	120	719	0	0	18	405	200	839	0	0
12-Aug	0	0	0	0	0	0	0	0	77	628	6	290	0	0	9	328	0	0
13-Aug	9	328	0	0	0	0	0	0	0	0	4	257	0	0	0	0	0	0
14-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Aug	0	0	0	0	0	0	20	418	0	0	0	0	0	0	0	0	0	0
17-Aug	0	0	0	0	0	0	15	383	0	0	0	0	0	0	0	0	490	1100
18-Aug	0	0	0	0	0	0	0	0	164	790	0	0	0	0	0	0	1540	1557
19-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1140	1421
20-Aug	0	0	0	0	0	0	0	0	210	851	0	0	0	0	0	0	0	0
21-Aug	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Aug	0	0	0	0	0	0	0	0	0	0	185	819	0	0	0	0	0	0
23-Aug	0	0	0	0	0	0	141	755	0	0	1050	1386	0	0	0	0	0	0
24-Aug	0	0	0	0	0	0	189	825	0	0	634	1190	0	0	0	0	0	0
25-Aug	0	0	0	0	0	0	694	1223	0	0	4	257	0	0	0	0	0	0
26-Aug	0	0	0	0	0	0	177	808	0	0	0	0	0	0	0	0	0	0
27-Aug	0	0	0	0	0	0	1200	1443	0	0	0	0	0	0	0	0	0	0
28-Aug	0	0	0	0	355	998	386	1024	23	436	0	0	0	0	0	0	0	0
29-Aug	0	0	0	0	612	1177	100	680	0	0	0	0	0	0	0	0	0	0
30-Aug	0	0	0	0	1810	1635	37	503	0	0	0	0	0	0	0	0	0	0
31-Aug	0	0	0	0	584	1161	864	1307	0	0	0	0	0	0	0	0	0	0
1-Sep	0	0	0	0	130	736	1400	1512	0	0	0	0	0	0	0	0	0	0
2-Sep	0	0	0	0	207	848	480	1094	0	0	0	0	0	0	0	0	0	0
3-Sep	0	0	0	0	150	769	1130	1417	0	0	0	0	0	0	0	0	0	0
4-Sep	0	0	0	0	43	527	1060	1390	0	0	0	0	0	0	300	949	0	0
5-Sep	0	0	0	0	1	169	350	994	0	0	0	0	0	0	1430	1522	0	0
6-Sep	0	0	0	0	0	0	275	924	0	0	0	0	0	0	1340	1492	0	0
7-Sep	0	0	0	0	0	0	140	753	0	0	0	0	0	0	1170	1432	0	0
8-Sep	0	0	0	0	0	0	26	452	0	0	0	0	0	0	610	1176	0	0
9-Sep	0	0	0	0	0	0	8	317	0	0	0	0	0	0	216	859	0	0
10-Sep	0	0	121	721	0	0	0	0	0	0	0	0	0	0	32	482	0	0
11-Sep	0	0	93	665	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Sep	0	0	18	405	0	0	0	0	0	0	0	0	0	0	1560	1563	0	0
13-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2720	1849	0	0
14-Sep	0	0	0	0	0	0	0	0	260	908	0	0	0	0	1000	1366	0	0
15-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	305	953	0	0
16-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	180	813	0	0
17-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	636	0	0
18-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	551	0	0
19-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Sep	0	0	0	0	0	0	5	275	0	0	0	0	0	0	0	0	0	0
27-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Sep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

GILA RIVER BELOW GILLESPIE DAM, 1921 - 1931, AVERAGE DAILY FLOWS CORRELATED WITH GILA RIVER ABOVE SALT RIVER

Month/ Day	GRblGl 1921	GRabS Computed 1-Day Q	GRblGl 1922	GRabS Computed 1 Day Q	GRblGl 1923	GRabS Computed 1-Day Q	GRblGl 1924	GRabS Computed 1-Day Q	GRblGl 1925	GRabS Computed 1-Day Q	GRblGl 1926	GRabS Computed 1-Day Q	GRblGl 1927	GRabS Computed 1-Day Q	GRblGl 1928	GRabS Computed 1-Day Q	GRblGl 1929	GRabS Computed 1-Day Q	GRblGl 1930	GRabS Computed 1-Day Q	GRblGl 1931	GRabS Computed 1-Day Q
1-Oct	2000	1685	315	963	215	858	0	0	105	690	3970	2073	27	458	0	0	254	902	0	0	0	0
2-Oct	5150	2396	260	908	170	799	0	0	60	583	2920	1889	0	0	0	0	45	534	0	0	0	0
3-Oct	2000	1685	260	908	0	0	0	0	35	495	2580	1820	0	0	0	0	0	0	0	0	480	1094
4-Oct	780	1267	260	908	0	0	0	0	28	463	1740	1615	0	0	0	0	0	0	0	0	873	1311
5-Oct	780	1267	260	908	0	0	0	0	570	1152	1220	1451	0	0	0	0	0	0	0	0	320	967
6-Oct	780	1267	260	908	0	0	0	0	4070	2084	920	1332	0	0	0	0	0	0	0	0	130	736
7-Oct	780	1267	260	908	0	0	0	0	821	1287	880	1314	0	0	0	0	0	0	0	0	82	588
8-Oct	780	1267	260	908	0	0	0	0	861	1305	765	1259	0	0	0	0	0	0	0	0	8	317
9-Oct	780	1267	260	908	0	0	0	0	1360	1499	660	1204	0	0	0	0	0	0	0	0	58	577
10-Oct	780	1267	260	908	0	0	0	0	840	1296	560	1146	0	0	0	0	0	0	0	0	0	0
11-Oct	475	1090	260	908	0	0	50	551	600	1170	635	1190	0	0	0	0	0	0	0	0	0	0
12-Oct	475	1090	315	963	0	0	95	670	460	1080	1280	1472	0	0	0	0	0	0	0	0	0	0
13-Oct	475	1090	260	908	0	0	95	670	370	1011	765	1259	0	0	0	0	0	0	0	0	0	0
14-Oct	475	1090	260	908	0	0	95	670	315	963	695	1223	0	0	0	0	0	0	0	0	0	0
15-Oct	475	1090	315	963	0	0	0	0	265	914	440	1065	0	0	0	0	0	0	0	0	0	0
16-Oct	475	1090	260	908	0	0	0	0	524	1123	385	1023	0	0	0	0	0	0	0	0	0	0
17-Oct	475	1090	260	908	0	0	0	0	495	1104	310	958	0	0	0	0	0	0	0	0	0	0
18-Oct	405	1039	260	908	0	0	0	0	460	1080	285	934	0	0	0	0	0	0	0	0	0	0
19-Oct	315	963	260	908	0	0	50	551	430	1058	170	799	0	0	0	0	0	0	0	0	0	0
20-Oct	215	858	260	908	0	0	30	472	430	1058	150	769	0	0	0	0	0	0	0	0	0	0
21-Oct	215	858	260	908	0	0	30	472	430	1058	90	659	0	0	0	0	0	0	0	0	0	0
22-Oct	315	963	260	908	0	0	30	472	370	1011	90	659	0	0	0	0	0	0	0	0	0	0
23-Oct	315	963	260	908	0	0	30	472	315	963	75	623	0	0	0	0	0	0	0	0	0	0
24-Oct	315	963	260	908	0	0	30	472	265	914	110	700	0	0	0	0	0	0	0	0	0	0
25-Oct	215	858	260	908	0	0	30	472	265	914	175	806	0	0	0	0	0	0	0	0	0	0
26-Oct	215	858	260	908	0	0	30	472	265	914	75	623	0	0	0	0	0	0	0	0	0	0
27-Oct	405	1039	260	908	0	0	30	472	240	887	45	534	0	0	0	0	0	0	0	0	0	0
28-Oct	405	1039	260	908	0	0	140	753	240	887	30	472	0	0	0	0	0	0	0	0	0	0
29-Oct	475	1090	315	963	0	0	140	753	215	858	4	257	0	0	0	0	0	0	0	0	0	0
30-Oct	475	1090	315	963	0	0	140	753	195	833	0	0	0	0	0	0	0	0	0	0	0	0
31-Oct	475	1090	315	963	0	0	140	753	175	806	0	0	0	0	0	0	0	0	0	0	0	0
1-Nov	475	1090	125	728	260	908	140	753	195	833	0	0	0	0	0	0	0	0	0	0	0	0
2-Nov	475	1090	125	728	315	963	140	753	240	887	70	610	0	0	0	0	0	0	0	0	0	0
3-Nov	475	1090	125	728	315	963	95	670	135	745	90	659	0	0	0	0	0	0	0	0	0	0
4-Nov	475	1090	125	728	620	1182	95	670	155	777	110	700	0	0	0	0	0	0	0	0	0	0
5-Nov	475	1090	170	799	780	1267	95	670	195	833	130	736	0	0	0	0	0	0	0	0	0	0
6-Nov	315	963	215	858	545	1136	95	670	175	806	110	700	0	0	0	0	0	0	0	0	0	0
7-Nov	315	963	260	908	780	1267	95	670	195	833	150	769	0	0	0	0	0	0	0	0	0	0
8-Nov	315	963	260	908	545	1136	95	670	195	833	210	851	0	0	0	0	0	0	0	0	0	0
9-Nov	315	963	170	799	780	1267	95	670	155	777	190	826	0	0	0	0	0	0	0	0	0	0
10-Nov	475	1090	215	858	620	1182	290	939	120	719	150	769	0	0	0	0	0	0	0	0	0	0
11-Nov	475	1090	260	908	6920	2906	155	777	120	719	190	826	0	0	0	0	0	0	0	0	0	0
12-Nov	475	1090	315	963	13100	4687	155	777	105	690	210	851	0	0	0	0	0	0	0	0	64	594
13-Nov	475	1090	405	1039	4870	2315	155	777	90	659	190	826	0	0	0	0	0	0	0	0	903	1324
14-Nov	475	1090	315	963	4320	2156	155	777	90	659	210	851	0	0	0	0	0	0	0	0	242	889
15-Nov	475	1090	315	963	5150	2396	175	806	90	659	235	881	0	0	0	0	0	0	0	0	75	623
16-Nov	475	1090	315	963	2670	1839	195	833	105	690	130	736	0	0	0	0	0	0	0	0	45	534
17-Nov	475	1090	215	858	2330	1765	215	858	105	690	110	700	0	0	0	0	0	0	0	0	35	495
18-Nov	475	1090	215	858	2000	1685	240	887	90	659	110	700	0	0	0	0	0	0	40	515	35	495
19-Nov	475	1090	260	908	2000	1685	215	858	90	659	90	659	0	0	0	0	0	0	0	0	25	447
20-Nov	475	1090	260	908	1780	1626	215	858	75	623	110	700	0	0	0	0	0	0	0	0	8	317
21-Nov	475	1090	260	908	1670	1595	195	833	75	623	90	659	0	0	0	0	0	0	335	981	19	411
22-Nov	475	1090	215	858	1560	1563	215	858	75	623	90	659	0	0	0	0	0	0	112	704	117	713
23-Nov	475	1090	215	858	1450	1528	215	858	90	659	90	659	0	0	0	0	0	0	41	519	818	1285
24-Nov	475	1090	215	858	1360	1499	265	914	90	659	75	623	0	0	0	0	0	0	36	499	1290	1475
25-Nov	475	1090	215	858	1140	1421	290	939	90	659	75	623	0	0	0	0	0	0	0	0	860	1305
26-Nov	545	1136	215	858	1040	1382	290	939	105	690	75	623	0	0	0	0	0	0	0	0	480	1094
27-Nov	545	1136	215	858	1140	1421	315	963	105	690	75	623	0	0	0	0	0	0	0	0	252	900
28-Nov	545	1136	260	908	1040	1382	370	1011	90	659	90	659	0	0	0	0	0	0	0	0	170	799
29-Nov	545	1136	260	908	1040	1382	400	1035	90	659	150	769	0	0	0	0	0	0	0	0	130	736
30-Nov	620	1182	405	1039	955	1347	430	1058	105	690	110	700	0	0	0	0	0	0	0	0	110	700
1-Dec	620	1182	545	1136	1040	1382	460	1080	105	690	90	659	0	0	0	0	0	0	0	0	110	700
2-Dec	620	1182	780	1267	1040	1382	370	1011	120	719	90	659	0	0	0	0	0	0	0	0	90	659
3-Dec	545	1136	1140	1421	1040	1382	265	914	175	806	90	659	0	0	0	0	0	0	0	0	75	623
4-Dec	545	1136	1140	1421	1040	1382	215	858	910	1327	130	736	0	0	0	0	0	0	0	0	60	583
5-Dec	475	1090	1140	1421	1040	1382	215	858	1150	1425	285	934	0	0	0	0	0	0	0	0	35	495
6-Dec	475	1090	700	1226	1040	1382	240	887	720	1236	440	1065	0	0	0	0	0	0	0	0	45	534
7-Dec	475	1090	1140	1421	1040	1382	315	963	430	1058	3240	1950	0	0	0	0	0	0	0	0	75	623
8-Dec	475	1090	0	0	1140	1421	315	963	315	963	5060	2370	0	0	0	0	0	0	0	0	60	583
9-Dec	475	1090	955	1347	1040	1382	340	985	290	939	1650	1589	0	0	0	0	0	0	0	0	75	623
10-Dec	475	1090	780	1267	1040	1382	340	985	215	858	1240	1458	0	0	0	0	0	0	0	0	150	769
11-Dec	475	1090	620	1182	1040	1382	340	985	155	777	1200	1443	0	0	0	0	0	0	0	0	1970	1677
12-Dec	475	1090	620	1182	1360	1499	315	963	135	745	1000	1366	42	523	0	0	0	0	0	0	2310	1760
13-Dec	475	1090	620	1182	1140	1421	315	963	135	745	960	1349	190	826	0	0	0	0	0	0	1180	1436
14-Dec	475	1090	780	1267	1140	1421	315	963	135	745	1260	1465	150	769	0	0	0	0	0	0	720	1236
15-Dec	475	1090	1140	1421	1140	1421	315	963	105	690	2350	1769	130	736	0	0	0	0	0	0	540	1133
16-Dec	475	1090	6920	2906	1140	1421	315	963	90	659	2200	1734	130	736	0	0	0	0	0	0	420	1050
17-Dec	405	1039	2970	1899	1140	1421	315	963	90	659	1850	1645	130	736	0	0	0	0	0	0	266	915
18-Dec	405	1039	2440	1789	1140	1421	290	939	90	659	1550	1560	130	736	0	0	0	0	0	0	220	864
19-Dec	405	1039	2000	1685	1140	1421	495	1104	90	659	1360	1499	150	769	0	0	0	0	0	0	195	833
20-Dec	475	1090	1140	1421	1040	1382	530	1127	75	623	1360	1499	110	700	0	0	0	0	0	0	170	799
21-Dec	475	1090	1140	1421	1140	1421	460	1080	90	659	1400	1512	110	700	0	0	0	0	0	0	170	799
22-Dec	475	1090	1040	1382	1670	1595	460	1080	109	698	1360	1499	90	659	0	0	0	0	4	257	208	849
23-Dec	620	1182	1040	1382	1780	1626	430	1058	155	777	1280	1472	90	659	0	0	0	0	0	0	270	919
24-Dec	955	1347	780	1267	1670	1595	460	1080	155	777	1500	1544	75	623	0	0	0	0	0	0	320	967
25-Dec	955	1347	700	1226	1780	1626	460	1080	175	806	1800	1632	75	623	0	0	0	0	0	0	425	1054
26-Dec	780	1267	620	1182	1780	1626	495	1104	195	833	1550	1560	90	659	131	738	0	0	0	0	510	1114
27-Dec	1140	1421	620	1182	13100	4687	495	1104	175	806	1500	1544	130	736	150	769	0	0	0	0	450	1072
28-Dec	9770	3727	545	1136	70000	21085	495	1104	195	833	1360	1499	150	769	170	799	0	0	0	0	320	967
29-Dec	13900	4917	405	1039	23600	7713	495	1104	120	719	1550	1560	150	769	170	799	0	0	0	0	220	864
30-Dec	6340	2739	315	963	23600	7713	460	1080	90	659	1650	1589	150	769	190	826	0	0	0	0	150	769
31-Dec	3220	1946	260	908	19400	6503	430	1058	90	659	1600	1575	150	769	190	826	0	0	0	0	150	769

1421 Indicates daily flow rate (cfs) for Gila River above Salt River Confluence (GRabS) "estimated" from Gila River below Gillespie Dam (GRblGL) daily flow (cfs, refer to adjacent column).

NR Indicates no record available for GRblGL for date noted

GILA RIVER BELOW GILLESPIE DAM, 1932 - 1940, AVERAGE DAILY FLOWS CORRELATED WITH GILA RIVER ABOVE SALT RIVER

Month/ Day	GRblGl 1932	GRabS Computed 1-Day Q	GRblGl 1933	GRabS Computed 1-Day Q	GRblGl 1934	GRabS Computed 1-Day Q	GRblGl 1935	GRabS Computed 1-Day Q	GRblGl 1936	GRabS Computed 1-Day Q	GRblGl 1937	GRabS Computed 1-Day Q	GRblGl 1938	GRabS Computed 1-Day Q	GRblGl 1939	GRabS Computed 1-Day Q	GRblGl 1940	GRabS Computed 1-Day Q
1-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Oct	0	0	0	0	0	0	5	275	0	0	0	0	0	0	0	0	0	0
4-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Oct	726	1240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Oct	168	796	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Oct	48	545	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-Oct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Nov	0	0	0	0	0	0	0	0	21	424	0	0	0	0	0	0	0	0
4-Nov	0	0	0	0	0	0	0	0	53	561	0	0	0	0	0	0	0	0
5-Nov	0	0	0	0	0	0	0	0	1	169	0	0	0	0	0	0	0	0
6-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	537	1131
22-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	411	1043
23-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	166	793
24-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	600
25-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Nov	0	0	0	0	0	0	105	690	0	0	0	0	0	0	0	0	0	0
29-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Dec	0	0	100	680	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Dec	18	390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Dec	75	623	0	0	131	738	0	0	0	0	0	0	0	0	0	0	0	0
16-Dec	90	659	0	0	140	753	8	317	0	0	0	0	0	0	0	0	0	0
17-Dec	270	919	0	0	65	597	5	275	0	0	0	0	0	0	0	0	0	0
18-Dec	245	892	0	0	270	919	9	328	0	0	0	0	0	0	0	0	0	0
19-Dec	150	769	0	0	265	914	0	0	0	0	0	0	0	0	0	0	0	0
20-Dec	90	659	0	0	97	674	8	317	0	0	0	0	0	0	0	0	0	0
21-Dec	75	623	0	0	0	0	20	418	0	0	0	0	375	1015	0	0	0	0
22-Dec	90	659	0	0	0	0	29	468	0	0	0	0	180	813	0	0	0	0
23-Dec	90	659	0	0	0	0	13	367	0	0	0	0	120	719	0	0	0	0
24-Dec	90	659	0	0	0	0	29	468	0	0	0	0	120	719	0	0	0	0
25-Dec	90	659	0	0	0	0	53	561	0	0	0	0	120	719	0	0	200	839
26-Dec	75	623	0	0	0	0	69	608	0	0	0	0	100	680	0	0	300	949
27-Dec	174	804	0	0	0	0	40	515	0	0	0	0	100	680	0	0	700	1226
28-Dec	220	864	0	0	0	0	53	561	0	0	0	0	38	507	0	0	200	839
29-Dec	195	833	0	0	0	0	53	561	0	0	0	0	1	169	0	0	100	680
30-Dec	195	833	0	0	0	0	69	608	544	1136	0	0	0	0	0	0	100	680
31-Dec	195	833	0	0	140	753	40	515	571	1153	0	0	0	0	0	0	200	839

1421 Indicates daily flow rate (cfs) for Gila River above Salt River Confluence (GRabS) "estimated" from Gila River below Gillespie Dam (GRblGL) daily flow (cfs, refer to adjacent column).

NR Indicates no record available for GRblGL for date noted

APPENDIX B

Field Photographs and Logs

Photos Taken on August 8, 2002

Figure 1. Existing Mining Pit Downstream of 116th Ave. Bridge (looking west)

Figure 2. Existing Pond at 116th Ave. Bridge

Figure 3. Looking Downstream at 116th Ave. Bridge and Holy Acres Levee

Figure 4. Looking South at 116th Ave. Bridge

Figure 5. Looking South Upstream of 116th Ave. Bridge

Figure 6. Looking Southeast Upstream of 116th Ave. Bridge

Figure 7. Looking southwest at 116th Ave. Bridge

Figure 8. Looking West at 116th Ave. Bridge

APPENDIX C

Investigation of 1993 High Water Observations

Investigation of Local Reports of 1993 Water Surface Elevations
April 10, 2003

Background

During the interior drainage meeting held at the Corps' Phoenix office in December 2002, longtime local resident Adron Reichert reported that the water was within a 1.5' of the top of the Holly Acres Levee during the 1993 flood. This caused some concern among the Corps, the City of Phoenix, Flood Control and WEST personnel who were present since one of the initially recommended designs did not call for significantly increasing the height of the exiting Holly Acres Levee. Based on Mr. Reichert's comments Dr. Gary Freeman met Mr. Reichert in the field on January 6, 2003 to view the areas where the water was close to the top of the levee.

Field Inspection and Tour

Dr. Freeman met Mr. Reichert at the 116th Avenue Bridge and viewed areas that Adron noted as being high during the 1993 flood. An area above the 116th Avenue Bridge approximately midway between the bridge and the existing levee tieback was pointed out as being one of the areas of concern. After discussions with Mr. Reichert, it was further determined that the flood water would have flanked the upstream end of the levee if the flood control had not built an earthen berm from the end of the levee tie extending to the north until higher ground was reached. This was verified in conversations with Dick Perreault who corroborated that there was flooding immediately east of the Holly Acres levee and the tie back extension berm. Mr. Perreault confirmed that the berm was constructed by pushing up dirt from the adjacent agricultural fields during the rising limb of the flood and protected Holly Acres from flood damage during the 1993 flood. Available photos indicate that water just reached the base of the berm but no significant depth can be seen in the photos.

Mr. Reichert and Dr. Freeman also examined the levee downstream from 115th Avenue to 123rd Avenue. Mr. Reichert indicated that areas of concern were associated with the two spur dikes between 115th and 123rd Avenues. Mr. Reichert indicated, however, that as far as he remembered the tips of these dikes were not submerged during the 1993 flood although as he remembered the water as being very near the top of the intermediate portions of spur dikes. Based on available topography the tips of the dikes appear to be approximately 2 feet lower than the crest of the levee with areas closer to the bank being approximately 3 feet lower than the levee. Discussions with Mr. Perreault indicated that the spur dikes had been placed so as to prevent flow in a channel that was along the toe of the Holly Acres Levee prior to its construction. The spur dikes were to prevent high velocities from impinging directly on the toe of the levee. If no action was taken to block the channel along the levee additional erosion would be expected and deeper toe down would have been required to obtain the same level protection from failure due to erosion.

Analysis of Data

As a result of the meeting and field investigation, an effort was undertaken to more closely review the HEC-RAS water surface elevation at the location of the 116th Avenue Bridge for the 1993 flood. Rating curves were available for both the Estrella Parkway Bridge and the 116th Avenue Bridge. The rating curve for the 116th Avenue Bridge was raised (elevations increased) by 5.5 feet to plot on the curve for the Estrella Parkway for comparison.

The rating curves for the Gila River at the 116th and Estrella Parkway bridges are very similar when adjusted to plot similar flows at similar elevations as can be seen in Figure 1. The rating curve values were obtained from the Flood Control District website. The rating curve for the 116th Avenue Bridge was extrapolated from the published maximum of 100,000 cfs up to 250,000 cfs by equalizing the third derivative of the curve. It was also compared with the general form of the Estrella Parkway Bridge curve to insure reasonable results. While error is inevitable in this extrapolation (channel slope differences, etc) it was not intended to be exact but to give an estimate what the flood elevation could have been at the bridge during the peak of the 1993 flood if the bridge had been in place.

The extended rating curve indicates that a stage of approximately 14.7 feet (20.2 from the calculations-5.5 ft offset) would be necessary to pass a 162,000 cfs peak for the 1993 flood. The elevation of the water surface based on a gage datum of 927.14 ft (See Maricopa County Alert gage description for the 116th Ave. gage) would be 941.84. The levee elevation at the bridge is 946 feet. This leaves freeboard of 4.16 feet. In order to pass the combined Salt / Gila 100 year flood with an additional 65,000 cfs (227,000 cfs total) the flow would require approximately 1.8 feet of additional elevation or a water surface elevation of approximately 943.6 ft. This leaves a freeboard of 2.36 ft. Given the approximate character of the numbers this is well within the error of the analysis used to estimate the water surface elevation of the 100 year flood.

[Note that the flow for the 1993 flood has subsequently been estimated to be nearer 120-130,000 cfs. This would place the elevation at the 116th Ave bridge at 940.14 (18.75'-5.5+927.14=940.3) which is approximately equal to the lowest elevation of the upstream dike was obtained from the digital elevation model at 940 ft. This would appear to substantiate the other data developed later and described in section 3.4 and 3.5 of the main report.]

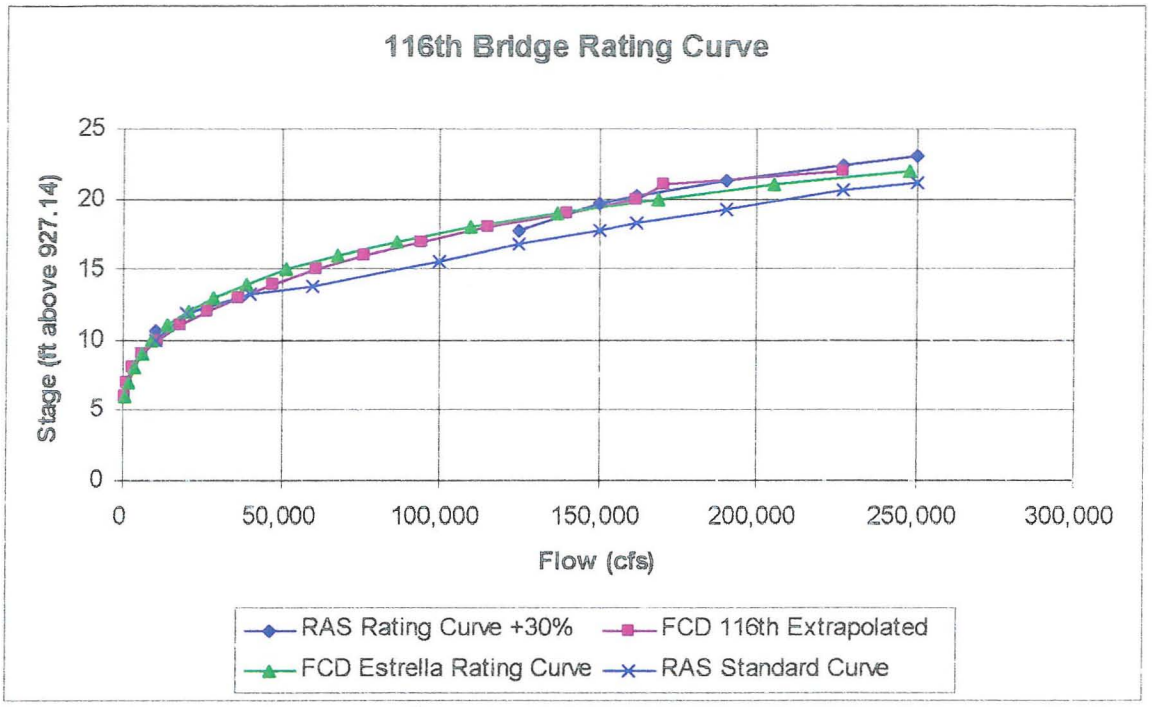


Figure 1. Rating Curves for 116th Ave. Bridge and Estrella Parkway.

The aerial photos obtained from the District were not helpful in performing this analysis since they are not of extremely high resolution and it was determined that the aerial photos are not from the peak of the Salt River flows (January 9, 1993) but were taken during the peak of the flood from upstream on the Gila River (i.e. flow from the south above Leveen rather than from flows originating on the Salt River). The Gila River peak occurred later in January (approximately the 21st) of 1993. The photos from just upstream of the Holly Acres Levee were actually taken two to three weeks after the Gila River peak and after the flooding had subsided. Several regular photos were taken on January 8th and later but they also were not extremely helpful in the analysis. (Two photos are shown in Figures 2 and 3.)

Analysis Using HEC-RAS

The Mannings n value for the main channel of the Salt and Gila Rivers in this reach was raised by 10, 20 and 30% and produced results as shown in Figure 4. The elevation of the spur dikes and levee from both RAS and the ArcView DTM are also shown in Figure 4. The uniform increase in water surface elevation appears to agree with the field observations by Mr. Reichert. His memory was that the tips of the dikes were not submerged but the area between the tip of the dikes and the levee (with approximately 1 foot lower in elevation) was nearly submerged. The HEC-RAS model with the +30% n values produced a water surface elevation of 941.88 at cross section 199.18 which is located just downstream of the bridge. The water surface from the +30% model (941.88) is very close to the extrapolated rating curve value of 941.84 but appears to be higher than Mr. Reichert's observations.

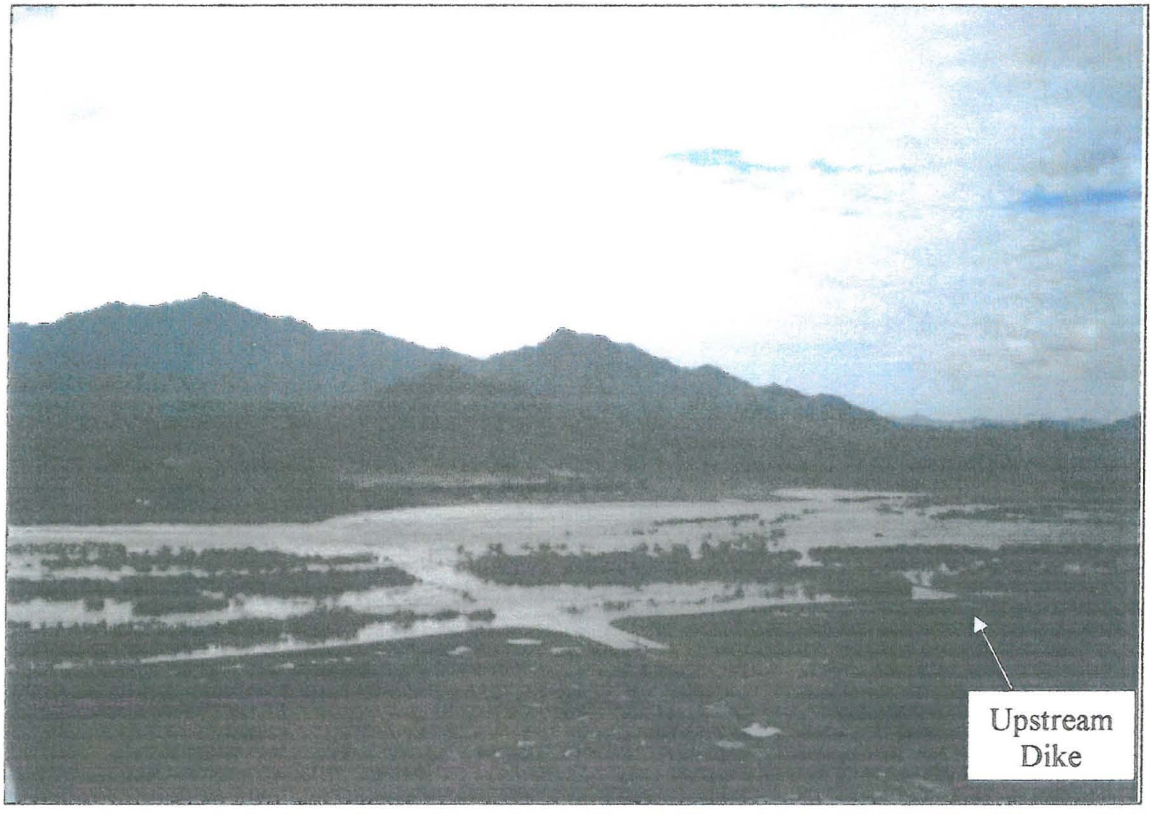


Figure 2. Photo of 1993 Flood at 115th Ave. Note dike to right of Road. (FCD)

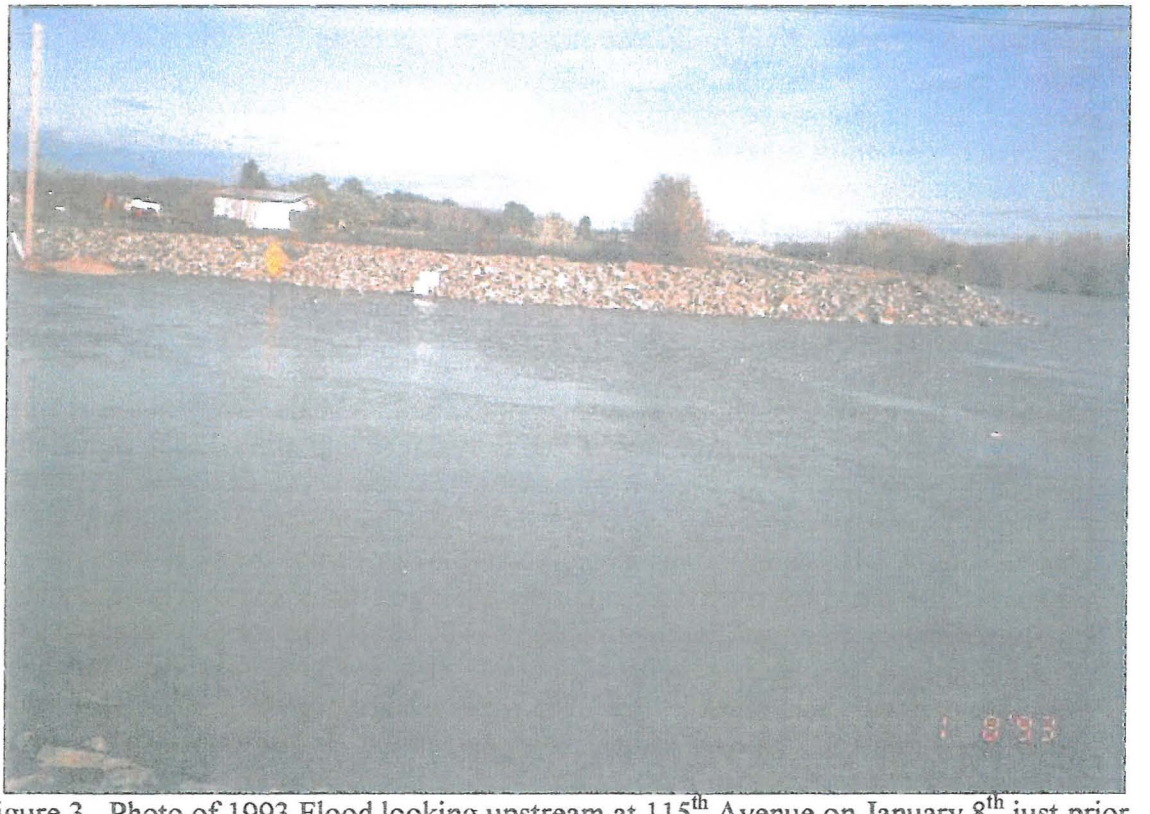


Figure 3. Photo of 1993 Flood looking upstream at 115th Avenue on January 8th just prior to peak on January 9, 1003. (FCD)

From Figure 4 it would also appear that the levee may have been raised upstream of the bridge to account for head losses at the bridge when the bridge was built. This is based on the flattening of the levee slope upstream from the bridge and the rapid lowering of the levee downstream from the bridge as shown in Figure 2.

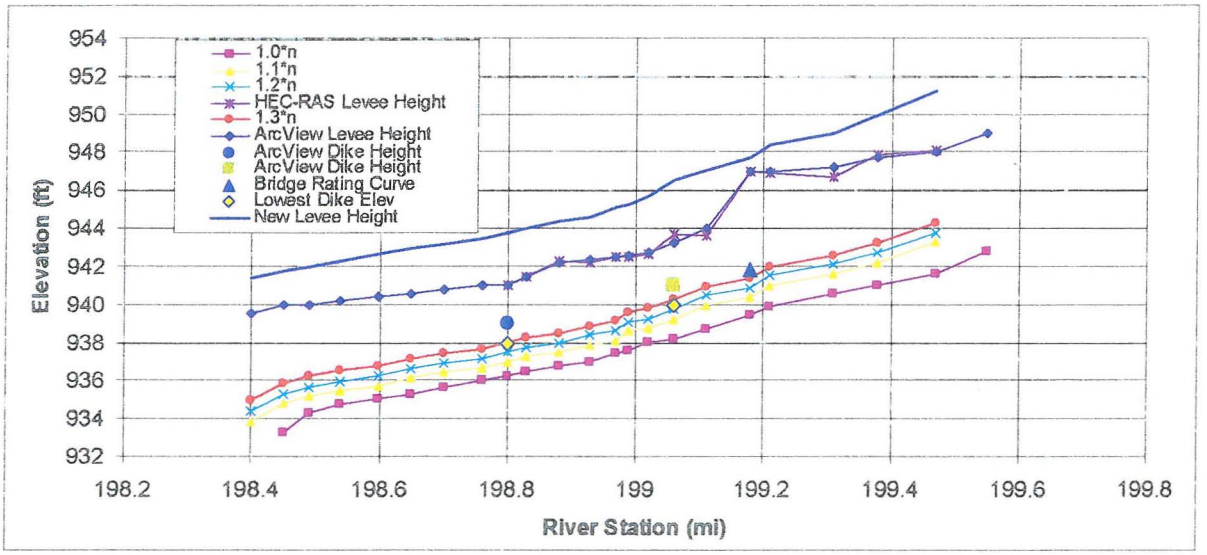


Figure 4. Water Surface and Levee Elevations for Holly Acres Levee. Legends indicating 1.1*n shown base n values plus 10%, etc.

Rating curves were also developed using HEC-RAS for the cross section immediately downstream of the bridge (the cross section closest to the existing gage). The rating curve obtained in the HEC-RAS model used for this analysis using the Manning's n values reported in the 90% report were compared with the extrapolated values for the rating curve at the bridge . The values are almost uniformly low in comparison to the extrapolated curve. It should be noted that the District developed the curve from another HEC-RAS model so even the lower portion of the curve is somewhat subjective. The HEC-RAS values for the +30% model are also shown in Figure 1 and correspond closely with the extended curve. The +20% data shown in Figure 4, however, appeared to more closely represent the data provided by Mr. Reichert.

Subsequent to the above investigation, discussions were held with Mr. Harry Millsaps, Hydraulic Engineer with the Gila River Indian Community. Mr. Millsaps indicated that based on his discussions with tribal members located on the south side of the Salt River above the confluence with the Gila River, it appeared that our water surface elevations for the 1993 flood (which was approximately the 100 year flood on the Salt River) were about one foot low. If the elevations were raised approximately one foot in elevation the inundation boundaries predicted in the HEC-RAS model would more closely correspond with the area observed to be flooded during the 1993 flood.

Based on the available data it thus appeared that the use of a higher water surface elevation was justified even though past studies have all predicted a lower water surface

elevation in this reach. Given the observed data and the other factors based on the 1D HEC-RAS results, it was recommended that the higher water surface elevations be used for levee design and determination of flood heights unless a more detailed study (i.e. two-dimensional study) could give more accurate results.

Additional Analysis and Comments

From analysis of the aerial photos taken during the later peak of the Gila River flood, photos from approximately two weeks later, and current photos, it is evident that a channel exists along the north bank until just upstream from the first spur dike. This channel ends abruptly in a relatively large group of trees and the spur dike. It was thought that the impact of the spur dike and the dense trees caused increased water surface elevations upstream from the spur dike and along the upstream reach of the Holly Acres Levee. The exact impact of this phenomenon, however, could not be estimated without a two-dimensional model. It was recommended that a two-dimensional model be constructed of the confluence area to better determine the impacts of the two-dimensional flows at the confluence and at the downstream end of the levee.

Based on the limitation of using one-dimensional modeling, it was recommended that a higher n value be used for the levee height analysis to ensure that the levee provides sufficient reliability to contain the 100 year flood. In order to obtain the water surface elevations it was necessary to raise the Manning's n value for the entire reach by 20%.

Subsequent to the HEC-RAS modeling, however, it was determined through the use of two-dimensional modeling that the phenomenon was local in nature and that the water surface in the base models adequately predicted water surface elevations.

Impact to 91st Avenue Wastewater Treatment Plant. The City of Phoenix, owner and operator the 91st Avenue Wastewater Treatment Plant, raised concerns in regards to the impact of any increased water surface elevations resulting from the levee on their treatment plant and associated levees. An analysis was performed to compare the new water surface elevations with the levee heights at the 91st Avenue plant. This analysis indicates that the levees surrounding the plant are at elevations of approximately 970 (west end of plant levee) to 983 ft (east end of levees) as shown in Table 1. The water surface elevations in the reach range from 966.57 to 976.97. These elevations indicate that levee height may be inadequate to provide 3 ft of freeboard for portions of its length between cross sections 202.48 to 202.85. If the lower freeboard requirements from the FDA program are used from the area downstream of the plant the same area still lacks adequate freeboard although the amount is near the mapping error of 0.5 ft and any conclusion would require a detailed survey. The analysis clearly showed, however that there is no impact to the plant from the levee designed in this study. Any impacts are present only well downstream of the 91st Ave plant.

[Based on the two-dimensional results in this area, however, it appears that the levee freeboard is sufficient for the 100 year event but this is near the upper limit of the modeled area and the model may not be adequately tuned in this reach (See Table 1)4. Any statements regarding the 2D model results in the area of the 91st Ave Wastewater Plant should be used with extreme caution.]

Conclusions

Based on the HEC-RAS results alone, it appeared that the model as presented in the 90% report used n values that are approximately 20% to 25% low based on information supplied by Mr. Reichert and Mr. Millsaps. Analysis of the impacts of increasing Manning's n values by 20% as a part of the sensitivity analysis indicated very little change in bed elevations due to the increased Manning's n for the 105 year partial hydrographs analyzed (See Appendix K of the main report). This indicates that long term trends should not differ but that levee heights would have to be increased to account for the higher water surfaces resulting from increased roughness in the river channel and low terraces.

In this reach of the river a 3 ft freeboard requirement meets or exceeds the requirements of the HEC-FDA analysis with the exception of the reach between cross sections 200.22 and 200.47 which require a 3.25 ft freeboard height.

Later two-dimensional analysis, however; revealed that the water surfaces near the dikes are impacted by a local two-dimensional phenomenon. Therefore the higher water surface elevations at the dikes are not reliable indicators of channel water surface elevations. The conclusion is that the base models (without increased Manning's n values) perform adequately so as to provide reliable results. Note that the necessity to raise the n values was eliminated through use of the 2D model and thus any recommendations regarding raising the Manning's n values to match the higher water surface elevations are now invalid.

Table 1. Freeboard and Levee Impacts at the 91st Avenue Waste Water Treatment Plant.

		<----------HEC-RAS---------->							
Final River Sta	RMA-2 100 Year W.S. Elev	HEC-RAS 100-Year W.S. Elev	91st Ave Levee Elev	Free board	Minimum FDA Free board	FDA Free board Deficit (ft)	3.0' Min Free board Deficit (ft)	New Levee Impact	RMA-2 Excess Freeboard
					WS+2.7		WS+3.0		
202.40	966.48	966.57	970.00	3.43	969.27	OK	OK	0	0.52
202.48	966.83	967.94	971.00	3.06	970.64	OK	OK	0	1.17
202.54	967.67	968.95	971.50	2.55	971.65	0.15	0.45	0	0.83
202.61	967.82	969.75	972.00	2.25	972.45	0.45	0.75	0	1.18
202.69	968.25	970.65	973.00	2.35	973.35	0.35	0.65	0	1.75
202.78	969.13	971.52	974.00	2.48	974.22	0.22	0.52	0	1.87
202.85	970.18	971.94	975.00	3.06	974.64	OK	OK	0	1.82
202.97	971.73	972.76	977.00	4.24	975.46	OK	OK	0	2.27
203.10	972.93	973.59	979.00	5.41	976.29	OK	OK	0	3.07
203.20	973.94	974.26	982.00	7.74	976.96	OK	OK	0	5.06
203.30	974.72	975.56	980.00	4.44	978.26	OK	OK	0	2.28
203.38	975.20	976.34	981.00	4.66	979.04	OK	OK	0	2.80
203.48	976.18	976.97	983.00	6.03	979.67	OK	OK	0	3.82

APPENDIX D

Existing Conditions
HEC-RAS Model Results

i. 5-, 20-, 100-Year Standard Table
ii. Cross Section Plots for the Lower Gila
iii. Cross Section Plots for the Salt
iv. Cross Section Plots for the Upper Gila

D-i

5-, 20-, 100-Year Standard Table

HEC-RAS Plan: TRPED Full M River: Gila Reach: Lower Gila

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)	
Lower Gila	195.16	5_year	23500.00	891.00	903.68	899.99	904.02	0.001660	4.67	5027.43	1685.71	0.35
Lower Gila	195.16	20_year	92000.00	891.00	907.15	905.01	907.77	0.001658	6.48	14730.56	1937.37	0.38
Lower Gila	195.16	100_year	227000.00	891.00	913.24	906.89	914.48	0.001660	9.18	25593.24	3706.96	0.42
Lower Gila	195.2	5_year	23500.00	891.00	904.00	900.50	904.32	0.001322	4.56	5154.64	1722.58	0.32
Lower Gila	195.2	20_year	92000.00	891.00	907.55	905.05	908.09	0.001279	6.06	15818.91	1838.68	0.34
Lower Gila	195.2	100_year	227000.00	891.00	913.69	906.80	914.82	0.001428	8.86	26653.41	3604.26	0.39
Lower Gila	195.21		Bridge									
Lower Gila	195.22	5_year	23500.00	891.00	904.32	900.34	904.61	0.001179	4.34	5420.89	1719.58	0.30
Lower Gila	195.22	20_year	92000.00	891.00	907.89	905.12	908.41	0.001247	6.01	15983.38	1838.12	0.34
Lower Gila	195.22	100_year	227000.00	891.00	914.13	906.98	915.23	0.001375	8.76	26998.03	4098.17	0.38
Lower Gila	195.28	5_year	23500.00	892.60	904.44	900.89	904.83	0.001641	4.98	4718.46	1617.99	0.36
Lower Gila	195.28	20_year	92000.00	892.60	908.02	905.19	908.63	0.001666	6.56	14932.43	2117.38	0.38
Lower Gila	195.28	100_year	227000.00	892.60	914.30	907.83	915.42	0.001524	8.92	26880.32	4192.71	0.40
Lower Gila	195.34	5_year	23500.00	892.60	905.01	900.45	905.23	0.000866	3.78	6209.33	1807.33	0.26
Lower Gila	195.34	20_year	92000.00	892.60	908.55	905.14	909.15	0.001556	6.79	15468.52	2101.84	0.38
Lower Gila	195.34	100_year	227000.00	892.60	914.93	908.43	915.90	0.001311	8.66	29641.12	4086.70	0.38
Lower Gila	195.45	5_year	23500.00	896.41	905.25	902.26	905.61	0.001581	4.77	4925.28	1769.79	0.35
Lower Gila	195.45	20_year	92000.00	896.41	909.00	906.06	909.68	0.001959	7.40	14778.90	2238.41	0.42
Lower Gila	195.45	100_year	227000.00	896.41	915.35	909.54	916.29	0.001408	8.81	30373.41	3801.50	0.39
Lower Gila	195.55	5_year	23500.00	897.89	906.09	902.58	906.45	0.001426	4.84	4857.87	1717.04	0.34
Lower Gila	195.55	20_year	92000.00	897.89	910.05	906.47	910.73	0.001766	7.42	14887.17	2290.63	0.41
Lower Gila	195.55	100_year	227000.00	897.89	916.13	910.67	917.11	0.001455	9.15	29698.54	4455.60	0.40
Lower Gila	195.65	5_year	23500.00	897.58	906.62	902.49	907.16	0.001093	5.91	3978.59	1318.15	0.44
Lower Gila	195.65	20_year	92000.00	897.58	910.75	908.33	911.76	0.001752	9.07	12778.51	1952.01	0.53
Lower Gila	195.65	100_year	227000.00	897.58	916.64	912.65	918.05	0.001618	11.24	26607.39	3518.52	0.51
Lower Gila	195.77	5_year	23500.00	897.58	907.17	904.54	907.99	0.001756	7.27	3234.16	1486.39	0.57
Lower Gila	195.77	20_year	92000.00	897.58	911.88	909.30	912.69	0.001573	8.31	13977.09	2132.26	0.49
Lower Gila	195.77	100_year	227000.00	897.58	917.80	913.00	918.90	0.001373	10.00	28859.42	4554.36	0.46
Lower Gila	195.86	5_year	23500.00	897.39	908.44	904.69	908.79	0.000892	4.77	4929.71	1436.37	0.33
Lower Gila	195.86	20_year	92000.00	897.39	912.88	909.75	913.55	0.001290	7.40	15240.24	2286.11	0.40
Lower Gila	195.86	100_year	227000.00	897.39	918.74	913.40	919.67	0.001188	9.24	32091.32	4590.93	0.40
Lower Gila	195.98	5_year	23500.00	899.24	909.02	904.24	909.29	0.001116	4.19	5614.28	2714.89	0.28
Lower Gila	195.98	20_year	92000.00	899.24	913.67	909.40	914.20	0.001340	6.35	17290.75	3402.80	0.33
Lower Gila	195.98	100_year	227000.00	899.24	919.54	913.22	920.27	0.001203	7.83	36174.29	6538.21	0.33
Lower Gila	196.08	5_year	23500.00	899.26	909.44	907.50	910.83	0.003735	9.45	2486.65	2793.69	0.71
Lower Gila	196.08	20_year	92000.00	899.26	914.69	913.15	915.56	0.002371	9.57	18917.63	4508.90	0.60
Lower Gila	196.08	100_year	227000.00	899.26	920.26	916.06	921.44	0.001808	11.88	40662.43	8169.31	0.57
Lower Gila	196.14	5_year	23500.00	906.39	911.66	909.84	912.26	0.001988	6.21	3785.22	3457.61	0.50
Lower Gila	196.14	20_year	92000.00	906.39	915.97	913.16	916.37	0.000983	6.40	23087.42	4431.55	0.39
Lower Gila	196.14	100_year	227000.00	906.39	921.49	915.23	922.13	0.000877	8.46	46885.51	8144.52	0.40
Lower Gila	196.23	5_year	23500.00	901.72	912.44	908.91	912.67	0.000712	3.89	6044.09	3526.10	0.28
Lower Gila	196.23	20_year	92000.00	901.72	916.39	912.88	916.68	0.000691	5.26	26537.47	6155.13	0.30
Lower Gila	196.23	100_year	227000.00	901.72	922.05	915.84	922.39	0.000478	5.87	55623.55	7809.91	0.27
Lower Gila	196.32	5_year	23500.00	905.91	912.84	909.75	913.24	0.002009	5.07	4632.58	2698.00	0.38
Lower Gila	196.32	20_year	92000.00	905.91	916.80	914.63	917.12	0.001258	5.51	22646.55	6573.68	0.32
Lower Gila	196.32	100_year	227000.00	905.91	922.36	916.86	922.63	0.000542	4.96	55087.08	8393.13	0.23
Lower Gila	196.38	5_year	23500.00	906.38	913.56	909.92	913.86	0.000867	4.38	5365.98	2661.08	0.32
Lower Gila	196.38	20_year	92000.00	906.38	917.28	914.54	917.71	0.001039	6.28	22155.66	6590.76	0.36
Lower Gila	196.38	100_year	227000.00	906.38	922.58	916.97	922.88	0.000501	5.72	55402.85	8297.63	0.26
Lower Gila	196.44	5_year	23500.00	906.38	913.86	909.99	914.09	0.000657	3.86	6084.12	2205.37	0.27
Lower Gila	196.44	20_year	92000.00	906.38	917.55	914.15	918.04	0.001098	6.51	21232.75	6570.25	0.37
Lower Gila	196.44	100_year	227000.00	906.38	922.71	918.36	923.04	0.000549	5.97	54580.70	8746.50	0.27
Lower Gila	196.5	5_year	23500.00	906.38	914.07	910.19	914.31	0.000685	3.95	5948.92	2187.88	0.28
Lower Gila	196.5	20_year	92000.00	906.38	917.85	914.52	918.46	0.001292	7.07	19239.08	5203.47	0.40
Lower Gila	196.5	100_year	227000.00	906.38	922.85	919.28	923.28	0.000732	6.84	50215.77	8585.64	0.31
Lower Gila	196.57	5_year	23500.00	906.38	914.37	910.73	914.61	0.001156	3.91	6003.01	1903.76	0.28
Lower Gila	196.57	20_year	92000.00	906.38	918.45	914.78	918.97	0.001726	6.55	19511.78	5446.59	0.37
Lower Gila	196.57	100_year	227000.00	906.38	923.17	919.47	923.58	0.001047	6.54	49956.77	8345.09	0.30
Lower Gila	196.63	5_year	23500.00	906.38	914.79	910.28	914.95	0.000749	3.23	7276.50	2288.57	0.22
Lower Gila	196.63	20_year	92000.00	906.38	919.04	914.13	919.55	0.001469	6.22	19422.17	5060.21	0.33
Lower Gila	196.63	100_year	227000.00	906.38	923.47	918.84	924.08	0.001427	7.68	46313.59	8068.91	0.35

HEC-RAS Plan: TRPED Full M River: Gila Reach: Lower Gila (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)	
Lower Gila	196.69	5_year	23500.00	906.54	915.02	909.99	915.13	0.000458	2.72	8649.65	2282.71	0.18
Lower Gila	196.69	20_year	92000.00	906.54	919.57	913.56	919.90	0.000857	5.07	23779.96	4899.65	0.27
Lower Gila	196.69	100_year	227000.00	906.54	923.96	918.36	924.46	0.001013	6.78	50334.84	7460.37	0.30
Lower Gila	196.75	5_year	23500.00	906.28	915.19	910.95	915.36	0.001025	3.33	7057.50	2251.00	0.24
Lower Gila	196.75	20_year	92000.00	906.28	919.91	914.94	920.20	0.001004	4.93	25185.06	4325.09	0.27
Lower Gila	196.75	100_year	227000.00	906.28	924.36	918.95	924.80	0.001112	6.64	52055.88	7672.23	0.30
Lower Gila	196.81	5_year	23500.00	906.40	915.47	911.58	915.69	0.000866	3.73	6299.51	2093.08	0.28
Lower Gila	196.81	20_year	92000.00	906.40	920.17	915.80	920.52	0.000823	5.42	22575.29	4235.53	0.30
Lower Gila	196.81	100_year	227000.00	906.40	924.62	919.18	925.18	0.000958	7.45	49065.41	7584.19	0.34
Lower Gila	196.87	5_year	23500.00	906.40	915.63	912.21	915.97	0.000891	4.64	5064.99	1715.74	0.36
Lower Gila	196.87	20_year	92000.00	906.40	920.32	917.03	920.81	0.000936	6.44	19916.94	3952.42	0.37
Lower Gila	196.87	100_year	227000.00	906.40	924.80	919.40	925.50	0.001034	8.52	45862.41	7770.45	0.40
Lower Gila	196.94	5_year	23500.00	906.40	915.92	912.07	916.31	0.001204	4.98	4719.88	1562.14	0.39
Lower Gila	196.94	20_year	92000.00	906.40	920.63	917.66	921.14	0.001133	6.45	18505.90	3624.84	0.37
Lower Gila	196.94	100_year	227000.00	906.40	925.16	920.61	925.85	0.001191	8.31	43427.43	8243.46	0.39
Lower Gila	196.99	5_year	23500.00	906.40	916.51	912.98	916.86	0.001820	4.72	4975.45	1508.05	0.38
Lower Gila	196.99	20_year	92000.00	906.40	921.11	918.06	921.64	0.001590	6.39	17149.60	3062.67	0.38
Lower Gila	196.99	100_year	227000.00	906.40	925.64	921.19	926.35	0.001504	8.11	40985.17	8457.66	0.39
Lower Gila	197.05	5_year	23500.00	908.12	917.05	913.36	917.35	0.001439	4.36	5384.32	1972.25	0.34
Lower Gila	197.05	20_year	92000.00	908.12	921.66	918.26	922.07	0.001253	5.87	21412.78	3560.20	0.34
Lower Gila	197.05	100_year	227000.00	908.12	926.16	921.19	926.78	0.001318	7.80	44245.13	8005.14	0.37
Lower Gila	197.09	5_year	23500.00	908.08	917.40	914.15	917.72	0.001234	4.50	5217.00	2413.70	0.35
Lower Gila	197.09	20_year	92000.00	908.08	922.10	918.79	922.32	0.000588	4.46	26120.57	3833.70	0.26
Lower Gila	197.09	100_year	227000.00	908.08	926.64	921.24	927.08	0.000745	6.56	49244.46	8028.02	0.31
Lower Gila	197.14	5_year	23500.00	909.26	917.81	914.55	918.03	0.001410	3.78	6219.93	2482.55	0.30
Lower Gila	197.14	20_year	92000.00	909.26	922.24	918.35	922.50	0.000804	4.49	22951.11	3542.61	0.26
Lower Gila	197.14	100_year	227000.00	909.26	926.84	921.45	927.27	0.000901	6.29	45509.48	6890.89	0.30
Lower Gila	197.16	5_year	23500.00	909.80	918.07	915.19	918.34	0.001088	4.11	5713.53	2591.43	0.32
Lower Gila	197.16	20_year	92000.00	909.80	922.39	918.91	922.70	0.000791	5.22	23306.92	3305.50	0.30
Lower Gila	197.16	100_year	227000.00	909.80	926.98	921.26	927.53	0.000978	7.55	45722.59	7066.42	0.36
Lower Gila	197.18	5_year	23500.00	910.95	918.24	915.09	918.47	0.000864	3.81	6167.10	2780.39	0.30
Lower Gila	197.18	20_year	92000.00	910.95	922.49	918.78	922.81	0.000786	5.30	25038.89	3446.63	0.31
Lower Gila	197.18	100_year	227000.00	910.95	927.04	921.55	927.70	0.001079	8.04	47005.30	7487.99	0.38
Lower Gila	197.23	5_year	23500.00	910.88	918.28	915.48	918.63	0.001288	4.72	4978.97	2264.05	0.40
Lower Gila	197.23	20_year	92000.00	910.88	922.47	919.86	923.00	0.001434	6.62	20949.38	3546.44	0.42
Lower Gila	197.23	100_year	227000.00	910.88	927.06	922.59	927.92	0.001569	8.95	42748.31	8051.85	0.45
Lower Gila	197.28	5_year	23500.00	910.50	918.62	914.55	918.84	0.000579	3.79	6205.83	2200.20	0.27
Lower Gila	197.28	20_year	92000.00	910.50	922.77	918.85	923.30	0.001075	6.55	20739.59	3186.11	0.40
Lower Gila	197.28	100_year	227000.00	910.50	927.37	921.91	928.30	0.001362	9.15	42107.55	8040.10	0.45
Lower Gila	197.33	5_year	23500.00	911.65	918.68	916.00	919.11	0.001373	5.31	4426.80	2145.29	0.43
Lower Gila	197.33	20_year	92000.00	911.65	922.98	920.01	923.67	0.001655	7.54	18487.87	2916.77	0.48
Lower Gila	197.33	100_year	227000.00	911.65	927.56	923.51	928.79	0.001987	10.55	38082.00	7448.43	0.53
Lower Gila	197.38	5_year	23500.00	911.90	919.14	916.81	919.66	0.002977	5.77	4074.01	1823.95	0.51
Lower Gila	197.38	20_year	92000.00	911.90	923.48	921.47	924.23	0.002551	7.71	15181.62	2610.23	0.48
Lower Gila	197.38	100_year	227000.00	911.90	928.43	924.68	929.36	0.002109	9.48	37389.12	8447.01	0.46
Lower Gila	197.42	5_year	23500.00	911.90	919.72	917.93	920.31	0.001874	6.17	3808.25	1797.02	0.55
Lower Gila	197.42	20_year	92000.00	911.90	924.02	922.36	924.90	0.002210	8.40	15741.15	3140.87	0.55
Lower Gila	197.42	100_year	227000.00	911.90	928.80	925.93	930.00	0.002068	10.58	37599.45	8372.68	0.54
Lower Gila	197.48	5_year	23500.00	911.90	920.15	918.49	920.92	0.002880	7.02	3348.06	1658.59	0.63
Lower Gila	197.48	20_year	92000.00	911.90	924.58	922.48	925.51	0.002672	8.70	15657.13	3441.35	0.57
Lower Gila	197.48	100_year	227000.00	911.90	929.41	926.87	930.53	0.002258	10.46	38847.02	8867.27	0.53
Lower Gila	197.53	5_year	23500.00	911.90	921.10	918.16	921.52	0.001298	5.23	4493.15	1781.64	0.42
Lower Gila	197.53	20_year	92000.00	911.90	925.49	923.16	926.22	0.001857	7.66	17534.11	3842.86	0.47
Lower Gila	197.53	100_year	227000.00	911.90	930.25	925.70	931.16	0.001655	9.41	42092.70	8966.43	0.46
Lower Gila	197.58	5_year	23500.00	911.90	921.42	917.43	921.82	0.000950	5.12	4589.18	1844.71	0.39
Lower Gila	197.58	20_year	92000.00	911.90	925.90	923.48	926.64	0.001294	7.78	18170.96	4157.92	0.46
Lower Gila	197.58	100_year	227000.00	911.90	930.63	927.17	931.55	0.001268	9.65	42869.18	9114.14	0.46
Lower Gila	197.64	5_year	23500.00	911.90	921.75	916.40	922.00	0.000433	4.01	5860.55	1722.08	0.28
Lower Gila	197.64	20_year	92000.00	911.90	926.37	922.23	926.93	0.000852	6.70	19886.54	4329.27	0.37
Lower Gila	197.64	100_year	227000.00	911.90	931.18	925.72	931.85	0.000834	8.14	46906.92	9508.33	0.37

HEC-RAS Plan: TRPED Full M River: Gila Reach: Lower Gila (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)	
Lower Gila	197.7	5_year	23500.00	911.90	921.90	917.93	922.18	0.000708	4.24	5541.40	1877.27	0.31
Lower Gila	197.7	20_year	92000.00	911.90	926.72	922.75	927.20	0.000839	6.35	20090.23	3831.43	0.35
Lower Gila	197.7	100_year	227000.00	911.90	931.51	926.26	932.11	0.000832	7.92	47175.89	9626.06	0.36
Lower Gila	197.75	5_year	23500.00	911.90	922.17	918.21	922.39	0.000638	3.78	6216.95	2384.05	0.27
Lower Gila	197.75	20_year	92000.00	911.90	927.12	922.41	927.42	0.000549	5.09	23537.66	3575.27	0.27
Lower Gila	197.75	100_year	227000.00	911.90	931.89	926.34	932.34	0.000621	6.90	49704.25	9599.74	0.31
Lower Gila	197.81	5_year	23500.00	912.13	922.33	919.11	922.64	0.001061	4.51	5211.92	2114.08	0.35
Lower Gila	197.81	20_year	92000.00	912.13	927.22	923.54	927.64	0.000812	6.03	20989.89	3182.98	0.34
Lower Gila	197.81	100_year	227000.00	912.13	931.94	926.59	932.62	0.000919	8.27	42962.02	9597.59	0.38
Lower Gila	197.87	5_year	23500.00	912.14	922.65	919.72	922.99	0.001288	4.72	4982.22	1909.67	0.36
Lower Gila	197.87	20_year	92000.00	912.14	927.50	924.27	927.91	0.001002	5.81	20154.65	3294.37	0.35
Lower Gila	197.87	100_year	227000.00	912.14	932.25	926.97	932.90	0.001000	7.87	40747.20	9717.61	0.38
Lower Gila	197.92	5_year	23500.00	912.14	923.03	919.36	923.35	0.000888	4.50	5222.03	2246.06	0.33
Lower Gila	197.92	20_year	92000.00	912.14	927.88	924.25	928.20	0.000739	5.20	22625.99	3377.39	0.32
Lower Gila	197.92	100_year	227000.00	912.14	932.63	926.75	933.21	0.000803	7.36	43002.69	9561.51	0.36
Lower Gila	197.95	5_year	23500.00	912.14	923.28	919.53	923.58	0.000859	4.37	5378.59	2341.39	0.33
Lower Gila	197.95	20_year	92000.00	912.14	928.09	924.44	928.38	0.000601	4.74	24017.40	3593.61	0.29
Lower Gila	197.95	100_year	227000.00	912.14	932.86	926.77	933.41	0.000688	6.92	44489.84	9410.89	0.34
Lower Gila	197.98	5_year	23500.00	915.60	923.20	922.22	923.98	0.004257	7.08	3321.26	2180.79	0.67
Lower Gila	197.98	20_year	92000.00	915.60	928.17	925.01	928.52	0.001112	5.74	23228.81	3715.42	0.38
Lower Gila	197.98	100_year	227000.00	915.60	932.92	926.70	933.57	0.001088	8.05	43685.41	9399.80	0.42
Lower Gila	198.03	5_year	23500.00	917.47	923.77	922.77	924.84	0.004842	8.28	2838.83	2313.85	0.72
Lower Gila	198.03	20_year	92000.00	917.47	928.37	926.13	928.74	0.001332	6.00	21687.14	3453.59	0.42
Lower Gila	198.03	100_year	227000.00	917.47	933.07	927.40	933.81	0.001374	8.77	41376.26	9225.90	0.46
Lower Gila	198.08	5_year	23500.00	917.90	925.16	923.18	925.74	0.002369	6.08	3865.17	2341.64	0.51
Lower Gila	198.08	20_year	92000.00	917.90	928.67	926.71	929.13	0.001466	6.53	18568.88	3188.72	0.44
Lower Gila	198.08	100_year	227000.00	917.90	933.39	928.28	934.21	0.001479	9.26	38170.46	8833.09	0.48
Lower Gila	198.15	5_year	23500.00	918.06	925.77	924.28	926.38	0.002847	6.25	3760.22	2877.15	0.58
Lower Gila	198.15	20_year	92000.00	918.06	929.08	927.32	929.44	0.001034	5.62	25733.71	3361.26	0.38
Lower Gila	198.15	100_year	227000.00	918.06	933.75	927.58	934.54	0.001188	8.60	45293.29	8743.71	0.45
Lower Gila	198.2	5_year	23500.00	917.83	926.76	924.49	927.26	0.002001	5.72	4104.90	2987.55	0.49
Lower Gila	198.2	20_year	92000.00	917.83	929.48	928.67	929.86	0.001071	5.69	25456.40	3422.77	0.39
Lower Gila	198.2	100_year	227000.00	917.83	934.20	928.67	935.03	0.001264	8.84	46014.46	8111.67	0.46
Lower Gila	198.26	5_year	23500.00	919.07	927.33	925.22	927.83	0.001753	5.67	4141.33	2931.36	0.47
Lower Gila	198.26	20_year	92000.00	919.07	929.78	928.57	930.21	0.001012	5.70	24692.53	3413.73	0.38
Lower Gila	198.26	100_year	227000.00	919.07	934.58	929.03	935.43	0.001239	8.89	44262.13	7382.41	0.46
Lower Gila	198.33	5_year	23500.00	920.97	927.87	925.51	928.28	0.001313	5.16	4552.69	2115.15	0.41
Lower Gila	198.33	20_year	92000.00	920.97	929.96	928.79	930.61	0.001305	6.44	15490.39	2397.38	0.43
Lower Gila	198.33	100_year	227000.00	920.97	934.88	930.37	935.84	0.001320	9.14	31637.66	5999.96	0.48
Lower Gila	198.4	5_year	23500.00	922.23	928.42	926.28	928.90	0.001886	5.55	4230.88	1751.54	0.44
Lower Gila	198.4	20_year	92000.00	922.23	930.43	929.53	931.24	0.001812	6.65	13397.52	1913.98	0.45
Lower Gila	198.4	100_year	227000.00	922.23	935.34	931.48	936.61	0.002462	10.36	26857.17	5352.16	0.56
Lower Gila	198.45	5_year	23500.00	922.19	929.10	926.42	929.45	0.001302	4.74	4962.57	1893.98	0.36
Lower Gila	198.45	20_year	92000.00	922.19	931.20	930.31	931.76	0.001164	5.53	15878.98	2027.41	0.36
Lower Gila	198.45	100_year	227000.00	922.19	936.39	930.81	937.30	0.001475	8.75	32607.57	9367.58	0.44
Lower Gila	198.49	5_year	23500.00	922.46	929.41	926.46	929.72	0.000847	4.49	5236.74	2206.09	0.34
Lower Gila	198.49	20_year	92000.00	922.46	931.58	930.51	932.04	0.000911	5.70	17479.34	2412.65	0.37
Lower Gila	198.49	100_year	227000.00	922.46	936.82	930.79	937.61	0.000965	8.29	35714.24	9353.87	0.41
Lower Gila	198.54	5_year	23500.00	922.67	929.62	926.95	929.94	0.000952	4.54	5172.85	2343.28	0.35
Lower Gila	198.54	20_year	92000.00	922.67	931.82	930.01	932.28	0.001028	5.90	17564.49	2635.89	0.39
Lower Gila	198.54	100_year	227000.00	922.67	937.13	931.05	937.85	0.000931	7.90	37773.58	9318.07	0.40
Lower Gila	198.6	5_year	23500.00	923.30	929.87	927.66	930.27	0.001380	5.04	4658.56	2368.66	0.42
Lower Gila	198.6	20_year	92000.00	923.30	932.09	931.01	932.59	0.001160	5.84	17007.62	2635.95	0.41
Lower Gila	198.6	100_year	227000.00	923.30	937.34	932.01	938.15	0.001041	8.12	35361.70	8878.84	0.42
Lower Gila	198.65	5_year	23500.00	923.88	930.34	928.11	930.72	0.001336	4.93	4766.60	2515.89	0.41
Lower Gila	198.65	20_year	92000.00	923.88	932.50	931.71	932.97	0.001086	5.56	17706.25	2880.96	0.39
Lower Gila	198.65	100_year	227000.00	923.88	937.74	932.30	938.49	0.000938	7.71	37373.89	8682.09	0.40
Lower Gila	198.7	5_year	23500.00	923.90	930.71	928.06	931.03	0.000988	4.48	5247.76	2723.89	0.36
Lower Gila	198.7	20_year	92000.00	923.90	932.87	931.51	933.24	0.000870	5.28	19789.62	2868.51	0.35
Lower Gila	198.7	100_year	227000.00	923.90	938.07	931.90	938.74	0.000867	7.61	39984.33	8670.82	0.39
Lower Gila	198.76	5_year	23500.00	923.90	930.98	928.27	931.28	0.000965	4.36	5387.48	2698.58	0.35

HEC-RAS Plan: TRPED Full M River: Gila Reach: Lower Gila (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)	
Lower Gila	198.76	20_year	92000.00	923.90	933.08	932.00	933.49	0.000977	5.57	19060.80	2796.25	0.38
Lower Gila	198.76	100_year	227000.00	923.90	938.27	932.38	938.98	0.000896	7.76	39241.88	8431.40	0.39
Lower Gila	198.8	5_year	23500.00	923.90	931.35	928.55	931.63	0.001563	4.29	5473.30	2265.23	0.34
Lower Gila	198.8	20_year	92000.00	923.90	933.39	932.20	933.88	0.001641	5.46	16266.74	2365.84	0.37
Lower Gila	198.8	100_year	227000.00	923.90	938.58	933.07	939.32	0.001435	7.39	34576.16	8098.57	0.37
Lower Gila	198.83	5_year	23500.00	923.90	931.59	928.99	931.91	0.000969	4.58	5125.70	2477.25	0.36
Lower Gila	198.83	20_year	92000.00	923.90	933.74	932.71	934.18	0.001132	6.04	18248.78	2699.66	0.40
Lower Gila	198.83	100_year	227000.00	923.90	938.80	933.23	939.61	0.001092	8.54	36706.61	7676.49	0.44
Lower Gila	198.88	5_year	23500.00	923.90	931.77	929.26	932.14	0.001566	4.90	4795.37	2537.42	0.39
Lower Gila	198.88	20_year	92000.00	923.90	933.96	932.61	934.44	0.001627	6.15	18105.04	2864.41	0.41
Lower Gila	198.88	100_year	227000.00	923.90	939.03	933.79	939.84	0.001470	8.46	35883.89	6463.01	0.43
Lower Gila	198.93	5_year	23500.00	923.90	932.17	929.10	932.50	0.001199	4.58	5136.20	2550.93	0.34
Lower Gila	198.93	20_year	92000.00	923.90	934.36	933.21	934.81	0.001320	5.86	18251.50	2914.41	0.38
Lower Gila	198.93	100_year	227000.00	923.90	939.41	933.98	940.19	0.001265	8.11	35161.86	6631.12	0.40
Lower Gila	198.97	5_year	23500.00	925.10	932.45	929.64	932.86	0.001966	5.15	4565.22	2622.48	0.39
Lower Gila	198.97	20_year	92000.00	925.10	934.62	933.51	935.25	0.002342	6.98	16126.43	2945.17	0.44
Lower Gila	198.97	100_year	227000.00	925.10	939.53	934.36	940.68	0.002339	9.70	30414.52	5444.61	0.48
Lower Gila	198.99	5_year	23500.00	925.10	932.92	929.81	933.29	0.001597	4.86	4833.71	2678.48	0.35
Lower Gila	198.99	20_year	92000.00	925.10	935.14	934.01	935.76	0.001964	6.55	16552.49	2934.36	0.41
Lower Gila	198.99	100_year	227000.00	925.10	940.05	935.48	941.19	0.001997	9.10	31309.19	9138.17	0.45
Lower Gila	199.02	5_year	23500.00	925.40	933.21	929.93	933.47	0.001501	4.10	5731.23	2789.45	0.30
Lower Gila	199.02	20_year	92000.00	925.40	935.32	934.01	936.03	0.002586	6.63	16516.57	2864.16	0.42
Lower Gila	199.02	100_year	227000.00	925.40	940.15	935.90	941.50	0.002542	9.05	31204.39	8829.83	0.45
Lower Gila	199.06	5_year	23500.00	925.40	933.48	929.93	933.69	0.001487	3.70	6343.02	2502.44	0.27
Lower Gila	199.06	20_year	92000.00	925.40	935.86	933.72	936.43	0.002394	5.91	16413.05	2553.52	0.36
Lower Gila	199.06	100_year	227000.00	925.40	940.76	935.58	941.91	0.002588	8.40	30802.19	8312.14	0.41
Lower Gila	199.11	5_year	23500.00	925.40	933.76	929.50	933.92	0.000848	3.23	7284.97	2791.96	0.23
Lower Gila	199.11	20_year	92000.00	925.40	936.43	933.31	936.80	0.001316	5.07	19676.57	2828.10	0.30
Lower Gila	199.11	100_year	227000.00	925.40	941.64	935.12	942.35	0.001416	7.19	36868.60	7444.38	0.34
Lower Gila	199.18	5_year	23500.00	925.40	934.01	931.61	934.41	0.002329	5.11	4601.08	2625.84	0.41
Lower Gila	199.18	20_year	92000.00	925.40	936.82	935.51	937.33	0.002274	6.86	17702.82	2747.55	0.44
Lower Gila	199.18	100_year	227000.00	925.40	942.02	936.48	942.96	0.002212	9.56	33264.99	7315.11	0.47
Lower Gila	199.19		Mult Open									
Lower Gila	199.21	5_year	23500.00	927.64	934.59	930.67	934.79	0.000753	3.53	6658.77	2391.82	0.25
Lower Gila	199.21	20_year	92000.00	927.64	937.40	934.40	937.74	0.001026	5.24	21034.41	2402.88	0.30
Lower Gila	199.21	100_year	227000.00	927.64	942.74	936.01	943.50	0.001286	7.95	34885.86	6000.98	0.37
Lower Gila	199.31	5_year	23500.00	928.11	934.97	931.52	935.21	0.000801	3.94	5966.68	2528.02	0.28
Lower Gila	199.31	20_year	92000.00	928.11	937.89	935.41	938.40	0.001156	6.18	18986.92	2630.91	0.37
Lower Gila	199.31	100_year	227000.00	928.11	943.29	937.62	944.22	0.001192	8.62	34650.91	6339.79	0.40
Lower Gila	199.38	5_year	23500.00	931.10	935.19	934.72	936.20	0.009983	8.06	2916.91	2030.75	0.79
Lower Gila	199.38	20_year	92000.00	931.10	938.46	937.01	939.40	0.005507	9.03	14020.06	2787.84	0.65
Lower Gila	199.38	100_year	227000.00	931.10	943.84	940.08	944.99	0.002773	9.85	31298.84	6855.58	0.52
Lower Gila	199.47	5_year	23500.00	931.64	937.52	935.45	937.92	0.001964	5.04	4658.76	2907.07	0.42
Lower Gila	199.47	20_year	92000.00	931.64	940.14	938.52	940.71	0.002166	7.23	18767.91	3876.31	0.48
Lower Gila	199.47	100_year	227000.00	931.64	944.92	940.49	945.86	0.001881	9.53	36253.31	8541.47	0.49

HEC-RAS Plan: TRPED Full M River: Salt Reach: Salt

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)	
Salt	199.55	5_year	19500.00	931.65	938.64	935.85	939.05	0.001044	5.13	3824.64	1982.76	0.38
Salt	199.55	20_year	82000.00	931.65	941.30	940.01	942.32	0.002281	9.75	15414.12	2477.03	0.59
Salt	199.55	100_year	162000.00	931.65	946.25	941.48	947.46	0.001564	11.00	29586.57	7488.52	0.53
Salt	199.69	5_year	19500.00	931.79	939.39	935.79	939.68	0.000662	4.35	4485.03	1870.80	0.31
Salt	199.69	20_year	82000.00	931.79	942.89	940.53	943.69	0.001354	8.35	16128.66	2307.20	0.47
Salt	199.69	100_year	162000.00	931.79	947.65	942.58	948.41	0.000894	8.83	33538.18	6927.13	0.41
Salt	199.86	5_year	19500.00	931.12	940.03	935.78	940.19	0.000483	3.27	5970.38	1989.67	0.22
Salt	199.86	20_year	82000.00	931.12	944.20	939.78	944.57	0.000704	5.45	18696.44	3005.41	0.29
Salt	199.86	100_year	162000.00	931.12	948.65	942.01	949.10	0.000623	6.47	34763.57	6462.89	0.29
Salt	199.98	5_year	19500.00	932.56	940.30	936.73	940.52	0.000526	3.74	5208.34	1780.86	0.27
Salt	199.98	20_year	82000.00	932.56	944.56	940.84	945.09	0.000825	6.61	17443.05	2418.89	0.37
Salt	199.98	100_year	162000.00	932.56	948.88	943.01	949.61	0.000791	8.22	32013.03	6461.07	0.38
Salt	200.02	5_year	19500.00	931.98	940.46	936.22	940.63	0.000413	3.28	5945.69	1744.53	0.23
Salt	200.02	20_year	82000.00	931.98	944.83	940.24	945.25	0.000701	5.88	18145.47	2623.80	0.31
Salt	200.02	100_year	162000.00	931.98	949.25	943.66	949.78	0.000647	7.04	34520.60	6323.59	0.32
Salt	200.11	5_year	19500.00	931.98	940.66	936.37	940.85	0.000509	3.41	5711.38	1443.51	0.23
Salt	200.11	20_year	82000.00	931.98	945.14	940.56	945.60	0.000759	5.84	16653.34	2077.95	0.31
Salt	200.11	100_year	162000.00	931.98	949.53	943.84	950.13	0.000786	7.41	31331.41	6488.49	0.33
Salt	200.22	5_year	19500.00	931.78	940.98	935.21	941.12	0.000431	2.94	6625.85	1427.99	0.19
Salt	200.22	20_year	82000.00	931.78	945.62	939.93	946.06	0.000819	5.56	18334.97	2661.80	0.28
Salt	200.22	100_year	162000.00	931.78	950.04	943.67	950.62	0.000866	7.05	34006.49	6976.06	0.31
Salt	200.31	5_year	19500.00	931.67	941.17	936.20	941.35	0.000519	3.40	5734.52	1523.39	0.23
Salt	200.31	20_year	82000.00	931.67	945.99	941.09	946.44	0.000790	6.02	18592.53	2853.24	0.31
Salt	200.31	100_year	162000.00	931.67	950.40	945.01	951.02	0.000789	7.49	33835.84	5139.41	0.33
Salt	200.4	5_year	19500.00	931.55	941.41	936.82	941.59	0.000483	3.38	5763.97	1519.09	0.23
Salt	200.4	20_year	82000.00	931.55	946.38	941.20	946.81	0.000751	5.97	19147.19	3147.44	0.31
Salt	200.4	100_year	162000.00	931.55	950.87	945.06	951.37	0.000648	6.89	35556.10	4243.29	0.30
Salt	200.47	5_year	19500.00	931.67	941.62	937.42	941.80	0.000548	3.43	5691.15	1610.27	0.24
Salt	200.47	20_year	82000.00	931.67	946.71	941.63	947.13	0.000732	5.81	18852.72	2790.06	0.30
Salt	200.47	100_year	162000.00	931.67	951.15	945.35	951.66	0.000655	6.84	33798.85	4181.19	0.30
Salt	200.52	5_year	19500.00	932.45	941.75	937.38	941.93	0.000592	3.46	5642.57	1434.52	0.25
Salt	200.52	20_year	82000.00	932.45	946.89	941.89	947.31	0.000755	5.82	17967.79	2817.28	0.31
Salt	200.52	100_year	162000.00	932.45	951.31	945.50	951.81	0.000650	6.73	32810.22	4127.83	0.30
Salt	200.6	5_year	19500.00	932.82	942.05	938.77	942.30	0.001230	4.01	4865.23	1410.74	0.30
Salt	200.6	20_year	82000.00	932.82	947.27	943.01	947.72	0.001181	6.12	17544.38	2876.95	0.33
Salt	200.6	100_year	162000.00	932.82	951.65	945.88	952.15	0.000914	6.76	32637.25	4233.27	0.31
Salt	200.68	5_year	19500.00	937.28	942.66	941.81	943.41	0.005243	6.96	2803.05	1531.44	0.66
Salt	200.68	20_year	82000.00	937.28	947.81	944.51	948.40	0.001788	7.41	17311.38	2972.92	0.45
Salt	200.68	100_year	162000.00	937.28	952.00	947.28	952.70	0.001346	8.41	31463.17	4192.40	0.42
Salt	200.75	5_year	19500.00	937.28	944.50	943.89	945.66	0.005791	8.62	2261.70	2002.12	0.82
Salt	200.75	20_year	82000.00	937.28	948.55	947.01	949.28	0.002485	8.62	17056.06	3059.85	0.59
Salt	200.75	100_year	162000.00	937.28	952.46	948.51	953.37	0.001751	9.88	30984.44	4263.47	0.54
Salt	200.83	5_year	19500.00	937.28	946.18	943.25	946.47	0.000872	4.30	4539.50	2505.29	0.34
Salt	200.83	20_year	82000.00	937.28	949.50	947.52	949.94	0.001026	6.42	19198.41	3366.28	0.40
Salt	200.83	100_year	162000.00	937.28	953.35	948.72	953.88	0.000814	7.38	33519.65	4226.41	0.38
Salt	200.88	5_year	19500.00	938.71	946.43	944.00	946.80	0.001300	4.87	4007.52	2192.80	0.40
Salt	200.88	20_year	82000.00	938.71	949.80	948.01	950.25	0.001141	6.49	17913.24	3282.92	0.41
Salt	200.88	100_year	162000.00	938.71	953.58	948.67	954.13	0.000905	7.46	31794.91	3873.37	0.39
Salt	200.95	5_year	19500.00	938.69	946.87	945.40	947.58	0.002895	6.76	2885.81	2127.66	0.59
Salt	200.95	20_year	82000.00	938.69	950.19	948.98	950.85	0.002013	8.13	16837.23	3446.32	0.54
Salt	200.95	100_year	162000.00	938.69	953.85	950.37	954.60	0.001472	9.05	30268.13	3837.08	0.49
Salt	201.01	5_year	19500.00	938.69	947.86	946.53	948.54	0.002898	6.61	2951.49	2215.65	0.59
Salt	201.01	20_year	82000.00	938.69	950.98	949.50	951.54	0.002129	7.58	17248.11	3562.53	0.54
Salt	201.01	100_year	162000.00	938.69	954.39	950.90	955.11	0.001570	8.75	29888.27	3908.05	0.50
Salt	201.1	5_year	19500.00	942.17	949.54	948.90	950.41	0.005457	7.48	2608.21	2916.75	0.73
Salt	201.1	20_year	82000.00	942.17	952.15	950.62	952.79	0.003256	8.28	18591.67	3821.35	0.62
Salt	201.1	100_year	162000.00	942.17	955.20	952.33	956.06	0.002450	9.62	30314.75	3879.44	0.58

HEC-RAS Plan: TRPED Full M River: Salt Reach: Salt (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)	
Salt	201.16	5_year	19500.00	943.39	950.79	948.66	951.10	0.001134	4.41	4424.96	3300.81	0.37
Salt	201.16	20_year	82000.00	943.39	953.01	951.50	953.29	0.000926	5.25	21368.96	3673.90	0.36
Salt	201.16	100_year	162000.00	943.39	956.06	951.52	956.53	0.000963	6.92	32588.49	3784.80	0.39
Salt	201.2	5_year	19500.00	942.38	950.95	948.89	951.57	0.002558	6.29	3098.20	2795.09	0.56
Salt	201.2	20_year	82000.00	942.38	953.21	951.79	953.58	0.001466	6.32	19078.63	3520.58	0.45
Salt	201.2	100_year	162000.00	942.38	956.24	952.05	956.84	0.001479	8.29	29928.21	3851.08	0.48
Salt	201.26	5_year	19500.00	942.38	951.82	950.42	952.76	0.004248	7.80	2498.56	2234.86	0.71
Salt	201.26	20_year	82000.00	942.38	953.79	952.31	954.32	0.002771	7.11	15129.98	3270.26	0.59
Salt	201.26	100_year	162000.00	942.38	956.73	953.43	957.55	0.002382	9.17	25100.57	3723.78	0.59
Salt	201.33	5_year	19500.00	942.38	953.37	950.73	954.01	0.002914	6.41	3041.88	2654.99	0.59
Salt	201.33	20_year	82000.00	942.38	954.77	953.85	955.36	0.003095	7.89	15754.24	3071.00	0.63
Salt	201.33	100_year	162000.00	942.38	957.54	954.31	958.56	0.003120	10.65	24841.64	3601.16	0.68
Salt	201.41	5_year	19500.00	942.38	954.49	950.68	954.74	0.001076	4.02	4851.03	2986.31	0.32
Salt	201.41	20_year	82000.00	942.38	955.93	954.93	956.29	0.001590	5.80	18419.61	3175.58	0.41
Salt	201.41	100_year	162000.00	942.38	958.92	955.06	959.50	0.001571	7.45	28270.40	4108.11	0.43
Salt	201.48	5_year	19500.00	943.46	954.90	951.10	955.14	0.001136	3.93	4961.97	2731.80	0.29
Salt	201.48	20_year	82000.00	943.46	956.52	955.27	956.85	0.001612	5.51	18728.20	2977.51	0.36
Salt	201.48	100_year	162000.00	943.46	959.52	955.27	960.10	0.001831	7.42	28331.03	3966.21	0.41
Salt	201.54	5_year	19500.00	944.01	955.18	951.74	955.47	0.000731	4.36	4474.15	2620.24	0.32
Salt	201.54	20_year	82000.00	944.01	956.94	955.75	957.37	0.001215	6.67	17988.42	2842.37	0.43
Salt	201.54	100_year	162000.00	944.01	959.97	955.75	960.70	0.001380	8.88	27315.73	3918.73	0.48
Salt	201.62	5_year	19500.00	944.97	955.48	951.46	955.73	0.000558	3.98	4902.92	2717.32	0.28
Salt	201.62	20_year	82000.00	944.97	957.40	956.31	957.83	0.001110	6.70	19154.65	3138.58	0.41
Salt	201.62	100_year	162000.00	944.97	960.53	956.31	961.22	0.001189	8.61	29204.50	3744.01	0.45
Salt	201.7	5_year	19500.00	945.11	955.78	951.83	956.05	0.001002	4.23	4607.79	2727.14	0.31
Salt	201.7	20_year	82000.00	945.11	957.97	956.36	958.53	0.002022	7.44	18030.37	3286.02	0.46
Salt	201.7	100_year	162000.00	945.11	961.13	957.43	961.93	0.002018	9.27	28511.23	3501.31	0.49
Salt	201.81	5_year	19500.00	945.11	956.20	951.58	956.36	0.000311	3.19	6175.73	2733.06	0.21
Salt	201.81	20_year	82000.00	945.11	958.83	955.74	959.17	0.000662	5.76	21037.93	3281.41	0.33
Salt	201.81	100_year	162000.00	945.11	962.08	957.94	962.65	0.000786	7.62	31938.86	3881.06	0.37
Salt	201.89	5_year	19500.00	946.82	956.33	952.20	956.51	0.000401	3.35	5828.03	2641.14	0.24
Salt	201.89	20_year	82000.00	946.82	959.04	956.32	959.50	0.000812	5.99	16102.58	3093.47	0.36
Salt	201.89	100_year	162000.00	946.82	962.26	958.33	963.08	0.001000	8.19	24579.09	3785.30	0.42
Salt	201.96	5_year	19500.00	946.20	956.53	952.42	956.72	0.000805	3.45	5654.35	2149.67	0.25
Salt	201.96	20_year	82000.00	946.20	959.38	956.74	959.95	0.001640	6.31	14076.78	2806.84	0.38
Salt	201.96	100_year	162000.00	946.20	962.73	958.77	963.54	0.001608	7.78	23554.44	3529.82	0.40
Salt	202.01	5_year	19500.00	946.85	956.71	952.46	956.92	0.000813	3.64	5363.02	2186.11	0.26
Salt	202.01	20_year	82000.00	946.85	959.69	957.02	960.40	0.001818	6.98	13737.14	3058.82	0.40
Salt	202.01	100_year	162000.00	946.85	962.96	959.53	964.05	0.001985	8.91	22511.96	3605.82	0.44
Salt	202.06	5_year	19500.00	947.33	956.91	953.31	957.17	0.000949	4.11	4747.22	2669.84	0.31
Salt	202.06	20_year	82000.00	947.33	960.23	958.01	960.89	0.001647	7.28	15241.00	3313.40	0.43
Salt	202.06	100_year	162000.00	947.33	963.52	959.72	964.57	0.001816	9.47	24450.44	4035.19	0.48
Salt	202.11	5_year	19500.00	948.26	957.09	953.76	957.40	0.000771	4.48	4352.29	1813.52	0.33
Salt	202.11	20_year	82000.00	948.26	960.55	958.11	961.30	0.001397	8.16	15267.53	3065.28	0.47
Salt	202.11	100_year	162000.00	948.26	964.08	960.95	964.97	0.001237	9.49	27991.78	4093.80	0.47
Salt	202.18	5_year	19500.00	946.86	957.35	953.68	957.67	0.000694	4.48	4356.58	1583.44	0.31
Salt	202.18	20_year	82000.00	946.86	961.03	958.48	961.78	0.001262	8.07	14645.31	2947.38	0.45
Salt	202.18	100_year	162000.00	946.86	964.52	961.41	965.40	0.001149	9.42	27257.09	4125.91	0.45
Salt	202.24	5_year	19500.00	948.09	957.65	955.42	958.12	0.002422	5.52	3532.09	1620.95	0.44
Salt	202.24	20_year	82000.00	948.09	961.64	959.39	962.39	0.002698	7.70	12990.90	2935.22	0.50
Salt	202.24	100_year	162000.00	948.09	965.09	962.11	965.92	0.002085	8.70	25137.19	4200.07	0.47
Salt	202.32	5_year	19500.00	950.65	958.69	956.73	959.04	0.002141	4.80	4062.98	1926.85	0.41
Salt	202.32	20_year	82000.00	950.65	962.77	960.01	963.24	0.001613	6.49	17435.38	3420.47	0.39
Salt	202.32	100_year	162000.00	950.65	966.02	962.05	966.64	0.001484	7.74	29966.48	4293.68	0.40
Salt	202.4	5_year	19500.00	952.19	959.77	959.31	960.85	0.008108	8.33	2342.18	1913.27	0.82
Salt	202.4	20_year	82000.00	952.19	963.54	962.27	964.31	0.003476	8.90	16242.47	3155.75	0.60

HEC-RAS Plan: TRPED Full M River: Salt Reach: Salt (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)	
Salt	202.4	100_year	162000.00	952.19	966.57	963.75	967.73	0.003368	11.23	27037.59	3887.28	0.63
Salt	202.48	5_year	19500.00	953.23	962.34	961.36	963.06	0.003446	6.79	2872.16	2313.32	0.63
Salt	202.48	20_year	82000.00	953.23	965.00	963.76	965.64	0.002696	8.36	18151.35	3368.76	0.61
Salt	202.48	100_year	162000.00	953.23	967.94	963.91	969.04	0.002757	11.07	28887.95	5596.38	0.66
Salt	202.54	5_year	19500.00	953.49	963.35	961.65	963.91	0.002036	5.96	3272.05	2868.31	0.50
Salt	202.54	20_year	82000.00	953.49	965.87	964.31	966.35	0.001794	7.47	20282.22	3139.93	0.51
Salt	202.54	100_year	162000.00	953.49	968.95	964.31	969.81	0.001999	10.12	31293.72	6064.78	0.57
Salt	202.61	5_year	19500.00	955.76	964.28	963.05	964.90	0.003264	6.30	3094.21	3342.68	0.61
Salt	202.61	20_year	82000.00	955.76	966.63	965.51	967.08	0.002034	7.09	18952.87	3564.16	0.52
Salt	202.61	100_year	162000.00	955.76	969.75	965.51	970.60	0.002134	9.73	30104.62	6858.99	0.58
Salt	202.69	5_year	19500.00	958.23	965.40	963.26	965.76	0.001372	4.77	4087.62	2680.79	0.41
Salt	202.69	20_year	82000.00	958.23	967.39	966.61	967.81	0.001546	6.55	18130.79	2861.86	0.46
Salt	202.69	100_year	162000.00	958.23	970.65	966.61	971.35	0.001514	8.61	29598.46	6150.90	0.49
Salt	202.78	5_year	19500.00	956.08	966.05	962.32	966.29	0.000858	3.95	4932.60	2945.71	0.27
Salt	202.78	20_year	82000.00	956.08	968.14	966.71	968.54	0.001481	6.27	18571.43	3196.12	0.38
Salt	202.78	100_year	162000.00	956.08	971.52	966.92	972.08	0.001424	7.68	30916.34	5157.06	0.39
Salt	202.85	5_year	19500.00	953.44	966.32	962.86	966.64	0.000894	4.53	4305.15	2739.74	0.34
Salt	202.85	20_year	82000.00	953.44	968.62	967.51	969.06	0.001279	6.80	19606.50	3158.68	0.44
Salt	202.85	100_year	162000.00	953.44	971.94	967.51	972.64	0.001335	8.86	31012.89	5281.17	0.47
Salt	202.97	5_year	19500.00	957.32	966.93	962.84	967.21	0.000922	4.25	4588.05	2801.87	0.34
Salt	202.97	20_year	82000.00	957.32	969.39	968.21	969.81	0.001189	6.37	18394.19	3182.58	0.42
Salt	202.97	100_year	162000.00	957.32	972.76	968.21	973.42	0.001163	8.13	29542.79	5151.26	0.44
Salt	203.1	5_year	19500.00	955.78	967.56	963.02	967.83	0.000848	4.19	4653.91	2433.57	0.32
Salt	203.1	20_year	82000.00	955.78	970.24	969.00	970.70	0.001311	6.52	17487.69	2981.95	0.42
Salt	203.1	100_year	162000.00	955.78	973.59	969.35	974.28	0.001246	8.17	27956.17	5109.08	0.44
Salt	203.2	5_year	19500.00	955.00	968.05	965.40	968.52	0.001676	5.49	3553.19	2229.29	0.44
Salt	203.2	20_year	82000.00	955.00	971.00	969.51	971.78	0.002450	8.71	16163.85	3232.69	0.56
Salt	203.2	100_year	162000.00	955.00	974.26	971.39	975.31	0.002219	10.57	27159.68	5069.18	0.57
Salt	203.3	5_year	19500.00	955.59	968.97	965.23	969.23	0.001137	4.06	4803.24	2096.46	0.31
Salt	203.3	20_year	82000.00	955.59	972.32	970.04	972.86	0.001820	6.89	17270.23	4147.15	0.42
Salt	203.3	100_year	162000.00	955.59	975.56	971.68	976.37	0.001908	8.76	28749.96	5891.07	0.45
Salt	203.38	5_year	19500.00	955.24	969.50	966.58	969.74	0.001119	3.92	4979.09	1987.38	0.30
Salt	203.38	20_year	82000.00	955.24	973.08	970.40	973.67	0.001678	6.80	16426.12	3426.42	0.40
Salt	203.38	100_year	162000.00	955.24	976.34	972.53	977.24	0.001807	8.70	27751.95	6470.18	0.44
Salt	203.48	5_year	19500.00	958.17	969.91	966.63	970.16	0.000625	3.96	4929.69	1656.65	0.29
Salt	203.48	20_year	82000.00	958.17	973.68	970.75	974.34	0.001026	7.09	16439.06	3360.83	0.41
Salt	203.48	100_year	162000.00	958.17	976.97	972.98	978.05	0.001242	9.51	27635.68	6925.52	0.47

HEC-RAS Plan: TRPED Full M River: Gila Reach: Upper Gila

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)	
Upper Gila	0.00	5_year	4000.00	931.64	938.64	934.18	938.71	0.000235	2.14	1867.14	1278.67	0.15
Upper Gila	0.00	20_year	10000.00	931.64	941.30	935.76	941.32	0.000066	1.43	8729.84	1291.08	0.09
Upper Gila	0.00	100_year	65000.00	931.64	946.25	939.96	946.55	0.000461	5.13	15215.27	1314.86	0.25
Upper Gila	0.06	5_year	4000.00	931.64	938.72	935.13	938.83	0.000452	2.60	1541.08	1537.42	0.21
Upper Gila	0.06	20_year	10000.00	931.64	941.32	936.99	941.34	0.000106	1.67	9804.38	1645.97	0.11
Upper Gila	0.06	100_year	65000.00	931.64	946.44	939.77	946.70	0.000614	5.69	18317.68	1667.38	0.28
Upper Gila	0.12	5_year	4000.00	931.86	938.86	935.15	938.98	0.000564	2.78	1439.97	1566.75	0.23
Upper Gila	0.12	20_year	10000.00	931.86	941.35	937.33	941.38	0.000164	1.96	9549.35	1878.44	0.13
Upper Gila	0.12	100_year	65000.00	931.86	946.63	940.56	946.89	0.000698	5.91	20127.46	2019.40	0.30
Upper Gila	0.17	5_year	4000.00	931.82	939.02	934.96	939.09	0.000249	2.09	1916.82	1752.41	0.16
Upper Gila	0.17	20_year	10000.00	931.82	941.39	936.37	941.41	0.000090	1.58	11547.31	2174.71	0.10
Upper Gila	0.17	100_year	65000.00	931.82	946.83	940.26	947.02	0.000411	4.82	23676.88	2236.18	0.23
Upper Gila	0.22	5_year	4000.00	931.82	939.09	936.20	939.18	0.000479	2.40	1665.10	2192.08	0.21
Upper Gila	0.22	20_year	10000.00	931.82	941.41	937.56	941.43	0.000109	1.54	12261.33	2434.32	0.11
Upper Gila	0.22	100_year	65000.00	931.82	946.95	940.08	947.12	0.000443	4.67	26018.16	2495.01	0.24
Upper Gila	0.27	5_year	4000.00	931.86	939.20	934.56	939.27	0.000270	2.03	1970.52	2555.03	0.16
Upper Gila	0.27	20_year	10000.00	931.86	941.44	936.25	941.45	0.000070	1.32	14070.23	2818.24	0.09
Upper Gila	0.27	100_year	65000.00	931.86	947.08	940.47	947.21	0.000294	3.98	29579.76	2848.19	0.20
Upper Gila	0.35	5_year	4000.00	931.88	939.32	935.01	939.36	0.000184	1.73	2316.68	3026.42	0.13
Upper Gila	0.35	20_year	10000.00	931.88	941.47	936.58	941.48	0.000051	1.15	15735.91	3253.36	0.07
Upper Gila	0.35	100_year	65000.00	931.88	947.21	940.52	947.30	0.000192	3.26	34701.88	3364.13	0.16
Upper Gila	0.40	5_year	4000.00	931.88	939.37	936.01	939.47	0.000660	2.53	1581.96	2707.58	0.21
Upper Gila	0.40	20_year	10000.00	931.88	941.48	937.75	941.50	0.000171	1.67	11552.84	3398.29	0.12
Upper Gila	0.40	100_year	65000.00	931.88	947.28	941.21	947.37	0.000393	3.89	32608.58	3884.76	0.20
Upper Gila	0.44	5_year	4000.00	931.88	939.48	936.64	939.68	0.001072	3.59	1114.99	2121.73	0.35
Upper Gila	0.44	20_year	10000.00	931.88	941.51	939.17	941.55	0.000206	2.14	9511.37	3331.71	0.16
Upper Gila	0.44	100_year	65000.00	931.88	947.33	941.54	947.46	0.000355	4.60	32987.38	4225.03	0.24
Upper Gila	0.49	5_year	4000.00	931.89	939.77	936.48	940.02	0.001618	4.06	985.89	1487.57	0.42
Upper Gila	0.49	20_year	10000.00	931.89	941.56	939.84	941.61	0.000339	2.53	8005.09	3273.60	0.21
Upper Gila	0.49	100_year	65000.00	931.89	947.44	942.11	947.55	0.000339	4.36	31391.45	4280.03	0.24
Upper Gila	0.53	5_year	4000.00	931.89	940.05	935.12	940.19	0.000395	2.98	1340.31	1945.81	0.23
Upper Gila	0.53	20_year	10000.00	931.89	941.62	937.32	941.67	0.000254	2.42	9267.25	3091.84	0.18
Upper Gila	0.53	100_year	65000.00	931.89	947.49	941.81	947.63	0.000411	5.01	32410.28	4443.48	0.26
Upper Gila	0.59	5_year	4000.00	931.89	940.15	937.22	940.46	0.001537	4.50	888.68	2082.64	0.42
Upper Gila	0.59	20_year	10000.00	931.89	941.73	940.31	941.81	0.000755	3.31	8089.50	3217.88	0.30
Upper Gila	0.59	100_year	65000.00	931.89	947.64	942.88	947.78	0.000498	4.99	32048.29	4500.11	0.28
Upper Gila	0.64	5_year	4000.00	931.89	940.64	936.88	940.84	0.001086	3.60	1111.68	1786.25	0.28
Upper Gila	0.64	20_year	10000.00	931.89	941.95	939.52	942.06	0.000831	3.49	6238.82	2581.78	0.25
Upper Gila	0.64	100_year	65000.00	931.89	947.83	943.35	947.98	0.000814	5.38	29597.93	4335.43	0.28
Upper Gila	0.69	5_year	4000.00	931.89	940.91	936.55	941.04	0.000523	2.80	1427.19	1939.69	0.25
Upper Gila	0.69	20_year	10000.00	931.89	942.13	939.60	942.20	0.000390	2.88	7074.10	2758.82	0.22
Upper Gila	0.69	100_year	65000.00	931.89	947.99	943.29	948.10	0.000275	4.03	31391.01	4661.18	0.21
Upper Gila	0.74	5_year	4000.00	931.89	941.04	937.37	941.20	0.000876	3.14	1274.85	1379.22	0.28
Upper Gila	0.74	20_year	10000.00	931.89	942.23	940.12	942.33	0.000691	3.28	5175.02	2286.44	0.26
Upper Gila	0.74	100_year	65000.00	931.89	948.07	943.82	948.18	0.000387	4.08	28663.22	4556.58	0.22
Upper Gila	0.80	5_year	4000.00	931.96	941.24	935.59	941.34	0.000252	2.53	1582.03	1061.94	0.16
Upper Gila	0.80	20_year	10000.00	931.96	942.38	937.69	942.48	0.000352	3.17	5486.37	1934.51	0.20
Upper Gila	0.80	100_year	65000.00	931.96	948.18	943.69	948.32	0.000459	5.02	29365.84	4847.75	0.24
Upper Gila	0.86	5_year	4000.00	932.03	941.23	937.01	941.51	0.000606	4.28	935.60	746.81	0.29
Upper Gila	0.86	20_year	10000.00	932.03	942.45	939.83	942.71	0.001034	5.14	3951.84	1341.00	0.37
Upper Gila	0.86	100_year	65000.00	932.03	948.33	945.72	948.54	0.000830	6.34	25541.51	4816.32	0.36
Upper Gila	0.91	5_year	4000.00	932.10	941.49	936.69	941.68	0.000546	3.48	1150.00	713.42	0.24
Upper Gila	0.91	20_year	10000.00	932.10	942.75	939.16	942.97	0.000797	4.57	4149.24	1266.61	0.29
Upper Gila	0.91	100_year	65000.00	932.10	948.59	945.46	948.79	0.000864	5.78	23001.34	4196.77	0.32
Upper Gila	0.96	5_year	4000.00	932.50	941.61	936.90	941.85	0.000644	3.98	1006.09	408.83	0.26
Upper Gila	0.96	20_year	10000.00	932.50	942.88	939.66	943.27	0.001140	5.77	2636.28	851.89	0.35
Upper Gila	0.96	100_year	65000.00	932.50	948.82	946.08	949.13	0.001517	7.26	21708.89	4059.00	0.42

HEC-RAS Plan: TRPED Full M River: Gila Reach: Upper Gila (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)	
Upper Gila	1.02	5_year	4000.00	932.50	941.85	937.80	942.16	0.001199	4.41	906.65	226.07	0.30
Upper Gila	1.02	20_year	10000.00	932.50	943.34	940.62	943.89	0.002597	6.51	1891.02	798.60	0.45
Upper Gila	1.02	100_year	65000.00	932.50	949.40	946.64	949.71	0.001801	7.53	22825.96	4397.47	0.41
Upper Gila	1.09	5_year	4000.00	933.01	942.33	938.30	942.56	0.000988	3.90	1025.93	499.46	0.30
Upper Gila	1.09	20_year	10000.00	933.01	944.22	941.49	944.55	0.001200	5.27	4095.43	2507.79	0.35
Upper Gila	1.09	100_year	65000.00	933.01	949.90	947.27	950.33	0.001438	8.55	24884.28	4938.43	0.43
Upper Gila	1.15	5_year	4000.00	933.19	942.56	937.80	942.83	0.000704	4.14	965.78	555.43	0.31
Upper Gila	1.15	20_year	10000.00	933.19	944.52	940.83	944.93	0.001036	5.89	4298.73	2209.70	0.38
Upper Gila	1.15	100_year	65000.00	933.19	950.22	948.12	950.82	0.001397	9.98	24522.37	4292.33	0.49
Upper Gila	1.21	5_year	4000.00	933.35	942.90	937.91	943.05	0.000586	3.15	1270.48	350.21	0.24
Upper Gila	1.21	20_year	10000.00	933.35	944.97	940.76	945.25	0.000839	4.64	3508.96	1875.25	0.30
Upper Gila	1.21	100_year	65000.00	933.35	950.93	947.64	951.15	0.000651	5.99	23240.79	4098.38	0.29
Upper Gila	1.28	5_year	4000.00	934.31	943.15	939.38	943.29	0.000898	2.95	1355.01	310.64	0.25
Upper Gila	1.28	20_year	10000.00	934.31	945.36	941.68	945.56	0.001078	3.94	3627.17	2332.08	0.29
Upper Gila	1.28	100_year	65000.00	934.31	951.18	947.30	951.31	0.000409	3.84	23374.99	4526.42	0.20
Upper Gila	1.35	5_year	4000.00	934.59	943.33	939.11	943.57	0.000516	3.96	1009.30	285.97	0.27
Upper Gila	1.35	20_year	10000.00	934.59	945.47	941.66	946.07	0.001056	6.62	2508.40	1783.33	0.40
Upper Gila	1.35	100_year	65000.00	934.59	951.25	948.45	951.56	0.000906	7.31	21026.51	3691.86	0.39
Upper Gila	1.41	5_year	4000.00	934.69	943.45	941.54	944.00	0.002810	5.94	673.52	275.30	0.56
Upper Gila	1.41	20_year	10000.00	934.69	945.83	944.38	946.69	0.002705	7.82	1951.82	1401.48	0.59
Upper Gila	1.41	100_year	65000.00	934.69	951.40	949.54	952.09	0.001906	10.22	19099.23	4509.11	0.55
Upper Gila	1.48	5_year	4000.00	934.79	944.27	940.59	944.46	0.000643	3.45	1160.72	454.39	0.25
Upper Gila	1.48	20_year	10000.00	934.79	946.89	942.67	947.24	0.000850	5.08	4064.78	1698.05	0.31
Upper Gila	1.48	100_year	65000.00	934.79	951.92	950.66	952.95	0.002353	11.54	19123.16	4948.83	0.55
Upper Gila	1.55	5_year	4000.00	935.19	944.57	939.81	944.71	0.000759	3.04	1315.01	710.62	0.26
Upper Gila	1.55	20_year	10000.00	935.19	947.33	942.14	947.51	0.000605	3.66	4769.87	1847.96	0.25
Upper Gila	1.55	100_year	65000.00	935.19	953.03	949.91	953.59	0.001305	8.14	25020.03	5973.74	0.41
Upper Gila	1.59	5_year	4000.00	935.42	944.68	940.05	944.84	0.000485	3.29	1216.24	179.30	0.22
Upper Gila	1.59	20_year	10000.00	935.42	947.36	942.40	947.70	0.000818	5.01	2780.96	1486.29	0.30
Upper Gila	1.59	100_year	65000.00	935.42	953.52	950.10	953.80	0.000723	6.75	21358.71	5583.51	0.31
Upper Gila	1.63	5_year	4000.00	935.65	944.80	940.20	944.97	0.000500	3.24	1235.06	187.48	0.22
Upper Gila	1.63	20_year	10000.00	935.65	947.55	942.46	947.91	0.000825	5.06	2572.37	1114.97	0.30
Upper Gila	1.63	100_year	65000.00	935.65	953.61	950.82	954.05	0.001087	8.19	22596.53	4979.16	0.37
Upper Gila	1.67	5_year	4000.00	935.89	944.90	940.84	945.09	0.000819	3.48	1149.57	191.09	0.25
Upper Gila	1.67	20_year	10000.00	935.89	947.73	943.19	948.09	0.001138	5.15	3251.92	2003.53	0.31
Upper Gila	1.67	100_year	65000.00	935.89	953.82	951.10	954.30	0.001532	8.57	25516.60	5522.38	0.40

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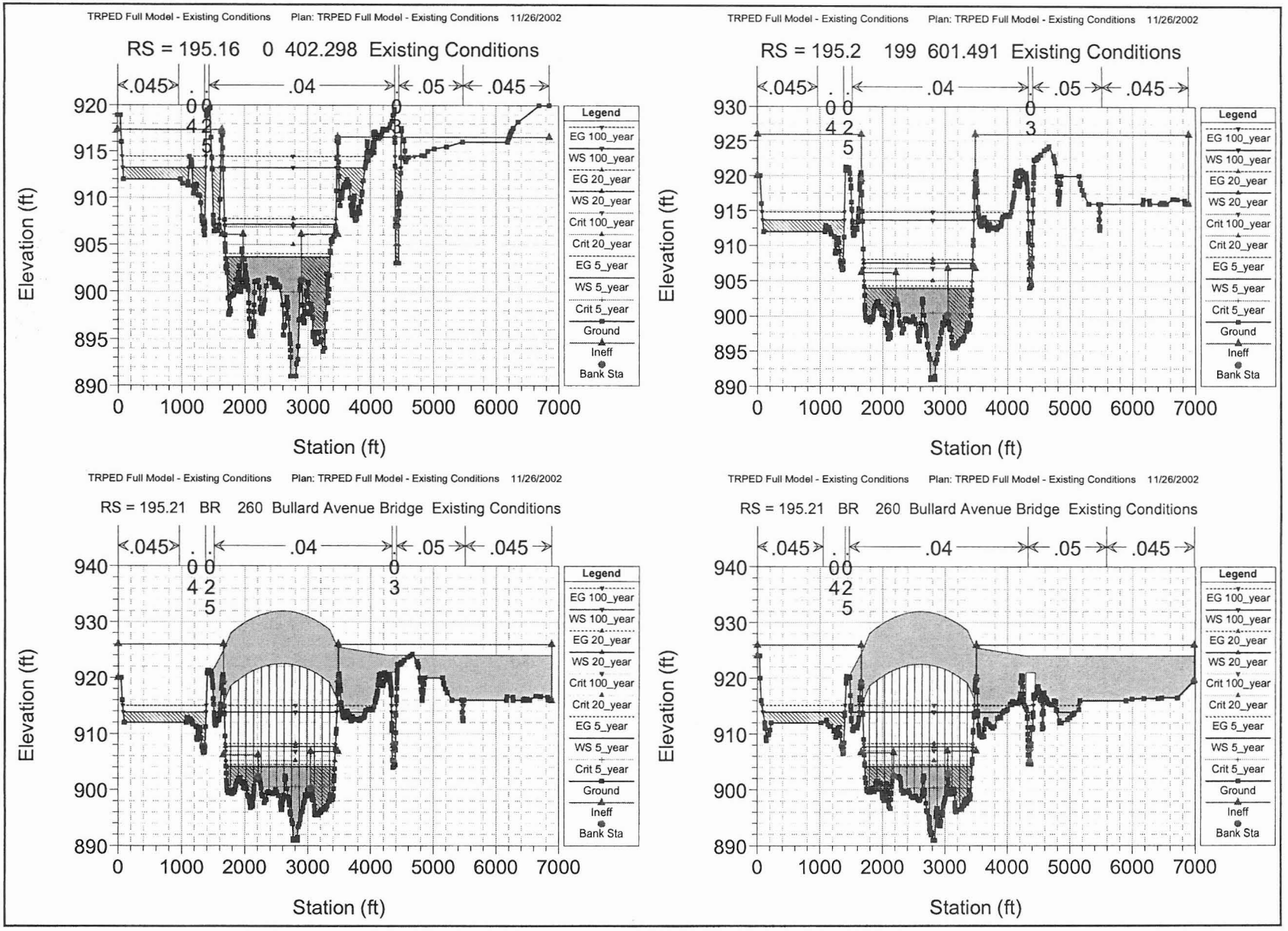
Cross Section Plots for the Lower Gila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.045
.04
.05
.045
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Station (ft)
Legend
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WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 195.2 199 601.491 Existing Conditions
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
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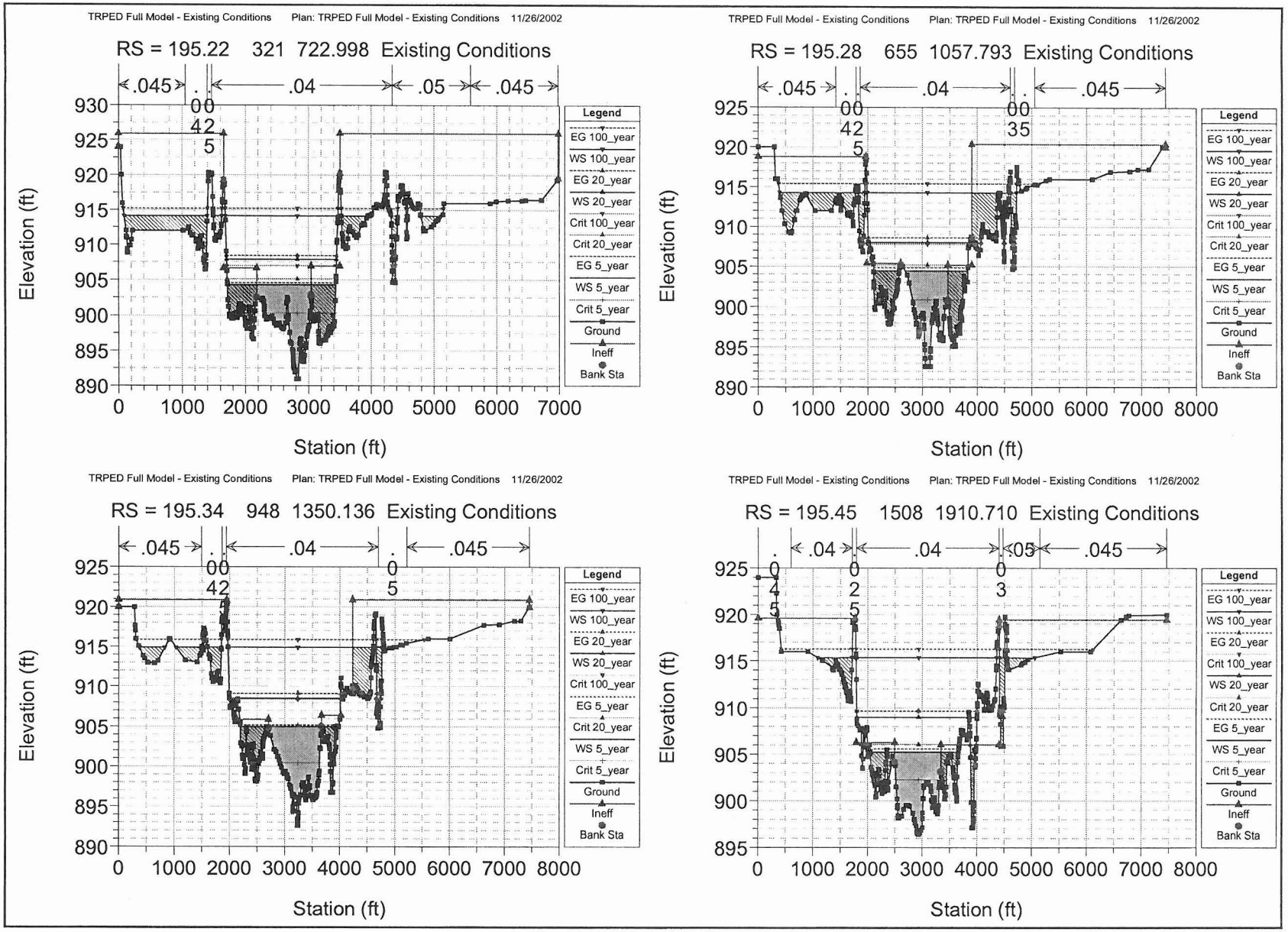
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 195.21 BR 260 Bullard Avenue Bridge Existing Conditions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Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 195.28 655 1057.793 Existing Conditions
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Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
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Elevation (ft)
Station (ft)
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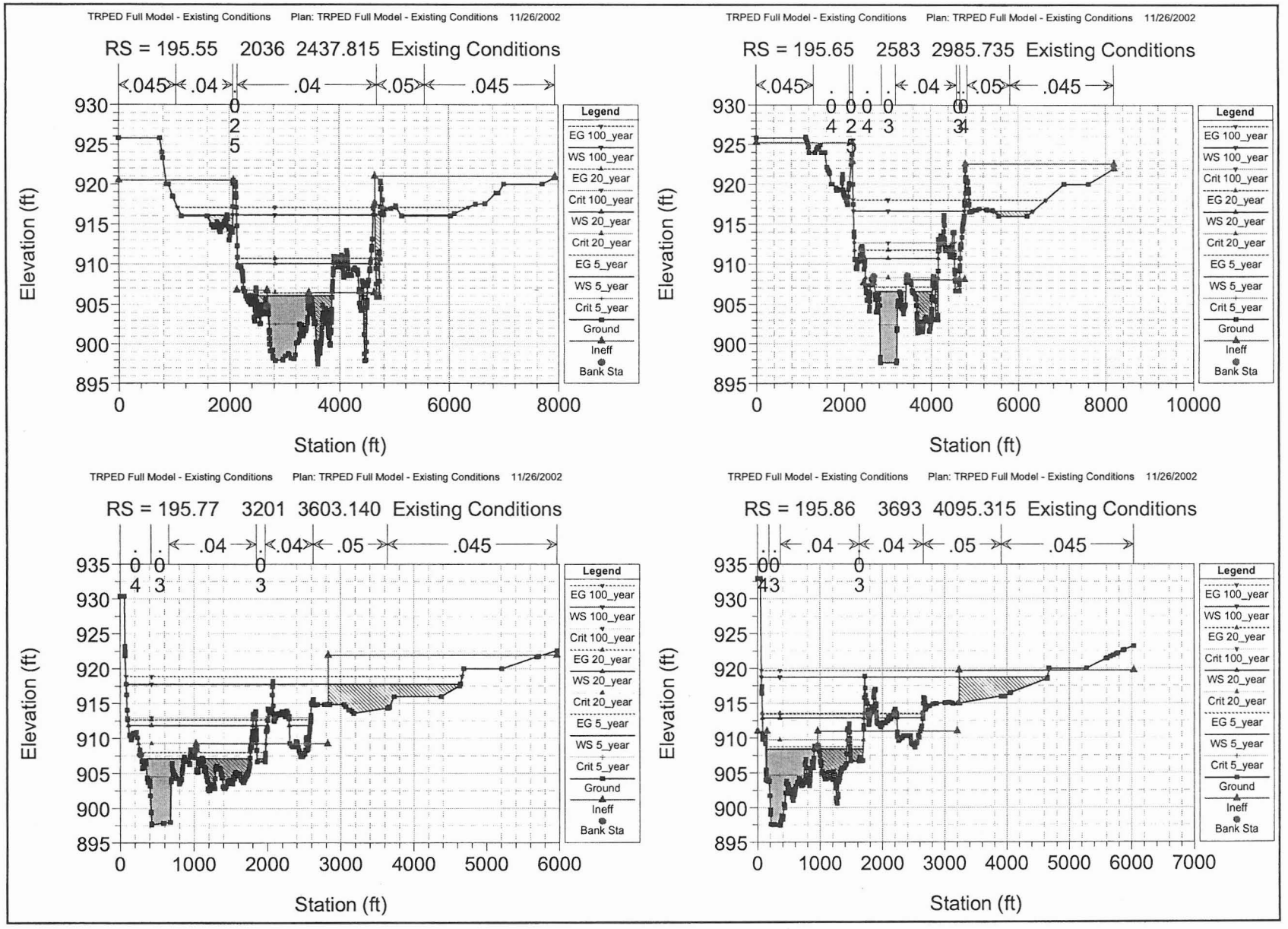
Elevation (ft)
Station (ft)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Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 195.65 2583 2985.735 Existing Conditions
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Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 195.77 3201 3603.140 Existing Conditions
.04 .04 .05 .045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
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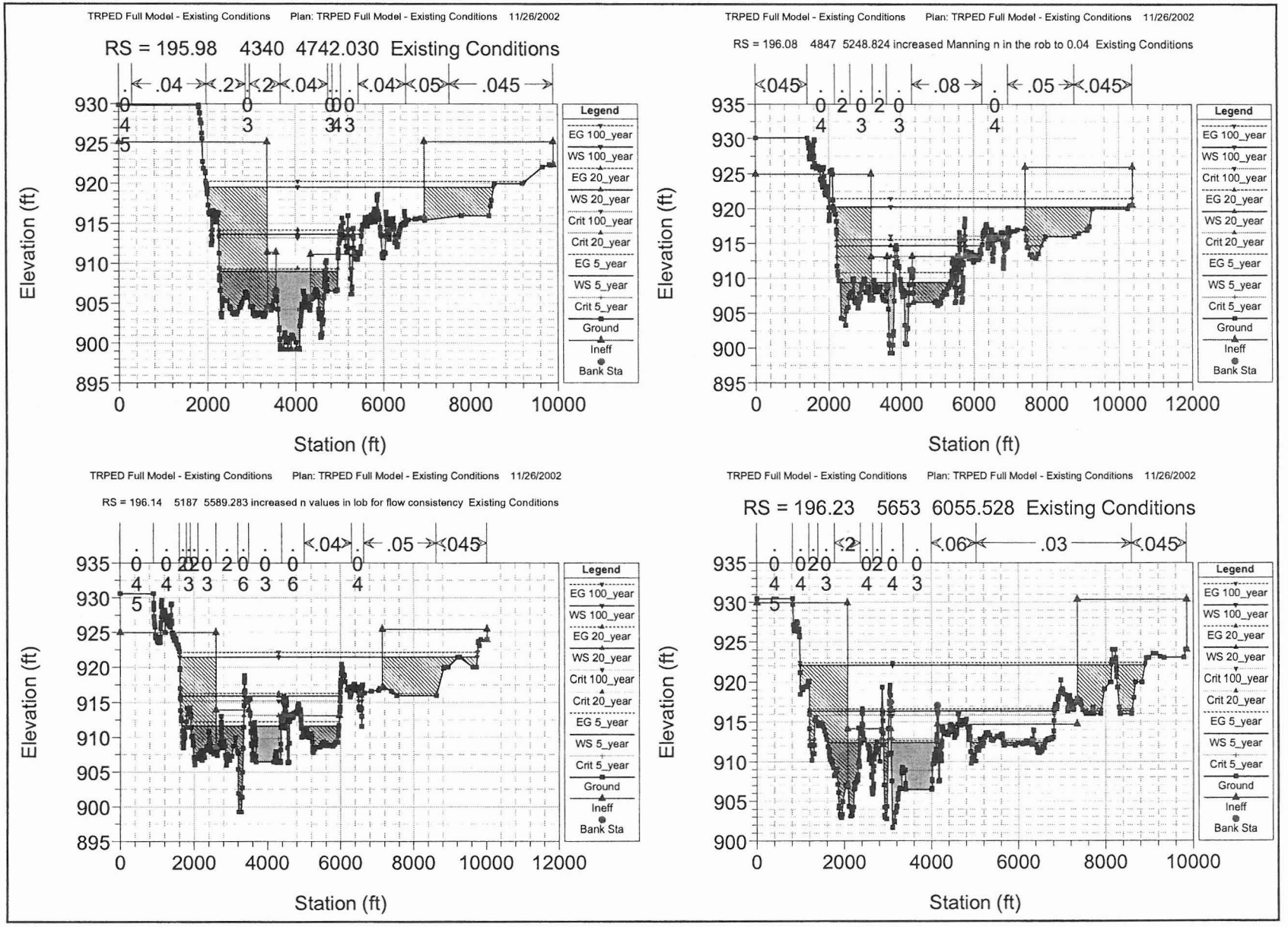
Elevation (ft)
Station (ft)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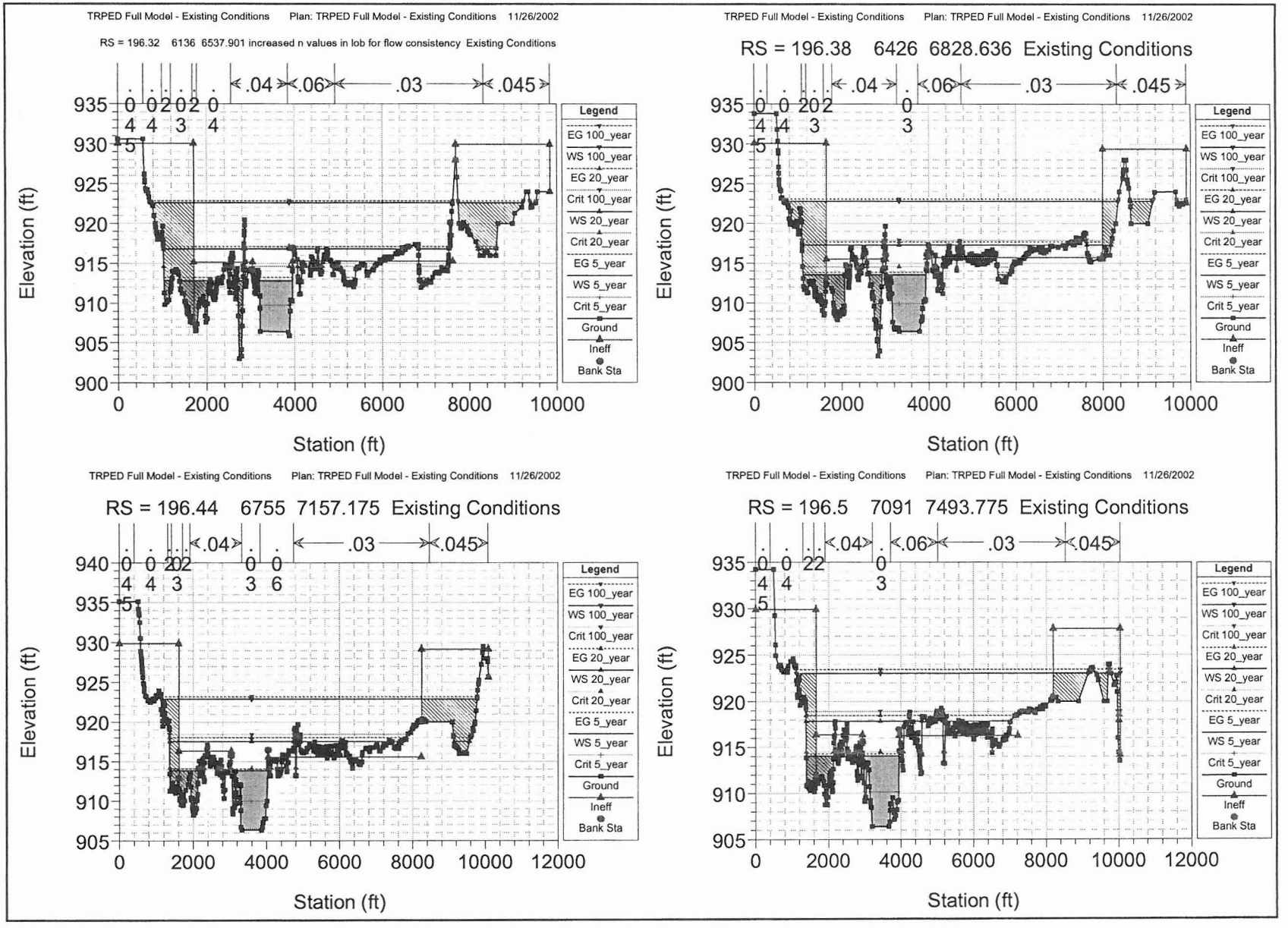
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.08 4847 5248.824 increased Manning n in the rob to 0.04 Existing Conditions
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.14 5187 5589.283 increased n values in lob for flow consistency Existing Conditions
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.23 5653 6055.528 Existing Conditions
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta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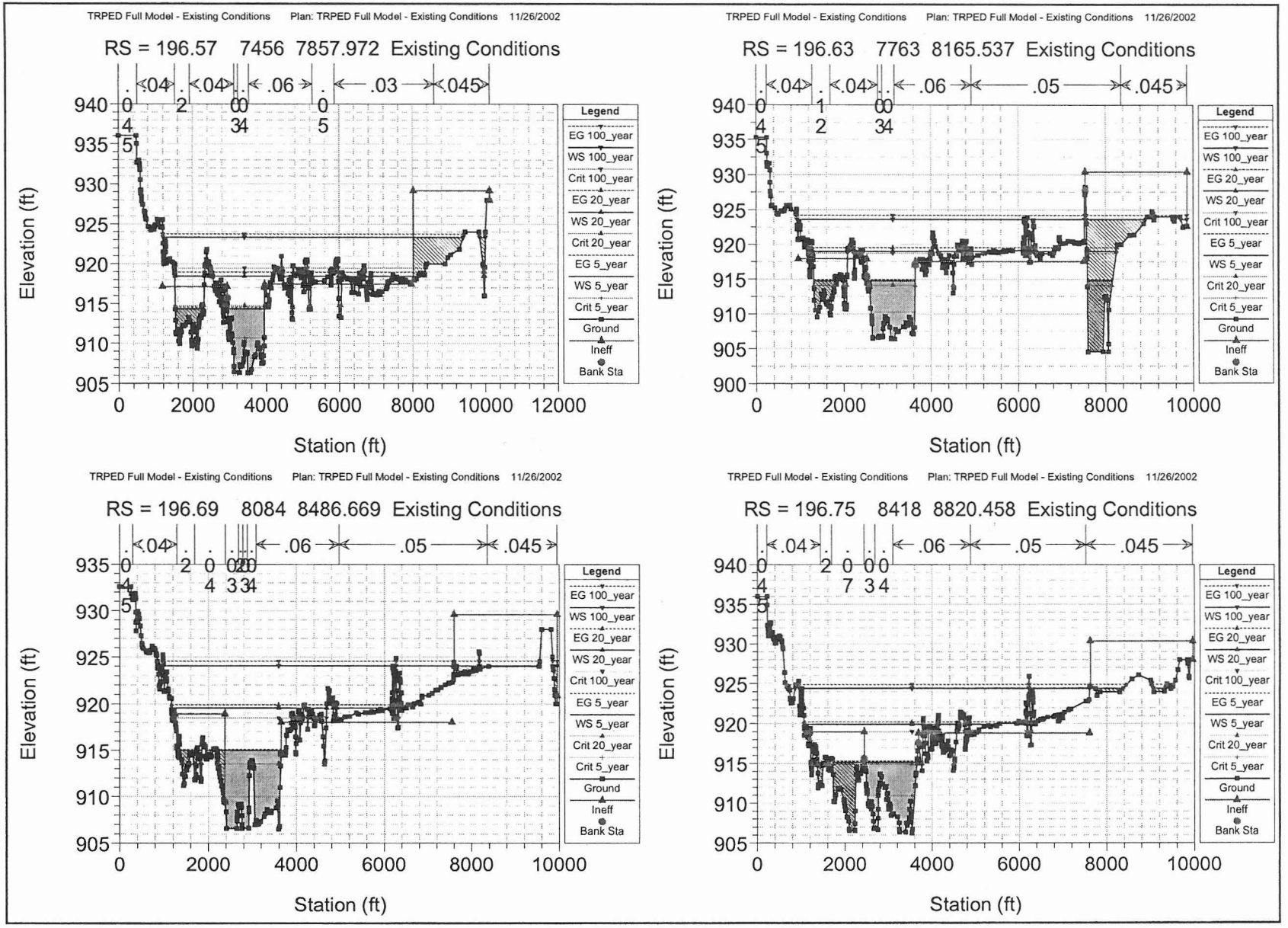
RS = 196.32 6136 6537.901 increased n values in lob for flow consistency Existing Conditions
.04
.06
.03
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.38 6426 6828.636 Existing Conditions
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.44 6755 7157.175 Existing Conditions
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.5 7091 7493.775 Existing Conditions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.04 .04 .06 .03 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.63 7763 8165.537 Existing Conditions
.04 .04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.69 8084 8486.669 Existing Conditions
.04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.75 8418 8820.458 Existing Conditions
.04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
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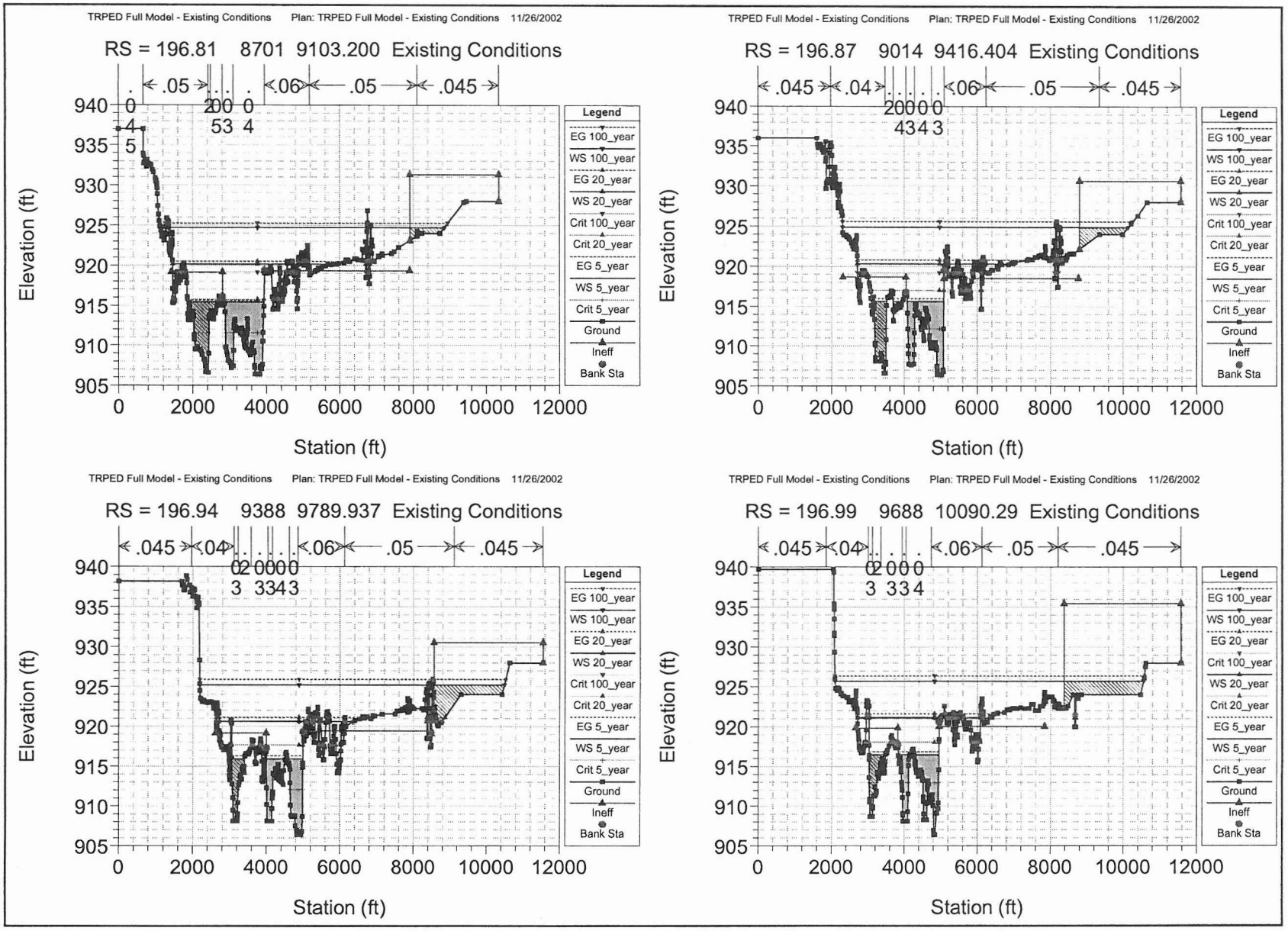
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta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RS = 196.81 8701 9103.200 Existing Conditions
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Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.87 9014 9416.404 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.94 9388 9789.937 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 196.99 9688 10090.29 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
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Crit 100_year
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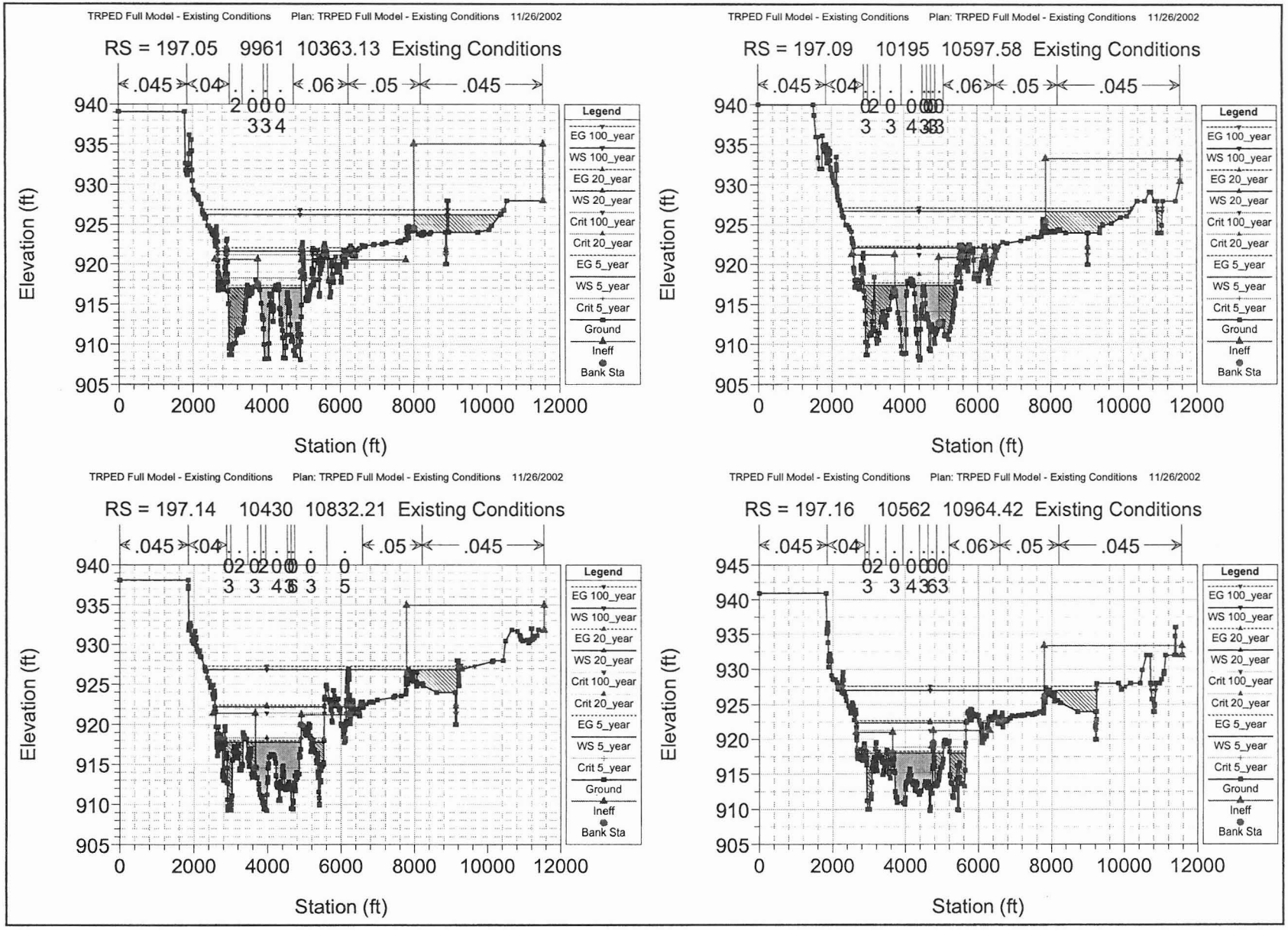
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta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Elevation (ft)
Station (ft)
Legend
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WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.09 10195 10597.58 Existing Conditions
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Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.14 10430 10832.21 Existing Conditions
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Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
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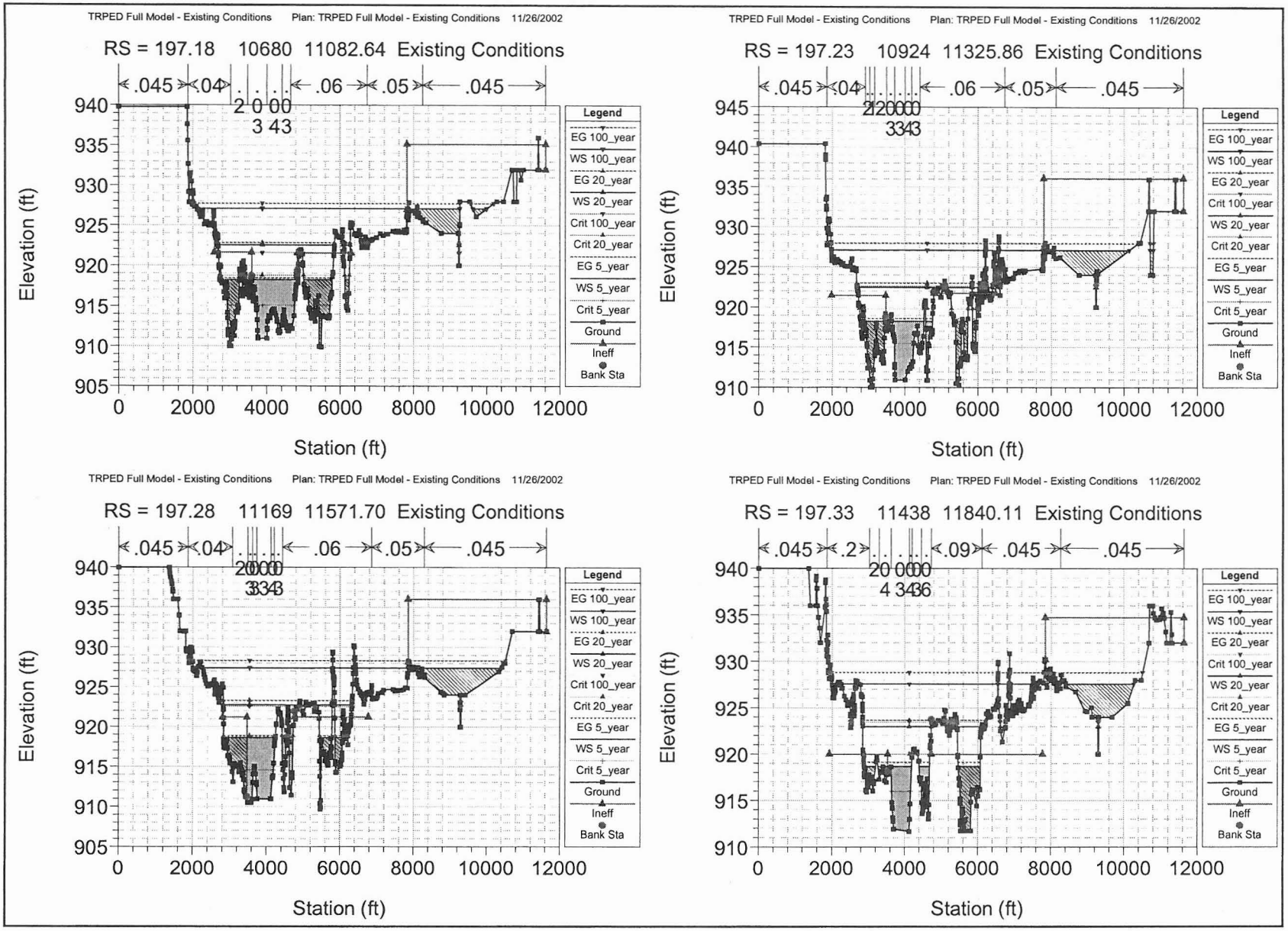
Elevation (ft)
Station (ft)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Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.23 10924 11325.86 Existing Conditions
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Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.28 11169 11571.70 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.33 11438 11840.11 Existing Conditions
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Elevation (ft)
Station (ft)
Legend
EG 100_year
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Crit 100_year
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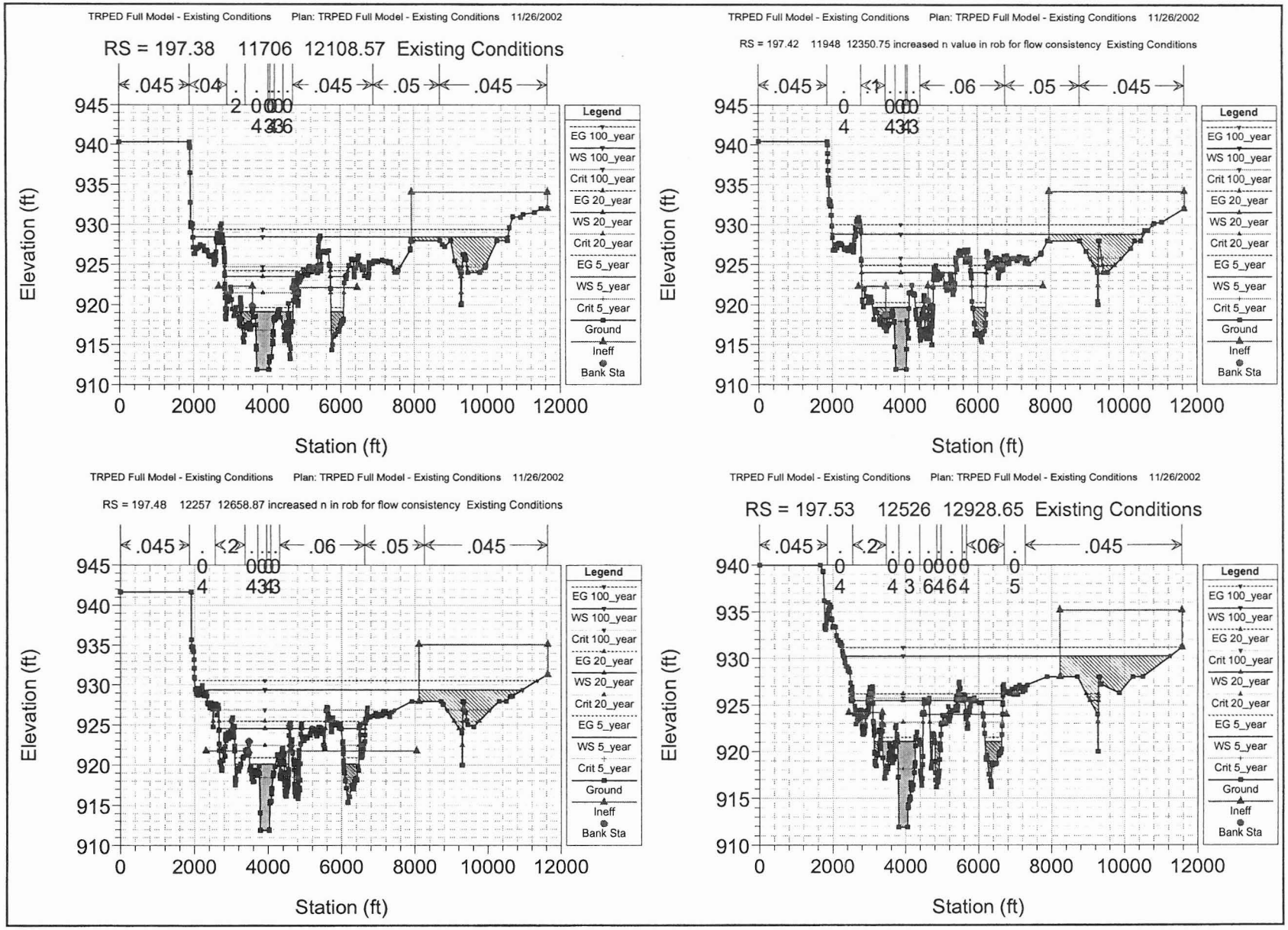
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta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Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
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Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
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Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
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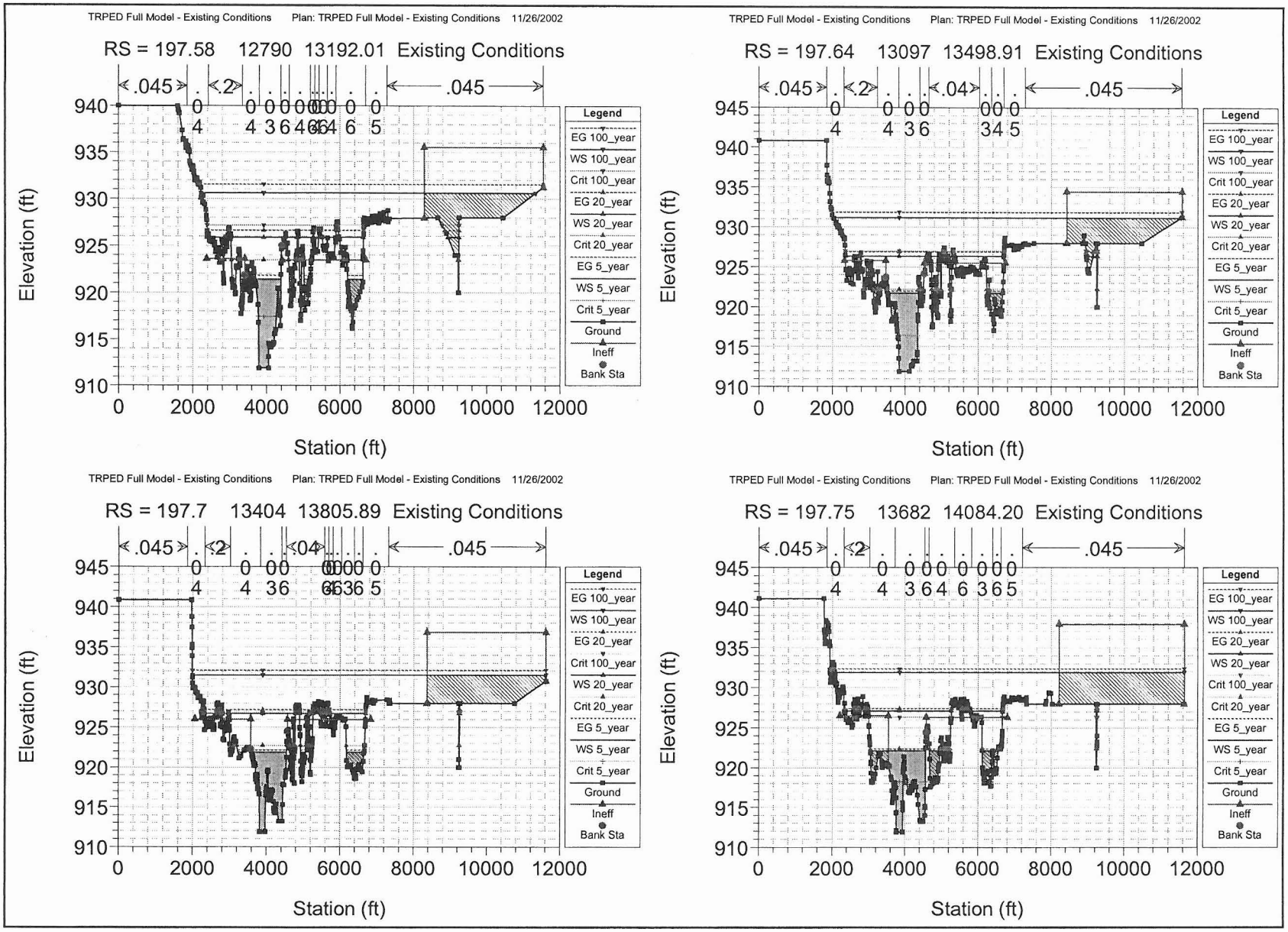
Elevation (ft)
Station (ft)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.2
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.64 13097 13498.91 Existing Conditions
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Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
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.045
.2
.04
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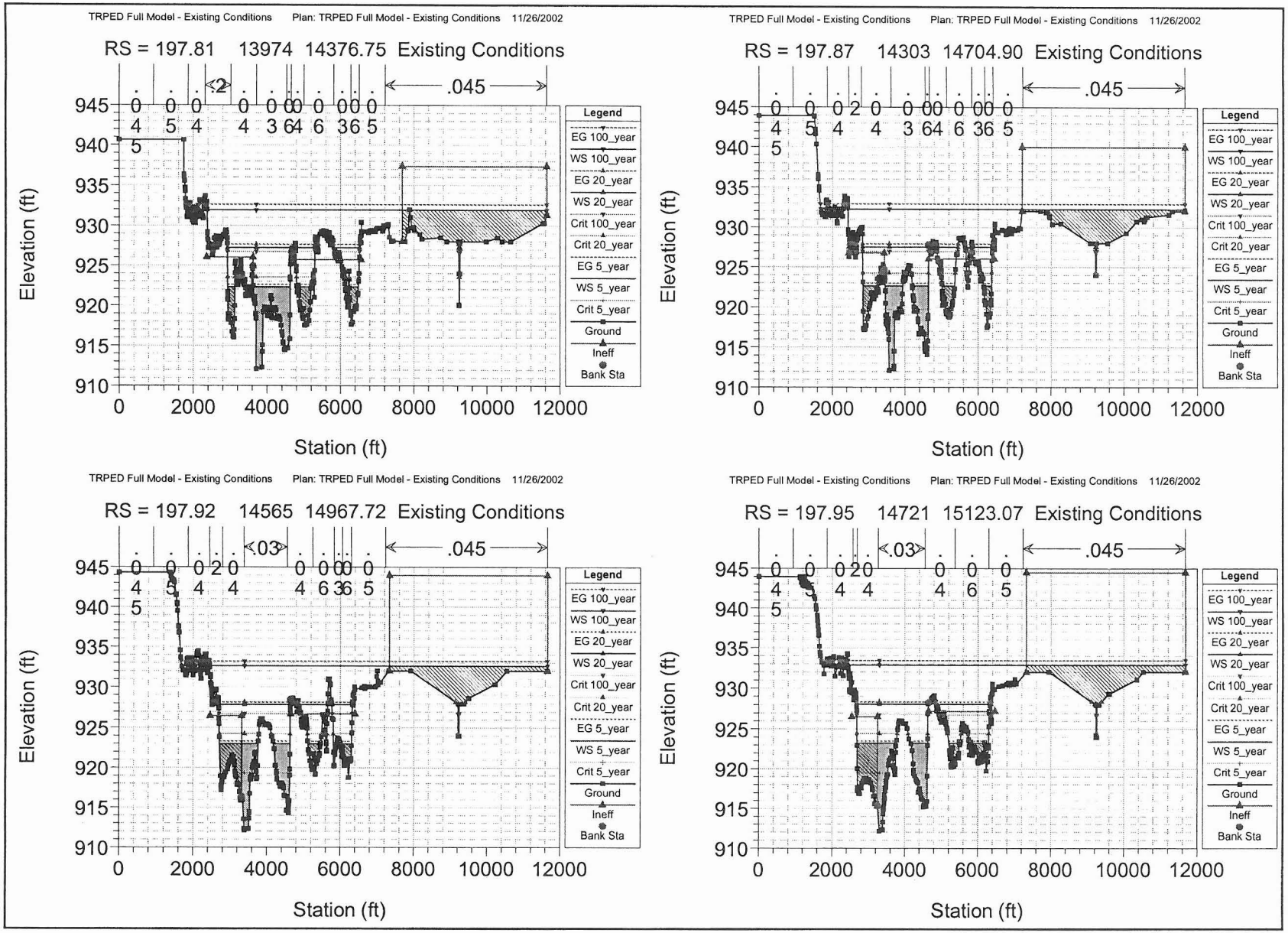
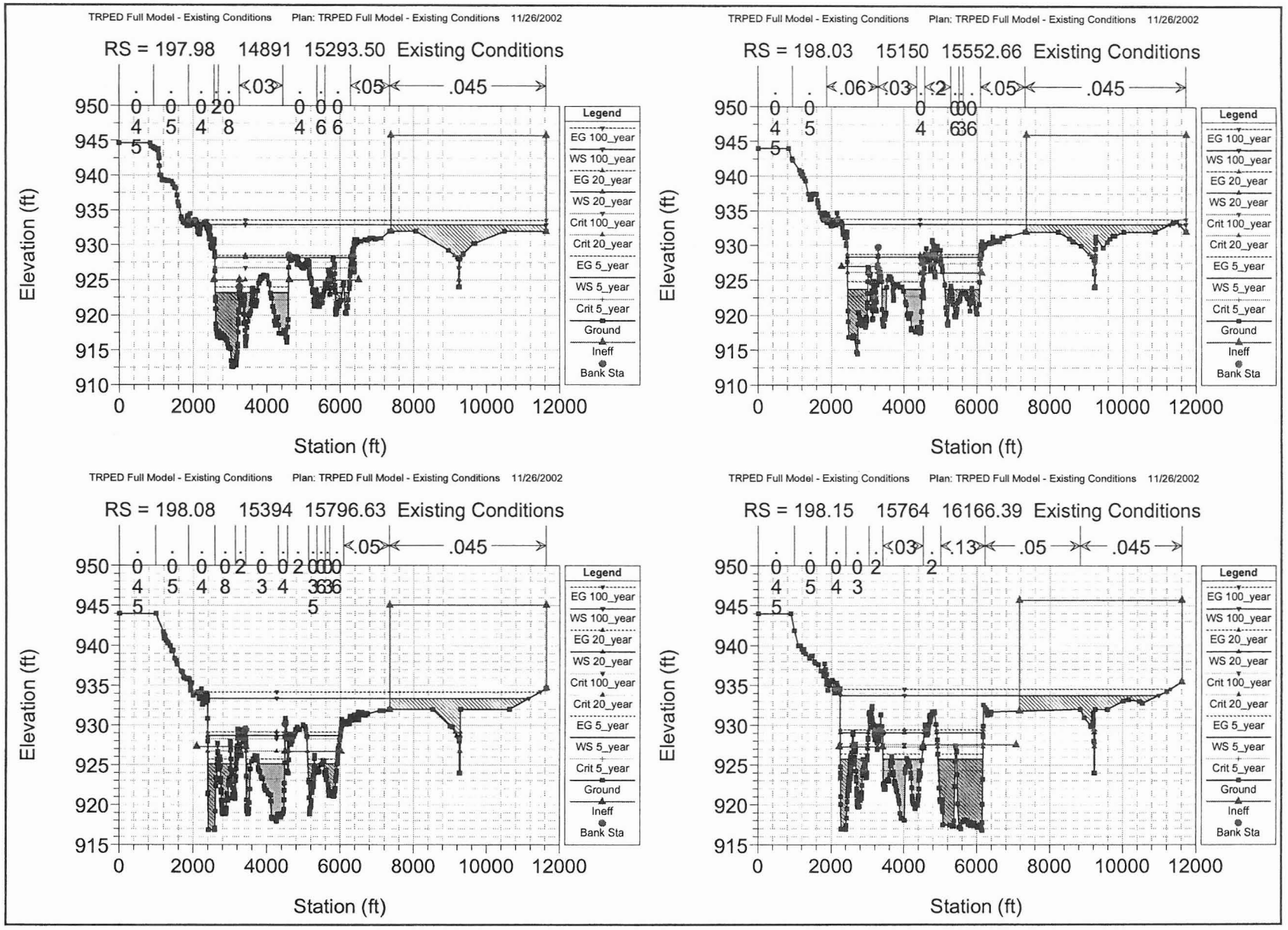
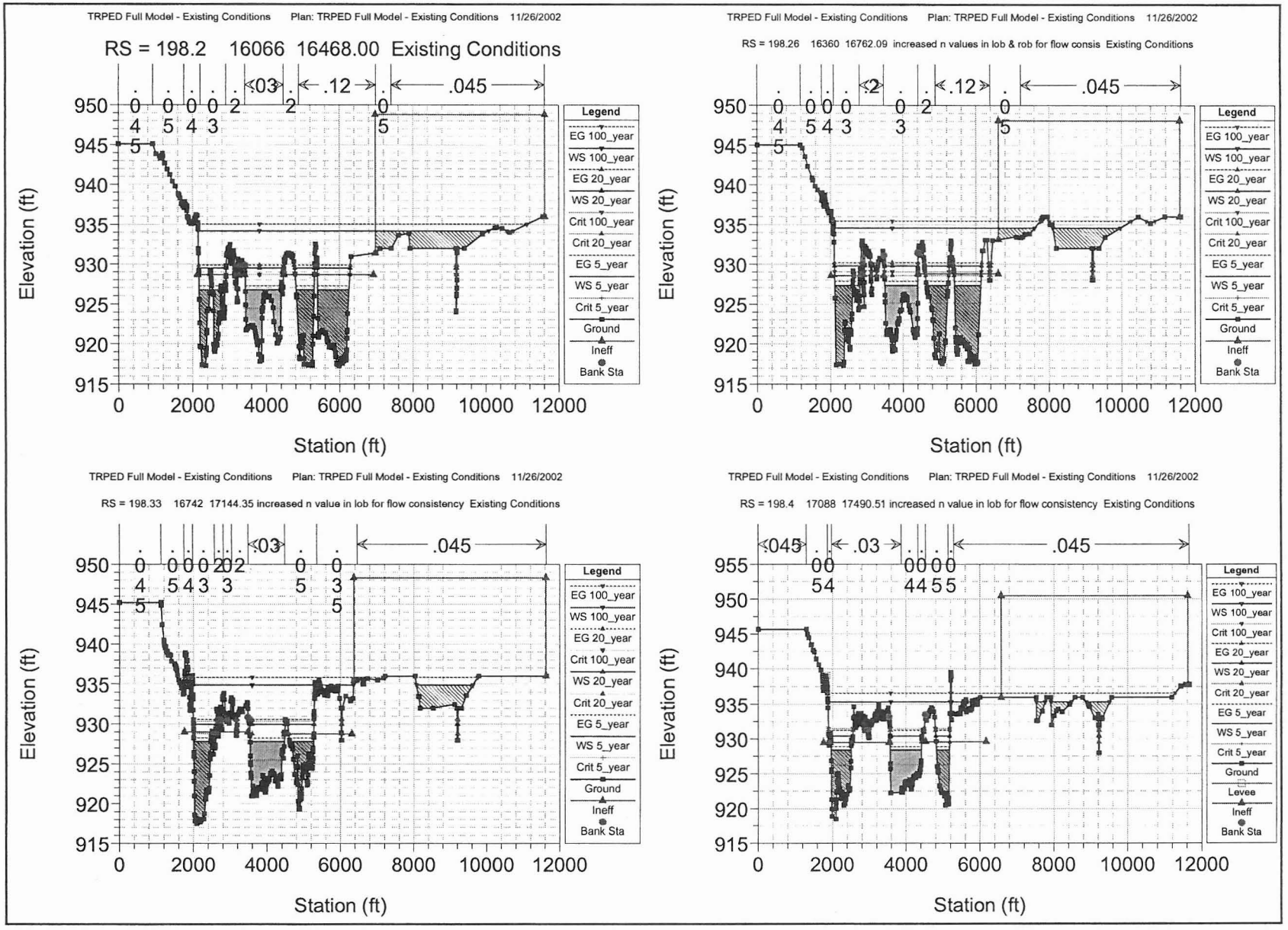
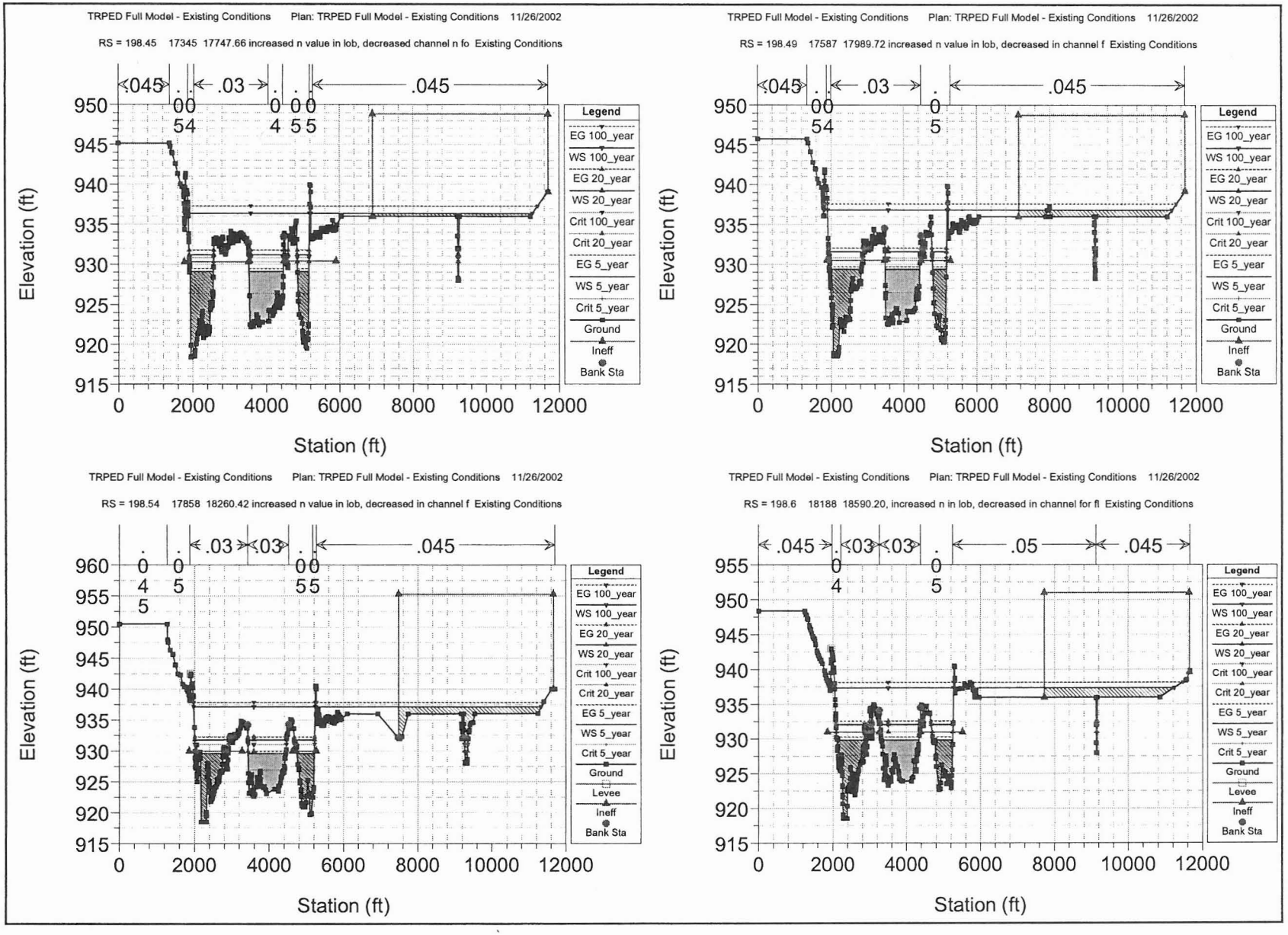
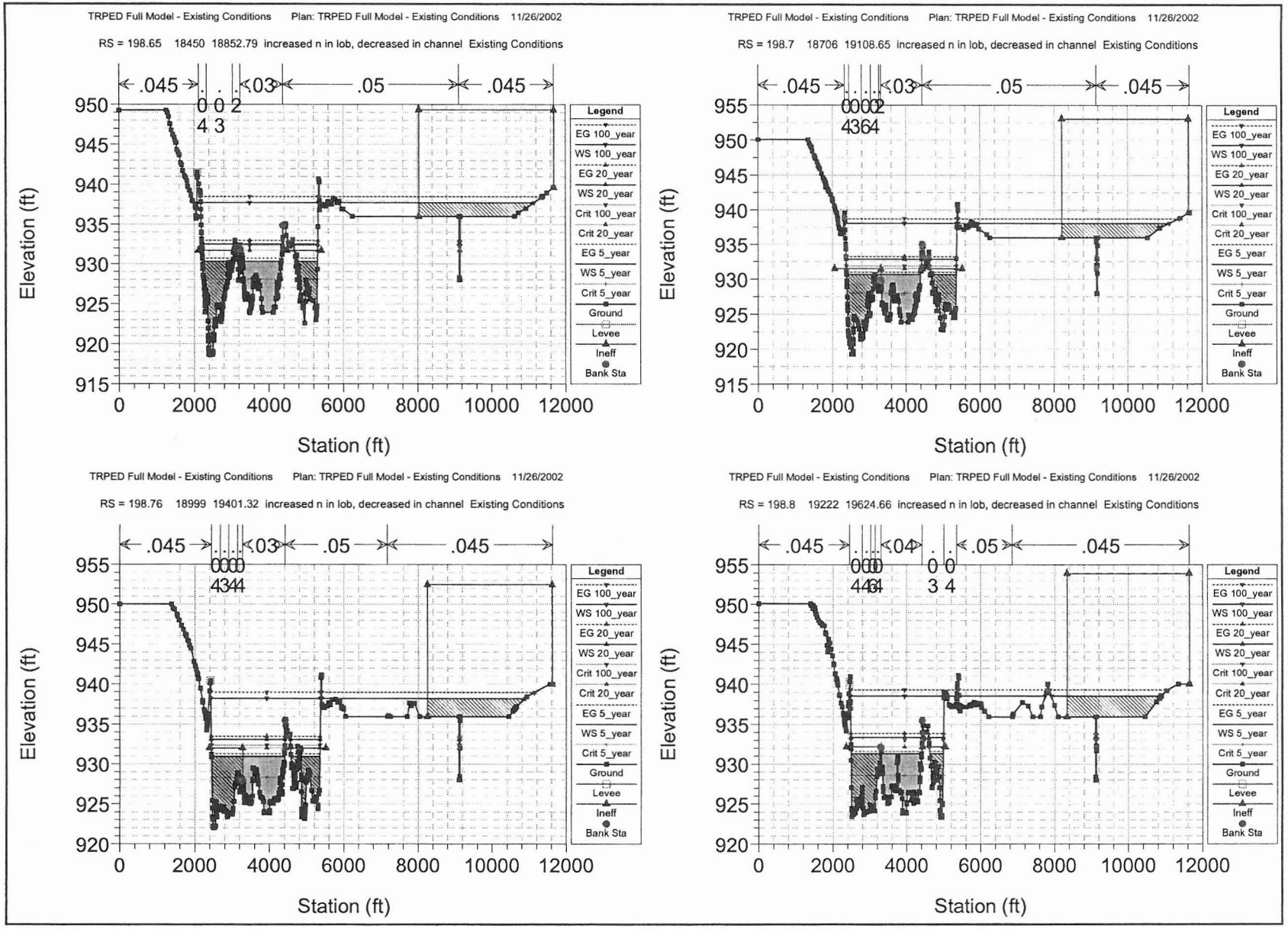
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.75 13682 14084.20 Existing Conditions
.045
.2
.045
Elevation (ft)
Station (ft)

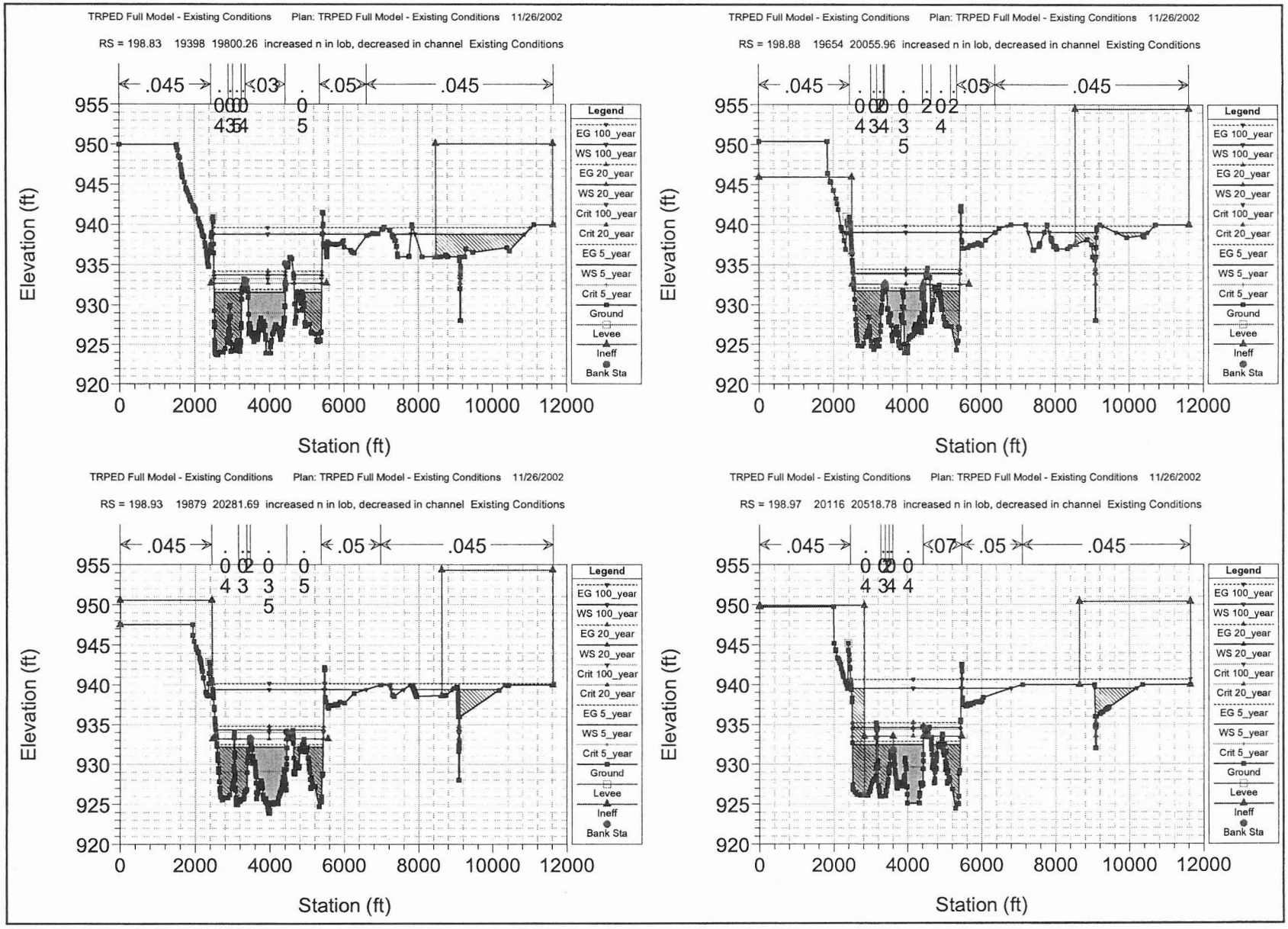

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.81 13974 14376.75 Existing Conditions
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.87 14303 14704.90 Existing Conditions
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.92 14565 14967.72 Existing Conditions
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.95 14721 15123.07 Existing Conditions
.045
Elevation (ft)
Station (ft)

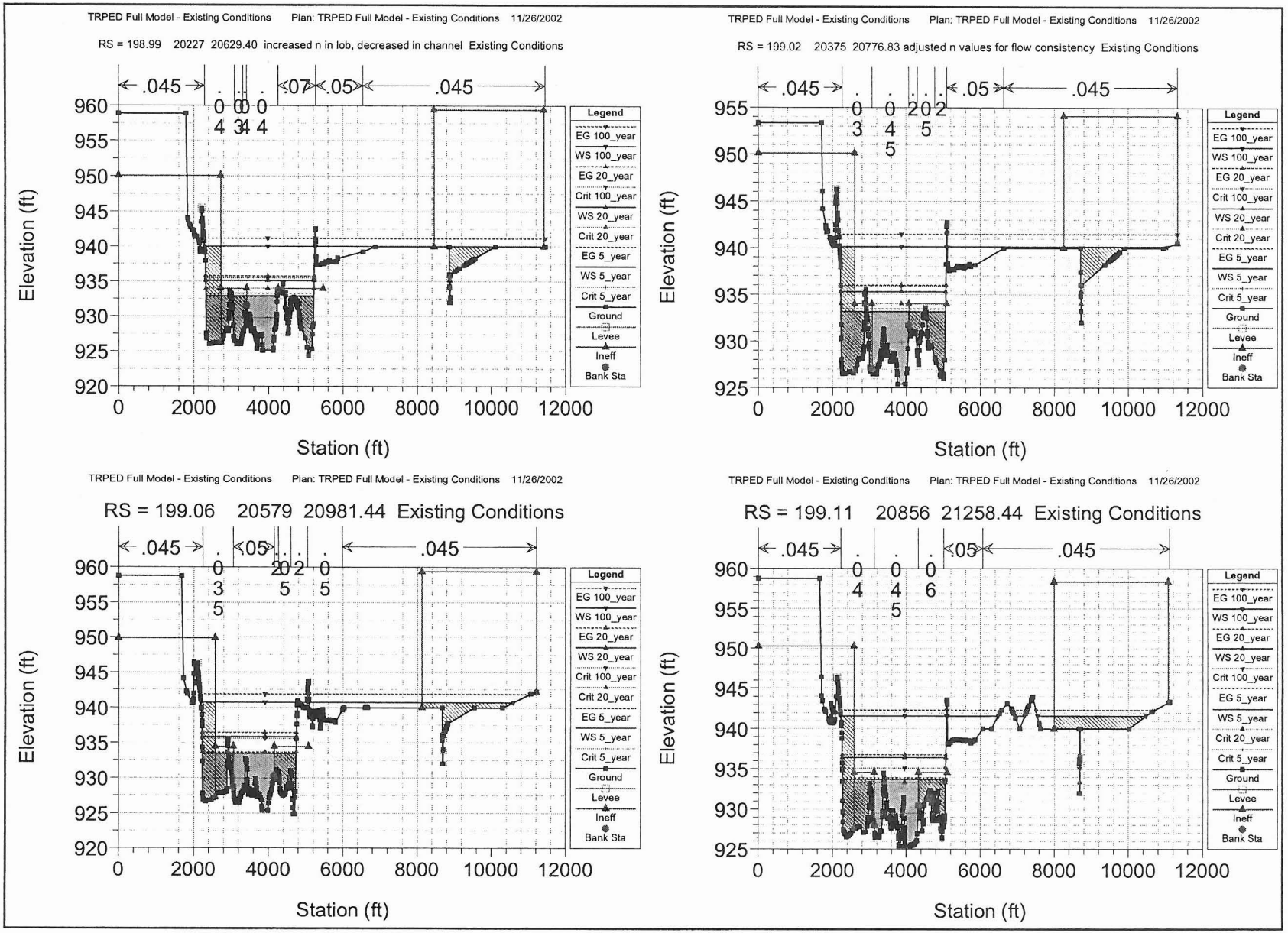

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 197.98 14891 15293.50 Existing Conditions
.03
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.03 15150 15552.66 Existing Conditions
.06
.03
.2
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.08 15394 15796.63 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.15 15764 16166.39 Existing Conditions
.03
.13
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

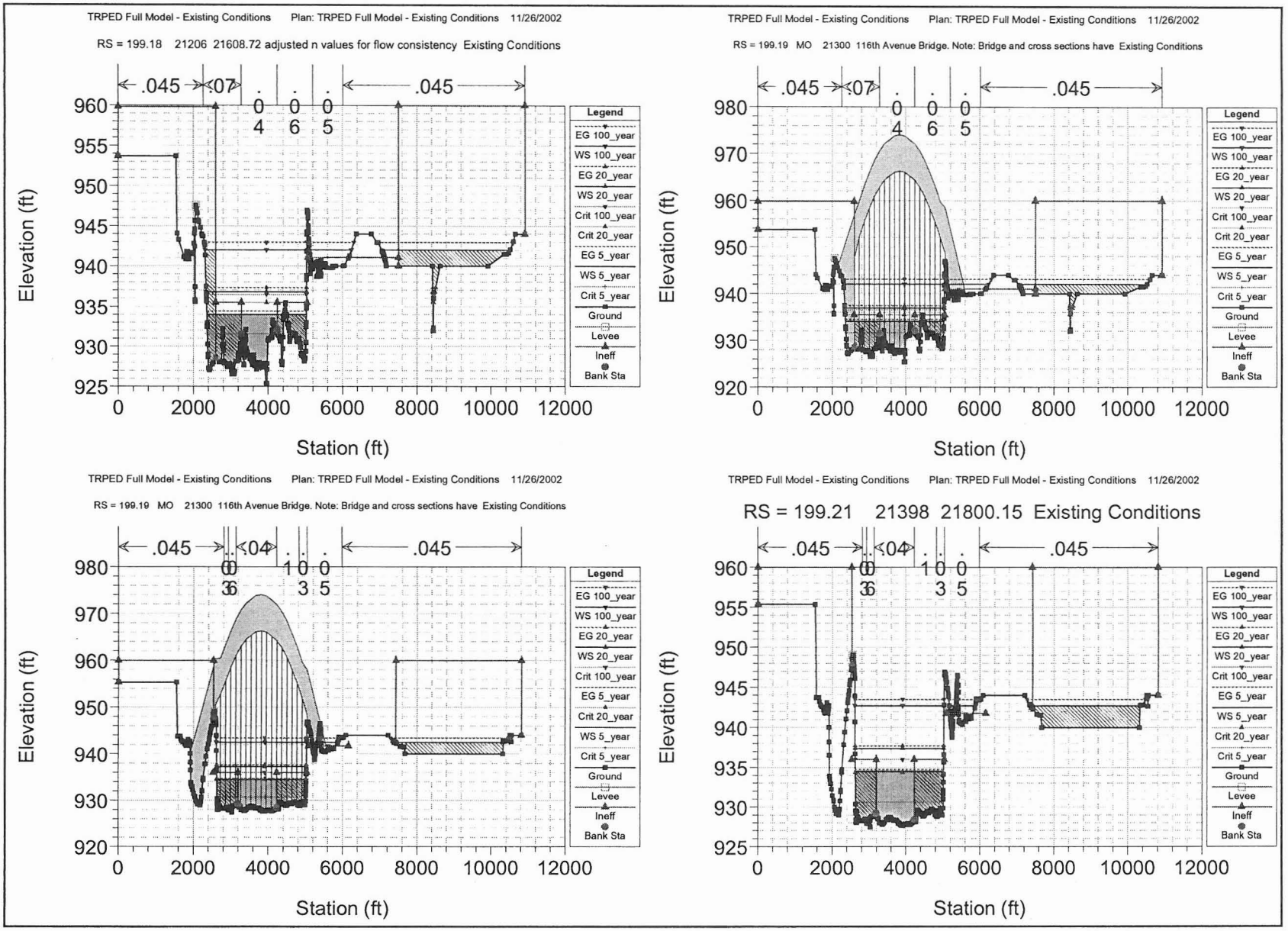

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.2 16066 16468.00 Existing Conditions
.03
.12
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.26 16360 16762.09 increased n values in lob & rob for flow consis Existing Conditions
.12
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.33 16742 17144.35 increased n value in lob for flow consistency Existing Conditions
.03
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.4 17088 17490.51 increased n value in lob for flow consistency Existing Conditions
.045
.03
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta

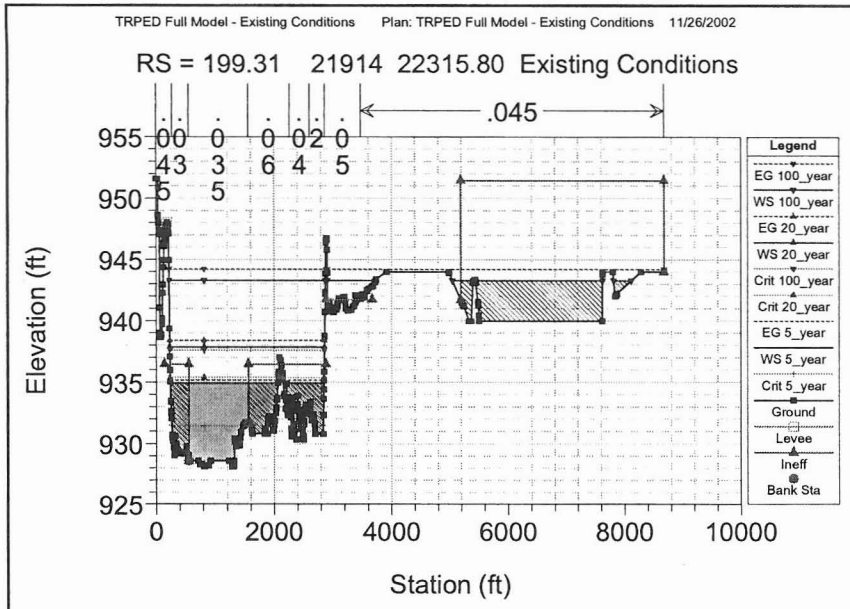

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.45 17345 17747.66 increased n value in lob, decreased channel n fo Existing Conditions
.045 .03 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.49 17587 17989.72 increased n value in lob, decreased in channel f Existing Conditions
.045 .03 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.54 17858 18260.42 increased n value in lob, decreased in channel f Existing Conditions
.03 .03 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.6 18188 18590.20, increased n in lob, decreased in channel for fl Existing Conditions
.045 .03 .03 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta

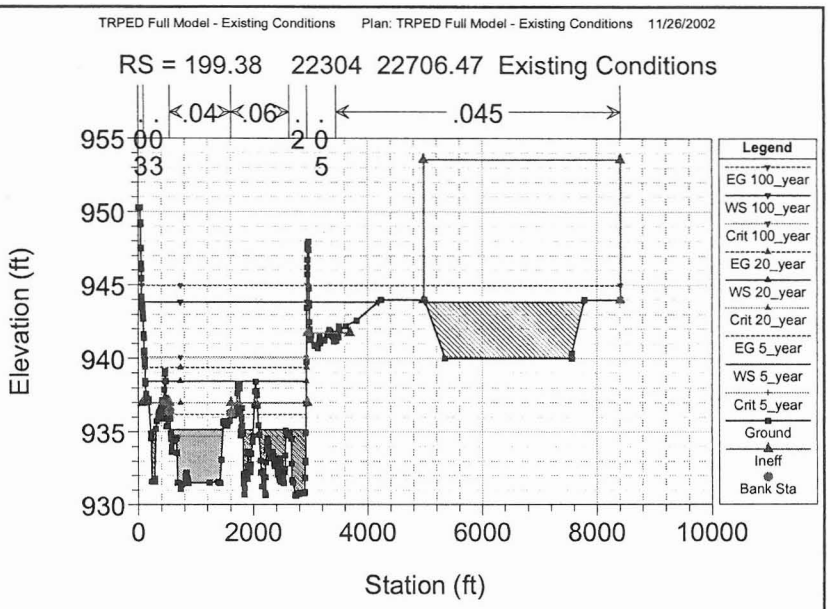

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.65 18450 18852.79 increased n in lob, decreased in channel Existing Conditions
.045
.03
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.7 18706 19108.65 increased n in lob, decreased in channel Existing Conditions
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.76 18999 19401.32 increased n in lob, decreased in channel Existing Conditions
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.8 19222 19624.66 increased n in lob, decreased in channel Existing Conditions
.04
.05

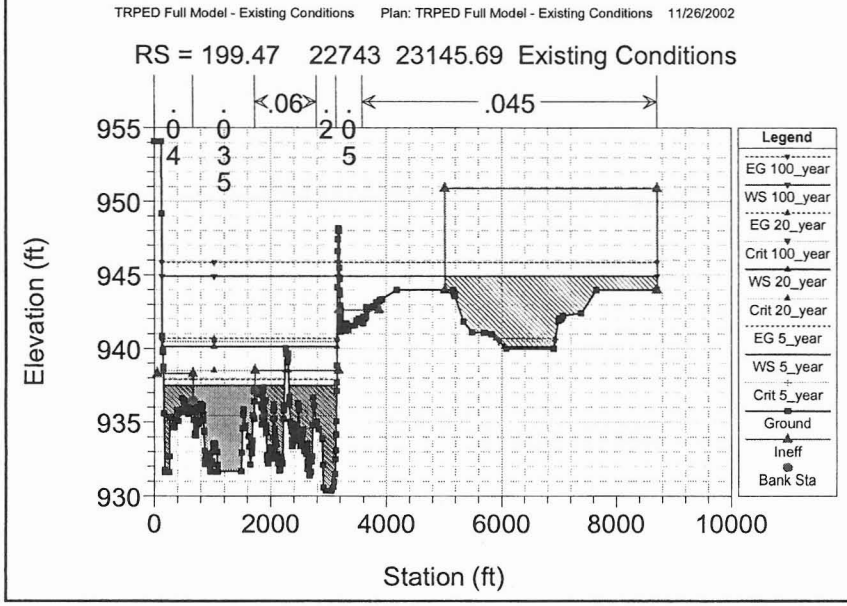

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.83 19398 19800.26 increased n in lob, decreased in channel Existing Conditions
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.88 19654 20055.96 increased n in lob, decreased in channel Existing Conditions
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.93 19879 20281.69 increased n in lob, decreased in channel Existing Conditions
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.97 20116 20518.78 increased n in lob, decreased in channel Existing Conditions
.045
.05
.045
Elevation (ft)
Station (ft)
955
950
945
940
935
930
925
920
0
2000
4000
6000
8000
10000
12000
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 198.99 20227 20629.40 increased n in lob, decreased in channel Existing Conditions
.045
.07
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.02 20375 20776.83 adjusted n values for flow consistency Existing Conditions
.045
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.06 20579 20981.44 Existing Conditions
.045
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.11 20856 21258.44 Existing Conditions
.045
.05
.045
Elevation (ft)
Station (ft)


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.18 21206 21608.72 adjusted n values for flow consistency Existing Conditions
.045
.07
.045
.045
.065
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.19 MO 21300 116th Avenue Bridge. Note: Bridge and cross sections have Existing Conditions
.045
.07
.045
.065
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.19 MO 21300 116th Avenue Bridge. Note: Bridge and cross sections have Existing Conditions
.045
.04
.045
.035
.105
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.21 21398 21800.15 Existing Conditions
.045
.04
.045
.035
.105
Elevation (ft)
Station (ft)

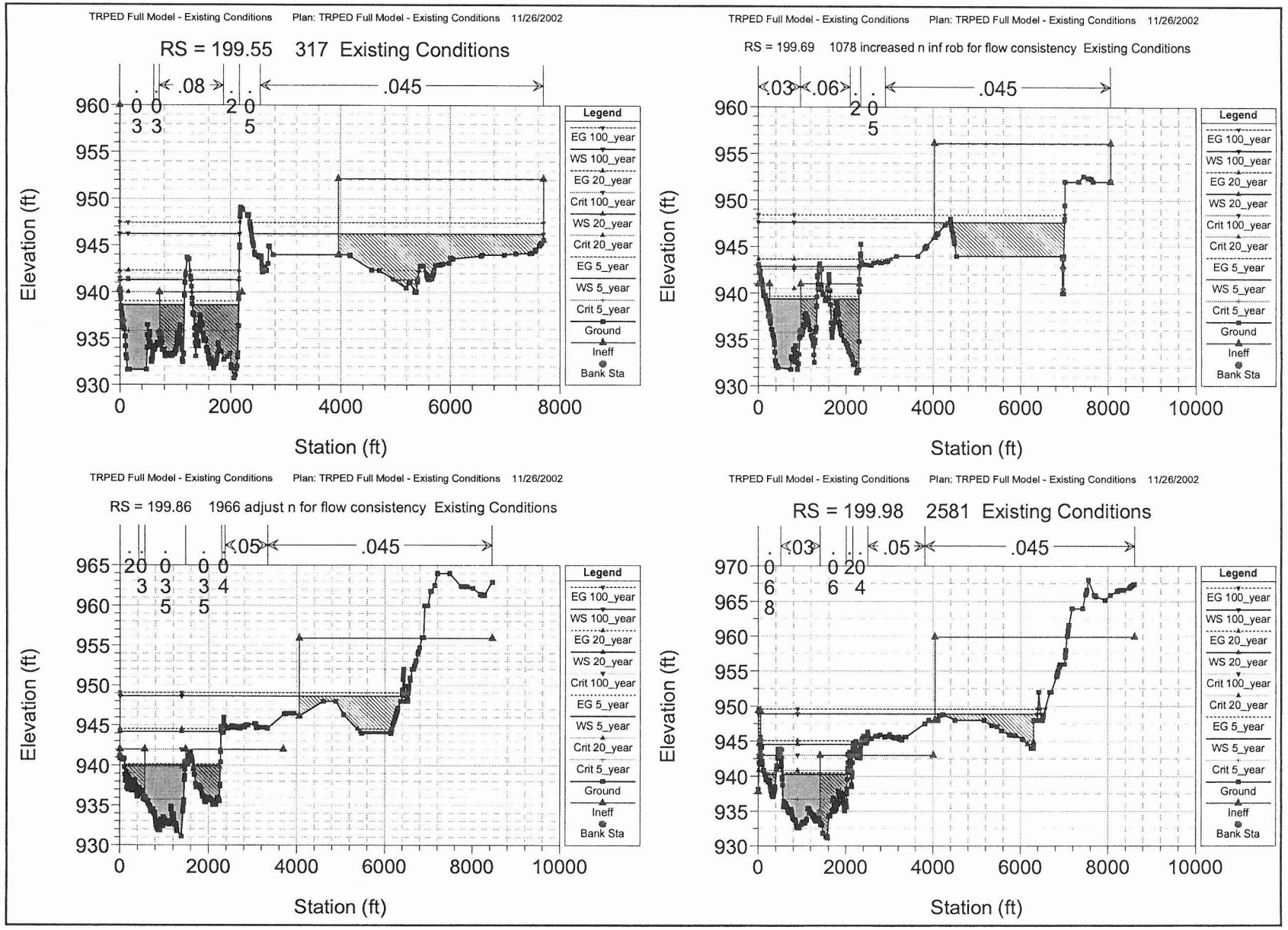

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.31 21914 22315.80 Existing Conditions
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta

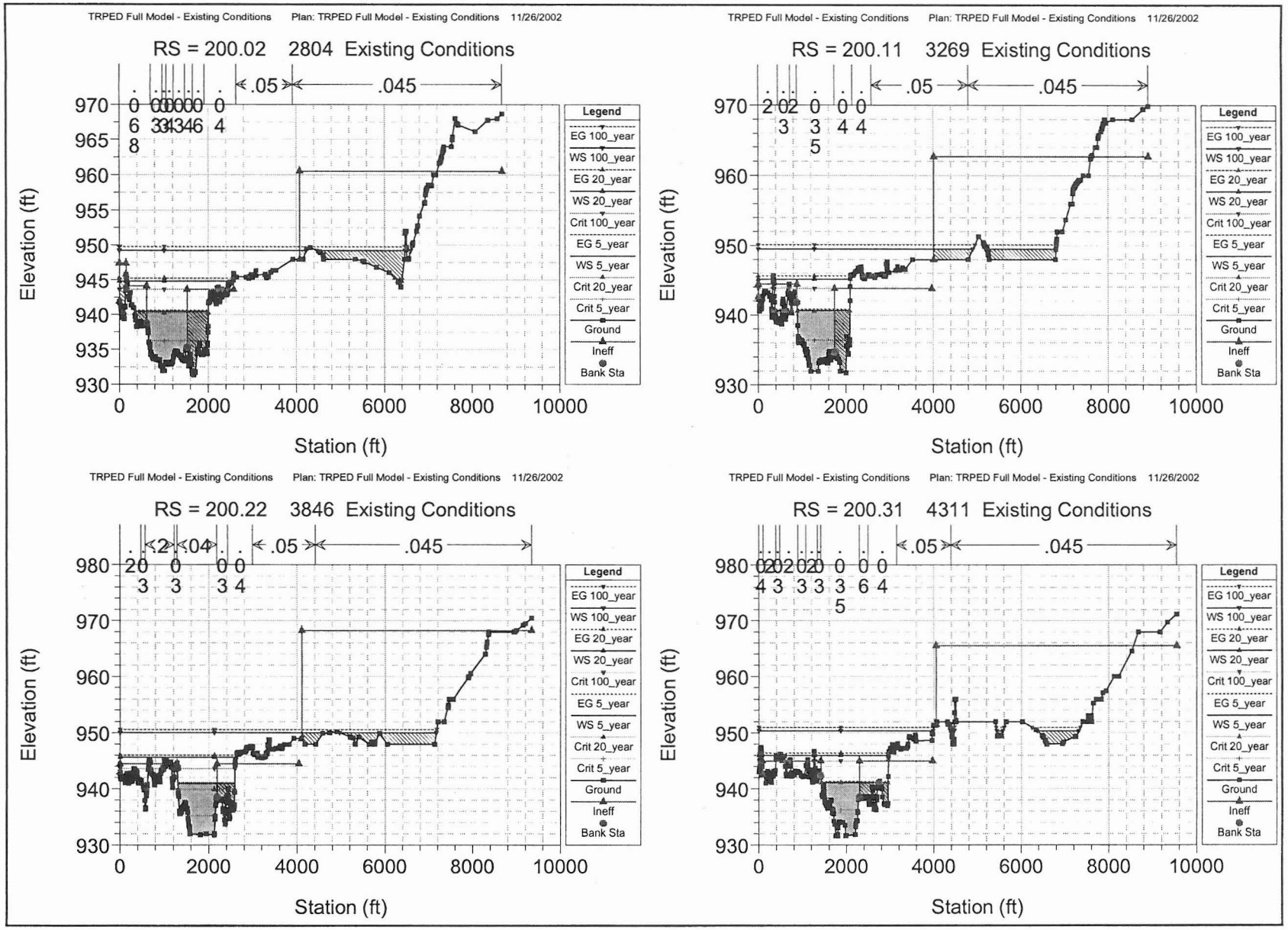

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.38 22304 22706.47 Existing Conditions
.04
.06
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

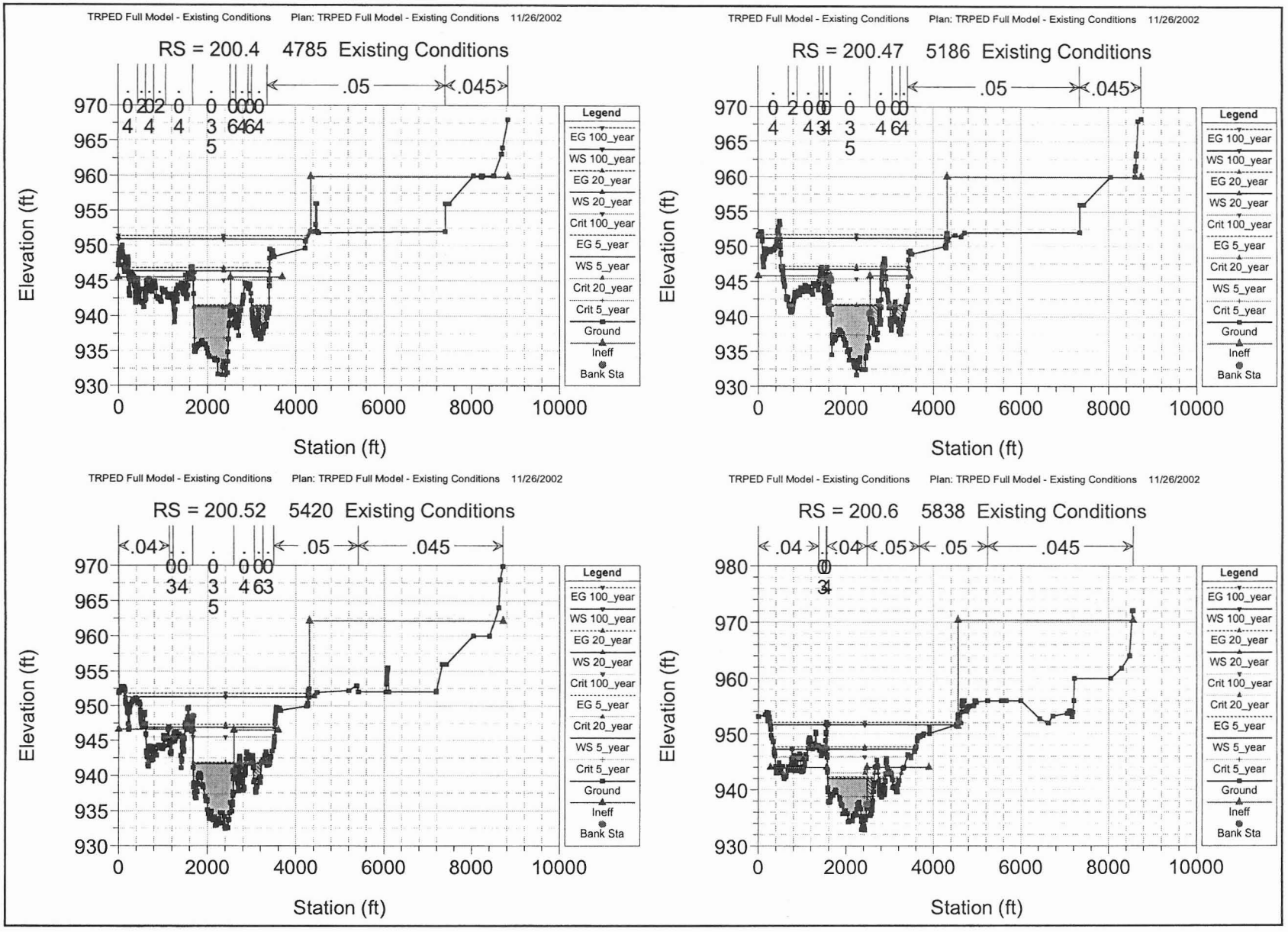

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.47 22743 23145.69 Existing Conditions
.06
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

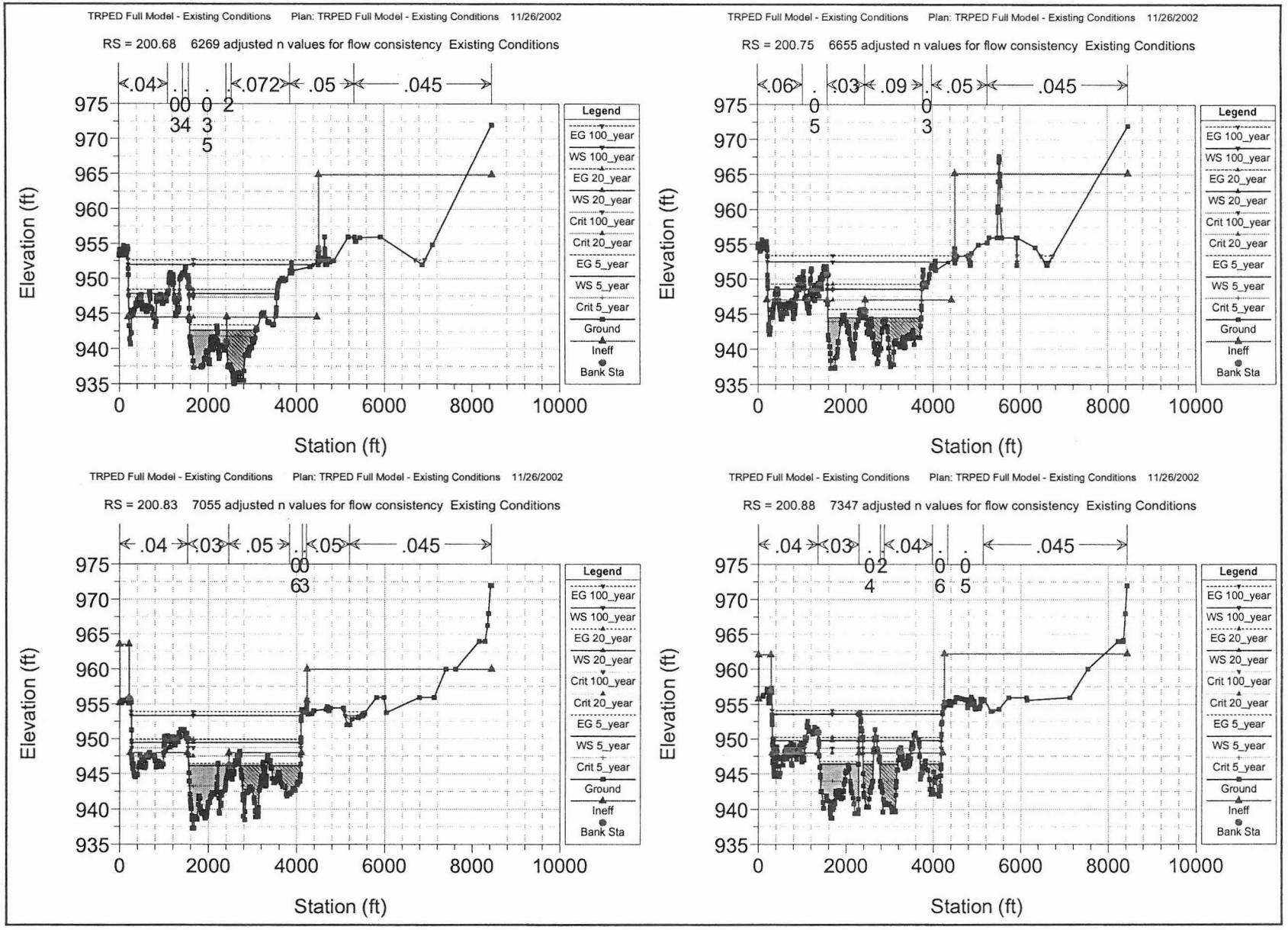
D-iii

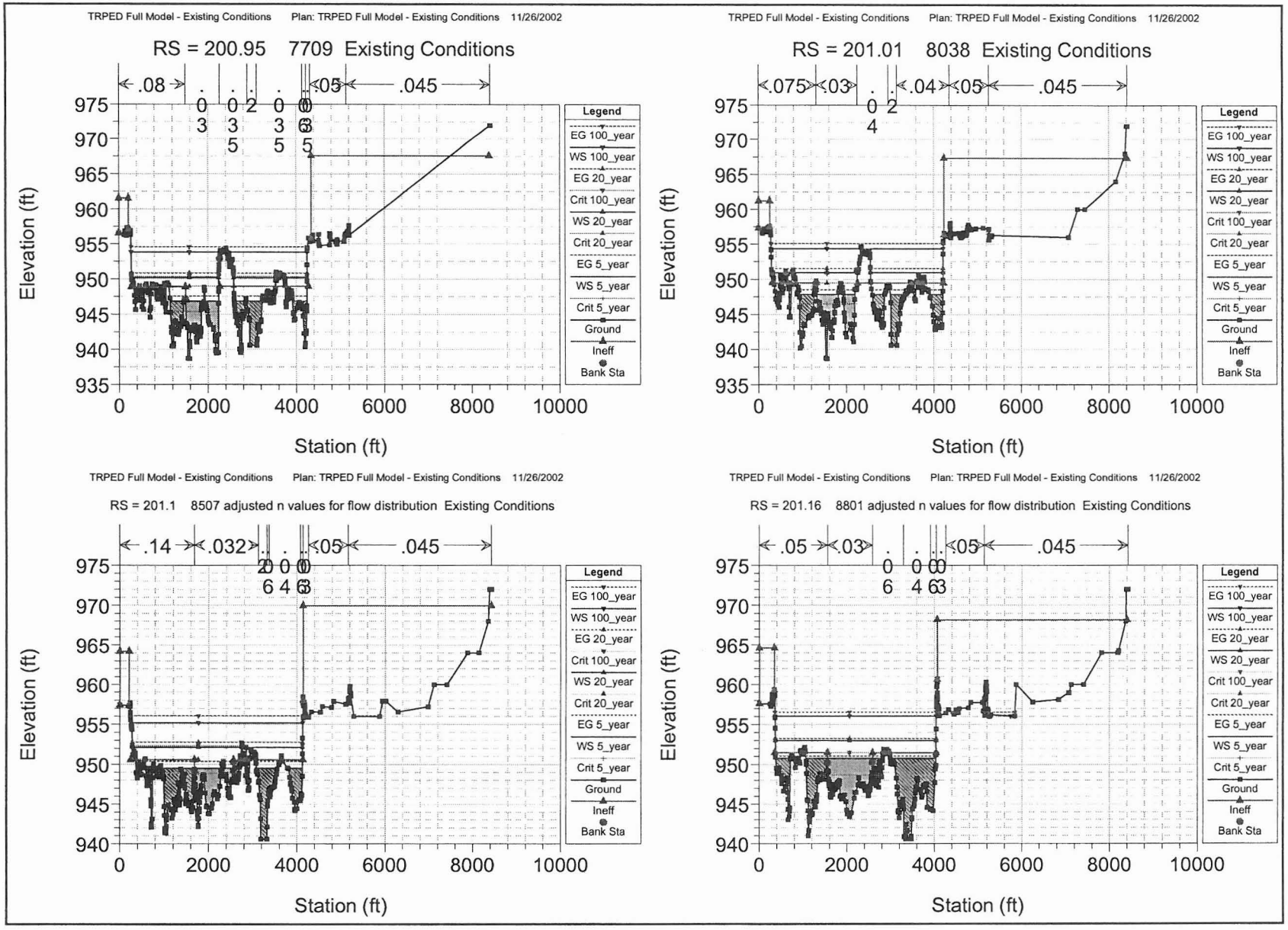
Cross Section Plots for the Salt


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.55 317 Existing Conditions
.08
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.69 1078 increased n inf rob for flow consistency Existing Conditions
.03
.06
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.86 1966 adjust n for flow consistency Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 199.98 2581 Existing Conditions
.03
.05
.045
Elevation (ft)
Station (ft)


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.02 2804 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.11 3269 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.22 3846 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.31 4311 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta

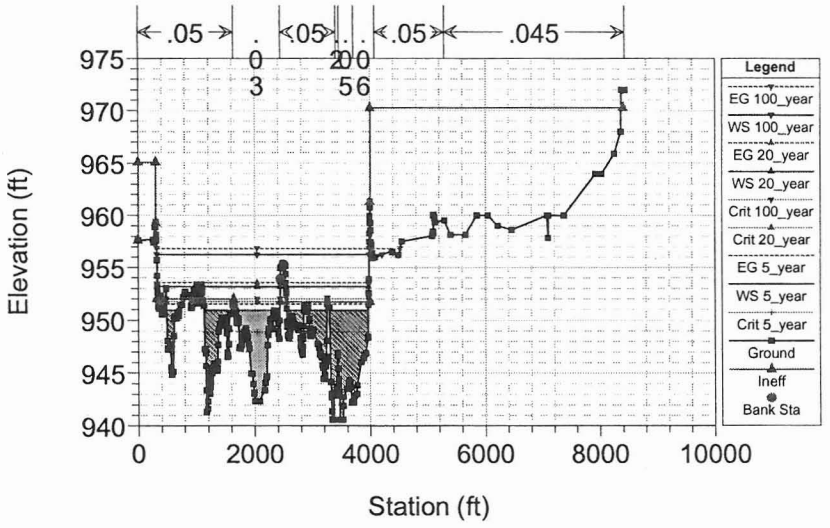

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.4 4785 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.47 5186 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.52 5420 Existing Conditions
.04
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.6 5838 Existing Conditions
.04
.04
.05
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.68 6269 adjusted n values for flow consistency Existing Conditions
.04
.072
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.75 6655 adjusted n values for flow consistency Existing Conditions
.06
.03
.09
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.83 7055 adjusted n values for flow consistency Existing Conditions
.04
.03
.05
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.88 7347 adjusted n values for flow consistency Existing Conditions
.04
.03
.04
.045
Elevation (ft)
Station (ft)


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 200.95 7709 Existing Conditions
.08
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 201.01 8038 Existing Conditions
.075
.03
.04
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 201.1 8507 adjusted n values for flow distribution Existing Conditions
.14
.032
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 201.16 8801 adjusted n values for flow distribution Existing Conditions
.05
.03
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

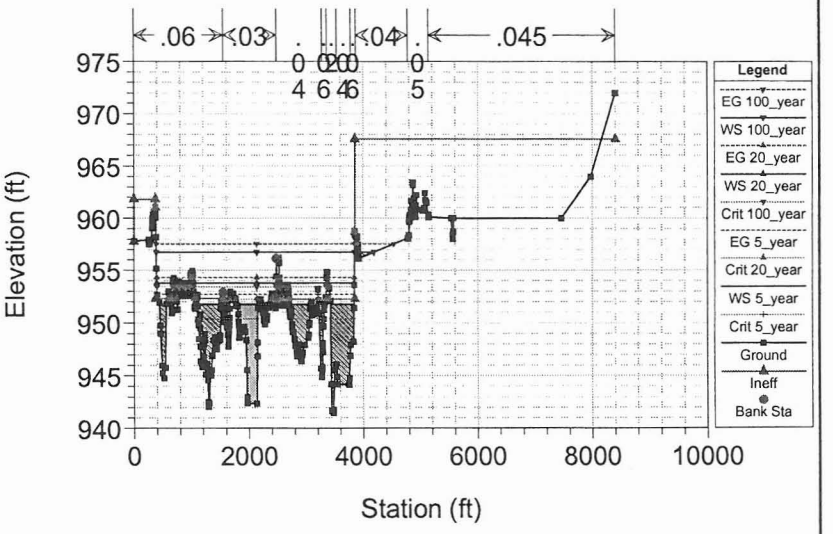
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002

RS = 201.2 9031 adjusted n values for flow distribution Existing Conditions



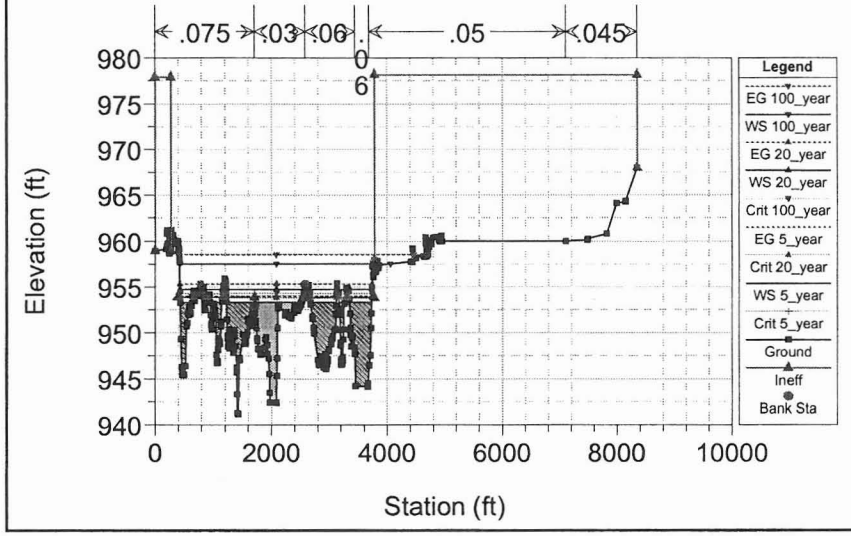
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002

RS = 201.26 9369 adjusted n values for flow distribution Existing Conditions



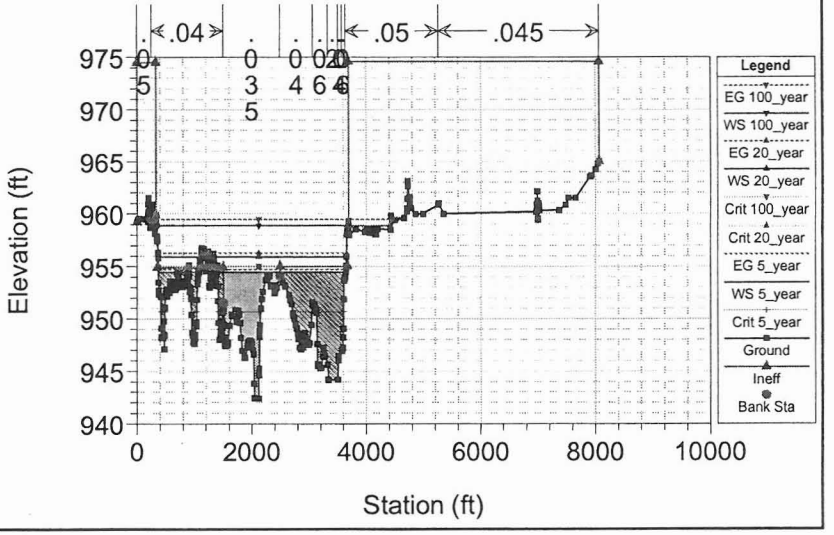
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002

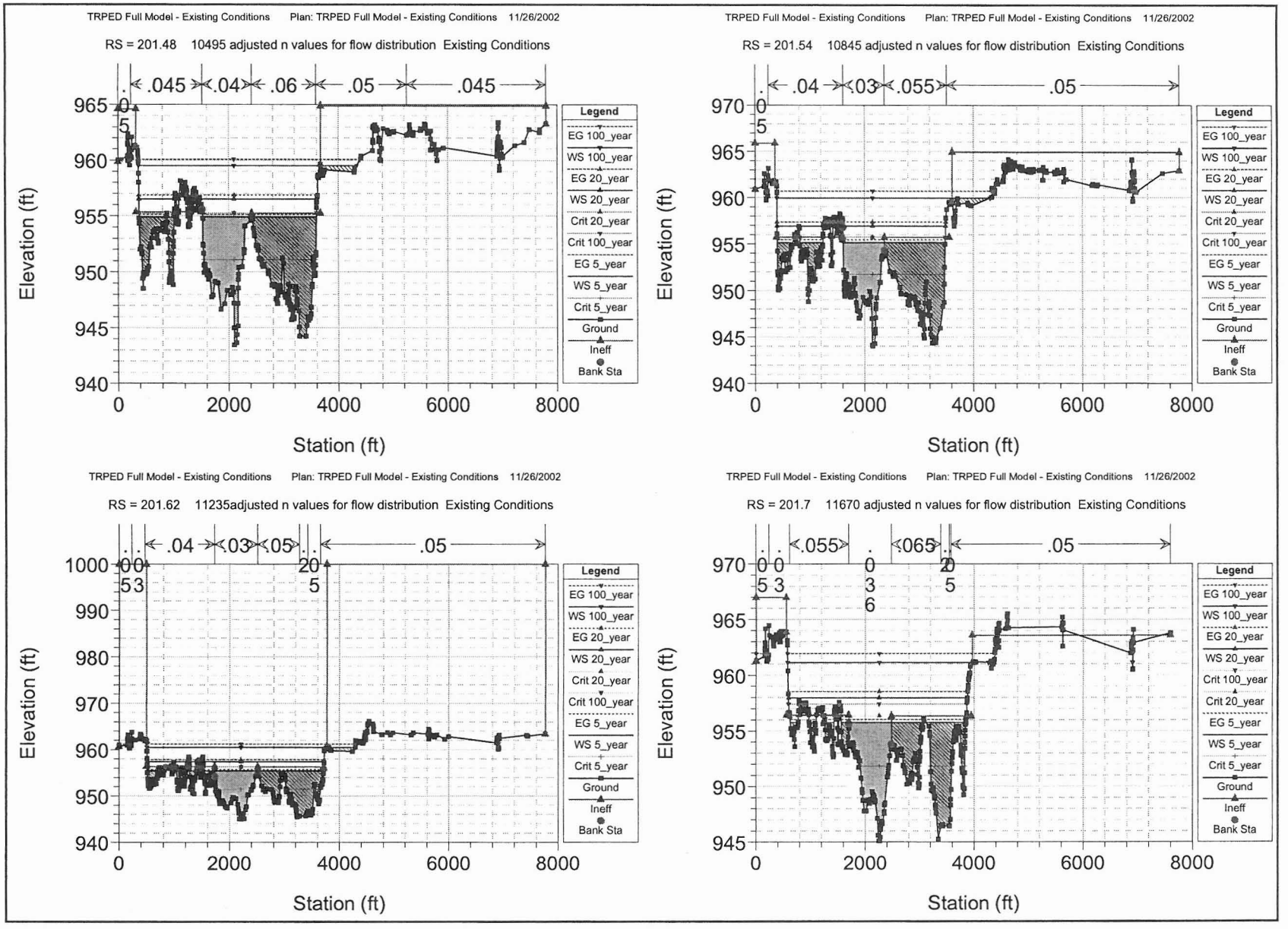
RS = 201.33 9717adjusted n values for flow distribution Existing Conditions



TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002

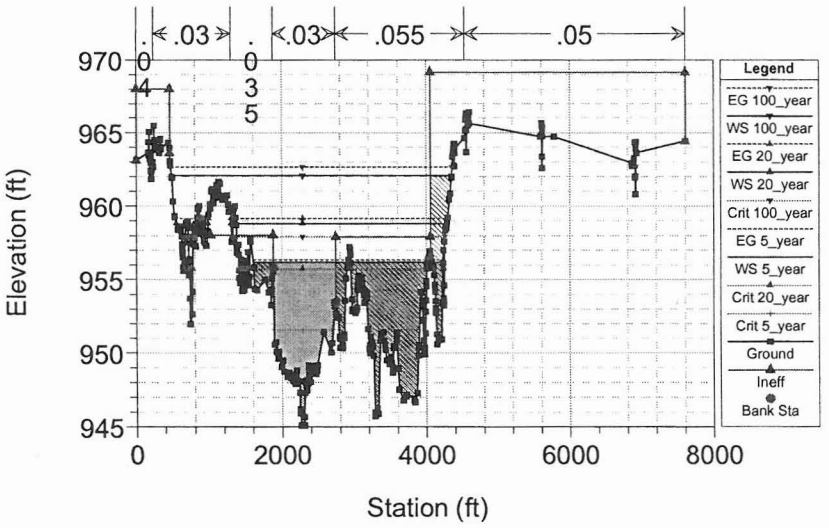
RS = 201.41 10137adjusted n values for flow distribution Existing Conditions




TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 201.48 10495 adjusted n values for flow distribution Existing Conditions
.045
.04
.06
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 201.54 10845 adjusted n values for flow distribution Existing Conditions
.04
.03
.055
.05
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 201.62 11235adjusted n values for flow distribution Existing Conditions
.04
.03
.05
.05
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 201.7 11670 adjusted n values for flow distribution Existing Conditions
.055
.065
.05
Elevation (ft)
Station (ft)

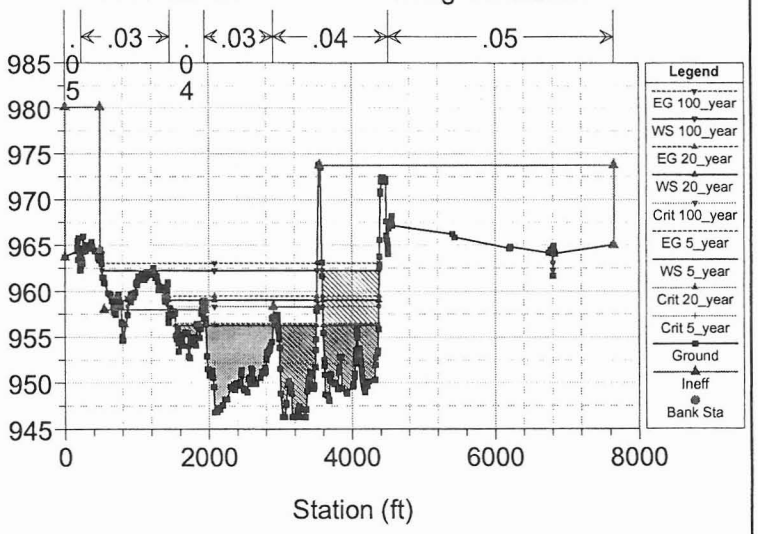
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002

RS = 201.81 12269 adjusted n values for flow consistency Existing Conditions



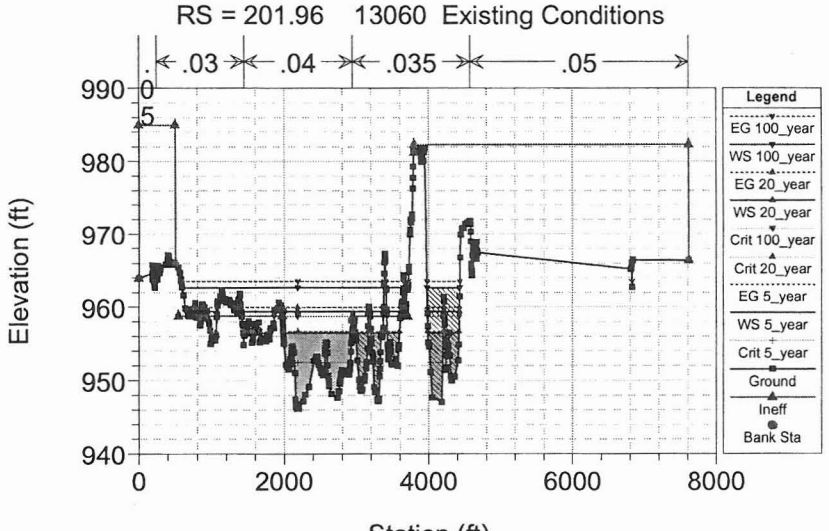
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002

RS = 201.89 12686 Existing Conditions



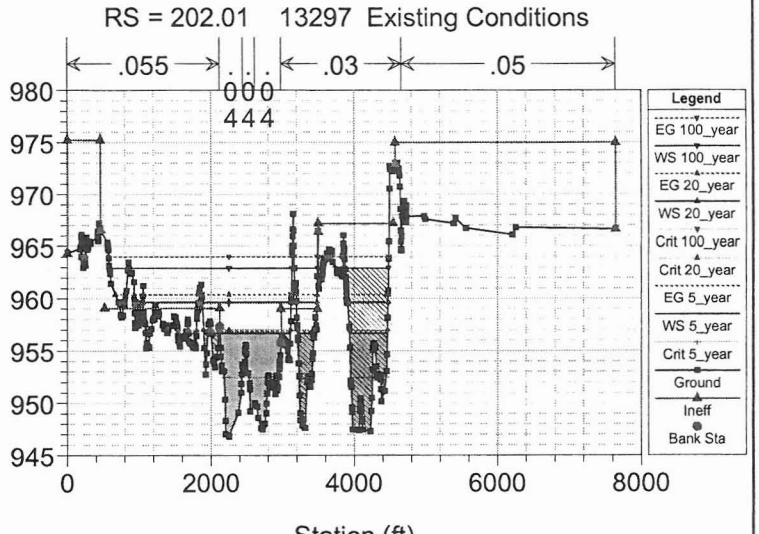
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002

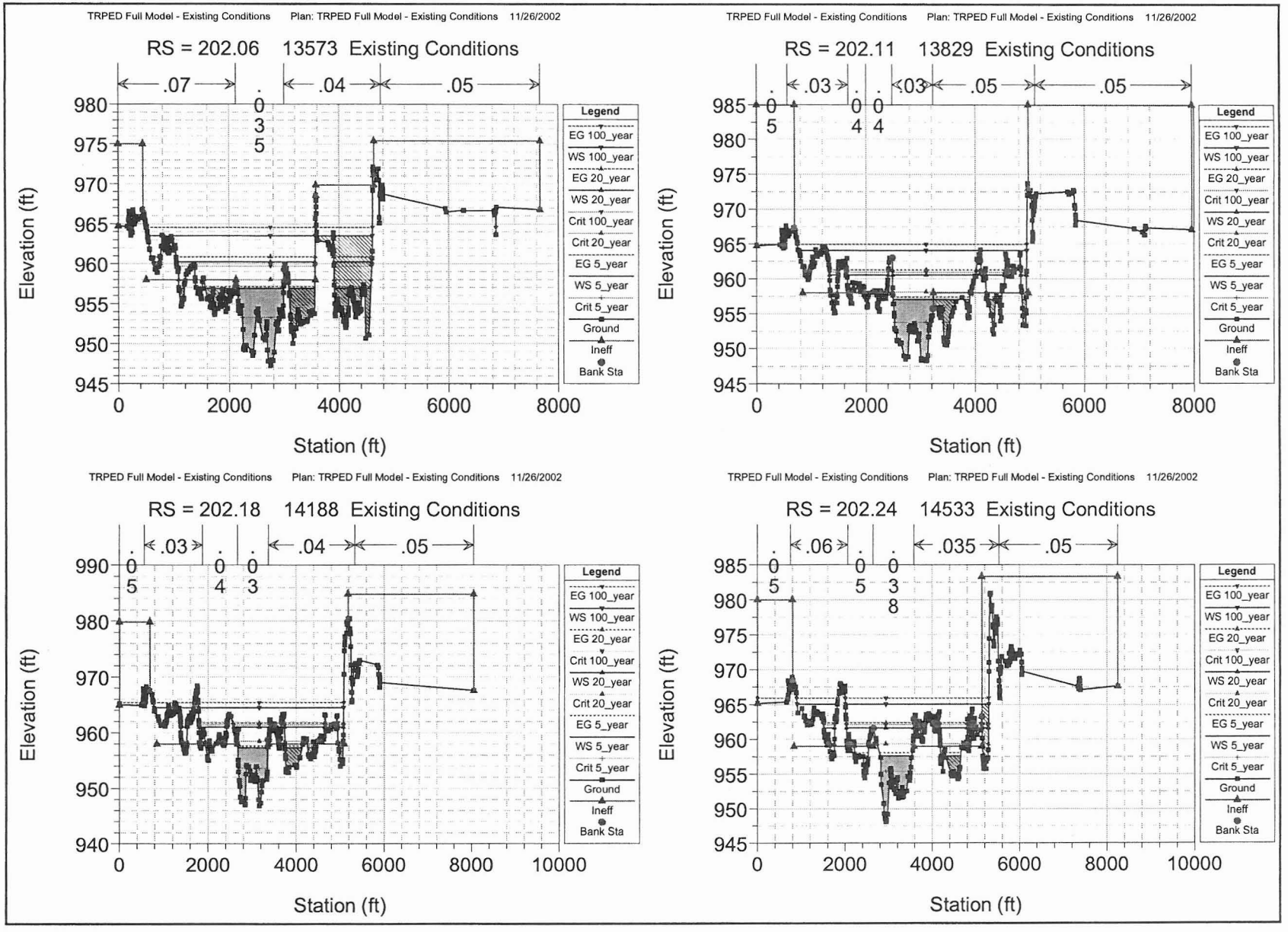
RS = 201.96 13060 Existing Conditions

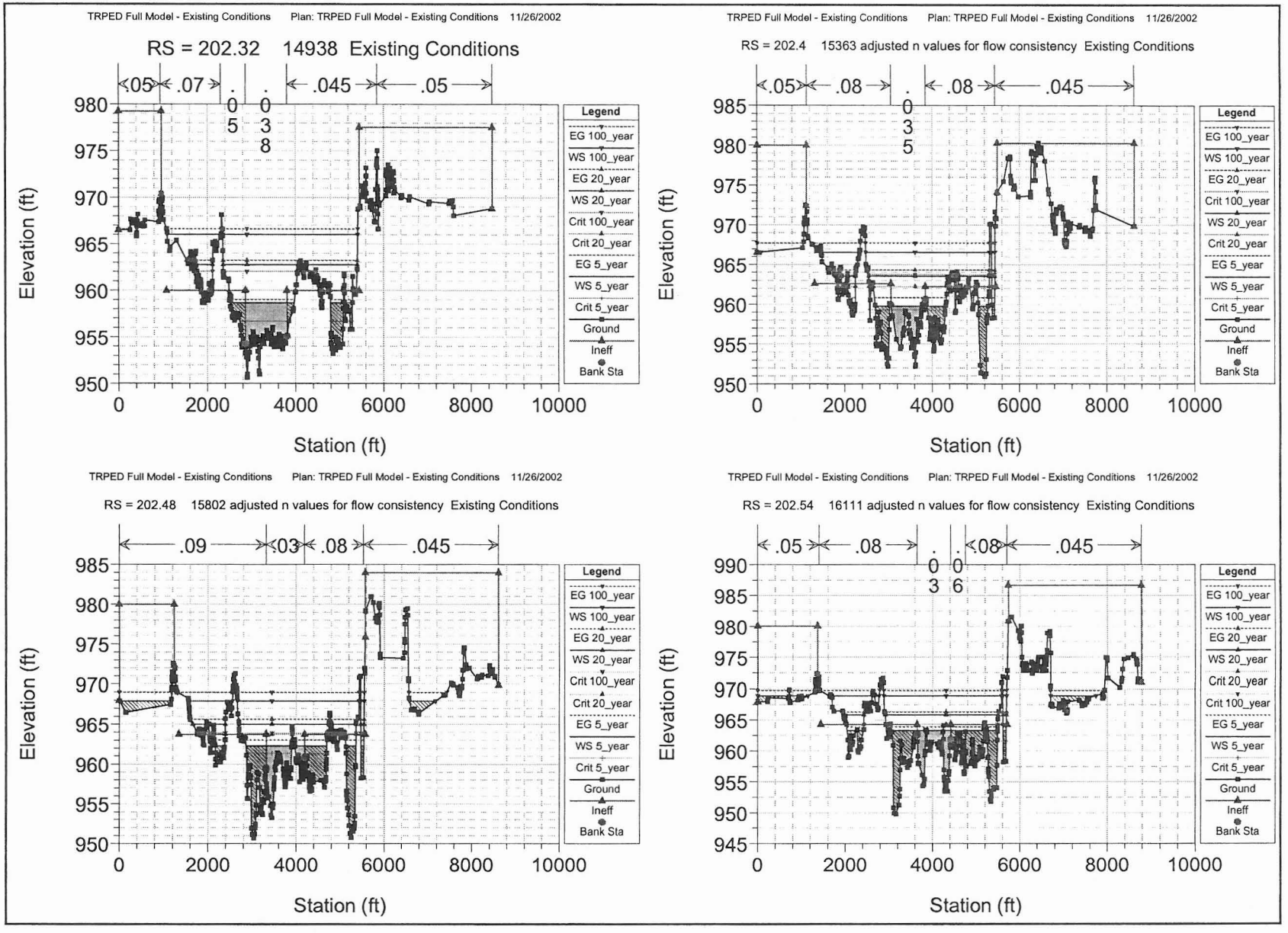


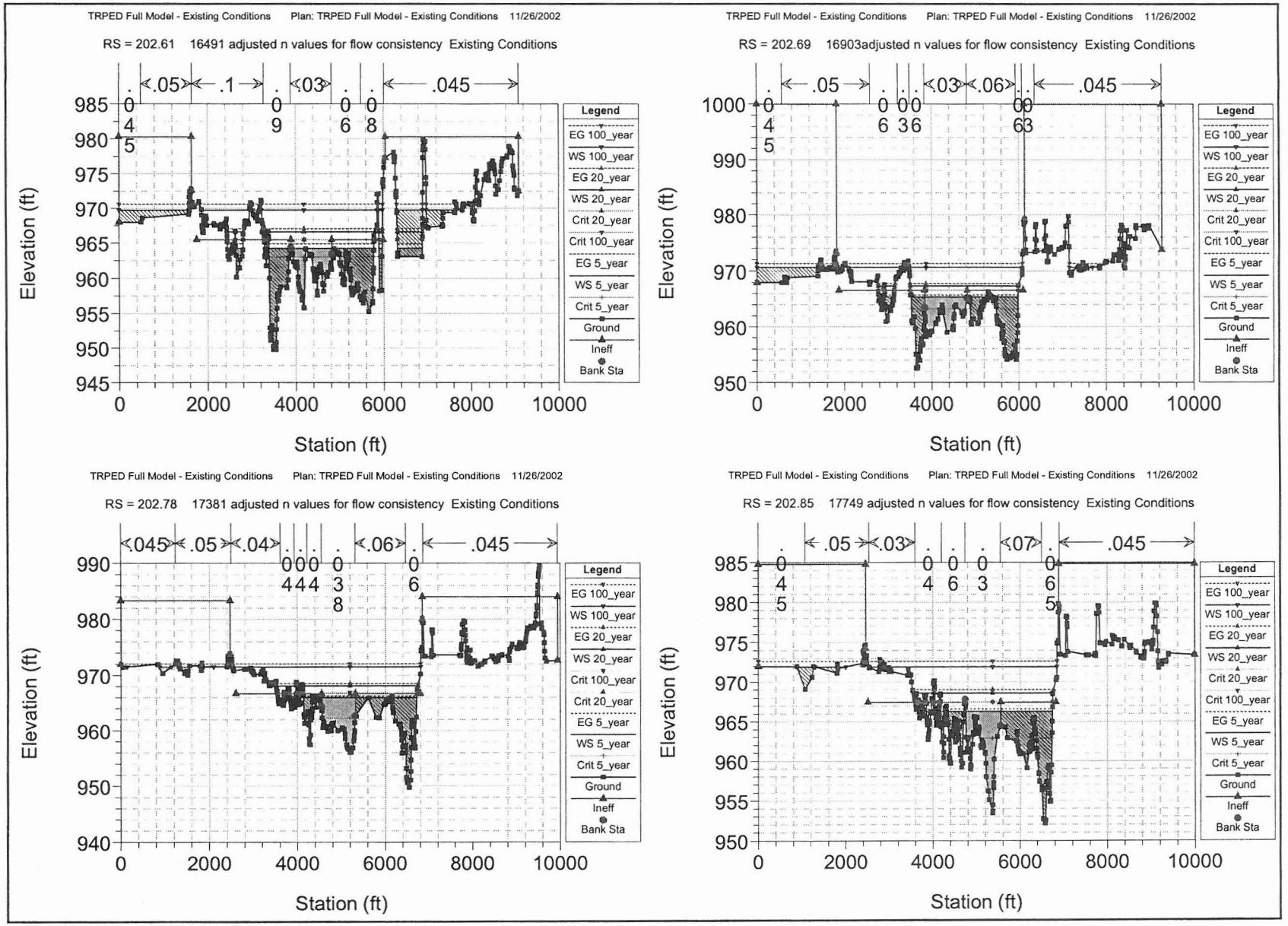
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002

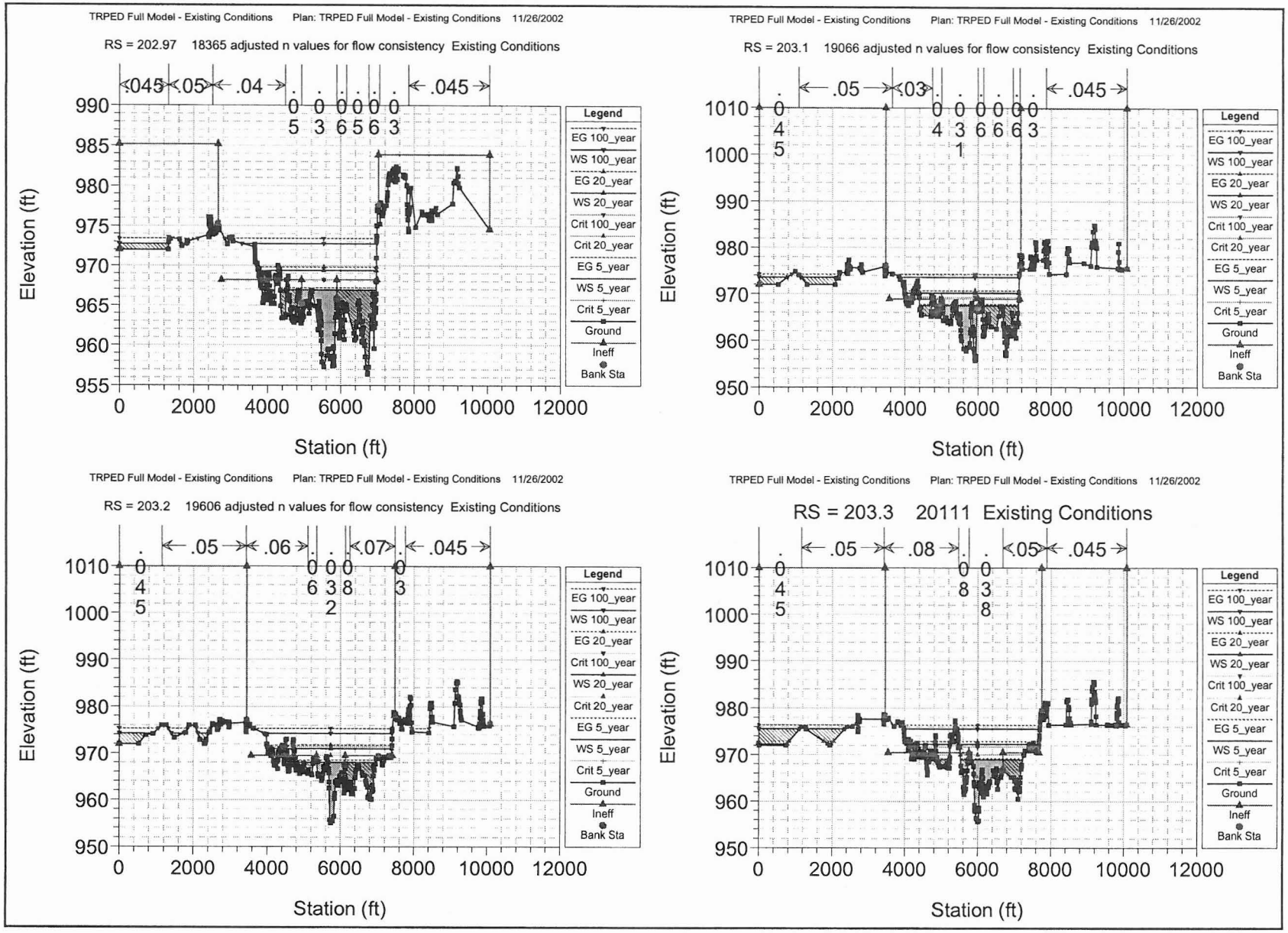
RS = 202.01 13297 Existing Conditions

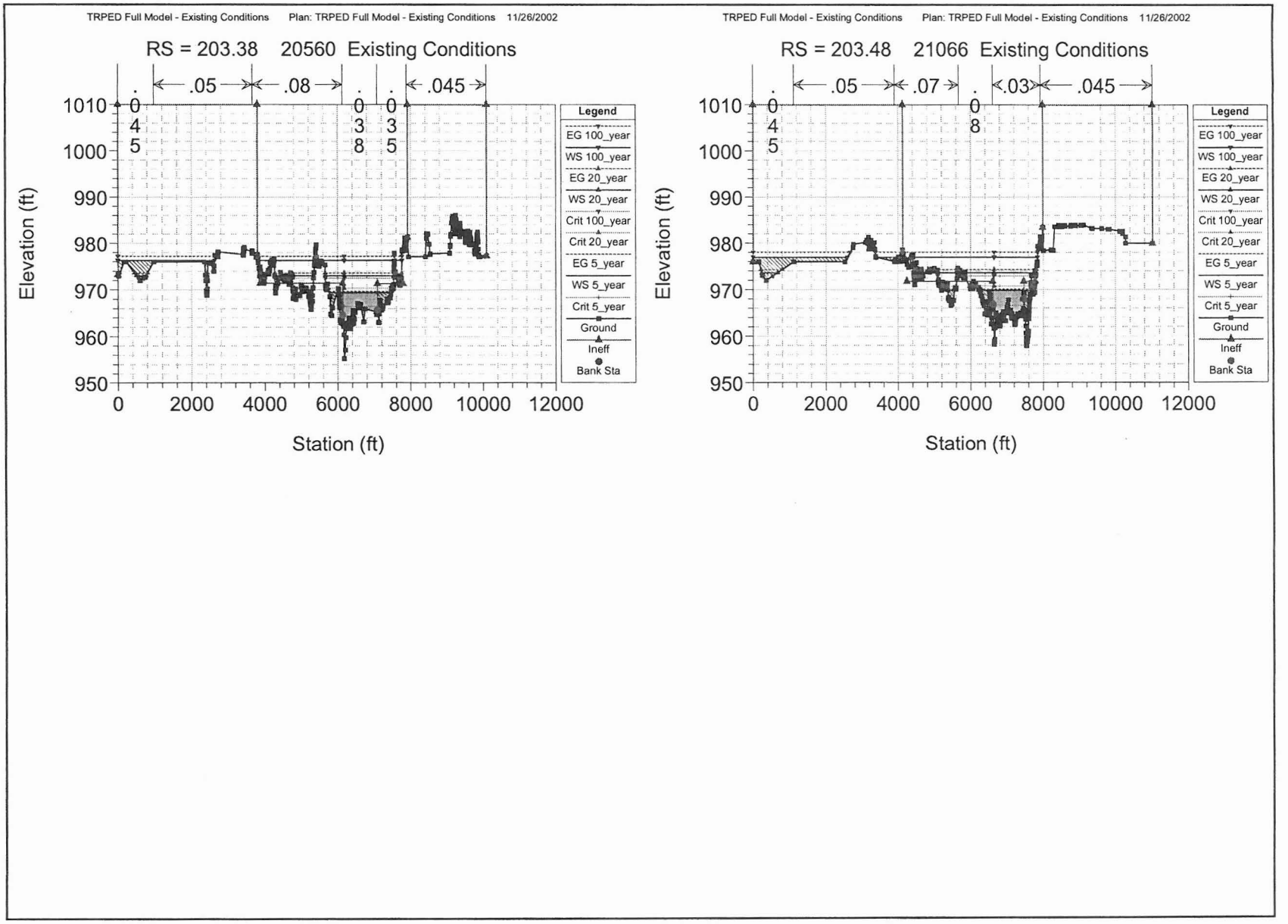



TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.06 13573 Existing Conditions
.07
.04
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.11 13829 Existing Conditions
.03
.03
.05
.05
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.18 14188 Existing Conditions
.03
.04
.05
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.24 14533 Existing Conditions
.06
.035
.05
Elevation (ft)
Station (ft)


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.32 14938 Existing Conditions
.05
.07
.045
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.4 15363 adjusted n values for flow consistency Existing Conditions
.05
.08
.08
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.48 15802 adjusted n values for flow consistency Existing Conditions
.09
.03
.08
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.54 16111 adjusted n values for flow consistency Existing Conditions
.05
.08
.08
.045
Elevation (ft)
Station (ft)

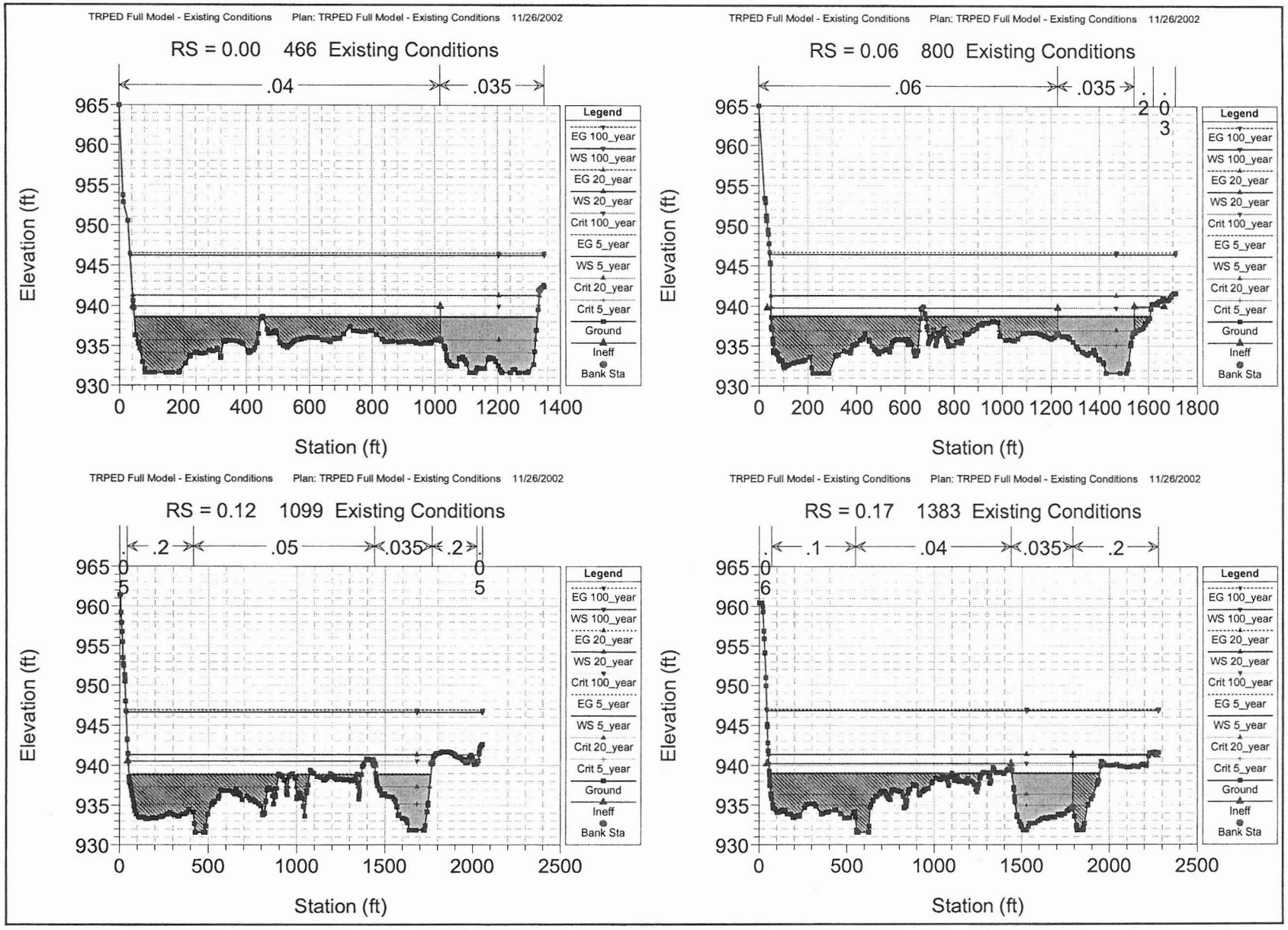

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.61 16491 adjusted n values for flow consistency Existing Conditions
.045 .05 .1 .03 .045
0 4 5
0 9
0 6
0 8
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.69 16903adjusted n values for flow consistency Existing Conditions
.045 .05 .03 .06 .045
0 4 5
0 0 0 6 3 6
0 0 6 3
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.78 17381 adjusted n values for flow consistency Existing Conditions
.045 .05 .04 .06 .045
0 0 0 4 4 4
0 3 8
0 6
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.85 17749 adjusted n values for flow consistency Existing Conditions
.05 .03 .07 .045
0 4 5
0 4 6 3
0 6 5
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

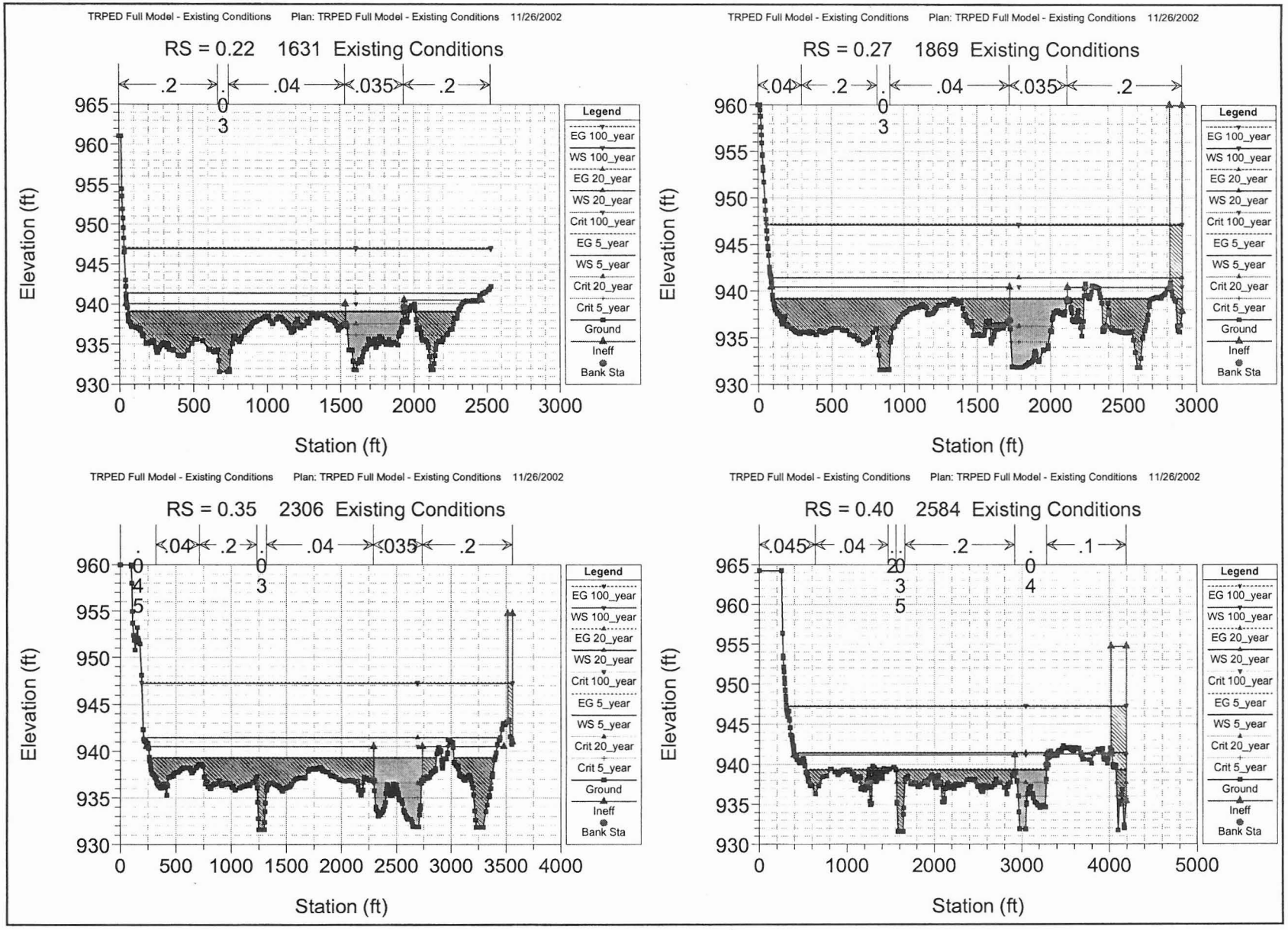

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 202.97 18365 adjusted n values for flow consistency Existing Conditions
.045 .05 .04 .045
0 5 0 3 0 6 5 6 0 3
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 203.1 19066 adjusted n values for flow consistency Existing Conditions
.045 .05 .03 .045
0 4 5 0 4 3 1 0 6 6 6 0 3
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 203.2 19606 adjusted n values for flow consistency Existing Conditions
.045 .05 .06 .07 .045
0 4 5 0 6 3 2 0 0 8 0 3
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 203.3 20111 Existing Conditions
.045 .05 .08 .05 .045
0 4 5 0 8 0 3 8
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

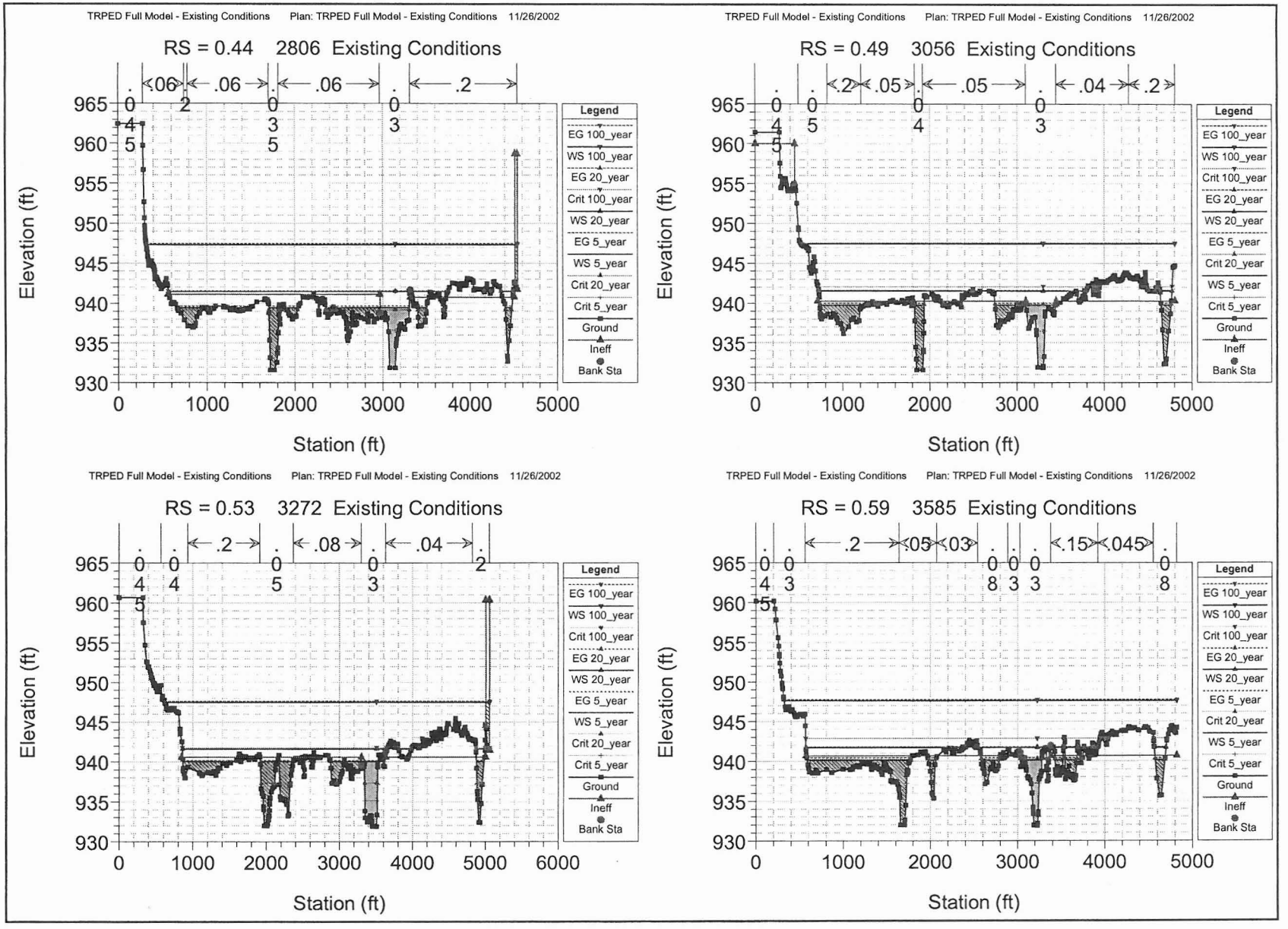

TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 203.38 20560 Existing Conditions
.05
.08
.045
.045
.038
.035
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 203.48 21066 Existing Conditions
.05
.07
.03
.045
.045
.038
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

D-iv

Cross Section Plots for the Upper Gila


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.00 466 Existing Conditions
.04
.035
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.06 800 Existing Conditions
.06
.035
.2
.03
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.12 1099 Existing Conditions
.2
.05
.035
.2
.05
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.17 1383 Existing Conditions
.1
.04
.035
.2
.06
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.22 1631 Existing Conditions
.2 .04 .035 .2
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.27 1869 Existing Conditions
.04 .2 .04 .035 .2
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.35 2306 Existing Conditions
.04 .2 .04 .035 .2
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.40 2584 Existing Conditions
.045 .04 .2 .1
Elevation (ft)
Station (ft)


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.44 2806 Existing Conditions
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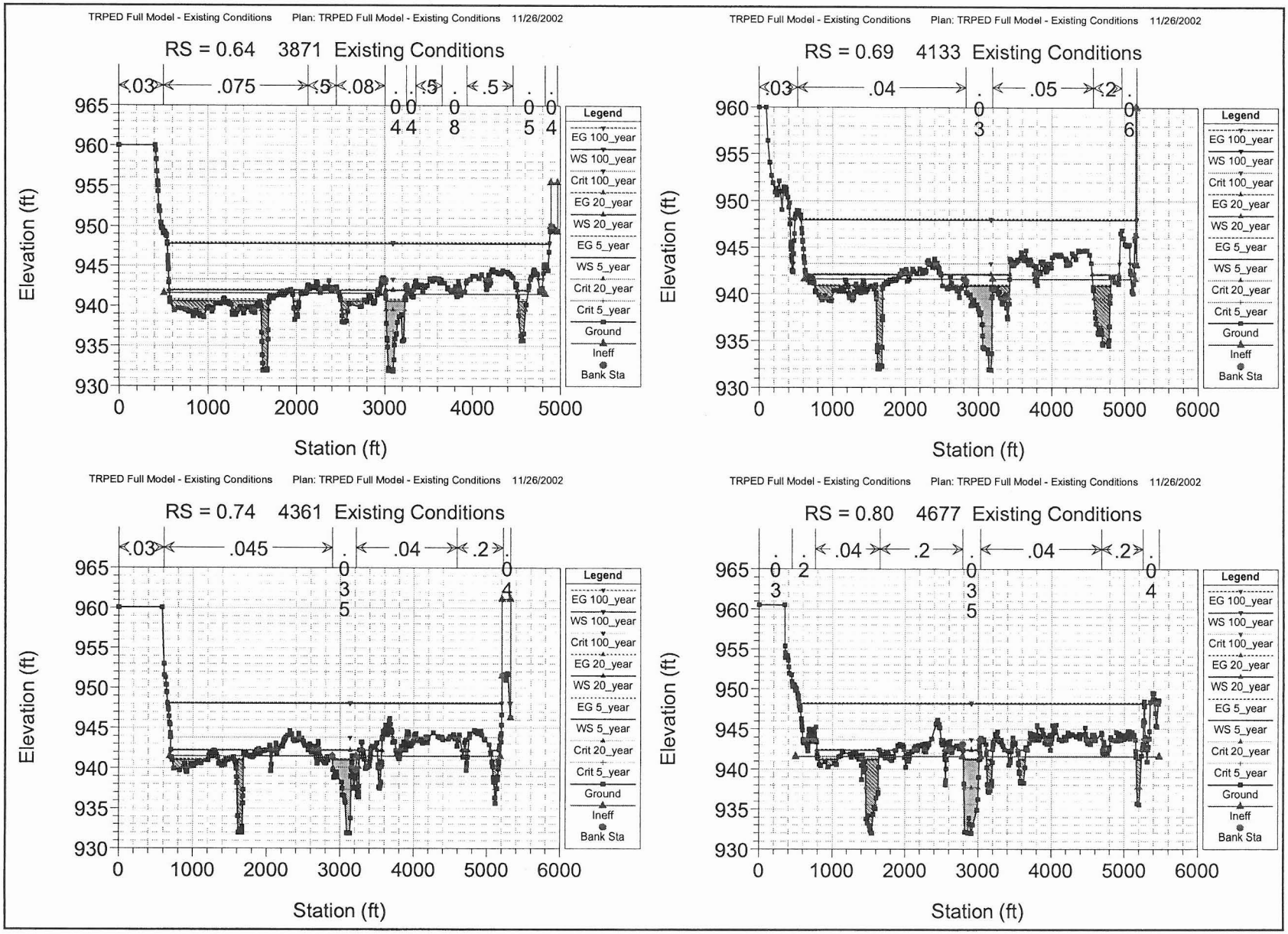
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.49 3056 Existing Conditions
.045 .05 .04 .05 .03 .2 .05 .2
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.53 3272 Existing Conditions
.045 .04 .05 .2 .03 .08 .2 .04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.59 3585 Existing Conditions
.045 .03 .08 .03 .03 .2 .05 .03 .15 .045 .08
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta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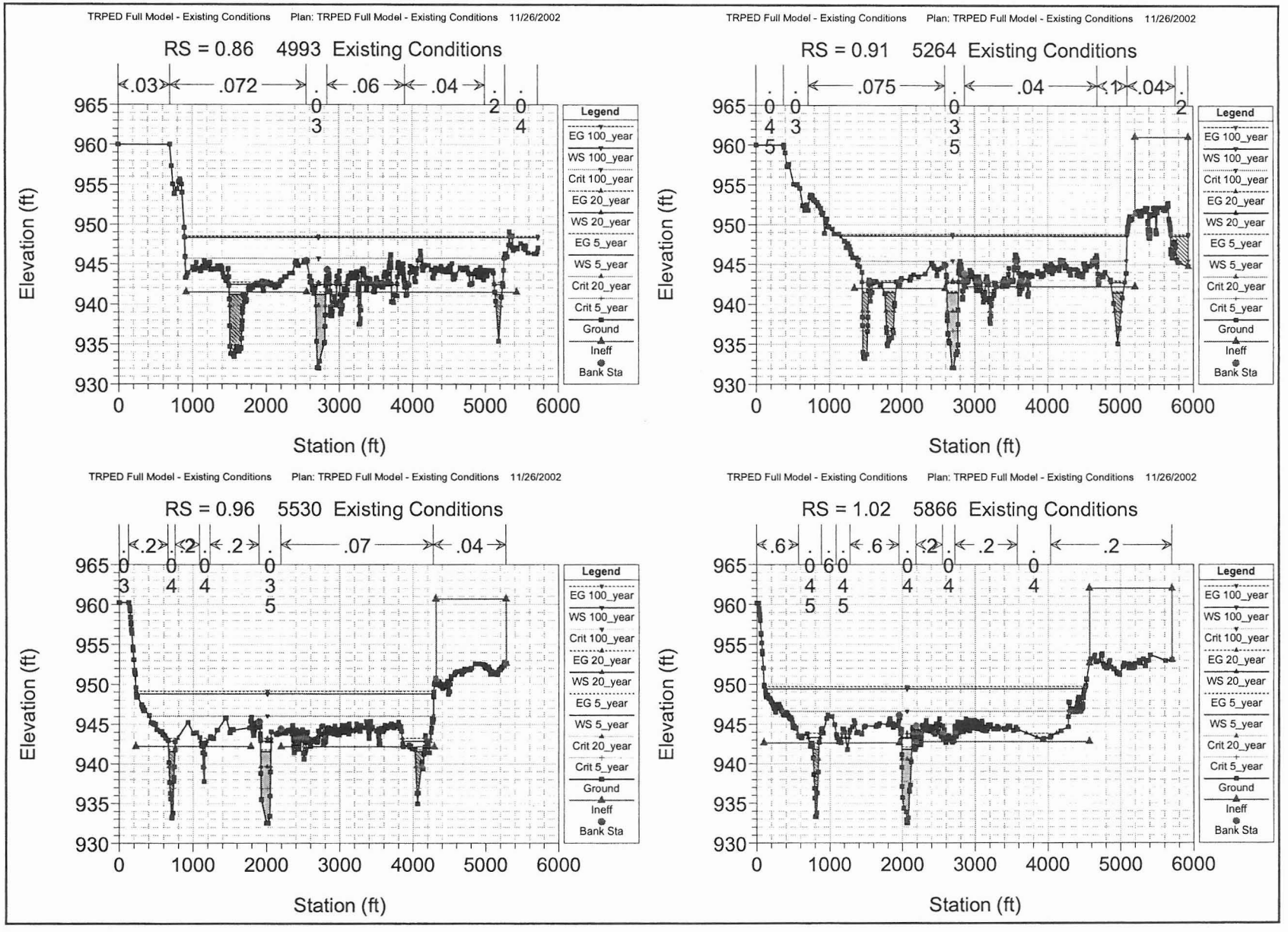
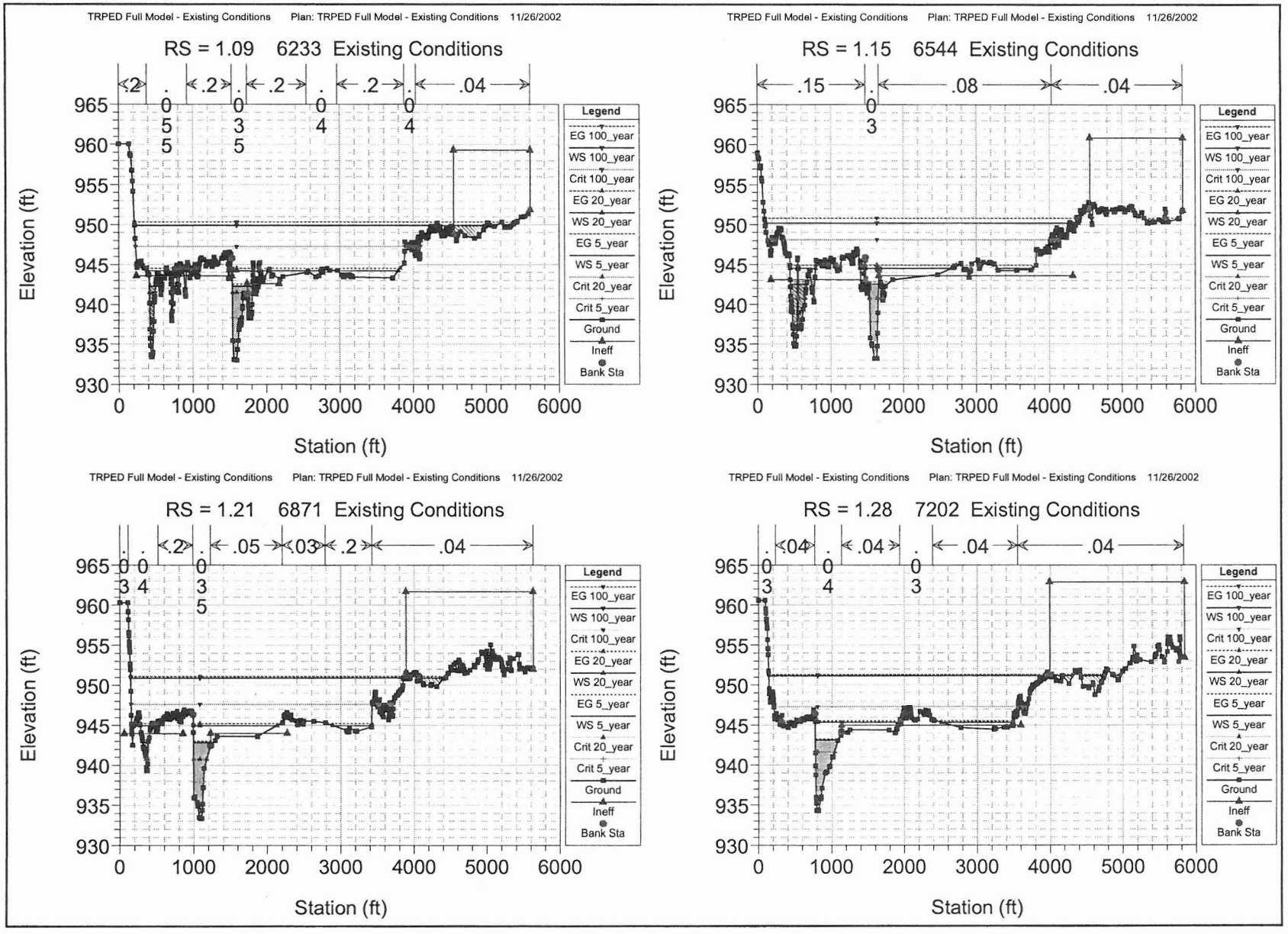
RS = 0.64 3871 Existing Conditions
.03 .075 .5 .08 .5 .5
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.69 4133 Existing Conditions
.03 .04 .05 .2
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.74 4361 Existing Conditions
.03 .045 .04 .2
Elevation (ft)
Station (ft)
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.80 4677 Existing Conditions
.04 .2 .04 .2
Elevation (ft)
Station (ft)


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.86 4993 Existing Conditions
.03 .072 .06 .04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.91 5264 Existing Conditions
.075 .04 .04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 0.96 5530 Existing Conditions
.2 .2 .2 .07 .04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 1.02 5866 Existing Conditions
.6 .6 .2 .2
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 1.09 6233 Existing Conditions
.2 .2 .2 .2 .04
.055 .035 .04 .04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Existing Conditions Plan: TRPED Full Model - Existing Conditions 11/26/2002
RS = 1.15 6544 Existing Conditions
.15 .08 .04
.03
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
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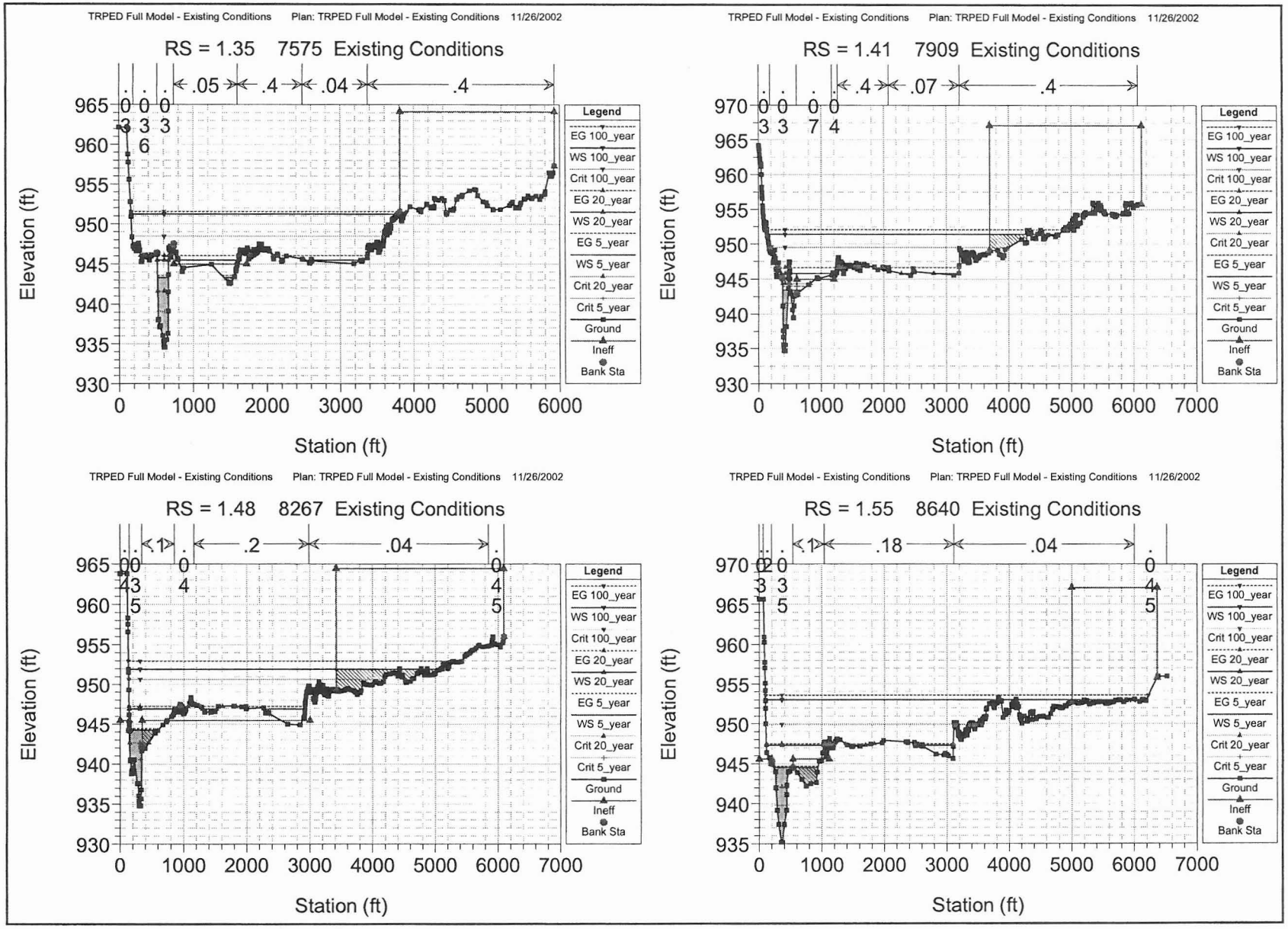
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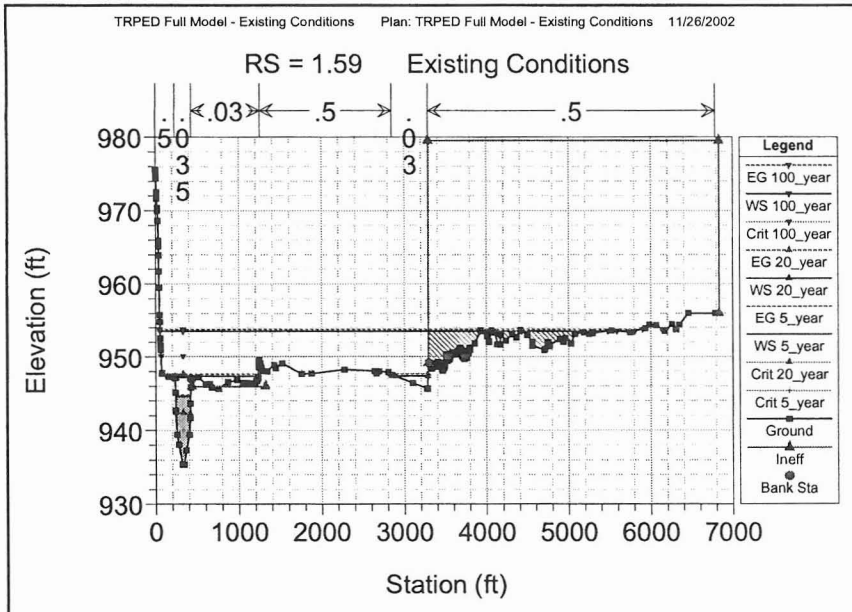
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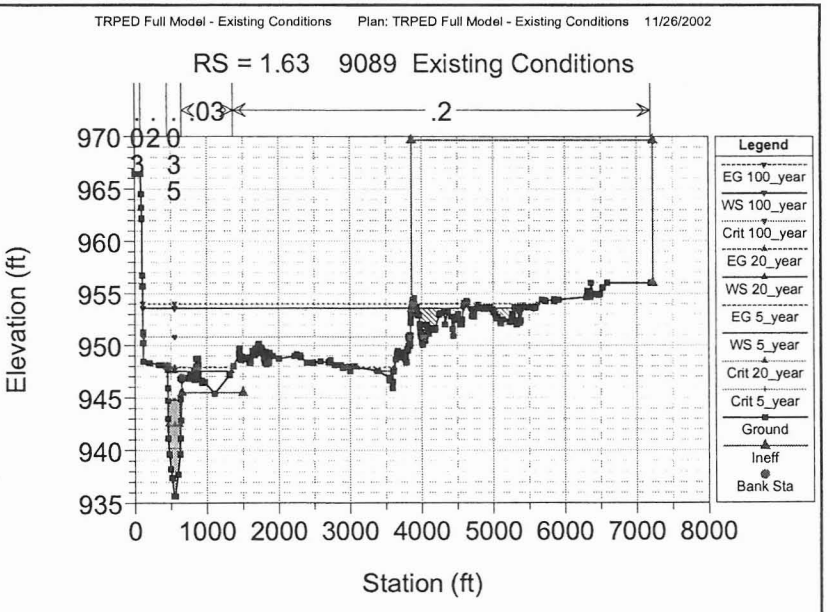
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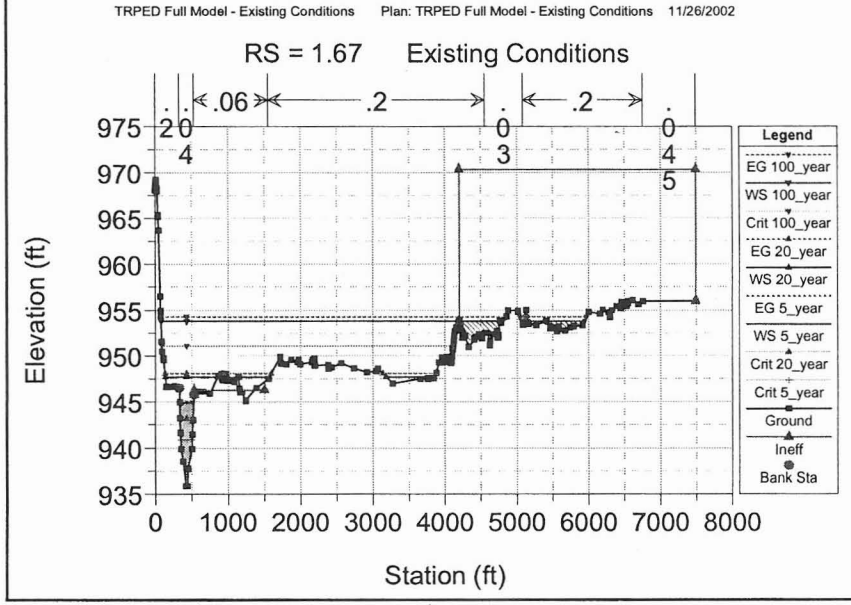
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APPENDIX E

Two-Dimensional Modeling of Tres Rios Study Area

PED Hydraulic Design of Tres Rios North Levee - 2D Model Analysis

Maricopa County

Final Design Report

Contract Number: DACW09-00-D-0021

Prepared for:

U.S. Army Corps of Engineers
Los Angeles District

Prepared by:

WEST Consultants, Inc
960 W. Elliot Road, Suite 201
Tempe, AZ 85284

April, 2004

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1. Introduction

This study was conducted in conjunction with a one-dimensional study of the Tres Rios area to gain a better understanding of flow through the relatively complex confluence area and along the north bank of the Gila and Salt Rivers. Based on the results of the one-dimensional HEC-RAS modeling, concerns were raised in regards to the calculated levee toe-down and protection requirements. The questions raised were in regards to why significant toe protection was required when the levee was placed back from the edge of the river, what the impacts of the thalweg movement to the north bank would be, and what was the likelihood that the river would return to an alignment along the north bank rather than the current course nearer the southern bank. Since the questions being asked could be more fully answered and illustrated utilizing a two-dimensional model, a two-dimensional study was initiated to further examine required toe down for the levee and to evaluate options that would reduce the construction costs over the initial protection design.

The two-dimensional hydraulic model extends from 83rd Avenue to the Bullard Avenue Bridge and covers the same area studied in the prior one-dimensional study. The modeling approach has been developed such that Agua Fria River flows can be modeled to view the impacts of flows entering from the Agua Fria on the lower reaches of the project. The flow in the Agua Fria River was not considered in the models discussed herein.

2. Data Sources

The following items have been provided by the Los Angeles District Army Corps of Engineers:

- Topographic mapping of the study area developed by photogrammetric methods with a one-foot vertical resolution. Flight date of October 23, 2001. Resolved in Arizona State Plane coordinates (central region), NAD 83.
- Aerial photographs of the study area.
- One hundred year peak and contemporaneous discharge flood frequency values for both the Salt and Gila Rivers.

3. Main Channel Migration

One of the basic assumptions of the one-dimensional (1-D) HEC-RAS analysis for levee protection was that the river could, at some future date, move its thalweg and main channel to the north side of the river bed and flow immediately adjacent to the levee. This would allow significant erosive forces to impact the levee and associated protection. The bed of the river currently has significant areas that are infested with salt cedar or tamarisk. The plant was originally introduced into the United States to help stabilize river banks and prevent erosion but has since been classified as an invasive species. The species is currently out of control in the western United States and chokes streams and floodplains throughout the southwestern United States. The extent of the salt cedar in the Salt and lower Gila River portions of the project area is roughly shown in Figure 1. Additional salt cedar infests what is identified as the upper Gila in this report but is not shown in Figure 1.

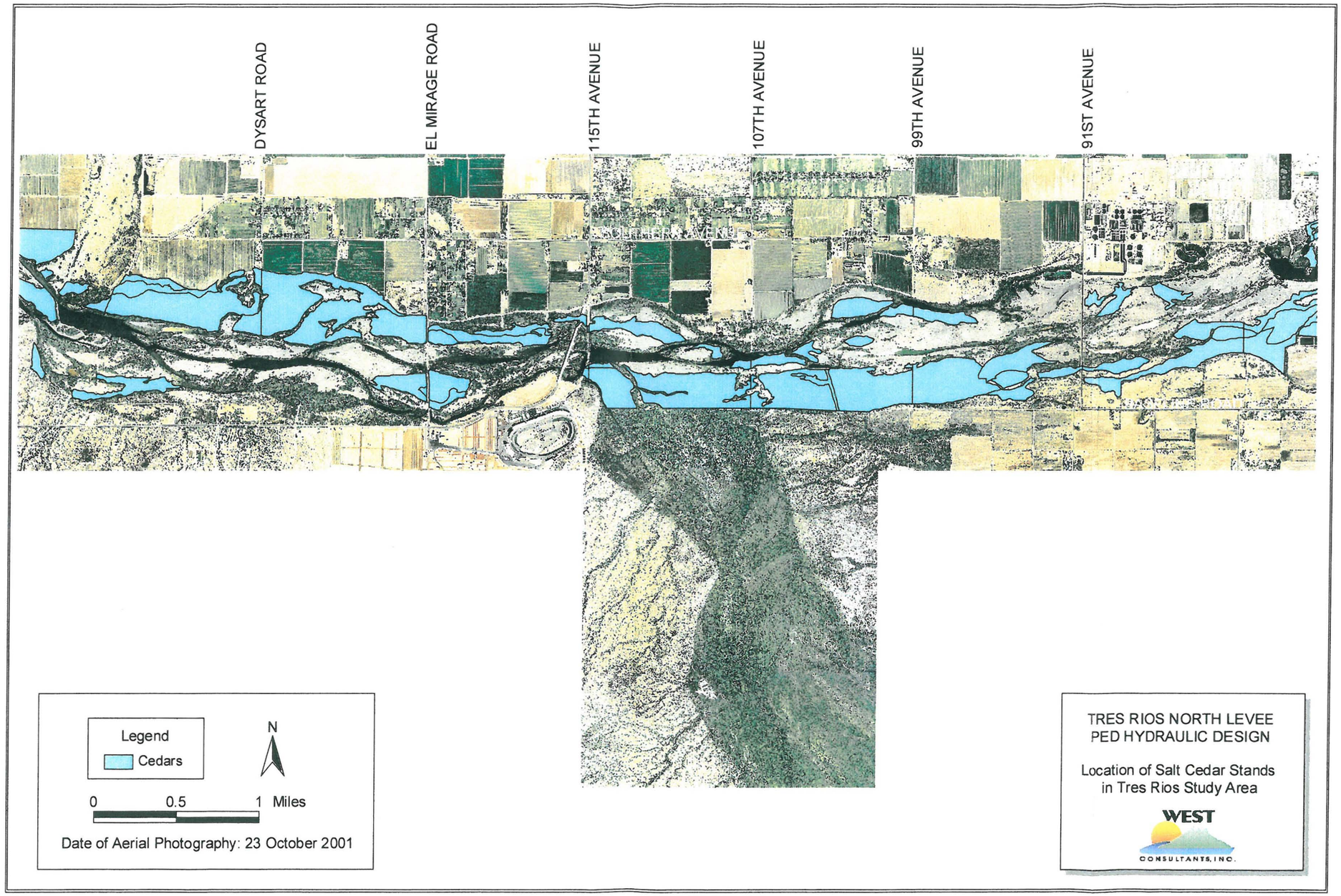


Figure 1. Location of Salt Cedar Stands in Tres Rios Study Area. Salt Cedar mixed with cottonwood – willow habitats are not included in above areas.

3.1. Channel Stability and Restoration Plans

Current restoration plans call for the removal of at least some of the tamarisk and the establishment and/or enhancement of a willow and cottonwood riparian zone. If the tamarisk is left in the river bottom it is less likely that the river will move slowly from its channel to the bank. A common process, however, is that when tamarisk or other dense vegetation begins to grow in the main channel the flood flows are forced outside the main channel to less vegetated areas. This often leads to avulsions where the main channel moves suddenly to an area that has not previously been subject to high velocity flows. This phenomenon can be noted in the model results (see Figure 7b, included later in this report) for the upper Gila River where very dense tamarisk populations force flood flows out of the river channel and onto the overbank areas where the tamarisk has not become established. A comparison of the velocities for the upper Gila shows significantly higher velocities on the floodplains than in the vegetation choked main channel.

Whether or not the tamarisk is reduced or eliminated, it will be important that a floodway be kept cleared in the river bottom to allow passage of the major floods. This will be especially important if the tamarisk is not eradicated from the reach. The willow and cottonwood communities may be less dense than the tamarisk and may allow more flow through these areas but care should be taken not to allow vegetation to encroach into and choke the main portion of the channel. The construction of the ponds should help keep main flows in the channel area, however, vegetative encroachment into the main channel will direct high velocities into areas that are less densely vegetated and could result in sudden channel movement to one of the bank areas that are not currently subject

to direct flow impingement. Based on the desire to develop and preserve the cottonwood and willow plant communities in the Tres Rios project, it is likely that the tamarisk will be removed or reduced in the area. This will result in relatively more mobility for the low flow channel.

Typical channel migration in braided systems such as the Salt and Gila Rivers normally occurs due to either channel avulsion (discussed above) or sudden changes in flow patterns. Flow pattern changes occur unpredictably due to debris, sediment deposition, or other changes that impact the direction of the main currents in a channel. Given the types of vegetation currently in the river and the recent history of the river, it is very likely that a significant channel could be developed along a portion of the north bank. This channel could cause significant erosion along the north levee and terrace if the areas are not protected.

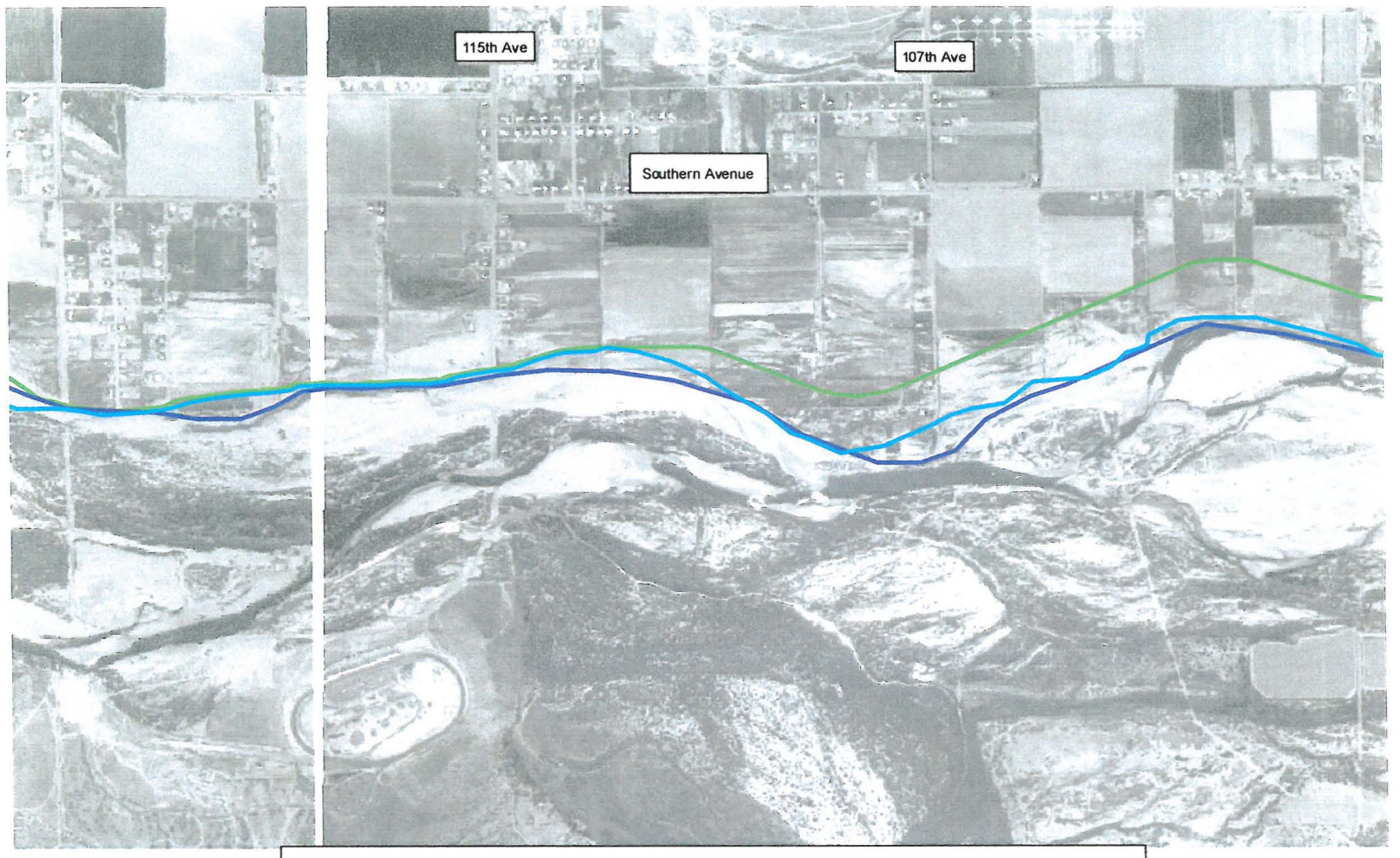
3.2. Historical Channel and Bank Migration

The historical photos of the Tres Rios area show significant bank migration and erosion. Between 1979 and 1999 the north bank moved up to 350 feet in the vicinity of 107th Avenue. (See Figure 2) This was an unprotected bank and illustrates the susceptibility of the banks to high erosion rates if protection is not provided. The events between 1979 and 1999 consisted of the 1993 flood (estimated between approximately 120,000 and 130,000 cfs) and another event in 1980 (130,000 cfs). The difference in estimates for the 1993 flood is due to differences between the various gages along the river. This is discussed more completely in the main Tres Rios Report.

Observations by Adron Reichert, local resident, indicated that one of the eroding bank scallops along the north bank near 107th Avenue was enlarged during one flood

when a debris jam occurred on the south side of the main channel. This can be seen by comparing the aerial photos for 1979 and 1999 in Figure 2. The western end of the scallop moved approximately 350 feet to the north from the 1979 alignment while the scallop to the east of 115th moved by about 300 feet. These changes indicate the tendency of the river banks to move significant distances during large flood events. It appears that the scallop just east of 115th enlarged during the 1983 flood since the existing Holly Acres Levee (constructed in 1985) smoothly ties into the existing bank at this location. This would indicate that the bank moved approximately 300 feet during a 130,000 cfs flood. Larger floods with higher flows could move the bank further during a single event.

Based on the historical data available the banks on the lower Salt River have retreated at least 300 ft during a single 130,000 cfs flood event in 1983.



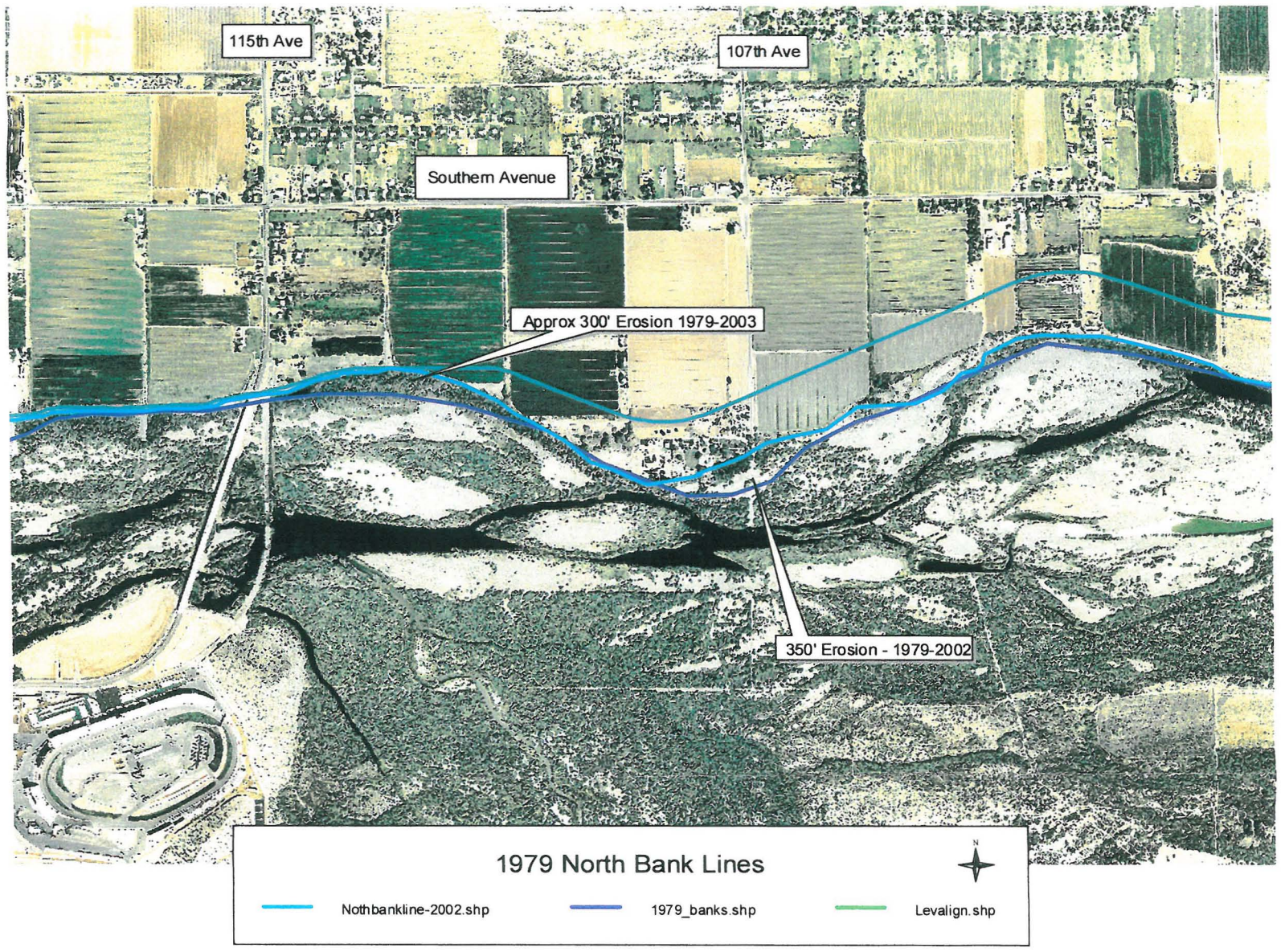


Figure 2. 1979 and 2003 North Bank Lines for Tres Rios Design Reach. Upper Photo is 1979 Aerial and Lower Photo is 2003 Aerial Photos Highlighting Areas of Bank Erosion between 1979 and 2003.

3.3. Analysis of Levee Set Back and Bank Migration Potential

WEST was asked to study the area between 91st Avenue and 115th Avenue to evaluate the potential to reduce bank protection in the setback portion of this reach. The only portion of the levee where protection could logically be reduced is the eastern portion of the levee where the levee is set back from the edge of the high terrace between approximately 111th and 95th Ave. The reasoning that supports reduction of levee protection is the assumption that the river cannot migrate the distance between the edge of the high terrace and the levee in one flood event. This would allow repairs and the addition of protection at a future date if needed to protect the levee.

The levee is set back from the edge of the high terrace (See Figure 3) an average distance of approximately 600 feet in the reach from about one-half mile west of 91st Avenue to approximately three-quarters mile east of 115th Avenue. This set back can also be noted in Figure 2 which shows the levee in relation to the historical bank lines. While the distance to the levee from the rivers edge of the high terrace is more than the amount eroded during the 1979 to 2003 time period, the historic erosion is approximately 50% of the distance to the levee as shown in Figure 2 during an approximate 50 year event (130,000 cfs) as discussed in the preceding section.

Since the levee set back of 600 ft is approximately double the amount of the historical bank retreat during a flood, it can be argued that the levee is far enough from the river so as to be safe from bank erosion during a single event. The 600 ft is, however, on the same order of magnitude as the 300 to 350 ft. Further the historical scour occurred under lower flow conditions that are expected for the 100 year event.

The combination of historical observations and high velocities in the main river channel indicates that the potential for lateral migration is high for the Salt and Gila Rivers in this reach. The existing and expected future development behind the levee will be severely impacted if the levee were to be breached during a flood event and, given development pressure in the area, it can be expected that the area will ultimately be developed as residential housing. Given the risk of lateral erosion and the impact of failure, it is important that the levee be adequately protected against lateral migration by the Salt and Gila Rivers. Based on the analysis of the historical conditions and the possibility of high velocities near the bank and levee, it is our recommendation that the risk of failure due to lateral migration be carefully balanced with possible cost savings to insure the integrity of the levee is not compromised due to reduced protection.

The installation of toe protection under conditions with this large of a set back is a matter of risk management. Ultimately, it is the Corps that must accept the risk of failure due to bank retreat if the toe is not protected. If the Corps is willing to accept the risk of the potential failure due to possible erosion of the toe (above and beyond any local sponsor flood fight activities), the levee could be protected against local scour and the toe left unprotected where the set back is deemed sufficient. In no case should the toe be left unprotected in the areas where the levee is less than 400' from the existing riverbank.

While we feel that reduced toe protection is probably adequate for the reach where the levee set back is greater than 400', we do not feel that we can decisively select this option due to the high damages that would occur upon levee failure. Since we cannot fully recommend the reduction in scour protection due to the residual risk, a series of alternative methods of protection were evaluated to find a least cost alternative to achieve

adequate levels of protection for the toe of the levee and bank protection. These options include options that are in place along the existing Holly Acres Levee as well as innovative ideas that have been proven effective in other areas but which have not, as yet, been applied in the Phoenix area. Two-dimensional modeling was performed to better understand flows and velocity patterns in the Tres Rios reach of the Salt and Gila Rivers and the impacts of the various protection methods on flows in the rivers.

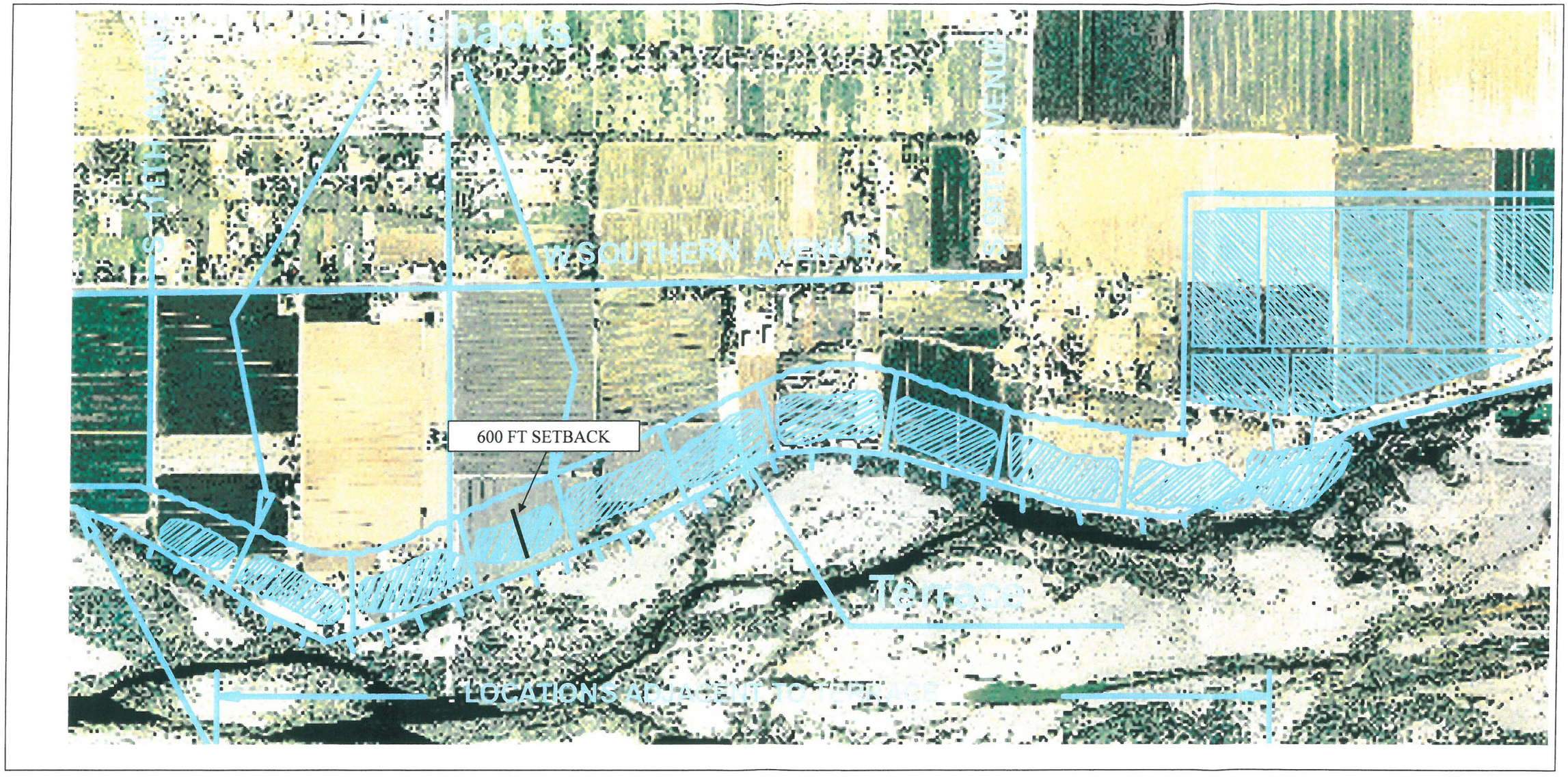


Figure 3. Area East of Holly Acres Levee Showing Set Back Levee and Alignment of Terrace Protection. (Bendway weir option is also shown)

4. Two Dimensional Modeling and Alternatives

The modeling of flows using traditional 1-D models is based on the simplification that the velocity and other parameters that vary along the cross-section are lumped together resulting in estimates of a single value for variables for the entire cross-section. As a result, the major variables such as velocity and water surface elevation are represented by a single value for the entire cross-section. Such an approach is reasonable when there is little or no change expected across the cross-section. However, in areas where the flows could vary significantly along the cross-section, two-dimensional modeling provides a better picture on the horizontal variations in the parameters such as velocities and water surface elevations. In a two-dimensional model the velocity and water surface elevation are allowed to vary both longitudinally along the river and transversely across the river. This allows the model to better predict both velocities and water surface elevations throughout the model, assuming of course that the two-dimensional model correctly represents the elevations and roughness of the river being modeled.

The presence of the confluence in the study area implies that significant flow variation can be expected across the cross-sections and application of two-dimensional models become essential to better understand the hydraulics. In this study, a two-dimensional modeling approach was also necessary to assess the effects of potential lateral channel migration on the project reach and recommend several design options to minimize the recommended toe-down for the North Levee, if possible.

Two-dimensional models were developed and run for two conditions: 1) existing conditions with the channel nearer the south bank and 2) channel "flipped" conditions

(explained in more detail later in this report) or "north channel" alignment with the channel located nearer the north bank and the levee. These runs were designed to analyze the impacts of levee protection features that could reduce toe down depths or costs for levee protection from those designed in the earlier analysis using one-dimensional results (WEST 2002). All evaluations include the existing protection and large dikes associated with the existing Holly Acres Levee.

4.1. Two Dimensional Model Development

4.1.1. Construction of Hydraulic Model Geometry

The various models described herein were developed using version 8.0 of the Surface water Modeling System (SMS) which was used to develop the model inputs and visualize the results. The computations were performed by RMA-2 Version 4.35 software developed by the US Army Corps of Engineers. SMS is a pre/post-processing system developed by the U.S. Army Corps of Engineers in conjunction with Brigham Young University that uses RMA-2 as one of several computational engines. The input data such as the channel bottom elevations and existing condition Manning's n data were obtained from the Arcview GIS software system which was also used to develop the inputs for the one-dimensional HEC-RAS study (WEST 2004). The data setup inside SMS was performed in such a way that the open water ponds features can be readily incorporated to aid in future modifications to the base model to study the influence of ponds. This was achieved by identifying the pond areas separately in the input data so that the channel bottom and the vegetation data for these areas can be easily changed to reflect the presence of the ponds. The existing dike top and toe elevations were set using

a 1' contour map of the area. The levee alignment as modeled at the west end of the project turns north at Dysart Road and then west along the south side of Southern Avenue rather than following the high terrace as originally proposed (and modeled) in the main report (See Figure 4). This alignment closely follows the final selected alignment to the point where Southern Avenue meets the Buckeye Feeder canal. The modeled alignment turns north and follows the canal back to the east rather than following the canal to the west but no significant changes can be expected in flow patterns from this slight change in alignment. These changes are more fully discussed in the main report.

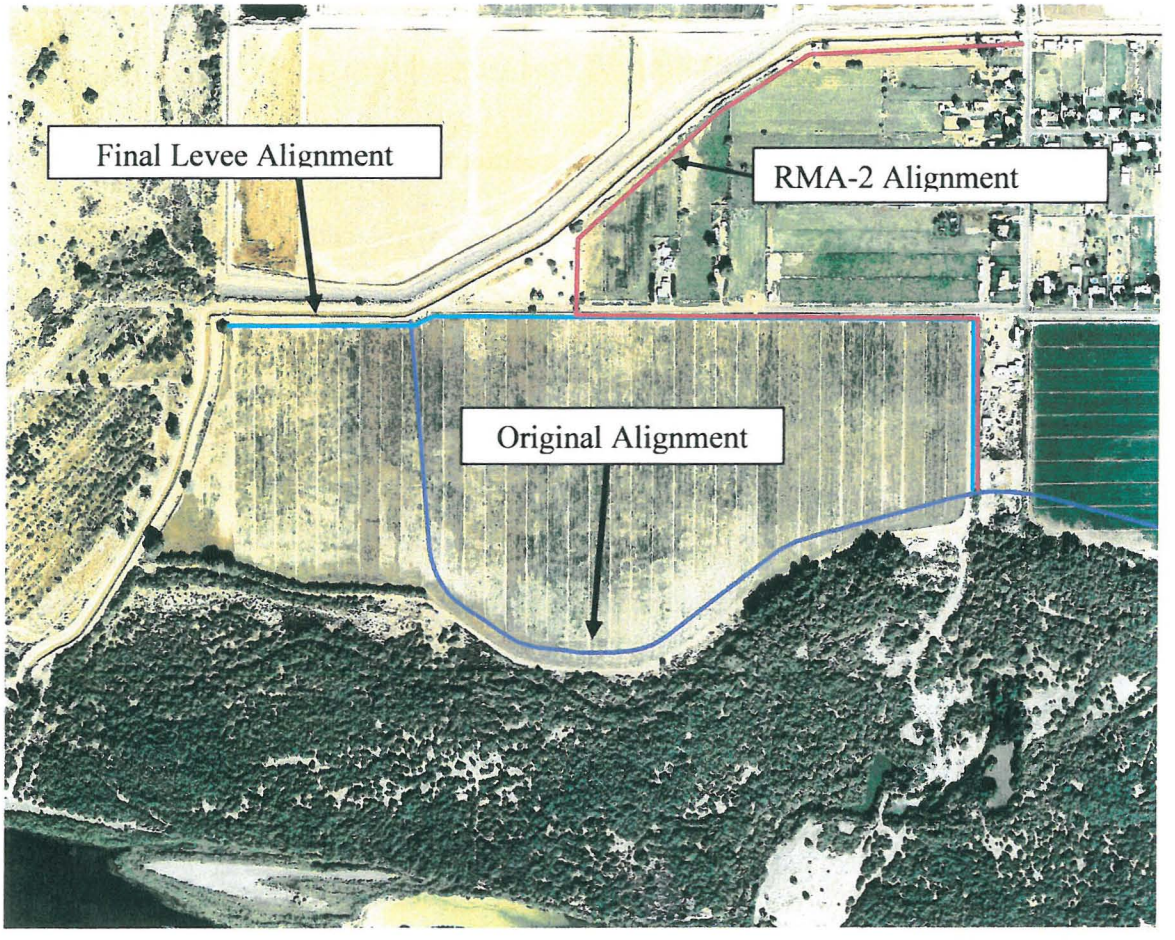


Figure 4. Levee Alignments for Original Study, RMA-2 Study and Final Alignment.

4.1.2. Model Boundary Conditions

The 100-year flows of 162,000 cfs and 65,000 cfs for the Salt and the Upper Gila Rivers, respectively, were set as boundary inflows (total flow downstream of the confluence is 227,000 cfs). The downstream water surface (head) boundary condition was set at 913.24 feet based on the with-levee existing conditions results from HEC-RAS models described in the main volume of the Tres Rios report (WEST 2004). The north boundary of the model follows the North Levee and the Buckeye Canal alignment to the west of the study reach.

4.2. Existing Condition With-Levee Hydraulic Analyses

The two-dimensional model geometry was developed to represent the "with levee" condition, as described in WEST (2004) and can be modified to represent various future levee protection features. The base RMA-2 model is flexible enough to allow for future inclusion of design features such as the open water ponds, dikes, Agua Fria River flows, modifications for land use cover changes, and potential main channel migration.

The RMA-2 model was compared with the HEC-RAS model for the existing conditions (100 year flow) and found to predict very similar elevations in the middle of the river. The comparison is shown in Figure 5. It can be seen that there are some rather large differences between the water surface elevations in the main channel as compared with the water surface elevations along the face of the levee but the main channel elevations predicted by the HEC-RAS and the RMA-2 model agree relatively well for the reach modeled. The differences between the main channel and the levee are due to the influence of the dense vegetation near the levee as well as the influence from the dikes associated with the Holly Acres Levee.

This RMA-2 model was used as the basis for comparison of the various alternatives under "existing conditions" to insure no adverse impact to neighboring landowners and communities. The existing conditions model was also used to evaluate the observed water surface elevations reported by the local resident Adron Reichert for the 1993 flood. Mr. Reichert is a retired architect and is a long time resident of the area. Observations made by Mr. Reichert indicated that the 1993 flood was near the top of the dikes along the Holly Acres Levee and would have flanked the levee had not the Flood Control District of Maricopa County (FCD) constructed a low berm running north from the east end of the Holly Acres Levee. These general observations were confirmed by FCD personnel.

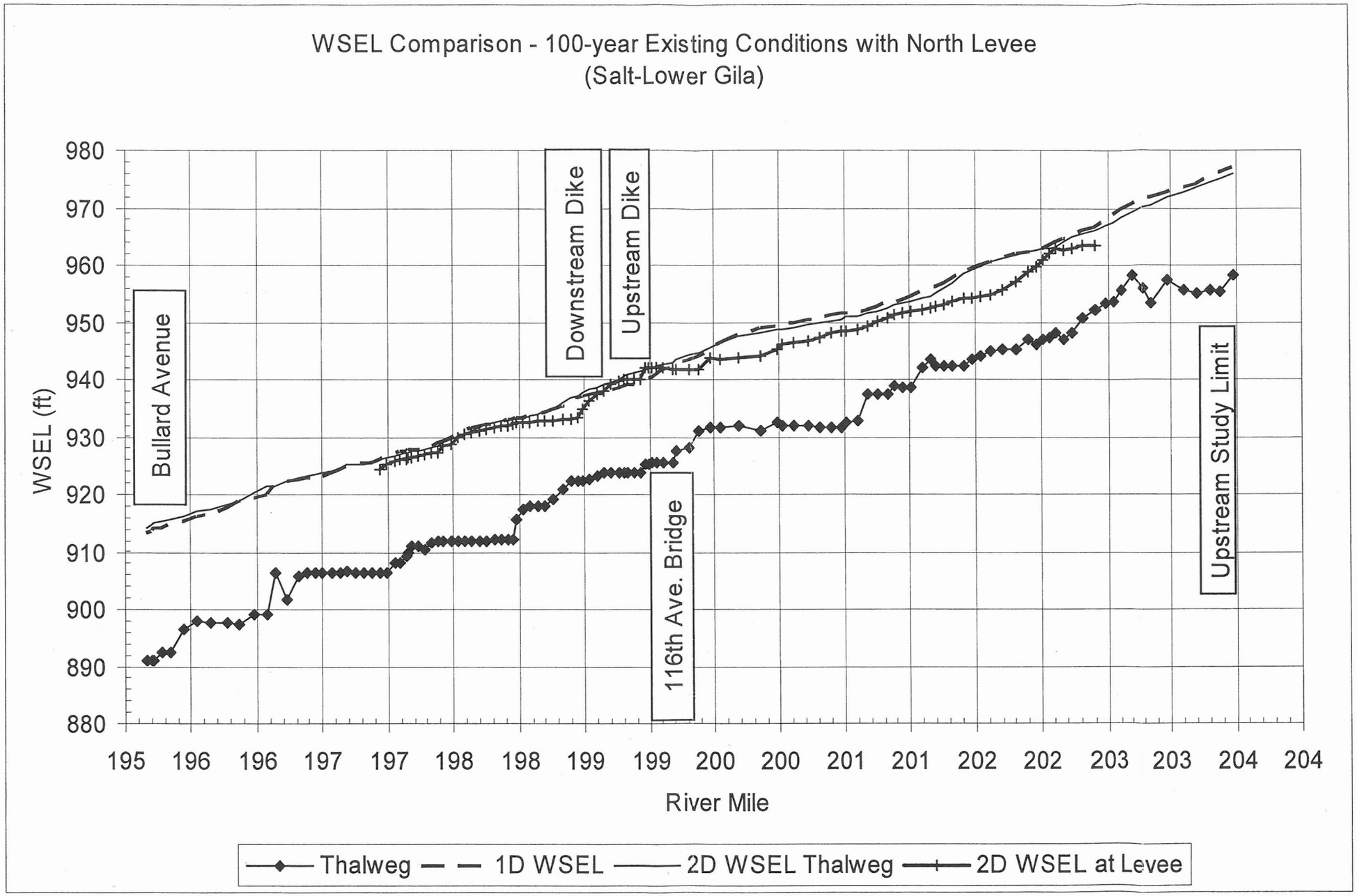


Figure 5. Comparison of 100 Year Water Surface Elevations for the RMA-2 Model and the HEC-RAS Existing Conditions Model.

In order to match the 1993 observed water surface elevations reported by Mr. Reichert, it was necessary to increase Manning's n values by 20% over the initial values in the 1-D HEC-RAS model. For example, the Manning's n values for the channels without vegetation were increased from 0.035 to 0.042 and the channels with relatively dense vegetation from 0.065 to 0.078. This impacted the 91st Avenue wastewater treatment plant protection and discharge during floods as well as the design levee heights.

The two-dimensional model runs indicate that for the existing conditions there is about a one foot rise in water surface elevation on the upstream side of dikes adjacent to the Holly Acres Levee due to backwater from the dikes. Since the one dimensional approach computes single values of water surface elevations for each cross-section, it fails to predict the local rise in water surface elevations immediately upstream from the dikes. The two-dimensional approach is much more robust in predicting variability in the horizontal plane not only in the upstream-downstream direction but also along the channel cross-sections. This enables the better prediction of local changes in the water surface elevation, in this case predicts a 1 foot rise on the upstream side of the dikes and eddies downstream from the dikes.

The 1993 water surface elevations computed by the various models and those observed by Mr. Reichert are shown in Figure 6. It can be noted that the RMA-2 water surface elevations are somewhat higher than those observed by Mr. Reichert which supports the idea that the 162,000 cfs estimate of the 1993 flood is too high (See hydrology section in main report for this discussion) but no further analysis of the various estimates of the 1993 flood peak was performed as a part of this portion of the study.

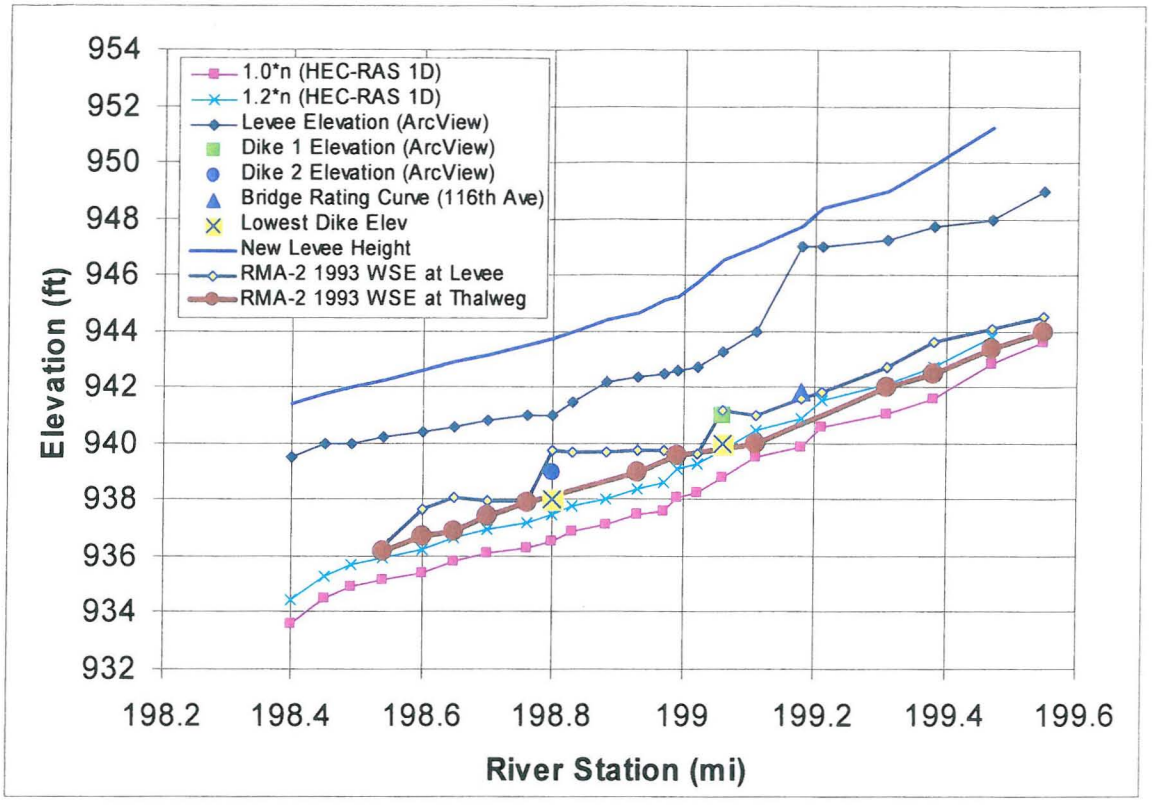


Figure 6. Water Surface Elevations along Holly Acres Levee for One- and Two- Dimensional Models Compared with Levee and Dike Elevations.

Since the models matched closely for the 100 year flows no adjustments were made for the 162,000 cfs flow. The two-dimensional model results show the back water upstream from the dikes, even for the lowered flows as shown in Figure 6. The two-dimensional results thus tend to substantiate use of the original Manning's n values developed in the main report and used by others in earlier studies. In summary, an increase in the Manning's n values to match the observed high water elevations is not necessary.

The results of the existing conditions run can be seen in Figures 7a-7c which show the velocity values as shaded contour values and velocity vectors. The direction of the vectors (arrows) indicates the direction of the flow and the length of the arrow

indicates the magnitude of the velocity. In other words, a longer arrow represents a larger velocity. The velocity magnitudes are also shown as color fills in the background of the plot with blue representing high velocities and red indicating low velocities. The mapping to actual values is shown by the legend in the plot. The areas of low velocity along the north bank are shallow areas near the high terrace and show the red color zones indicating areas of low velocity. The existing Holly Acres Levee can be seen in Figure 7b. The boundary of the RMA-2 model appears slightly removed from the levee but is due to elemental drying along the boundary. The full length of the dike is included to verify impacts on flow from the dikes, however. A large plot showing results for the entire study reach is included in Appendix A.

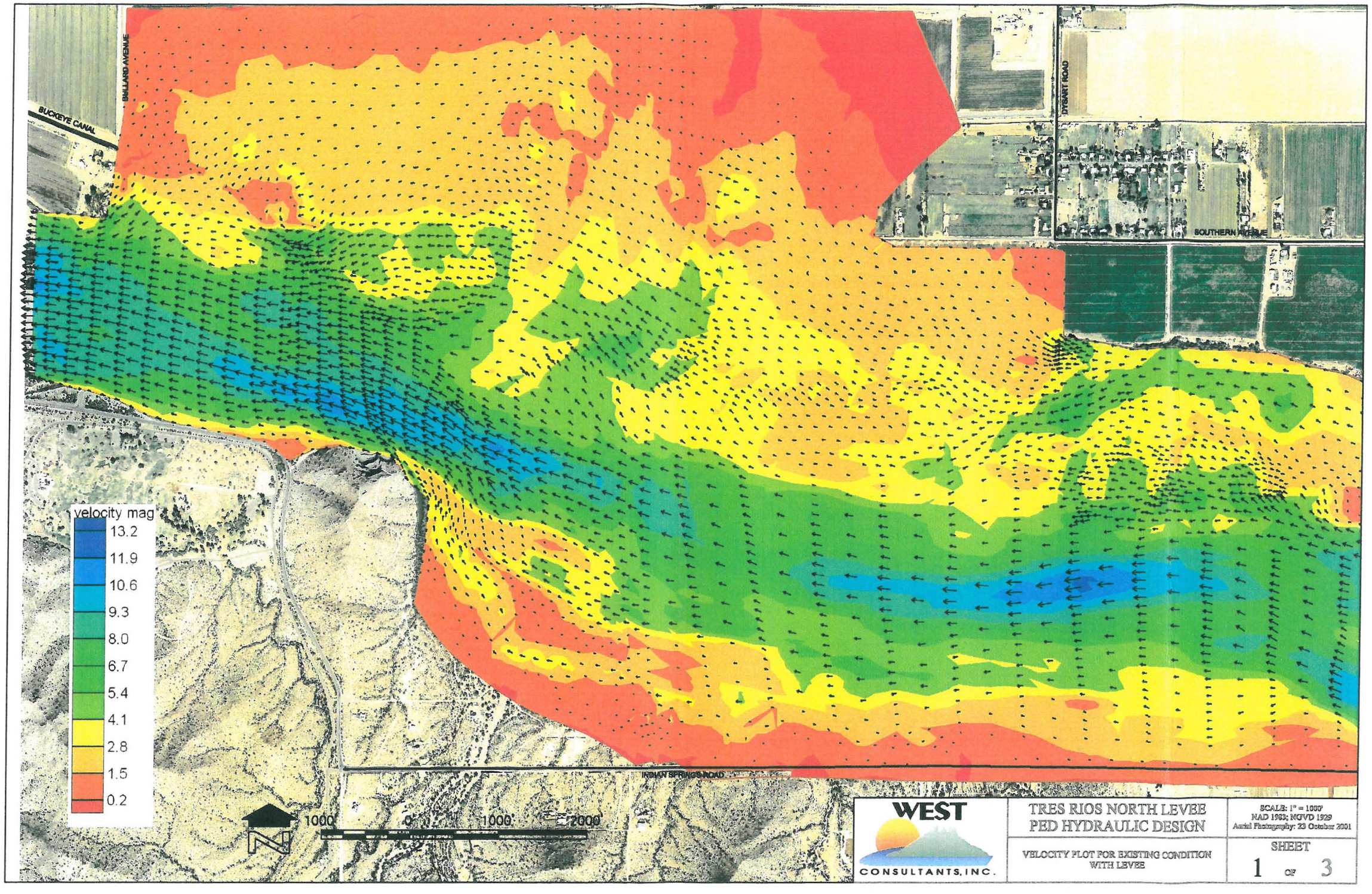


Figure 7a. Velocity Plot for Existing Condition with Levee (Downstream).

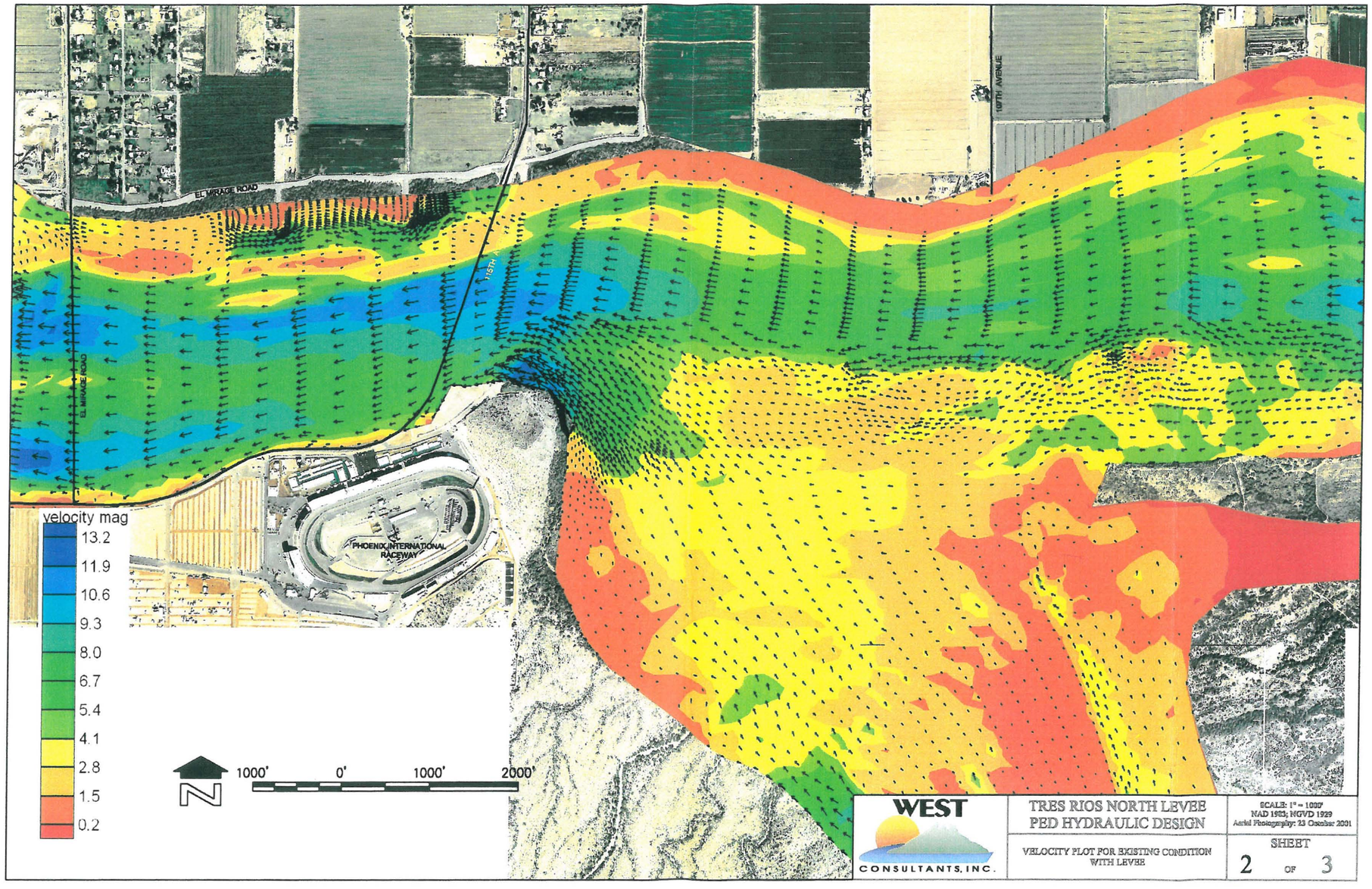


Figure 7b. Plot for Existing Condition with Levee (Confluence).

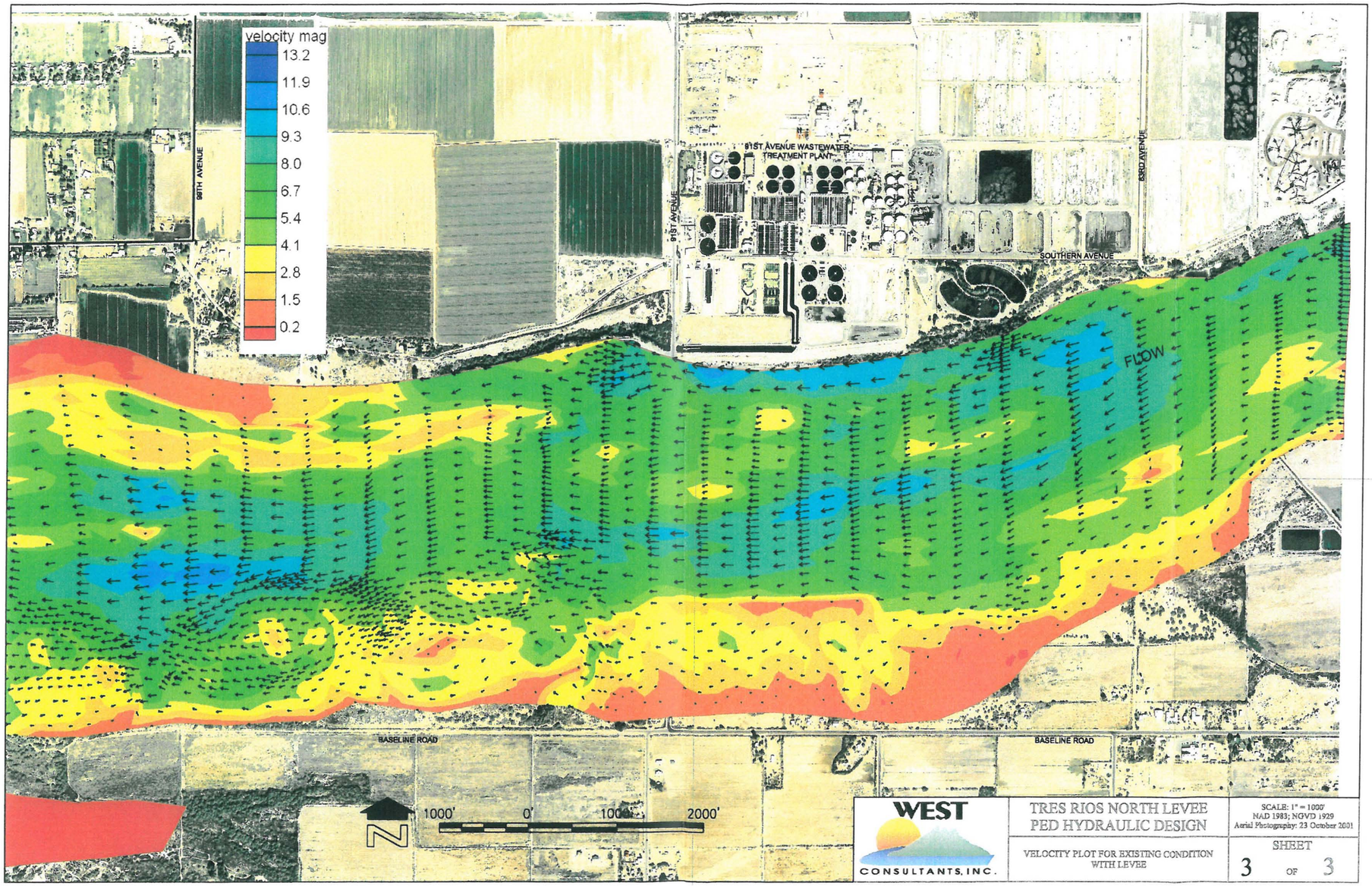


Figure 7c. Velocity Plot for Existing Condition with Levee (Upstream).

4.3. Modeling Alternative Channel Alignments

An alternative channel alignment model was developed to analyze the impacts of a "worst case" scenario where the channel was located along the north bank and against the levee. In order to model the condition, it was necessary to modify the existing river geometry to move the main channel to the northern portion of the river channel. The base existing conditions with levee model was thus modified to move the main channel to the north side of the floodway and adjacent to the proposed levee alignment. The details of this analysis and the procedure to move the channel to the north side of the river are presented in Appendix B. This alternative showed higher velocities along the levee since the channel was now adjacent to the levee. These values were used to check riprap sizing and toe down calculations. The north-channel alignment is used for the alternative analyses described later in this report.

5. Alternative Protection Options

Several alternatives were evaluated for their applicability to the area. These alternatives included riprap protection with thickened toes, riprap protection with scour aprons, riprap protection with scour aprons and large dikes, and riprap protection with thickened toes and bendway weirs.

The thickened toe protection used without any additional protection was eliminated since the banks in the area tend to scour vertically and the thickened toes have a significant probability of not adjusting properly when exposed by the erosion. If the river encroaches on the levee by eroding a vertical face, as has been often observed in local rivers, it is likely that the rock in the thickened toe will fall to the bottom of the vertical face and not provide full protection against continued erosion. For these reasons, it was concluded that the toe needs additional protection to insure stability of the toe. The use of a thickened toe by itself was thus not considered a viable alternative.

The scour aprons that were noted along the Holly Acres Levee appear to have performed adequately although mattresses used at the end of one of the existing dikes had failed after the underlying material had scoured away leaving a vertical wall with the mattress suspended above the bed. The gabion mattress did not adjust as expected and the mattress eventually broke (significantly after the flood event) spilling the contents into the scour hole as can be seen in Figure 8. It appears, however, this option is viable and the condition of the mattresses could be monitored and repaired if necessary. The gabion mattresses would protect against erosion during a design flood event and could be monitored and, if necessary, repaired after the event passed. It is not anticipated that

maintenance would be required except after large floods – perhaps the 20 year flood or higher unless the river is directly attacking the bank along the mattress.

Figure 8. Broken Gabion Basket at tip of Upstream Holly Acres Dike.

5.1. Modification of Protection Alignment

One option for protection of the upstream portion between 111th Ave and 91st Ave was to protect the face of the high terrace rather than the levee itself. The levee would still require protection but toe-down for the levee could be designed for local scour depths rather than ultimate scour depths. The protection of the high terrace could be set to the ultimate scour depths and reduce the required excavation. This would require

adjusting the high terrace bank to a smooth alignment. This would also protect the future restoration features on the high terrace. This alignment is shown in Figure 3.

The City of Phoenix and the Arizona Game and Fish Department expressed concerns regarding the impact of proposed bank protection features to high value cottonwood and willow riparian habitat along the toe of the levee and high terrace alignments. They also requested an alignment of protection that does not encroach into these high value areas. To address these concerns, it was determined that one option for the protection would be to protect the levee through the setback reach shown in Figure 3 by riprap down to an elevation approximately equal to the base of the terrace and then to place a gabion mattress horizontal to a distance twice the depth to the design toe depth. This design is shown in Figure 9. The mattress should be placed approximately 10' feet below the ground surface or at an elevation that is sufficiently above the water table so that construction can occur without dewatering. This would eliminate the need to protect the edge of the high terrace.

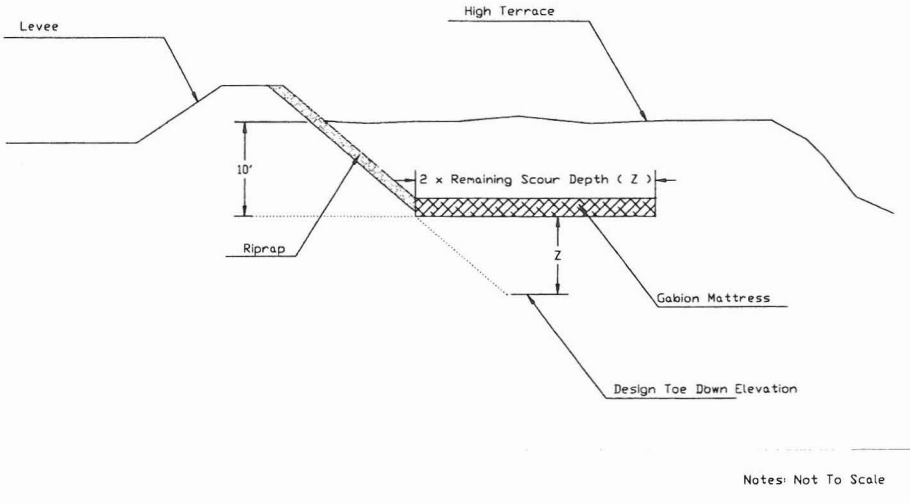


Figure 9. Design Details for Buried Gabion Mattress Option Along High Terrace.

5.2. Hydraulic Analysis for Levee Protection Features

After the existing and migrated (flipped) channel conditions were modeled, each of the models were subsequently modified to incorporate dikes as levee protection features that will minimize the lateral erosion threat to the existing toe area. The modeling alternatives and results are briefly discussed below.

The alternative of using thickened toe riprap protection and a gabion mattress without further protection in the form of dikes or bendway weirs would be very close to existing conditions and were not modeled separately.

6. Alternative Protection Options

Three alternatives thought to be most applicable to the Tres Rios North Levee are presented below.

6.1. Protection of Levee and High Terrace Bank

This alternative would require protection of the levee or high terrace face to approximately ten feet below the existing grade and where the levee is not located at the edge of the high terrace, rock tie backs approximately every 1,000 feet between the levee protection and the high terrace bank protection (See Figure 3). These tie backs could be spaced such that they pass between the proposed ponds and restoration features and could be lowered and buried so as to not interfere with flow between the ponds and placement of shallow pipelines. In areas where the levee is not set back from the high terrace bank the protection would be continuous from the top of the levee to the desired toe elevation.

The toe elevation would be based on the elevations calculated in the main report but the protection would be accomplished by the use of gabion mattresses that would drop and provide protection if the river bed were to erode from under the mattresses. This design for the high terrace and toe protection would be very similar to the protection used on the existing Holly Acres Levee but without the large dikes. This would include securing the mattress to the bottom of the levee such that it did not slip away from the toe and cause failure of the overall bank protection.

The use of the mattresses would require periodic inspection to insure that corrosion or erosion damage was repaired. Based on numerous field observations, it appears that the soils in the area tend to erode at a fairly vertical angle and the baskets

may not drop as smoothly as would be desirable in normal circumstances. Given the relatively short duration of floods in the area, however, it is expected that the baskets will provide adequate protection for the event but will require maintenance and inspection after large flood events to insure the continued integrity of the levee protection system.

6.2. Protection of Levee and High Terrace Bank + Dikes

This alternative is identical to Alternative 1 with the addition of dikes located from 700 to 1500 feet apart. The purpose of the dikes is to keep the flood flows from directly impinging on the bank protection reducing the size of protection required on the levee and high terrace bank. It is anticipated that the dikes would be constructed of earth with riprap facing for protection against erosion during flood events. Figure 11 shows the schematic of the plan view of the dikes. Figure 12 presents the schematic of the bank protection by the dikes at the terrace and Figure 13 shows the bank protection by the dikes at the levee.

The existing conditions include two dikes downstream of the 116th Avenue Bridge which are approximately 1440 feet apart and 200 feet in length. Additional dikes were added in this alternative to protect the levee from encroachment by the river. These additional dikes were initially modeled along the north levee at approximate the same spacing as the existing dikes but the spacing was reduced in some locations to insure that the river could not directly impinge on the bank between the dikes or to reduce high velocity areas along the levee / bank protection. The dikes were aligned perpendicular to the channel to help divert the current away from the levee toe area. The most upstream dike was set at a location such that backwater does not affect the nearby wastewater treatment plant.

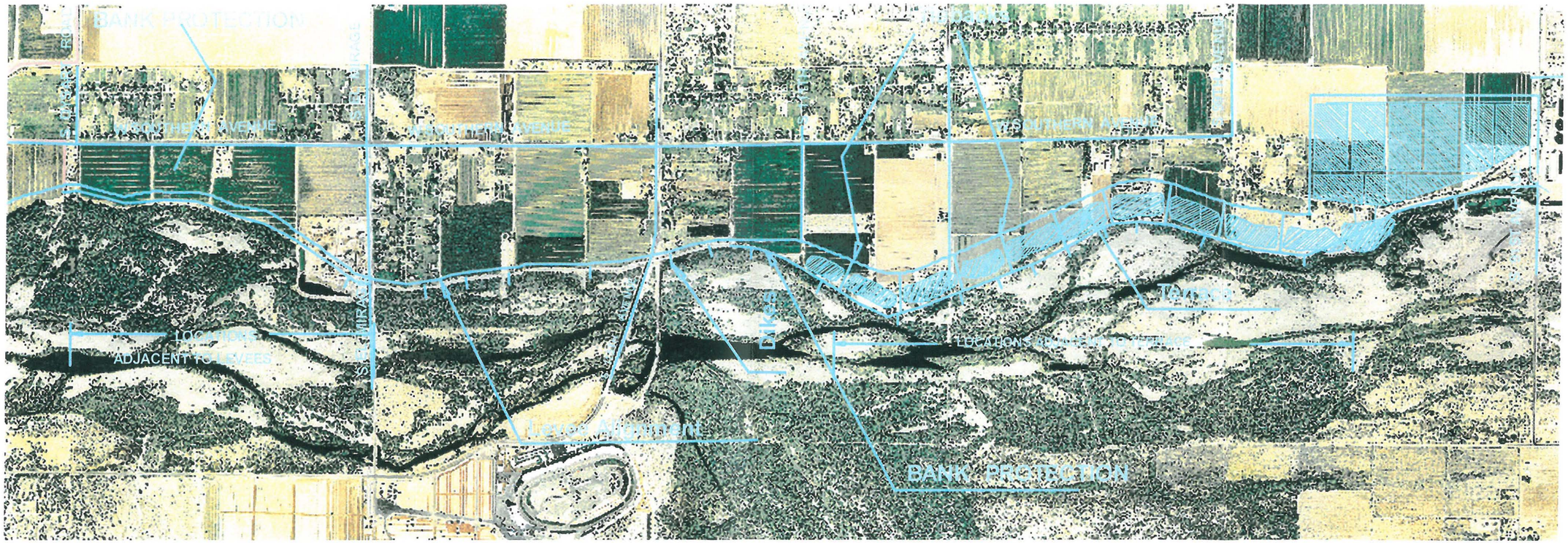


Figure 10. Bank Protection Alignment for Upper Levee.

In order to protect the levee and prevent the river from impinging directly on the levee protection during periods when water might be diverted into one of the braided channels adjacent to the levee, additional dikes were required as shown in Figure 10. The velocities for this option are shown in Figure 14. This figure shows that the presence of the dikes adjacent to the levees changes the flow patterns in such a way that the velocities reduce significantly along the northern levee and main flow is kept away from the levee. This can reduce the level of protection required on the levee face and toe.

The total number of dikes required to keep the thalweg away from the levee was 20 which includes the two existing dikes. Even with this many dikes, however, the flow could not be kept entirely from the levee. Therefore, most, if not all, of the levee would require full toe down protection. However, based on the existing levee and on field inspections it is anticipated that the levee protection could be constructed with riprap facing and gabion mattress scour aprons at the base of the levee similar to the Holly Acres design. It is not expected that damage would occur to the gabion mattresses unless large floods or direct impingement on the mattresses occurred.

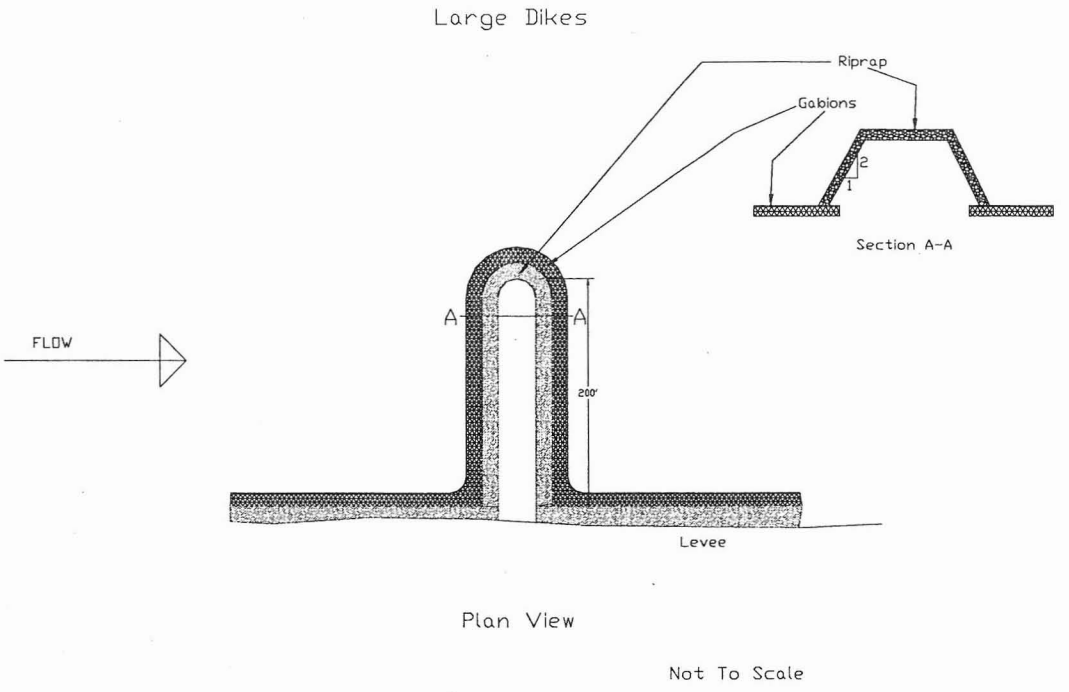


Figure 11. Plan View Schematic of Large Dikes

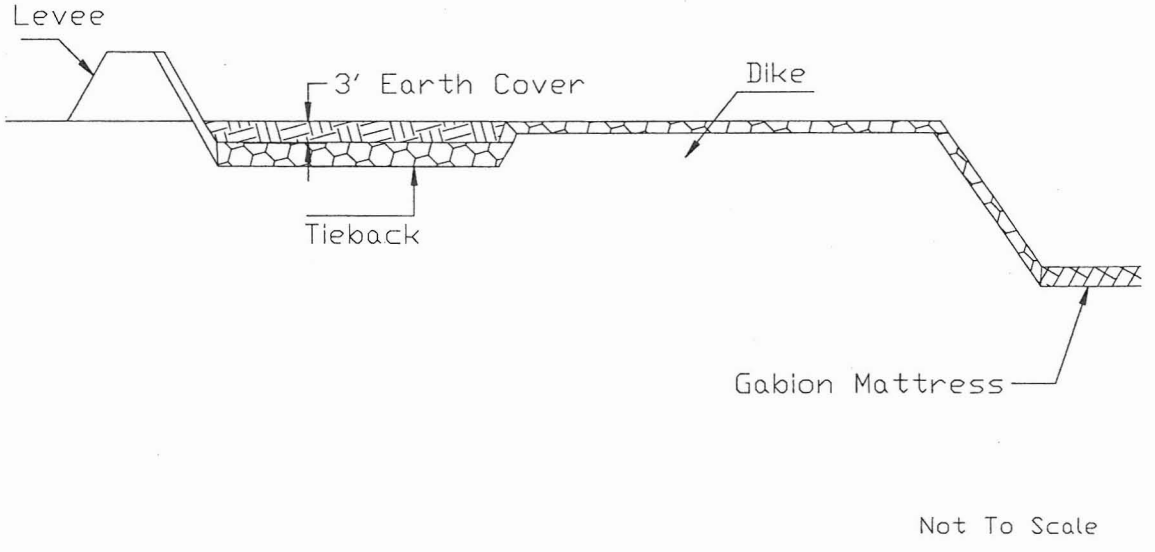


Figure 12. Bank Protection for Set Back Levee along Terrace With Large Dikes

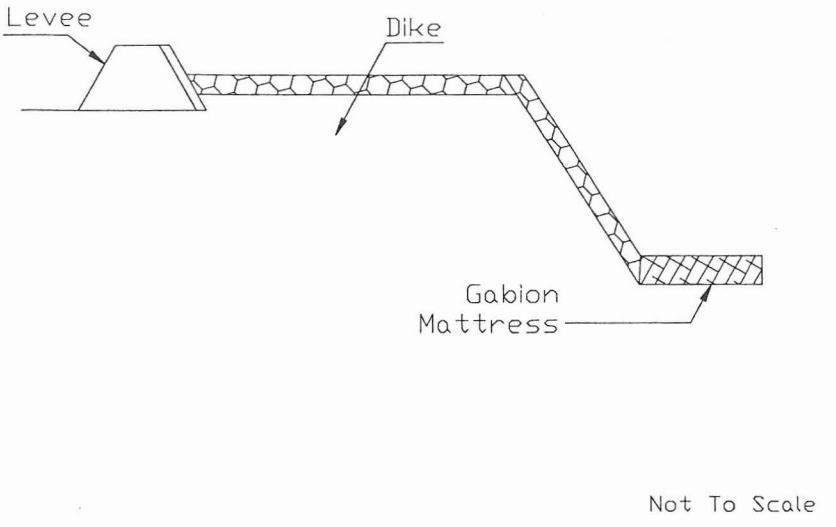


Figure 13. Bank Protection for Levee With Large Dikes

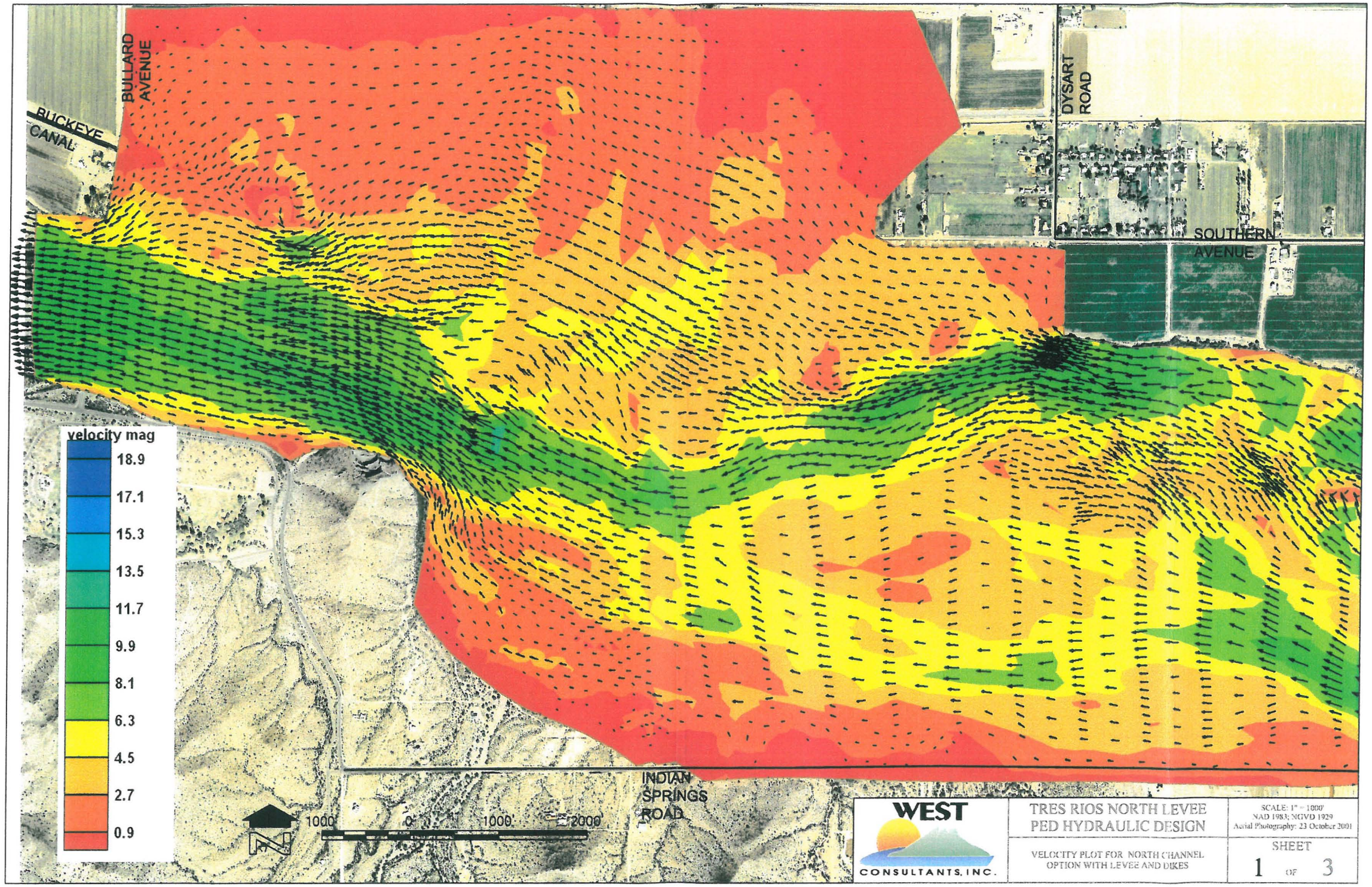


Figure 14a. Velocity Plots for 20 Large Dike Design (Downstream).

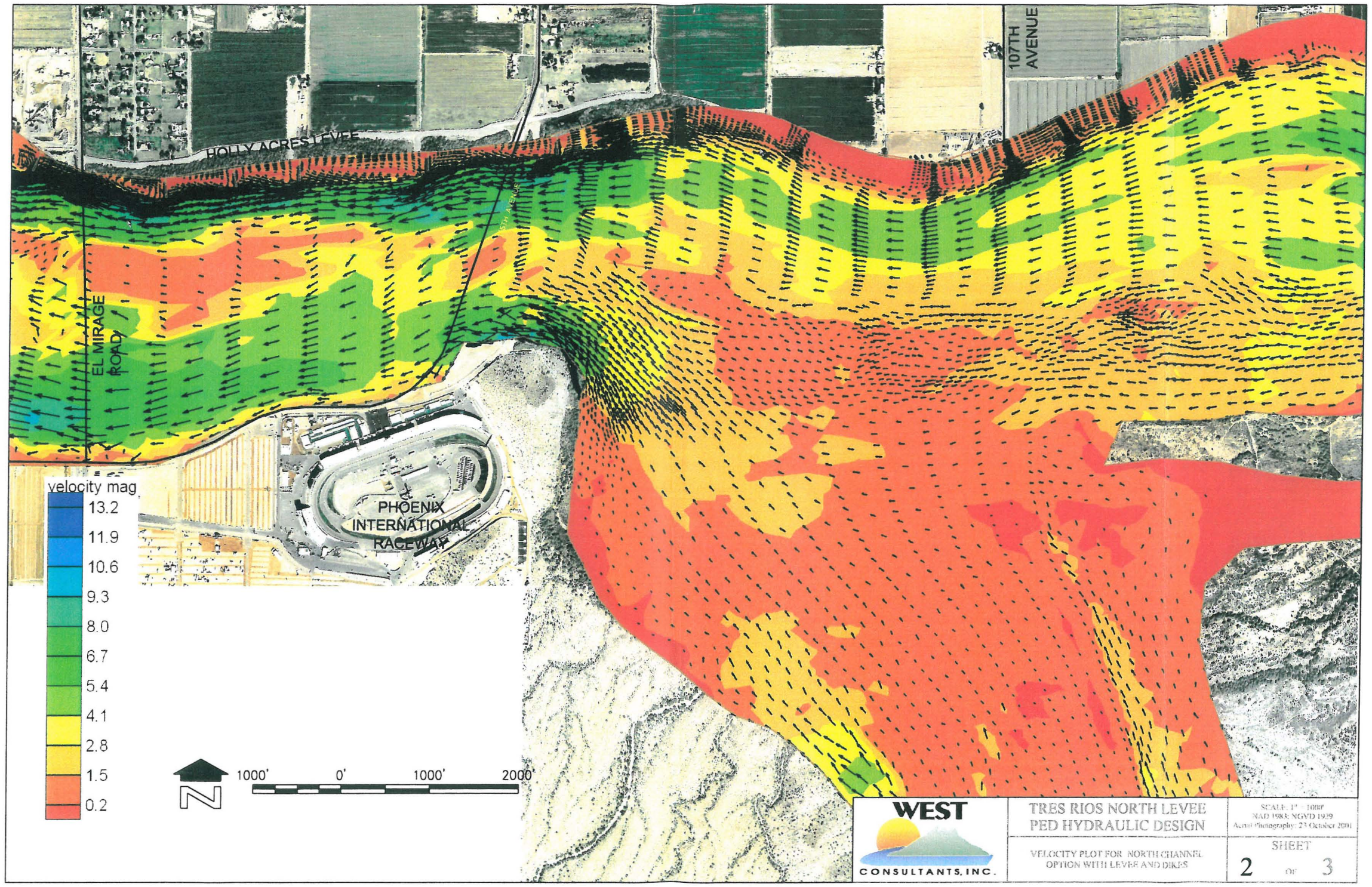


Figure 14b. Velocity Plots for 20 Large Dike Design (Confluence).

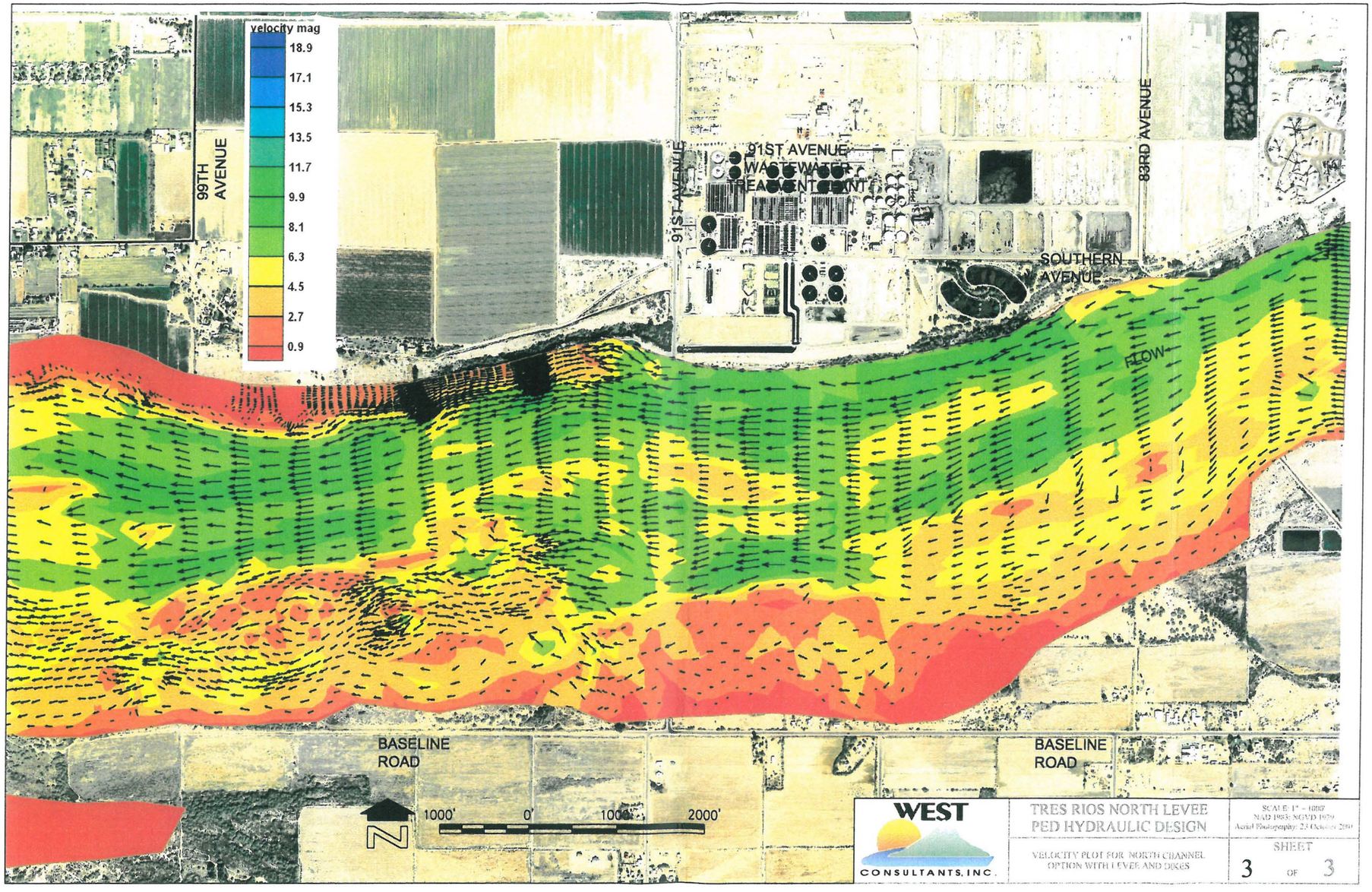


Figure 14c. Velocity Plots for 20 Large Dike Design (Upstream).

6.2.1. Channel Migration Conditions with Dikes

The channel migration model for existing conditions was modified to initially include the dikes along the levee as discussed in the previous section. Due to low Manning's *n* in between the dikes, caused by the channel migration, velocities increased, although not high enough to impact the levee. The velocity range along the north levee in between dikes was approximately 5 fps. Downstream of the most downstream dike, the velocity increased to approximately 10 fps. Near the gravel pit downstream of El Mirage Road, the velocity reached 5 feet per second. These velocities would reduce the size of stone required on the face of the levee but not appreciably reduce the toe down requirements due to the potential for channel migration. If the dikes are used in conjunction with a scour apron, adequate protection is expected to exist and the levee should withstand the 100-year flood event. Requirements for this protection scheme would include:

1) Riprap protection of levee/high terrace face – the levee face will require protection with 15" D_{100} stone based on a standard ETL gradation.

2) Gabion Mattress Scour Apron – The toe protection will be provided by a gabion mattress toe protection similar in design to that used on the Holly Acres Levee. This mattress will be up to 30 feet in width and sized to prevent movement during high flows. Stone used to fill the gabion baskets should have a range of 4" to 6" in diameter and can be rounded stone from the river. The scour apron will be required along the entire levee/terrace protection as well as along each dike face and tip.

3) Earthen dikes with riprap protection – 18 additional dikes would need to be constructed. Each dike is 200' feet long and the top elevation is 3' – 5' lower than the

height of the levee. The faces and top of the dikes will require protection with riprap (similar to the existing dikes) to insure dike stability. Scour holes can be expected just off the ends of the dikes depending on velocities experienced at the end of the dikes. Slopes and stone sizes for riprap are based on angular stone rather than rounded river stone. If rounded stone is used size requirements increase by 50% and slope stability limits the bank slope to a maximum of 3H:1V rather than the 2H:1V shown in the various design figures. This change in slope and rock size is not true of fill stone for the gabion mattresses where fill can be rounded stone of the size specified and placed at a maximum slope of 2H:1V.

Model runs show that the river is very constrained in the Holly Acres reach and any changes should be such that they do not interfere with flow through this reach. For this reason additional large dikes are not recommended in the Holly Acres reach.

6.3. Protection of Levee and High Terrace + Bendway Weirs

This alternative allows flow along the portion of the high terrace between the levee and the edge of the terrace during high flows and again requires tie-backs from the high terrace to the levee. The low dikes (bendway weirs) are angled slightly upstream (0 to 15 degrees) to move flow away from the bank area while still allowing flow along the bank to reduce the impact of the dikes on the large flood events. Bendway weirs are upstream angled low dikes and have been used extensively on the Mississippi River as well as other rivers and streams throughout the United States. The weirs were developed by the U.S. Army Engineering Research and Development Center. Figure 15 shows the bank protection by bendway weirs at terrace and Figure 16 shows the bank protection at levee.

The weirs envisioned in this alternative are approximately 100 to 150 ft in length depending on location along the river, 15 ft in width and 6 ft in height. It is anticipated that at least 3 ft of the height will be below the ground elevation as the weirs work better when they are long and broad but low. The dikes were placed every 150-300 ft along the new sections of the levee as shown in Figure 17. Rock size for the dikes is in the 24-27" range for the D_{100} but rock sizes should be well graded for best results. Bendway weirs have also been constructed from other materials including gabion baskets so other construction materials could be considered for this project.

It is expected that the weirs will be undermined to some extent but the weirs are sized such that portions can be undercut and collapse into the sour holes to form hard points at the end of the weirs while the remaining portion of the weir will continue to redirect flow away from the bank and the bank protection.

For this alternative the bank protection was again moved from the levee face to the edge of the high terrace along the set back portion of the levee. For the lower portion of the levee (below Dysart Rd) the terrace is close enough to the levee that it is very likely the offset of the protection to the terrace would increase levee protection costs. This will allow excavation for the protection without impacting the valuable riparian habitat at the toe of the terrace. For the upstream portion of the levee (above the Holly Acres Levee) the protection would serve as protection for the restoration features to be built on the high terrace and could be justified as a part of restoration project rather than a portion of the levee construction. It is our opinion that protection such as that described for this reach would insure levee safety.

The theory of bendway weirs is that the water column is redirected as it moves across the weirs to flow more perpendicular to the weir. Since the weir is angled from 0 to 15° upstream the velocities are moved away from the bank and deposition occurs near the bank. The weirs have been shown to be very effective in numerous applications across the United States. The use of bendway weirs would require 42 weirs in the upper levee and 13 in the lower levee as shown in Figure 17. This assumes protection for the Holly Acres Levee is adequate as currently installed.

The RMA-2 model was run for the condition with the weirs raised and without the weirs. While there were local changes in water surface elevations there were no general increases in water surface elevations away from the weirs. The velocity plot is shown in Figure 18.

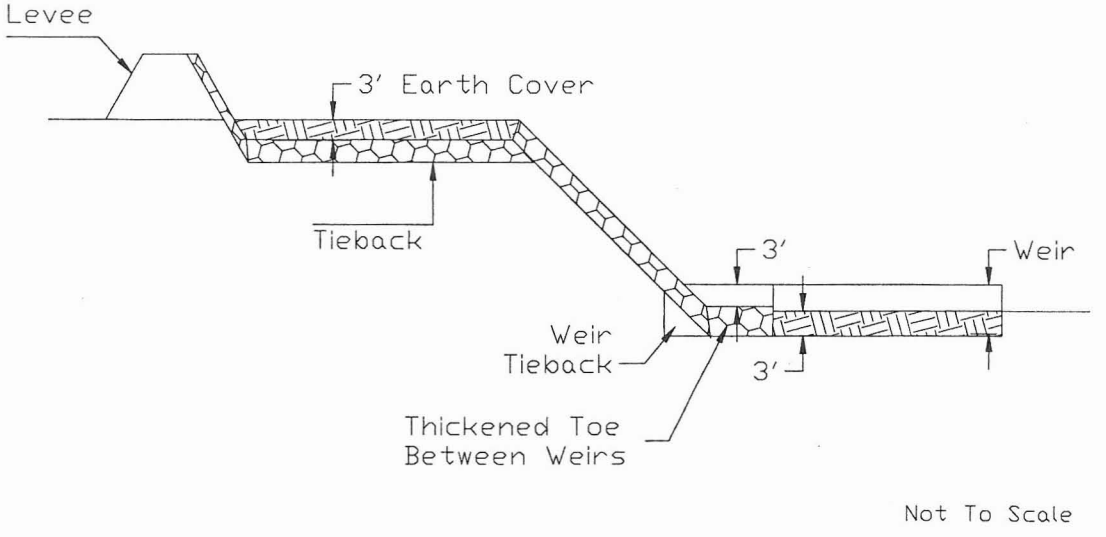


Figure 15. Bank Protection at Terrace using Bendway Weirs at Terrace

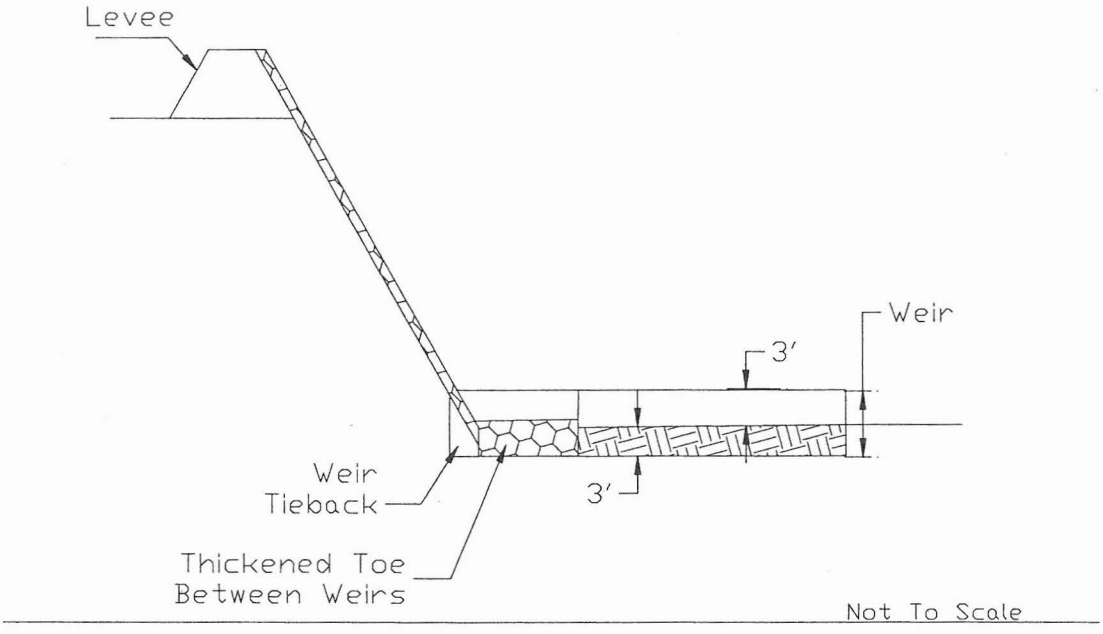


Figure 16. Bank Protection at Terrace using Bendway Weirs at Levee.

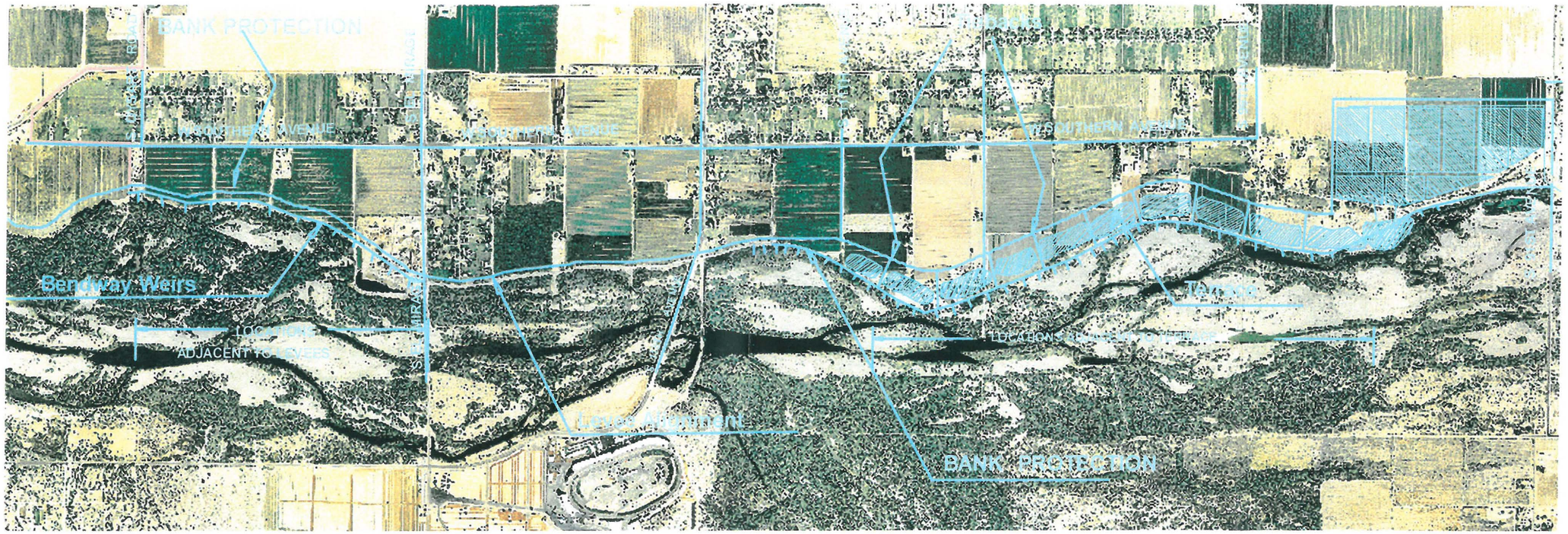


Figure 17. Bendway Weir Layout and Locations.

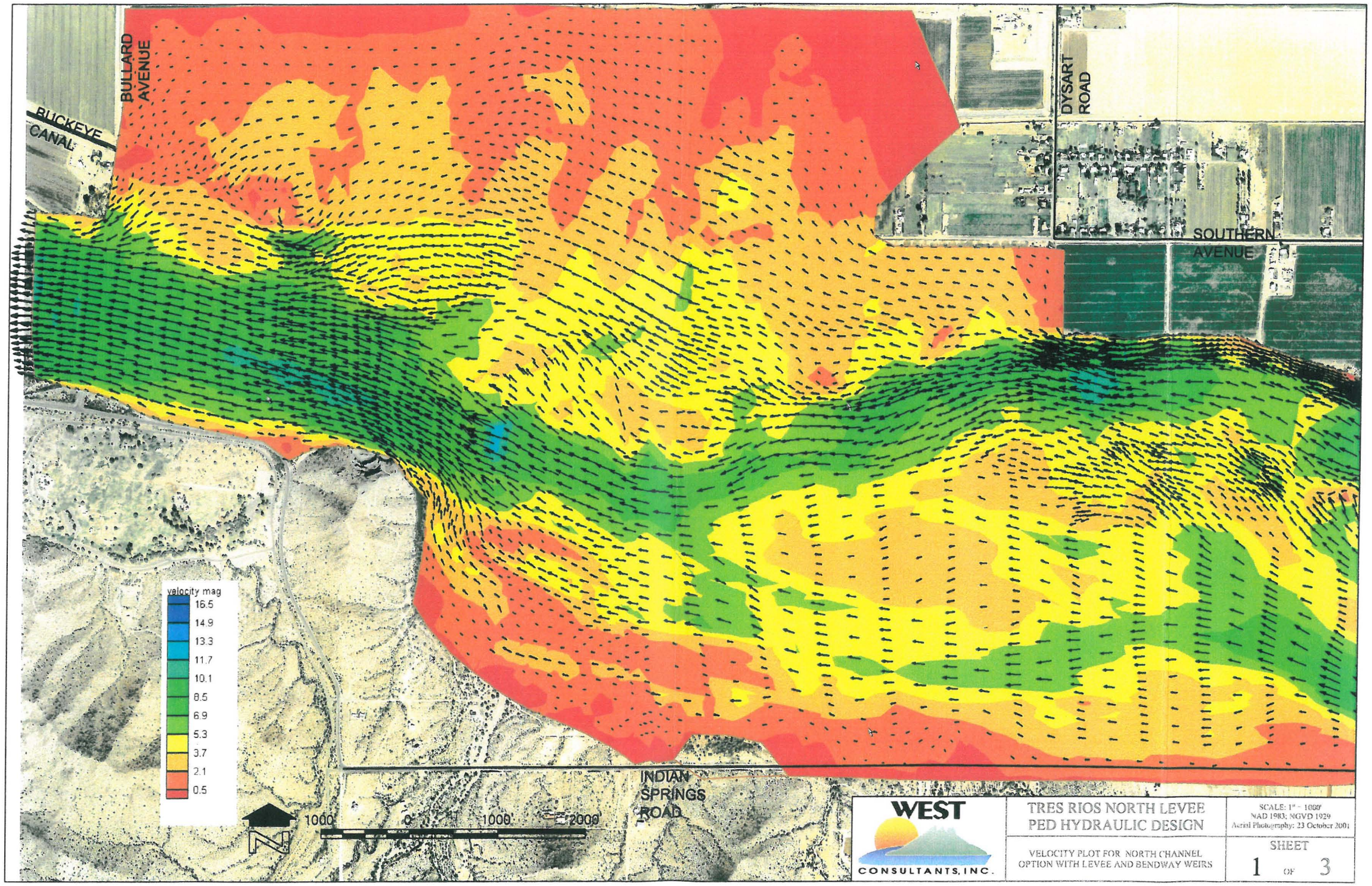


Figure 18a. Velocity Plot for Bendway Weir Alternative (Downstream).

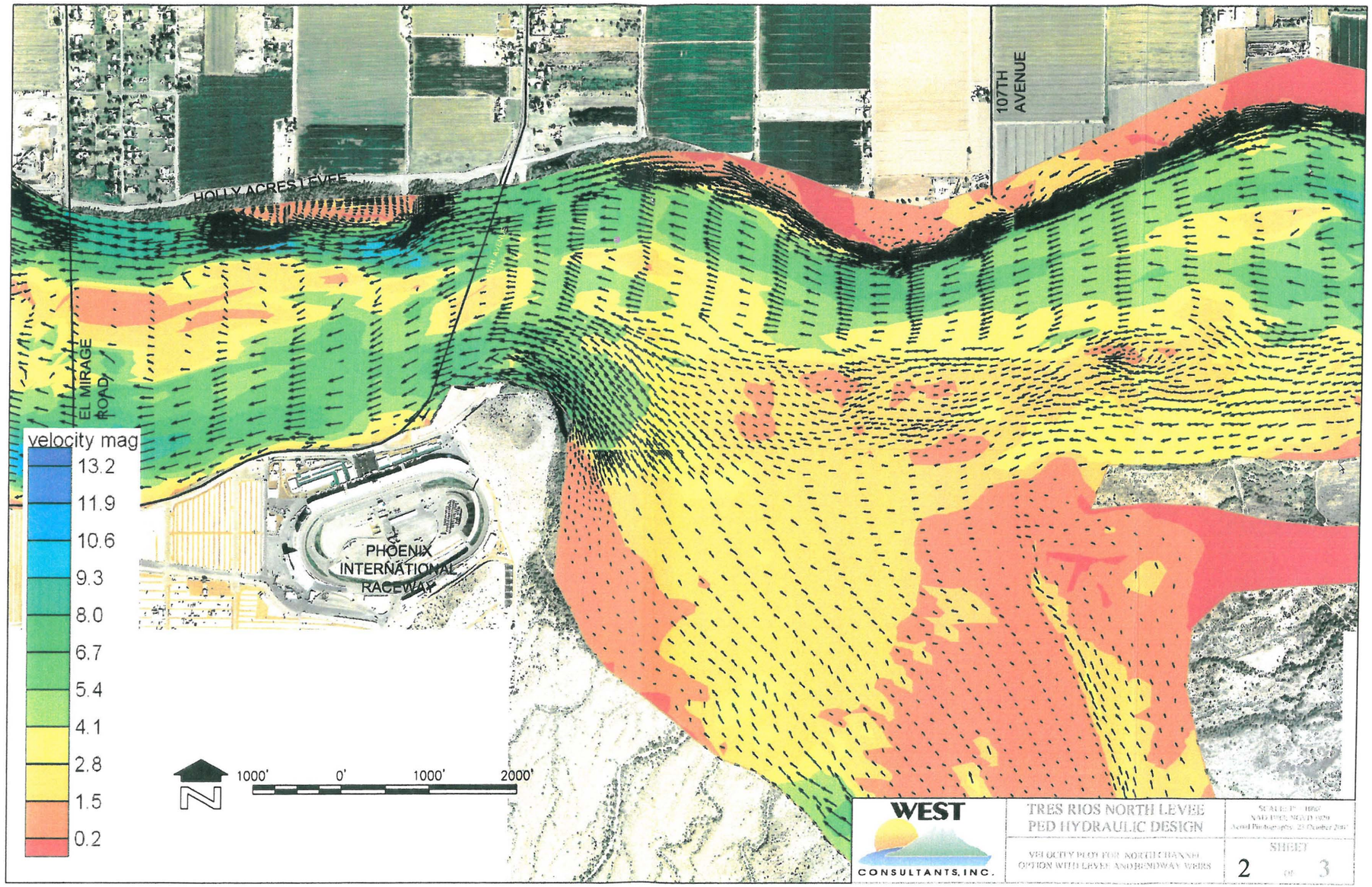


Figure 18b. Velocity Plot for Bendway Weir Alternative (Confluence).

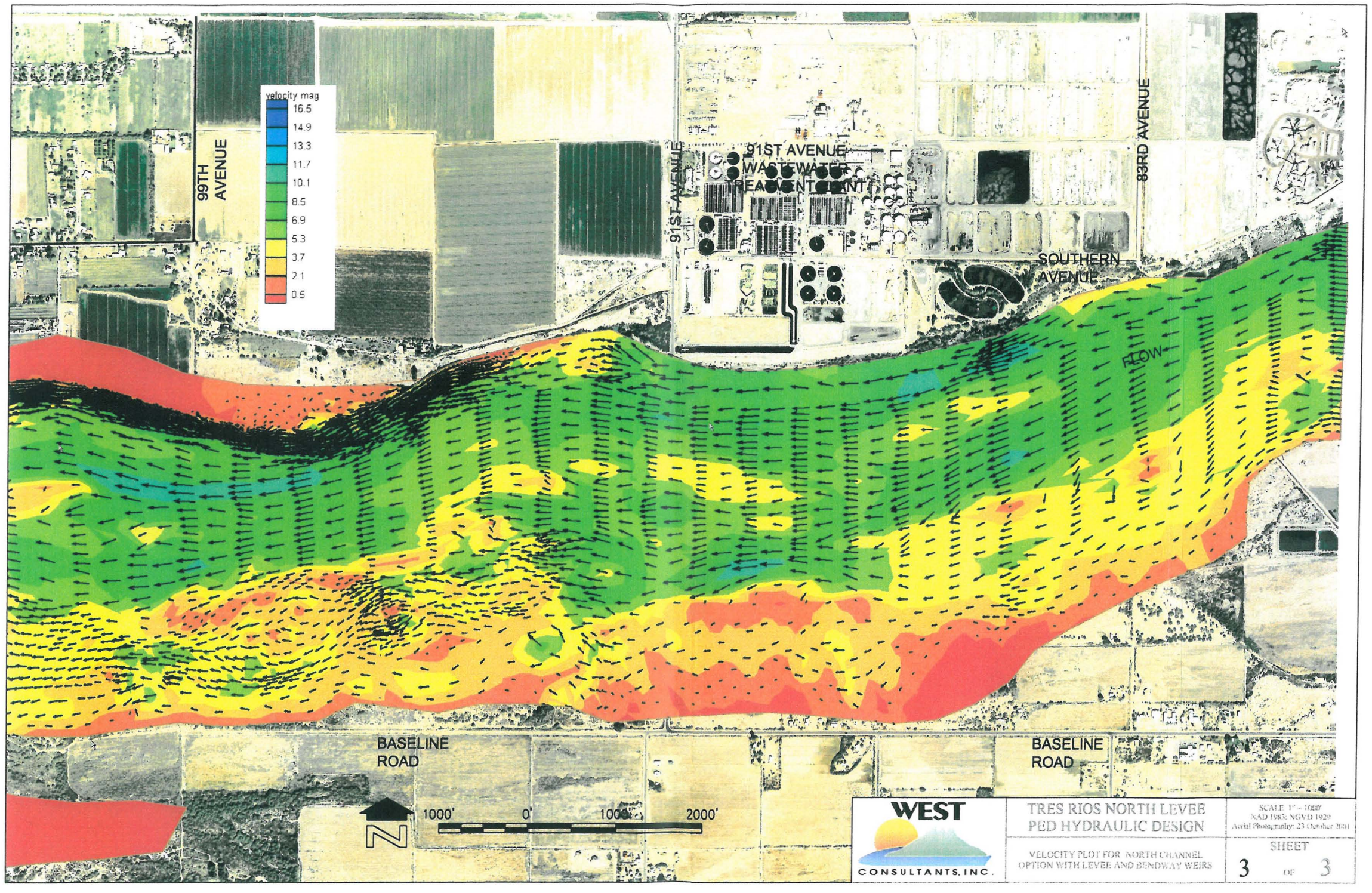


Figure 18c. Velocity Plot for Bendway Weir Alternative (Upstream).

The weir option would consist of the following:

1) Bank / Levee Protection above the existing/smoothed ground elevation – 15" D_{100} stone size assuming angular rock.

2) Thickened toe – The toe of the levee/bank protection should be thickened to prevent local scour along the toe. This should be enough riprap to protect to approximately 50% of the scour potential (distance to thalweg + calculated scour depth divided by 2). The full scour depth is approximately 10 to 17 ft resulting in protection depths from 5 to 8.5 feet. The use of the higher value (8.5) feet would result in a stone requirement of 2 tons per linear foot of protection for the thickened toe.

3) Bendway weirs – The bendway weirs (42 for the upper portion of the levee and 13 for the downstream portion) would require larger stone (24" D_{100}) and would require 503 tons per weir. This would thus require 27,700 tons of stone.

4) Weir tie backs. The upstream two weirs in each series (4 weirs total) would require tie-backs to insure they were not flanked by erosion. The length of these tie-backs should be equal to the depth of flow plus the potential scour depth. This yields a length of approximately 28 feet into the bank for tie-backs. The rock volume in the tie-backs should be equal to the volume of the weir on a per-linear-foot basis. This yields 5 tons per linear foot for an additional 560 tons of stone for the four upstream weirs. The remaining weirs should be tied back a minimum of 10' behind the bank protection for a additional stone requirement of 50 tons per weir.

6.4. Recommended Alternative

The recommended alternatives include either the large dikes or the bendway weirs. The use of gabion mattresses and riprap facing exclusively (i.e. without weirs or dikes) is likely feasible but would require additional maintenance and a viable inspection program to insure continuing integrity of the gabion mattresses. This option is likely sufficient to protect the levee and high terrace features but there remains a possibility of failure and one of the other alternatives is preferred due to the high velocities that may be encountered in this reach of the river.

All alternatives will require tie-backs between the high terrace and the levee unless the buried mattress alternative is selected for the area where the levee is set back from the edge of the terrace. The tie-backs are to prevent the river from flanking the protection on the high terrace and eroding a channel behind the terrace protection. These tie-backs should be on the order of the bendway weir tie-backs and be spaced not more than 1,000 feet apart. These tie-backs may be buried for aesthetics and portions may be lowered slightly to allow the construction of restoration features on the high terrace.

7. Protection for Western End of Levee

The portion of the levee along the west side of Dysart Road and north from the high terrace can be protected against anticipated local scour conditions. The area within 300' from the sharp turn in the levee to the north (as modeled in the two-dimensional model and as shown for the final design) should be protected to the full depth and against the design velocites. This will ensure that any return current formed by the sharp levee bend cannot attack the levee from the downstream direction. The remaining portion of the levee can be protected against local scour to a depth of approximately 4' below grade. Local velocities near the western end of the levee will be 4.5 ft/sec or less and the levee will require some minor protection against scour. Additionally the levee should be protected against possible wave action that could occur during flood events.

The corner of the levee should be rounded such that the initial angle between the levee and the tangent with the upstream levee does not exceed 30 degrees. Once this angle has been developed the levee can then make a smooth turn to the north. This will reduce the development of return currents immediately to the west of the levee turn.

It is anticipated that this portion of the levee west of the location where Dysart Road and the high terrace meet will have minimal, if any, freeboard and will be suitable as a least damaging overtopping section. This will allow the levee to fill from the downstream end, lowering the flow potential across the levee upstream for the lower end of the protected area during floods greater than the 100 year event.

8. Evaluation of Results

The two-dimensional hydraulic modeling confirmed prior assumptions that the movement of the channel to the north bank would impact the bank and cause scour along the levee which, if not protected, could result in levee failure and flooding of the protected area. The installation of dikes similar to those in place along the Holly Acres Levee could also be effective in keeping the main flow of the river away from the levee. This alternative requires approximately 18 additional dikes be constructed from just below 91st Avenue to approximately 116th Avenue. Even the use of the dikes, however, would only keep the highest channel velocities away from the bank while still allowing erosive velocities to impact the levee and high terrace bank.

The velocities along the levee under the modified ("flipped" or north channel alignment) conditions indicate that velocities near the ends of the dikes could be as high as 12-13 feet per second at the dike tips while velocities along the levee could still be as high as 6-8 feet per second. Non-erosive velocities for unprotected soils in this area are most likely in the 2.5 feet per second range. Velocities along the levee / high terrace without the dikes could reach 8-10 feet per second and require extensive protection.

Historical evidence from the 1979-2003 period indicates that the river has moved as much as 350 feet laterally during one to two large events. If this condition were to be repeated it is likely that the river could impinge directly on the levee in areas where the set back was less than 350 feet resulting in serious erosion damage if the levee is not protected against erosion to an adequate depth. Costs of excavation and dewatering make the placement of erosion protection to the depth specified in the main report uneconomical. Alternatives to the excavation, dewatering, and placement of the designed

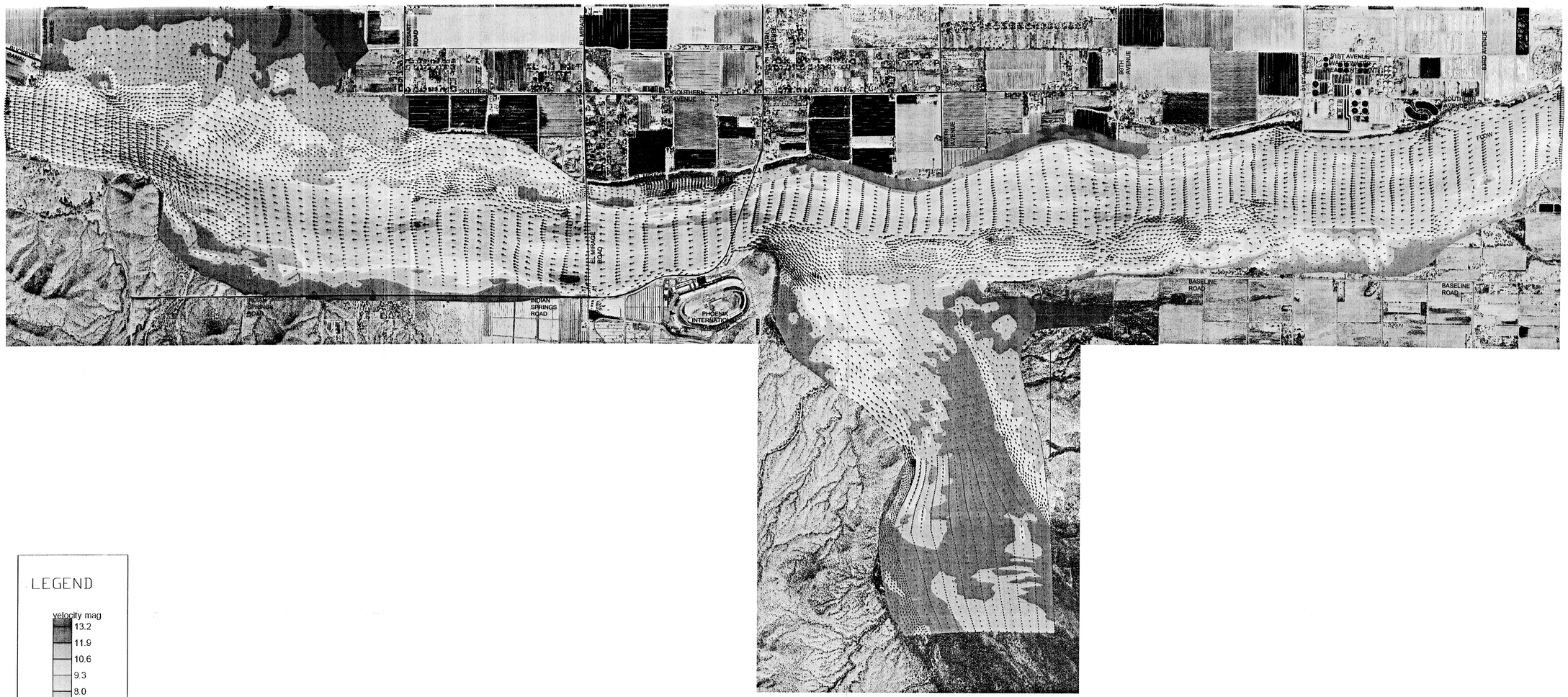
protection were therefore evaluated and found to be acceptable from the perspective of offering adequate protection for the levee.

9. References

WEST (2004), "PED Hydraulic Design of Tres Rios North Levee," Final Project Analysis Report. WEST Consultants, Inc., Tempe, AZ.

APPENDIX A

Velocity Plot for Existing Conditions Results Showing Velocities and Flow Patterns for Salt and Gila Rivers



LEGEND

velocity mag

- 13.2
- 11.9
- 10.6
- 9.3
- 8.0
- 6.7
- 5.4
- 4.1
- 2.8
- 1.5
- 0.2

N

1500' 0' 1500' 3000'

WEST CONSULTANTS, INC.	TRES RIOS NORTH LEVEE PED HYDRAULIC DESIGN VELOCITY PLOT FOR EXISTING CONDITION WITH LEVEE	SCALE: 1" = 1500' SHEET 1 OF 1

APPENDIX B

Evaluation and Development of "Flipped Channel" Option

Modeling Alternative Channel Alignments

An alternative channel alignment model was developed to analyze the impacts of a "worst case" scenario where the channel was located along the north bank and against the levee. In order to model the condition, it was necessary to modify the existing river geometry to move the main channel to the northern portion of the river channel. The base existing conditions with levee model was thus modified to move the main channel to the north side of the floodway and adjacent to the proposed levee alignment.

The channel modification was done to more fully evaluate methods to keep the higher velocities away from the levee. In order to accomplish this task, customized macro codes for ArcView GIS were developed to flip geometry and nodal elevations across the main channel between adjusted HEC-RAS bank stations (WEST 2004) at approximately equal height, i.e., the nodal elevations across a cross section were flipped to bring the existing main channel from the south side of the floodway to a position close to the levee.

The "flipping" process can be best visualized by viewing a cross section in HEC-RAS. If one were to take the cross section portion between the high terraces and simply turn it 180 degrees and hook the reversed section back onto the bank sections, the channel geometry would be reversed or "flipped" in relation to the original channel geometry. This is a basic illustration of a much more complex operation required to accomplish the modification. The actual process was much more complex due to the two-dimensional nature of the geometry for the model. Figure B-1 shows an example using a HEC-RAS cross-section before and after the flipping was achieved. In this figure, it can be seen that

the lower portion of the channels have shifted right indicating a shift towards the northern levee.

The Manning's n values for the channel were also modified to match the new geometry. The Manning's *n* values were also "flipped" by using ArcView GIS system macros. It was noted that Manning's n values in the reach near the 116th Avenue bridge are very important and resulting water surface elevations are sensitive to Manning's n changes in this reach. A comparison of the water surface elevations between the existing and the "flipped channel" case shows an increase in the water surface elevations of approximately 2.5 to 3 ft at the confluence which can be attributed to two aspects of the flipping process. The flipping, in effect, increases the elevations on the southern portion of the main channel which, at the confluence, is located at the downstream portion of the Gila River. This means that the flow from the Gila encounters a shallow portion as it enters the confluence and has to move further north before it encounters deeper regions. This causes the water surface elevations to increase for the "flipped" case when compared to the existing case. Another aspect of the flipping is the flipping of the Manning's n values. This means that in the downstream portion of the Gila River (below the confluence), higher values of Manning's n are prescribed in the southern areas while the lower values are used in the northern areas adjacent to levees where the channel is shifted. The use of higher values of Manning's n values on the south side adjacent to the Gila inflow also contributes to the increase in the water surface elevations at the confluence. In reality, if the channel migrates north, the vegetation at the confluence may not be any different from the existing conditions and, therefore, the water surface elevations may in fact be lower.

The velocity results for this "flipped channel" condition are shown in Figure B-2 and the differences in velocity magnitudes between the existing and the "flipped channel" conditions are shown in Figure B-3.

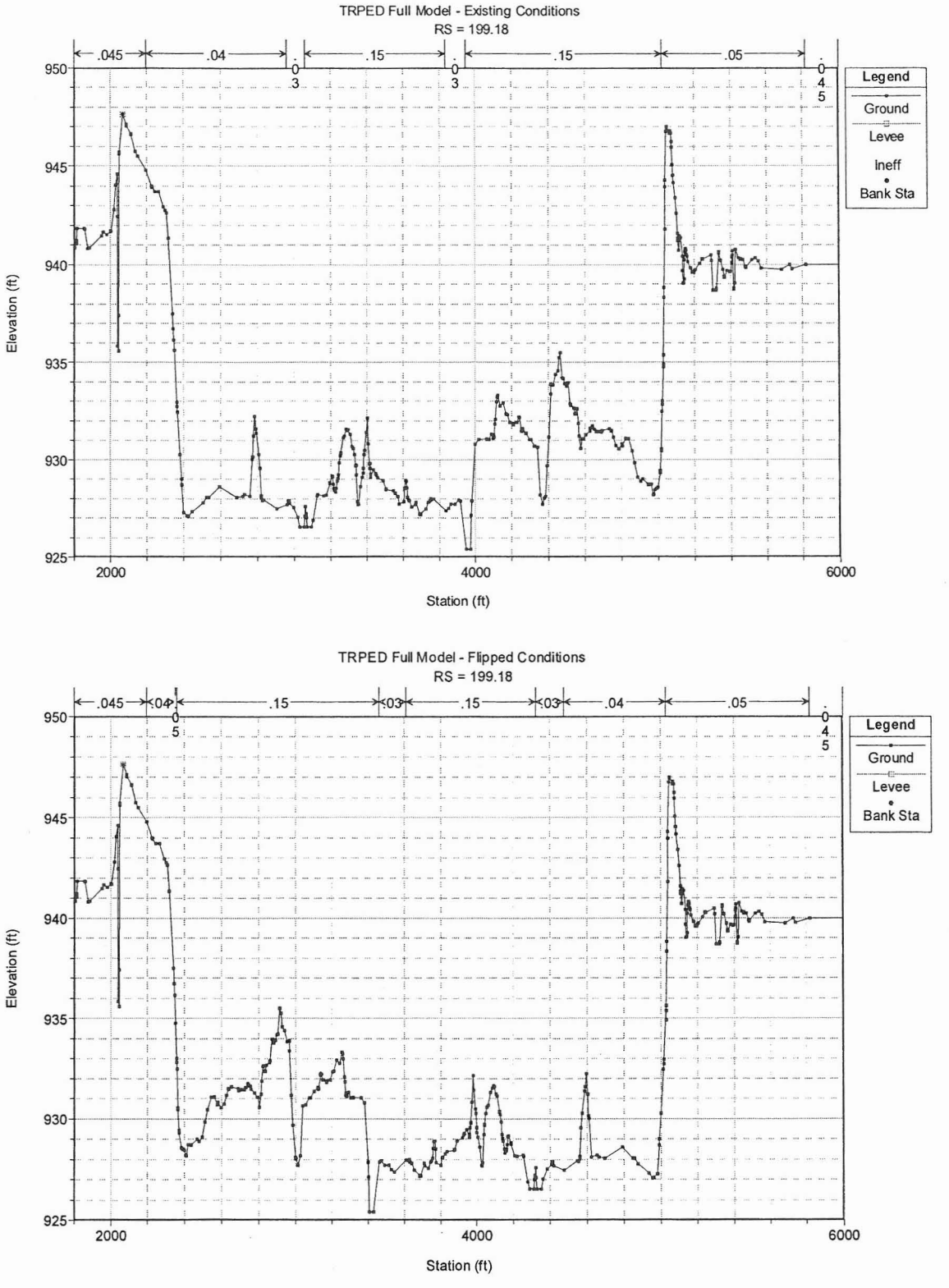


Figure B-1. HEC-RAS Cross Sections showing Existing and Flipped Conditions. Note Channel Thalweg has Moved from Left Side of Channel to Right Side.

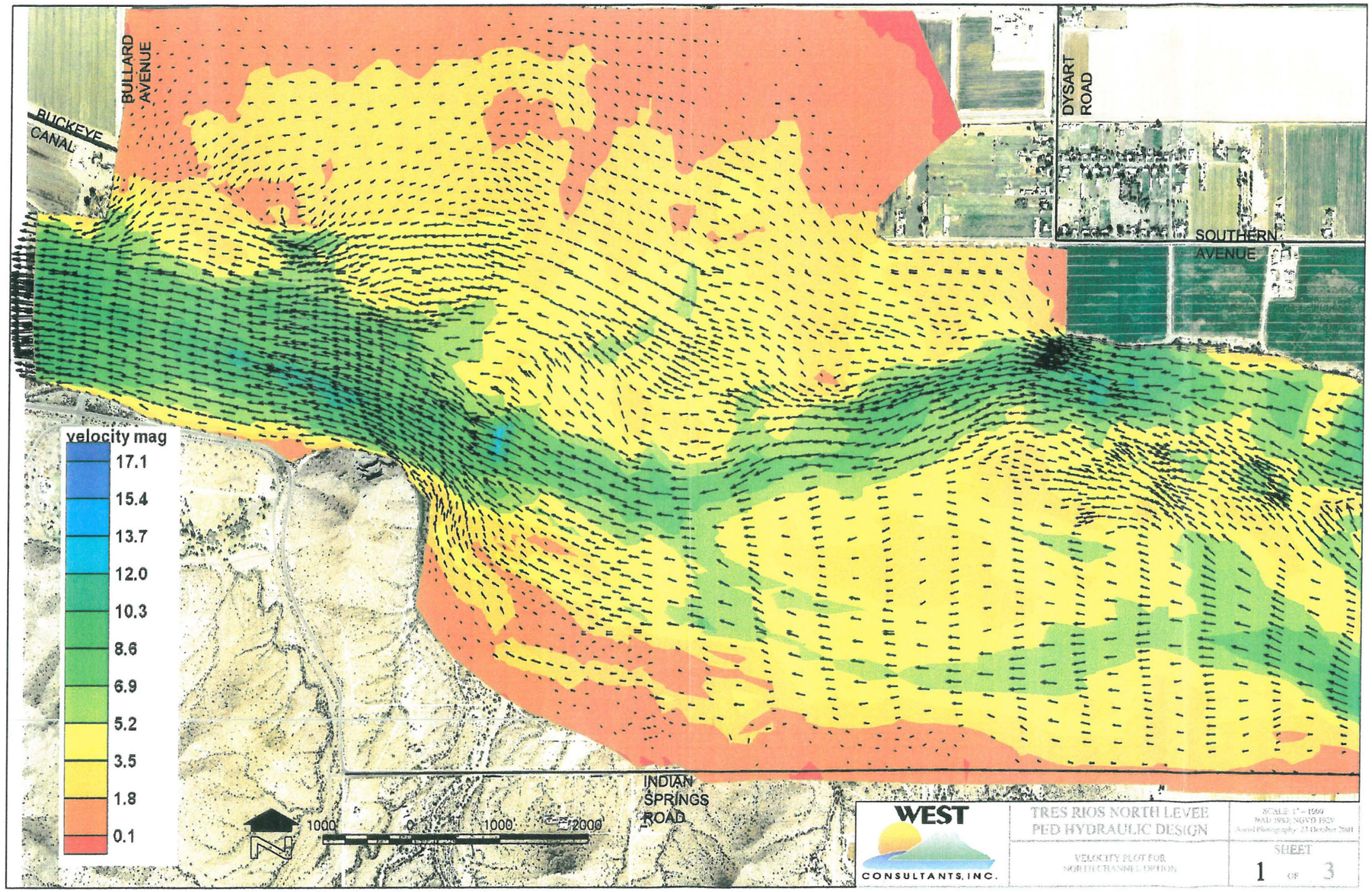


Figure B-2a. Velocity Plot for "Flipped Channel" Condition (Downstream). Note high velocities along north levee and terrace.

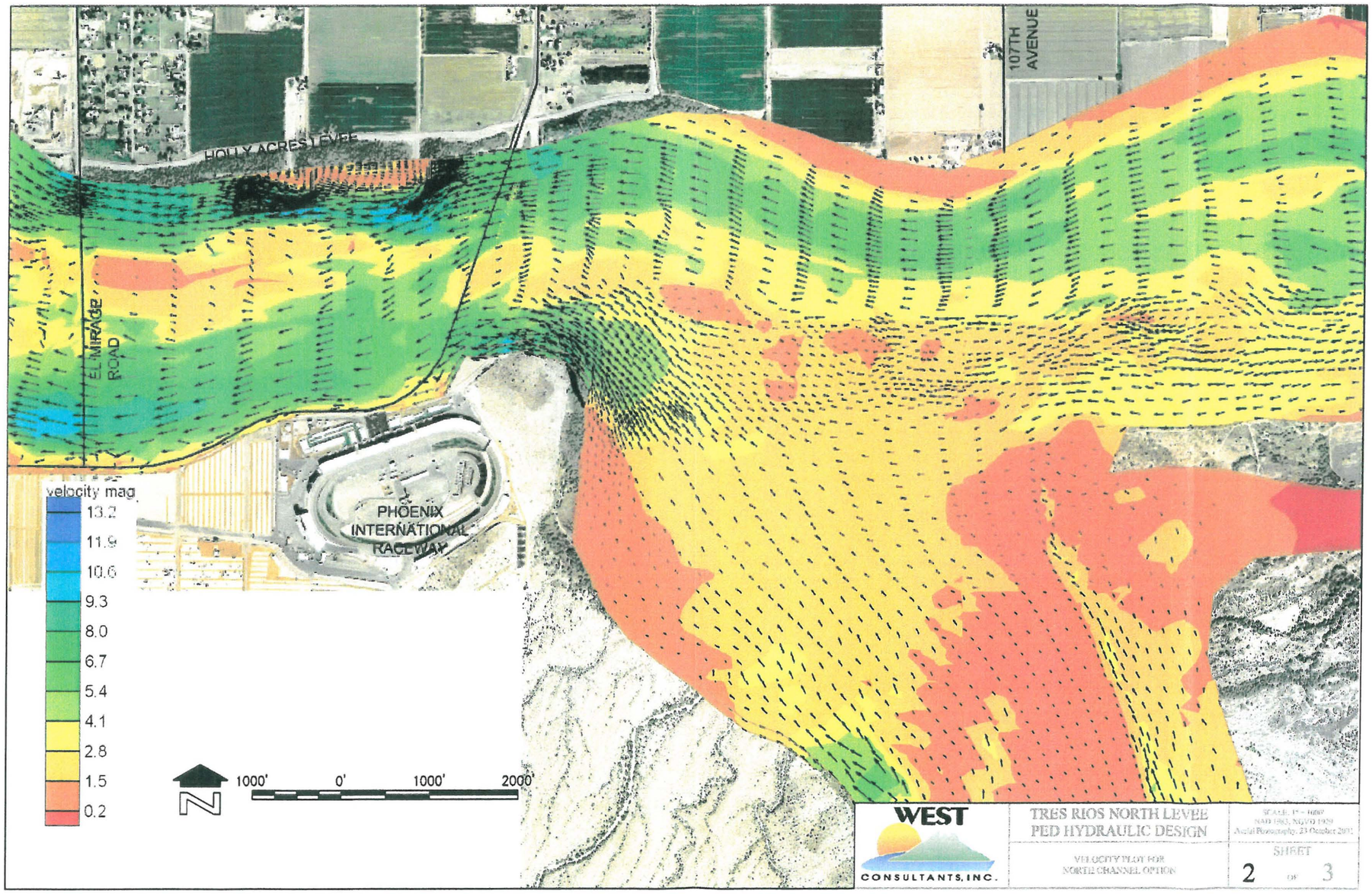


Figure B-2b. Velocity Plot for "Flipped Channel" Condition (Confluence). Note high velocities along north levee and terrace.

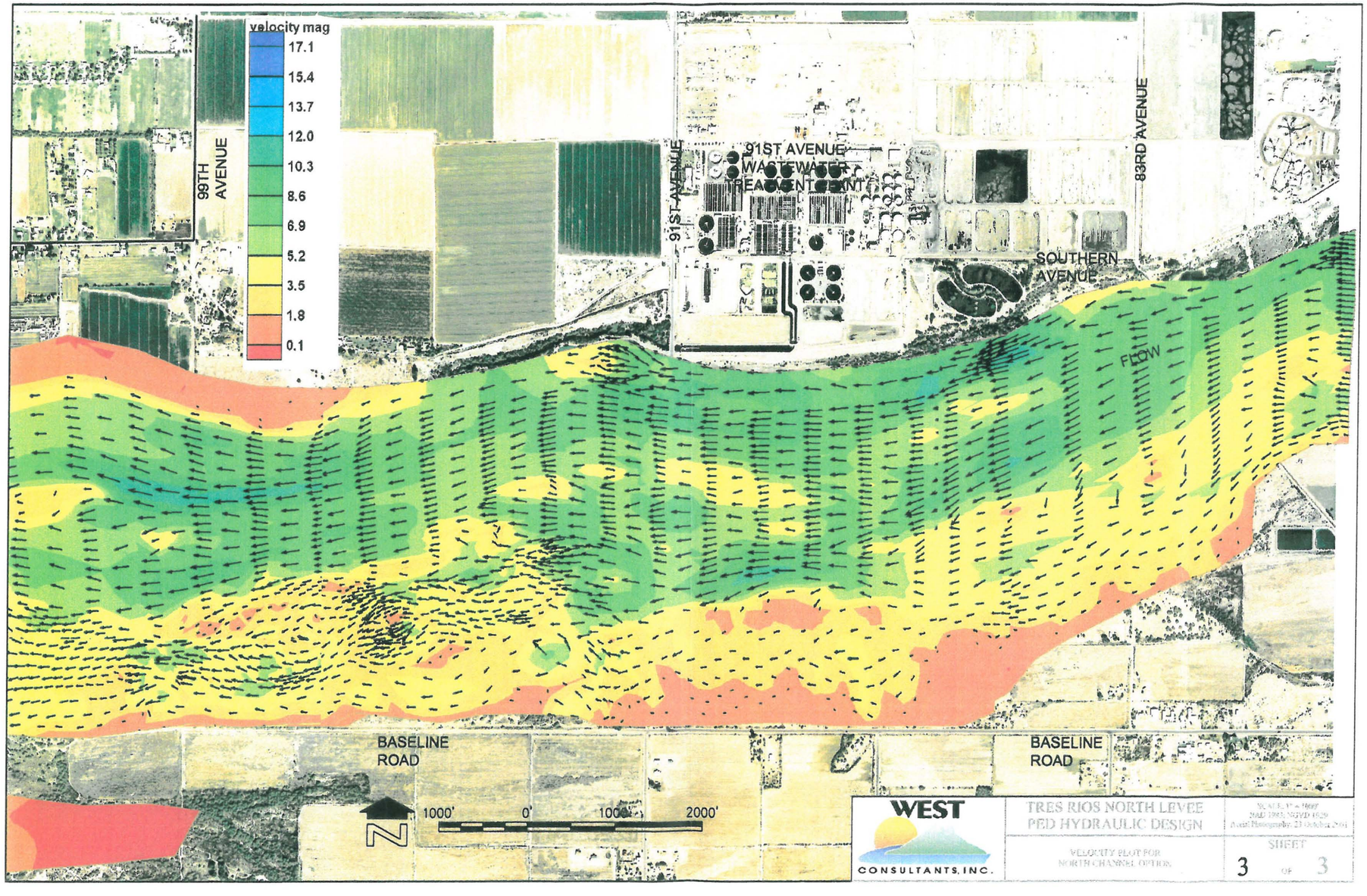


Figure B-2c. Velocity Plot for "Flipped Channel" Condition (Upstream). Note high velocities along north levee and terrace.

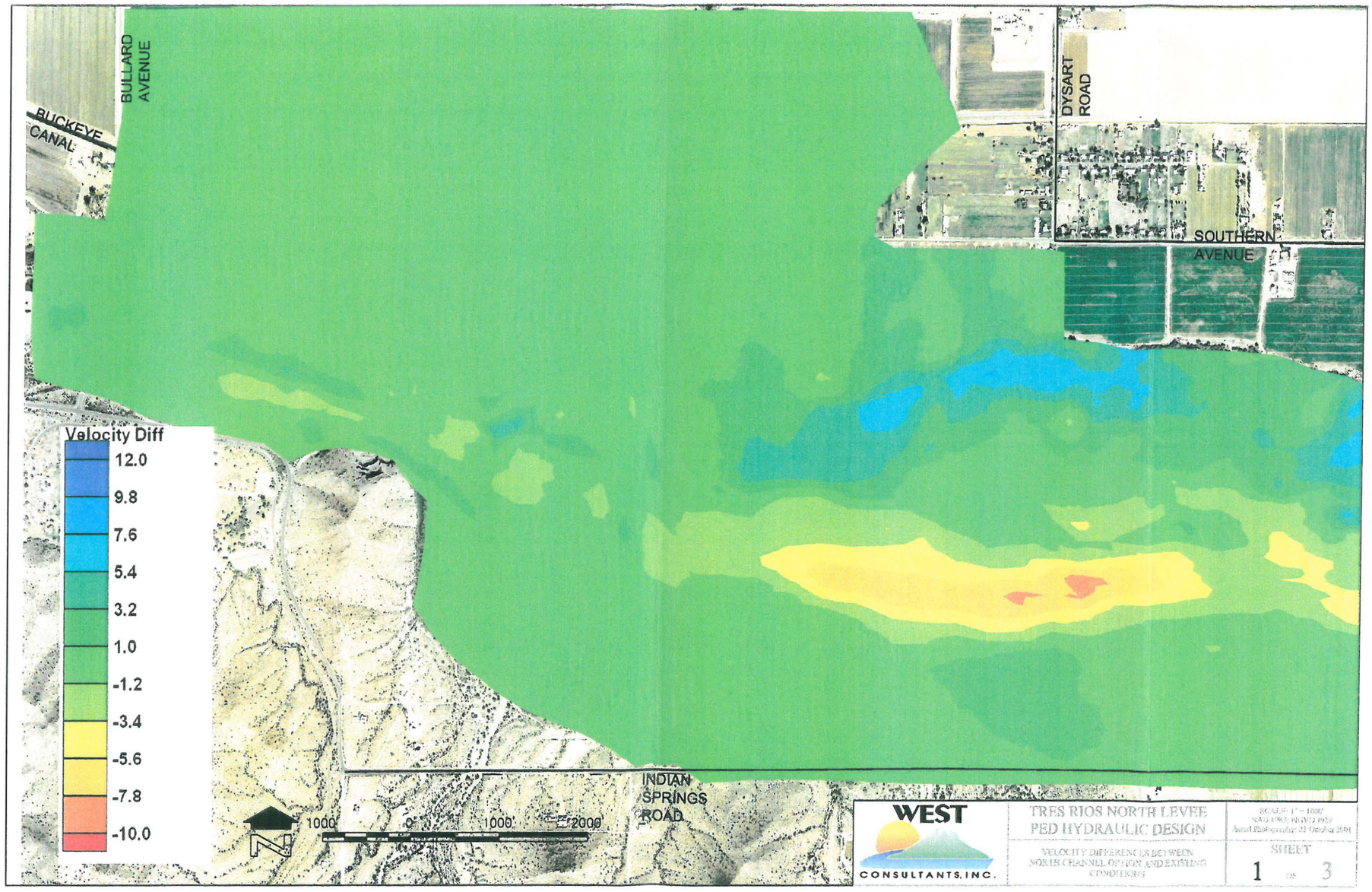


Figure B-3a. Velocity Differences Between "Flipped Channel" and Existing Conditions.

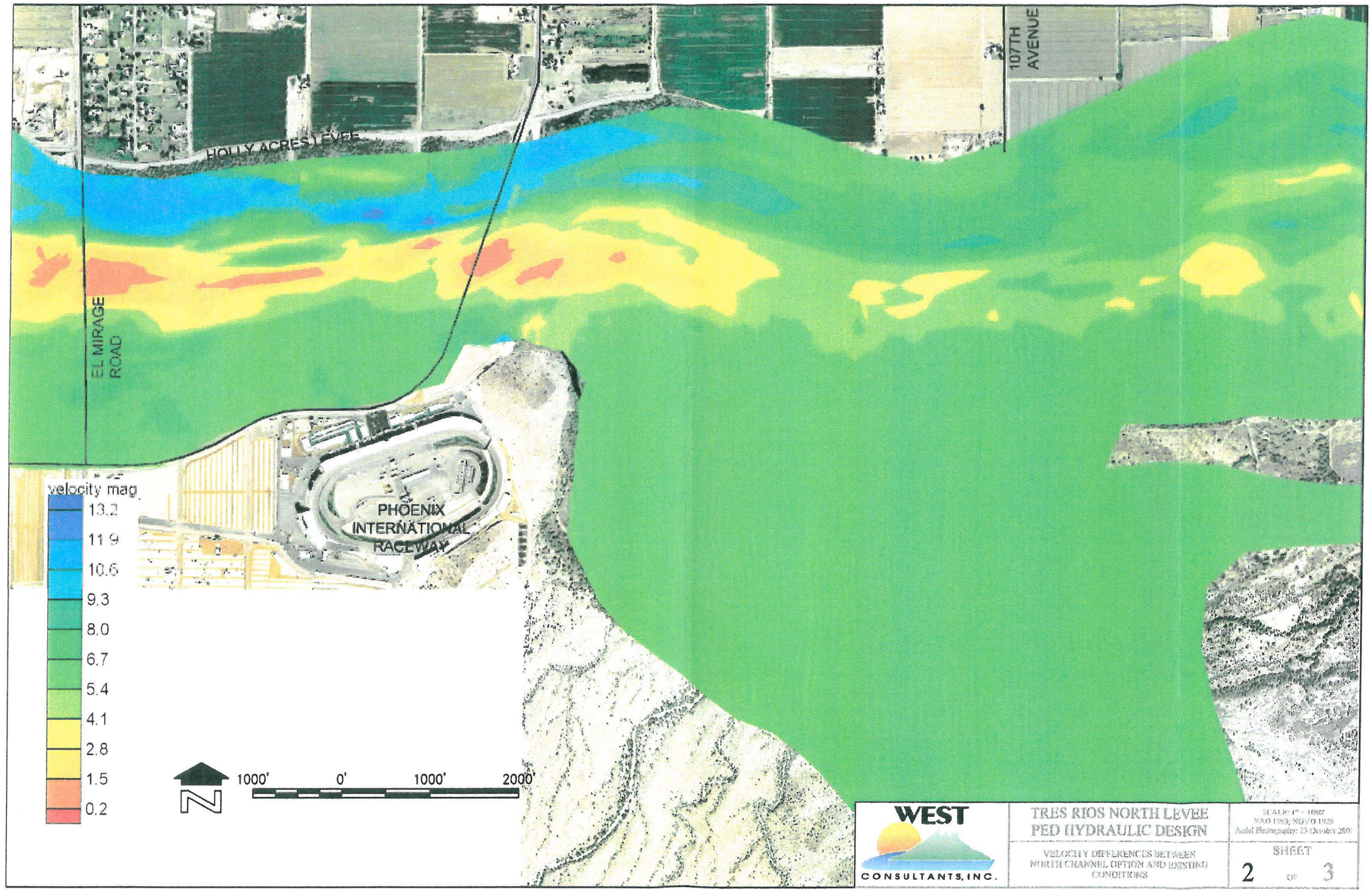


Figure B-3b. Velocity Differences Between "Flipped Channel" and Existing Conditions.

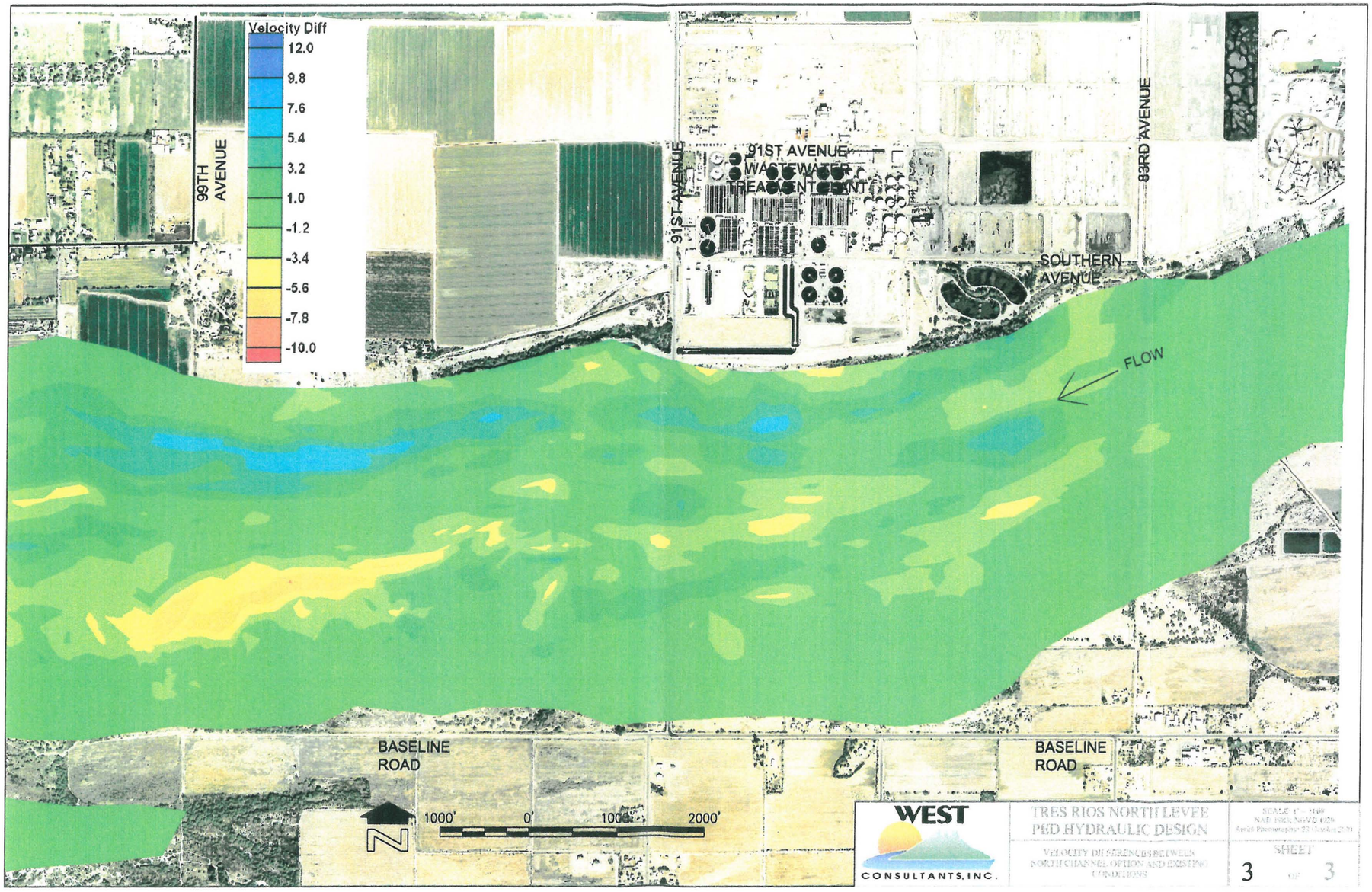


Figure B-3c. Velocity Differences Between "Flipped Channel" and Existing Conditions.

APPENDIX F

Future Conditions With Levee HEC-RAS Model Results

i. 5-, 20-, 100-Year Standard Table
ii. Cross Section Plots for the Lower Gila
iii. Cross Section Plots for the Salt
iv. Cross Section Plots for the Upper Gila

F-i

5-, 20-, 100-Year Standard Table

HEC-RAS Plan: Fut+Lev River: Gila Reach: Lower Gila

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)	
Lower Gila	195.16	5_year	23500.00	891.00	903.68	899.99	904.02	0.001660	4.67	5027.43	1685.71	0.35
Lower Gila	195.16	20_year	92000.00	891.00	907.15	905.01	907.77	0.001658	6.48	14730.56	1937.37	0.38
Lower Gila	195.16	100_year	227000.00	891.00	913.24	906.89	914.48	0.001660	9.18	25593.24	3706.96	0.42
Lower Gila	195.2	5_year	23500.00	891.00	904.00	900.50	904.32	0.001322	4.56	5154.64	1722.58	0.32
Lower Gila	195.2	20_year	92000.00	891.00	907.55	905.05	908.09	0.001279	6.06	15818.91	1838.68	0.34
Lower Gila	195.2	100_year	227000.00	891.00	913.69	906.80	914.82	0.001428	8.86	26653.41	3604.26	0.39
Lower Gila	195.21		Bridge									
Lower Gila	195.22	5_year	23500.00	891.00	904.32	900.34	904.61	0.001179	4.34	5420.89	1719.58	0.30
Lower Gila	195.22	20_year	92000.00	891.00	907.89	905.12	908.41	0.001247	6.01	15983.38	1838.12	0.34
Lower Gila	195.22	100_year	227000.00	891.00	914.13	906.98	915.23	0.001375	8.76	26998.03	4098.17	0.38
Lower Gila	195.28	5_year	23500.00	892.60	904.44	900.89	904.83	0.001641	4.98	4718.46	1617.99	0.36
Lower Gila	195.28	20_year	92000.00	892.60	908.02	905.19	908.63	0.001666	6.56	14932.43	2117.38	0.38
Lower Gila	195.28	100_year	227000.00	892.60	914.30	907.83	915.42	0.001524	8.92	26880.32	4192.71	0.40
Lower Gila	195.34	5_year	23500.00	892.60	905.01	900.45	905.23	0.000866	3.78	6209.33	1807.33	0.26
Lower Gila	195.34	20_year	92000.00	892.60	908.55	905.14	909.15	0.001556	6.79	15468.52	2101.84	0.38
Lower Gila	195.34	100_year	227000.00	892.60	914.93	908.43	915.90	0.001311	8.66	29641.12	4086.70	0.38
Lower Gila	195.45	5_year	23500.00	896.41	905.25	902.26	905.61	0.001581	4.77	4925.28	1769.79	0.35
Lower Gila	195.45	20_year	92000.00	896.41	909.00	906.06	909.68	0.001959	7.40	14778.90	2238.41	0.42
Lower Gila	195.45	100_year	227000.00	896.41	915.35	909.54	916.29	0.001408	8.81	30373.41	3801.50	0.39
Lower Gila	195.55	5_year	23500.00	897.89	906.09	902.58	906.45	0.001426	4.84	4857.87	1717.04	0.34
Lower Gila	195.55	20_year	92000.00	897.89	910.05	906.47	910.73	0.001766	7.42	14887.17	2290.63	0.41
Lower Gila	195.55	100_year	227000.00	897.89	916.13	910.67	917.11	0.001455	9.15	29698.54	4455.60	0.40
Lower Gila	195.65	5_year	23500.00	897.58	906.62	902.49	907.16	0.001093	5.91	3978.59	1318.15	0.44
Lower Gila	195.65	20_year	92000.00	897.58	910.75	908.33	911.76	0.001752	9.07	12778.51	1952.01	0.53
Lower Gila	195.65	100_year	227000.00	897.58	916.64	912.65	918.05	0.001618	11.24	26607.39	3518.52	0.51
Lower Gila	195.77	5_year	23500.00	897.58	907.17	904.54	907.99	0.001756	7.27	3234.16	1486.39	0.57
Lower Gila	195.77	20_year	92000.00	897.58	911.88	909.30	912.69	0.001573	8.31	13977.09	2132.26	0.49
Lower Gila	195.77	100_year	227000.00	897.58	917.80	913.00	918.90	0.001373	10.00	28859.42	4554.36	0.46
Lower Gila	195.86	5_year	23500.00	897.39	908.44	904.69	908.79	0.000892	4.77	4929.71	1436.37	0.33
Lower Gila	195.86	20_year	92000.00	897.39	912.88	909.75	913.55	0.001290	7.40	15240.24	2286.11	0.40
Lower Gila	195.86	100_year	227000.00	897.39	918.74	913.40	919.67	0.001188	9.24	32091.32	4590.93	0.40
Lower Gila	195.98	5_year	23500.00	899.24	909.02	904.24	909.29	0.001116	4.19	5614.28	2714.89	0.28
Lower Gila	195.98	20_year	92000.00	899.24	913.67	909.40	914.20	0.001340	6.35	17290.75	3402.80	0.33
Lower Gila	195.98	100_year	227000.00	899.24	919.54	913.22	920.27	0.001203	7.83	36174.29	6538.21	0.33
Lower Gila	196.08	5_year	23500.00	899.26	909.44	907.50	910.83	0.003735	9.45	2486.65	2793.69	0.71
Lower Gila	196.08	20_year	92000.00	899.26	914.69	913.15	915.56	0.002371	9.57	18917.63	4508.90	0.60
Lower Gila	196.08	100_year	227000.00	899.26	920.26	916.06	921.44	0.001808	11.88	40662.43	8169.31	0.57
Lower Gila	196.14	5_year	23500.00	906.39	911.66	909.84	912.26	0.001988	6.21	3785.21	3457.61	0.50
Lower Gila	196.14	20_year	92000.00	906.39	915.97	913.16	916.37	0.000983	6.40	23087.42	4431.55	0.39
Lower Gila	196.14	100_year	227000.00	906.39	921.48	915.23	922.14	0.000890	8.52	46277.63	8144.36	0.40
Lower Gila	196.23	5_year	23500.00	901.72	912.44	908.91	912.67	0.000712	3.89	6044.09	3526.10	0.28
Lower Gila	196.23	20_year	92000.00	901.72	916.37	912.88	916.68	0.000729	5.40	25732.29	6148.08	0.31
Lower Gila	196.23	100_year	227000.00	901.72	922.01	915.87	922.41	0.000542	6.24	51143.66	7808.03	0.28
Lower Gila	196.32	5_year	23500.00	905.91	912.84	909.75	913.24	0.002009	5.07	4632.58	2698.00	0.38
Lower Gila	196.32	20_year	92000.00	905.91	916.79	914.63	917.20	0.001543	6.10	20230.06	6571.48	0.36
Lower Gila	196.32	100_year	227000.00	905.91	922.31	917.14	922.72	0.000804	6.03	45669.62	8375.33	0.28
Lower Gila	196.38	5_year	23500.00	906.38	913.56	909.92	913.86	0.000859	4.38	5362.20	2659.41	0.32
Lower Gila	196.38	20_year	92000.00	906.38	917.39	914.54	917.81	0.000983	6.19	21517.49	6644.98	0.36
Lower Gila	196.38	100_year	227000.00	906.38	922.63	917.70	923.09	0.000691	6.77	45357.18	8324.65	0.31
Lower Gila	196.44	5_year	23500.00	906.38	913.91	909.99	914.14	0.001020	3.83	6136.77	2232.40	0.27
Lower Gila	196.44	20_year	92000.00	906.38	917.71	914.15	918.15	0.001426	6.12	20224.05	6684.28	0.34
Lower Gila	196.44	100_year	227000.00	906.38	922.85	918.13	923.32	0.000938	6.54	43568.38	8834.15	0.30
Lower Gila	196.5	5_year	23500.00	906.38	914.24	910.19	914.47	0.001025	3.84	6124.57	2277.98	0.27
Lower Gila	196.5	20_year	92000.00	906.38	918.14	914.53	918.69	0.001667	6.71	18730.15	5435.56	0.37
Lower Gila	196.5	100_year	227000.00	906.38	923.10	918.94	923.72	0.001279	7.67	39879.59	8664.31	0.35
Lower Gila	196.57	5_year	23500.00	906.38	914.62	910.73	914.84	0.001158	3.75	6258.55	1932.97	0.27
Lower Gila	196.57	20_year	92000.00	906.38	918.73	914.79	919.28	0.001888	6.65	18401.27	5824.30	0.37
Lower Gila	196.57	100_year	227000.00	906.38	923.53	919.21	924.26	0.001812	8.40	39412.28	8382.82	0.38
Lower Gila	196.63	5_year	23500.00	906.38	915.01	910.28	915.16	0.000673	3.12	7525.14	2316.18	0.21
Lower Gila	196.63	20_year	92000.00	906.38	919.39	914.13	919.85	0.001286	5.94	20438.20	5719.24	0.31
Lower Gila	196.63	100_year	227000.00	906.38	924.17	919.01	924.85	0.001425	7.90	40992.98	8855.18	0.35

HEC-RAS Plan: Fut+Lev River: Gila Reach: Lower Gila (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Lower Gila	196.69	5_year	23500.00	906.54	915.25	909.99	915.36	0.000573	2.63	8949.10	2390.29	0.17
Lower Gila	196.69	20_year	92000.00	906.54	919.92	913.56	920.21	0.000961	4.70	24670.67	5134.11	0.24
Lower Gila	196.69	100_year	227000.00	906.54	924.78	918.46	925.27	0.001177	6.53	45050.95	8778.33	0.28
Lower Gila	196.75	5_year	23500.00	906.28	915.44	910.95	915.60	0.000892	3.19	7367.84	2298.87	0.23
Lower Gila	196.75	20_year	92000.00	906.28	920.24	914.94	920.50	0.000888	4.73	26125.30	5015.74	0.26
Lower Gila	196.75	100_year	227000.00	906.28	925.13	918.95	925.64	0.001113	6.88	45891.04	8339.63	0.31
Lower Gila	196.81	5_year	23500.00	906.40	915.69	911.58	915.89	0.000764	3.59	6545.33	2157.31	0.26
Lower Gila	196.81	20_year	92000.00	906.40	920.46	915.80	920.80	0.000775	5.36	23288.72	3603.46	0.29
Lower Gila	196.81	100_year	227000.00	906.40	925.38	919.18	926.02	0.000945	7.65	42521.52	4093.51	0.34
Lower Gila	196.87	5_year	23500.00	906.40	915.83	912.21	916.14	0.000803	4.46	5264.31	1756.50	0.34
Lower Gila	196.87	20_year	92000.00	906.40	920.61	917.03	921.06	0.000838	6.20	20512.66	3425.08	0.35
Lower Gila	196.87	100_year	227000.00	906.40	925.54	919.40	926.35	0.001030	8.77	38987.20	4000.13	0.40
Lower Gila	196.94	5_year	23500.00	906.40	916.09	912.07	916.45	0.001105	4.82	4876.31	1587.64	0.37
Lower Gila	196.94	20_year	92000.00	906.40	920.88	917.66	921.36	0.001044	6.28	19130.88	3306.69	0.36
Lower Gila	196.94	100_year	227000.00	906.40	925.95	920.59	926.69	0.001123	8.35	38330.77	4033.18	0.38
Lower Gila	196.99	5_year	23500.00	906.40	916.63	912.98	916.96	0.001730	4.60	5103.99	1542.87	0.37
Lower Gila	196.99	20_year	92000.00	906.40	921.32	918.06	921.82	0.001448	6.19	17757.65	3046.93	0.36
Lower Gila	196.99	100_year	227000.00	906.40	926.41	921.17	927.15	0.001377	8.06	37171.04	4170.90	0.38
Lower Gila	197.05	5_year	23500.00	908.12	917.15	913.36	917.43	0.001380	4.28	5487.56	2033.16	0.34
Lower Gila	197.05	20_year	92000.00	908.12	921.83	918.26	922.22	0.001169	5.74	21995.86	3589.98	0.33
Lower Gila	197.05	100_year	227000.00	908.12	926.92	921.19	927.55	0.001176	7.63	42042.34	4183.06	0.35
Lower Gila	197.09	5_year	23500.00	908.08	917.48	914.15	917.79	0.001194	4.43	5299.86	2462.46	0.35
Lower Gila	197.09	20_year	92000.00	908.08	922.24	918.79	922.45	0.000556	4.38	26654.49	3854.49	0.26
Lower Gila	197.09	100_year	227000.00	908.08	927.38	921.24	927.81	0.000653	6.37	48030.38	4355.63	0.30
Lower Gila	197.14	5_year	23500.00	909.26	917.88	914.55	918.09	0.001350	3.73	6299.40	2496.87	0.29
Lower Gila	197.14	20_year	92000.00	909.26	922.37	918.35	922.62	0.000760	4.40	23417.84	3565.15	0.25
Lower Gila	197.14	100_year	227000.00	909.26	927.55	921.45	927.98	0.000784	6.08	44816.22	4435.39	0.28
Lower Gila	197.16	5_year	23500.00	909.80	918.13	915.19	918.38	0.001052	4.07	5772.33	2602.63	0.31
Lower Gila	197.16	20_year	92000.00	909.80	922.52	918.91	922.81	0.000757	5.15	23709.55	3322.51	0.29
Lower Gila	197.16	100_year	227000.00	909.80	927.68	921.26	928.21	0.000849	7.26	45301.85	4589.23	0.33
Lower Gila	197.18	5_year	23500.00	910.95	918.29	915.09	918.51	0.000839	3.78	6224.46	2791.07	0.29
Lower Gila	197.18	20_year	92000.00	910.95	922.61	918.78	922.92	0.000750	5.22	25444.26	3446.21	0.30
Lower Gila	197.18	100_year	227000.00	910.95	927.73	921.55	928.35	0.000932	7.71	47138.75	4781.98	0.36
Lower Gila	197.23	5_year	23500.00	910.88	918.33	915.48	918.67	0.001253	4.67	5032.56	2274.11	0.39
Lower Gila	197.23	20_year	92000.00	910.88	922.59	919.86	923.10	0.001362	6.50	21370.29	3560.08	0.41
Lower Gila	197.23	100_year	227000.00	910.88	927.76	922.59	928.53	0.001313	8.45	43639.66	4865.68	0.41
Lower Gila	197.28	5_year	23500.00	910.50	918.66	914.55	918.88	0.000569	3.76	6242.79	2204.92	0.27
Lower Gila	197.28	20_year	92000.00	910.50	922.87	918.85	923.39	0.001035	6.46	21067.56	3260.87	0.39
Lower Gila	197.28	100_year	227000.00	910.50	928.01	921.91	928.86	0.001173	8.72	42722.68	4865.43	0.42
Lower Gila	197.33	5_year	23500.00	911.65	918.71	916.00	919.14	0.001345	5.27	4460.74	2148.71	0.43
Lower Gila	197.33	20_year	92000.00	911.65	923.07	920.01	923.74	0.001593	7.44	18757.67	2925.36	0.47
Lower Gila	197.33	100_year	227000.00	911.65	928.17	923.51	929.28	0.001698	10.03	39802.66	4969.76	0.49
Lower Gila	197.38	5_year	23500.00	911.90	919.17	916.81	919.68	0.002928	5.73	4101.04	1835.87	0.51
Lower Gila	197.38	20_year	92000.00	911.90	923.55	921.47	924.29	0.002503	7.67	15366.58	2646.93	0.48
Lower Gila	197.38	100_year	227000.00	911.90	928.85	924.67	929.78	0.001962	9.34	36322.55	4845.39	0.45
Lower Gila	197.42	5_year	23500.00	911.90	919.74	917.93	920.32	0.001855	6.14	3824.50	1800.69	0.54
Lower Gila	197.42	20_year	92000.00	911.90	924.08	922.36	924.95	0.002150	8.32	15925.93	3003.51	0.54
Lower Gila	197.42	100_year	227000.00	911.90	929.19	925.72	930.38	0.001945	10.44	36369.19	4723.75	0.52
Lower Gila	197.48	5_year	23500.00	911.90	920.16	918.49	920.93	0.002860	7.00	3358.42	1648.41	0.63
Lower Gila	197.48	20_year	92000.00	911.90	924.62	922.48	925.54	0.002620	8.64	15807.52	3369.18	0.56
Lower Gila	197.48	100_year	227000.00	911.90	929.74	926.79	930.89	0.002161	10.40	37260.75	4759.01	0.52
Lower Gila	197.53	5_year	23500.00	911.90	921.11	918.16	921.53	0.001295	5.22	4497.92	1766.79	0.42
Lower Gila	197.53	20_year	92000.00	911.90	925.51	923.16	926.24	0.001836	7.63	17626.69	3665.46	0.47
Lower Gila	197.53	100_year	227000.00	911.90	930.50	925.70	931.50	0.001692	9.62	39007.93	4522.87	0.47
Lower Gila	197.58	5_year	23500.00	911.90	921.42	917.43	921.83	0.000948	5.12	4592.79	1828.33	0.39
Lower Gila	197.58	20_year	92000.00	911.90	925.92	923.48	926.65	0.001283	7.76	18251.80	3865.02	0.46
Lower Gila	197.58	100_year	227000.00	911.90	930.91	927.17	931.89	0.001264	9.74	40025.97	4578.84	0.46
Lower Gila	197.64	5_year	23500.00	911.90	921.76	916.40	922.01	0.000432	4.01	5863.75	1705.07	0.28
Lower Gila	197.64	20_year	92000.00	911.90	926.38	922.23	926.94	0.000846	6.68	19955.67	4121.43	0.37
Lower Gila	197.64	100_year	227000.00	911.90	931.46	925.72	932.19	0.000847	8.29	42953.45	4823.57	0.38

HEC-RAS Plan: Fut+Lev River: Gila Reach: Lower Gila (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)	
Lower Gila	197.7	5_year	23500.00	911.90	921.90	917.93	922.18	0.000707	4.24	5544.51	1859.90	0.31
Lower Gila	197.7	20_year	92000.00	911.90	926.73	922.75	927.21	0.000834	6.34	20143.38	3804.92	0.35
Lower Gila	197.7	100_year	227000.00	911.90	931.81	926.26	932.46	0.000838	8.04	43313.12	4824.10	0.36
Lower Gila	197.75	5_year	23500.00	911.90	922.17	918.21	922.39	0.000637	3.78	6219.82	2369.90	0.27
Lower Gila	197.75	20_year	92000.00	911.90	927.14	922.41	927.43	0.000546	5.08	23578.13	3547.85	0.27
Lower Gila	197.75	100_year	227000.00	911.90	932.20	926.34	932.69	0.000619	6.98	46155.23	4772.02	0.31
Lower Gila	197.81	5_year	23500.00	912.13	922.33	919.11	922.65	0.001060	4.51	5214.40	2097.16	0.35
Lower Gila	197.81	20_year	92000.00	912.13	927.24	923.54	927.65	0.000808	6.02	21024.13	3152.75	0.34
Lower Gila	197.81	100_year	227000.00	912.13	932.27	926.59	932.96	0.000875	8.19	41692.15	4742.65	0.38
Lower Gila	197.87	5_year	23500.00	912.14	922.65	919.72	923.00	0.001287	4.72	4984.02	1909.90	0.36
Lower Gila	197.87	20_year	92000.00	912.14	927.51	924.27	927.92	0.000998	5.80	20185.33	3265.43	0.35
Lower Gila	197.87	100_year	227000.00	912.14	932.59	926.97	933.22	0.000922	7.69	40703.16	4706.83	0.37
Lower Gila	197.92	5_year	23500.00	912.14	923.03	919.36	923.35	0.000888	4.50	5223.41	2246.50	0.33
Lower Gila	197.92	20_year	92000.00	912.14	927.89	924.25	928.21	0.000737	5.19	22652.14	3349.17	0.32
Lower Gila	197.92	100_year	227000.00	912.14	932.94	926.75	933.50	0.000748	7.22	42675.30	4513.15	0.35
Lower Gila	197.95	5_year	23500.00	912.14	923.28	919.53	923.58	0.000859	4.37	5379.90	2341.95	0.33
Lower Gila	197.95	20_year	92000.00	912.14	928.10	924.44	928.39	0.000599	4.74	24041.95	3468.46	0.29
Lower Gila	197.95	100_year	227000.00	912.14	933.16	926.77	933.69	0.000645	6.80	44030.09	4431.04	0.33
Lower Gila	197.98	5_year	23500.00	915.60	923.20	922.22	923.98	0.004252	7.07	3322.71	2181.28	0.66
Lower Gila	197.98	20_year	92000.00	915.60	928.18	925.01	928.53	0.001108	5.74	23253.38	3627.21	0.38
Lower Gila	197.98	100_year	227000.00	915.60	933.21	926.70	933.85	0.001019	7.92	43172.89	4485.86	0.40
Lower Gila	198.03	5_year	23500.00	917.47	923.77	922.77	924.84	0.004840	8.28	2839.25	2313.97	0.72
Lower Gila	198.03	20_year	92000.00	917.47	928.37	926.13	928.74	0.001328	5.99	21707.64	3358.11	0.41
Lower Gila	198.03	100_year	227000.00	917.47	933.33	927.40	934.08	0.001320	8.73	40445.71	4154.23	0.46
Lower Gila	198.08	5_year	23500.00	917.90	925.16	923.18	925.74	0.002369	6.08	3865.27	2321.38	0.51
Lower Gila	198.08	20_year	92000.00	917.90	928.67	926.71	929.13	0.001463	6.53	18584.92	3091.77	0.43
Lower Gila	198.08	100_year	227000.00	917.90	933.63	928.28	934.47	0.001432	9.23	36670.77	3852.30	0.47
Lower Gila	198.15	5_year	23500.00	918.06	925.77	924.28	926.38	0.002847	6.25	3760.29	2553.10	0.58
Lower Gila	198.15	20_year	92000.00	918.06	929.01	927.32	929.47	0.001233	6.10	22044.86	2995.59	0.42
Lower Gila	198.15	100_year	227000.00	918.06	933.90	928.20	934.84	0.001303	9.08	38901.94	3623.15	0.47
Lower Gila	198.2	5_year	23500.00	917.83	926.76	924.49	927.26	0.002001	5.72	4104.90	2337.05	0.49
Lower Gila	198.2	20_year	92000.00	917.83	929.45	928.67	930.01	0.001436	6.56	18896.15	2719.43	0.45
Lower Gila	198.2	100_year	227000.00	917.83	934.33	929.42	935.42	0.001474	9.62	34777.41	3474.85	0.50
Lower Gila	198.26	5_year	23500.00	919.07	927.33	925.22	927.83	0.001753	5.67	4141.33	2213.61	0.47
Lower Gila	198.26	20_year	92000.00	919.07	929.81	928.57	930.47	0.001348	6.59	17424.97	2589.09	0.44
Lower Gila	198.26	100_year	227000.00	919.07	934.71	930.26	935.91	0.001544	10.00	32594.96	3332.30	0.52
Lower Gila	198.33	5_year	23500.00	920.97	927.87	925.51	928.28	0.001313	5.16	4552.69	2102.00	0.41
Lower Gila	198.33	20_year	92000.00	920.97	930.24	928.79	930.84	0.001171	6.18	16060.96	2377.64	0.41
Lower Gila	198.33	100_year	227000.00	920.97	935.45	930.37	936.34	0.001146	8.79	32155.37	3488.21	0.45
Lower Gila	198.4	5_year	23500.00	922.23	928.42	926.28	928.90	0.001886	5.55	4230.88	1739.06	0.44
Lower Gila	198.4	20_year	92000.00	922.23	930.65	929.53	931.41	0.001655	6.45	13820.59	1920.91	0.43
Lower Gila	198.4	100_year	227000.00	922.23	935.84	931.47	936.98	0.002044	9.71	27857.95	3320.07	0.51
Lower Gila	198.45	5_year	23500.00	922.19	929.10	926.42	929.45	0.001302	4.74	4962.57	1875.46	0.36
Lower Gila	198.45	20_year	92000.00	922.19	931.35	930.31	931.90	0.001096	5.43	16191.18	2015.18	0.35
Lower Gila	198.45	100_year	227000.00	922.19	936.69	930.81	937.58	0.001369	8.57	31541.27	3315.17	0.42
Lower Gila	198.49	5_year	23500.00	922.46	929.41	926.46	929.72	0.000847	4.49	5236.74	2194.50	0.34
Lower Gila	198.49	20_year	92000.00	922.46	931.72	930.51	932.16	0.000860	5.60	17800.07	2400.07	0.36
Lower Gila	198.49	100_year	227000.00	922.46	937.09	930.79	937.88	0.000909	8.17	34158.41	3299.35	0.40
Lower Gila	198.54	5_year	23500.00	922.67	929.62	926.95	929.94	0.000952	4.54	5172.85	2266.31	0.35
Lower Gila	198.54	20_year	92000.00	922.67	931.94	930.01	932.38	0.000972	5.80	17871.51	2547.07	0.38
Lower Gila	198.54	100_year	227000.00	922.67	937.35	931.05	938.11	0.000922	7.96	34308.18	3257.75	0.40
Lower Gila	198.6	5_year	23500.00	923.30	929.87	927.66	930.27	0.001380	5.04	4658.56	2346.35	0.42
Lower Gila	198.6	20_year	92000.00	923.30	932.19	931.01	932.68	0.001104	5.75	17283.04	2622.00	0.40
Lower Gila	198.6	100_year	227000.00	923.30	937.57	932.01	938.39	0.000992	8.03	33604.30	3247.83	0.41
Lower Gila	198.65	5_year	23500.00	923.88	930.34	928.11	930.72	0.001336	4.93	4766.60	2493.19	0.41
Lower Gila	198.65	20_year	92000.00	923.88	932.59	931.71	933.04	0.001042	5.49	17950.37	2870.70	0.38
Lower Gila	198.65	100_year	227000.00	923.88	937.94	932.31	938.71	0.000920	7.73	34524.64	3261.25	0.40
Lower Gila	198.7	5_year	23500.00	923.90	930.71	928.06	931.03	0.000988	4.48	5247.76	2700.71	0.36
Lower Gila	198.7	20_year	92000.00	923.90	932.94	931.51	933.30	0.000843	5.23	19990.47	2844.67	0.35
Lower Gila	198.7	100_year	227000.00	923.90	938.25	931.91	938.96	0.000871	7.70	36018.05	3191.31	0.39
Lower Gila	198.76	5_year	23500.00	923.90	930.98	928.27	931.28	0.000965	4.36	5387.48	2676.49	0.35

HEC-RAS Plan: Fut+Lev River: Gila Reach: Lower Gila (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)	
Lower Gila	198.76	20_year	92000.00	923.90	933.14	932.00	933.54	0.000949	5.53	19237.12	2770.14	0.37
Lower Gila	198.76	100_year	227000.00	923.90	938.45	932.23	939.20	0.000905	7.87	35009.13	3141.14	0.40
Lower Gila	198.8	5_year	23500.00	923.90	931.35	928.55	931.63	0.001563	4.29	5473.30	2243.35	0.34
Lower Gila	198.8	20_year	92000.00	923.90	933.44	932.20	933.93	0.001601	5.42	16392.65	2343.73	0.36
Lower Gila	198.8	100_year	227000.00	923.90	938.71	933.07	939.57	0.001484	7.57	30417.33	3059.14	0.38
Lower Gila	198.83	5_year	23500.00	923.90	931.59	928.97	931.91	0.000969	4.58	5125.70	2454.74	0.36
Lower Gila	198.83	20_year	92000.00	923.90	933.78	932.71	934.22	0.001109	6.00	18369.47	2673.07	0.40
Lower Gila	198.83	100_year	227000.00	923.90	939.01	933.21	939.85	0.001082	8.60	33761.12	3174.36	0.43
Lower Gila	198.88	5_year	23500.00	923.90	931.77	929.26	932.14	0.001566	4.90	4795.37	2515.04	0.39
Lower Gila	198.88	20_year	92000.00	923.90	934.00	932.61	934.47	0.001595	6.11	18220.27	2841.07	0.41
Lower Gila	198.88	100_year	227000.00	923.90	939.23	933.79	940.08	0.001446	8.49	33518.00	3088.28	0.43
Lower Gila	198.93	5_year	23500.00	923.90	932.17	929.10	932.50	0.001199	4.58	5136.20	2528.34	0.34
Lower Gila	198.93	20_year	92000.00	923.90	934.39	933.21	934.84	0.001299	5.83	18346.12	2887.17	0.38
Lower Gila	198.93	100_year	227000.00	923.90	939.63	933.98	940.42	0.001213	8.03	33758.01	2991.95	0.40
Lower Gila	198.97	5_year	23500.00	925.10	932.45	929.64	932.86	0.001966	5.15	4565.22	2600.49	0.39
Lower Gila	198.97	20_year	92000.00	925.10	934.64	933.51	935.28	0.002374	7.04	16177.19	2919.56	0.45
Lower Gila	198.97	100_year	227000.00	925.10	939.75	934.63	940.89	0.002244	9.61	29525.30	2979.14	0.47
Lower Gila	198.99	5_year	23500.00	925.10	932.92	929.81	933.29	0.001597	4.86	4833.71	2657.14	0.35
Lower Gila	198.99	20_year	92000.00	925.10	935.18	934.01	935.79	0.001927	6.51	16654.97	2907.63	0.41
Lower Gila	198.99	100_year	227000.00	925.10	940.22	934.64	941.40	0.001980	9.14	29303.84	2958.40	0.45
Lower Gila	199.02	5_year	23500.00	925.40	933.21	929.93	933.47	0.001501	4.10	5731.23	2768.59	0.30
Lower Gila	199.02	20_year	92000.00	925.40	935.36	934.01	936.06	0.002543	6.60	16607.32	2839.68	0.41
Lower Gila	199.02	100_year	227000.00	925.40	940.31	935.91	941.72	0.002549	9.14	28855.06	2895.11	0.45
Lower Gila	199.06	5_year	23500.00	925.40	933.48	929.93	933.69	0.001487	3.70	6343.02	2478.98	0.27
Lower Gila	199.06	20_year	92000.00	925.40	935.89	933.72	936.45	0.002366	5.89	16471.02	2524.18	0.36
Lower Gila	199.06	100_year	227000.00	925.40	940.87	935.58	942.13	0.002681	8.59	27489.37	2824.49	0.42
Lower Gila	199.11	5_year	23500.00	925.40	933.76	929.50	933.92	0.000848	3.23	7284.97	2773.02	0.23
Lower Gila	199.11	20_year	92000.00	925.40	936.45	933.32	936.82	0.001304	5.06	19728.85	2803.82	0.30
Lower Gila	199.11	100_year	227000.00	925.40	941.78	935.12	942.58	0.001473	7.38	33016.63	2863.13	0.35
Lower Gila	199.18	5_year	23500.00	925.40	934.01	931.61	934.41	0.002329	5.11	4601.08	2608.70	0.41
Lower Gila	199.18	20_year	92000.00	925.40	936.84	935.51	937.35	0.002256	6.84	17745.56	2688.35	0.44
Lower Gila	199.18	100_year	227000.00	925.40	942.18	936.48	943.19	0.002236	9.69	31002.11	2852.95	0.47
Lower Gila	199.19		Mult Open									
Lower Gila	199.21	5_year	23500.00	927.64	934.59	930.67	934.79	0.000753	3.53	6658.77	2391.82	0.25
Lower Gila	199.21	20_year	92000.00	927.64	937.42	934.40	937.75	0.001021	5.24	21065.21	2402.92	0.30
Lower Gila	199.21	100_year	227000.00	927.64	942.96	936.01	943.72	0.001236	7.87	34507.83	2473.54	0.36
Lower Gila	199.31	5_year	23500.00	928.11	934.97	931.52	935.21	0.000801	3.94	5966.68	2528.02	0.28
Lower Gila	199.31	20_year	92000.00	928.11	937.90	935.42	938.40	0.001151	6.17	19014.38	2630.97	0.37
Lower Gila	199.31	100_year	227000.00	928.11	943.48	937.62	944.42	0.001155	8.56	33781.20	2656.82	0.40
Lower Gila	199.38	5_year	23500.00	931.10	935.19	934.72	936.20	0.009983	8.06	2916.91	2030.75	0.79
Lower Gila	199.38	20_year	92000.00	931.10	938.47	937.01	939.40	0.005480	9.01	14040.99	2788.12	0.65
Lower Gila	199.38	100_year	227000.00	931.10	943.98	940.09	945.19	0.002765	9.92	29691.47	2883.17	0.52
Lower Gila	199.47	5_year	23500.00	931.64	937.52	935.45	937.92	0.001964	5.04	4658.76	2907.07	0.42
Lower Gila	199.47	20_year	92000.00	931.64	940.14	938.52	940.71	0.002165	7.23	18772.32	3007.38	0.48
Lower Gila	199.47	100_year	227000.00	931.64	945.06	940.49	946.07	0.001911	9.68	33627.49	3029.68	0.49

HEC-RAS Plan: Fut+Lev River: Salt Reach: Salt

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)	
Salt	199.55	5_year	19500.00	931.65	938.64	935.85	939.05	0.001044	5.13	3824.64	1982.76	0.38
Salt	199.55	20_year	82000.00	931.65	941.30	940.01	942.32	0.002280	9.75	15415.62	2050.13	0.59
Salt	199.55	100_year	162000.00	931.65	946.35	941.44	947.73	0.001692	11.49	26164.38	2167.74	0.55
Salt	199.69	5_year	19500.00	931.79	939.39	935.79	939.68	0.000662	4.35	4485.03	1870.80	0.31
Salt	199.69	20_year	82000.00	931.79	942.89	940.53	943.69	0.001354	8.34	16129.35	2273.08	0.47
Salt	199.69	100_year	162000.00	931.79	947.84	942.58	948.78	0.001003	9.43	28342.96	2481.00	0.43
Salt	199.86	5_year	19500.00	931.12	940.03	935.78	940.19	0.000483	3.27	5970.38	1989.67	0.22
Salt	199.86	20_year	82000.00	931.12	944.20	939.78	944.57	0.000704	5.45	18696.87	2299.86	0.29
Salt	199.86	100_year	162000.00	931.12	948.99	942.01	949.51	0.000622	6.57	31498.48	2719.00	0.29
Salt	199.98	5_year	19500.00	932.56	940.30	936.73	940.52	0.000526	3.74	5208.34	1780.86	0.27
Salt	199.98	20_year	82000.00	932.56	944.56	940.84	945.09	0.000825	6.61	17443.32	2278.17	0.37
Salt	199.98	100_year	162000.00	932.56	949.24	943.01	950.02	0.000778	8.29	29279.35	2630.00	0.38
Salt	200.02	5_year	19500.00	931.98	940.46	936.22	940.63	0.000413	3.28	5945.69	1744.53	0.23
Salt	200.02	20_year	82000.00	931.98	944.83	940.24	945.25	0.000701	5.88	18145.62	2530.10	0.31
Salt	200.02	100_year	162000.00	931.98	949.60	943.66	950.18	0.000641	7.11	31375.96	2660.00	0.32
Salt	200.11	5_year	19500.00	931.98	940.66	936.37	940.85	0.000509	3.41	5711.38	1443.51	0.23
Salt	200.11	20_year	82000.00	931.98	945.14	940.56	945.60	0.000759	5.84	16653.47	2077.95	0.31
Salt	200.11	100_year	162000.00	931.98	949.88	943.84	950.53	0.000757	7.38	29357.21	2782.00	0.33
Salt	200.22	5_year	19500.00	931.78	940.98	935.21	941.12	0.000431	2.94	6625.85	1427.99	0.19
Salt	200.22	20_year	82000.00	931.78	945.62	939.93	946.06	0.000819	5.56	18334.59	2644.45	0.28
Salt	200.22	100_year	162000.00	931.78	950.39	943.67	950.99	0.000817	6.94	33157.38	3223.00	0.30
Salt	200.31	5_year	19500.00	931.67	941.17	936.20	941.35	0.000519	3.40	5734.52	1523.39	0.23
Salt	200.31	20_year	82000.00	931.67	945.99	941.09	946.44	0.000790	6.02	18592.53	2853.24	0.31
Salt	200.31	100_year	162000.00	931.67	950.77	945.01	951.35	0.000718	7.25	34529.88	3610.00	0.32
Salt	200.4	5_year	19500.00	931.55	941.41	936.82	941.59	0.000483	3.38	5763.97	1519.09	0.23
Salt	200.4	20_year	82000.00	931.55	946.38	941.20	946.81	0.000751	5.97	19147.19	3147.44	0.31
Salt	200.4	100_year	162000.00	931.55	951.21	945.06	951.67	0.000588	6.65	36628.73	4025.00	0.29
Salt	200.47	5_year	19500.00	931.67	941.62	937.42	941.80	0.000548	3.43	5691.15	1610.27	0.24
Salt	200.47	20_year	82000.00	931.67	946.71	941.63	947.13	0.000732	5.81	18852.72	2790.06	0.30
Salt	200.47	100_year	162000.00	931.67	951.46	945.35	951.93	0.000598	6.62	34839.46	3975.80	0.29
Salt	200.52	5_year	19500.00	932.45	941.75	937.38	941.93	0.000592	3.46	5642.57	1434.52	0.25
Salt	200.52	20_year	82000.00	932.45	946.89	941.89	947.31	0.000755	5.82	17967.79	2817.28	0.31
Salt	200.52	100_year	162000.00	932.45	951.61	945.50	952.08	0.000592	6.51	33949.59	4063.68	0.29
Salt	200.6	5_year	19500.00	932.82	942.05	938.77	942.30	0.001230	4.01	4865.23	1410.74	0.30
Salt	200.6	20_year	82000.00	932.82	947.27	943.01	947.72	0.001181	6.12	17544.73	2876.98	0.33
Salt	200.6	100_year	162000.00	932.82	951.92	945.89	952.38	0.000837	6.54	33609.90	3994.43	0.30
Salt	200.68	5_year	19500.00	937.28	942.66	941.81	943.41	0.005243	6.96	2803.05	1531.44	0.66
Salt	200.68	20_year	82000.00	937.28	947.81	944.51	948.40	0.001787	7.41	17311.93	2972.95	0.45
Salt	200.68	100_year	162000.00	937.28	952.23	947.28	952.89	0.001237	8.16	32439.46	4183.45	0.40
Salt	200.75	5_year	19500.00	937.28	944.50	943.89	945.66	0.005791	8.62	2261.70	2002.12	0.82
Salt	200.75	20_year	82000.00	937.28	948.55	947.01	949.28	0.002484	8.62	17056.43	3059.88	0.59
Salt	200.75	100_year	162000.00	937.28	952.65	948.52	953.51	0.001632	9.65	31766.50	4192.92	0.52
Salt	200.83	5_year	19500.00	937.28	946.18	943.25	946.47	0.000872	4.30	4539.50	2505.29	0.34
Salt	200.83	20_year	82000.00	937.28	949.50	947.52	949.94	0.001026	6.41	19198.61	3366.28	0.40
Salt	200.83	100_year	162000.00	937.28	953.48	948.72	953.99	0.000778	7.27	34024.21	3841.77	0.37
Salt	200.88	5_year	19500.00	938.71	946.43	944.00	946.80	0.001300	4.87	4007.52	2192.80	0.40
Salt	200.88	20_year	82000.00	938.71	949.80	948.01	950.25	0.001141	6.49	17913.44	3282.93	0.41
Salt	200.88	100_year	162000.00	938.71	953.70	948.66	954.23	0.000866	7.35	32261.99	3884.98	0.38
Salt	200.95	5_year	19500.00	938.69	946.87	945.40	947.58	0.002895	6.76	2885.81	2127.66	0.59
Salt	200.95	20_year	82000.00	938.69	950.19	948.98	950.85	0.002013	8.13	16837.44	3446.32	0.54
Salt	200.95	100_year	162000.00	938.69	953.96	950.37	954.68	0.001417	8.94	30678.91	3904.59	0.48
Salt	201.01	5_year	19500.00	938.69	947.86	946.53	948.54	0.002898	6.61	2951.49	2215.65	0.59
Salt	201.01	20_year	82000.00	938.69	950.98	949.50	951.54	0.002129	7.58	17248.11	3562.53	0.54
Salt	201.01	100_year	162000.00	938.69	954.48	950.90	955.17	0.001516	8.65	30218.98	3910.55	0.49
Salt	201.1	5_year	19500.00	942.17	949.54	948.90	950.41	0.005457	7.48	2608.21	2916.75	0.73
Salt	201.1	20_year	82000.00	942.17	952.15	950.62	952.79	0.003256	8.28	18591.67	3821.35	0.62
Salt	201.1	100_year	162000.00	942.17	955.25	952.33	956.10	0.002392	9.55	30527.64	3880.41	0.57

HEC-RAS Plan: Fut+Lev River: Salt Reach: Salt (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)	
Salt	201.16	5_year	19500.00	943.39	950.79	948.66	951.10	0.001134	4.41	4424.96	3300.81	0.37
Salt	201.16	20_year	82000.00	943.39	953.01	951.50	953.29	0.000926	5.25	21368.96	3673.90	0.36
Salt	201.16	100_year	162000.00	943.39	956.09	951.52	956.56	0.000950	6.89	32728.41	3699.77	0.39
Salt	201.2	5_year	19500.00	942.38	950.95	948.89	951.57	0.002558	6.29	3098.20	2795.09	0.56
Salt	201.2	20_year	82000.00	942.38	953.21	951.79	953.58	0.001466	6.32	19078.63	3520.58	0.45
Salt	201.2	100_year	162000.00	942.38	956.27	952.05	956.87	0.001459	8.26	30056.55	3884.69	0.48
Salt	201.26	5_year	19500.00	942.38	951.82	950.42	952.76	0.004248	7.80	2498.56	2234.86	0.71
Salt	201.26	20_year	82000.00	942.38	953.79	952.31	954.32	0.002771	7.11	15129.98	3270.26	0.59
Salt	201.26	100_year	162000.00	942.38	956.76	953.43	957.57	0.002353	9.14	25195.04	3735.53	0.59
Salt	201.33	5_year	19500.00	942.38	953.37	950.73	954.01	0.002914	6.41	3041.88	2654.99	0.59
Salt	201.33	20_year	82000.00	942.38	954.77	953.85	955.36	0.003095	7.89	15754.24	3071.00	0.63
Salt	201.33	100_year	162000.00	942.38	957.55	954.30	958.57	0.003098	10.62	24898.17	3626.74	0.68
Salt	201.41	5_year	19500.00	942.38	954.49	950.68	954.74	0.001076	4.02	4851.03	2986.31	0.32
Salt	201.41	20_year	82000.00	942.38	955.93	954.93	956.29	0.001590	5.80	18419.61	3175.58	0.41
Salt	201.41	100_year	162000.00	942.38	958.93	955.06	959.51	0.001566	7.44	28300.27	3983.83	0.43
Salt	201.48	5_year	19500.00	943.46	954.90	951.10	955.14	0.001136	3.93	4961.97	2731.80	0.29
Salt	201.48	20_year	82000.00	943.46	956.52	955.27	956.85	0.001612	5.51	18728.20	2977.51	0.36
Salt	201.48	100_year	162000.00	943.46	959.53	955.27	960.11	0.001827	7.42	28353.40	3865.87	0.41
Salt	201.54	5_year	19500.00	944.01	955.18	951.74	955.47	0.000731	4.36	4474.15	2620.24	0.32
Salt	201.54	20_year	82000.00	944.01	956.94	955.75	957.37	0.001215	6.67	17988.42	2842.37	0.43
Salt	201.54	100_year	162000.00	944.01	959.97	955.75	960.71	0.001377	8.87	27333.56	3794.63	0.48
Salt	201.62	5_year	19500.00	944.97	955.48	951.46	955.73	0.000558	3.98	4902.92	2717.32	0.28
Salt	201.62	20_year	82000.00	944.97	957.40	956.31	957.83	0.001110	6.70	19154.65	3138.58	0.41
Salt	201.62	100_year	162000.00	944.97	960.53	956.31	961.22	0.001187	8.60	29218.40	3647.33	0.45
Salt	201.7	5_year	19500.00	945.11	955.78	951.83	956.05	0.001002	4.23	4607.79	2727.14	0.31
Salt	201.7	20_year	82000.00	945.11	957.97	956.36	958.53	0.002022	7.44	18030.37	3286.02	0.46
Salt	201.7	100_year	162000.00	945.11	961.13	957.43	961.93	0.002015	9.26	28522.61	3417.83	0.49
Salt	201.81	5_year	19500.00	945.11	956.20	951.58	956.36	0.000311	3.19	6175.73	2733.06	0.21
Salt	201.81	20_year	82000.00	945.11	958.83	955.74	959.17	0.000662	5.76	21037.93	3281.41	0.33
Salt	201.81	100_year	162000.00	945.11	962.08	957.94	962.65	0.000785	7.61	31946.92	3838.03	0.37
Salt	201.89	5_year	19500.00	946.82	956.33	952.20	956.51	0.000401	3.35	5828.03	2641.14	0.24
Salt	201.89	20_year	82000.00	946.82	959.04	956.32	959.50	0.000812	5.99	16102.58	3093.47	0.36
Salt	201.89	100_year	162000.00	946.82	962.26	958.33	963.08	0.001000	8.19	24585.28	3783.29	0.42
Salt	201.96	5_year	19500.00	946.20	956.53	952.42	956.72	0.000805	3.45	5654.35	2149.67	0.25
Salt	201.96	20_year	82000.00	946.20	959.38	956.74	959.95	0.001640	6.31	14076.78	2806.84	0.38
Salt	201.96	100_year	162000.00	946.20	962.73	958.77	963.54	0.001607	7.78	23559.88	3529.97	0.40
Salt	202.01	5_year	19500.00	946.85	956.71	952.46	956.92	0.000813	3.64	5363.02	2186.11	0.26
Salt	202.01	20_year	82000.00	946.85	959.69	957.02	960.40	0.001818	6.98	13737.14	3058.82	0.40
Salt	202.01	100_year	162000.00	946.85	962.96	959.53	964.05	0.001984	8.91	22516.29	3606.08	0.44
Salt	202.06	5_year	19500.00	947.33	956.91	953.31	957.17	0.000949	4.11	4747.22	2669.84	0.31
Salt	202.06	20_year	82000.00	947.33	960.23	958.01	960.89	0.001647	7.28	15241.00	3313.40	0.43
Salt	202.06	100_year	162000.00	947.33	963.52	959.72	964.58	0.001816	9.46	24453.95	4035.39	0.48
Salt	202.11	5_year	19500.00	948.26	957.09	953.76	957.40	0.000771	4.48	4352.29	1813.52	0.33
Salt	202.11	20_year	82000.00	948.26	960.55	958.09	961.30	0.001397	8.16	15267.53	3065.28	0.47
Salt	202.11	100_year	162000.00	948.26	964.08	960.94	964.97	0.001237	9.48	27996.02	4094.04	0.47
Salt	202.18	5_year	19500.00	946.86	957.35	953.68	957.67	0.000694	4.48	4356.58	1583.44	0.31
Salt	202.18	20_year	82000.00	946.86	961.03	958.42	961.78	0.001262	8.07	14645.31	2947.38	0.45
Salt	202.18	100_year	162000.00	946.86	964.53	961.41	965.40	0.001149	9.42	27260.62	4125.98	0.45
Salt	202.24	5_year	19500.00	948.09	957.65	955.42	958.12	0.002422	5.52	3532.09	1620.95	0.44
Salt	202.24	20_year	82000.00	948.09	961.64	959.56	962.39	0.002698	7.70	12990.90	2935.22	0.50
Salt	202.24	100_year	162000.00	948.09	965.09	962.10	965.92	0.002085	8.70	25139.66	4200.09	0.47
Salt	202.32	5_year	19500.00	950.65	958.69	956.73	959.04	0.002141	4.80	4062.98	1926.85	0.41
Salt	202.32	20_year	82000.00	950.65	962.77	960.01	963.24	0.001613	6.49	17435.38	3420.47	0.39
Salt	202.32	100_year	162000.00	950.65	966.02	962.06	966.64	0.001484	7.74	29968.05	4293.69	0.40
Salt	202.4	5_year	19500.00	952.19	959.77	959.31	960.85	0.008108	8.33	2342.18	1913.27	0.82
Salt	202.4	20_year	82000.00	952.19	963.54	962.27	964.31	0.003476	8.90	16242.47	3155.75	0.60

HEC-RAS Plan: Fut+Lev River: Salt Reach: Salt (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)	
Salt	202.4	100_year	162000.00	952.19	966.57	963.75	967.73	0.003367	11.23	27038.52	3887.70	0.63
Salt	202.48	5_year	19500.00	953.23	962.34	961.36	963.06	0.003446	6.79	2872.16	2313.32	0.63
Salt	202.48	20_year	82000.00	953.23	965.00	963.76	965.64	0.002696	8.36	18151.35	3368.76	0.61
Salt	202.48	100_year	162000.00	953.23	967.94	963.91	969.04	0.002757	11.07	28888.18	5596.41	0.66
Salt	202.54	5_year	19500.00	953.49	963.35	961.65	963.91	0.002036	5.96	3272.05	2868.31	0.50
Salt	202.54	20_year	82000.00	953.49	965.87	964.31	966.35	0.001794	7.47	20282.22	3139.93	0.51
Salt	202.54	100_year	162000.00	953.49	968.95	964.31	969.81	0.001999	10.12	31293.96	6064.89	0.57
Salt	202.61	5_year	19500.00	955.76	964.28	963.05	964.90	0.003264	6.30	3094.21	3342.68	0.61
Salt	202.61	20_year	82000.00	955.76	966.63	965.51	967.08	0.002034	7.09	18952.87	3564.16	0.52
Salt	202.61	100_year	162000.00	955.76	969.75	965.51	970.60	0.002134	9.73	30104.87	6859.00	0.58
Salt	202.69	5_year	19500.00	958.23	965.40	963.26	965.76	0.001372	4.77	4087.62	2680.79	0.41
Salt	202.69	20_year	82000.00	958.23	967.39	966.61	967.81	0.001546	6.55	18130.79	2861.86	0.46
Salt	202.69	100_year	162000.00	958.23	970.65	966.61	971.35	0.001514	8.61	29598.46	6150.90	0.49
Salt	202.78	5_year	19500.00	956.08	966.05	962.32	966.29	0.000858	3.95	4932.60	2945.71	0.27
Salt	202.78	20_year	82000.00	956.08	968.14	966.71	968.54	0.001481	6.27	18571.43	3196.12	0.38
Salt	202.78	100_year	162000.00	956.08	971.52	966.92	972.08	0.001424	7.68	30916.34	5157.06	0.39
Salt	202.85	5_year	19500.00	953.44	966.32	962.86	966.64	0.000894	4.53	4305.15	2739.74	0.34
Salt	202.85	20_year	82000.00	953.44	968.62	967.51	969.06	0.001279	6.80	19606.50	3158.68	0.44
Salt	202.85	100_year	162000.00	953.44	971.94	967.51	972.64	0.001335	8.86	31012.89	5281.17	0.47
Salt	202.97	5_year	19500.00	957.32	966.93	962.84	967.21	0.000922	4.25	4588.05	2801.87	0.34
Salt	202.97	20_year	82000.00	957.32	969.39	968.21	969.81	0.001189	6.37	18394.19	3182.58	0.42
Salt	202.97	100_year	162000.00	957.32	972.76	968.21	973.42	0.001163	8.13	29542.79	5151.26	0.44
Salt	203.1	5_year	19500.00	955.78	967.56	963.02	967.83	0.000848	4.19	4653.91	2433.57	0.32
Salt	203.1	20_year	82000.00	955.78	970.24	969.00	970.70	0.001311	6.52	17487.69	2981.95	0.42
Salt	203.1	100_year	162000.00	955.78	973.59	969.35	974.28	0.001246	8.17	27956.17	5109.08	0.44
Salt	203.2	5_year	19500.00	955.00	968.05	965.40	968.52	0.001676	5.49	3553.19	2229.29	0.44
Salt	203.2	20_year	82000.00	955.00	971.00	969.51	971.78	0.002450	8.71	16163.85	3232.69	0.56
Salt	203.2	100_year	162000.00	955.00	974.26	971.39	975.31	0.002219	10.57	27159.68	5069.18	0.57
Salt	203.3	5_year	19500.00	955.59	968.97	965.23	969.23	0.001137	4.06	4803.24	2096.46	0.31
Salt	203.3	20_year	82000.00	955.59	972.32	970.04	972.86	0.001820	6.89	17270.23	4147.15	0.42
Salt	203.3	100_year	162000.00	955.59	975.56	971.68	976.37	0.001908	8.76	28749.96	5891.07	0.45
Salt	203.38	5_year	19500.00	955.24	969.50	966.58	969.74	0.001119	3.92	4979.09	1987.38	0.30
Salt	203.38	20_year	82000.00	955.24	973.08	970.40	973.67	0.001678	6.80	16426.12	3426.42	0.40
Salt	203.38	100_year	162000.00	955.24	976.34	972.53	977.24	0.001807	8.70	27751.95	6470.18	0.44
Salt	203.48	5_year	19500.00	958.17	969.91	966.63	970.16	0.000625	3.96	4929.69	1656.65	0.29
Salt	203.48	20_year	82000.00	958.17	973.68	970.75	974.34	0.001026	7.09	16439.06	3360.83	0.41
Salt	203.48	100_year	162000.00	958.17	976.97	972.98	978.05	0.001242	9.51	27635.68	6925.52	0.47

HEC-RAS Plan: Fut+Lev River: Gila Reach: Upper Gila

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)	
Upper Gila	0.00	5_year	4000.00	931.64	938.64	934.18	938.71	0.000235	2.14	1867.14	1278.67	0.15
Upper Gila	0.00	20_year	10000.00	931.64	941.30	935.76	941.32	0.000066	1.43	8730.78	1291.08	0.09
Upper Gila	0.00	100_year	65000.00	931.64	946.35	939.96	946.64	0.000448	5.08	15340.23	1315.01	0.24
Upper Gila	0.06	5_year	4000.00	931.64	938.72	935.13	938.83	0.000452	2.60	1541.08	1537.42	0.21
Upper Gila	0.06	20_year	10000.00	931.64	941.32	936.99	941.34	0.000106	1.67	9805.49	1645.97	0.11
Upper Gila	0.06	100_year	65000.00	931.64	946.53	939.77	946.79	0.000598	5.64	18469.01	1667.57	0.28
Upper Gila	0.12	5_year	4000.00	931.86	938.86	935.15	938.98	0.000564	2.78	1439.97	1566.75	0.23
Upper Gila	0.12	20_year	10000.00	931.86	941.35	937.33	941.38	0.000164	1.96	9550.61	1878.50	0.13
Upper Gila	0.12	100_year	65000.00	931.86	946.71	940.56	946.98	0.000679	5.86	20300.89	2019.55	0.30
Upper Gila	0.17	5_year	4000.00	931.82	939.02	934.96	939.09	0.000249	2.09	1916.82	1752.41	0.16
Upper Gila	0.17	20_year	10000.00	931.82	941.39	936.37	941.41	0.000090	1.58	11548.77	2174.71	0.10
Upper Gila	0.17	100_year	65000.00	931.82	946.91	940.26	947.10	0.000401	4.78	23857.73	2236.30	0.23
Upper Gila	0.22	5_year	4000.00	931.82	939.09	936.20	939.18	0.000479	2.40	1665.10	2192.08	0.21
Upper Gila	0.22	20_year	10000.00	931.82	941.42	937.56	941.43	0.000109	1.53	12262.96	2434.38	0.11
Upper Gila	0.22	100_year	65000.00	931.82	947.03	940.08	947.20	0.000432	4.64	26212.94	2495.19	0.23
Upper Gila	0.27	5_year	4000.00	931.86	939.20	934.56	939.27	0.000270	2.03	1970.52	2555.03	0.16
Upper Gila	0.27	20_year	10000.00	931.86	941.44	936.25	941.46	0.000070	1.32	14072.07	2818.24	0.09
Upper Gila	0.27	100_year	65000.00	931.86	947.15	940.47	947.28	0.000287	3.96	29787.91	2848.46	0.19
Upper Gila	0.35	5_year	4000.00	931.88	939.32	935.01	939.36	0.000184	1.73	2316.68	3026.42	0.13
Upper Gila	0.35	20_year	10000.00	931.88	941.47	936.58	941.48	0.000051	1.15	15738.08	3253.39	0.07
Upper Gila	0.35	100_year	65000.00	931.88	947.29	940.52	947.37	0.000188	3.24	34943.38	3364.31	0.16
Upper Gila	0.40	5_year	4000.00	931.88	939.37	936.01	939.47	0.000660	2.53	1581.96	2707.58	0.21
Upper Gila	0.40	20_year	10000.00	931.88	941.48	937.75	941.50	0.000171	1.67	11554.81	3398.41	0.12
Upper Gila	0.40	100_year	65000.00	931.88	947.35	941.21	947.44	0.000383	3.85	32873.76	3885.35	0.19
Upper Gila	0.44	5_year	4000.00	931.88	939.48	936.64	939.68	0.001072	3.59	1114.99	2121.73	0.35
Upper Gila	0.44	20_year	10000.00	931.88	941.51	939.17	941.55	0.000206	2.14	9513.40	3331.87	0.16
Upper Gila	0.44	100_year	65000.00	931.88	947.40	941.54	947.53	0.000345	4.56	33281.22	4225.31	0.24
Upper Gila	0.49	5_year	4000.00	931.89	939.77	936.48	940.02	0.001618	4.06	985.89	1487.57	0.42
Upper Gila	0.49	20_year	10000.00	931.89	941.56	939.84	941.61	0.000339	2.53	8007.09	3273.85	0.21
Upper Gila	0.49	100_year	65000.00	931.89	947.51	942.11	947.61	0.000330	4.32	31680.99	4282.79	0.23
Upper Gila	0.53	5_year	4000.00	931.89	940.05	935.12	940.19	0.000395	2.98	1340.31	1945.81	0.23
Upper Gila	0.53	20_year	10000.00	931.89	941.63	937.32	941.67	0.000254	2.42	9268.94	3091.92	0.18
Upper Gila	0.53	100_year	65000.00	931.89	947.56	941.81	947.70	0.000399	4.96	32700.57	4444.82	0.26
Upper Gila	0.59	5_year	4000.00	931.89	940.15	937.22	940.46	0.001537	4.50	888.68	2082.64	0.42
Upper Gila	0.59	20_year	10000.00	931.89	941.73	940.31	941.81	0.000754	3.31	8091.07	3218.40	0.30
Upper Gila	0.59	100_year	65000.00	931.89	947.71	942.88	947.84	0.000484	4.94	32327.38	4501.08	0.28
Upper Gila	0.64	5_year	4000.00	931.89	940.64	936.88	940.84	0.001086	3.60	1111.68	1786.25	0.28
Upper Gila	0.64	20_year	10000.00	931.89	941.95	939.52	942.06	0.000830	3.49	6239.77	2582.05	0.25
Upper Gila	0.64	100_year	65000.00	931.89	947.89	943.35	948.03	0.000795	5.34	29844.57	4336.25	0.27
Upper Gila	0.69	5_year	4000.00	931.89	940.91	936.55	941.04	0.000523	2.80	1427.19	1939.69	0.25
Upper Gila	0.69	20_year	10000.00	931.89	942.13	939.60	942.20	0.000390	2.88	7074.94	2758.97	0.22
Upper Gila	0.69	100_year	65000.00	931.89	948.04	943.29	948.15	0.000268	3.99	31638.35	4661.97	0.21
Upper Gila	0.74	5_year	4000.00	931.89	941.04	937.37	941.20	0.000876	3.14	1274.85	1379.22	0.28
Upper Gila	0.74	20_year	10000.00	931.89	942.23	940.12	942.33	0.000695	3.29	5175.58	2286.57	0.26
Upper Gila	0.74	100_year	65000.00	931.89	948.12	943.82	948.23	0.000378	4.05	28896.23	4557.65	0.22
Upper Gila	0.80	5_year	4000.00	931.96	941.24	935.59	941.34	0.000252	2.53	1582.03	1061.94	0.16
Upper Gila	0.80	20_year	10000.00	931.96	942.38	937.69	942.48	0.000351	3.17	5488.85	1935.86	0.20
Upper Gila	0.80	100_year	65000.00	931.96	948.23	943.69	948.37	0.000449	4.98	29601.70	4849.54	0.24
Upper Gila	0.86	5_year	4000.00	932.03	941.23	937.01	941.51	0.000606	4.28	935.60	746.81	0.29
Upper Gila	0.86	20_year	10000.00	932.03	942.45	939.83	942.71	0.001033	5.14	3953.48	1343.09	0.37
Upper Gila	0.86	100_year	65000.00	932.03	948.37	945.72	948.58	0.000808	6.28	25759.95	4817.43	0.36
Upper Gila	0.91	5_year	4000.00	932.10	941.49	936.69	941.68	0.000546	3.48	1150.00	713.42	0.24
Upper Gila	0.91	20_year	10000.00	932.10	942.75	939.16	942.97	0.000796	4.57	4150.55	1267.46	0.29
Upper Gila	0.91	100_year	65000.00	932.10	948.63	945.46	948.83	0.000847	5.74	23151.12	4200.68	0.32
Upper Gila	0.96	5_year	4000.00	932.50	941.61	936.90	941.85	0.000644	3.98	1006.09	408.83	0.26
Upper Gila	0.96	20_year	10000.00	932.50	942.88	939.66	943.28	0.001139	5.77	2637.11	852.45	0.35
Upper Gila	0.96	100_year	65000.00	932.50	948.85	946.08	949.16	0.001492	7.21	21842.88	4061.09	0.41

HEC-RAS Plan: Fut+Lev River: Gila Reach: Upper Gila (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)	
Upper Gila	1.02	5_year	4000.00	932.50	941.85	937.80	942.16	0.001199	4.41	906.65	226.07	0.30
Upper Gila	1.02	20_year	10000.00	932.50	943.34	940.62	943.89	0.002596	6.51	1891.61	799.58	0.45
Upper Gila	1.02	100_year	65000.00	932.50	949.42	946.64	949.73	0.001781	7.50	22930.12	4398.79	0.40
Upper Gila	1.09	5_year	4000.00	933.01	942.33	938.30	942.56	0.000988	3.90	1025.93	499.46	0.30
Upper Gila	1.09	20_year	10000.00	933.01	944.22	941.49	944.55	0.001199	5.27	4096.35	2508.06	0.35
Upper Gila	1.09	100_year	65000.00	933.01	949.92	947.27	950.35	0.001426	8.52	24962.90	4956.52	0.42
Upper Gila	1.15	5_year	4000.00	933.19	942.56	937.80	942.83	0.000704	4.14	965.78	555.43	0.31
Upper Gila	1.15	20_year	10000.00	933.19	944.52	940.83	944.93	0.001036	5.89	4299.27	2209.85	0.38
Upper Gila	1.15	100_year	65000.00	933.19	950.24	948.12	950.83	0.001387	9.95	24587.26	4308.24	0.49
Upper Gila	1.21	5_year	4000.00	933.35	942.90	937.91	943.05	0.000586	3.15	1270.48	350.21	0.24
Upper Gila	1.21	20_year	10000.00	933.35	944.97	940.76	945.25	0.000839	4.64	3509.30	1875.37	0.30
Upper Gila	1.21	100_year	65000.00	933.35	950.94	947.64	951.16	0.000648	5.98	23277.80	4103.73	0.29
Upper Gila	1.28	5_year	4000.00	934.31	943.15	939.38	943.29	0.000898	2.95	1355.01	310.64	0.25
Upper Gila	1.28	20_year	10000.00	934.31	945.36	941.68	945.56	0.001078	3.94	3627.46	2332.17	0.29
Upper Gila	1.28	100_year	65000.00	934.31	951.19	947.30	951.32	0.000407	3.83	23408.59	4529.92	0.20
Upper Gila	1.35	5_year	4000.00	934.59	943.33	939.11	943.57	0.000516	3.96	1009.30	285.97	0.27
Upper Gila	1.35	20_year	10000.00	934.59	945.47	941.66	946.07	0.001056	6.62	2508.62	1783.44	0.40
Upper Gila	1.35	100_year	65000.00	934.59	951.26	948.45	951.57	0.000902	7.30	21056.86	3694.32	0.38
Upper Gila	1.41	5_year	4000.00	934.69	943.45	941.54	944.00	0.002810	5.94	673.52	275.30	0.56
Upper Gila	1.41	20_year	10000.00	934.69	945.83	944.38	946.69	0.002705	7.82	1951.91	1401.62	0.59
Upper Gila	1.41	100_year	65000.00	934.69	951.41	949.54	952.10	0.001899	10.20	19126.16	4510.86	0.55
Upper Gila	1.48	5_year	4000.00	934.79	944.27	940.59	944.46	0.000643	3.45	1160.72	454.39	0.25
Upper Gila	1.48	20_year	10000.00	934.79	946.89	942.67	947.24	0.000850	5.08	4064.88	1698.07	0.31
Upper Gila	1.48	100_year	65000.00	934.79	951.93	950.66	952.95	0.002347	11.53	19141.02	4950.01	0.55
Upper Gila	1.55	5_year	4000.00	935.19	944.57	939.81	944.71	0.000759	3.04	1315.01	710.62	0.26
Upper Gila	1.55	20_year	10000.00	935.19	947.33	942.14	947.51	0.000605	3.66	4769.98	1848.06	0.25
Upper Gila	1.55	100_year	65000.00	935.19	953.03	949.91	953.59	0.001304	8.14	25031.32	5981.58	0.41
Upper Gila	1.59	5_year	4000.00	935.42	944.68	940.05	944.84	0.000485	3.29	1216.24	179.30	0.22
Upper Gila	1.59	20_year	10000.00	935.42	947.36	942.40	947.70	0.000818	5.01	2781.05	1486.31	0.30
Upper Gila	1.59	100_year	65000.00	935.42	953.52	950.10	953.80	0.000722	6.75	21364.24	5587.57	0.31
Upper Gila	1.63	5_year	4000.00	935.65	944.80	940.20	944.97	0.000500	3.24	1235.06	187.48	0.22
Upper Gila	1.63	20_year	10000.00	935.65	947.55	942.46	947.91	0.000825	5.06	2572.37	1114.97	0.30
Upper Gila	1.63	100_year	65000.00	935.65	953.61	950.82	954.05	0.001086	8.19	22602.70	4982.20	0.37
Upper Gila	1.67	5_year	4000.00	935.89	944.90	940.84	945.09	0.000819	3.48	1149.57	191.09	0.25
Upper Gila	1.67	20_year	10000.00	935.89	947.73	943.19	948.09	0.001138	5.15	3251.92	2003.53	0.31
Upper Gila	1.67	100_year	65000.00	935.89	953.82	951.10	954.30	0.001531	8.57	25522.88	5523.59	0.40

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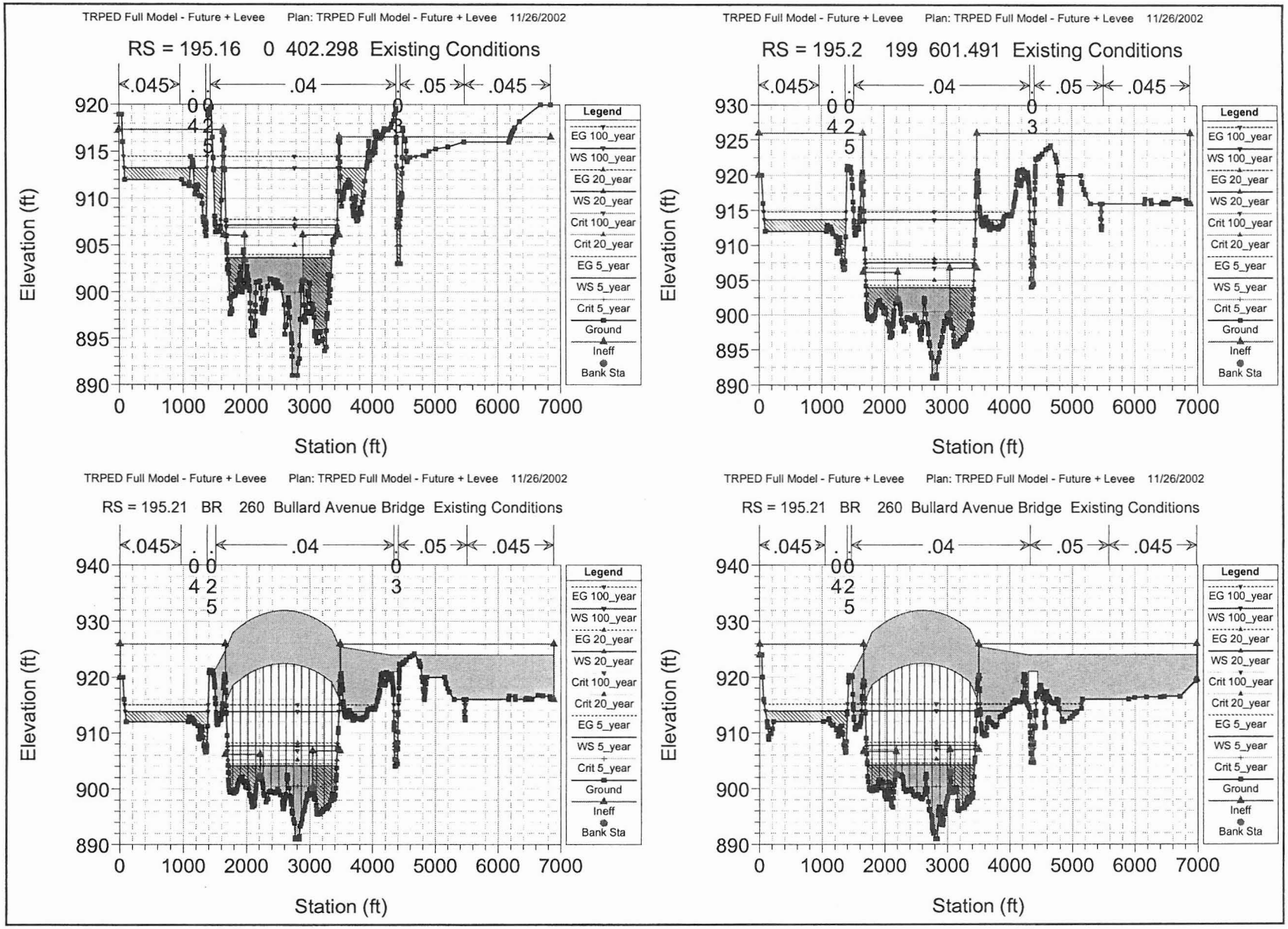
Cross Section Plots for the Lower Gila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.05
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Station (ft)
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WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
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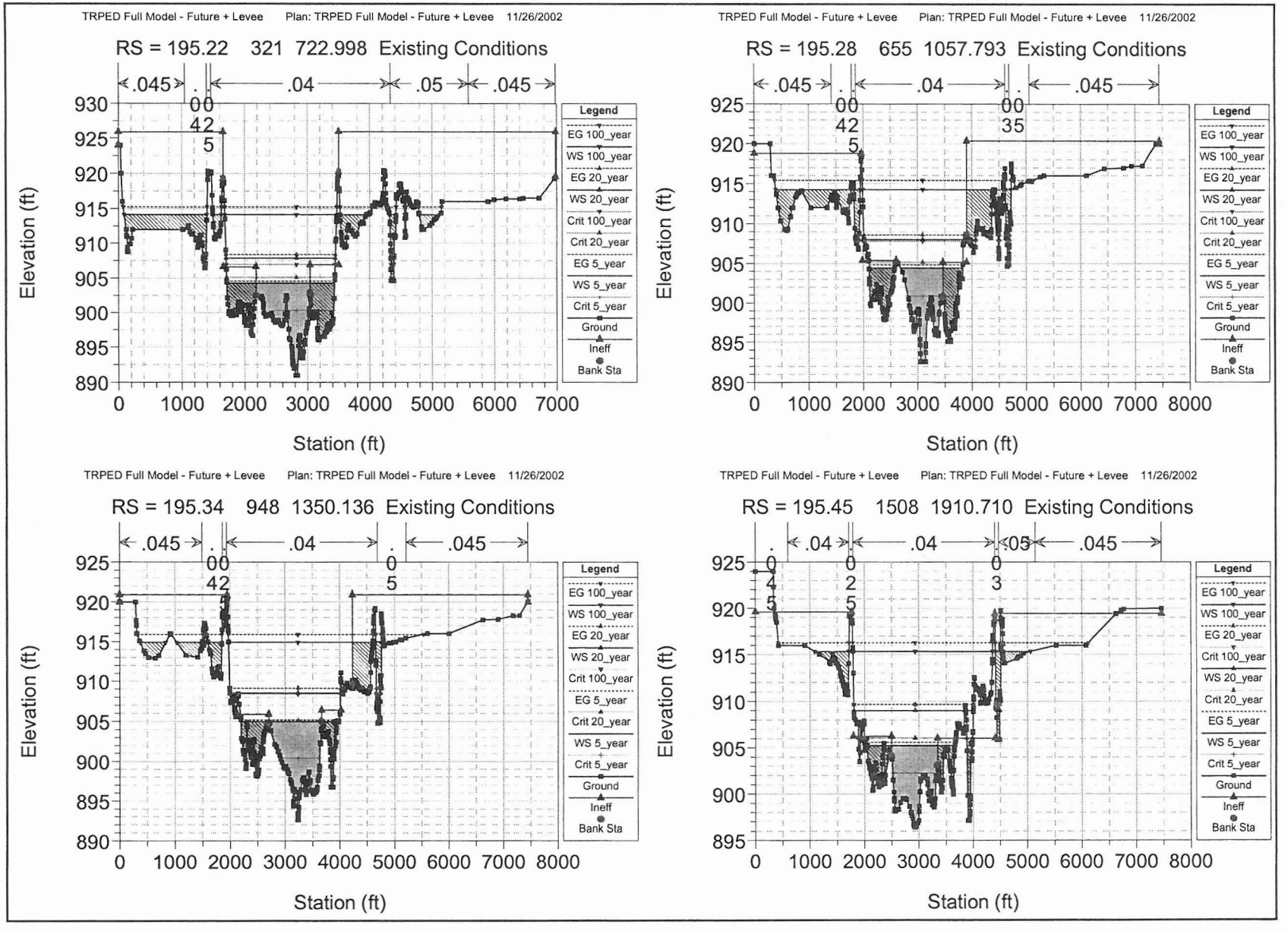
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 195.21 BR 260 Bullard Avenue Bridge Existing Conditions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WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
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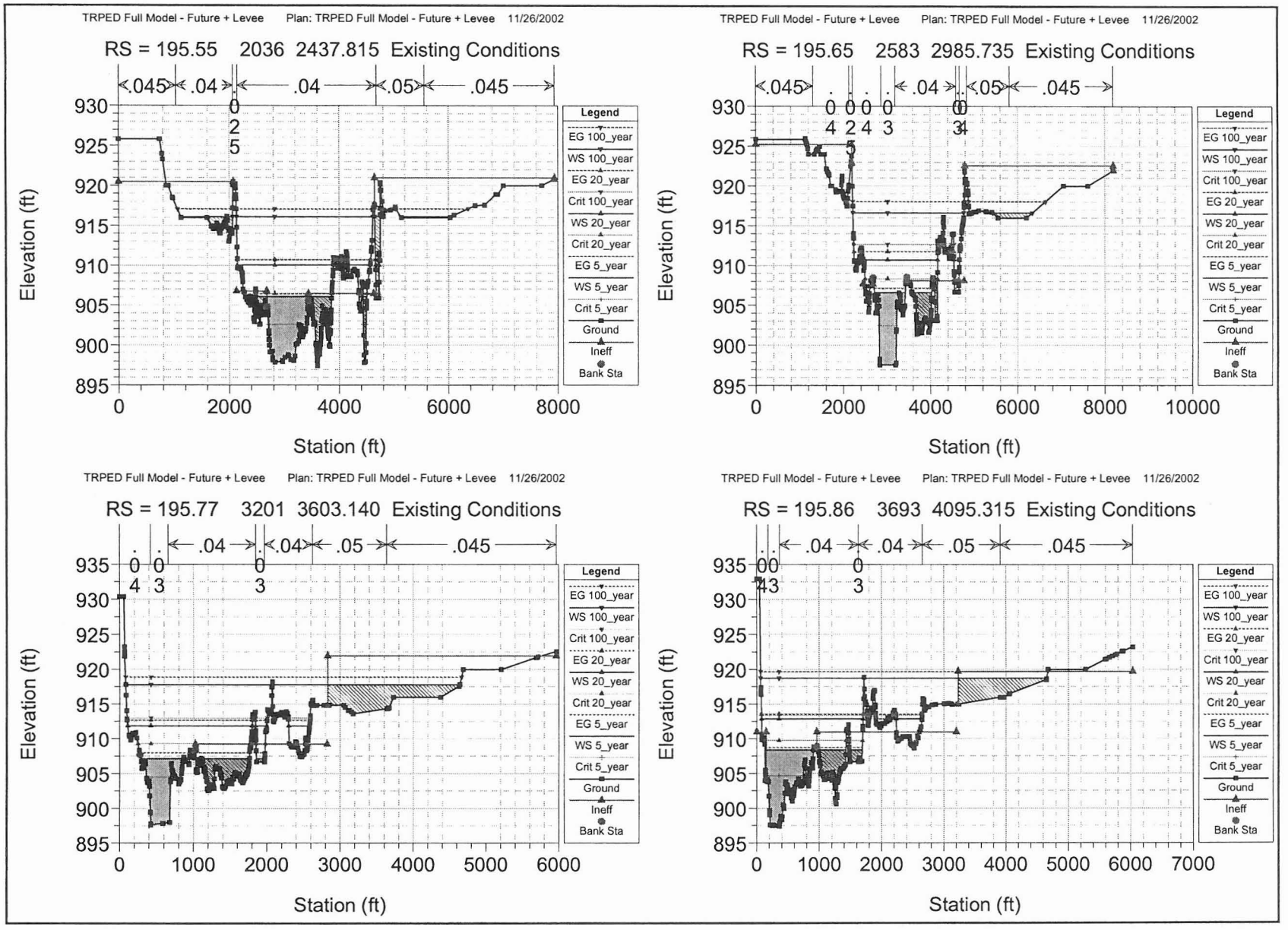
Station (ft)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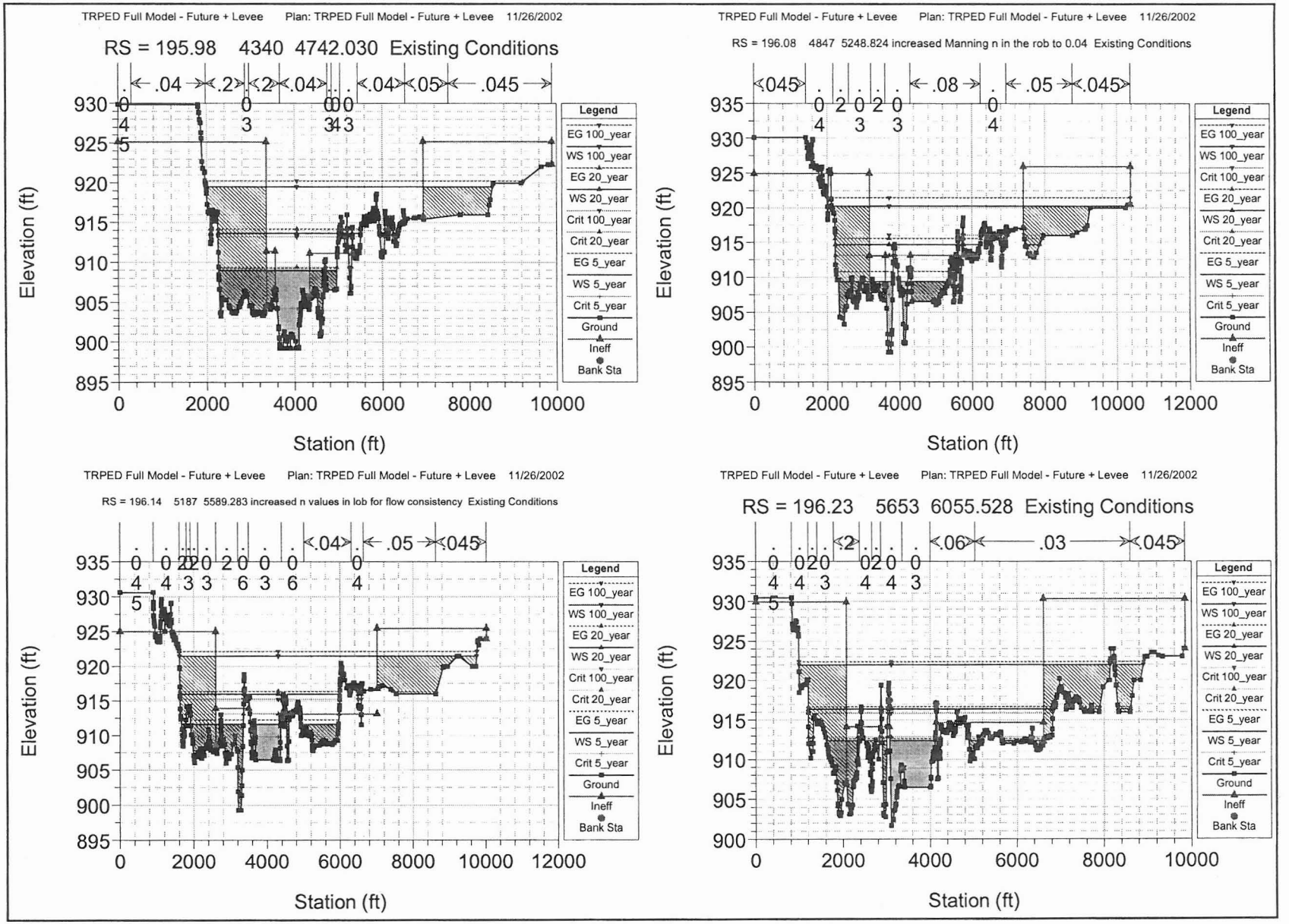
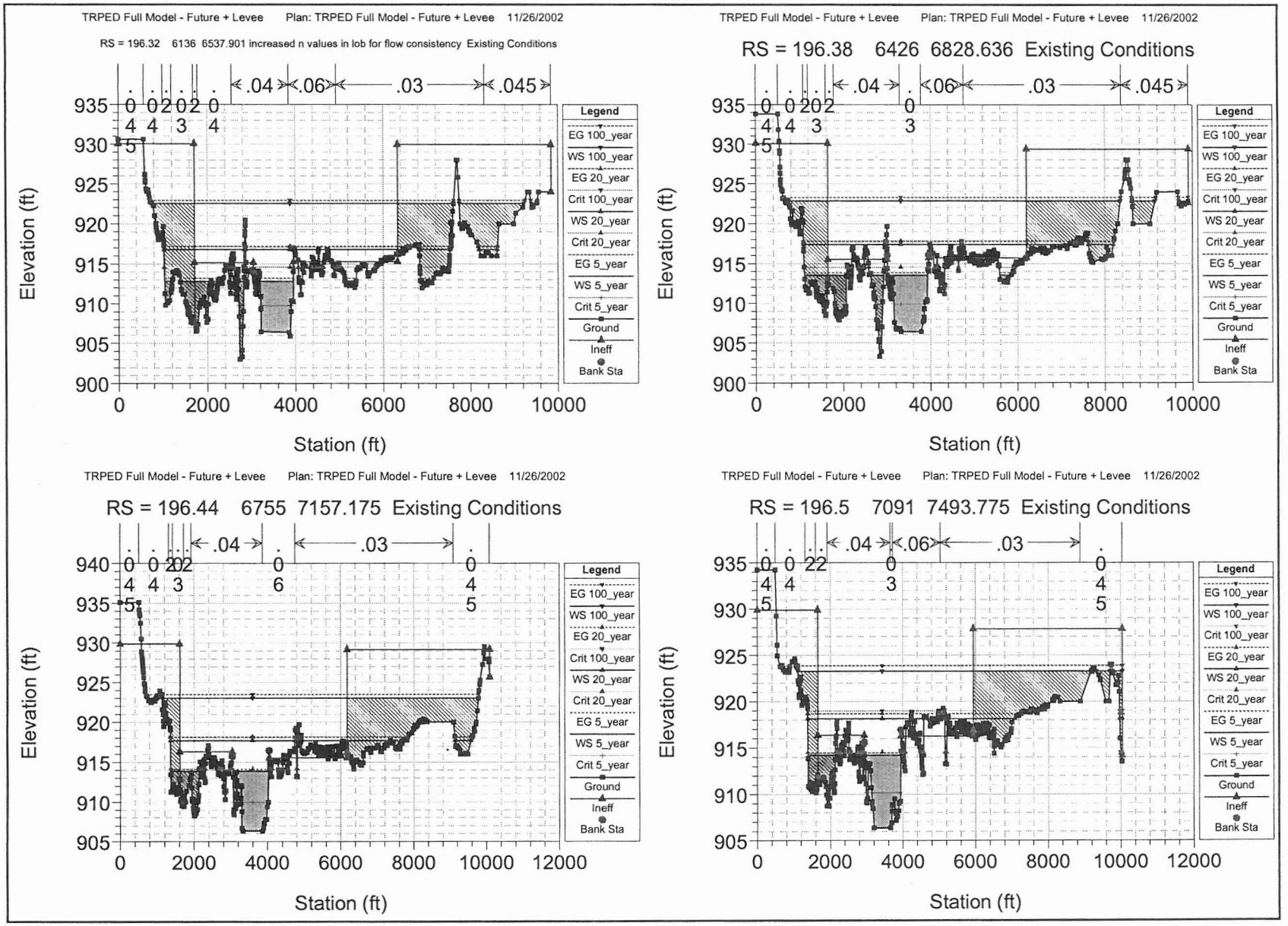
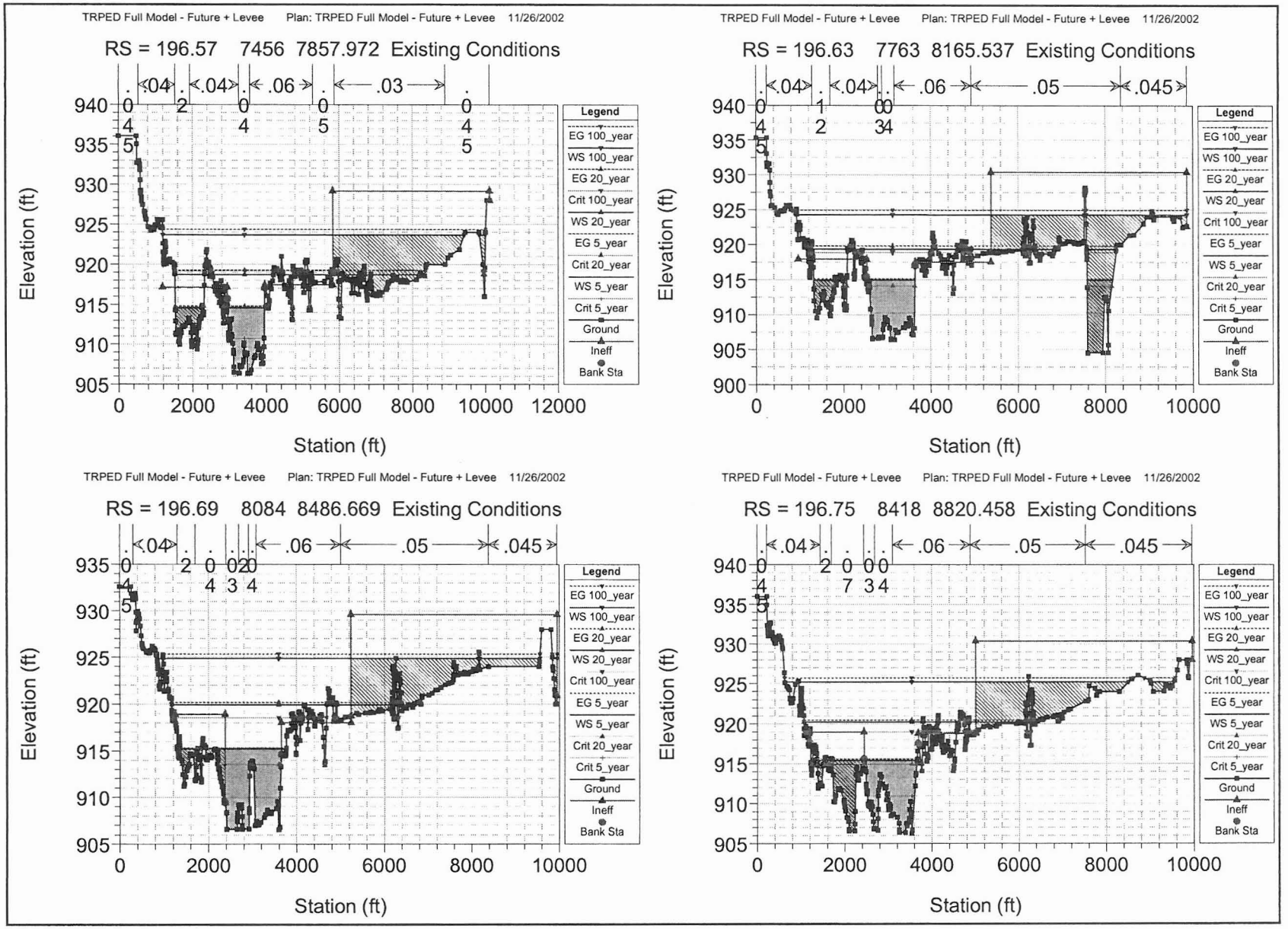
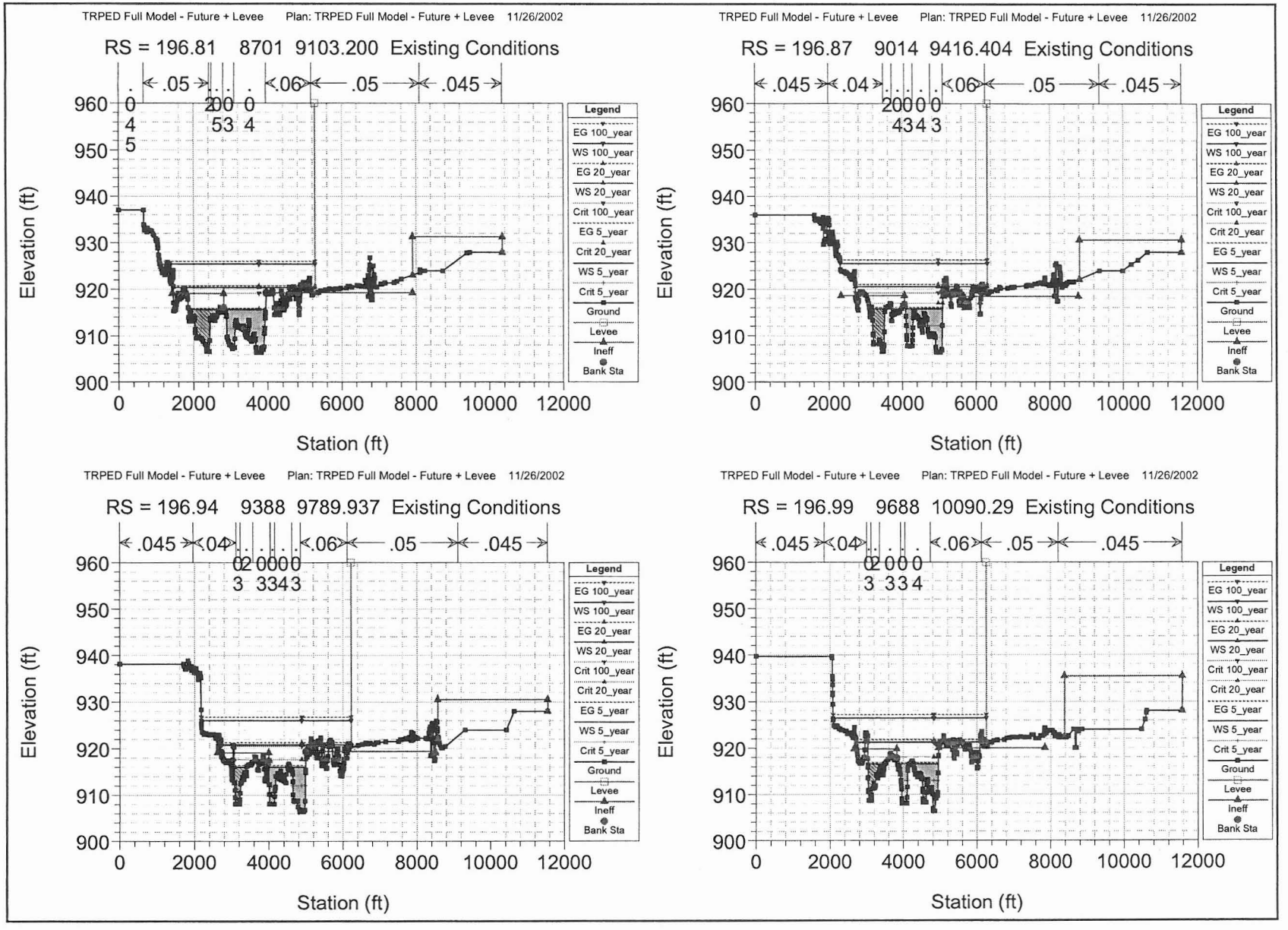
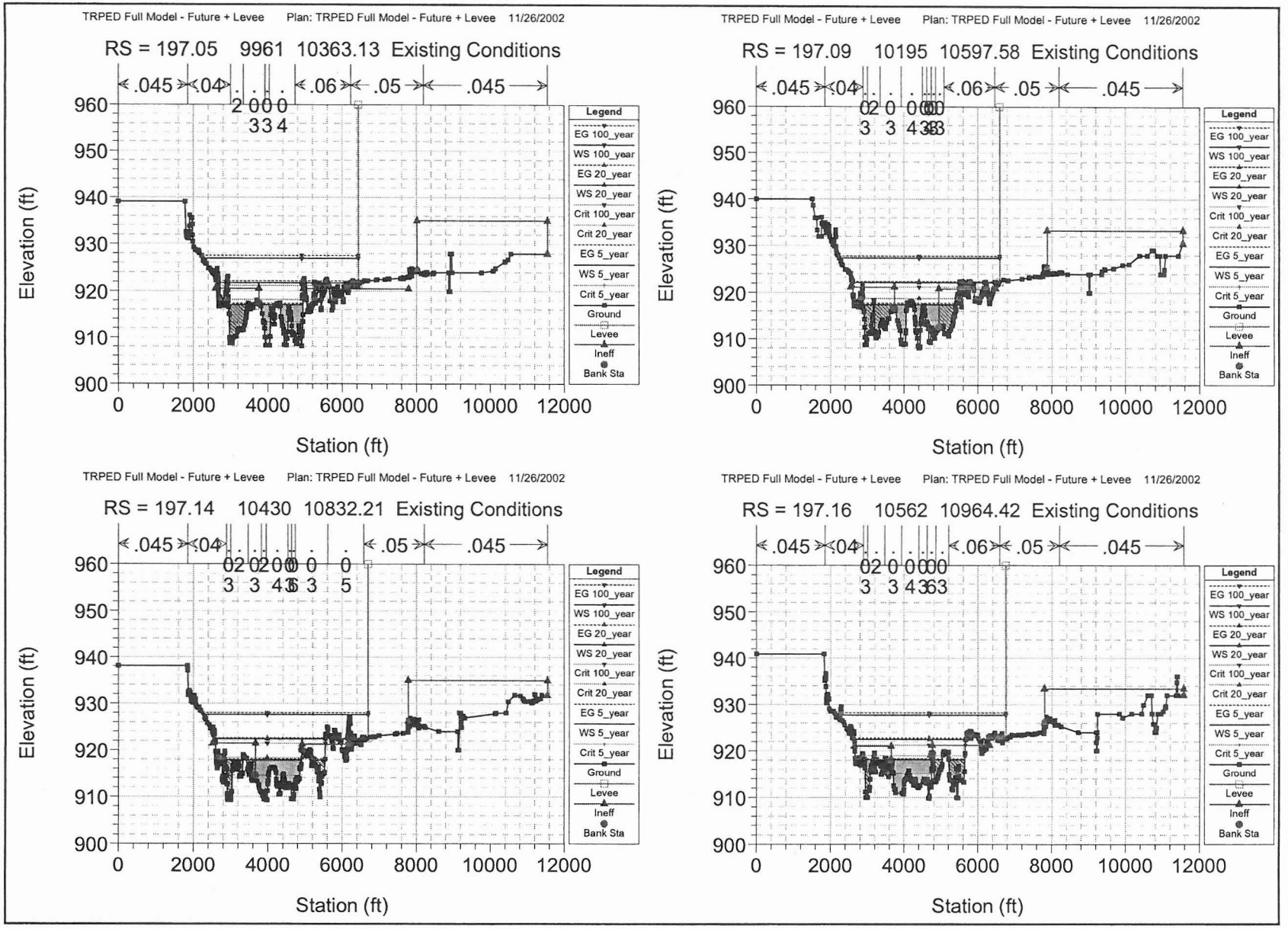
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 195.65 2583 2985.735 Existing Conditions
.045 .04 .05 .045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 195.77 3201 3603.140 Existing Conditions
.04 .04 .05 .045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 195.86 3693 4095.315 Existing Conditions
.04 .04 .05 .045
Elevation (ft)
Station (ft)

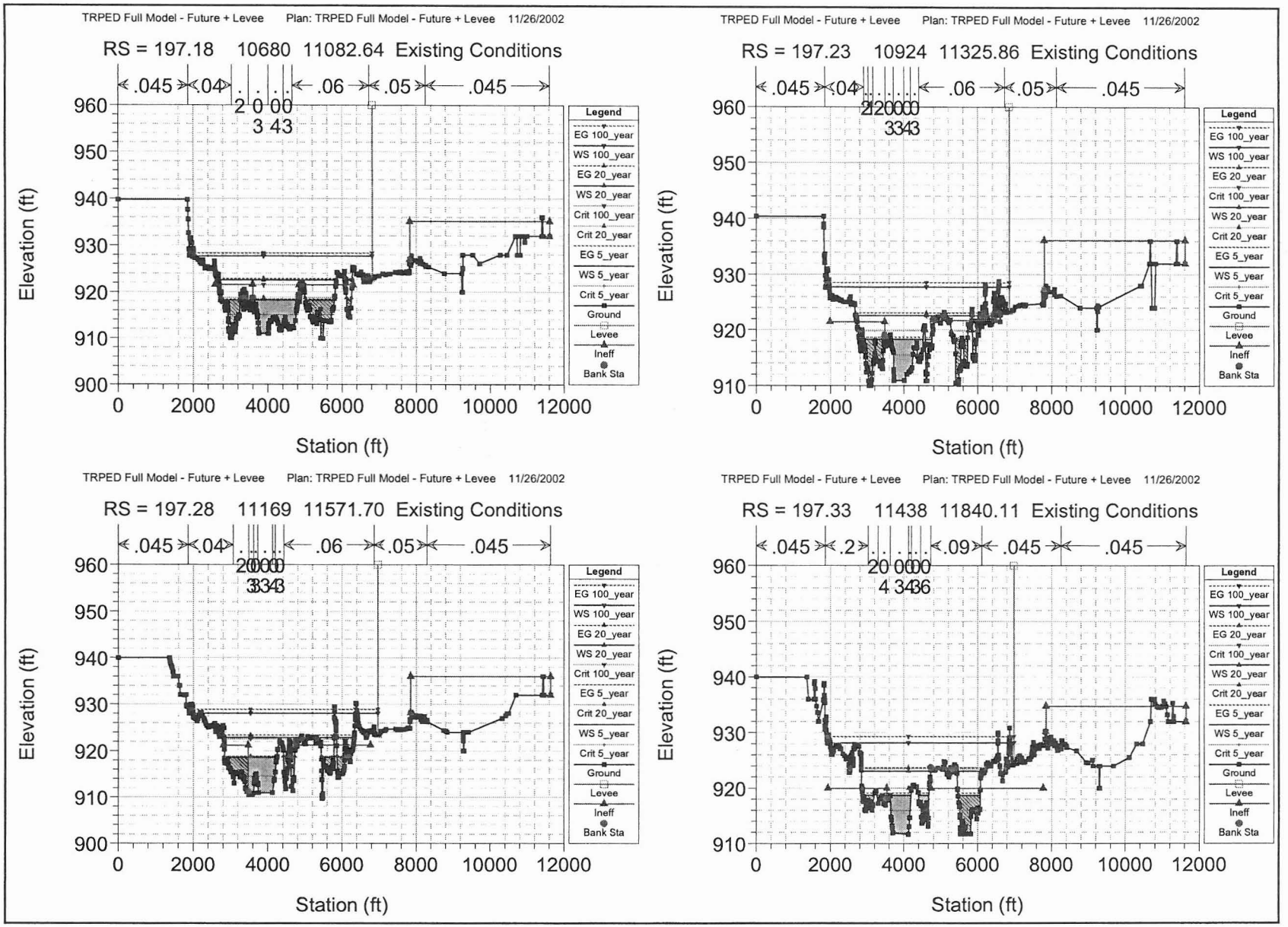

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 195.98 4340 4742.030 Existing Conditions
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.08 4847 5248.824 increased Manning n in the rob to 0.04 Existing Conditions
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.14 5187 5589.283 increased n values in lob for flow consistency Existing Conditions
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.23 5653 6055.528 Existing Conditions
Elevation (ft)
Station (ft)

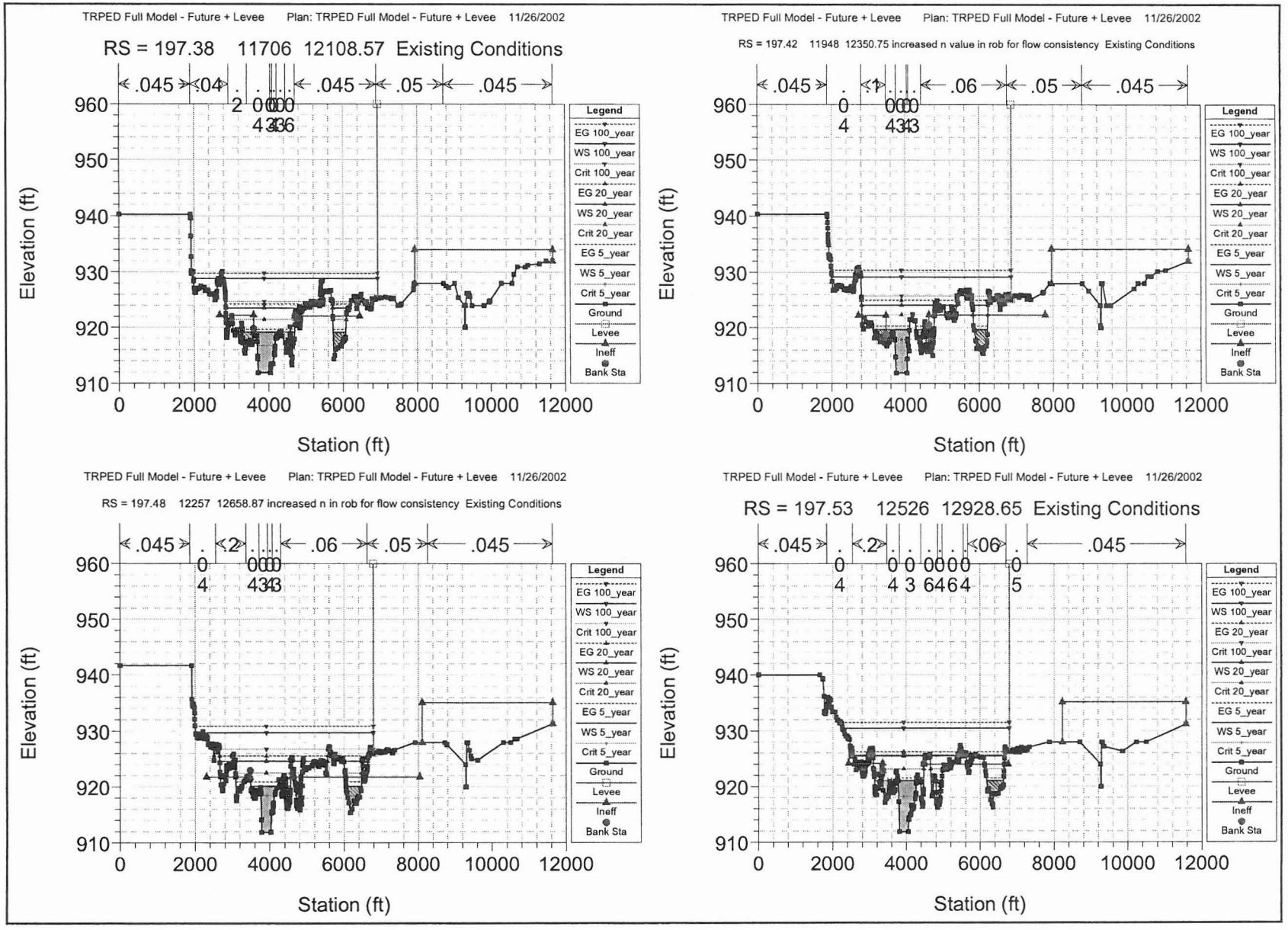

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.32 6136 6537.901 increased n values in lob for flow consistency Existing Conditions
RS = 196.38 6426 6828.636 Existing Conditions
RS = 196.44 6755 7157.175 Existing Conditions
RS = 196.5 7091 7493.775 Existing Conditions
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

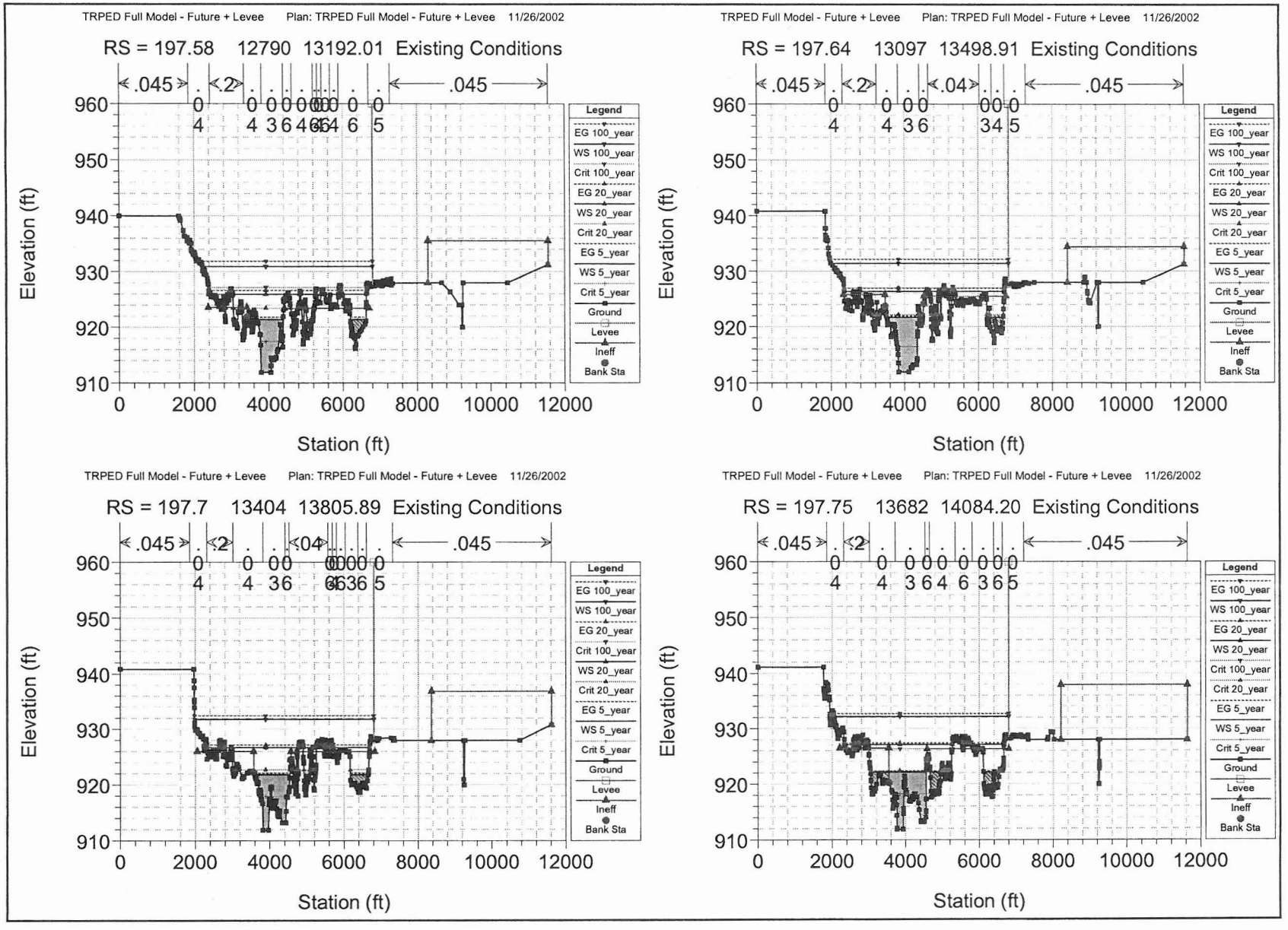

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.57 7456 7857.972 Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.63 7763 8165.537 Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.69 8084 8486.669 Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.75 8418 8820.458 Existing Conditions
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
EG 5_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

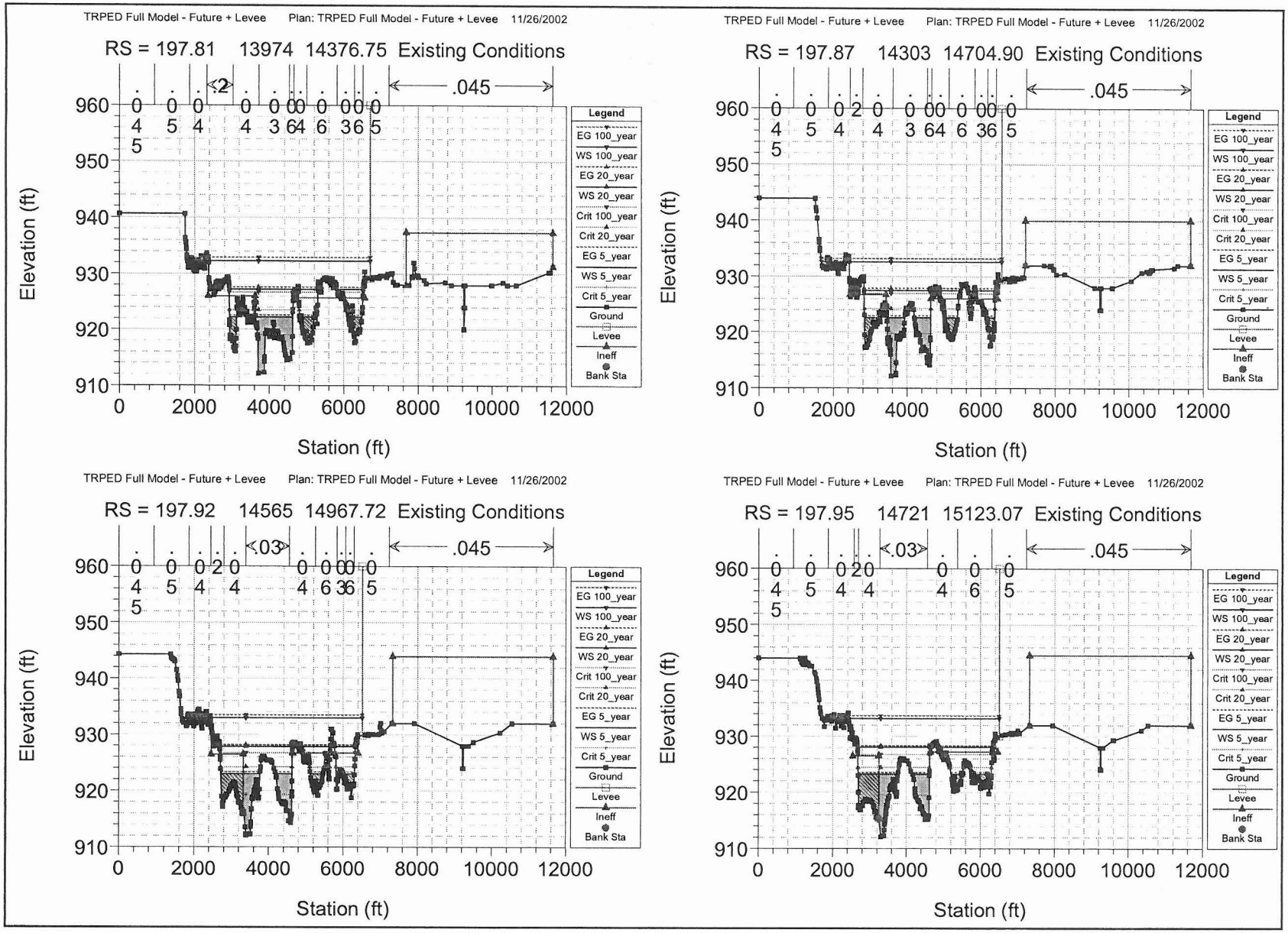

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.81 8701 9103.200 Existing Conditions
.05 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.87 9014 9416.404 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.94 9388 9789.937 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 196.99 9688 10090.29 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)

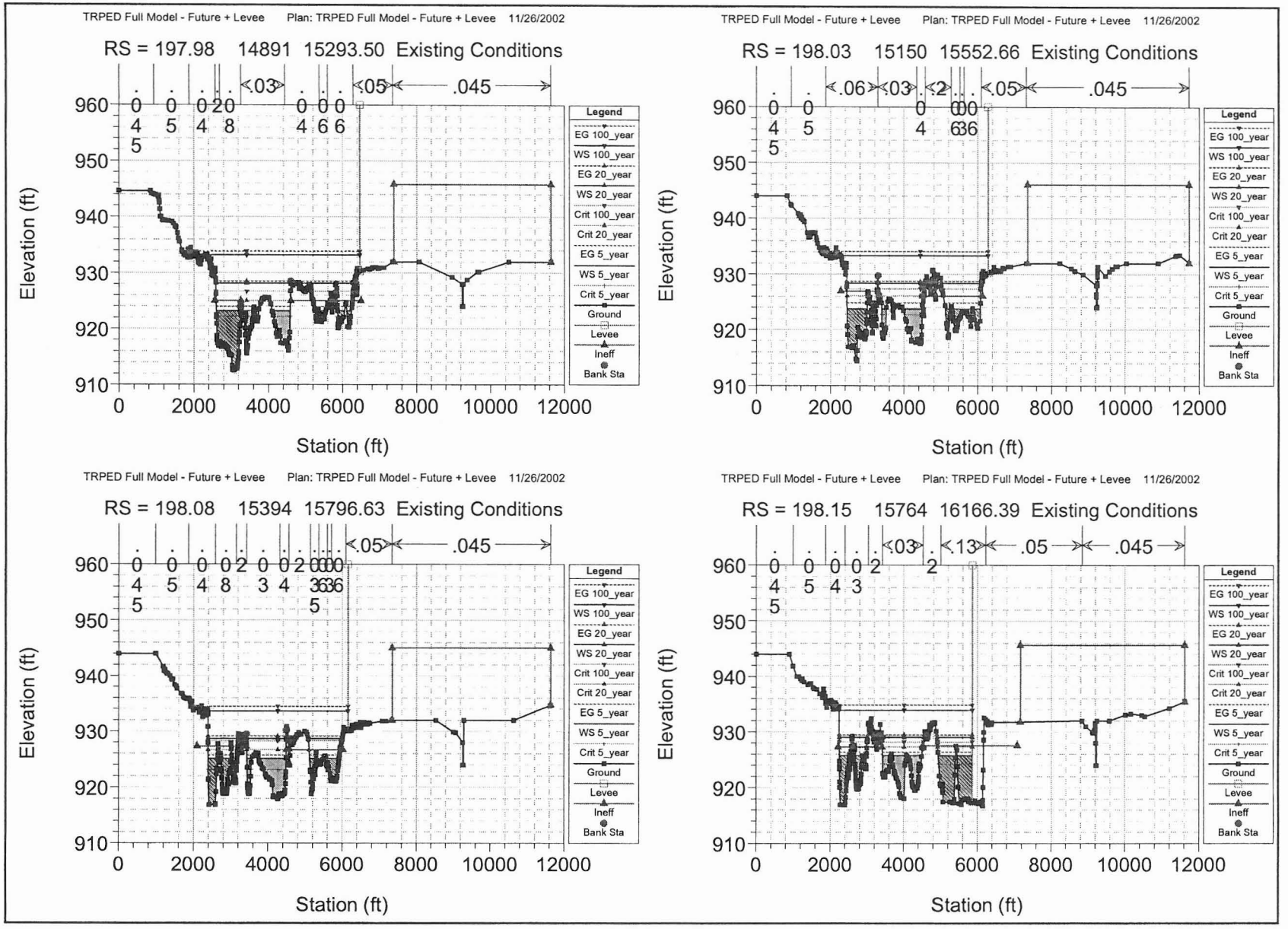

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.05 9961 10363.13 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
960
950
940
930
920
910
900
0
2000
4000
6000
8000
10000
12000
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.09 10195 10597.58 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.14 10430 10832.21 Existing Conditions
.045 .04 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.16 10562 10964.42 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.18 10680 11082.64 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.23 10924 11325.86 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.28 11169 11571.70 Existing Conditions
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.33 11438 11840.11 Existing Conditions
.045 .2 .09 .045 .045
Elevation (ft)
Station (ft)


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.38 11706 12108.57 Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.42 11948 12350.75 increased n value in rob for flow consistency Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.48 12257 12658.87 increased n in rob for flow consistency Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.53 12526 12928.65 Existing Conditions
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta

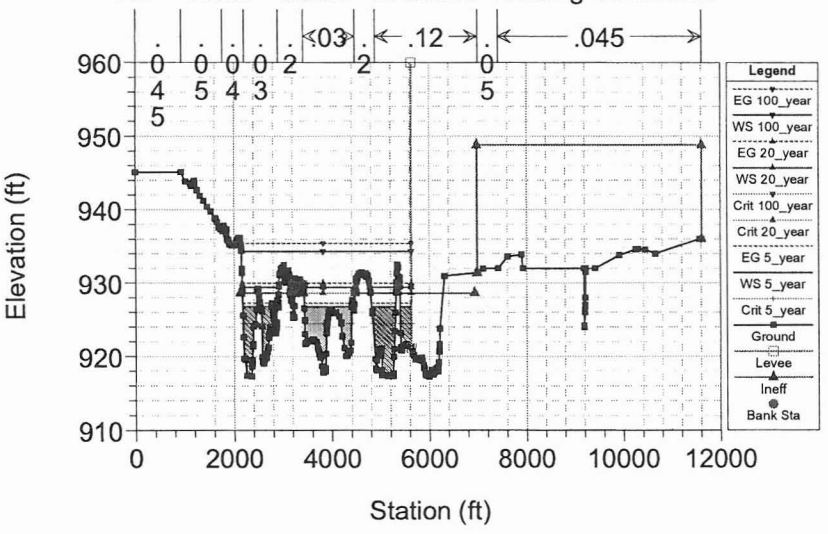

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.58 12790 13192.01 Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.64 13097 13498.91 Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.7 13404 13805.89 Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.75 13682 14084.20 Existing Conditions
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.81 13974 14376.75 Existing Conditions
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.87 14303 14704.90 Existing Conditions
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.92 14565 14967.72 Existing Conditions
.03
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.95 14721 15123.07 Existing Conditions
.03
.045
Elevation (ft)
Station (ft)


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 197.98 14891 15293.50 Existing Conditions
.03
.05
.045
Elevation (ft)
Station (ft)
960
950
940
930
920
910
0
2000
4000
6000
8000
10000
12000
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.03 15150 15552.66 Existing Conditions
.06
.03
.2
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.08 15394 15796.63 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.15 15764 16166.39 Existing Conditions
.03
.13
.05
.045
Elevation (ft)
Station (ft)

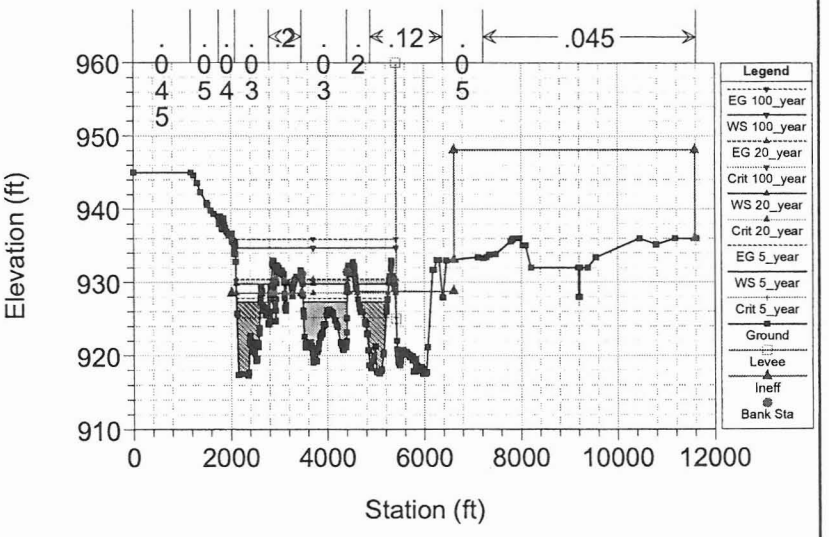
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 198.2 16066 16468.00 Existing Conditions



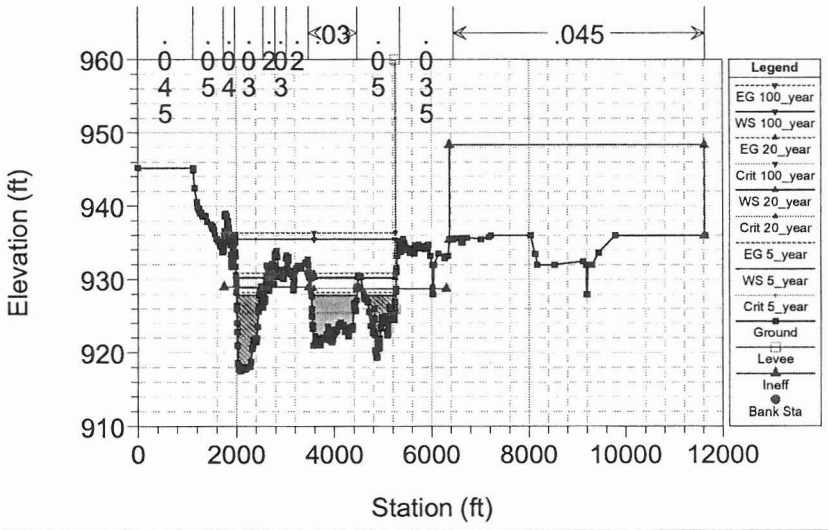
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 198.26 16360 16762.09 increased n values in lob & rob for flow consis Existing Conditions



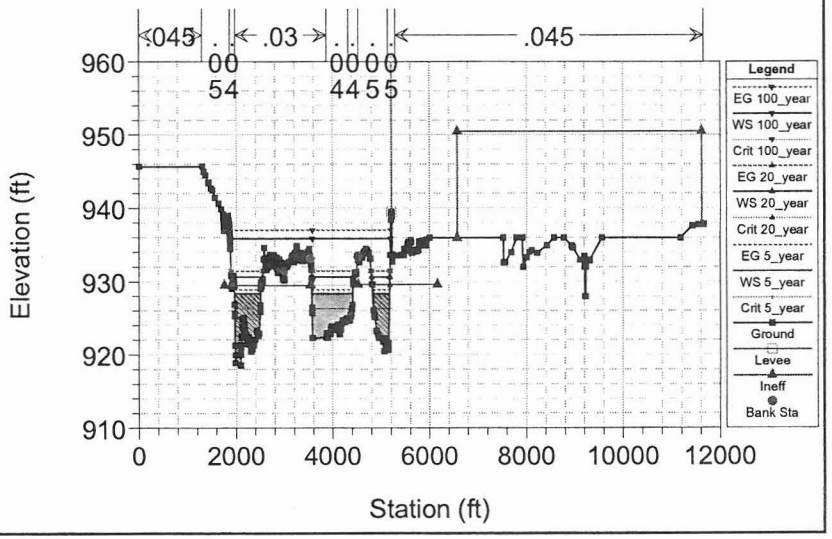
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

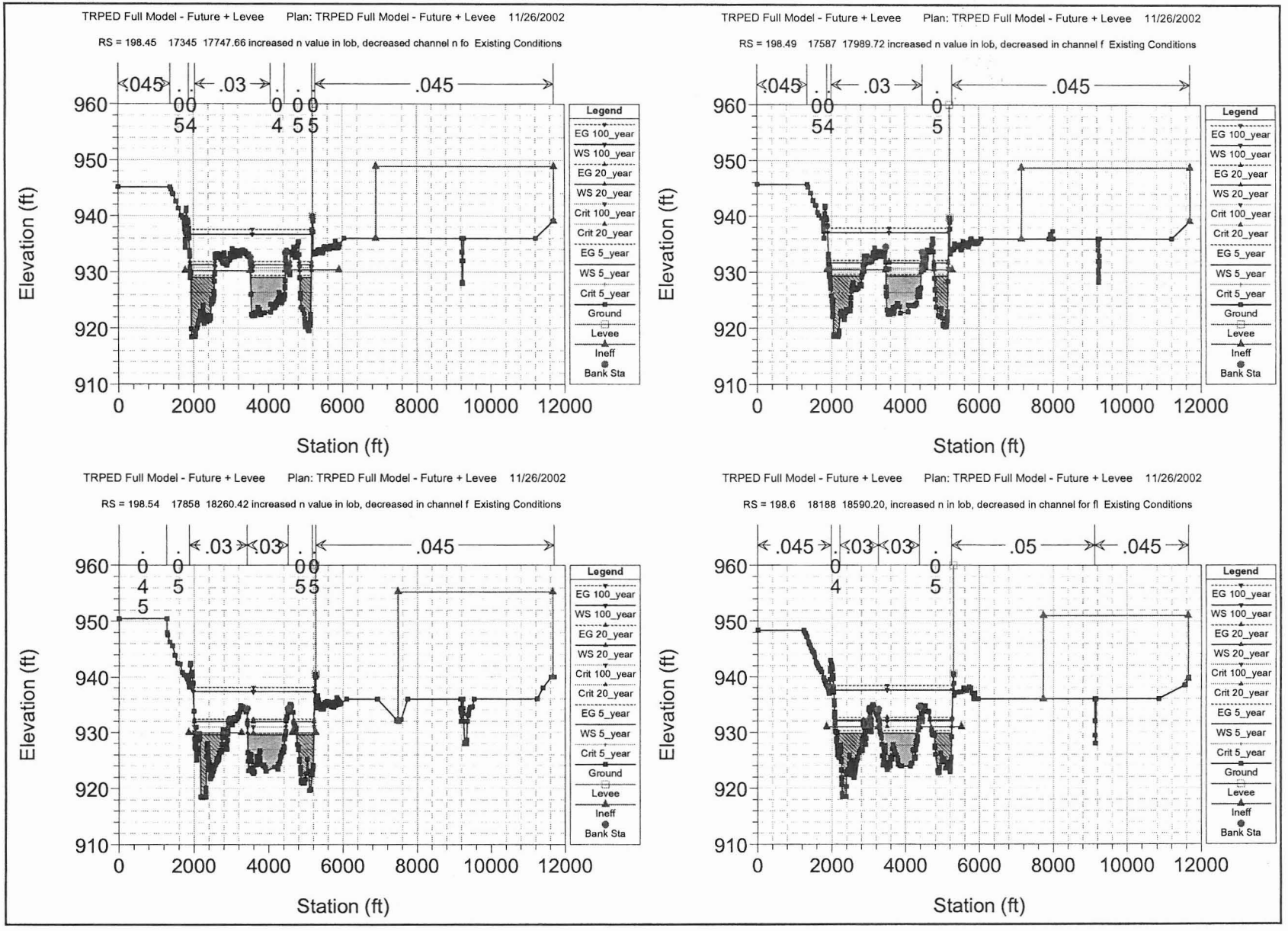
RS = 198.33 16742 17144.35 increased n value in lob for flow consistency Existing Conditions

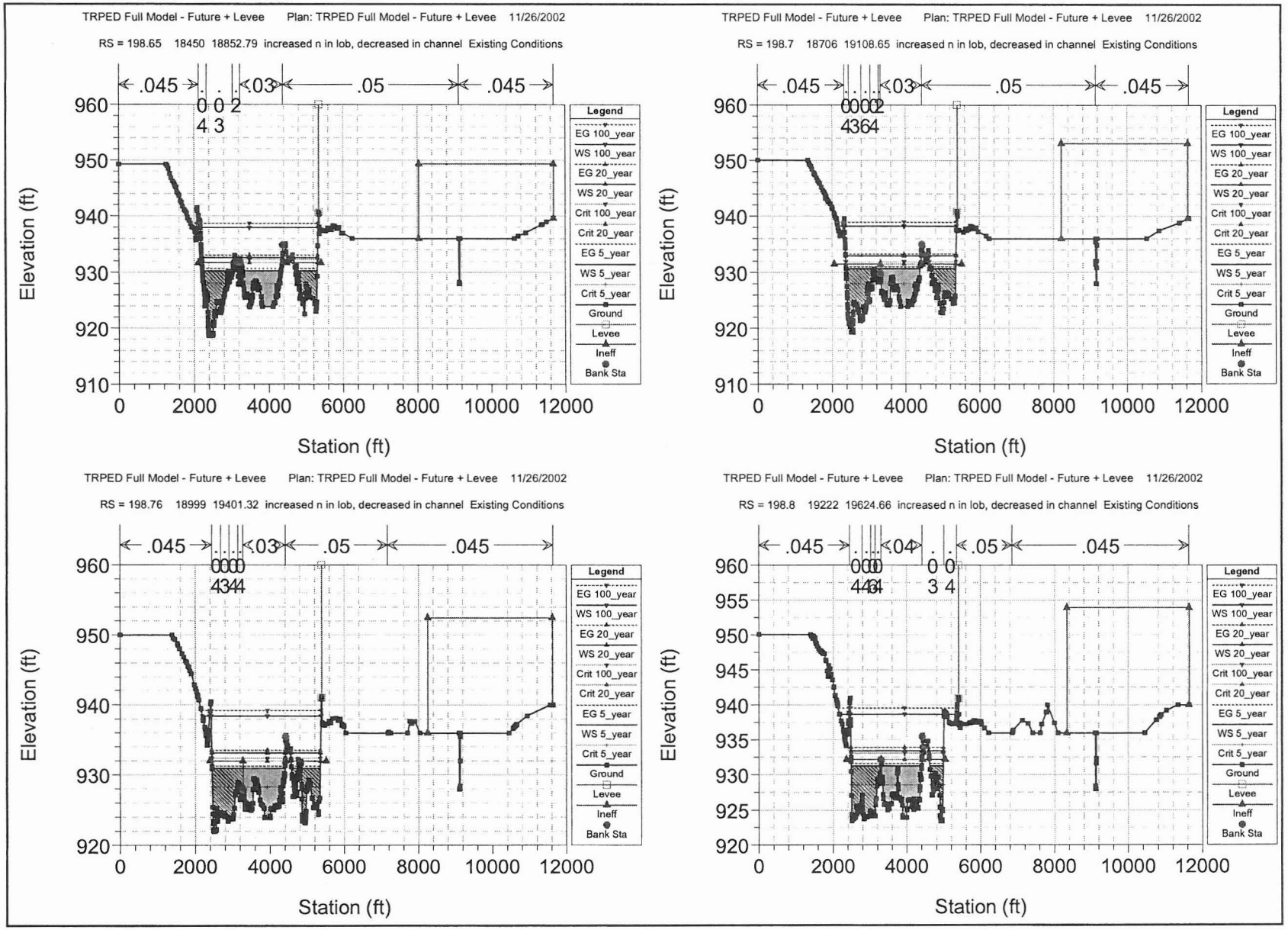


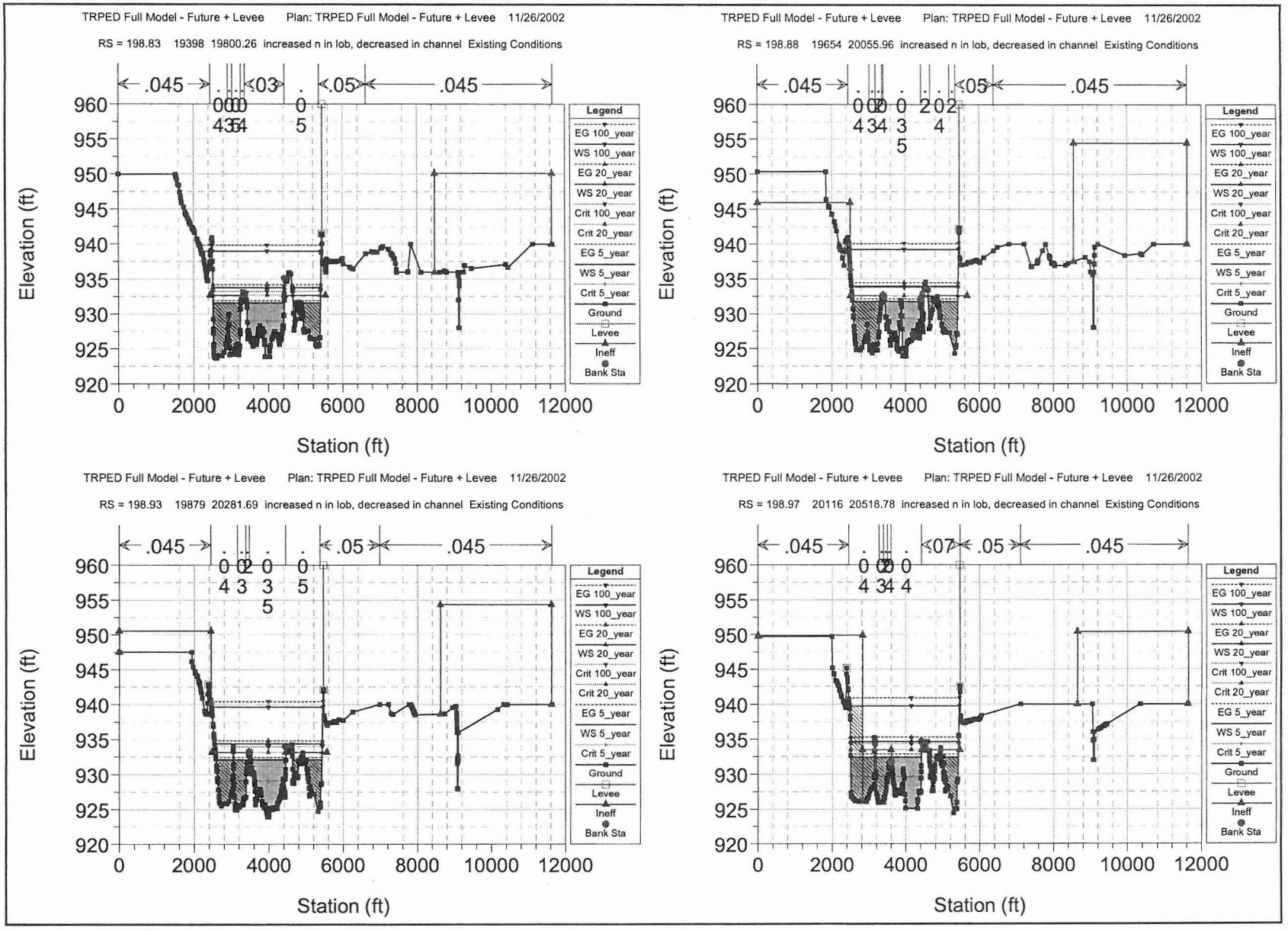
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

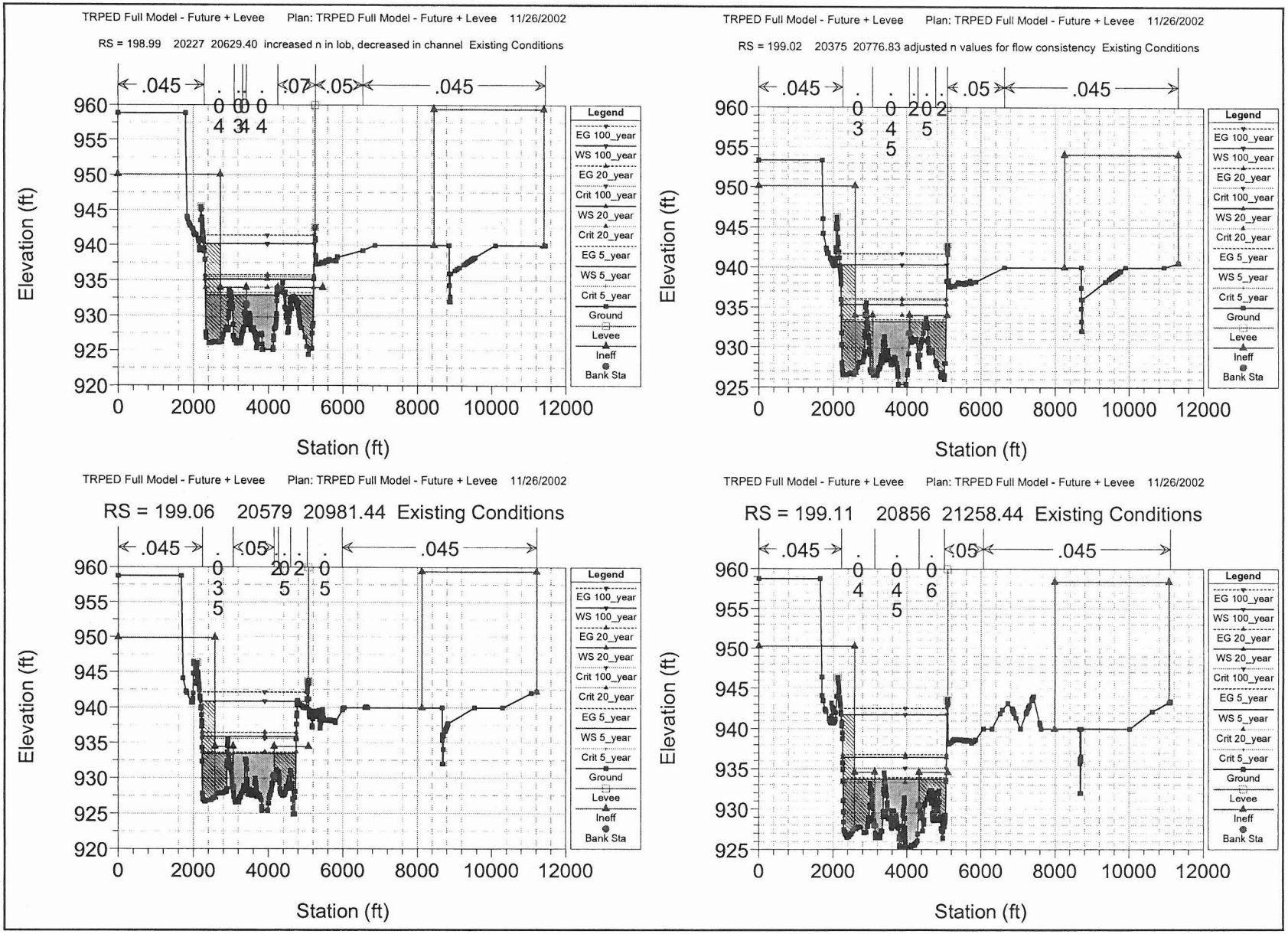
RS = 198.4 17088 17490.51 increased n value in lob for flow consistency Existing Conditions

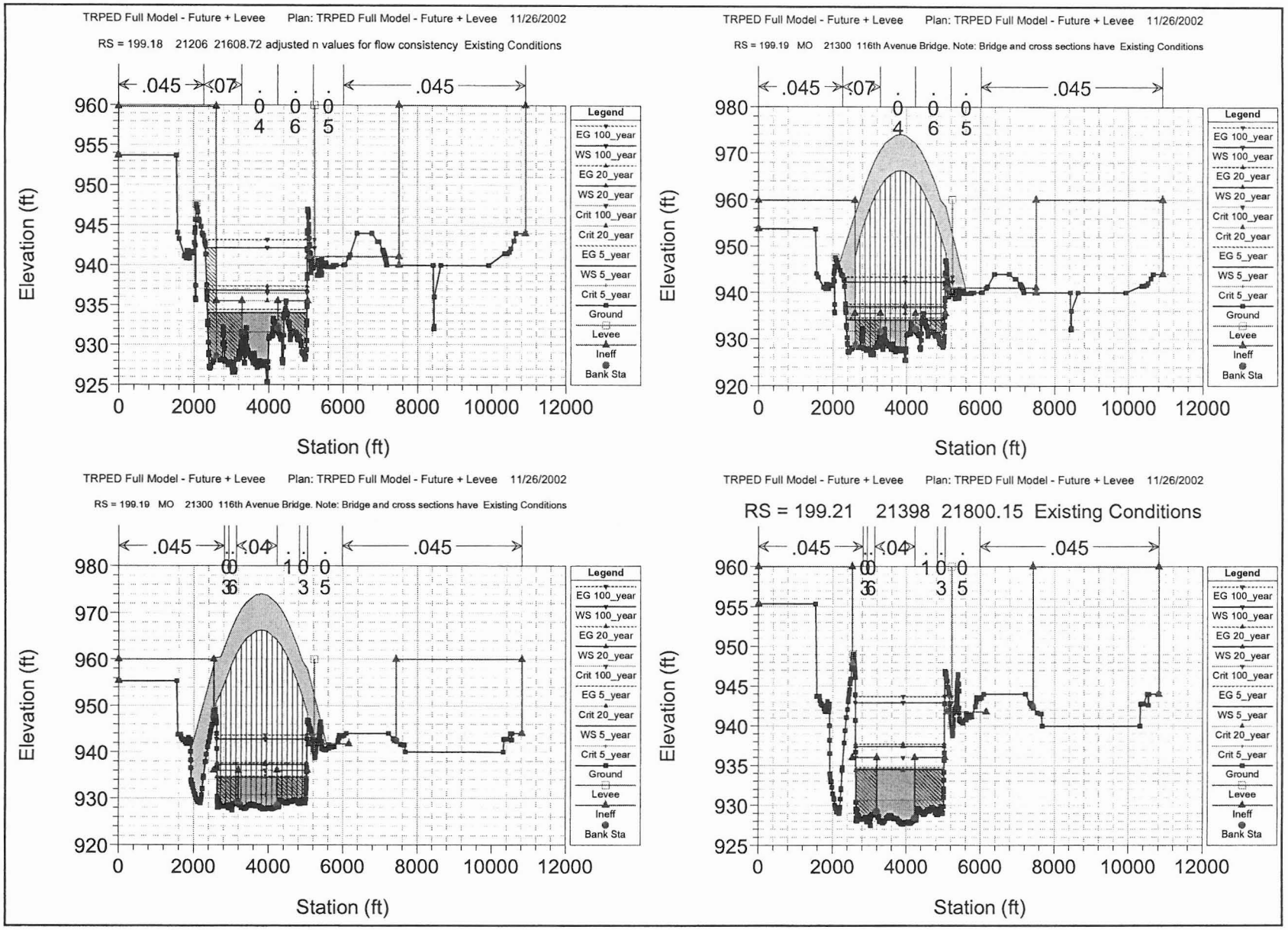


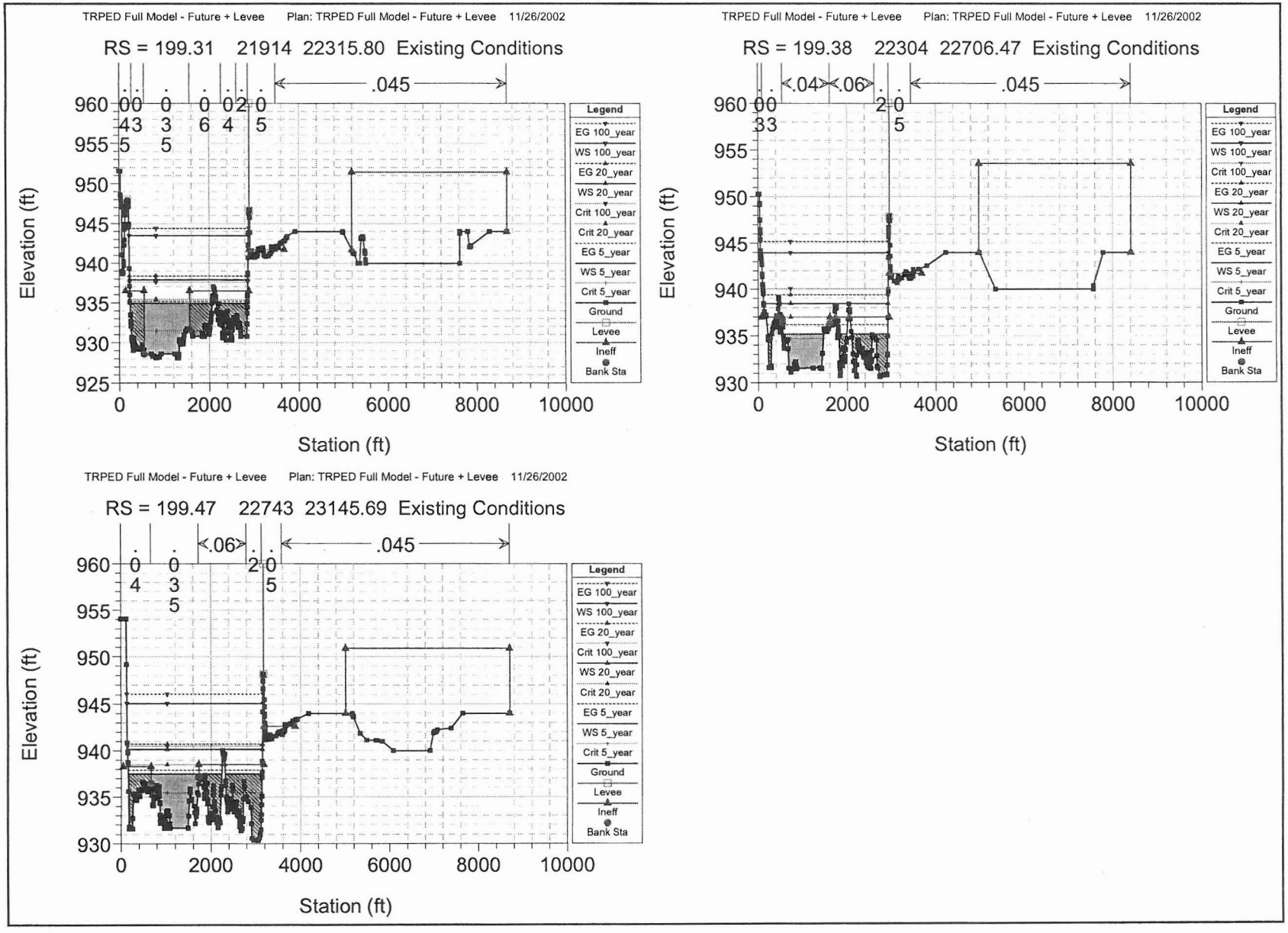

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.45 17345 17747.66 increased n value in lob, decreased channel n fo Existing Conditions
.045 .03 .045
960
950
940
930
920
910
0 2000 4000 6000 8000 10000 12000
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.49 17587 17989.72 increased n value in lob, decreased in channel f Existing Conditions
.045 .03 .045
960
950
940
930
920
910
0 2000 4000 6000 8000 10000 12000
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.54 17858 18260.42 increased n value in lob, decreased in channel f Existing Conditions
.03 .03 .045
960
950
940
930
920
910
0 2000 4000 6000 8000 10000 12000
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.6 18188 18590.20, increased n in lob, decreased in channel for fl Existing Conditions
.045 .03 .03 .05 .045
960
950
940
930
920
910
0 2000 4000 6000 8000 10000 12000
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.65 18450 18852.79 increased n in lob, decreased in channel Existing Conditions
.045
.03
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.7 18706 19108.65 increased n in lob, decreased in channel Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.76 18999 19401.32 increased n in lob, decreased in channel Existing Conditions
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.8 19222 19624.66 increased n in lob, decreased in channel Existing Conditions
.04
.05


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.83 19398 19800.26 increased n in lob, decreased in channel Existing Conditions
.045
.03
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.88 19654 20055.96 increased n in lob, decreased in channel Existing Conditions
.045
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.93 19879 20281.69 increased n in lob, decreased in channel Existing Conditions
.045
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.97 20116 20518.78 increased n in lob, decreased in channel Existing Conditions
.045
.07
.05
.045
Elevation (ft)
Station (ft)

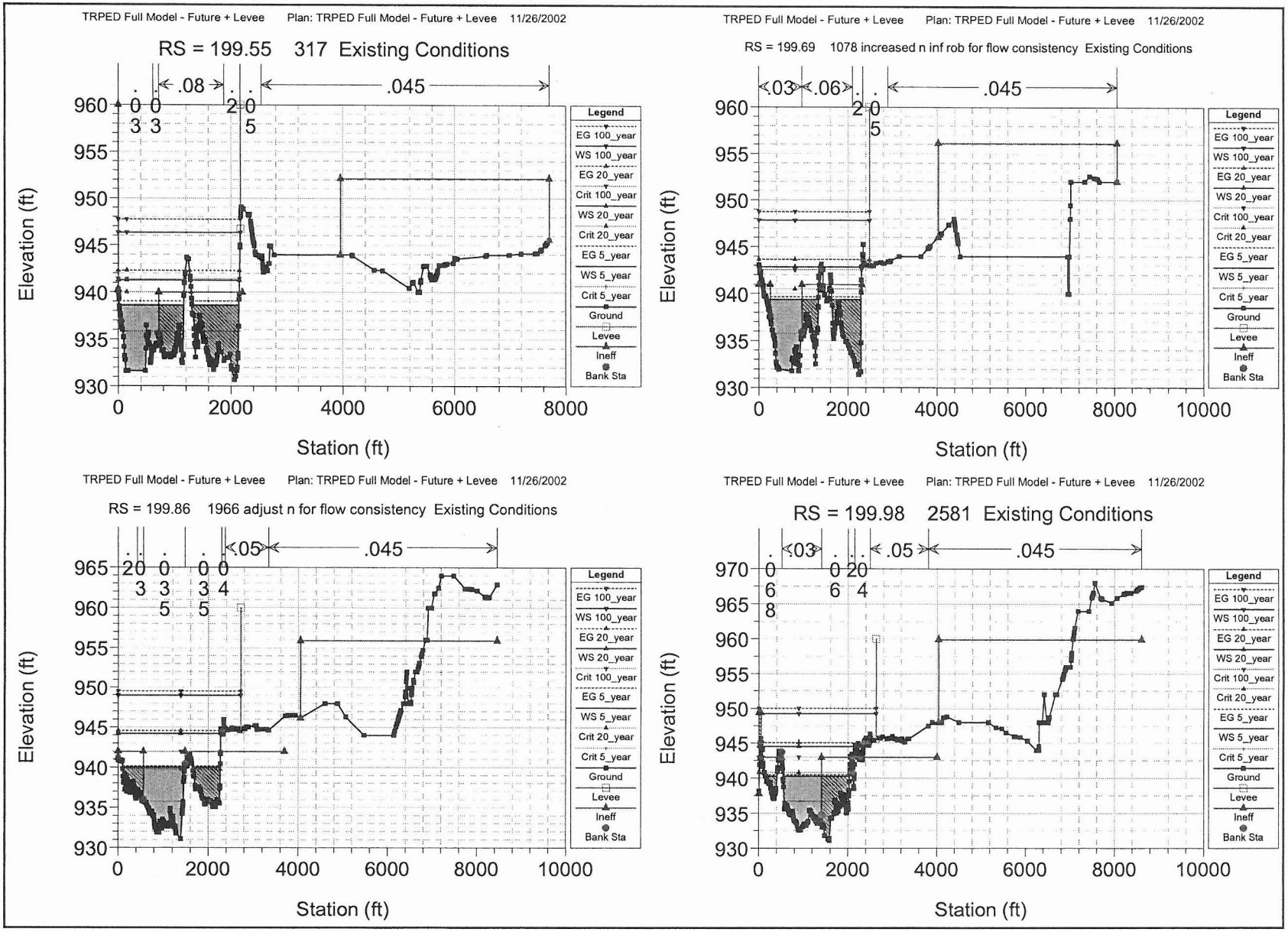

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 198.99 20227 20629.40 increased n in lob, decreased in channel Existing Conditions
.045
.07
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.02 20375 20776.83 adjusted n values for flow consistency Existing Conditions
.045
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.06 20579 20981.44 Existing Conditions
.045
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.11 20856 21258.44 Existing Conditions
.045
.05
.045
Elevation (ft)
Station (ft)

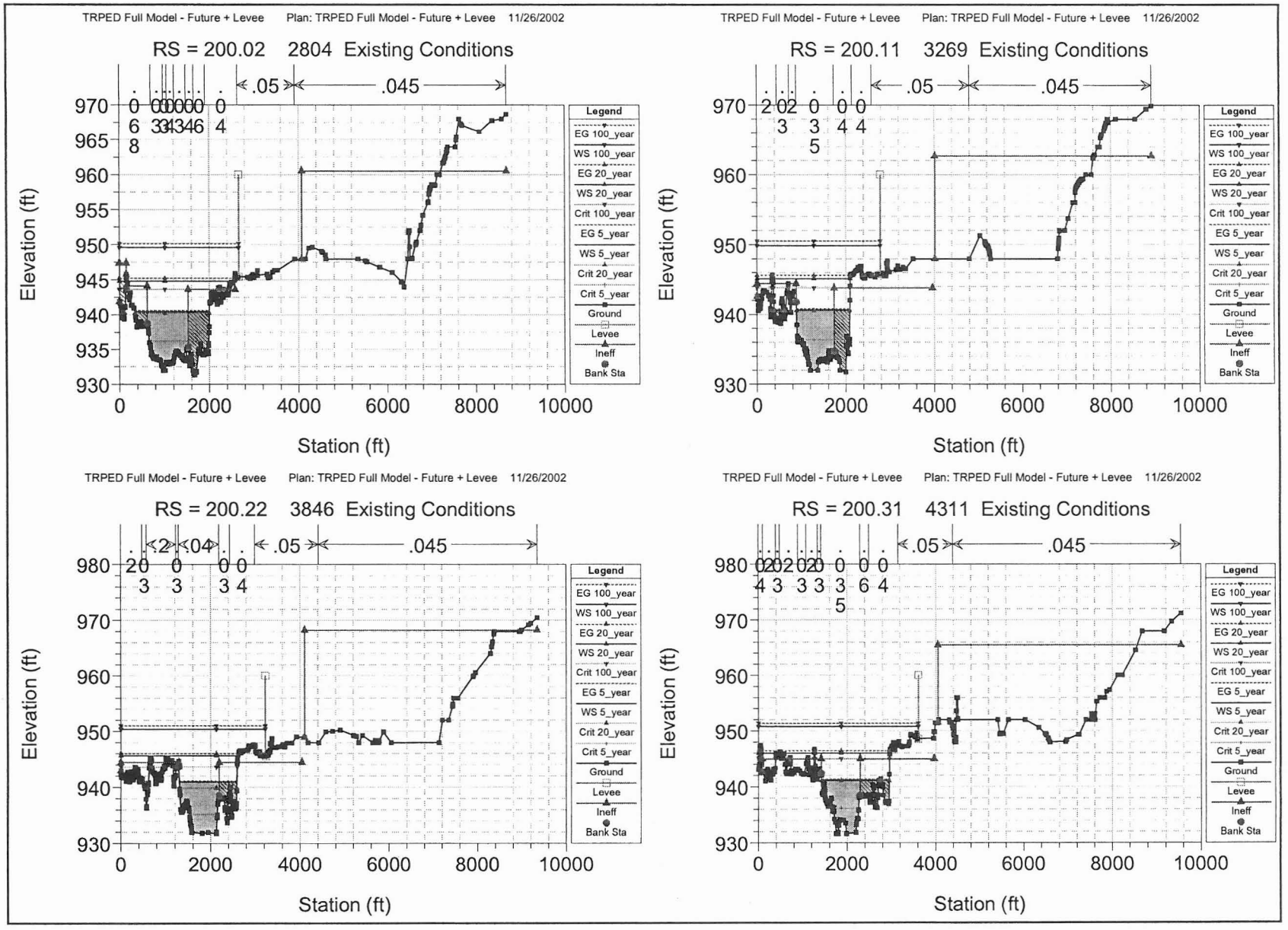

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.18 21206 21608.72 adjusted n values for flow consistency Existing Conditions
.045
.07
.045
0 4
0 6
0 5
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
960
955
950
945
940
935
930
925
0
2000
4000
6000
8000
10000
12000
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.19 MO 21300 116th Avenue Bridge. Note: Bridge and cross sections have Existing Conditions
.045
.07
.045
0 4
0 6
0 5
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
980
970
960
950
940
930
920
0
2000
4000
6000
8000
10000
12000
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.19 MO 21300 116th Avenue Bridge. Note: Bridge and cross sections have Existing Conditions
.045
.04
.045
1 0 0
3 5
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
980
970
960
950
940
930
920
0
2000
4000
6000
8000
10000
12000
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.21 21398 21800.15 Existing Conditions
.045
.04
.045
1 0 0
3 5
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
960
955
950
945
940
935
930
925
0
2000
4000
6000
8000
10000
12000

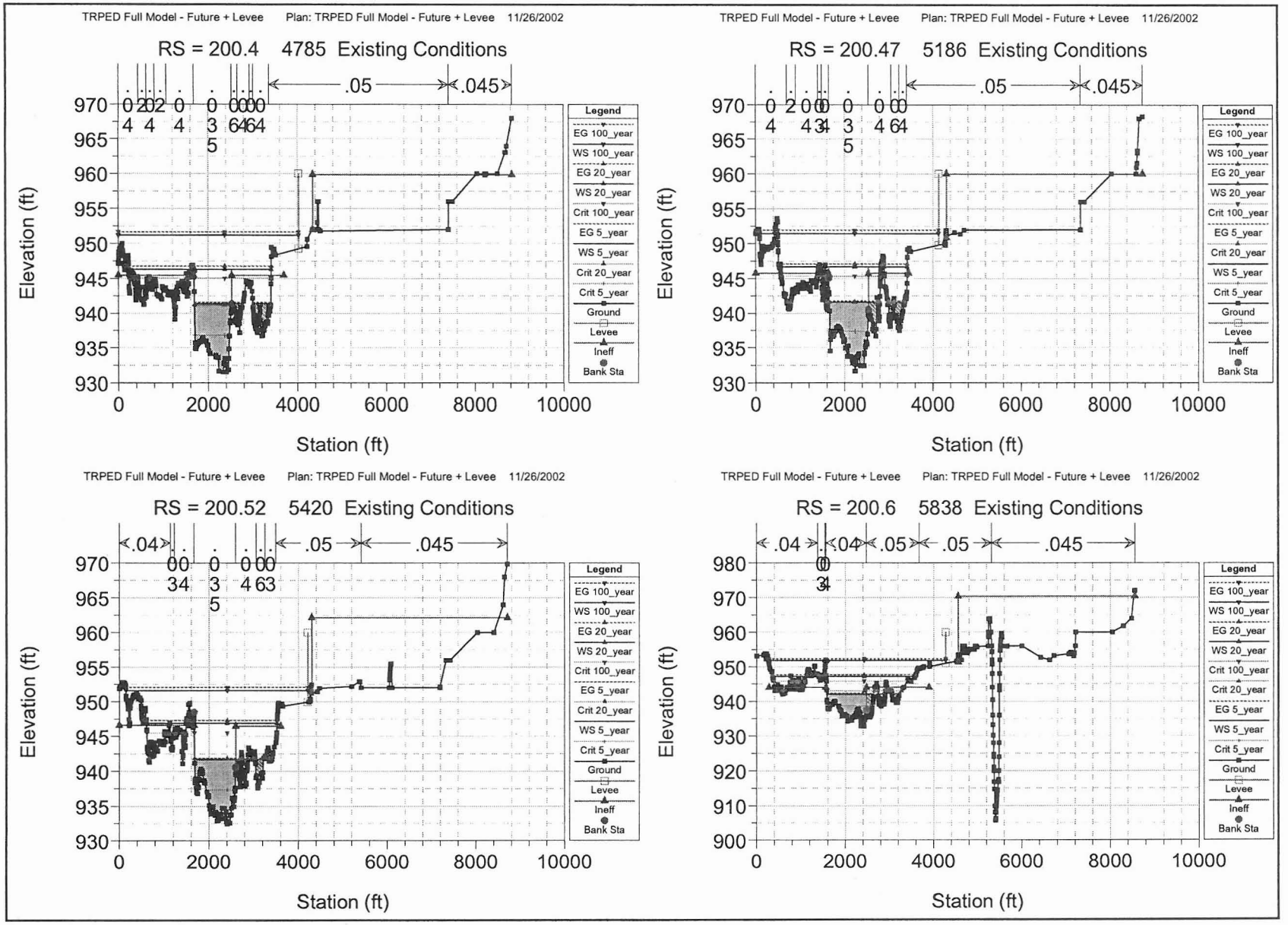

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.31 21914 22315.80 Existing Conditions
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.38 22304 22706.47 Existing Conditions
.04
.06
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.47 22743 23145.69 Existing Conditions
.06
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta

F-iii

Cross Section Plots for the Salt

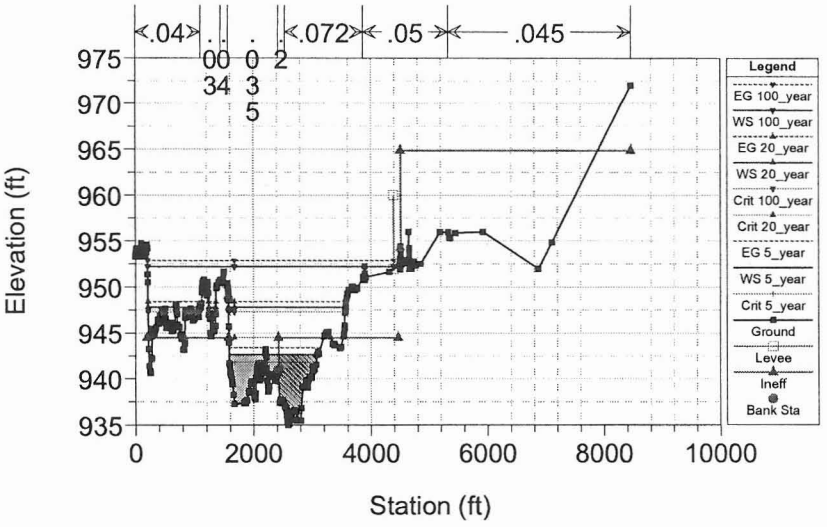

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.55 317 Existing Conditions
.08
.045
.003
.205
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.69 1078 increased n inf rob for flow consistency Existing Conditions
.03
.06
.045
.205
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.86 1966 adjust n for flow consistency Existing Conditions
.05
.045
.203
.035
.004
.035
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 199.98 2581 Existing Conditions
.03
.05
.045
.068
.026
.046
Elevation (ft)
Station (ft)


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 200.02 2804 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 200.11 3269 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 200.22 3846 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 200.31 4311 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 200.4 4785 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 200.47 5186 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 200.52 5420 Existing Conditions
.04
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 200.6 5838 Existing Conditions
.04
.04
.05
.05
.045
Elevation (ft)
Station (ft)

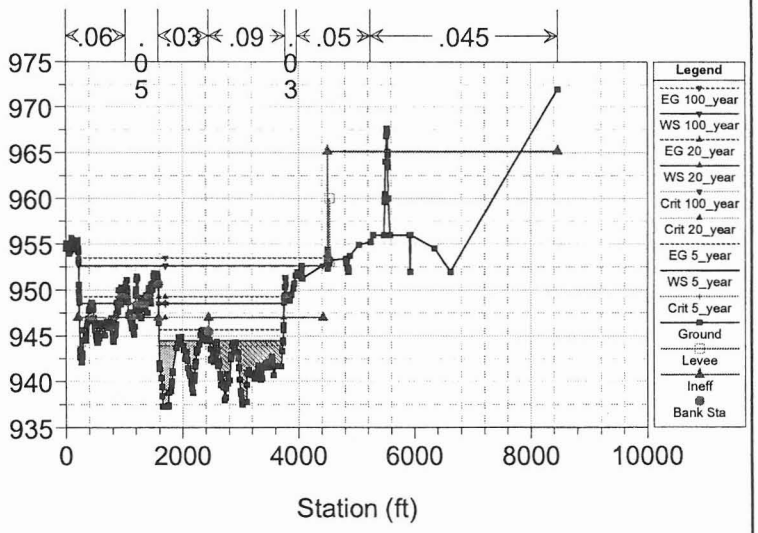
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 200.68 6269 adjusted n values for flow consistency Existing Conditions



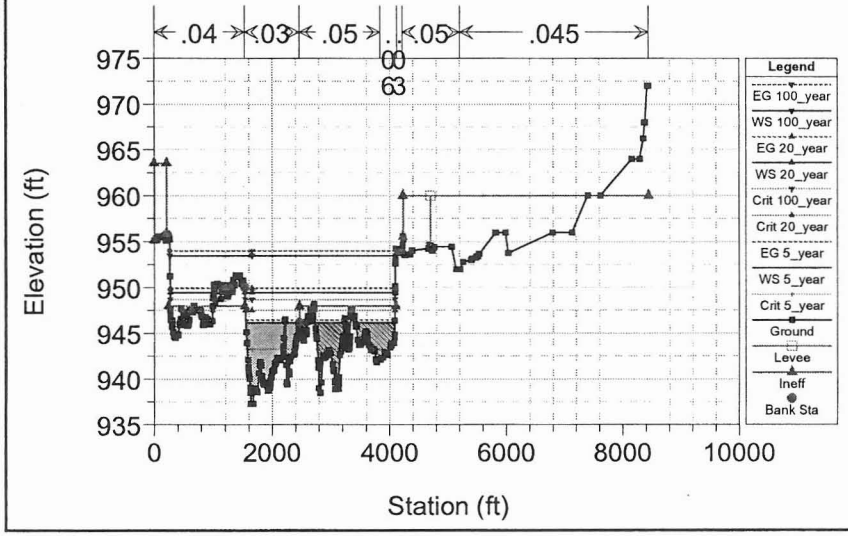
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 200.75 6655 adjusted n values for flow consistency Existing Conditions



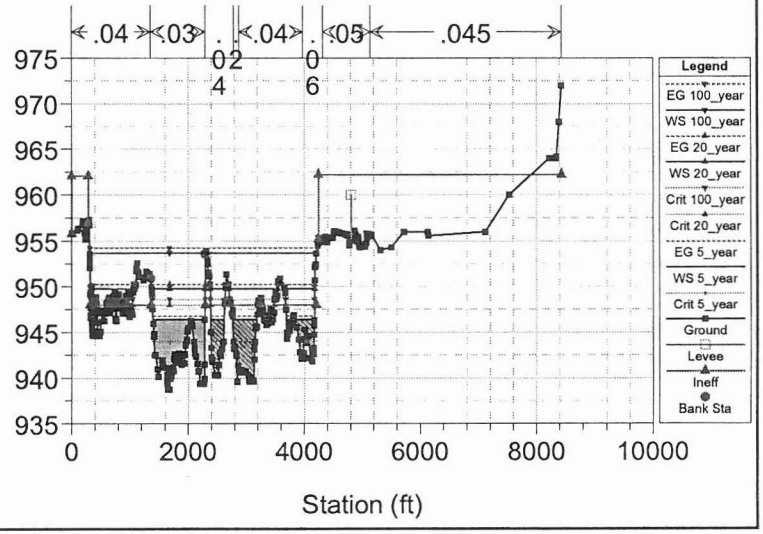
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

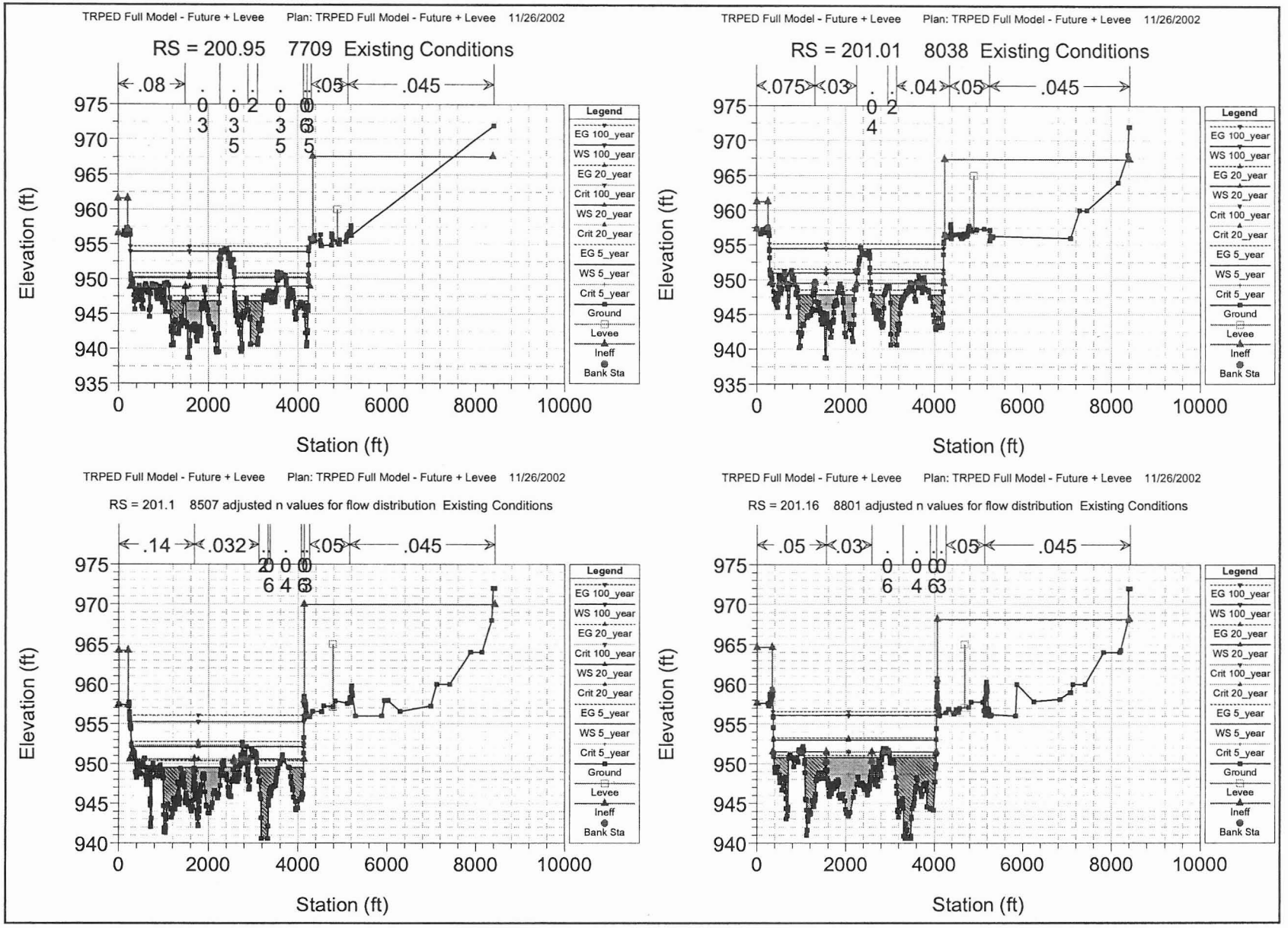
RS = 200.83 7055 adjusted n values for flow consistency Existing Conditions



TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

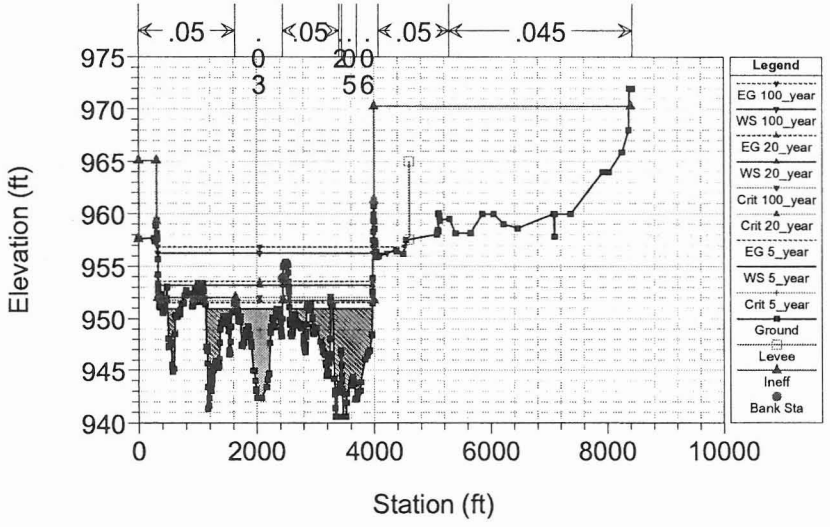
RS = 200.88 7347 adjusted n values for flow consistency Existing Conditions




TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 200.95 7709 Existing Conditions
.08
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.01 8038 Existing Conditions
.075
.03
.04
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.1 8507 adjusted n values for flow distribution Existing Conditions
.14
.032
.05
.045
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.16 8801 adjusted n values for flow distribution Existing Conditions
.05
.03
.05
.045
Elevation (ft)
Station (ft)

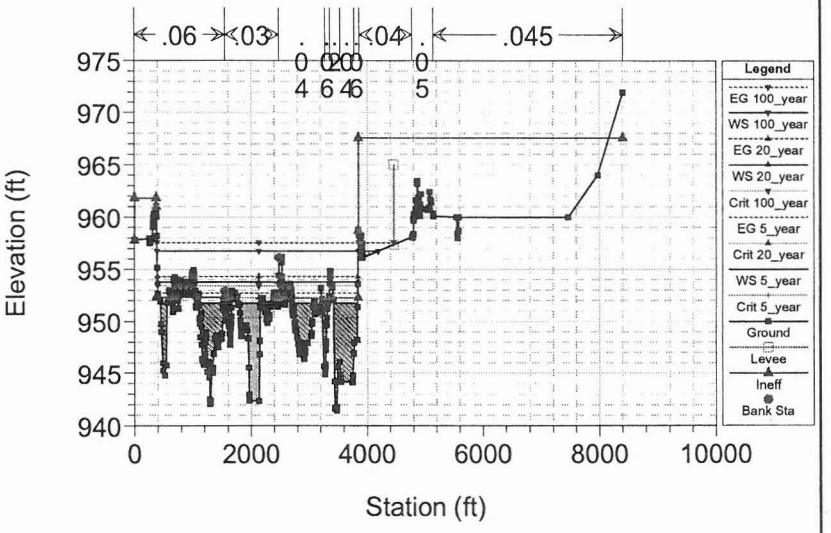
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 201.2 9031 adjusted n values for flow distribution Existing Conditions



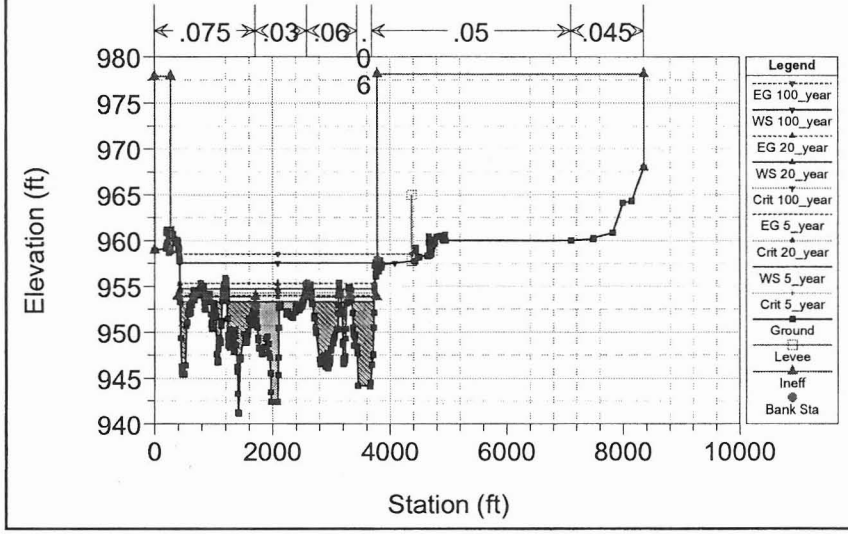
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 201.26 9369 adjusted n values for flow distribution Existing Conditions



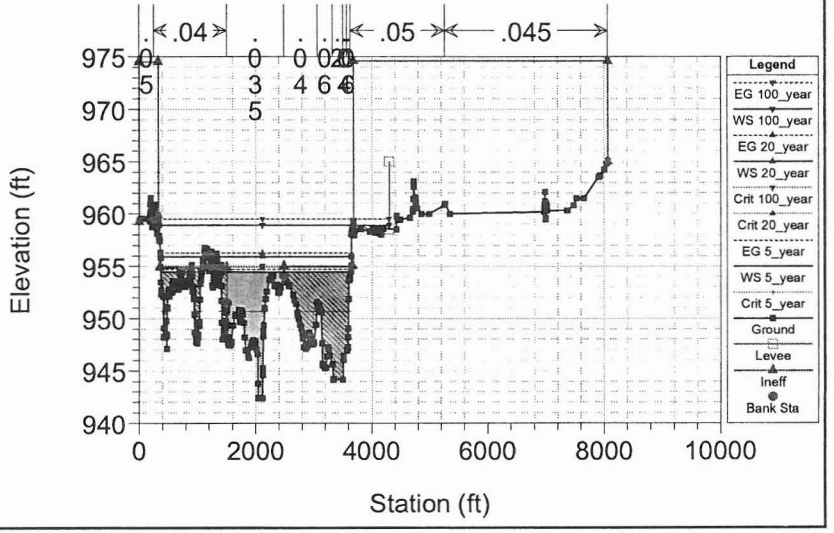
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

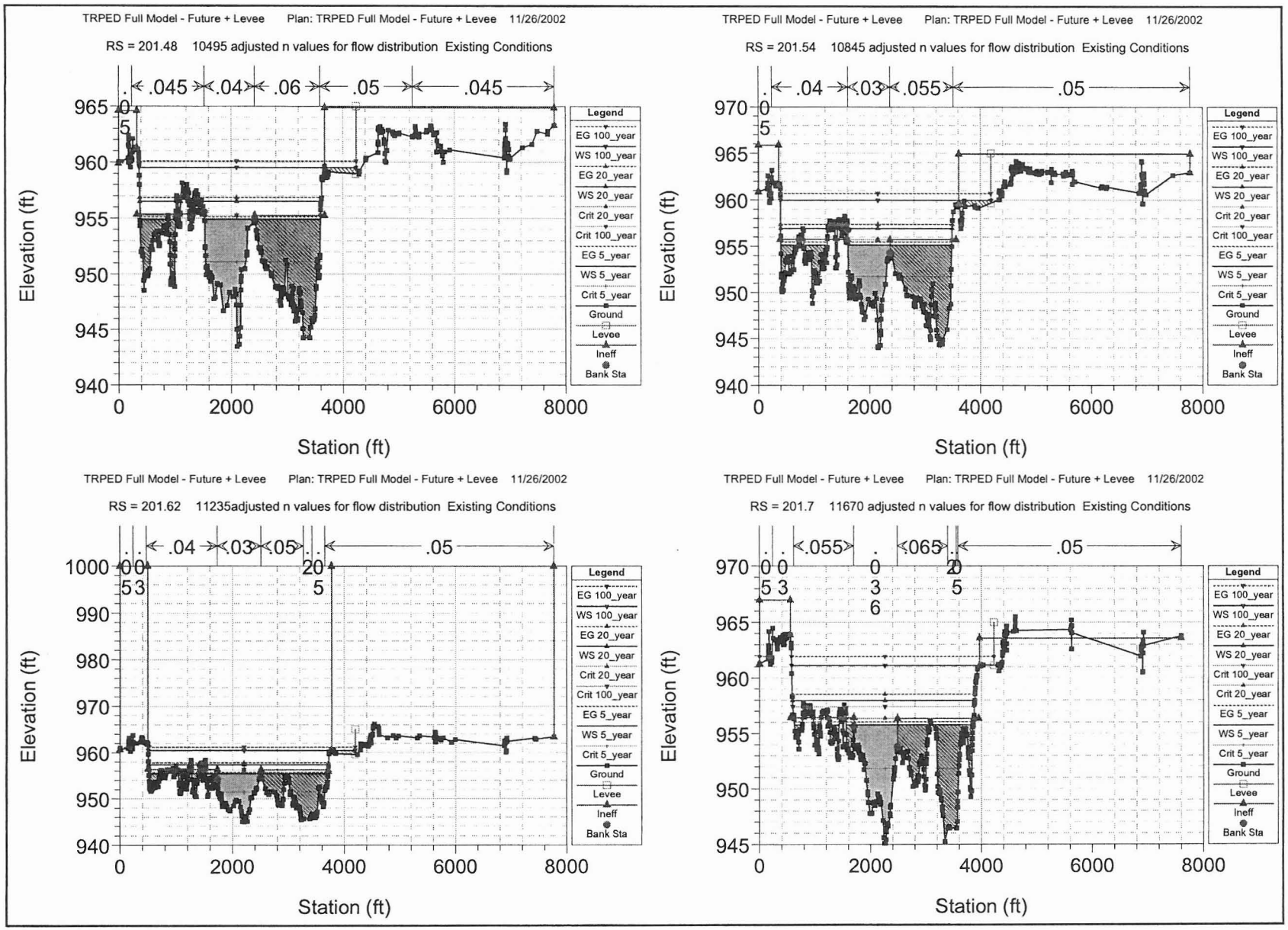
RS = 201.33 9717adjusted n values for flow distribution Existing Conditions

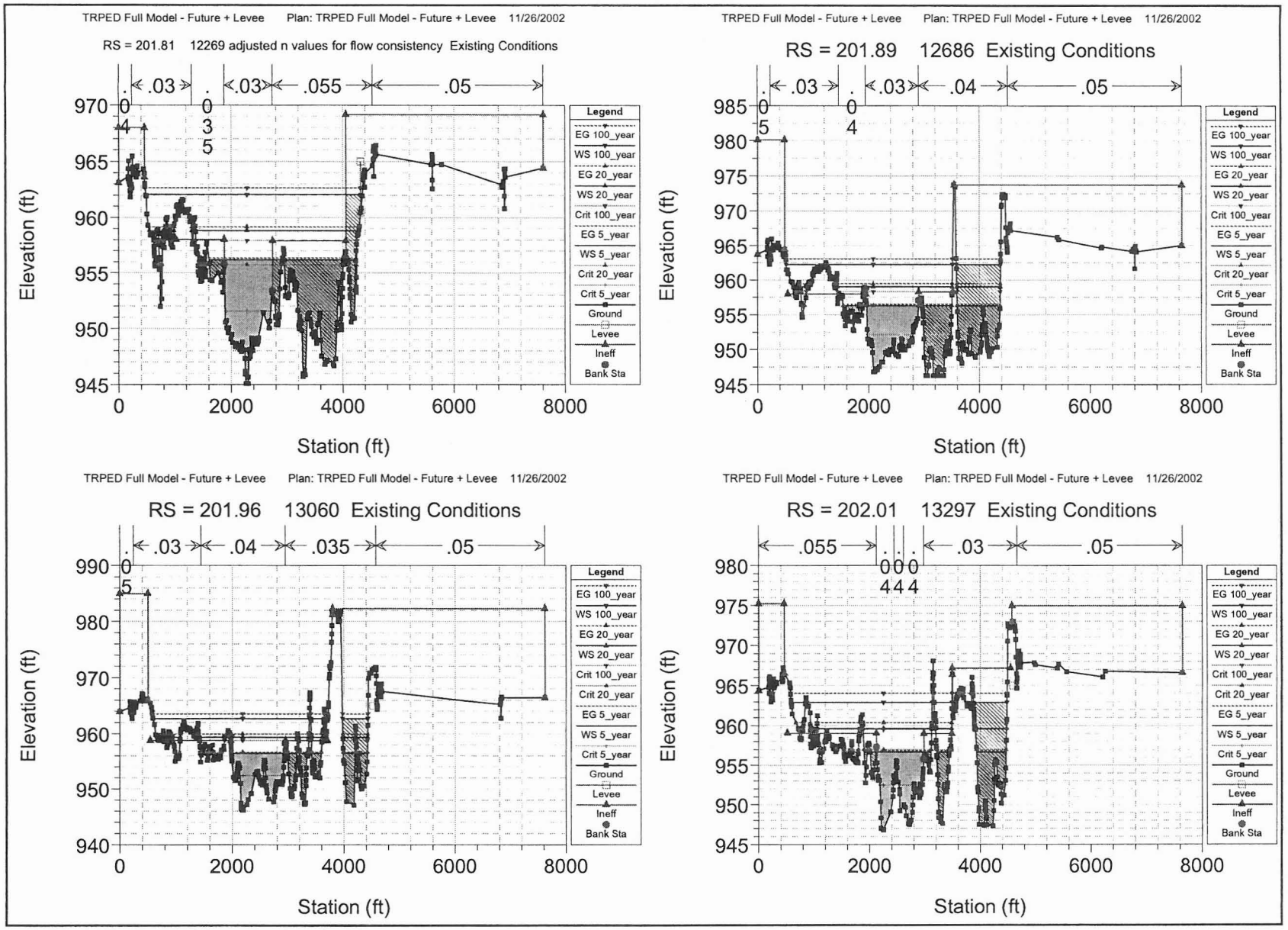


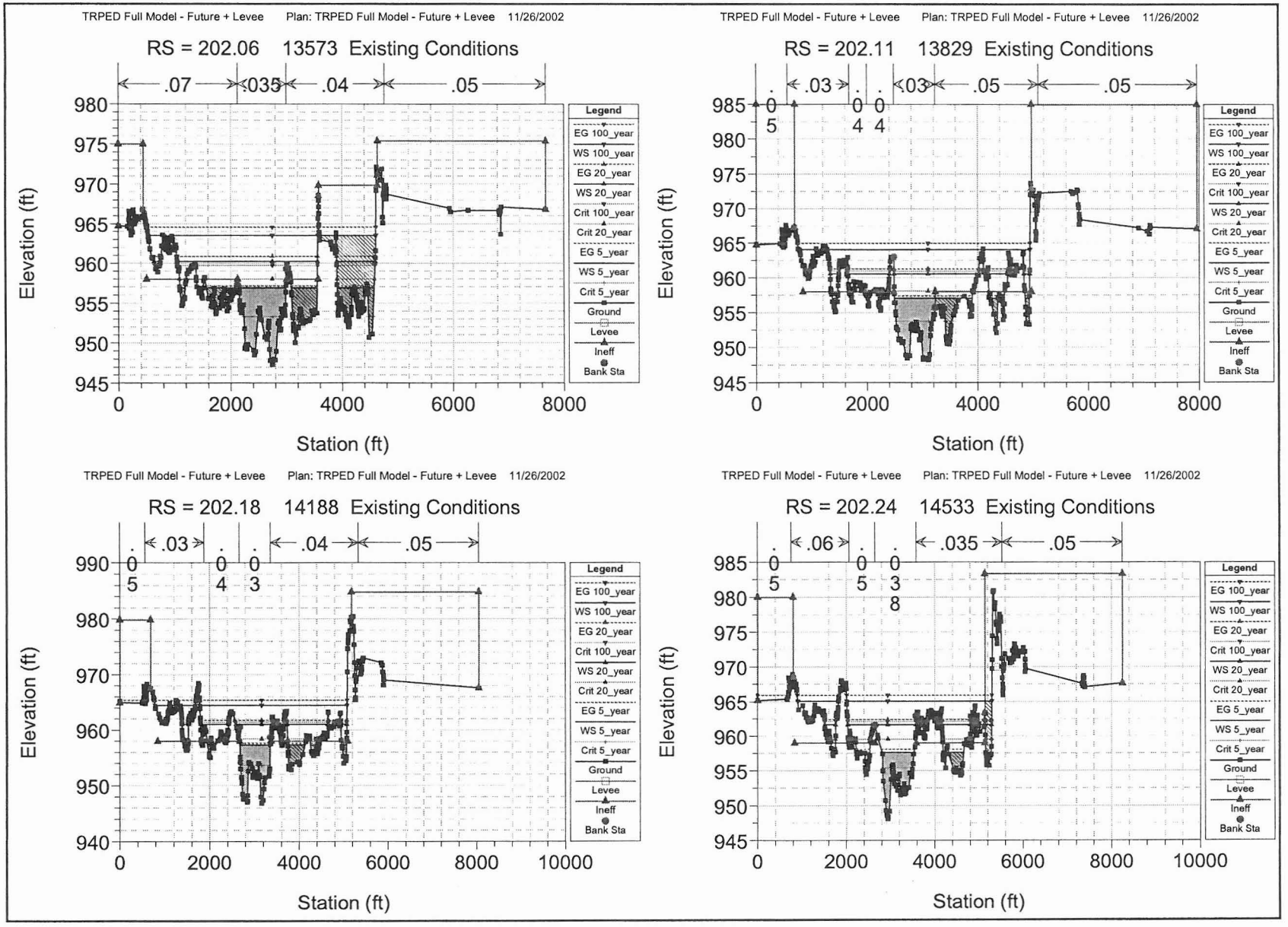
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 201.41 10137adjusted n values for flow distribution Existing Conditions



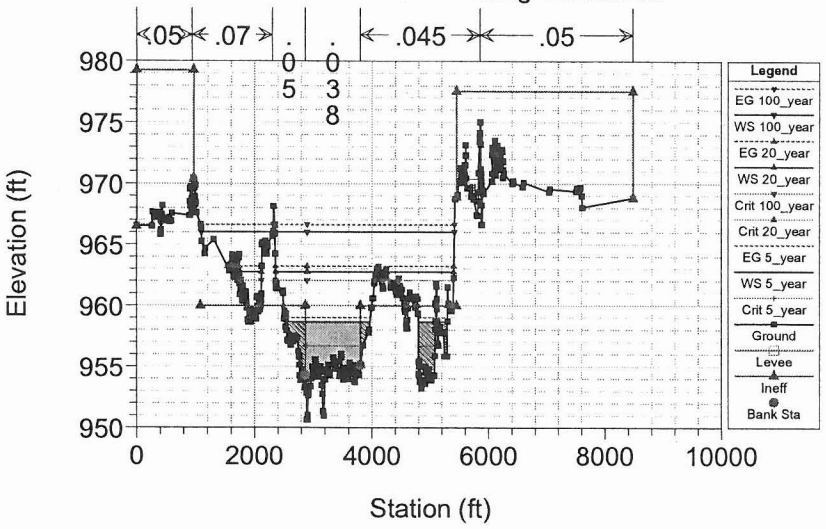

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.48 10495 adjusted n values for flow distribution Existing Conditions
.045
.04
.06
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.54 10845 adjusted n values for flow distribution Existing Conditions
.04
.03
.055
.05
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.62 11235adjusted n values for flow distribution Existing Conditions
.04
.03
.05
.05
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.7 11670 adjusted n values for flow distribution Existing Conditions
.055
.065
.05
Elevation (ft)
Station (ft)


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.81 12269 adjusted n values for flow consistency Existing Conditions
.03 .03 .055 .05
0 4 0 3 5
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.89 12686 Existing Conditions
.03 .03 .04 .05
0 5 0 4
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 201.96 13060 Existing Conditions
.03 .04 .035 .05
0 5
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.01 13297 Existing Conditions
.055 .03 .05
0 0 0 4 4 4
Elevation (ft)
Station (ft)


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.06 13573 Existing Conditions
.07
.035
.04
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.11 13829 Existing Conditions
.03
.03
.05
.05
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.18 14188 Existing Conditions
.03
.04
.05
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.24 14533 Existing Conditions
.06
.035
.05
Elevation (ft)
Station (ft)

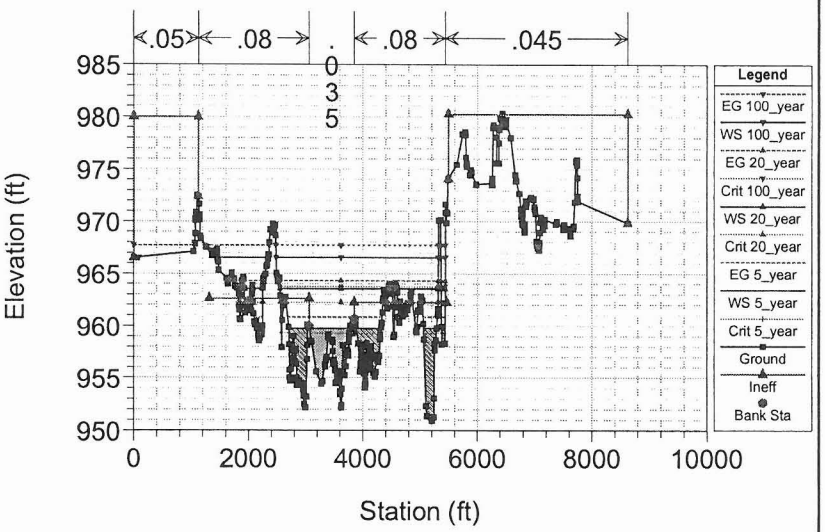
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 202.32 14938 Existing Conditions



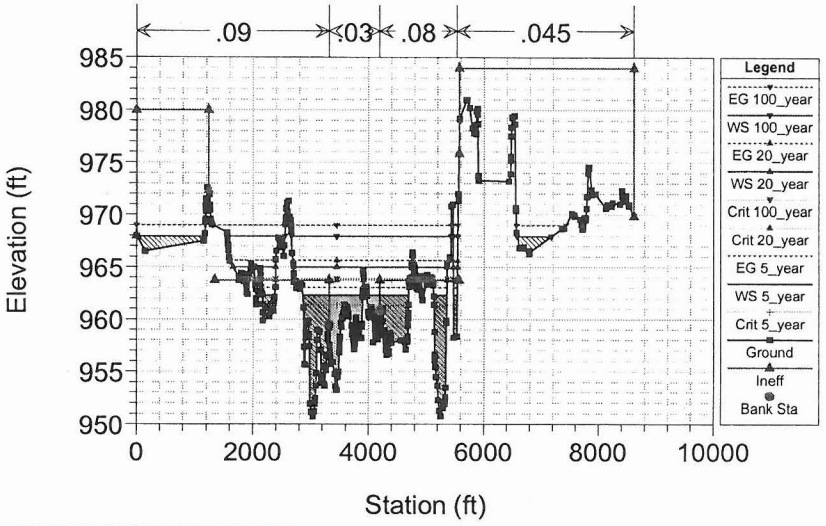
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 202.4 15363 adjusted n values for flow consistency Existing Conditions



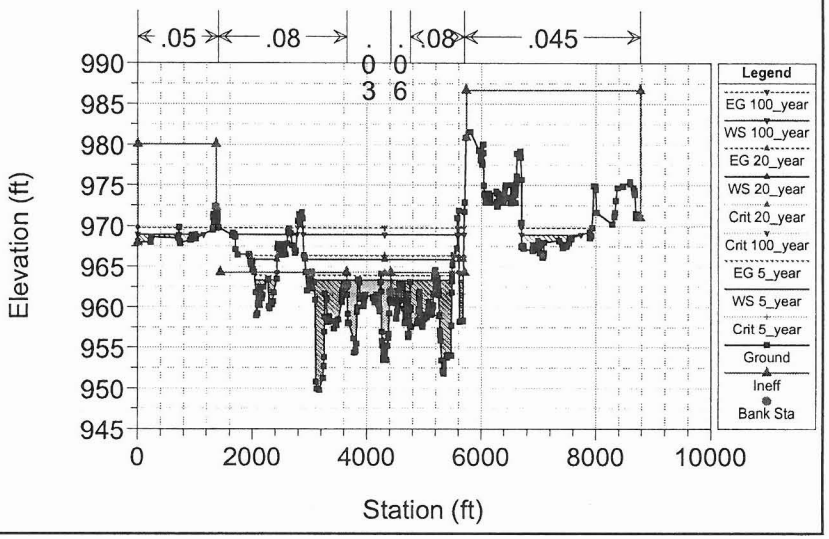
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

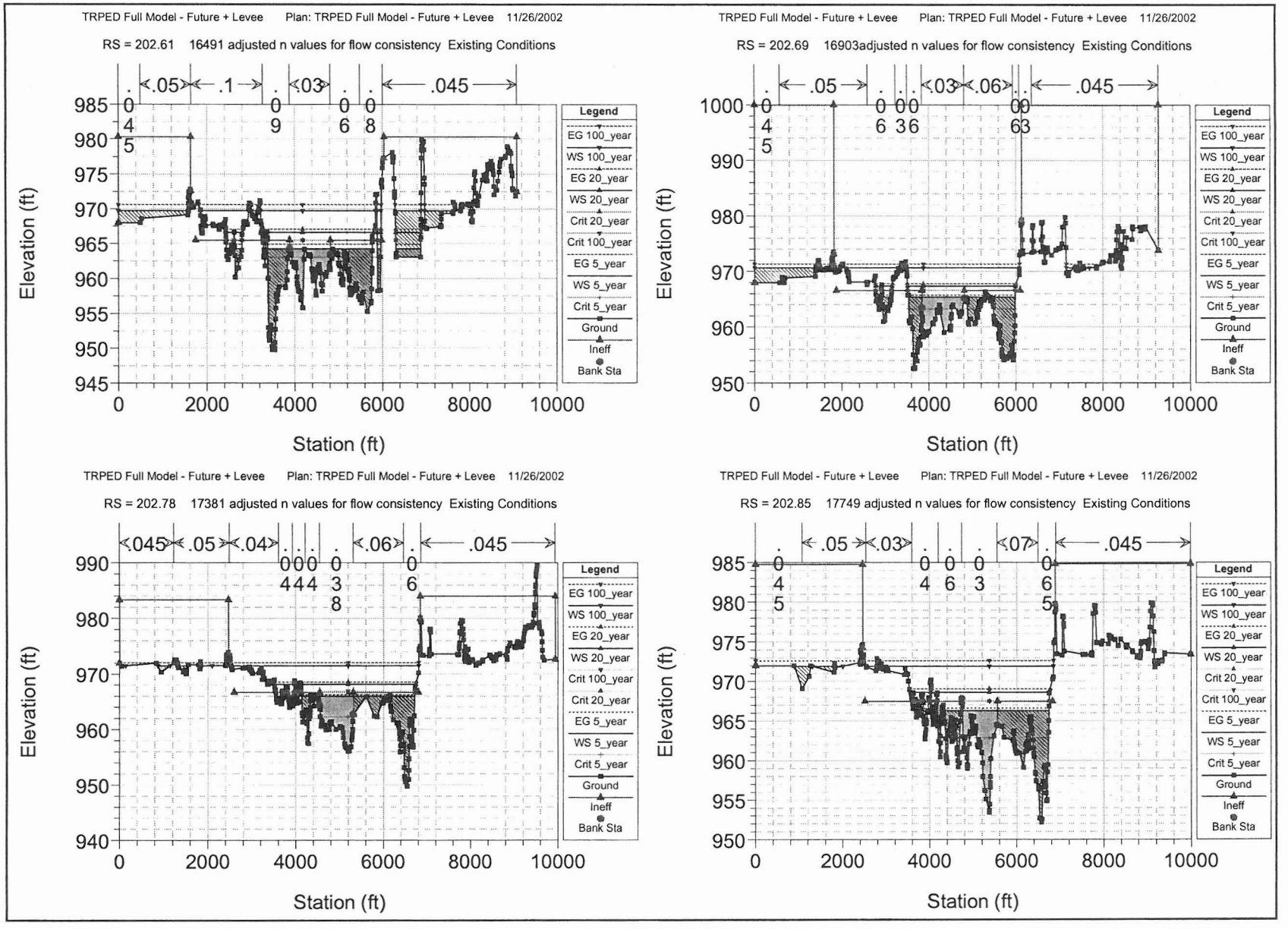
RS = 202.48 15802 adjusted n values for flow consistency Existing Conditions

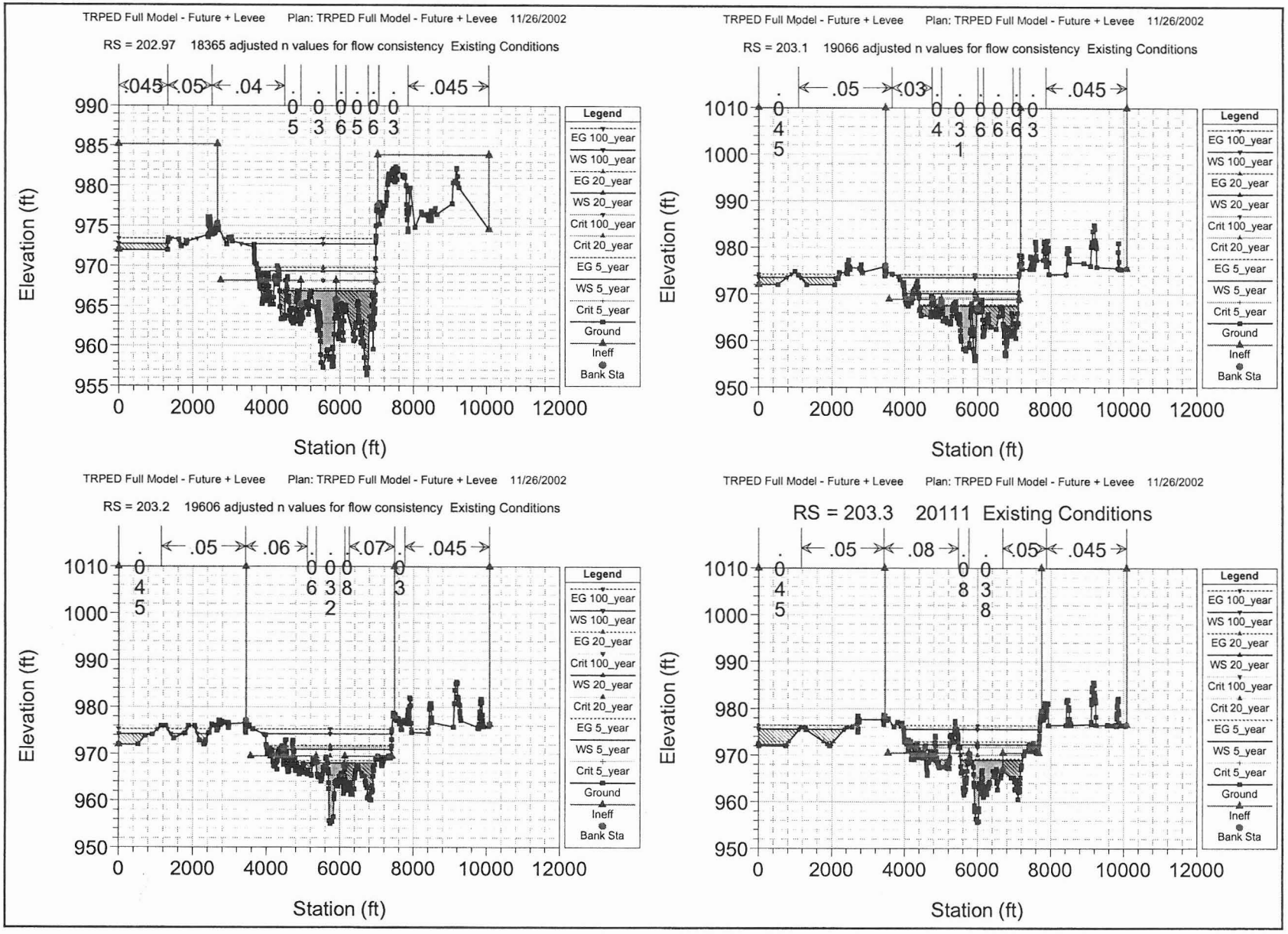


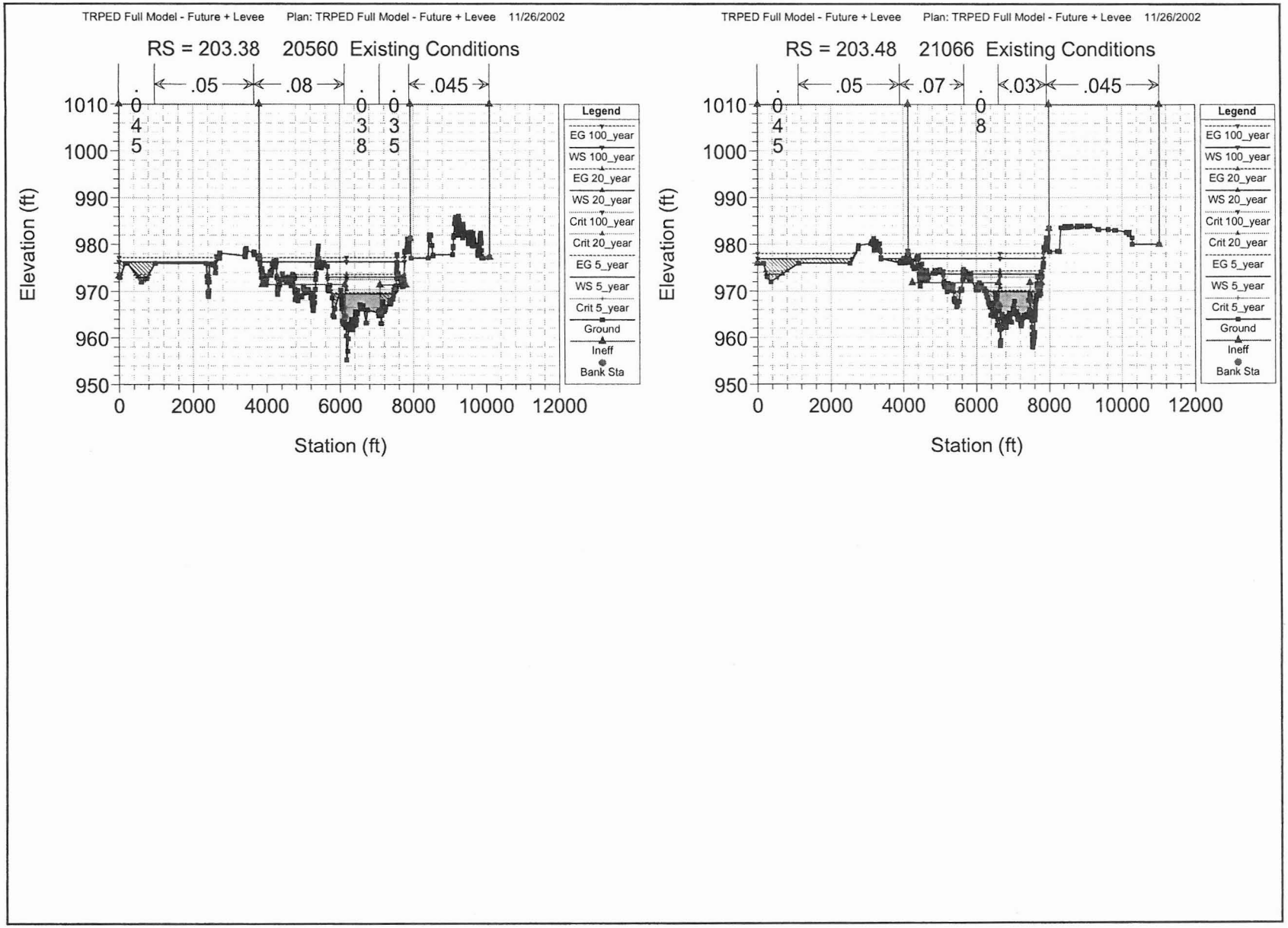
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002

RS = 202.54 16111 adjusted n values for flow consistency Existing Conditions




TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.61 16491 adjusted n values for flow consistency Existing Conditions
.045 .05 .1 .03 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.69 16903adjusted n values for flow consistency Existing Conditions
.045 .05 .03 .06 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.78 17381 adjusted n values for flow consistency Existing Conditions
.045 .05 .04 .06 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.85 17749 adjusted n values for flow consistency Existing Conditions
.045 .05 .03 .07 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 202.97 18365 adjusted n values for flow consistency Existing Conditions
.045 .05 .04 .045
0 0 0 0 0 0 0 0
5 3 6 5 6 3
Elevation (ft)
990
985
980
975
970
965
960
955
0 2000 4000 6000 8000 10000 12000
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 203.1 19066 adjusted n values for flow consistency Existing Conditions
.045 .05 .03 .045
0 0 0 0 0 0 0 0
4 3 6 6 6 3
5 1
Elevation (ft)
1010
1000
990
980
970
960
950
0 2000 4000 6000 8000 10000 12000
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 203.2 19606 adjusted n values for flow consistency Existing Conditions
.045 .05 .06 .07 .045
0 0 0 0 0
4 6 3 8 3
5 2
Elevation (ft)
1010
1000
990
980
970
960
950
0 2000 4000 6000 8000 10000 12000
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 203.3 20111 Existing Conditions
.045 .05 .08 .05 .045
0 0 0
4 8 3
5 8
Elevation (ft)
1010
1000
990
980
970
960
950
0 2000 4000 6000 8000 10000 12000
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 203.38 20560 Existing Conditions
.05
.08
.045
.045
.038
.035
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 203.48 21066 Existing Conditions
.05
.07
.03
.045
.045
.08
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta

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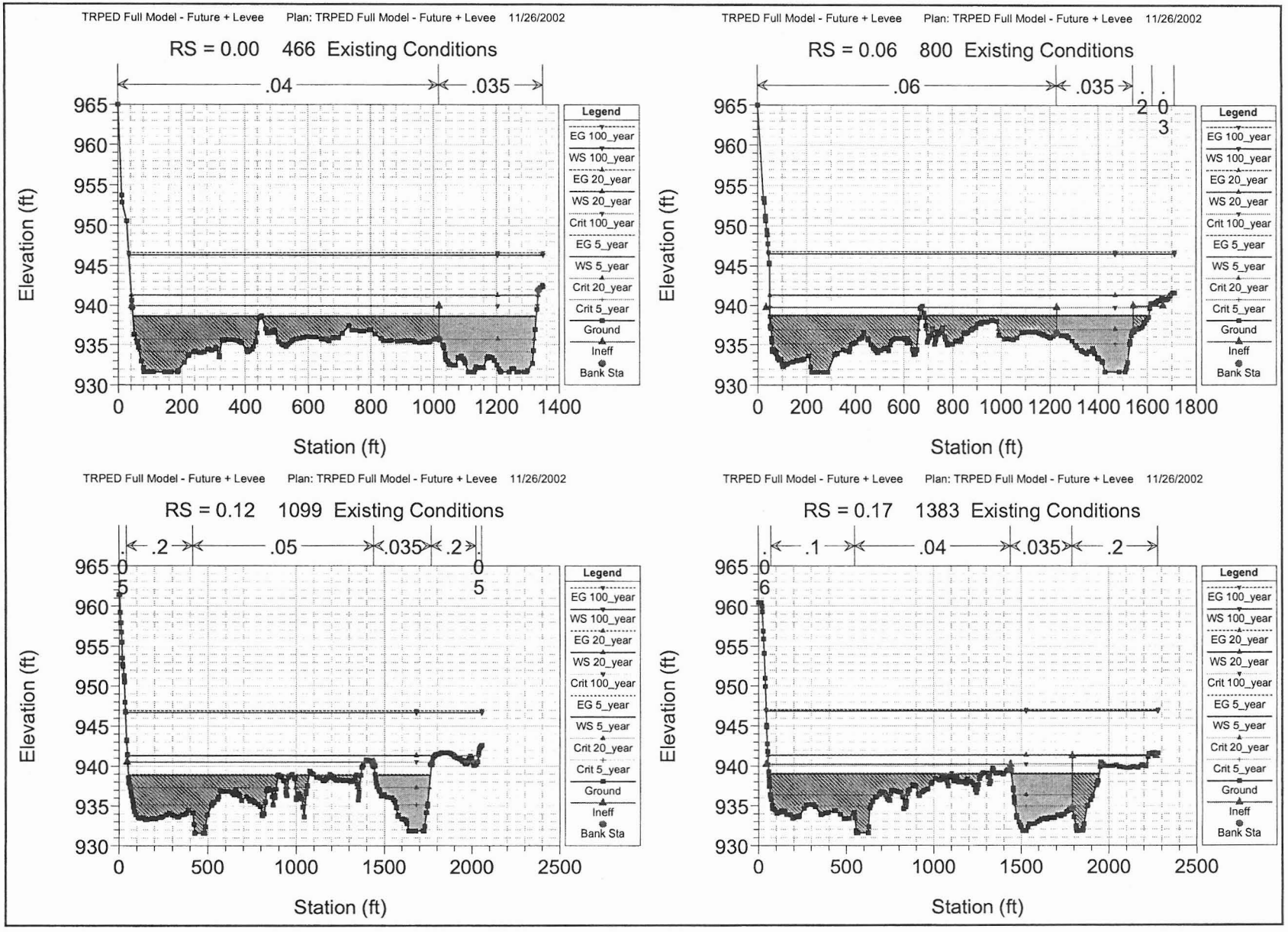
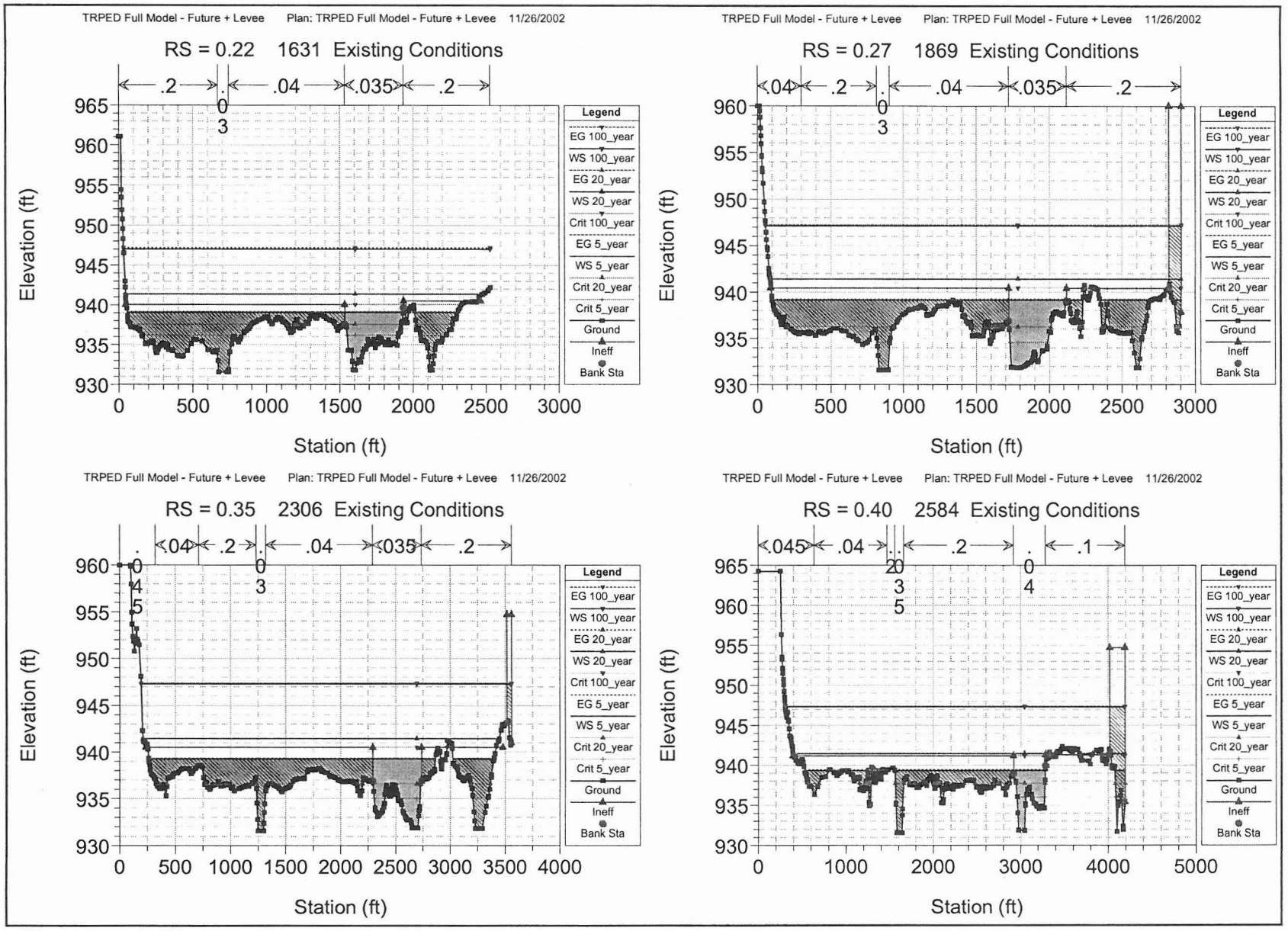
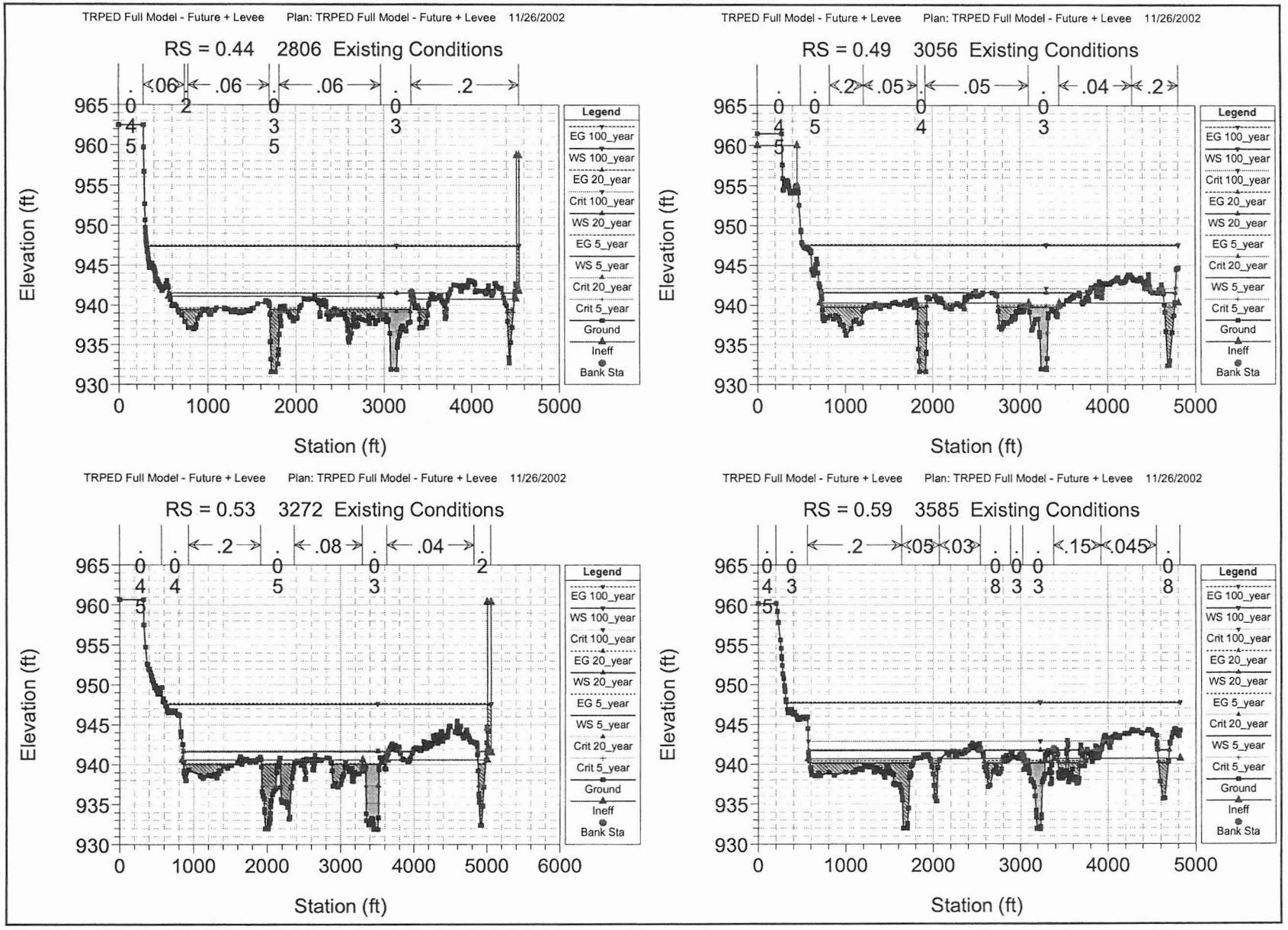
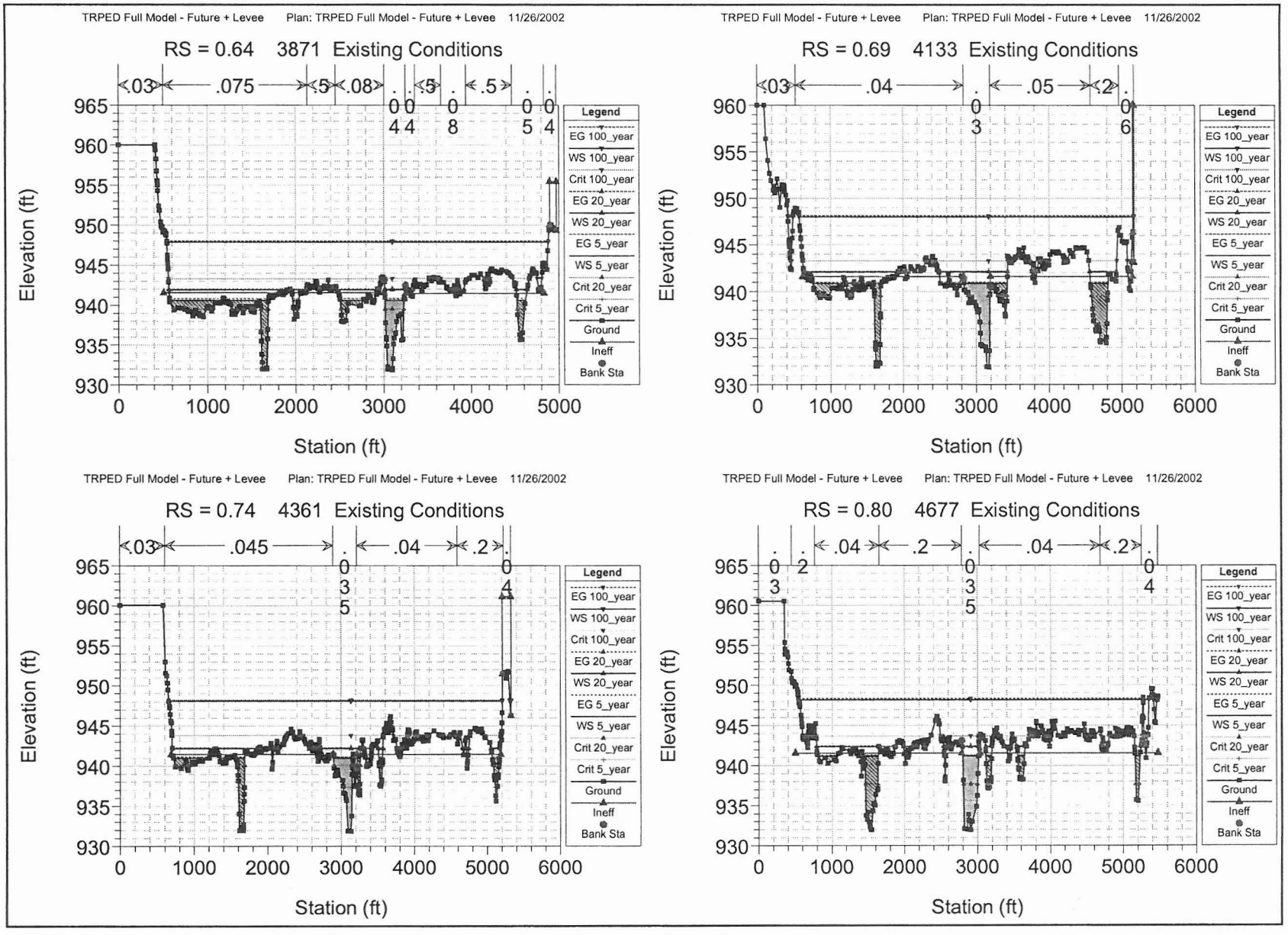
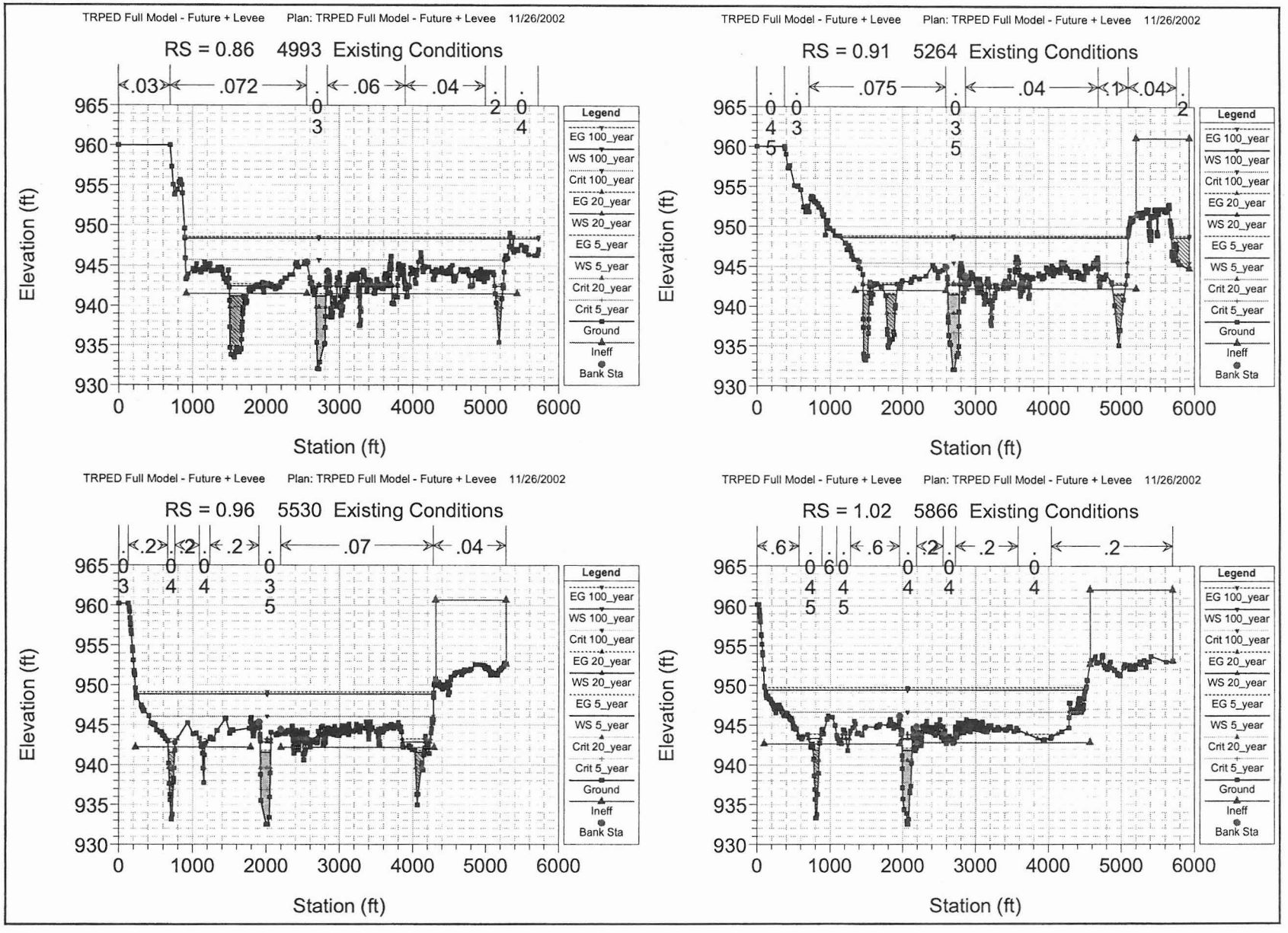
Cross Section Plots for the Upper Gila

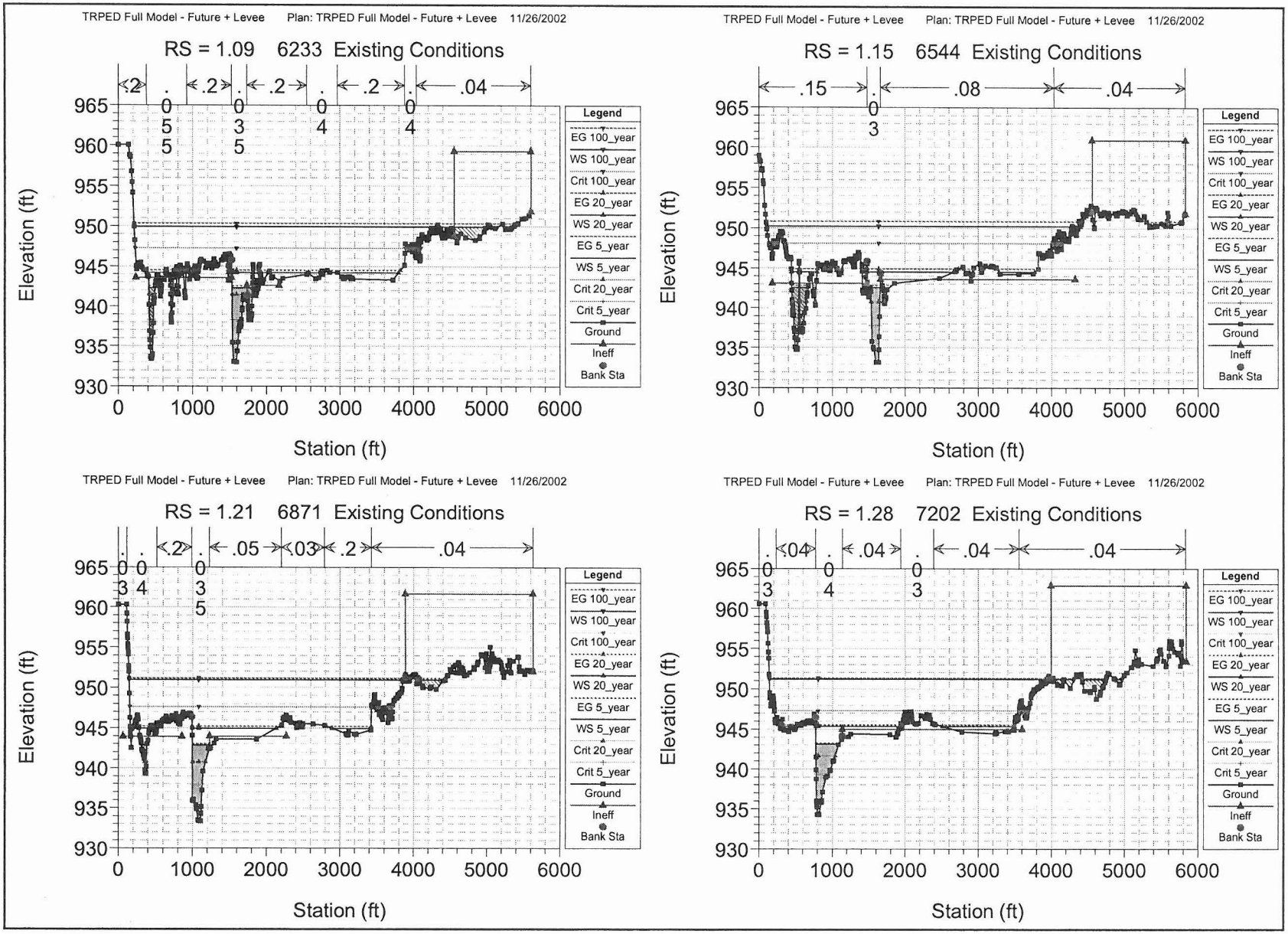

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.00 466 Existing Conditions
.04
.035
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.06 800 Existing Conditions
.06
.035
.2
.03
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.12 1099 Existing Conditions
.2
.05
.035
.2
.05
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.17 1383 Existing Conditions
.1
.04
.035
.2
.06
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta

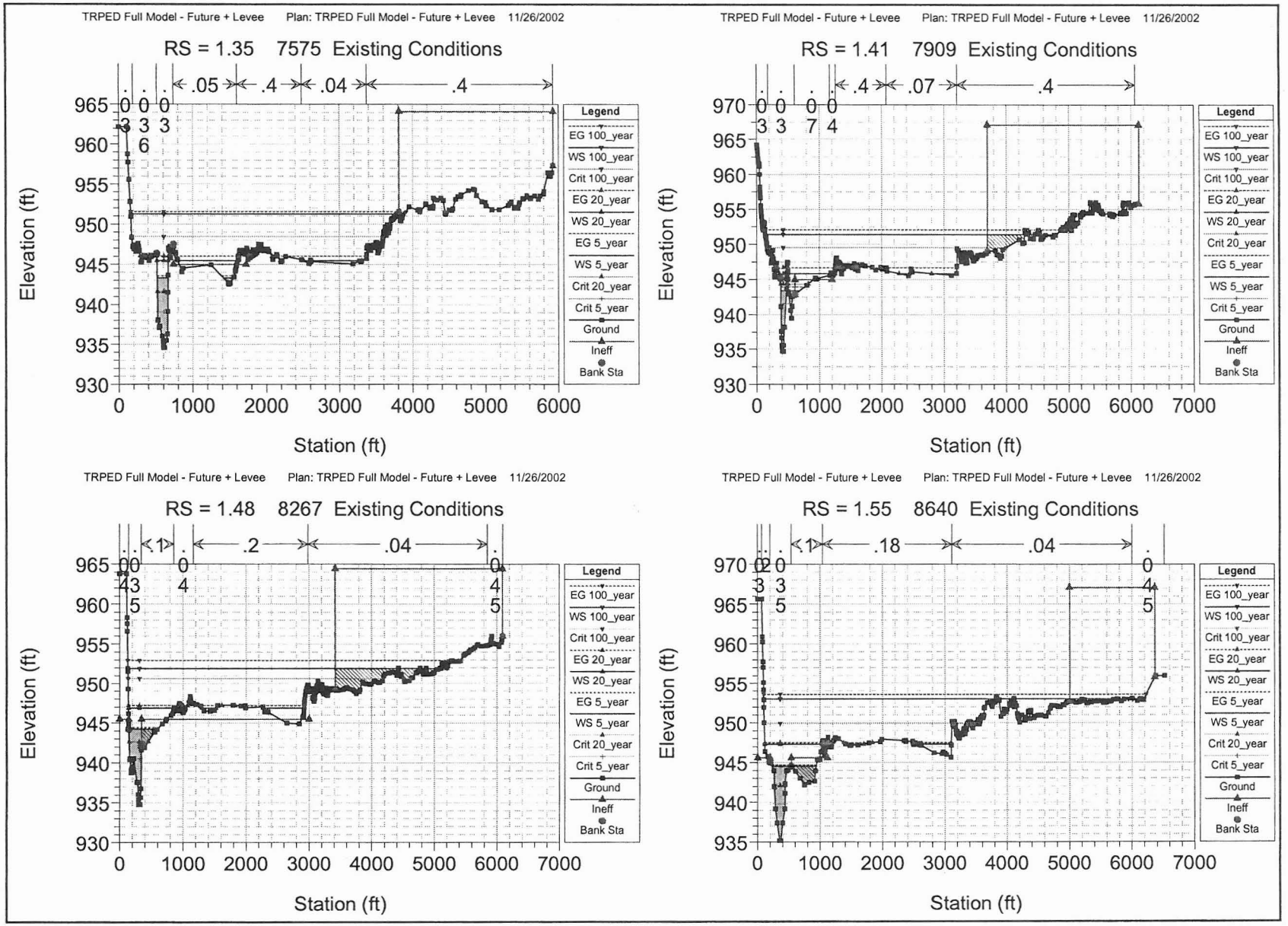

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.22 1631 Existing Conditions
.2 .03 .04 .035 .2
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.27 1869 Existing Conditions
.04 .2 .03 .04 .035 .2
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.35 2306 Existing Conditions
.045 .04 .2 .03 .04 .035 .2
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.40 2584 Existing Conditions
.045 .04 .2 .0235 .04 .1
Elevation (ft)
Station (ft)

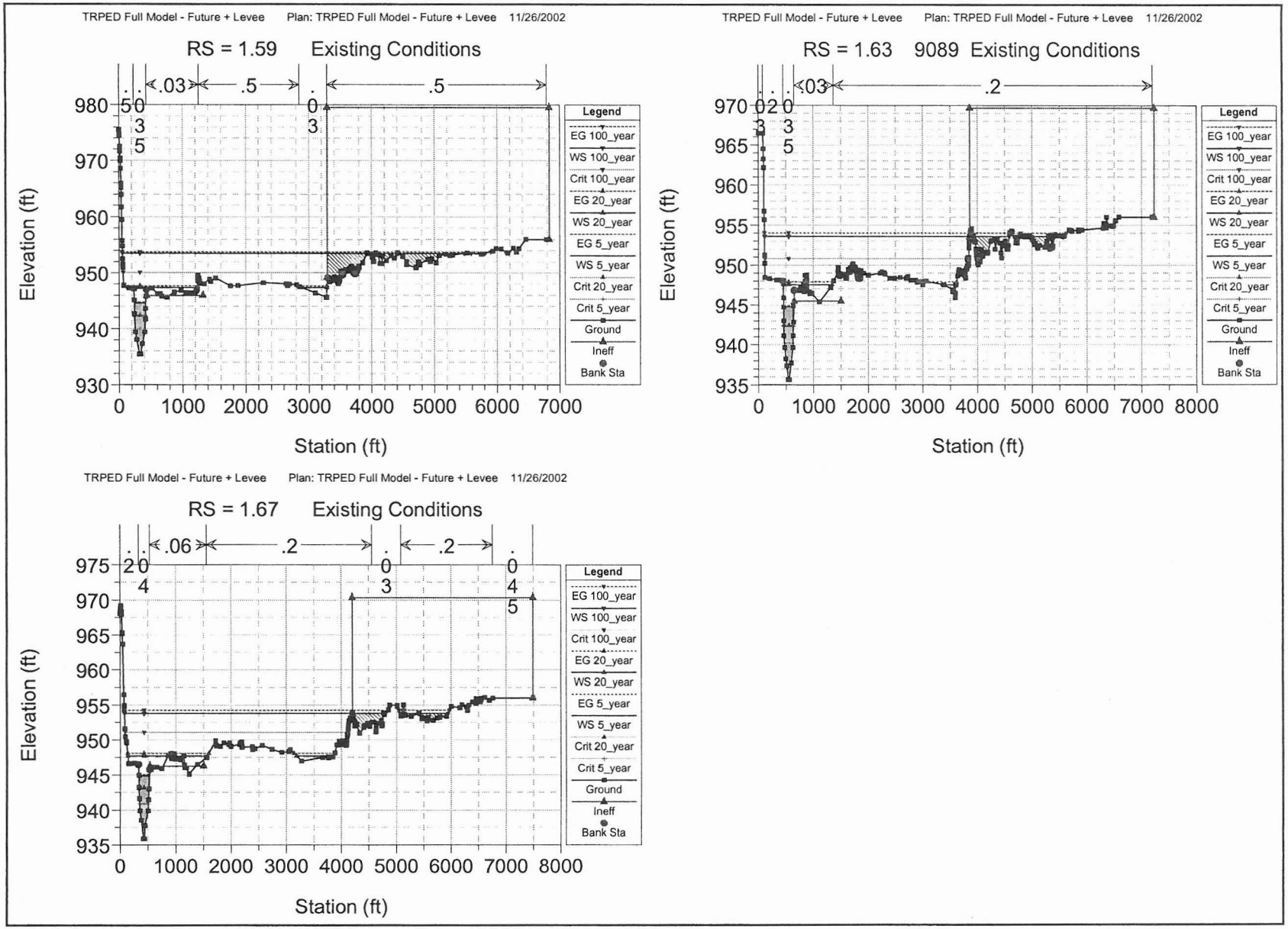

TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.44 2806 Existing Conditions
.06 .06 .06 .2
0 4 5 0 2 0 3 5 0 3
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.49 3056 Existing Conditions
.2 .05 .05 .04 .2
0 4 5 0 5 0 4 0 3
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.53 3272 Existing Conditions
.2 .08 .04
0 4 5 0 4 0 5 0 3 2
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.59 3585 Existing Conditions
.2 .05 .03 .15 .045
0 4 3 5 0 8 0 3 0 3 0 8
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.64 3871 Existing Conditions
.03 .075 .5 .08 .5 .5
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.69 4133 Existing Conditions
.03 .04 .05 .2
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.74 4361 Existing Conditions
.03 .045 .04 .2
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.80 4677 Existing Conditions
.04 .2 .04 .2
Elevation (ft)
Station (ft)


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.86 4993 Existing Conditions
.03 .072 .06 .04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.91 5264 Existing Conditions
.075 .04 .1 .04
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 0.96 5530 Existing Conditions
.2 .2 .2 .07 .04
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.02 5866 Existing Conditions
.6 .6 .2 .2
Elevation (ft)
Station (ft)


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.09 6233 Existing Conditions
.2 .2 .2 .2 .04
0.055 0.035 0.04 0.04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.15 6544 Existing Conditions
.15 .08 .04
0.03
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.21 6871 Existing Conditions
.2 .05 .03 .2 .04
0.03 0.04 0.035
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.28 7202 Existing Conditions
.04 .04 .04 .04
0.03 0.04 0.03
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.35 7575 Existing Conditions
.05
.4
.04
.4
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.41 7909 Existing Conditions
.4
.07
.4
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.48 8267 Existing Conditions
.1
.2
.04
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.55 8640 Existing Conditions
.1
.18
.04
Elevation (ft)
Station (ft)


TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.59 Existing Conditions
.03
.5
.5
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.63 9089 Existing Conditions
.03
.2
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee Plan: TRPED Full Model - Future + Levee 11/26/2002
RS = 1.67 Existing Conditions
.06
.2
.2
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta

APPENDIX G

Future Conditions With Levee & Ponds HEC-RAS Model Results

i. 5-, 20-, 100-Year Standard Table
ii. Cross Section Plots for the Lower Gila
iii. Cross Section Plots for the Salt
iv. Cross Section Plots for the Upper Gila

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5-, 20-, 100-Year Standard Table

HEC-RAS Plan: no balance River: Gila Reach: Lower Gila

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)	
Lower Gila	195.16	5_year	23500.00	891.00	903.68	899.99	904.02	0.001660	4.67	5027.43	1685.71	0.35
Lower Gila	195.16	20_year	92000.00	891.00	907.15	905.01	907.77	0.001658	6.48	14730.56	1937.37	0.38
Lower Gila	195.16	100_year	227000.00	891.00	913.24	906.89	914.48	0.001660	9.18	25593.24	3706.96	0.42
Lower Gila	195.2	5_year	23500.00	891.00	904.00	900.50	904.32	0.001322	4.56	5154.64	1722.58	0.32
Lower Gila	195.2	20_year	92000.00	891.00	907.55	905.05	908.09	0.001279	6.06	15818.91	1838.68	0.34
Lower Gila	195.2	100_year	227000.00	891.00	913.69	906.80	914.82	0.001428	8.86	26653.41	3604.26	0.39
Lower Gila	195.21		Bridge									
Lower Gila	195.22	5_year	23500.00	891.00	904.32	900.34	904.61	0.001179	4.34	5420.89	1719.58	0.30
Lower Gila	195.22	20_year	92000.00	891.00	907.89	905.12	908.41	0.001247	6.01	15983.38	1838.12	0.34
Lower Gila	195.22	100_year	227000.00	891.00	914.13	906.98	915.23	0.001375	8.76	26998.03	4098.17	0.38
Lower Gila	195.28	5_year	23500.00	892.60	904.44	900.89	904.83	0.001641	4.98	4718.46	1617.99	0.36
Lower Gila	195.28	20_year	92000.00	892.60	908.02	905.19	908.63	0.001666	6.56	14932.43	2117.38	0.38
Lower Gila	195.28	100_year	227000.00	892.60	914.30	907.83	915.42	0.001524	8.92	26880.32	4192.71	0.40
Lower Gila	195.34	5_year	23500.00	892.60	905.01	900.45	905.23	0.000866	3.78	6209.33	1807.33	0.26
Lower Gila	195.34	20_year	92000.00	892.60	908.55	905.14	909.15	0.001556	6.79	15468.52	2101.84	0.38
Lower Gila	195.34	100_year	227000.00	892.60	914.93	908.43	915.90	0.001311	8.66	29641.12	4086.70	0.38
Lower Gila	195.45	5_year	23500.00	896.41	905.25	902.26	905.61	0.001581	4.77	4925.28	1769.79	0.35
Lower Gila	195.45	20_year	92000.00	896.41	909.00	906.06	909.68	0.001959	7.40	14778.90	2238.41	0.42
Lower Gila	195.45	100_year	227000.00	896.41	915.35	909.54	916.29	0.001408	8.81	30373.41	3801.50	0.39
Lower Gila	195.55	5_year	23500.00	897.89	906.09	902.58	906.45	0.001426	4.84	4857.87	1717.04	0.34
Lower Gila	195.55	20_year	92000.00	897.89	910.05	906.47	910.73	0.001766	7.42	14887.17	2290.63	0.41
Lower Gila	195.55	100_year	227000.00	897.89	916.13	910.67	917.11	0.001455	9.15	29698.54	4455.60	0.40
Lower Gila	195.65	5_year	23500.00	897.58	906.62	902.49	907.16	0.001093	5.91	3978.59	1318.15	0.44
Lower Gila	195.65	20_year	92000.00	897.58	910.75	908.33	911.76	0.001752	9.07	12778.51	1952.01	0.53
Lower Gila	195.65	100_year	227000.00	897.58	916.64	912.65	918.05	0.001618	11.24	26607.39	3518.52	0.51
Lower Gila	195.77	5_year	23500.00	897.58	907.17	904.54	907.99	0.001756	7.27	3234.16	1486.39	0.57
Lower Gila	195.77	20_year	92000.00	897.58	911.88	909.30	912.69	0.001573	8.31	13977.09	2132.26	0.49
Lower Gila	195.77	100_year	227000.00	897.58	917.80	913.00	918.90	0.001373	10.00	28859.42	4554.36	0.46
Lower Gila	195.86	5_year	23500.00	897.39	908.44	904.69	908.79	0.000892	4.77	4929.71	1436.37	0.33
Lower Gila	195.86	20_year	92000.00	897.39	912.88	909.75	913.55	0.001290	7.40	15240.24	2286.11	0.40
Lower Gila	195.86	100_year	227000.00	897.39	918.74	913.40	919.67	0.001188	9.24	32091.32	4590.93	0.40
Lower Gila	195.98	5_year	23500.00	899.24	909.02	904.24	909.29	0.001116	4.19	5614.28	2714.89	0.28
Lower Gila	195.98	20_year	92000.00	899.24	913.67	909.40	914.20	0.001340	6.35	17290.75	3402.80	0.33
Lower Gila	195.98	100_year	227000.00	899.24	919.54	913.22	920.27	0.001203	7.83	36174.29	6538.21	0.33
Lower Gila	196.08	5_year	23500.00	899.26	909.44	907.50	910.83	0.003735	9.45	2486.65	2793.69	0.71
Lower Gila	196.08	20_year	92000.00	899.26	914.69	913.15	915.56	0.002371	9.57	18917.63	4508.90	0.60
Lower Gila	196.08	100_year	227000.00	899.26	920.26	916.06	921.44	0.001808	11.88	40662.43	8169.31	0.57
Lower Gila	196.14	5_year	23500.00	906.39	911.66	909.84	912.26	0.001988	6.21	3785.21	3457.61	0.50
Lower Gila	196.14	20_year	92000.00	906.39	915.97	913.16	916.37	0.000983	6.40	23087.42	4431.55	0.39
Lower Gila	196.14	100_year	227000.00	906.39	921.48	915.23	922.14	0.000890	8.52	46277.63	8144.36	0.40
Lower Gila	196.23	5_year	23500.00	901.72	912.44	908.91	912.67	0.000712	3.89	6044.09	3526.10	0.28
Lower Gila	196.23	20_year	92000.00	901.72	916.37	912.88	916.68	0.000729	5.40	25732.29	6148.08	0.31
Lower Gila	196.23	100_year	227000.00	901.72	922.01	915.87	922.41	0.000542	6.24	51143.66	7808.03	0.28
Lower Gila	196.32	5_year	23500.00	905.91	912.84	909.75	913.24	0.002009	5.07	4632.58	2698.00	0.38
Lower Gila	196.32	20_year	92000.00	905.91	916.79	914.63	917.20	0.001543	6.10	20230.06	6571.48	0.36
Lower Gila	196.32	100_year	227000.00	905.91	922.31	917.14	922.72	0.000804	6.03	45669.62	8375.33	0.28
Lower Gila	196.38	5_year	23500.00	906.38	913.56	909.92	913.86	0.000859	4.38	5362.20	2659.41	0.32
Lower Gila	196.38	20_year	92000.00	906.38	917.39	914.54	917.81	0.000983	6.19	21517.49	6644.98	0.36
Lower Gila	196.38	100_year	227000.00	906.38	922.63	917.70	923.09	0.000691	6.77	45357.18	8324.65	0.31
Lower Gila	196.44	5_year	23500.00	906.38	913.91	910.01	914.14	0.001020	3.83	6136.77	2383.01	0.27
Lower Gila	196.44	20_year	92000.00	906.38	917.77	914.14	918.12	0.001161	5.54	21090.71	6718.75	0.31
Lower Gila	196.44	100_year	227000.00	906.38	922.87	917.74	923.30	0.000774	5.95	44278.57	8841.32	0.27
Lower Gila	196.5	5_year	23500.00	906.38	914.24	910.18	914.47	0.001025	3.84	6124.57	2743.69	0.27
Lower Gila	196.5	20_year	92000.00	906.38	918.12	914.52	918.45	0.000869	4.84	22097.91	5454.89	0.27
Lower Gila	196.5	100_year	227000.00	906.38	923.11	917.47	923.57	0.000807	6.09	43326.20	8664.76	0.28
Lower Gila	196.57	5_year	23500.00	906.38	914.62	910.73	914.84	0.001158	3.75	6258.55	2577.02	0.27
Lower Gila	196.57	20_year	92000.00	906.38	918.41	914.79	918.74	0.000832	4.32	22565.44	5667.96	0.24
Lower Gila	196.57	100_year	227000.00	906.38	923.39	917.07	923.87	0.000918	5.94	44260.05	8368.28	0.27
Lower Gila	196.63	5_year	23500.00	906.38	915.01	910.27	915.16	0.000673	3.12	7525.14	2967.39	0.21
Lower Gila	196.63	20_year	92000.00	906.38	918.71	914.13	919.02	0.000662	4.09	23521.04	4551.55	0.22
Lower Gila	196.63	100_year	227000.00	906.38	923.71	916.74	924.18	0.000797	5.80	44644.27	8144.28	0.26

HEC-RAS Plan: no balance River: Gila Reach: Lower Gila (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)	
Lower Gila	196.69	5_year	23500.00	906.54	915.25	909.98	915.36	0.000573	2.63	8949.10	3023.59	0.17
Lower Gila	196.69	20_year	92000.00	906.54	918.98	913.55	919.21	0.000571	3.43	26813.71	4117.78	0.18
Lower Gila	196.69	100_year	227000.00	906.54	924.02	916.59	924.42	0.000722	4.96	47563.96	8643.27	0.22
Lower Gila	196.75	5_year	23500.00	906.28	915.44	910.95	915.60	0.000892	3.19	7367.84	2886.52	0.23
Lower Gila	196.75	20_year	92000.00	906.28	919.16	914.98	919.40	0.000565	3.51	27358.19	3794.34	0.20
Lower Gila	196.75	100_year	227000.00	906.28	924.23	916.87	924.67	0.000719	5.31	47345.95	7602.57	0.24
Lower Gila	196.81	5_year	23500.00	906.40	915.69	911.58	915.89	0.000764	3.59	6545.33	2726.00	0.26
Lower Gila	196.81	20_year	92000.00	906.40	919.32	915.80	919.58	0.000497	3.97	24727.48	3314.30	0.23
Lower Gila	196.81	100_year	227000.00	906.40	924.42	916.91	924.91	0.000638	6.02	44008.78	4031.77	0.28
Lower Gila	196.87	5_year	23500.00	906.40	915.83	912.20	916.14	0.000803	4.46	5264.31	2432.98	0.34
Lower Gila	196.87	20_year	92000.00	906.40	919.43	916.65	919.74	0.000515	4.52	22625.91	3196.58	0.27
Lower Gila	196.87	100_year	227000.00	906.40	924.53	917.41	925.12	0.000668	6.77	40998.50	3995.04	0.32
Lower Gila	196.94	5_year	23500.00	906.40	916.09	912.09	916.45	0.001105	4.82	4876.31	2290.10	0.37
Lower Gila	196.94	20_year	92000.00	906.40	919.60	916.96	919.90	0.000548	4.21	22007.09	3295.87	0.26
Lower Gila	196.94	100_year	227000.00	906.40	924.79	918.01	925.33	0.000661	6.09	41061.07	4030.45	0.29
Lower Gila	196.99	5_year	23500.00	906.40	916.63	912.98	916.96	0.001730	4.60	5103.99	2371.67	0.37
Lower Gila	196.99	20_year	92000.00	906.40	919.79	917.47	920.13	0.000588	3.52	22264.86	3208.50	0.22
Lower Gila	196.99	100_year	227000.00	906.40	925.02	918.64	925.59	0.000680	5.29	41057.55	4154.58	0.26
Lower Gila	197.05	5_year	23500.00	908.12	917.15	913.35	917.43	0.001380	4.28	5487.56	2677.32	0.34
Lower Gila	197.05	20_year	92000.00	908.12	919.96	917.94	920.30	0.000564	3.46	23841.63	3269.83	0.22
Lower Gila	197.05	100_year	227000.00	908.12	925.25	918.82	925.79	0.000645	5.22	43445.50	4050.90	0.26
Lower Gila	197.09	5_year	23500.00	908.08	917.48	914.15	917.79	0.001194	4.43	5299.86	2898.84	0.35
Lower Gila	197.09	20_year	92000.00	908.08	920.23	918.30	920.48	0.000608	3.90	24313.31	3648.62	0.26
Lower Gila	197.09	100_year	227000.00	908.08	925.57	918.68	925.99	0.000612	5.64	45439.20	4239.48	0.28
Lower Gila	197.14	5_year	23500.00	909.26	917.88	914.55	918.09	0.001350	3.73	6299.40	2649.42	0.29
Lower Gila	197.14	20_year	92000.00	909.26	920.34	918.36	920.76	0.001575	5.35	18069.97	3240.22	0.34
Lower Gila	197.14	100_year	227000.00	909.26	925.66	920.12	926.23	0.001104	6.54	38336.88	4263.15	0.32
Lower Gila	197.16	5_year	23500.00	909.80	918.13	915.18	918.38	0.001052	4.07	5772.33	2768.35	0.31
Lower Gila	197.16	20_year	92000.00	909.80	920.69	918.88	921.08	0.001156	5.54	19722.95	3126.54	0.35
Lower Gila	197.16	100_year	227000.00	909.80	925.88	919.97	926.53	0.001167	7.81	39073.38	4387.94	0.38
Lower Gila	197.18	5_year	23500.00	910.95	918.29	915.10	918.51	0.000839	3.78	6224.46	2883.82	0.29
Lower Gila	197.18	20_year	92000.00	910.95	920.90	918.80	921.22	0.000869	4.94	21966.54	3263.09	0.32
Lower Gila	197.18	100_year	227000.00	910.95	926.10	919.67	926.68	0.000942	7.18	41753.46	4516.34	0.35
Lower Gila	197.23	5_year	23500.00	910.88	918.33	915.48	918.67	0.001253	4.67	5032.56	2760.01	0.39
Lower Gila	197.23	20_year	92000.00	910.88	920.97	919.18	921.35	0.000928	4.81	21344.83	3237.93	0.34
Lower Gila	197.23	100_year	227000.00	910.88	926.19	920.06	926.81	0.001004	6.86	41691.08	4790.34	0.36
Lower Gila	197.28	5_year	23500.00	910.50	918.66	914.55	918.88	0.000569	3.76	6242.79	2790.35	0.27
Lower Gila	197.28	20_year	92000.00	910.50	921.22	918.82	921.55	0.000643	4.72	22533.69	3160.59	0.30
Lower Gila	197.28	100_year	227000.00	910.50	926.45	919.80	927.03	0.000792	6.71	42326.39	4559.35	0.34
Lower Gila	197.33	5_year	23500.00	911.65	918.71	916.01	919.14	0.001345	5.27	4460.74	2776.90	0.43
Lower Gila	197.33	20_year	92000.00	911.65	921.38	919.65	921.73	0.000793	4.76	21161.93	3158.59	0.34
Lower Gila	197.33	100_year	227000.00	911.65	926.66	920.09	927.23	0.000892	6.77	40914.32	4502.53	0.35
Lower Gila	197.38	5_year	23500.00	911.90	919.17	916.79	919.68	0.002928	5.73	4101.04	2668.91	0.51
Lower Gila	197.38	20_year	92000.00	911.90	921.51	920.19	921.96	0.000749	3.55	19710.73	3088.36	0.25
Lower Gila	197.38	100_year	227000.00	911.90	926.83	921.17	927.49	0.000859	5.56	38876.28	4480.77	0.29
Lower Gila	197.42	5_year	23500.00	911.90	919.74	917.93	920.32	0.001855	6.14	3824.50	2712.14	0.54
Lower Gila	197.42	20_year	92000.00	911.90	921.76	920.83	922.15	0.000619	3.89	20096.43	3222.28	0.30
Lower Gila	197.42	100_year	227000.00	911.90	927.09	920.83	927.71	0.000750	5.84	39348.02	4321.29	0.32
Lower Gila	197.48	5_year	23500.00	911.90	920.16	918.49	920.93	0.002860	7.00	3358.42	2663.65	0.63
Lower Gila	197.48	20_year	92000.00	911.90	921.90	921.41	922.30	0.000606	3.49	19591.99	3234.37	0.28
Lower Gila	197.48	100_year	227000.00	911.90	927.26	921.41	927.89	0.000714	5.27	39878.20	4227.79	0.30
Lower Gila	197.53	5_year	23500.00	911.90	921.11	918.16	921.53	0.001295	5.22	4497.92	2720.84	0.42
Lower Gila	197.53	20_year	92000.00	911.90	922.09	921.81	922.54	0.000746	3.76	18143.56	2995.02	0.29
Lower Gila	197.53	100_year	227000.00	911.90	927.46	921.81	928.15	0.000734	5.43	37982.63	4315.58	0.30
Lower Gila	197.58	5_year	23500.00	911.90	921.42	917.42	921.83	0.000948	5.12	4592.79	2439.16	0.39
Lower Gila	197.58	20_year	92000.00	911.90	922.15	922.01	922.95	0.001900	7.57	13275.68	2555.56	0.56
Lower Gila	197.58	100_year	227000.00	911.90	927.51	923.40	928.50	0.001428	8.89	31818.18	4332.03	0.48
Lower Gila	197.64	5_year	23500.00	911.90	921.76	916.39	922.01	0.000432	4.01	5863.75	2340.25	0.28
Lower Gila	197.64	20_year	92000.00	911.90	922.66	922.23	923.38	0.001407	7.44	14003.75	2526.64	0.50
Lower Gila	197.64	100_year	227000.00	911.90	927.96	923.73	928.85	0.001140	8.34	33773.56	4454.99	0.43

HEC-RAS Plan: no balance River: Gila Reach: Lower Gila (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)	
Lower Gila	197.7	5_year	23500.00	911.90	921.89	917.94	922.17	0.000631	4.24	5536.22	2395.61	0.31
Lower Gila	197.7	20_year	92000.00	911.90	923.19	922.82	923.81	0.001306	6.79	14975.26	2806.08	0.45
Lower Gila	197.7	100_year	227000.00	911.90	928.33	923.84	929.20	0.001113	8.61	33519.37	4586.90	0.44
Lower Gila	197.75	5_year	23500.00	911.90	922.15	918.21	922.38	0.000644	3.79	6199.82	2745.30	0.27
Lower Gila	197.75	20_year	92000.00	911.90	923.74	922.40	924.17	0.000967	5.35	17910.93	2911.88	0.34
Lower Gila	197.75	100_year	227000.00	911.90	928.85	923.46	929.54	0.000944	7.36	35812.69	4497.77	0.37
Lower Gila	197.81	5_year	23500.00	912.13	922.31	919.10	922.63	0.001071	4.52	5197.06	2452.90	0.35
Lower Gila	197.81	20_year	92000.00	912.13	923.97	923.26	924.52	0.001265	5.87	16138.96	2761.64	0.40
Lower Gila	197.81	100_year	227000.00	912.13	929.02	924.21	929.88	0.001139	7.95	32502.72	4046.70	0.41
Lower Gila	197.87	5_year	23500.00	912.14	922.64	919.72	922.98	0.001297	4.73	4971.09	2260.68	0.36
Lower Gila	197.87	20_year	92000.00	912.14	924.34	923.59	924.95	0.001509	5.62	15417.77	2719.47	0.40
Lower Gila	197.87	100_year	227000.00	912.14	929.42	925.07	930.23	0.001209	7.33	32216.29	3965.41	0.40
Lower Gila	197.92	5_year	23500.00	912.14	923.02	919.36	923.34	0.000893	4.51	5213.64	2615.89	0.33
Lower Gila	197.92	20_year	92000.00	912.14	924.93	923.92	925.40	0.001237	6.02	17379.32	2955.71	0.40
Lower Gila	197.92	100_year	227000.00	912.14	929.92	924.94	930.62	0.001133	7.46	34627.27	3951.13	0.41
Lower Gila	197.95	5_year	23500.00	912.14	923.27	919.51	923.57	0.000862	4.38	5370.59	2338.38	0.33
Lower Gila	197.95	20_year	92000.00	912.14	925.14	924.15	925.92	0.002111	7.70	14584.80	2759.33	0.53
Lower Gila	197.95	100_year	227000.00	912.14	930.03	926.41	931.10	0.001730	9.29	31237.16	3989.53	0.52
Lower Gila	197.98	5_year	23500.00	915.60	923.19	922.20	923.97	0.004290	7.09	3312.67	2177.93	0.67
Lower Gila	197.98	20_year	92000.00	915.60	925.61	924.53	926.37	0.004240	8.43	14991.14	2969.87	0.70
Lower Gila	197.98	100_year	227000.00	915.60	930.27	926.68	931.49	0.002786	10.83	31177.74	3928.16	0.64
Lower Gila	198.03	5_year	23500.00	917.47	923.77	922.77	924.84	0.004853	8.29	2836.28	2647.91	0.72
Lower Gila	198.03	20_year	92000.00	917.47	926.42	925.36	926.83	0.001570	5.19	18626.83	3335.26	0.43
Lower Gila	198.03	100_year	227000.00	917.47	931.18	926.21	931.87	0.001369	7.72	35774.43	3867.66	0.45
Lower Gila	198.08	5_year	23500.00	917.90	925.16	923.18	925.74	0.002370	6.08	3864.48	2610.17	0.51
Lower Gila	198.08	20_year	92000.00	917.90	926.79	926.25	927.35	0.002013	6.27	15803.35	3019.56	0.49
Lower Gila	198.08	100_year	227000.00	917.90	931.45	927.27	932.36	0.001766	8.94	31870.59	3767.80	0.51
Lower Gila	198.15	5_year	23500.00	918.06	925.77	924.29	926.38	0.002848	6.25	3759.66	2788.24	0.58
Lower Gila	198.15	20_year	92000.00	918.06	927.27	926.89	927.65	0.000692	3.74	19498.60	2962.56	0.30
Lower Gila	198.15	100_year	227000.00	918.06	931.97	926.89	932.66	0.000758	6.12	35120.99	3604.83	0.35
Lower Gila	198.2	5_year	23500.00	917.83	926.77	924.48	927.28	0.002056	5.70	4121.27	2630.87	0.49
Lower Gila	198.2	20_year	92000.00	917.83	927.53	927.41	928.02	0.000932	4.24	17149.32	2747.83	0.34
Lower Gila	198.2	100_year	227000.00	917.83	932.21	927.45	933.07	0.001044	6.80	31575.45	3436.06	0.39
Lower Gila	198.26	5_year	23500.00	919.07	927.35	925.22	927.85	0.001727	5.65	4159.72	2400.59	0.47
Lower Gila	198.26	20_year	92000.00	919.07	927.87	927.61	928.39	0.001232	5.11	16039.84	2432.39	0.40
Lower Gila	198.26	100_year	227000.00	919.07	932.56	927.90	933.50	0.001443	8.45	29289.08	3286.48	0.48
Lower Gila	198.33	5_year	23500.00	920.97	927.88	925.51	928.29	0.001302	5.15	4564.57	2155.54	0.41
Lower Gila	198.33	20_year	92000.00	920.97	928.09	928.01	928.98	0.002099	6.70	12667.23	2169.60	0.52
Lower Gila	198.33	100_year	227000.00	920.97	932.80	929.45	934.13	0.002034	9.93	24766.94	3197.78	0.57
Lower Gila	198.4	5_year	23500.00	922.23	928.37	926.28	928.86	0.001539	5.61	4186.32	1879.60	0.45
Lower Gila	198.4	20_year	92000.00	922.23	928.87	928.81	929.81	0.002157	7.07	11898.87	1888.74	0.54
Lower Gila	198.4	100_year	227000.00	922.23	933.37	930.36	935.06	0.002260	10.24	21798.87	2947.33	0.61
Lower Gila	198.45	5_year	23500.00	922.19	929.01	926.42	929.37	0.001375	4.82	4880.54	2045.97	0.37
Lower Gila	198.45	20_year	92000.00	922.19	929.79	929.51	930.43	0.001407	5.32	14568.32	2079.36	0.38
Lower Gila	198.45	100_year	227000.00	922.19	934.64	930.18	935.81	0.001833	8.82	26946.93	3284.79	0.48
Lower Gila	198.49	5_year	23500.00	922.46	929.34	926.47	929.66	0.000884	4.55	5168.62	2314.95	0.34
Lower Gila	198.49	20_year	92000.00	922.46	930.25	930.23	930.77	0.001132	5.68	15861.07	2365.79	0.40
Lower Gila	198.49	100_year	227000.00	922.46	935.30	930.23	936.21	0.001167	8.37	30237.76	3269.75	0.44
Lower Gila	198.54	5_year	23500.00	922.67	929.56	926.95	929.88	0.000989	4.60	5110.23	2298.65	0.36
Lower Gila	198.54	20_year	92000.00	922.67	930.51	930.45	931.09	0.001359	5.97	15175.13	2422.38	0.43
Lower Gila	198.54	100_year	227000.00	922.67	935.57	930.81	936.53	0.001308	8.53	29386.10	3242.39	0.47
Lower Gila	198.6	5_year	23500.00	923.30	929.82	927.64	930.23	0.001428	5.10	4605.77	2368.74	0.42
Lower Gila	198.6	20_year	92000.00	923.30	930.91	930.78	931.49	0.001543	6.01	15111.77	2506.45	0.45
Lower Gila	198.6	100_year	227000.00	923.30	935.95	931.23	936.90	0.001365	8.52	29497.64	3211.16	0.47
Lower Gila	198.65	5_year	23500.00	923.88	930.31	928.11	930.69	0.001368	4.97	4729.42	2563.97	0.41
Lower Gila	198.65	20_year	92000.00	923.88	931.47	931.23	931.99	0.001363	5.61	16092.89	2704.82	0.43
Lower Gila	198.65	100_year	227000.00	923.88	936.47	931.58	937.34	0.001186	8.03	31089.11	3159.09	0.44
Lower Gila	198.7	5_year	23500.00	923.90	930.69	928.05	931.00	0.001006	4.50	5219.45	2752.07	0.36
Lower Gila	198.7	20_year	92000.00	923.90	931.92	931.54	932.30	0.000933	4.97	18733.35	2799.13	0.36
Lower Gila	198.7	100_year	227000.00	923.90	936.89	931.54	937.63	0.000976	7.58	33384.36	3094.79	0.41
Lower Gila	198.76	5_year	23500.00	923.90	930.96	928.29	931.26	0.000979	4.38	5363.82	2763.02	0.35

HEC-RAS Plan: no balance River: Gila Reach: Lower Gila (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)	
Lower Gila	198.76	20_year	92000.00	923.90	932.17	931.79	932.56	0.001043	5.24	18298.93	2834.64	0.38
Lower Gila	198.76	100_year	227000.00	923.90	937.13	931.79	937.90	0.001015	7.73	32821.61	3064.48	0.41
Lower Gila	198.8	5_year	23500.00	923.90	931.29	928.55	931.58	0.001274	4.34	5414.46	2395.79	0.34
Lower Gila	198.8	20_year	92000.00	923.90	932.40	932.14	932.94	0.001266	4.89	16337.98	2449.75	0.35
Lower Gila	198.8	100_year	227000.00	923.90	937.30	932.50	938.32	0.001362	7.38	28831.25	2804.29	0.40
Lower Gila	198.83	5_year	23500.00	923.90	931.51	928.99	931.85	0.001017	4.65	5052.03	2651.40	0.36
Lower Gila	198.83	20_year	92000.00	923.90	932.81	932.42	933.19	0.000923	5.01	18947.14	2801.15	0.36
Lower Gila	198.83	100_year	227000.00	923.90	937.87	932.42	938.59	0.000956	7.57	33810.82	3075.50	0.40
Lower Gila	198.88	5_year	23500.00	923.90	931.71	929.26	932.09	0.001627	4.96	4734.05	2722.55	0.39
Lower Gila	198.88	20_year	92000.00	923.90	932.99	932.65	933.37	0.000937	4.22	19424.61	2875.21	0.31
Lower Gila	198.88	100_year	227000.00	923.90	938.06	932.65	938.78	0.001001	6.60	34202.52	3012.72	0.35
Lower Gila	198.93	5_year	23500.00	923.90	932.12	929.09	932.45	0.001232	4.62	5091.25	2750.43	0.35
Lower Gila	198.93	20_year	92000.00	923.90	933.22	933.01	933.59	0.000790	4.06	19757.54	2854.67	0.29
Lower Gila	198.93	100_year	227000.00	923.90	938.33	933.01	939.02	0.000889	6.40	34637.68	2962.65	0.33
Lower Gila	198.97	5_year	23500.00	925.10	932.41	929.64	932.83	0.002013	5.18	4532.88	2854.62	0.39
Lower Gila	198.97	20_year	92000.00	925.10	933.36	933.11	933.81	0.001015	4.09	18238.29	2870.84	0.28
Lower Gila	198.97	100_year	227000.00	925.10	938.45	933.11	939.30	0.001226	6.61	31454.80	2958.56	0.34
Lower Gila	198.99	5_year	23500.00	925.10	932.89	929.80	933.26	0.001623	4.89	4810.55	2806.85	0.35
Lower Gila	198.99	20_year	92000.00	925.10	933.59	933.21	934.04	0.000905	3.89	18212.61	2884.73	0.27
Lower Gila	198.99	100_year	227000.00	925.10	938.71	933.21	939.58	0.001115	6.32	31041.61	2934.51	0.33
Lower Gila	199.02	5_year	23500.00	925.40	933.18	929.94	933.45	0.001523	4.12	5706.80	2778.10	0.30
Lower Gila	199.02	20_year	92000.00	925.40	933.65	933.41	934.16	0.000939	3.41	17782.17	2785.28	0.24
Lower Gila	199.02	100_year	227000.00	925.40	938.78	933.54	939.73	0.001188	5.73	30389.55	2866.85	0.30
Lower Gila	199.06	5_year	23500.00	925.40	933.46	929.93	933.67	0.001505	3.72	6320.33	2478.73	0.27
Lower Gila	199.06	20_year	92000.00	925.40	933.79	933.50	934.36	0.001764	4.18	16369.67	2482.83	0.30
Lower Gila	199.06	100_year	227000.00	925.40	938.89	933.83	940.02	0.002182	6.96	27413.94	2547.24	0.37
Lower Gila	199.11	5_year	23500.00	925.40	933.74	929.51	933.91	0.000856	3.24	7263.89	2772.38	0.23
Lower Gila	199.11	20_year	92000.00	925.40	934.29	933.31	934.99	0.003630	7.01	14373.83	2786.94	0.48
Lower Gila	199.11	100_year	227000.00	925.40	939.42	935.11	940.61	0.002806	9.02	27126.19	2821.21	0.46
Lower Gila	199.18	5_year	23500.00	925.40	933.99	931.60	934.40	0.002353	5.12	4586.63	2607.72	0.41
Lower Gila	199.18	20_year	92000.00	925.40	935.33	934.92	936.15	0.004775	8.60	14097.80	2670.53	0.61
Lower Gila	199.18	100_year	227000.00	925.40	940.21	936.50	941.65	0.003933	11.52	25950.64	2790.44	0.61
Lower Gila	199.19		Mult Open									
Lower Gila	199.21	5_year	23500.00	927.64	934.58	930.67	934.78	0.000757	3.53	6648.08	2391.77	0.25
Lower Gila	199.21	20_year	92000.00	927.64	936.43	935.29	936.86	0.001510	5.91	18692.99	2400.14	0.36
Lower Gila	199.21	100_year	227000.00	927.64	941.49	935.53	942.44	0.001769	8.79	30873.99	2444.67	0.42
Lower Gila	199.31	5_year	23500.00	928.11	934.96	931.52	935.20	0.000805	3.94	5958.28	2527.75	0.29
Lower Gila	199.31	20_year	92000.00	928.11	937.11	935.71	937.59	0.001268	6.08	17798.04	2626.32	0.38
Lower Gila	199.31	100_year	227000.00	928.11	942.27	936.73	943.21	0.001298	8.56	31421.40	2651.47	0.41
Lower Gila	199.38	5_year	23500.00	926.60	935.21	932.53	935.55	0.000833	4.70	5001.22	2384.81	0.36
Lower Gila	199.38	20_year	92000.00	926.60	937.57	936.09	938.03	0.000938	5.86	17848.36	2746.23	0.39
Lower Gila	199.38	100_year	227000.00	926.60	942.81	937.30	943.66	0.000939	8.19	32641.04	2853.46	0.41
Lower Gila	199.47	5_year	23500.00	926.60	935.64	932.29	935.90	0.000750	4.11	5714.88	2798.00	0.32
Lower Gila	199.47	20_year	92000.00	926.60	937.99	936.44	938.30	0.000536	4.41	22052.29	3011.06	0.28
Lower Gila	199.47	100_year	227000.00	926.60	943.33	936.45	943.95	0.000602	6.67	38215.32	3040.85	0.33

HEC-RAS Plan: no balance River: Salt Reach: Salt

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)	
Salt	199.55	5_year	19500.00	931.65	937.60	935.86	938.21	0.002084	6.29	3098.81	2109.69	0.51
Salt	199.55	20_year	82000.00	931.65	938.49	938.01	939.05	0.001722	6.43	13653.99	2125.68	0.48
Salt	199.55	100_year	162000.00	931.65	943.86	938.01	944.54	0.000993	7.67	25196.46	2160.05	0.41
Salt	199.69	5_year	19500.00	931.79	938.88	935.79	939.22	0.000879	4.73	4119.48	2098.75	0.35
Salt	199.69	20_year	82000.00	931.79	939.64	939.21	940.10	0.000980	5.43	15231.55	2130.20	0.37
Salt	199.69	100_year	162000.00	931.79	944.63	939.21	945.22	0.000719	6.78	26712.62	2479.41	0.35
Salt	199.86	5_year	19500.00	931.12	939.68	935.78	939.86	0.000577	3.45	5653.18	2233.73	0.24
Salt	199.86	20_year	82000.00	931.12	940.36	939.76	940.74	0.000552	3.59	17552.16	2251.83	0.24
Salt	199.86	100_year	162000.00	931.12	945.22	940.11	945.75	0.000491	4.84	28833.20	2711.15	0.25
Salt	199.98	5_year	19500.00	932.56	940.01	936.73	940.25	0.000619	3.94	4953.07	2014.90	0.29
Salt	199.98	20_year	82000.00	932.56	940.77	940.31	941.29	0.001289	6.15	15456.80	2030.58	0.43
Salt	199.98	100_year	162000.00	932.56	945.49	940.31	946.27	0.001098	8.09	25537.52	2526.39	0.43
Salt	200.02	5_year	19500.00	931.98	940.19	936.22	940.37	0.000458	3.42	5700.57	1732.22	0.24
Salt	200.02	20_year	82000.00	931.98	940.60	940.30	942.05	0.004041	10.60	9800.47	1750.80	0.72
Salt	200.02	100_year	162000.00	931.98	945.11	942.17	946.95	0.002662	12.16	18838.89	2551.98	0.64
Salt	200.11	5_year	19500.00	931.98	940.42	936.38	940.61	0.000574	3.54	5504.43	1783.33	0.24
Salt	200.11	20_year	82000.00	931.98	942.57	940.56	943.11	0.001242	6.28	14001.01	1966.24	0.38
Salt	200.11	100_year	162000.00	931.98	947.08	941.80	947.81	0.001040	7.61	24185.86	2782.00	0.37
Salt	200.22	5_year	19500.00	931.78	940.78	935.22	940.92	0.000472	3.03	6441.94	1964.51	0.20
Salt	200.22	20_year	82000.00	931.78	943.39	939.92	943.78	0.000952	5.23	16530.13	2495.51	0.30
Salt	200.22	100_year	162000.00	931.78	947.89	941.80	948.39	0.000827	6.27	29016.78	3223.00	0.29
Salt	200.31	5_year	19500.00	931.67	940.98	936.20	941.17	0.000571	3.50	5571.45	2216.19	0.24
Salt	200.31	20_year	82000.00	931.67	943.84	941.09	944.21	0.000821	5.33	17587.38	2680.38	0.31
Salt	200.31	100_year	162000.00	931.67	948.27	942.14	948.76	0.000707	6.43	30510.26	3412.63	0.31
Salt	200.4	5_year	19500.00	931.55	941.25	936.83	941.43	0.000521	3.47	5626.98	2183.10	0.23
Salt	200.4	20_year	82000.00	931.55	944.21	941.18	944.61	0.000802	5.44	17309.15	2730.10	0.31
Salt	200.4	100_year	162000.00	931.55	948.62	942.51	949.10	0.000647	6.23	31057.71	3480.27	0.29
Salt	200.47	5_year	19500.00	931.67	941.47	937.41	941.66	0.000592	3.51	5559.71	1985.13	0.25
Salt	200.47	20_year	82000.00	931.67	944.54	941.63	945.04	0.001123	6.26	15514.33	2506.53	0.36
Salt	200.47	100_year	162000.00	931.67	948.84	943.53	949.46	0.000891	7.19	27524.41	2968.98	0.34
Salt	200.52	5_year	19500.00	932.45	941.61	937.39	941.80	0.000639	3.54	5515.85	1759.61	0.25
Salt	200.52	20_year	82000.00	932.45	944.73	941.88	945.40	0.001545	7.25	13765.65	2406.82	0.42
Salt	200.52	100_year	162000.00	932.45	949.01	944.69	949.72	0.001077	7.79	25687.94	3067.91	0.38
Salt	200.6	5_year	19500.00	932.82	942.01	938.76	942.26	0.002069	4.04	4831.29	2100.73	0.31
Salt	200.6	20_year	82000.00	932.82	945.59	944.40	946.09	0.001686	5.11	16709.29	2584.06	0.30
Salt	200.6	100_year	162000.00	932.82	949.56	944.18	950.25	0.001465	6.07	28490.21	3332.52	0.30
Salt	200.68	5_year	19500.00	937.28	942.95	941.82	943.59	0.004031	6.40	3044.81	2225.48	0.59
Salt	200.68	20_year	82000.00	937.28	946.28	944.19	946.78	0.001452	5.86	17423.65	2877.96	0.39
Salt	200.68	100_year	162000.00	937.28	950.14	944.96	950.84	0.001217	7.18	29170.77	3333.48	0.39
Salt	200.75	5_year	19500.00	937.28	944.44	943.89	945.64	0.005986	8.79	2217.73	2592.73	0.83
Salt	200.75	20_year	82000.00	937.28	946.82	946.15	947.49	0.001884	6.14	16483.60	3026.37	0.49
Salt	200.75	100_year	162000.00	937.28	950.60	946.87	951.38	0.001368	7.66	28879.49	3560.47	0.46
Salt	200.83	5_year	19500.00	937.28	946.17	943.26	946.46	0.000877	4.30	4530.83	3011.99	0.34
Salt	200.83	20_year	82000.00	937.28	947.60	946.97	948.05	0.001031	5.43	17769.32	3310.76	0.38
Salt	200.83	100_year	162000.00	937.28	951.25	946.97	951.82	0.000855	6.66	30477.49	3781.63	0.37
Salt	200.88	5_year	19500.00	938.71	946.43	944.01	946.80	0.001308	4.87	4000.49	2797.73	0.40
Salt	200.88	20_year	82000.00	938.71	947.92	947.31	948.33	0.000879	4.79	17817.85	3103.41	0.35
Salt	200.88	100_year	162000.00	938.71	951.48	947.31	952.08	0.000847	6.32	29752.06	3725.69	0.37
Salt	200.95	5_year	19500.00	938.69	946.87	945.40	947.58	0.002906	6.77	2882.35	2738.88	0.59
Salt	200.95	20_year	82000.00	938.69	948.24	947.91	948.73	0.001231	5.22	16540.12	3261.60	0.40
Salt	200.95	100_year	162000.00	938.69	951.83	947.91	952.42	0.001026	6.62	28992.45	3651.35	0.40
Salt	201.01	5_year	19500.00	938.69	947.86	946.54	948.53	0.002901	6.61	2950.58	2610.54	0.59
Salt	201.01	20_year	82000.00	938.69	948.71	948.21	949.36	0.002843	7.00	15188.83	3032.24	0.59
Salt	201.01	100_year	162000.00	938.69	952.13	948.41	952.99	0.002397	9.02	27131.79	3663.10	0.59
Salt	201.1	5_year	19500.00	942.17	949.47	948.90	950.38	0.005147	7.65	2549.27	3026.66	0.76
Salt	201.1	20_year	82000.00	942.17	950.32	949.61	950.85	0.003482	7.01	16298.61	3397.20	0.64
Salt	201.1	100_year	162000.00	942.17	953.47	949.85	954.23	0.002850	9.52	28024.34	3847.62	0.64

HEC-RAS Plan: no balance River: Salt Reach: Salt (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)	
Salt	201.16	5_year	19500.00	943.39	950.76	948.67	951.07	0.001165	4.44	4389.91	3291.19	0.38
Salt	201.16	20_year	82000.00	943.39	951.26	951.01	951.99	0.003765	8.60	15074.30	3381.62	0.69
Salt	201.16	100_year	162000.00	943.39	954.12	951.49	955.22	0.003136	10.74	25480.40	3678.00	0.69
Salt	201.2	5_year	19500.00	942.38	950.92	948.90	951.54	0.002508	6.35	3073.19	2762.07	0.55
Salt	201.2	20_year	82000.00	942.38	952.20	952.08	952.72	0.002534	7.37	15625.05	3269.84	0.58
Salt	201.2	100_year	162000.00	942.38	955.09	952.08	955.85	0.002131	9.10	25737.24	3582.68	0.57
Salt	201.26	5_year	19500.00	942.38	951.77	950.44	952.74	0.004342	7.89	2470.36	2720.41	0.71
Salt	201.26	20_year	82000.00	942.38	953.23	952.08	953.64	0.002817	6.57	18023.67	3279.48	0.58
Salt	201.26	100_year	162000.00	942.38	955.92	952.51	956.73	0.003092	9.68	27088.23	3412.47	0.66
Salt	201.33	5_year	19500.00	942.38	953.36	950.73	954.00	0.002928	6.42	3036.90	3025.23	0.59
Salt	201.33	20_year	82000.00	942.38	954.15	953.51	954.48	0.002020	5.95	20183.09	3094.30	0.50
Salt	201.33	100_year	162000.00	942.38	957.01	953.51	957.70	0.002423	8.94	29524.09	3341.55	0.59
Salt	201.41	5_year	19500.00	942.38	954.34	950.68	954.60	0.000768	4.15	4695.72	3269.80	0.34
Salt	201.41	20_year	82000.00	942.38	954.77	954.61	955.07	0.001026	5.09	22820.20	3278.40	0.39
Salt	201.41	100_year	162000.00	942.38	957.83	954.61	958.42	0.001253	7.66	32879.77	3311.75	0.47
Salt	201.48	5_year	19500.00	943.46	954.61	951.11	954.88	0.000750	4.15	4703.49	3153.14	0.32
Salt	201.48	20_year	82000.00	943.46	955.16	955.01	955.42	0.000905	4.80	23640.65	3190.94	0.35
Salt	201.48	100_year	162000.00	943.46	958.34	955.01	958.86	0.001142	7.19	33909.59	3249.96	0.42
Salt	201.54	5_year	19500.00	944.01	954.85	951.74	955.18	0.000884	4.62	4224.47	2978.28	0.34
Salt	201.54	20_year	82000.00	944.01	955.41	955.21	955.76	0.000844	4.80	21843.59	2983.34	0.34
Salt	201.54	100_year	162000.00	944.01	958.65	955.21	959.30	0.001122	7.34	31677.93	3152.74	0.42
Salt	201.62	5_year	19500.00	944.97	955.21	951.45	955.48	0.000645	4.16	4692.31	3081.88	0.30
Salt	201.62	20_year	82000.00	944.97	955.77	955.61	956.15	0.001169	5.93	21319.25	3119.61	0.41
Salt	201.62	100_year	162000.00	944.97	959.09	955.61	959.81	0.001438	8.65	31937.29	3217.30	0.48
Salt	201.7	5_year	19500.00	945.11	955.55	951.82	955.85	0.001137	4.40	4432.13	2802.45	0.33
Salt	201.7	20_year	82000.00	945.11	956.10	956.01	956.82	0.001503	5.38	16240.13	2936.44	0.38
Salt	201.7	100_year	162000.00	945.11	959.68	956.48	960.44	0.001436	7.13	27704.84	3319.67	0.40
Salt	201.81	5_year	19500.00	945.11	956.03	951.58	956.19	0.000339	3.28	6011.17	3011.87	0.22
Salt	201.81	20_year	82000.00	945.11	957.14	955.73	957.58	0.001083	6.48	18015.94	3155.40	0.41
Salt	201.81	100_year	162000.00	945.11	960.51	956.88	961.16	0.001025	7.98	28801.81	3684.63	0.42
Salt	201.89	5_year	19500.00	946.82	956.17	952.20	956.35	0.000437	3.44	5673.88	2894.72	0.25
Salt	201.89	20_year	82000.00	946.82	957.55	956.31	958.01	0.001043	6.01	15216.51	3060.24	0.39
Salt	201.89	100_year	162000.00	946.82	960.84	957.02	961.62	0.001099	7.90	23406.39	3494.67	0.43
Salt	201.96	5_year	19500.00	946.20	956.33	952.42	956.53	0.000505	3.57	5466.56	2434.77	0.26
Salt	201.96	20_year	82000.00	946.20	957.89	956.74	958.49	0.001307	6.66	13492.10	2576.92	0.44
Salt	201.96	100_year	162000.00	946.20	961.20	957.21	962.11	0.001298	8.50	21765.32	3395.45	0.46
Salt	202.01	5_year	19500.00	946.85	956.48	952.47	956.70	0.000919	3.78	5163.77	2390.70	0.27
Salt	202.01	20_year	82000.00	946.85	958.24	957.02	958.87	0.001847	6.29	12855.25	2844.04	0.40
Salt	202.01	100_year	162000.00	946.85	961.57	957.97	962.47	0.001804	7.86	21360.38	3340.07	0.42
Salt	202.06	5_year	19500.00	947.33	956.70	953.32	956.99	0.001054	4.27	4571.66	2901.00	0.32
Salt	202.06	20_year	82000.00	947.33	958.82	957.61	959.35	0.001674	6.54	14361.83	3180.31	0.43
Salt	202.06	100_year	162000.00	947.33	962.14	958.16	962.95	0.001648	8.31	23255.97	3631.35	0.45
Salt	202.11	5_year	19500.00	948.26	956.91	953.76	957.24	0.000857	4.62	4216.50	1954.11	0.34
Salt	202.11	20_year	82000.00	948.26	958.94	957.85	960.03	0.002506	9.65	11872.32	2697.18	0.61
Salt	202.11	100_year	162000.00	948.26	962.32	960.17	963.51	0.001921	10.71	22312.48	3628.64	0.57
Salt	202.18	5_year	19500.00	946.86	957.20	953.68	957.53	0.000751	4.59	4252.05	1519.72	0.32
Salt	202.18	20_year	82000.00	946.86	959.67	958.48	961.02	0.002567	10.45	10921.36	2524.55	0.63
Salt	202.18	100_year	162000.00	946.86	962.86	961.41	964.32	0.002151	11.80	20700.66	3589.54	0.61
Salt	202.24	5_year	19500.00	948.09	957.52	955.42	958.02	0.002601	5.67	3439.54	1536.86	0.46
Salt	202.24	20_year	82000.00	948.09	961.15	959.58	962.08	0.003511	8.52	11687.11	2733.62	0.56
Salt	202.24	100_year	162000.00	948.09	964.05	962.11	965.26	0.003397	10.38	20985.13	4068.80	0.59
Salt	202.32	5_year	19500.00	950.65	958.63	956.73	959.00	0.002238	4.86	4009.53	1918.43	0.41
Salt	202.32	20_year	82000.00	950.65	962.59	959.53	963.10	0.001777	6.71	16819.88	3385.73	0.41
Salt	202.32	100_year	162000.00	950.65	965.56	962.06	966.27	0.001786	8.26	27985.61	4248.08	0.44
Salt	202.4	5_year	19500.00	952.19	959.77	959.31	960.85	0.008133	8.33	2339.74	1911.84	0.82
Salt	202.4	20_year	82000.00	952.19	963.45	961.36	964.25	0.003666	9.05	15943.03	3138.15	0.62

HEC-RAS Plan: no balance River: Salt Reach: Salt (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)	
Salt	202.4	100_year	162000.00	952.19	966.26	962.63	967.53	0.003834	11.72	25845.96	3786.37	0.67
Salt	202.48	5_year	19500.00	953.23	962.34	961.37	963.06	0.003444	6.79	2872.75	2313.55	0.63
Salt	202.48	20_year	82000.00	953.23	964.98	963.57	965.62	0.002733	8.39	18063.00	3361.96	0.61
Salt	202.48	100_year	162000.00	953.23	967.83	963.64	968.96	0.002882	11.22	28464.38	5547.82	0.67
Salt	202.54	5_year	19500.00	953.49	963.35	961.64	963.91	0.002036	5.96	3272.19	2868.37	0.50
Salt	202.54	20_year	82000.00	953.49	965.85	964.42	966.33	0.001808	7.48	20231.44	3139.17	0.51
Salt	202.54	100_year	162000.00	953.49	968.88	964.44	969.76	0.002046	10.19	31045.50	5966.61	0.57
Salt	202.61	5_year	19500.00	955.76	964.28	963.03	964.90	0.003264	6.30	3094.27	3342.69	0.61
Salt	202.61	20_year	82000.00	955.76	966.62	965.41	967.07	0.002044	7.10	18922.27	3562.52	0.53
Salt	202.61	100_year	162000.00	955.76	969.71	965.41	970.56	0.002169	9.78	29931.65	6851.43	0.58
Salt	202.69	5_year	19500.00	958.23	965.40	963.26	965.76	0.001372	4.77	4087.68	2680.82	0.41
Salt	202.69	20_year	82000.00	958.23	967.38	966.27	967.80	0.001551	6.56	18111.06	2861.56	0.47
Salt	202.69	100_year	162000.00	958.23	970.62	966.27	971.32	0.001531	8.64	29478.02	6078.74	0.50
Salt	202.78	5_year	19500.00	956.08	966.05	962.32	966.29	0.000858	3.95	4932.65	2945.76	0.27
Salt	202.78	20_year	82000.00	956.08	968.14	966.80	968.53	0.001484	6.27	18556.80	3195.76	0.38
Salt	202.78	100_year	162000.00	956.08	971.50	966.92	972.06	0.001436	7.71	30826.96	4859.17	0.39
Salt	202.85	5_year	19500.00	953.44	966.32	962.85	966.64	0.000894	4.53	4305.20	2739.75	0.34
Salt	202.85	20_year	82000.00	953.44	968.62	967.15	969.05	0.001281	6.81	19595.31	3158.25	0.44
Salt	202.85	100_year	162000.00	953.44	971.92	967.24	972.63	0.001343	8.87	30941.12	5247.80	0.47
Salt	202.97	5_year	19500.00	957.32	966.93	962.84	967.21	0.000921	4.25	4588.10	2801.87	0.34
Salt	202.97	20_year	82000.00	957.32	969.39	967.72	969.81	0.001191	6.37	18386.61	3182.30	0.42
Salt	202.97	100_year	162000.00	957.32	972.75	968.20	973.41	0.001167	8.14	29501.54	5136.26	0.44
Salt	203.1	5_year	19500.00	955.78	967.56	963.02	967.83	0.000848	4.19	4653.97	2433.58	0.32
Salt	203.1	20_year	82000.00	955.78	970.24	968.34	970.70	0.001312	6.52	17483.32	2981.89	0.42
Salt	203.1	100_year	162000.00	955.78	973.58	969.33	974.27	0.001250	8.18	27927.66	5106.10	0.44
Salt	203.2	5_year	19500.00	955.00	968.05	965.40	968.52	0.001676	5.49	3553.23	2229.31	0.44
Salt	203.2	20_year	82000.00	955.00	971.00	969.03	971.78	0.002451	8.71	16161.08	3232.43	0.56
Salt	203.2	100_year	162000.00	955.00	974.25	971.40	975.31	0.002224	10.57	27137.90	5064.00	0.57
Salt	203.3	5_year	19500.00	955.59	968.97	965.22	969.23	0.001137	4.06	4803.29	2096.47	0.31
Salt	203.3	20_year	82000.00	955.59	972.32	969.74	972.86	0.001821	6.89	17269.23	4146.97	0.42
Salt	203.3	100_year	162000.00	955.59	975.55	971.66	976.37	0.001910	8.76	28736.64	5889.70	0.45
Salt	203.38	5_year	19500.00	955.24	969.50	966.58	969.74	0.001119	3.92	4979.15	1987.40	0.30
Salt	203.38	20_year	82000.00	955.24	973.08	970.24	973.67	0.001678	6.80	16425.55	3426.33	0.40
Salt	203.38	100_year	162000.00	955.24	976.34	972.44	977.24	0.001808	8.71	27742.10	6469.89	0.44
Salt	203.48	5_year	19500.00	958.17	969.91	966.62	970.16	0.000625	3.96	4929.74	1656.66	0.29
Salt	203.48	20_year	82000.00	958.17	973.68	970.67	974.34	0.001026	7.09	16438.70	3360.75	0.41
Salt	203.48	100_year	162000.00	958.17	976.96	973.53	978.05	0.001243	9.51	27628.58	6924.94	0.47

HEC-RAS Plan: no balance River: Gila Reach: Upper Gila

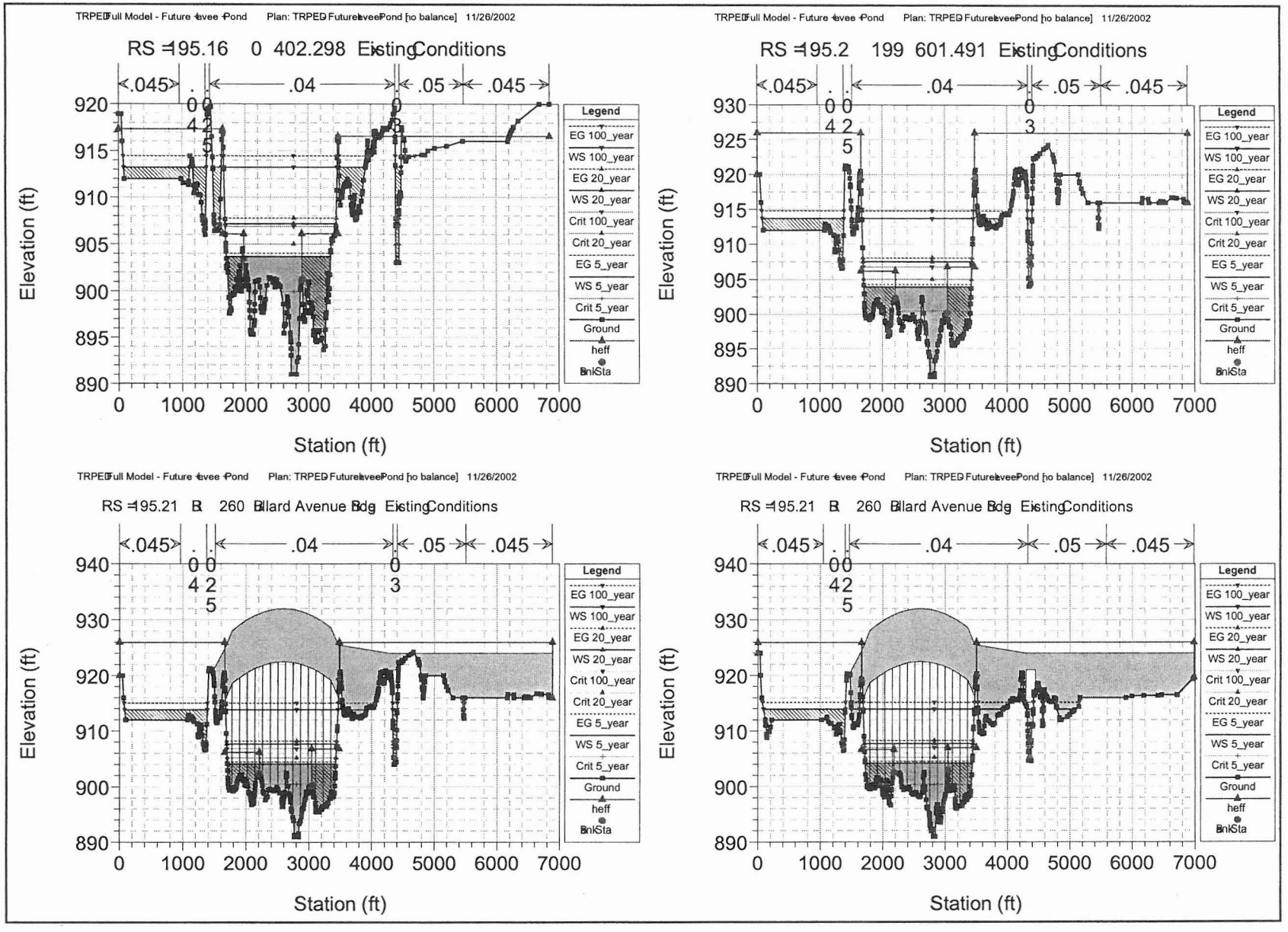
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Upper Gila	0.00	5_year	4000.00	926.60	937.60	928.74	937.62	0.000027	1.20	3323.22	1291.17	0.07
Upper Gila	0.00	20_year	10000.00	926.60	938.49	930.59	938.50	0.000008	0.68	14404.57	1293.00	0.04
Upper Gila	0.00	100_year	65000.00	926.60	943.86	938.00	944.01	0.000090	3.02	21391.22	1311.16	0.13
Upper Gila	0.06	5_year	4000.00	926.60	937.61	928.37	937.63	0.000024	1.21	3301.79	1620.54	0.06
Upper Gila	0.06	20_year	10000.00	926.60	938.49	929.86	938.50	0.000006	0.61	17507.48	1623.70	0.03
Upper Gila	0.06	100_year	65000.00	926.60	943.94	938.01	944.03	0.000064	2.65	26456.03	1663.58	0.11
Upper Gila	0.12	5_year	4000.00	926.60	937.61	928.37	937.64	0.000024	1.21	3303.99	1994.98	0.06
Upper Gila	0.12	20_year	10000.00	926.60	938.50	929.86	938.50	0.000005	0.55	20228.66	2002.35	0.03
Upper Gila	0.12	100_year	65000.00	926.60	943.98	938.01	944.05	0.000052	2.40	31244.81	2014.71	0.10
Upper Gila	0.17	5_year	4000.00	926.60	937.63	928.20	937.64	0.000018	1.04	3859.06	2217.76	0.06
Upper Gila	0.17	20_year	10000.00	926.60	938.50	929.54	938.50	0.000005	0.56	20714.21	2219.90	0.03
Upper Gila	0.17	100_year	65000.00	926.60	944.00	936.85	944.06	0.000050	2.35	32958.69	2231.80	0.10
Upper Gila	0.22	5_year	4000.00	926.60	937.63	928.06	937.65	0.000014	0.91	4413.62	2227.12	0.05
Upper Gila	0.22	20_year	10000.00	926.60	938.50	929.29	938.50	0.000006	0.65	18570.02	2457.94	0.03
Upper Gila	0.22	100_year	65000.00	926.60	944.00	935.96	944.08	0.000063	2.64	32218.75	2488.29	0.11
Upper Gila	0.27	5_year	4000.00	929.60	937.62	932.57	937.66	0.000134	1.68	2376.43	2401.18	0.12
Upper Gila	0.27	20_year	10000.00	929.60	938.50	934.02	938.51	0.000014	0.59	14661.45	2637.68	0.04
Upper Gila	0.27	100_year	65000.00	929.60	943.99	938.01	944.12	0.000103	2.34	29633.52	2833.65	0.12
Upper Gila	0.35	5_year	4000.00	931.88	937.69	935.00	937.79	0.000639	2.51	1594.04	2820.05	0.23
Upper Gila	0.35	20_year	10000.00	931.88	938.50	936.59	938.52	0.000033	0.65	13170.49	3252.60	0.05
Upper Gila	0.35	100_year	65000.00	931.88	944.05	938.17	944.16	0.000184	2.66	31179.18	3356.54	0.15
Upper Gila	0.40	5_year	4000.00	931.88	937.91	936.01	938.13	0.002206	3.75	1065.86	2250.32	0.37
Upper Gila	0.40	20_year	10000.00	931.88	938.51	937.75	938.55	0.000697	2.30	7811.89	2704.09	0.21
Upper Gila	0.40	100_year	65000.00	931.88	944.00	938.01	944.37	0.002073	7.25	26238.82	3837.44	0.43
Upper Gila	0.44	5_year	4000.00	931.88	938.35	936.64	938.80	0.003439	5.39	742.74	1115.59	0.60
Upper Gila	0.44	20_year	10000.00	931.88	938.59	938.56	939.03	0.004958	6.48	2303.05	1303.77	0.72
Upper Gila	0.44	100_year	65000.00	931.88	944.38	942.00	944.78	0.001534	7.79	20690.99	4137.60	0.48
Upper Gila	0.49	5_year	4000.00	931.89	939.13	936.48	939.53	0.002500	5.11	783.50	1143.33	0.52
Upper Gila	0.49	20_year	10000.00	931.89	939.58	939.40	939.77	0.001971	4.32	3344.80	1345.47	0.46
Upper Gila	0.49	100_year	65000.00	931.89	944.83	942.12	945.12	0.001233	6.88	20430.43	4160.13	0.43
Upper Gila	0.53	5_year	4000.00	931.89	939.57	935.14	939.73	0.000393	3.27	1221.45	1640.19	0.23
Upper Gila	0.53	20_year	10000.00	931.89	939.84	937.31	940.00	0.000775	4.11	4650.27	1824.52	0.32
Upper Gila	0.53	100_year	65000.00	931.89	945.04	941.81	945.39	0.001269	7.49	21946.56	4234.64	0.44
Upper Gila	0.59	5_year	4000.00	931.89	939.63	937.22	940.05	0.002177	5.22	766.75	1837.97	0.50
Upper Gila	0.59	20_year	10000.00	931.89	940.16	939.90	940.42	0.002377	5.60	4072.76	2085.64	0.52
Upper Gila	0.59	100_year	65000.00	931.89	945.51	942.89	945.83	0.001529	7.40	22598.50	4258.86	0.47
Upper Gila	0.64	5_year	4000.00	931.89	940.32	936.88	940.55	0.001330	3.83	1043.31	1594.10	0.31
Upper Gila	0.64	20_year	10000.00	931.89	940.84	939.52	941.11	0.002177	5.14	3851.80	1864.98	0.40
Upper Gila	0.64	100_year	65000.00	931.89	946.06	943.36	946.36	0.001887	7.34	21931.25	4321.62	0.41
Upper Gila	0.69	5_year	4000.00	931.89	940.65	936.54	940.79	0.000652	3.00	1332.71	1675.96	0.28
Upper Gila	0.69	20_year	10000.00	931.89	941.32	939.59	941.47	0.000854	3.80	5021.56	2202.41	0.32
Upper Gila	0.69	100_year	65000.00	931.89	946.42	943.29	946.63	0.000615	5.43	24139.45	4606.74	0.31
Upper Gila	0.74	5_year	4000.00	931.89	940.82	937.37	940.99	0.001052	3.33	1202.67	1246.40	0.30
Upper Gila	0.74	20_year	10000.00	931.89	941.55	940.13	941.72	0.001312	4.11	3783.84	1819.40	0.34
Upper Gila	0.74	100_year	65000.00	931.89	946.60	943.75	946.81	0.000871	5.57	21997.06	4528.88	0.32
Upper Gila	0.80	5_year	4000.00	931.96	941.04	935.59	941.15	0.000274	2.60	1540.20	1006.50	0.17
Upper Gila	0.80	20_year	10000.00	931.96	941.82	937.68	941.94	0.000411	3.33	4545.15	1431.43	0.21
Upper Gila	0.80	100_year	65000.00	931.96	946.84	944.03	947.10	0.000908	6.58	22906.42	4796.83	0.34
Upper Gila	0.86	5_year	4000.00	932.03	941.03	937.01	941.34	0.000662	4.40	908.82	670.77	0.30
Upper Gila	0.86	20_year	10000.00	932.03	941.90	939.83	942.21	0.001284	5.62	3344.70	943.63	0.41
Upper Gila	0.86	100_year	65000.00	932.03	947.13	945.72	947.55	0.001767	8.46	19839.52	4692.01	0.52
Upper Gila	0.91	5_year	4000.00	932.10	941.32	936.69	941.51	0.000588	3.57	1120.71	676.02	0.24
Upper Gila	0.91	20_year	10000.00	932.10	942.28	939.16	942.53	0.000964	4.88	3628.87	962.18	0.32
Upper Gila	0.91	100_year	65000.00	932.10	947.72	945.46	948.02	0.001412	6.97	19618.44	4102.24	0.40
Upper Gila	0.96	5_year	4000.00	932.50	941.44	936.90	941.70	0.000690	4.07	983.88	389.16	0.27
Upper Gila	0.96	20_year	10000.00	932.50	942.43	939.66	942.90	0.001396	6.20	2305.43	688.50	0.39
Upper Gila	0.96	100_year	65000.00	932.50	948.11	946.08	948.54	0.002207	8.31	18847.65	4019.01	0.50

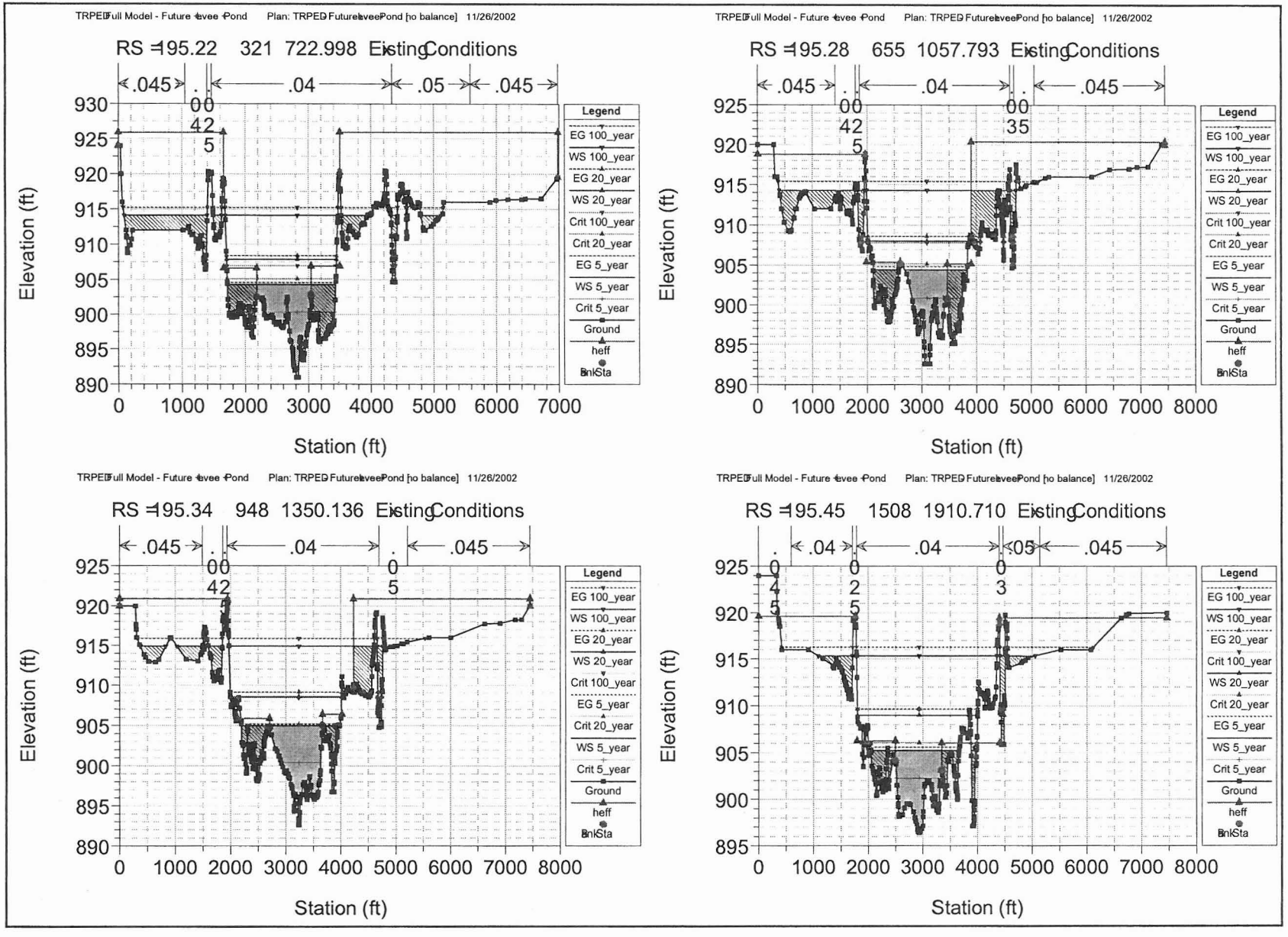
HEC-RAS Plan: no balance River: Gila Reach: Upper Gila (Continued)

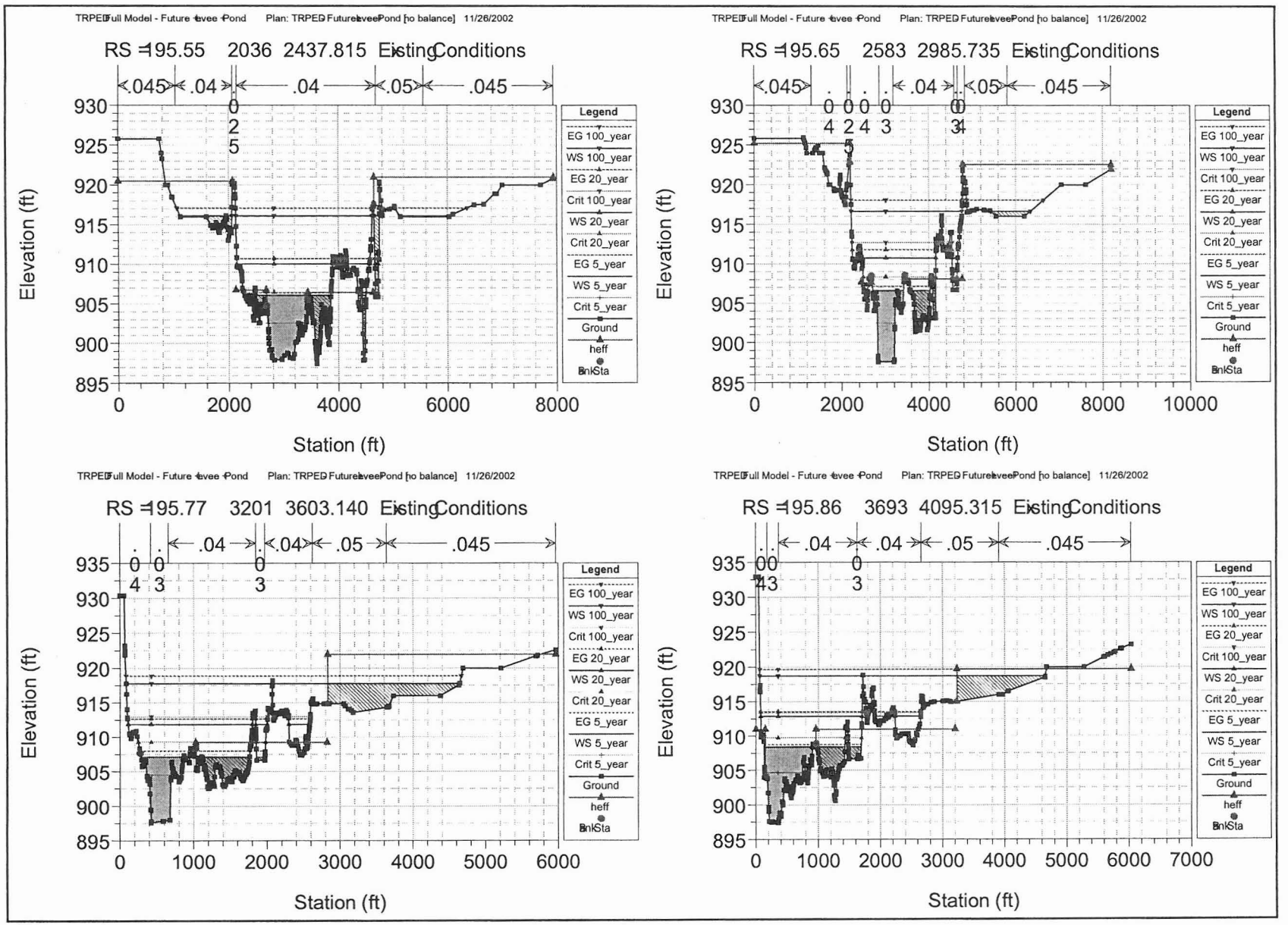
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Upper Gila	1.02	5_year	4000.00	932.50	941.71	937.81	942.03	0.001254	4.51	886.69	220.48	0.31
Upper Gila	1.02	20_year	10000.00	932.50	943.00	940.65	943.63	0.003036	6.95	1687.72	470.80	0.48
Upper Gila	1.02	100_year	65000.00	932.50	948.94	946.63	949.32	0.002256	8.19	20830.90	4373.28	0.45
Upper Gila	1.09	5_year	4000.00	933.01	942.21	938.30	942.46	0.001067	3.99	1002.19	483.18	0.32
Upper Gila	1.09	20_year	10000.00	933.01	944.03	941.49	944.40	0.001369	5.53	3630.35	2358.12	0.38
Upper Gila	1.09	100_year	65000.00	933.01	949.57	947.26	950.07	0.001680	9.07	23460.25	4648.37	0.46
Upper Gila	1.15	5_year	4000.00	933.19	942.46	937.80	942.74	0.000727	4.22	948.63	530.57	0.31
Upper Gila	1.15	20_year	10000.00	933.19	944.37	940.83	944.83	0.001142	6.11	3982.33	2102.51	0.40
Upper Gila	1.15	100_year	65000.00	933.19	949.95	948.14	950.63	0.001594	10.50	23359.73	4208.54	0.52
Upper Gila	1.21	5_year	4000.00	933.35	942.81	937.92	942.97	0.000618	3.20	1249.94	338.66	0.24
Upper Gila	1.21	20_year	10000.00	933.35	944.88	940.76	945.17	0.000900	4.77	3328.35	1816.86	0.31
Upper Gila	1.21	100_year	65000.00	933.35	950.76	947.65	951.00	0.000706	6.18	22605.40	4022.43	0.30
Upper Gila	1.28	5_year	4000.00	934.31	943.08	939.39	943.22	0.000934	3.00	1331.42	306.07	0.25
Upper Gila	1.28	20_year	10000.00	934.31	945.29	941.68	945.51	0.001165	4.07	3463.60	2281.34	0.30
Upper Gila	1.28	100_year	65000.00	934.31	951.03	947.29	951.17	0.000441	3.95	22806.03	4434.99	0.20
Upper Gila	1.35	5_year	4000.00	934.59	943.26	939.11	943.51	0.000533	4.00	999.22	274.22	0.27
Upper Gila	1.35	20_year	10000.00	934.59	945.42	941.66	946.05	0.001097	6.72	2415.59	1732.21	0.40
Upper Gila	1.35	100_year	65000.00	934.59	951.11	948.46	951.44	0.000970	7.50	20511.85	3663.79	0.40
Upper Gila	1.41	5_year	4000.00	934.69	943.39	941.54	943.96	0.002980	6.05	660.84	265.15	0.58
Upper Gila	1.41	20_year	10000.00	934.69	945.79	944.58	946.68	0.002776	7.89	1908.77	1326.90	0.60
Upper Gila	1.41	100_year	65000.00	934.69	951.28	949.65	952.01	0.002032	10.47	18644.13	4421.99	0.57
Upper Gila	1.48	5_year	4000.00	934.79	944.24	940.58	944.43	0.000654	3.46	1154.52	450.71	0.25
Upper Gila	1.48	20_year	10000.00	934.79	946.89	942.68	947.23	0.000853	5.08	4056.28	1696.08	0.31
Upper Gila	1.48	100_year	65000.00	934.79	951.83	950.66	952.90	0.002451	11.73	18831.33	4906.66	0.57
Upper Gila	1.55	5_year	4000.00	935.19	944.54	939.80	944.69	0.000770	3.06	1306.71	708.52	0.26
Upper Gila	1.55	20_year	10000.00	935.19	947.33	942.14	947.50	0.000606	3.67	4762.89	1841.89	0.25
Upper Gila	1.55	100_year	65000.00	935.19	952.99	949.90	953.56	0.001329	8.20	24841.07	5827.37	0.41
Upper Gila	1.59	5_year	4000.00	935.42	944.65	940.05	944.82	0.000490	3.30	1211.80	179.21	0.22
Upper Gila	1.59	20_year	10000.00	935.42	947.36	942.41	947.70	0.000820	5.02	2775.07	1484.76	0.30
Upper Gila	1.59	100_year	65000.00	935.42	953.49	950.10	953.78	0.000731	6.78	21273.96	5521.37	0.31
Upper Gila	1.63	5_year	4000.00	935.65	944.78	940.19	944.94	0.000505	3.25	1230.68	187.31	0.22
Upper Gila	1.63	20_year	10000.00	935.65	947.55	942.46	947.91	0.000826	5.06	2568.90	1111.70	0.30
Upper Gila	1.63	100_year	65000.00	935.65	953.59	950.83	954.03	0.001098	8.23	22502.30	4941.58	0.38
Upper Gila	1.67	5_year	4000.00	935.89	944.88	940.83	945.07	0.000828	3.49	1145.32	190.99	0.25
Upper Gila	1.67	20_year	10000.00	935.89	947.72	943.20	948.09	0.001140	5.15	3246.54	2002.20	0.31
Upper Gila	1.67	100_year	65000.00	935.89	953.80	951.10	954.28	0.001546	8.61	25422.56	5504.19	0.40

G-ii

Cross Section Plots for the Lower Gila

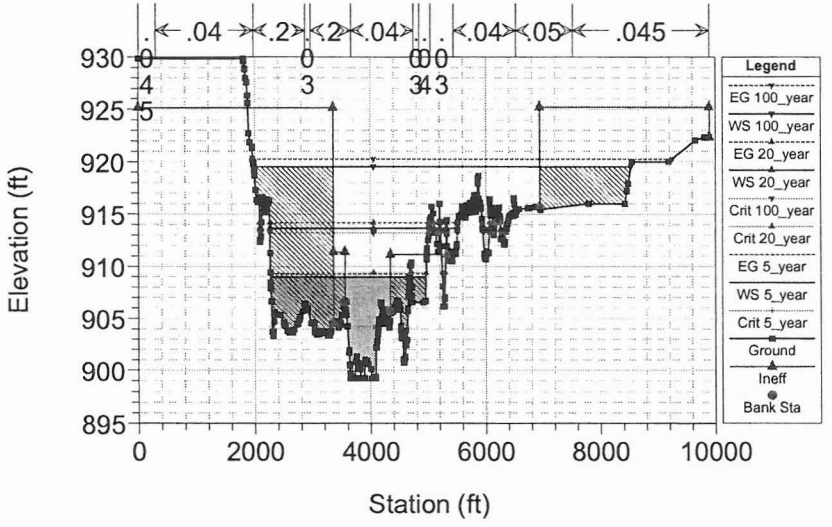

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 195.16 0 402.298 Existing Conditions
RS = 195.2 199 601.491 Existing Conditions
RS = 195.21 B 260 Ballard Avenue Bdg Existing Conditions
.045
.04
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta


TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 195.22 321 722.998 Existing Conditions
.045 .00425 .04 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 195.28 655 1057.793 Existing Conditions
.045 .00425 .04 .0035 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 195.34 948 1350.136 Existing Conditions
.045 .0042 .04 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 195.45 1508 1910.710 Existing Conditions
.045 .045 .04 .0245 .04 .03 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta


TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 95.55 2036 2437.815 Existing Conditions
.045 .04 .04 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 95.65 2583 2985.735 Existing Conditions
.045 .04 .05 .045
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 95.77 3201 3603.140 Existing Conditions
.04 .04 .05 .045
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 95.86 3693 4095.315 Existing Conditions
.04 .04 .05 .045
Elevation (ft)
Station (ft)

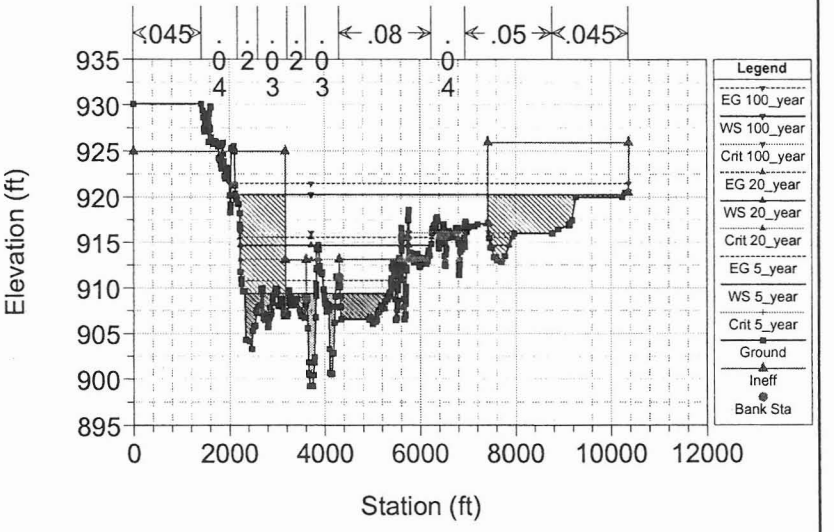
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 195.98 4340 4742.030 Existing Conditions



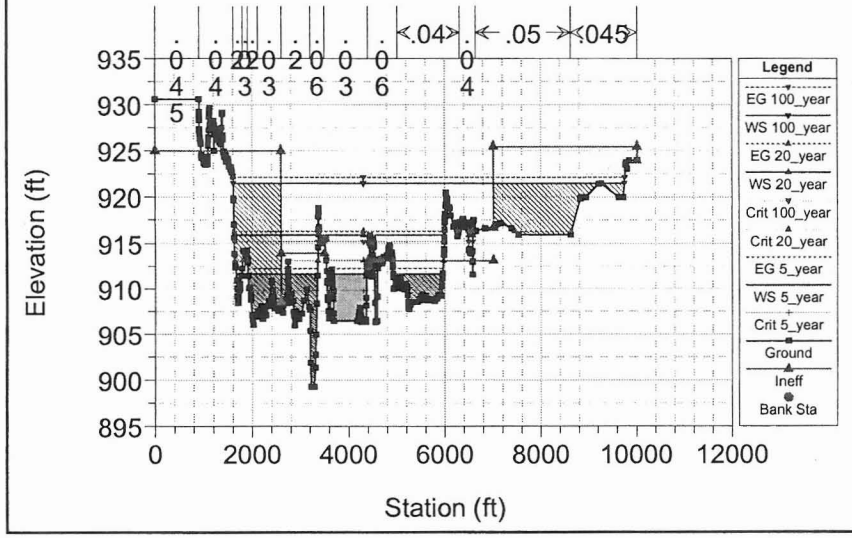
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 196.08 4847 5248.824 increased Manning n in the rob to 0.04 Existing Conditions



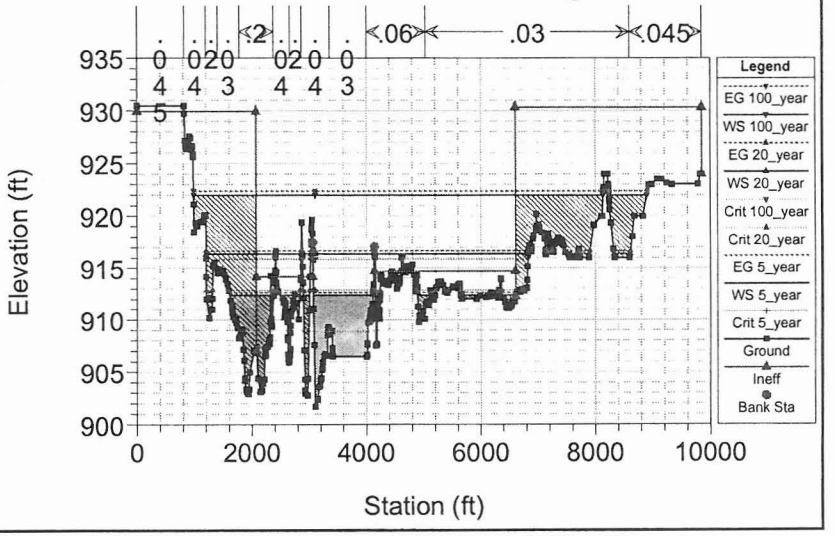
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

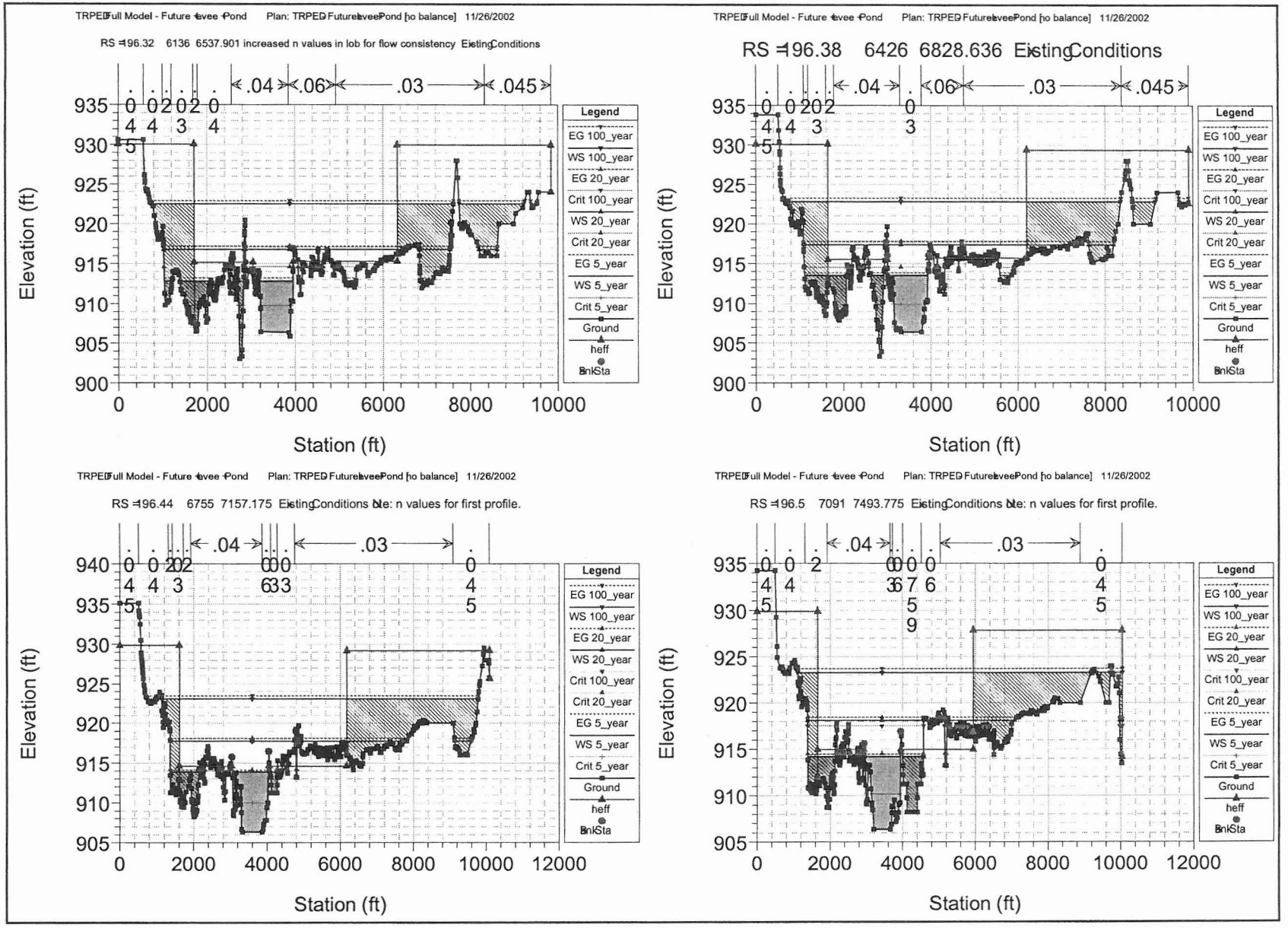
RS = 196.14 5187 5589.283 increased n values in lob for flow consistency Existing Conditions



TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

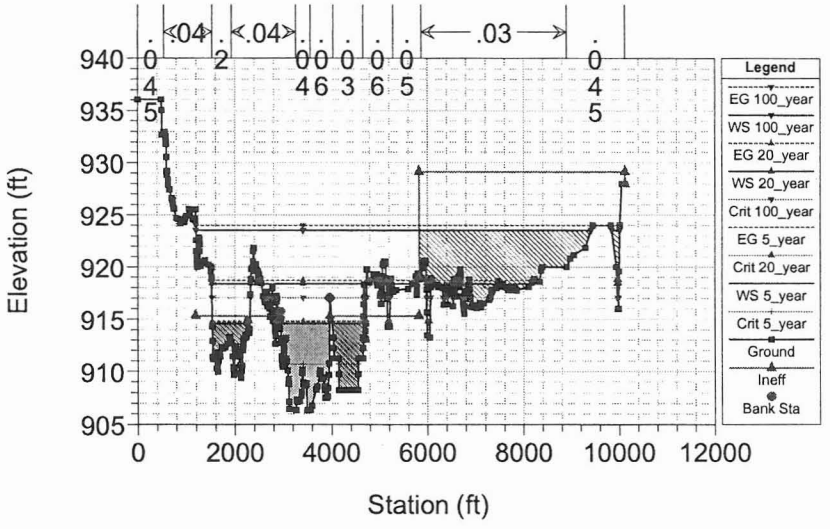
RS = 196.23 5653 6055.528 Existing Conditions




TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 96.32 6136 6537.901 increased n values in lob for flow consistency ExistingConditions
.04
.06
.03
.045
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 96.38 6426 6828.636 ExistingConditions
.04
.06
.03
.045
Legend
EG 100_year
WS 100_year
EG 20_year
Crit 100_year
WS 20_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 96.44 6755 7157.175 ExistingConditions Note: n values for first profile.
.04
.03
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 96.5 7091 7493.775 ExistingConditions Note: n values for first profile.
.04
.03
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta
Elevation (ft)
Station (ft)

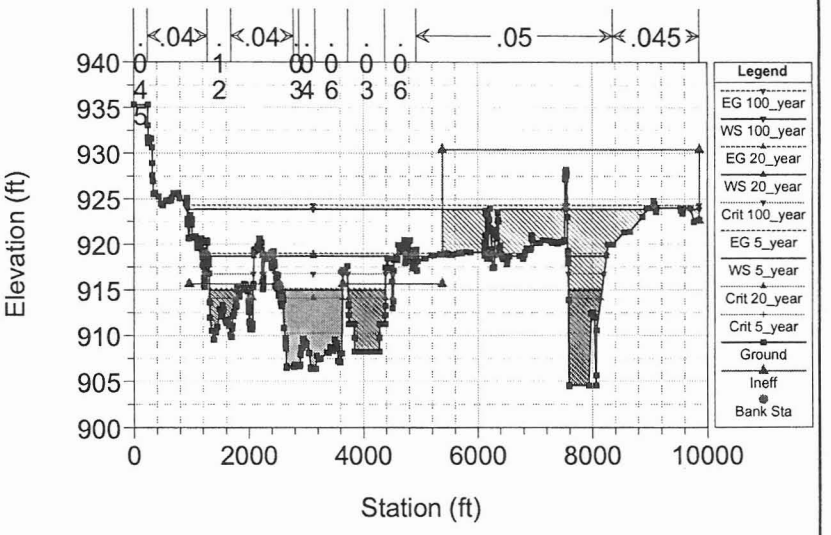
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 196.57 7456 7857.972 Existing Conditions Note: n values for first profile.



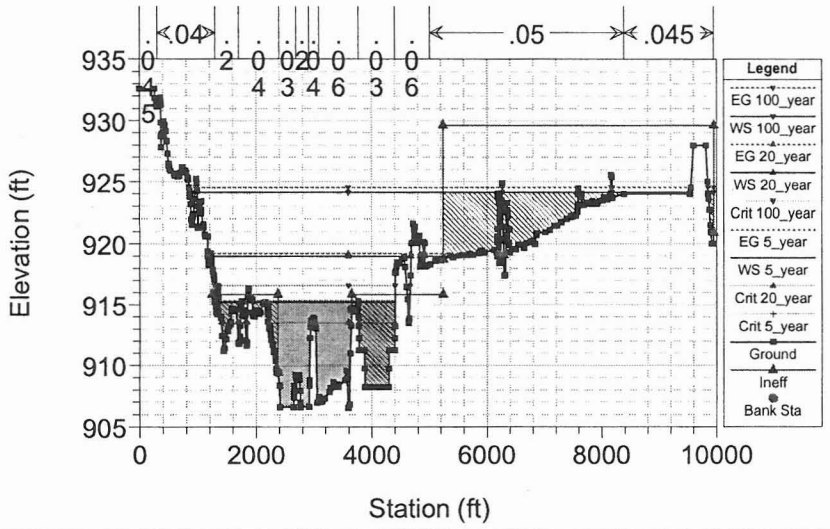
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 196.63 7763 8165.537 Existing Conditions Note: n values for first profile.



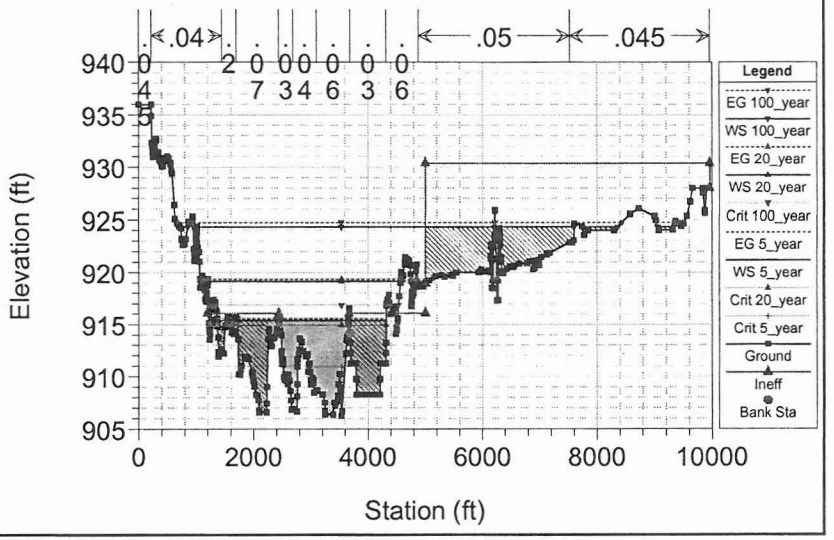
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 196.69 8084 8486.669 Existing Conditions Note: n values for first profile.



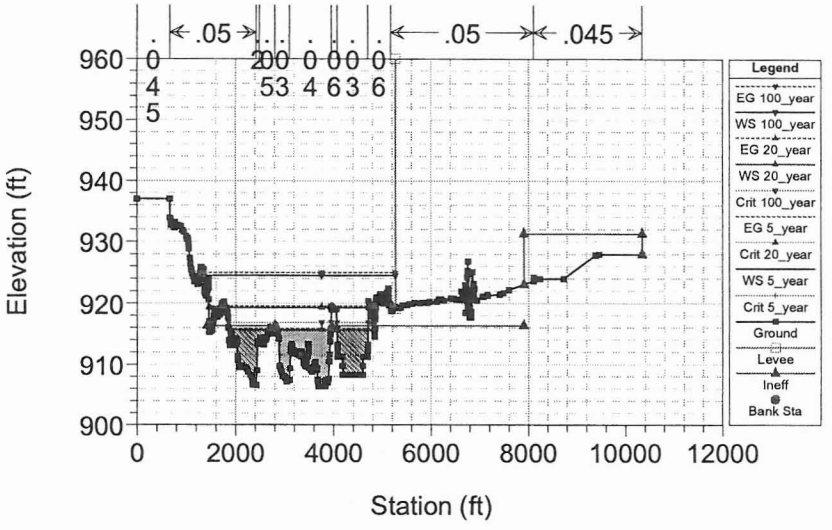
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 196.75 8418 8820.458 Existing Conditions Note: n values for first profile.



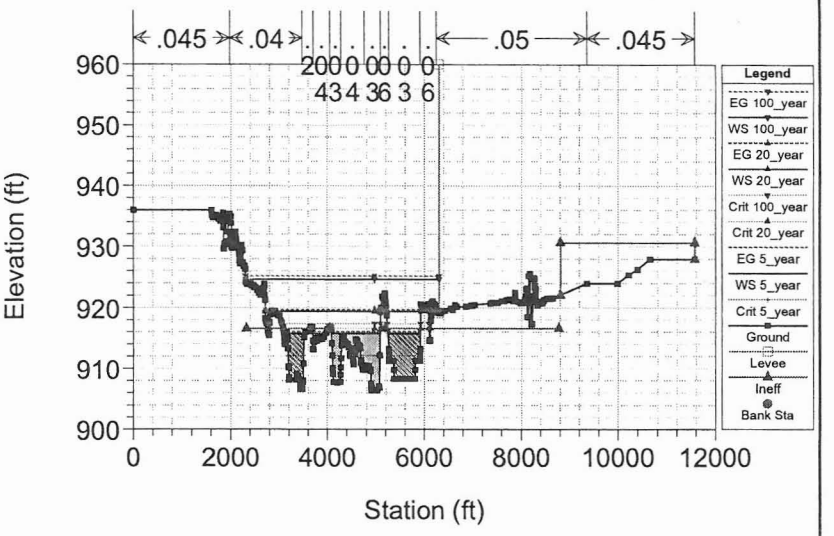
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 196.81 8701 9103.200 Existing Conditions Note: n values for first profile.



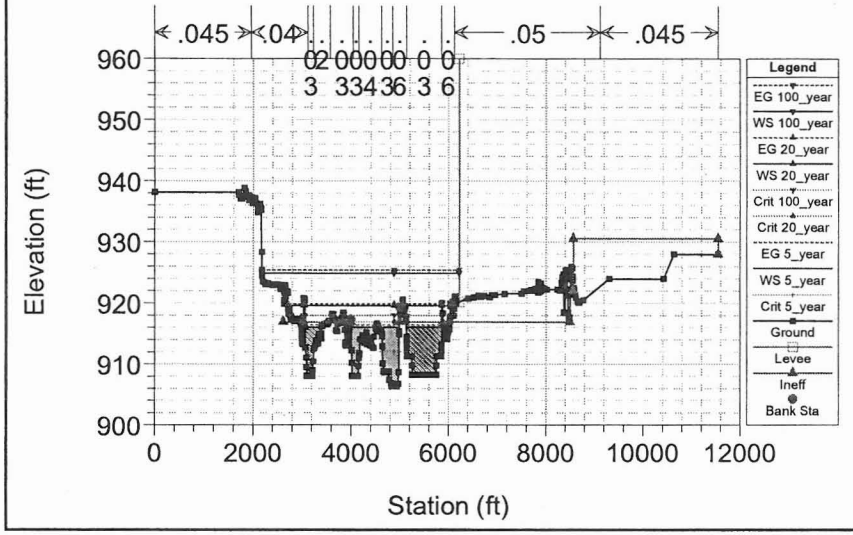
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 196.87 9014 9416.404 Existing Conditions Note: n values for first profile.



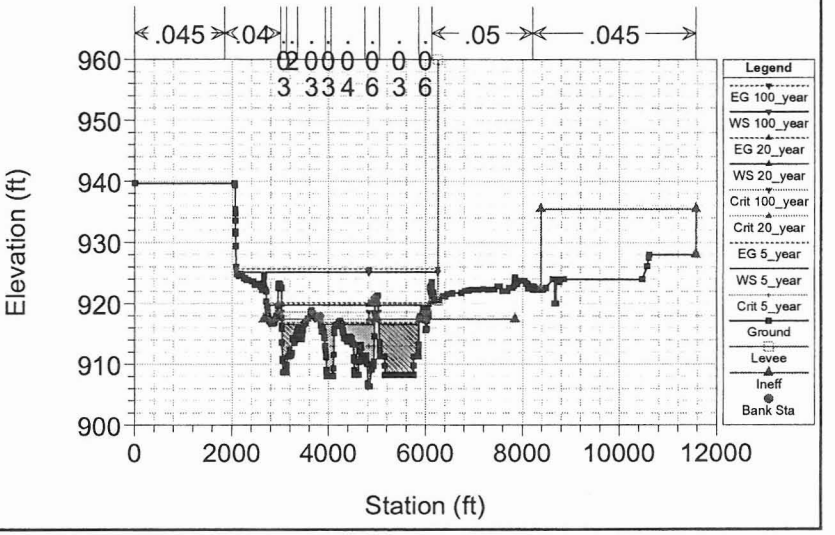
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

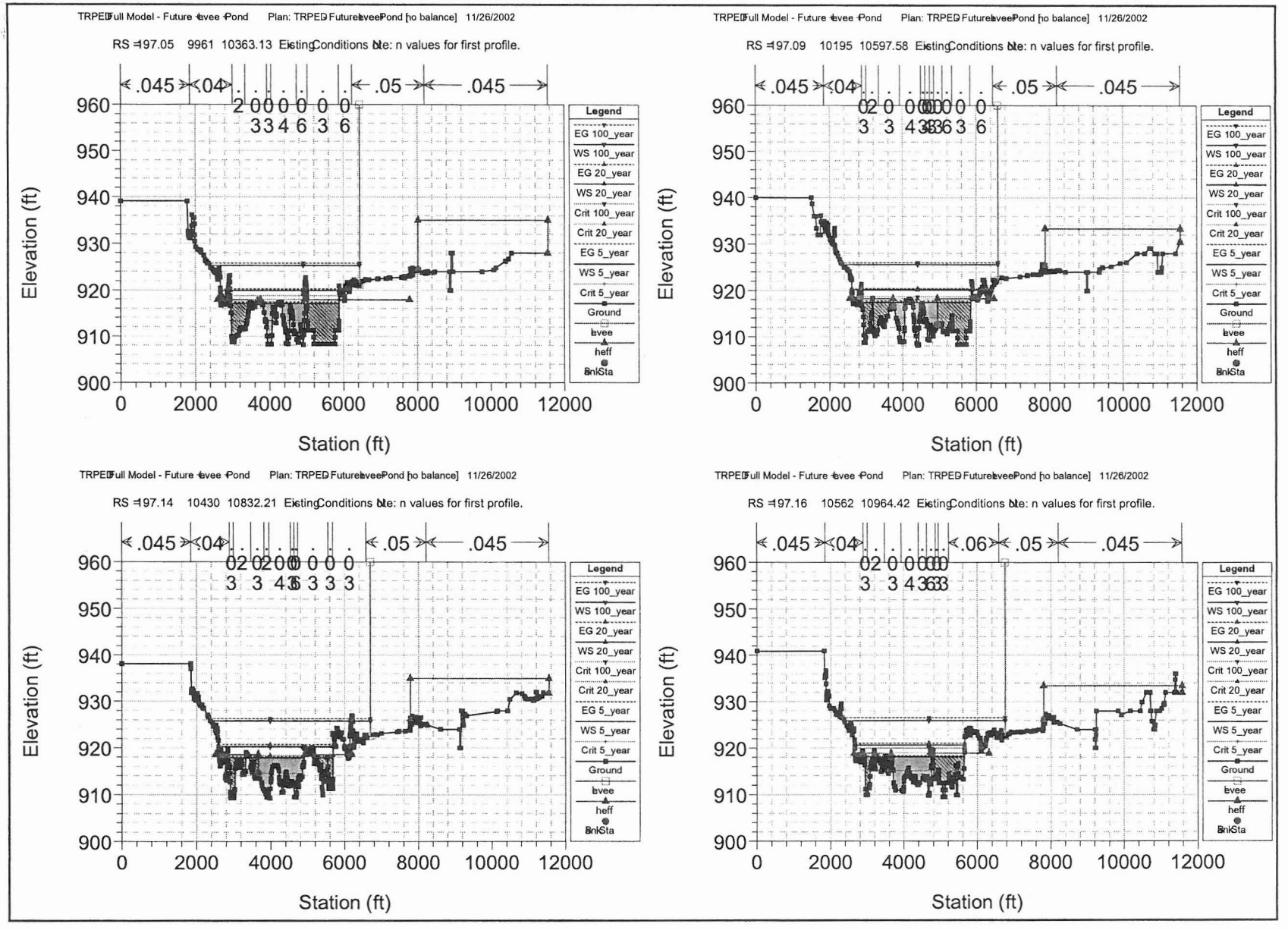
RS = 196.94 9388 9789.937 Existing Conditions Note: n values for first profile.



TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

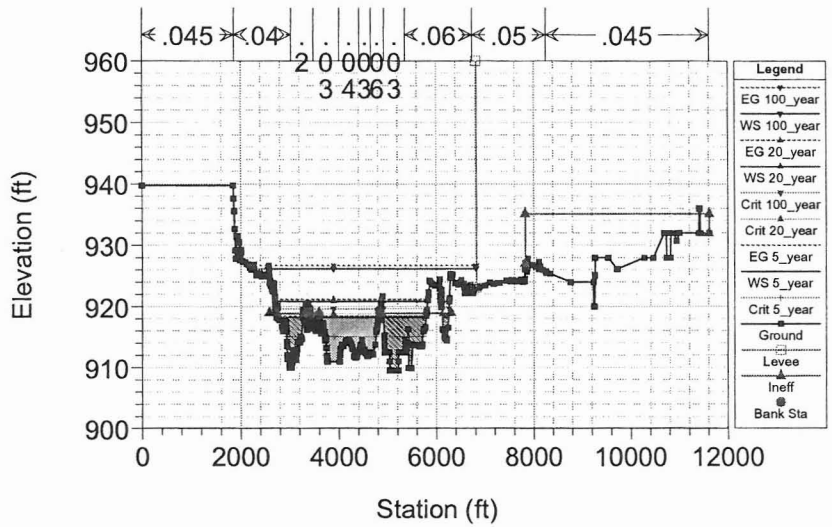
RS = 196.99 9688 10090.29 Existing Conditions Note: n values for first profile.




TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 97.05 9961 10363.13 Existing Conditions Note: n values for first profile.
.045 .04 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 97.09 10195 10597.58 Existing Conditions Note: n values for first profile.
.045 .04 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 97.14 10430 10832.21 Existing Conditions Note: n values for first profile.
.045 .04 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 97.16 10562 10964.42 Existing Conditions Note: n values for first profile.
.045 .04 .06 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
Crit 20_year
EG 5_year
WS 5_year
Crit 5_year
Ground
Levee
heff
BnkSta

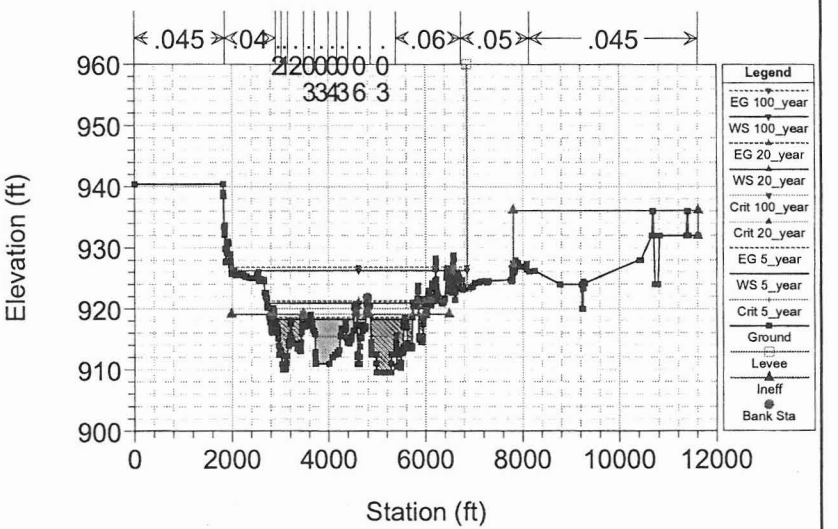
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.18 10680 11082.64 Existing Conditions Note: n values for first profile.



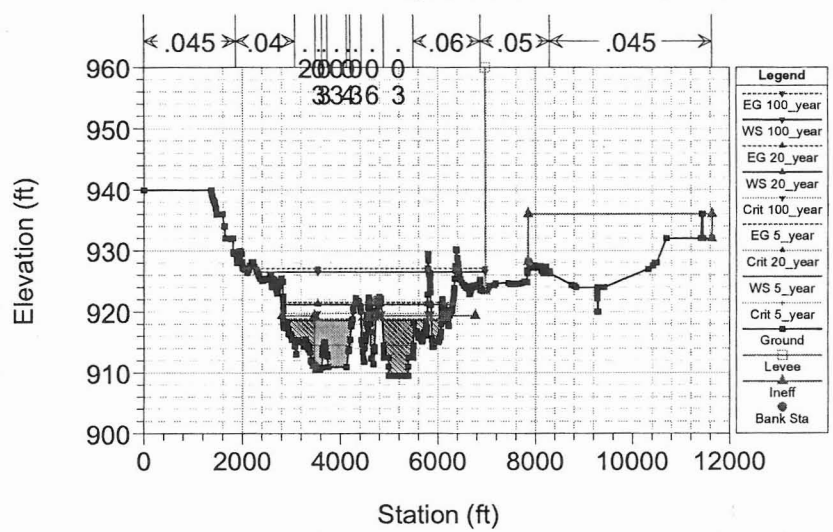
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.23 10924 11325.86 Existing Conditions Note: n values for first profile.



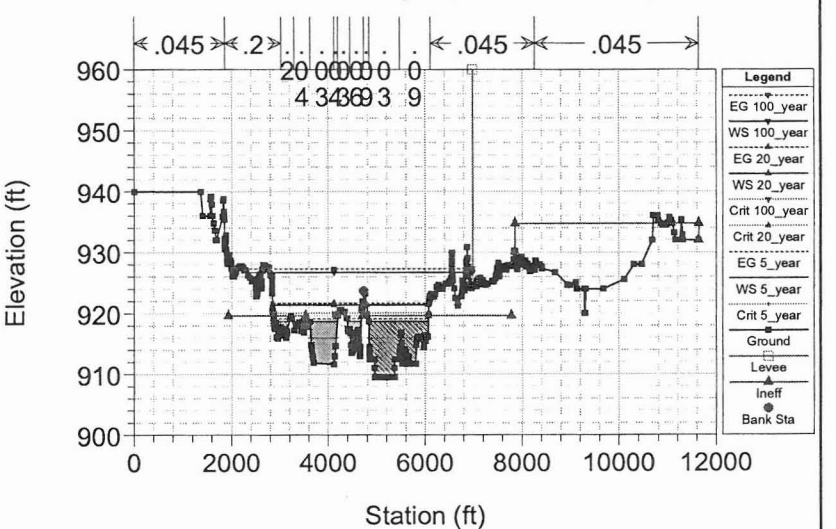
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.28 11169 11571.70 Existing Conditions Note: n values for first profile.



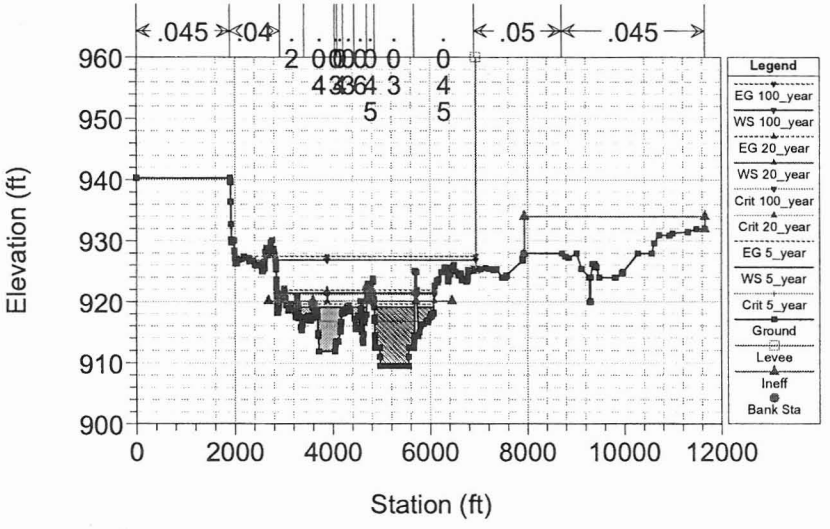
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.33 11438 11840.11 Existing Conditions Note: n values for first profile.



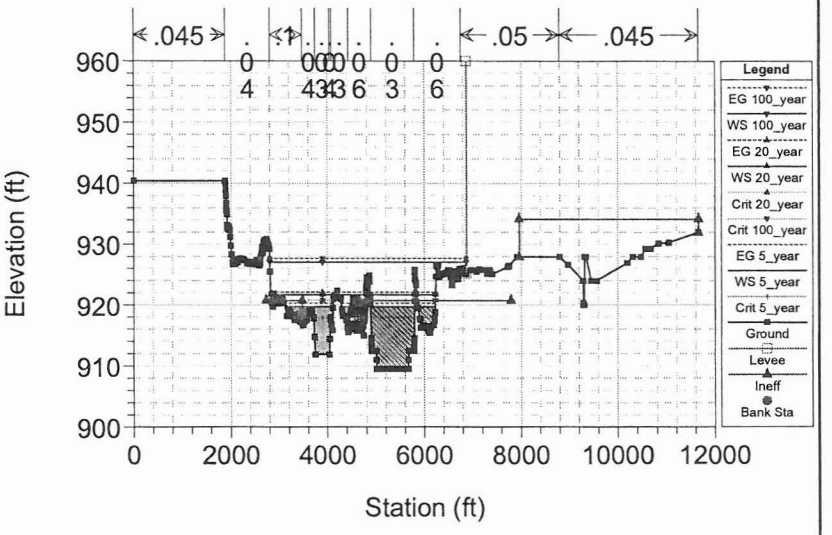
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.38 11706 12108.57 Existing Conditions Note: n values for first profile.



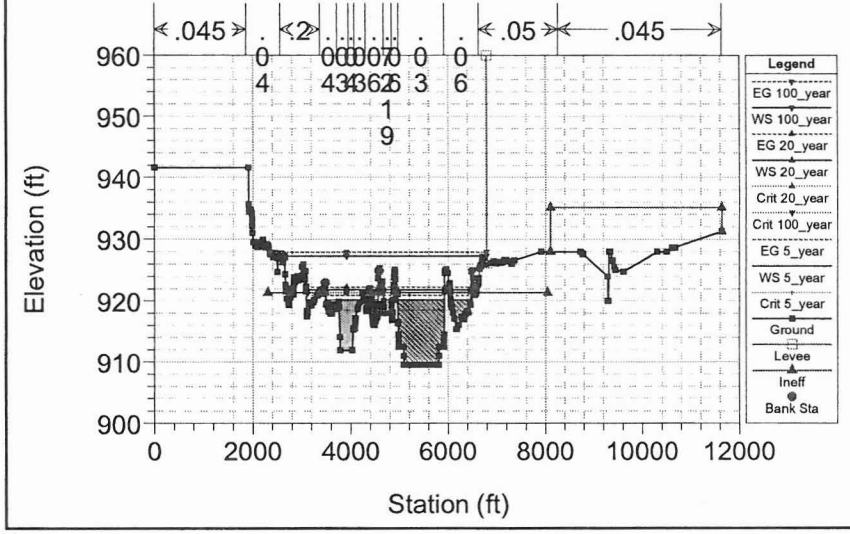
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.42 11948 12350.75 increased n value in rob for flow consistency Existing Conditions Note: n values for first profile.



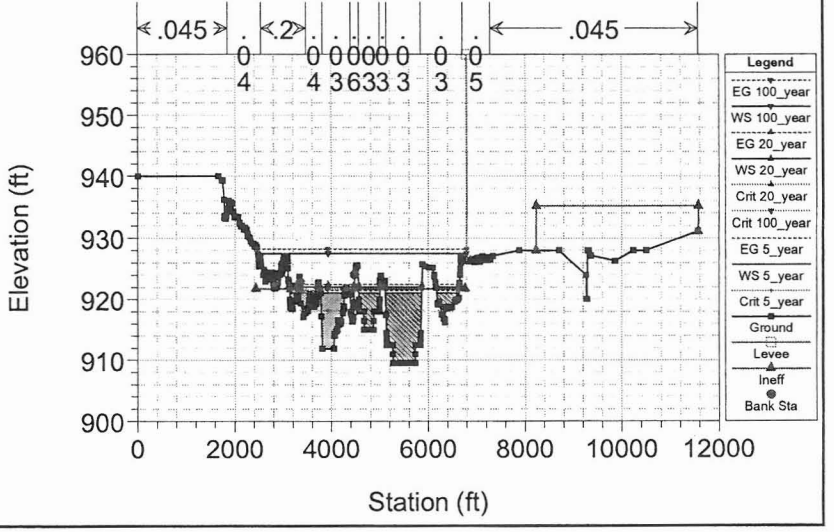
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.48 12257 12658.87 increased n in rob for flow consistency Existing Conditions Note: n values for first profile.



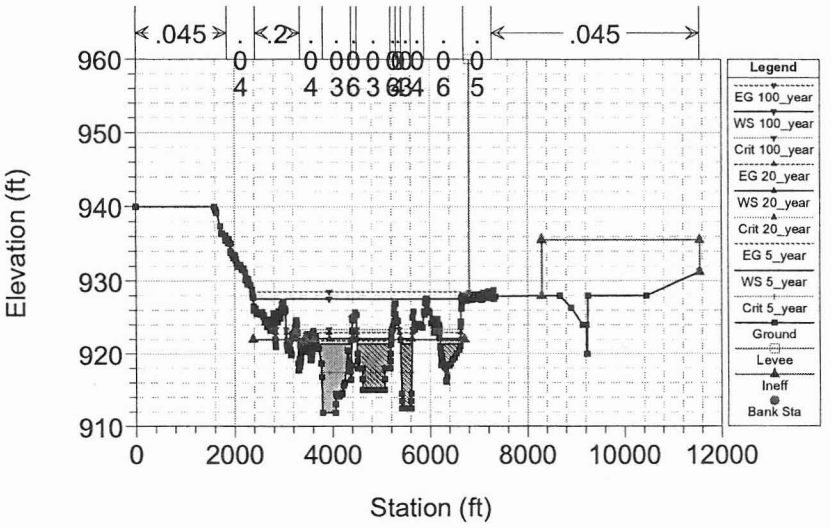
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.53 12526 12928.65 Existing Conditions Note: n values for first profile.



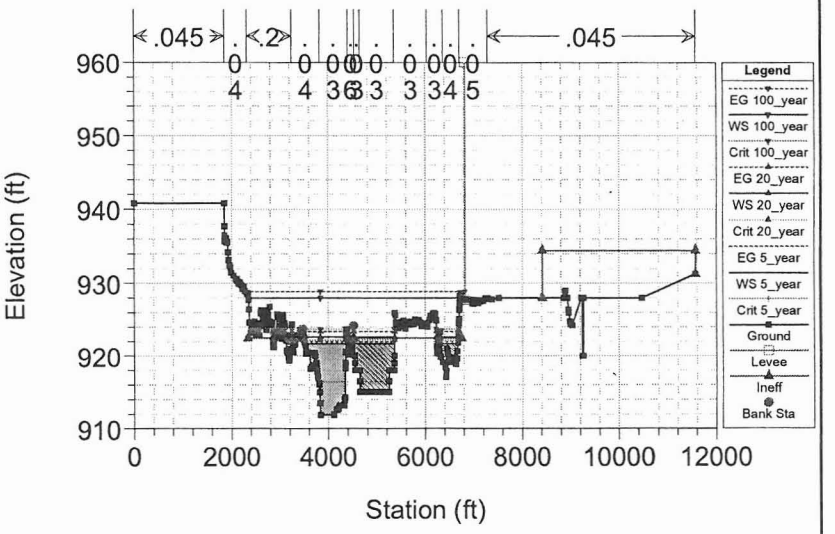
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.58 12790 13192.01 Existing Conditions Note: n values for first profile.



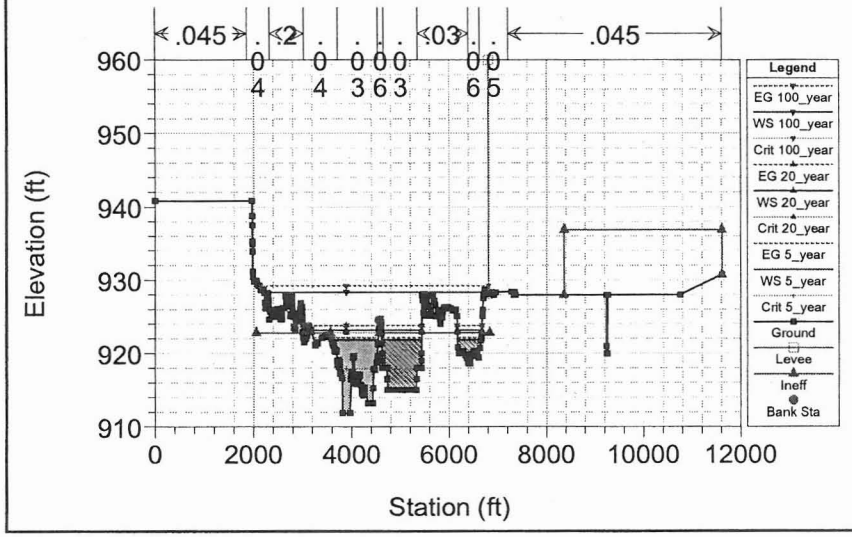
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.64 13097 13498.91 Existing Conditions Note: n values for first profile.



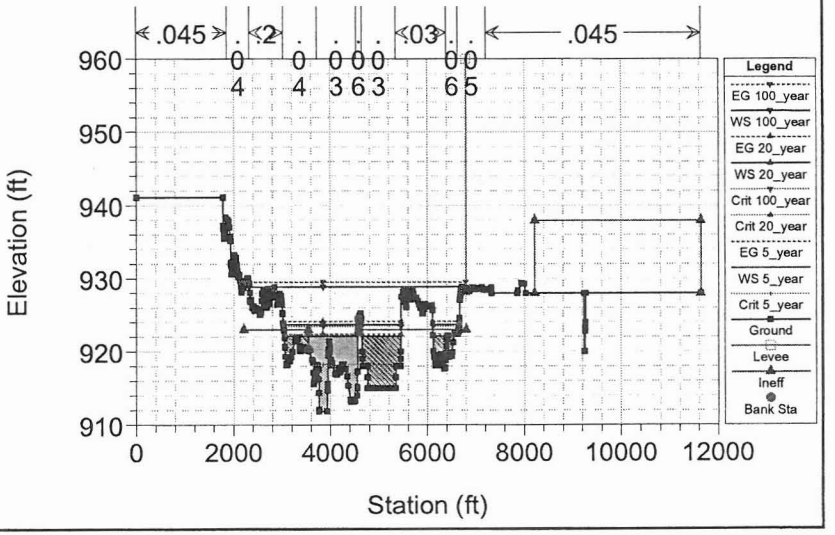
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.7 13404 13805.89 Existing Conditions Note: n values for first profile.



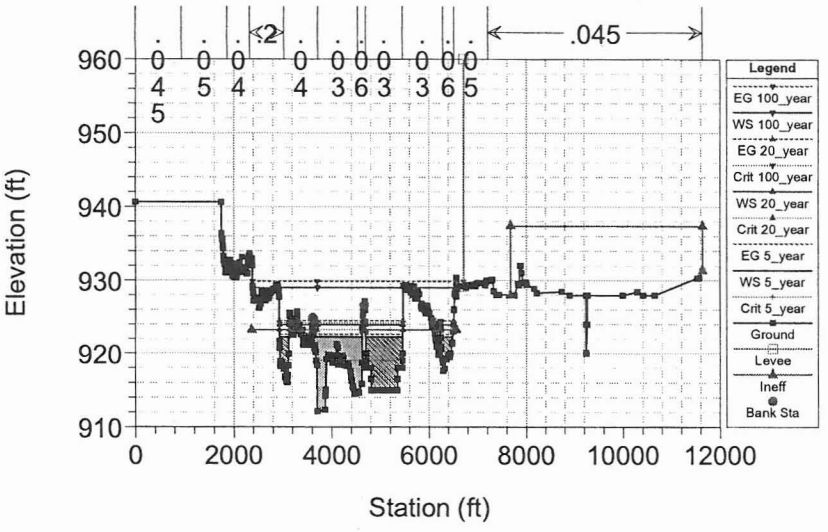
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.75 13682 14084.20 Existing Conditions Note: n values for first profile.



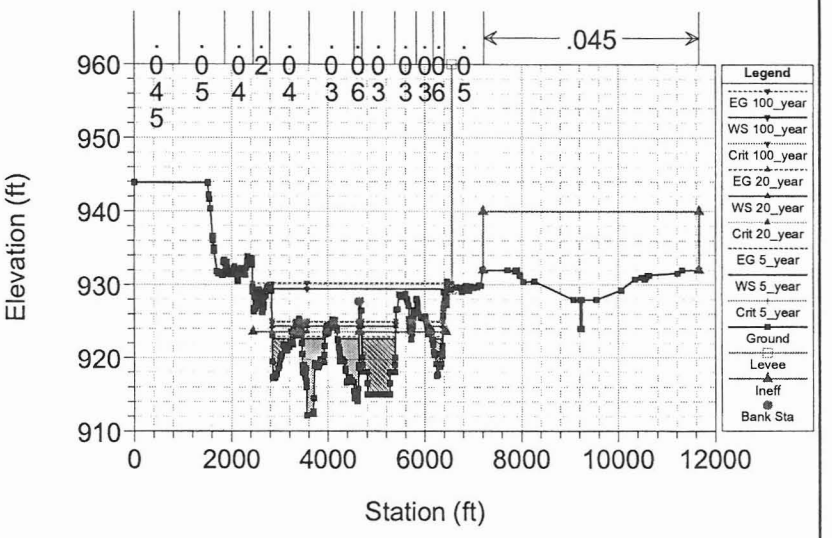
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.81 13974 14376.75 Existing Conditions Note: n values for first profile.



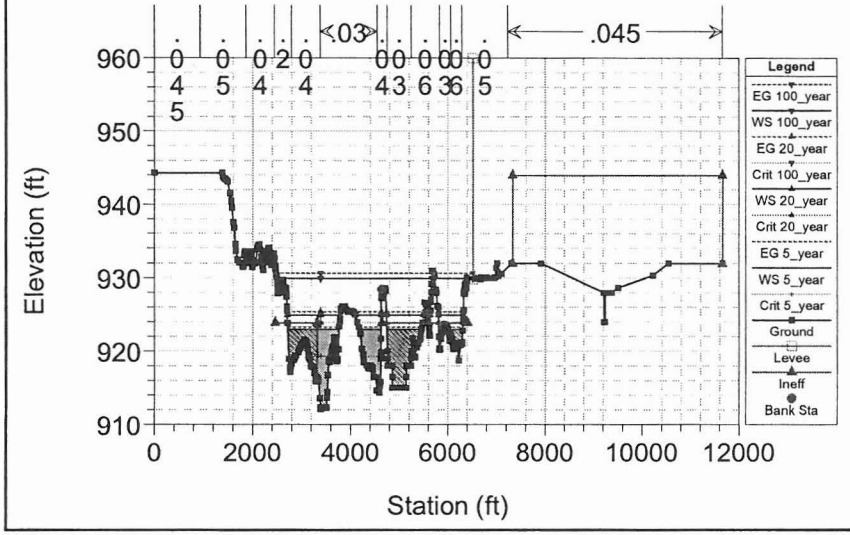
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

RS = 197.87 14303 14704.90 Existing Conditions Note: n values for first profile.



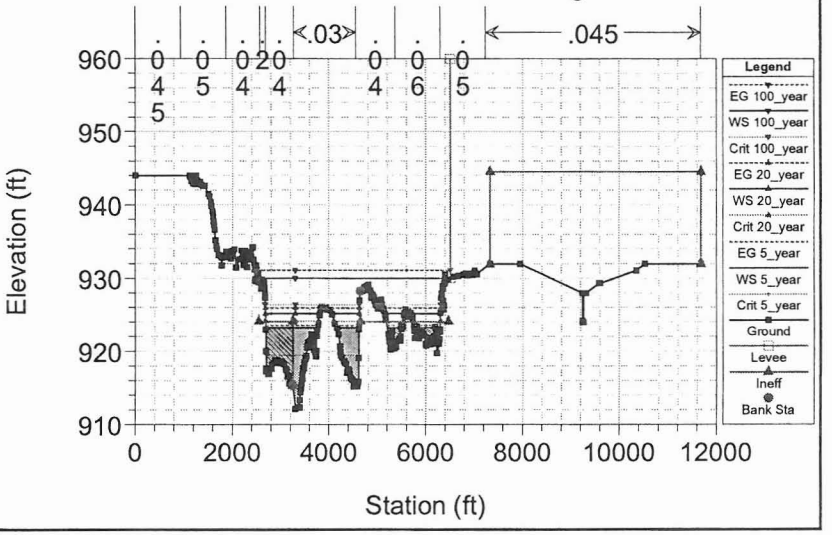
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

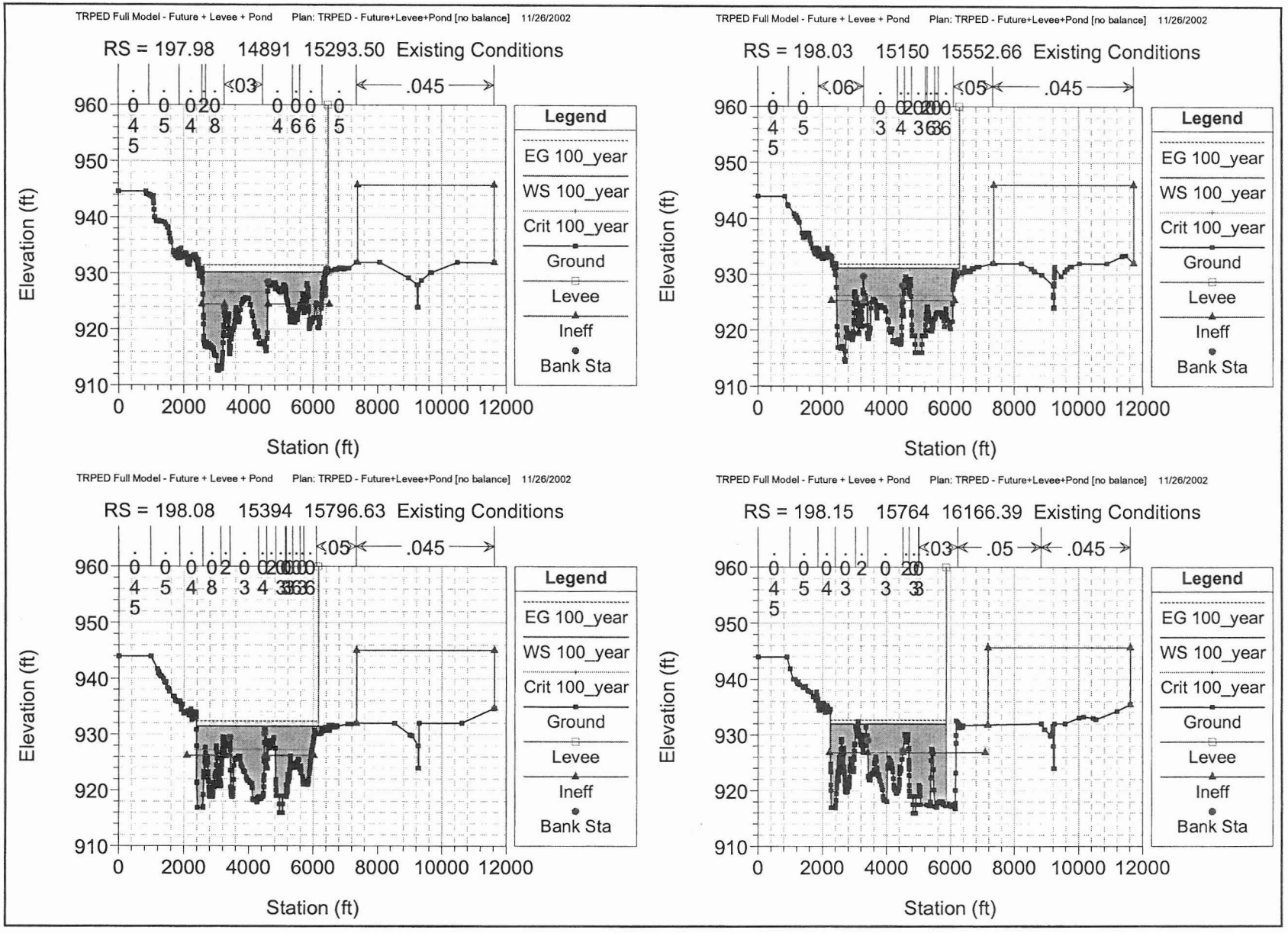
RS = 197.92 14565 14967.72 Existing Conditions Note: n values for first profile.

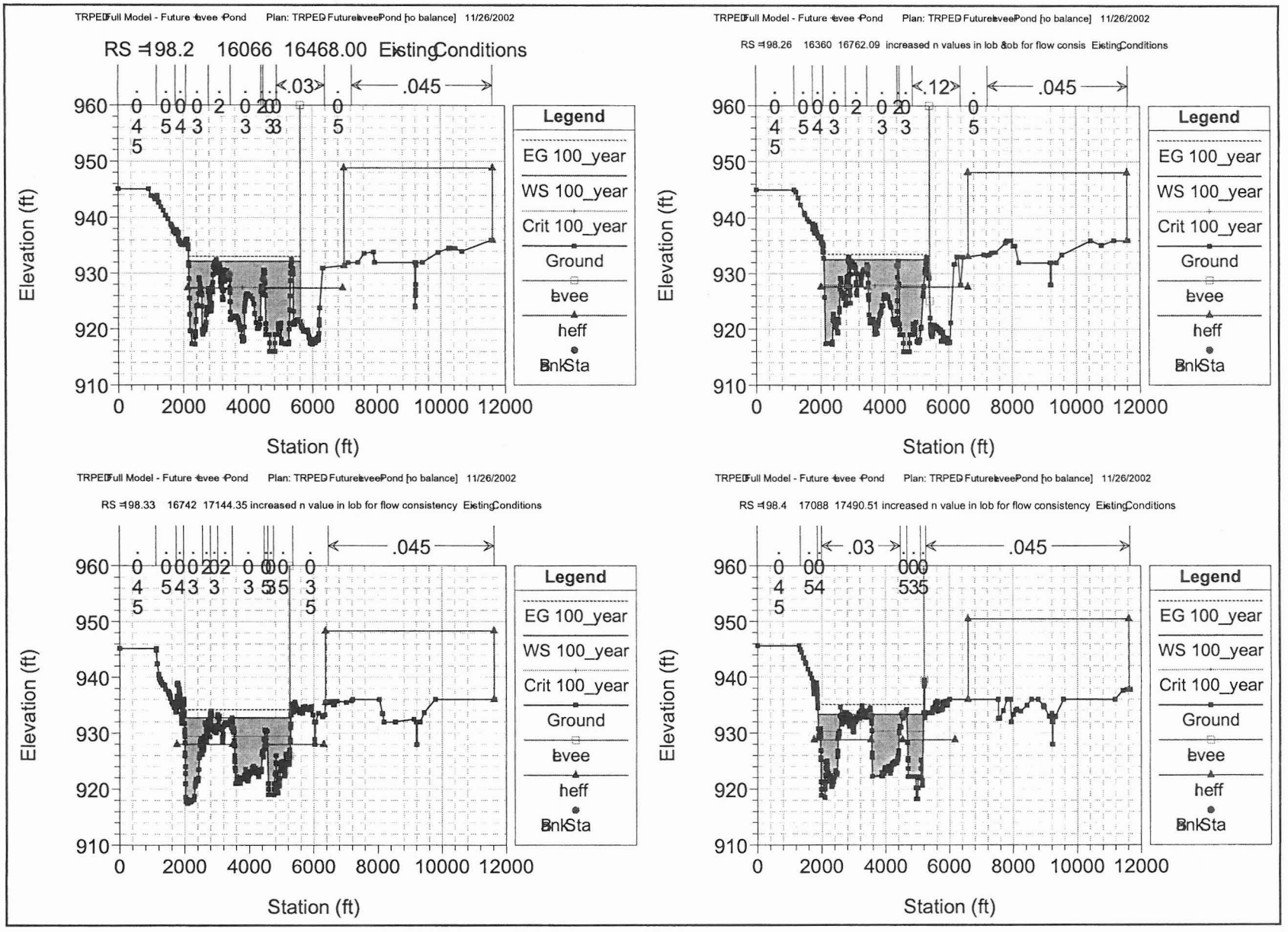


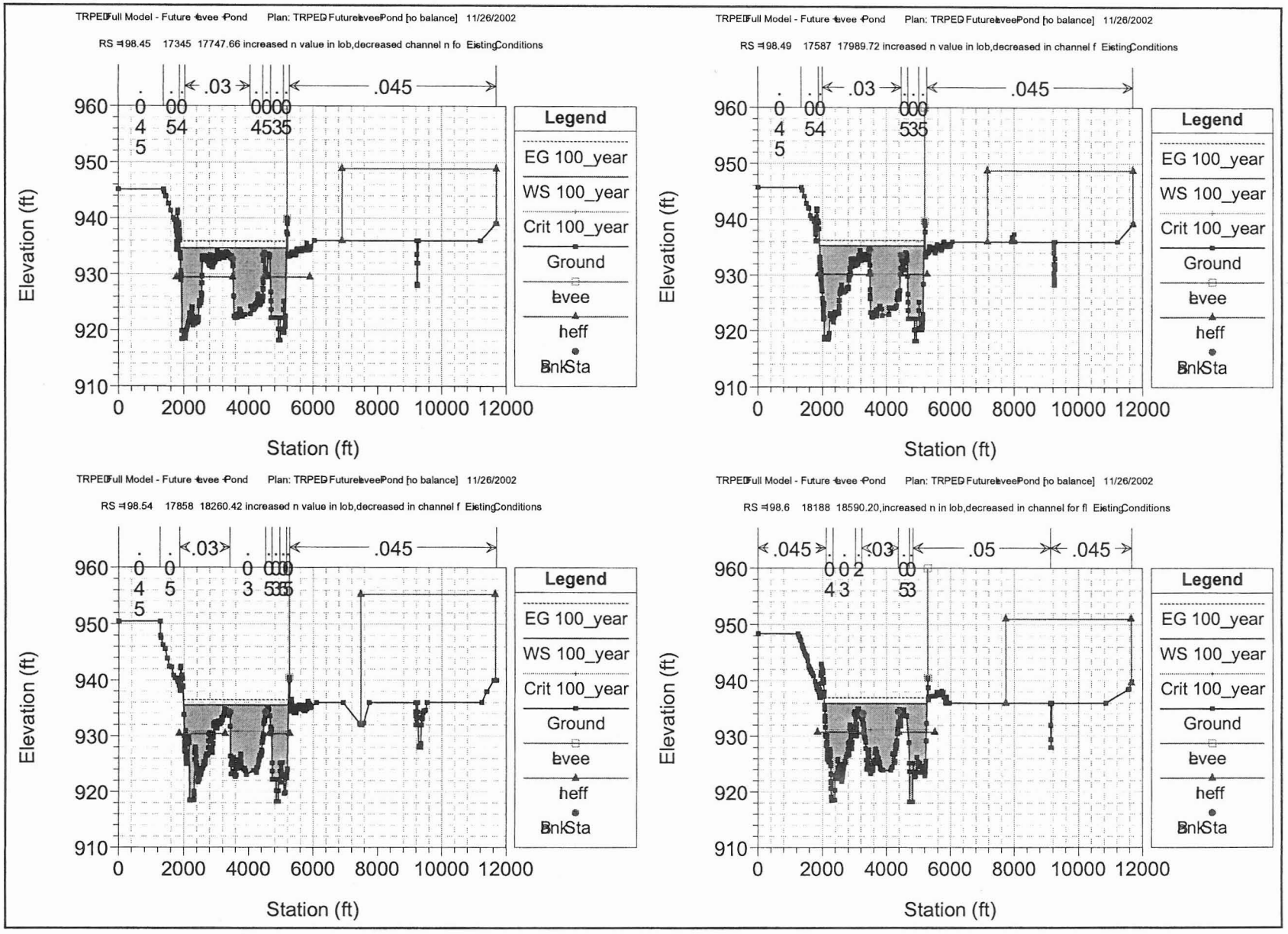
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002

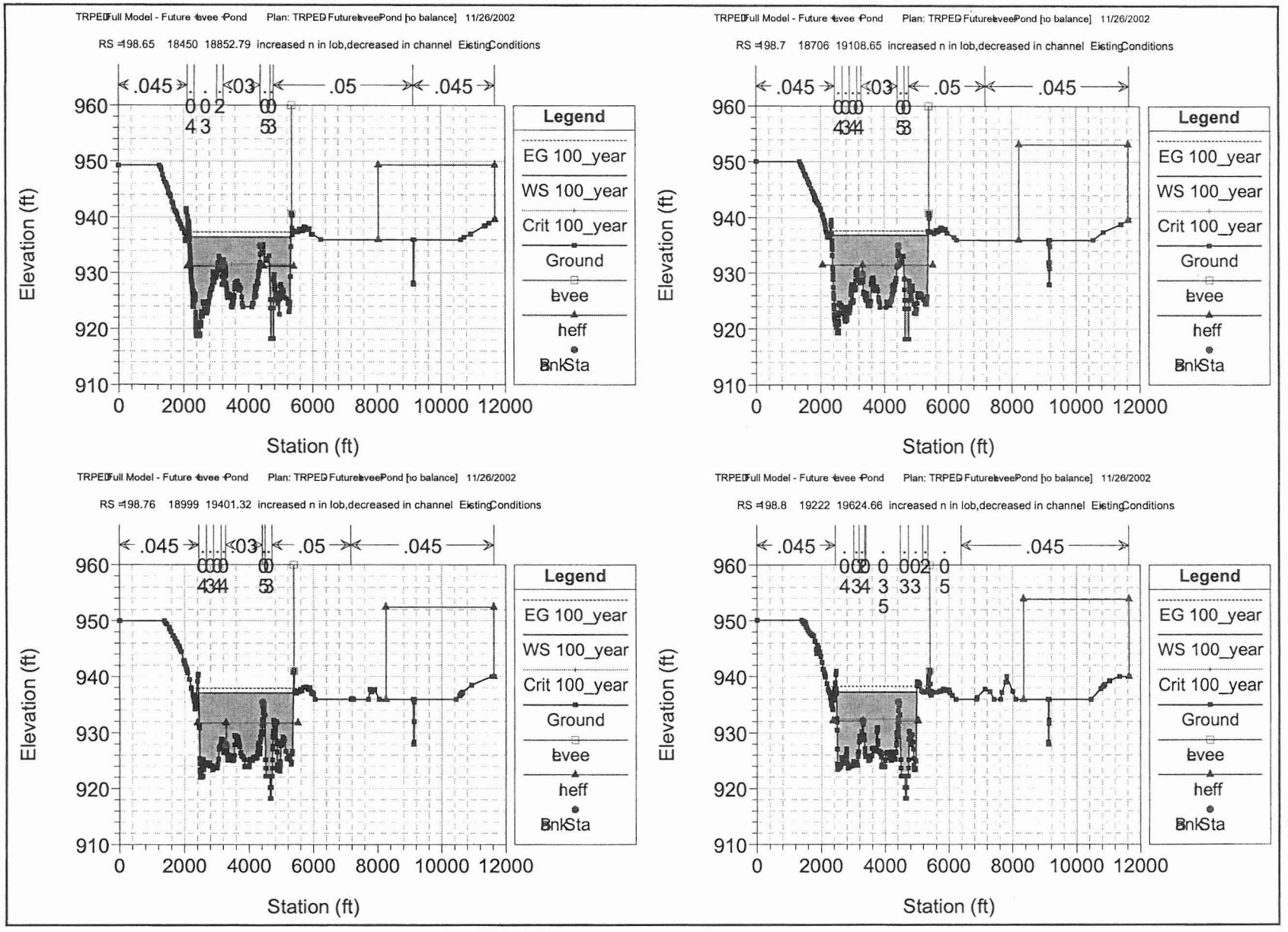
RS = 197.95 14721 15123.07 Existing Conditions

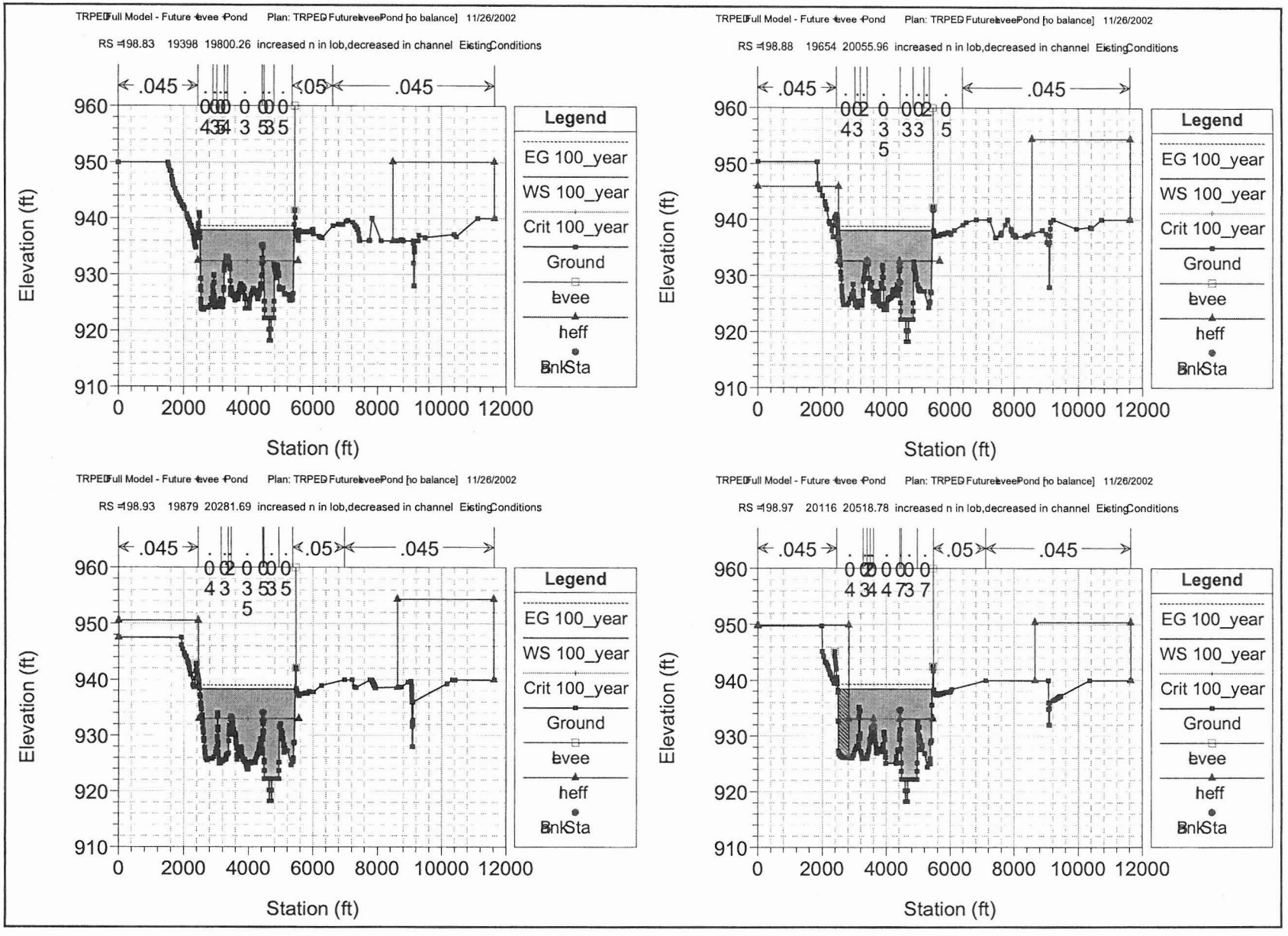


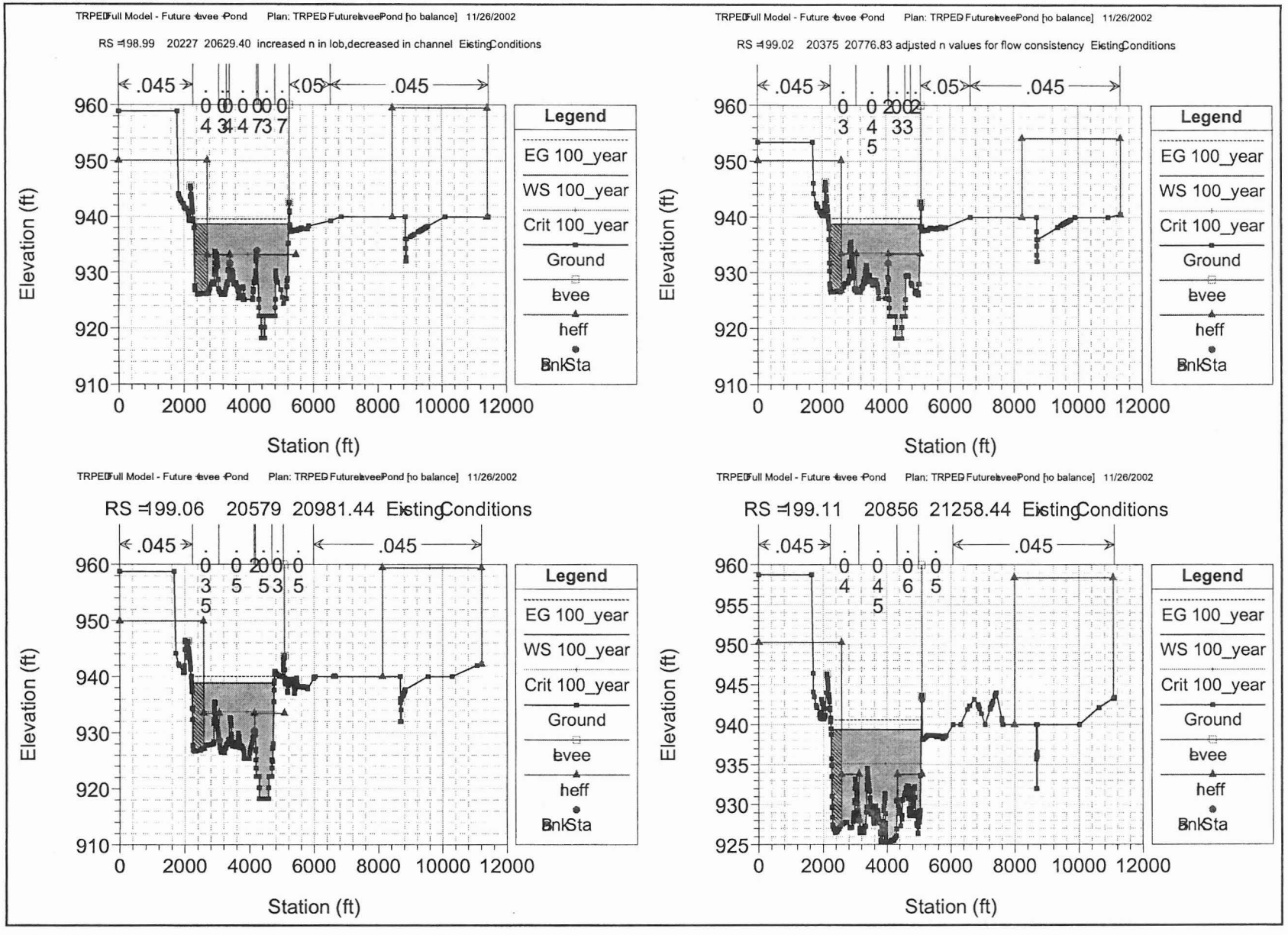

TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 197.98 14891 15293.50 Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 198.03 15150 15552.66 Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 198.08 15394 15796.63 Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 198.15 15764 16166.39 Existing Conditions
.05
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Ineff
Bank Sta
Elevation (ft)
Station (ft)

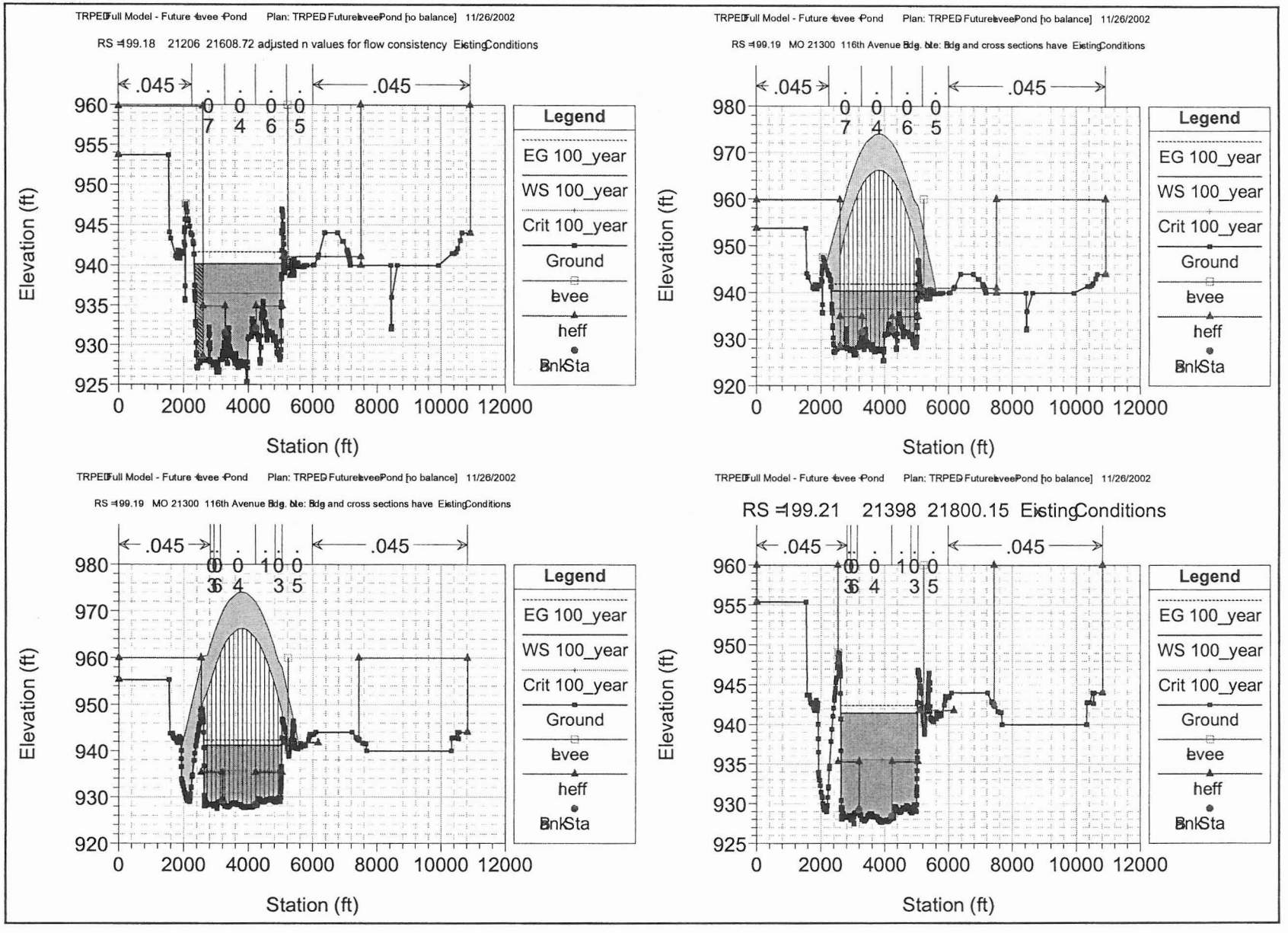

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.2 16066 16468.00 Existing Conditions
.03
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
960
950
940
930
920
910
0
2000
4000
6000
8000
10000
12000
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.26 16360 16762.09 increased n values in lob & lob for flow consis Existing Conditions
.12
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.33 16742 17144.35 increased n value in lob for flow consistency Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.4 17088 17490.51 increased n value in lob for flow consistency Existing Conditions
.03
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)

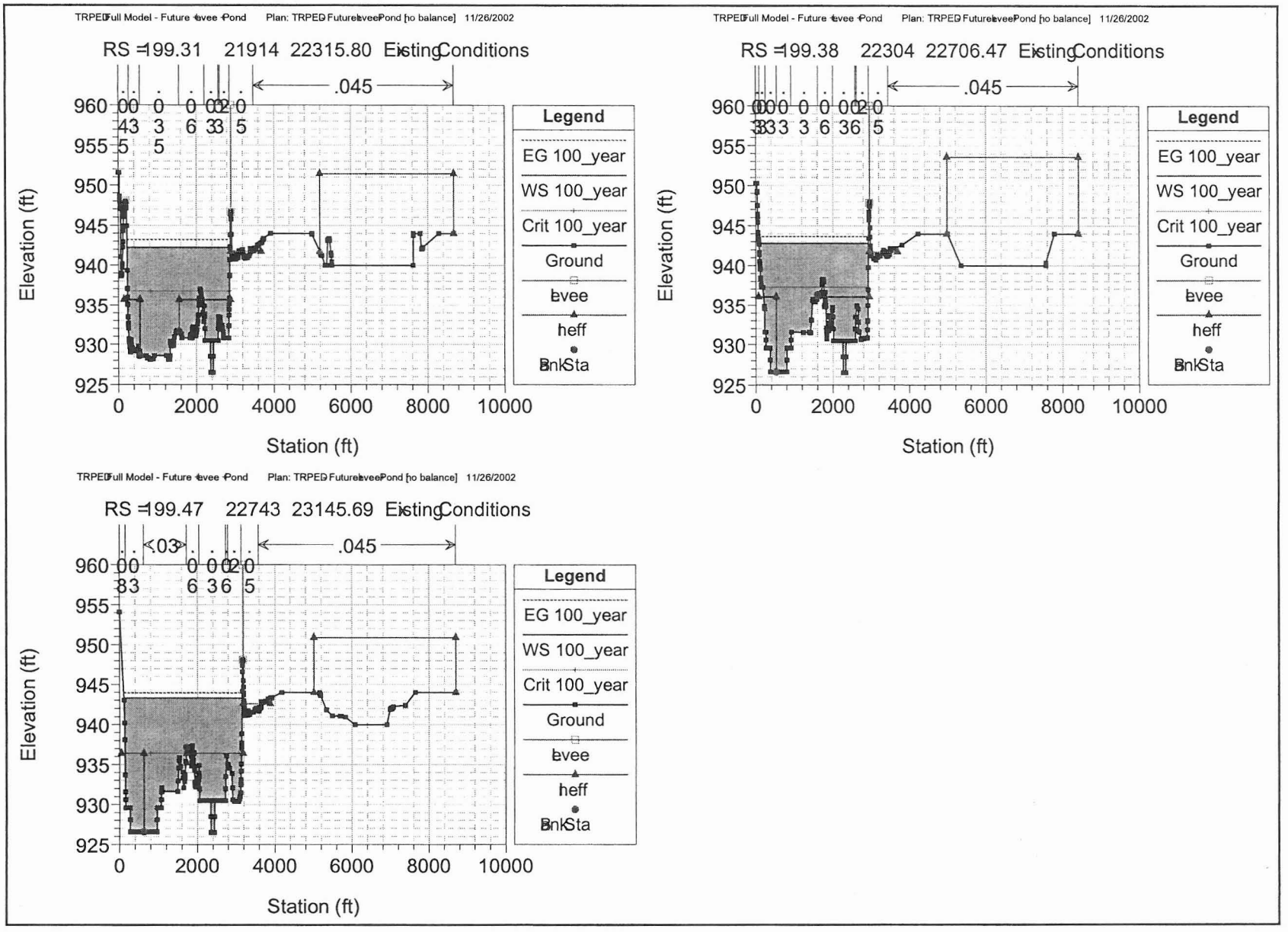

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 98.45 17345 17747.66 increased n value in lob, decreased channel n fo Existing Conditions
.03
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 98.49 17587 17989.72 increased n value in lob, decreased in channel f Existing Conditions
.03
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 98.54 17858 18260.42 increased n value in lob, decreased in channel f Existing Conditions
.03
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 98.6 18188 18590.20, increased n in lob, decreased in channel for fl Existing Conditions
.045
.03
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta


TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.65 18450 18852.79 increased n in lob, decreased in channel Existing Conditions
.045
.03
.05
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
960
950
940
930
920
910
0
2000
4000
6000
8000
10000
12000
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.7 18706 19108.65 increased n in lob, decreased in channel Existing Conditions
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.76 18999 19401.32 increased n in lob, decreased in channel Existing Conditions
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.8 19222 19624.66 increased n in lob, decreased in channel Existing Conditions


TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.83 19398 19800.26 increased n in lob, decreased in channel Existing Conditions
.045
.05
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
960
950
940
930
920
910
0
2000
4000
6000
8000
10000
12000
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.88 19654 20055.96 increased n in lob, decreased in channel Existing Conditions
.045
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.93 19879 20281.69 increased n in lob, decreased in channel Existing Conditions
.045
.05
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.97 20116 20518.78 increased n in lob, decreased in channel Existing Conditions
.045
.05
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)

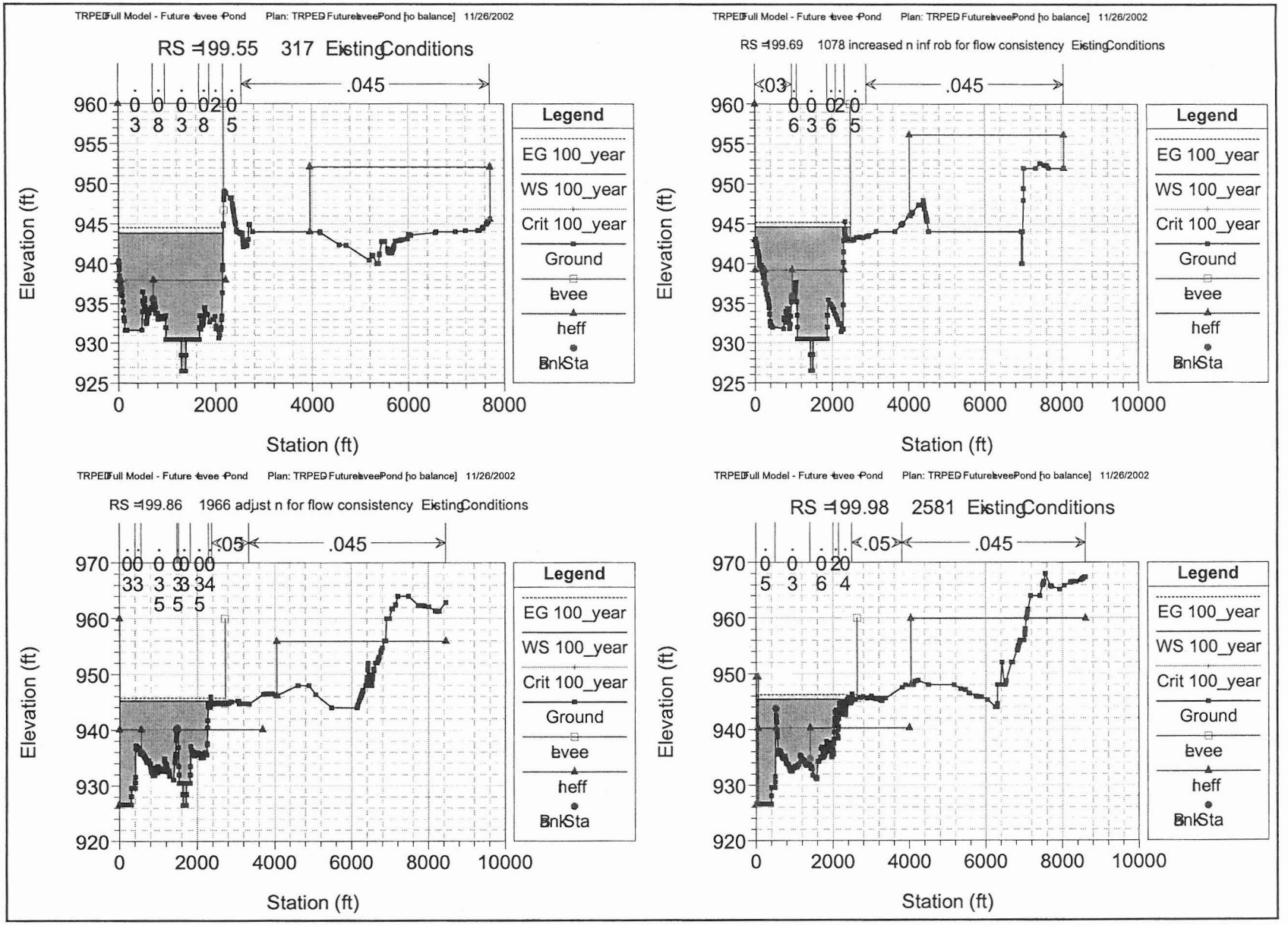

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 198.99 20227 20629.40 increased n in lob, decreased in channel Existing Conditions
.045
.05
.045
0.04 0.03 0.04 0.04 0.07 0.03 0.07
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
960
950
940
930
920
910
0
2000
4000
6000
8000
10000
12000
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.02 20375 20776.83 adjusted n values for flow consistency Existing Conditions
.045
.05
.045
0.03 0.04 0.05 0.02 0.02 0.03
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
960
950
940
930
920
910
0
2000
4000
6000
8000
10000
12000
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.06 20579 20981.44 Existing Conditions
.045
.045
0.03 0.05 0.02 0.05 0.03 0.05
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
960
950
940
930
920
910
0
2000
4000
6000
8000
10000
12000
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.11 20856 21258.44 Existing Conditions
.045
.045
0.04 0.04 0.06 0.05
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
960
955
950
945
940
935
930
925
0
2000
4000
6000
8000
10000
12000
Station (ft)

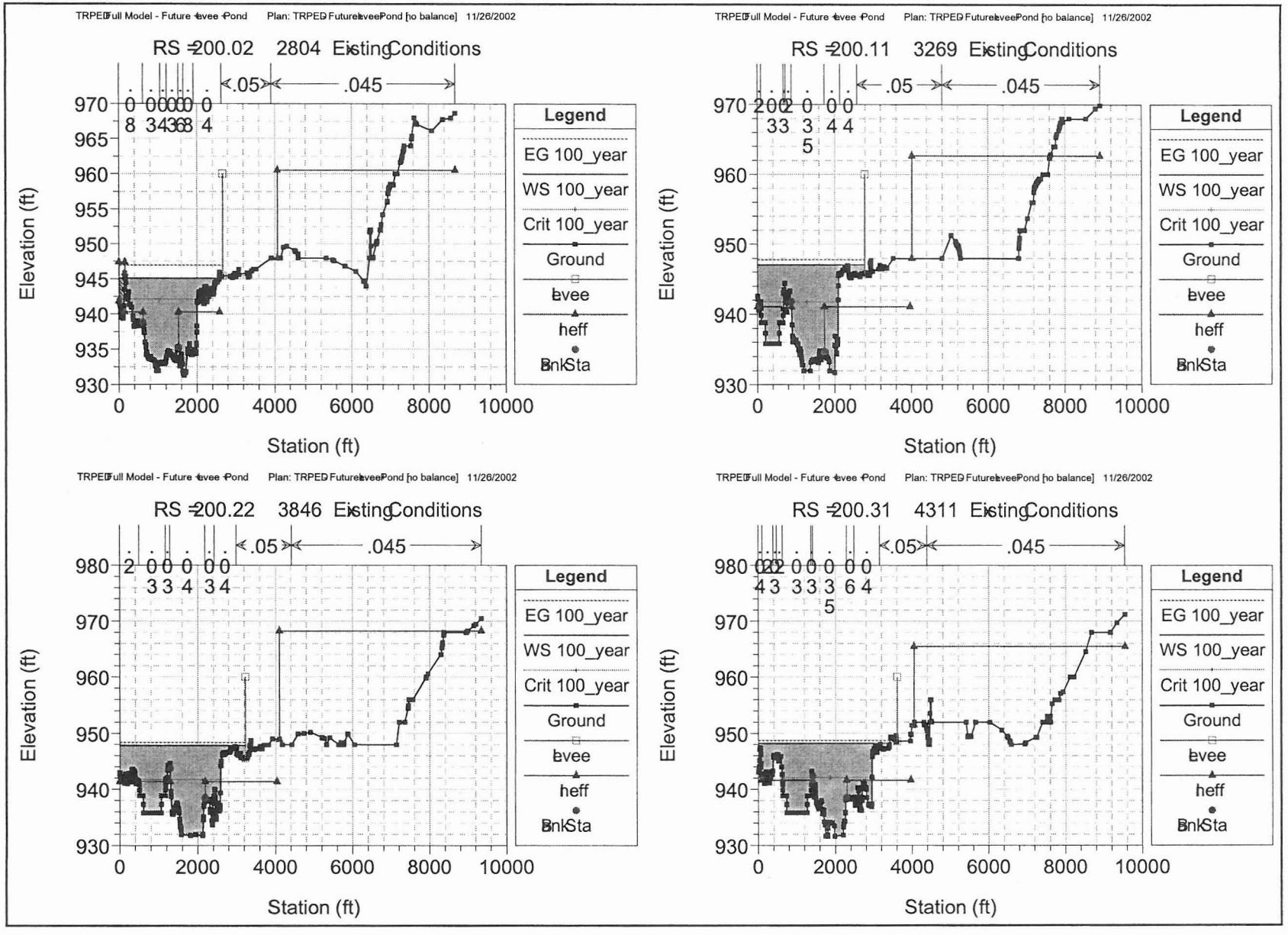

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.18 21206 21608.72 adjusted n values for flow consistency Existing Conditions
.045
.045
0.07
0.04
0.06
0.05
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
960
955
950
945
940
935
930
925
0
2000
4000
6000
8000
10000
12000
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.19 MO 21300 116th Avenue Bdg. Note: Bdg and cross sections have Existing Conditions
.045
.045
0.07
0.04
0.06
0.05
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
980
970
960
950
940
930
920
0
2000
4000
6000
8000
10000
12000
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.19 MO 21300 116th Avenue Bdg. Note: Bdg and cross sections have Existing Conditions
.045
.045
0.07
0.04
0.10
0.03
0.05
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
980
970
960
950
940
930
920
0
2000
4000
6000
8000
10000
12000
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.21 21398 21800.15 Existing Conditions
.045
.045
0.07
0.04
0.10
0.03
0.05
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
960
955
950
945
940
935
930
925
0
2000
4000
6000
8000
10000
12000

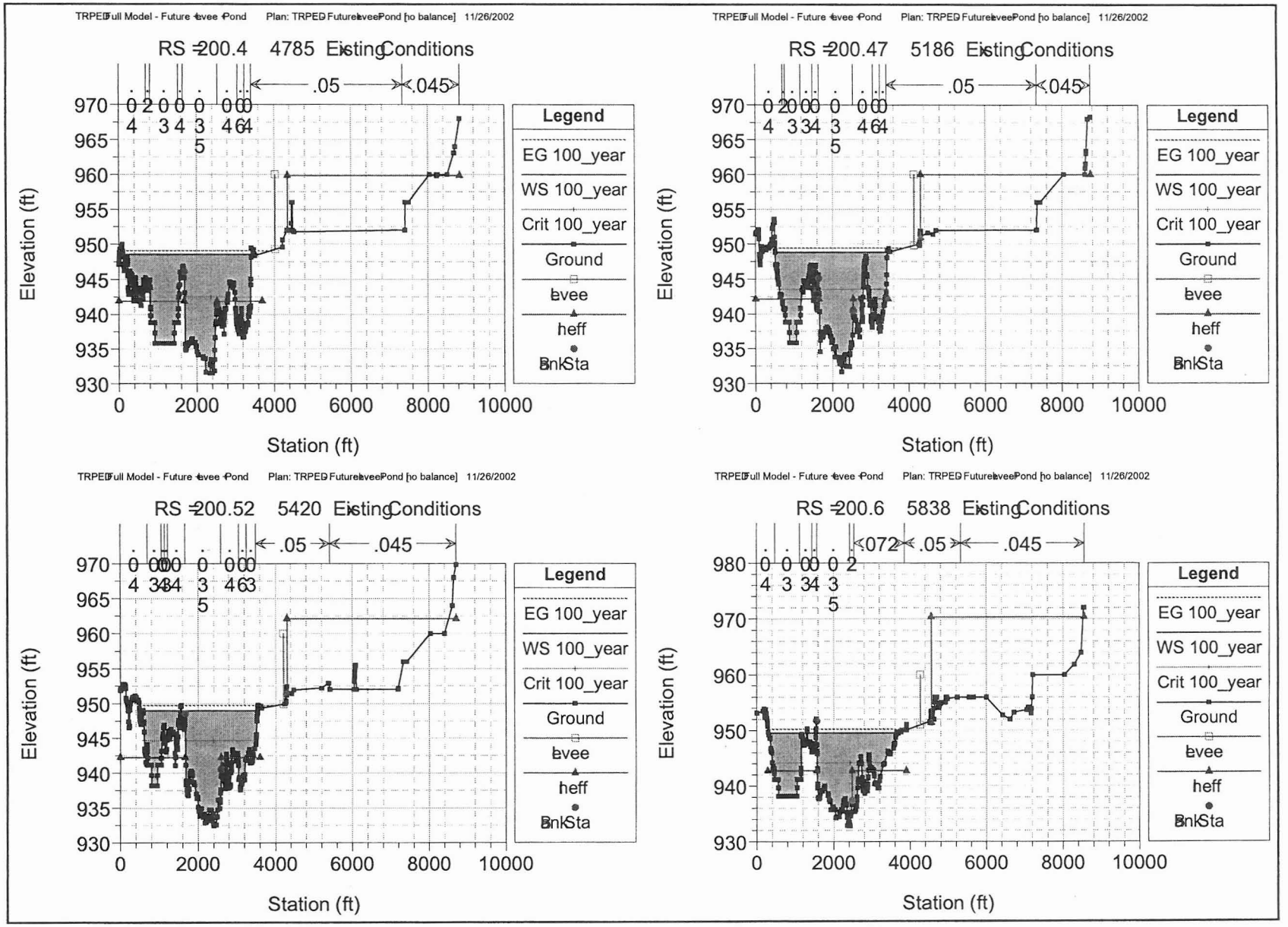

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.31 21914 22315.80 Existing Conditions
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.38 22304 22706.47 Existing Conditions
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 199.47 22743 23145.69 Existing Conditions
.03
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta

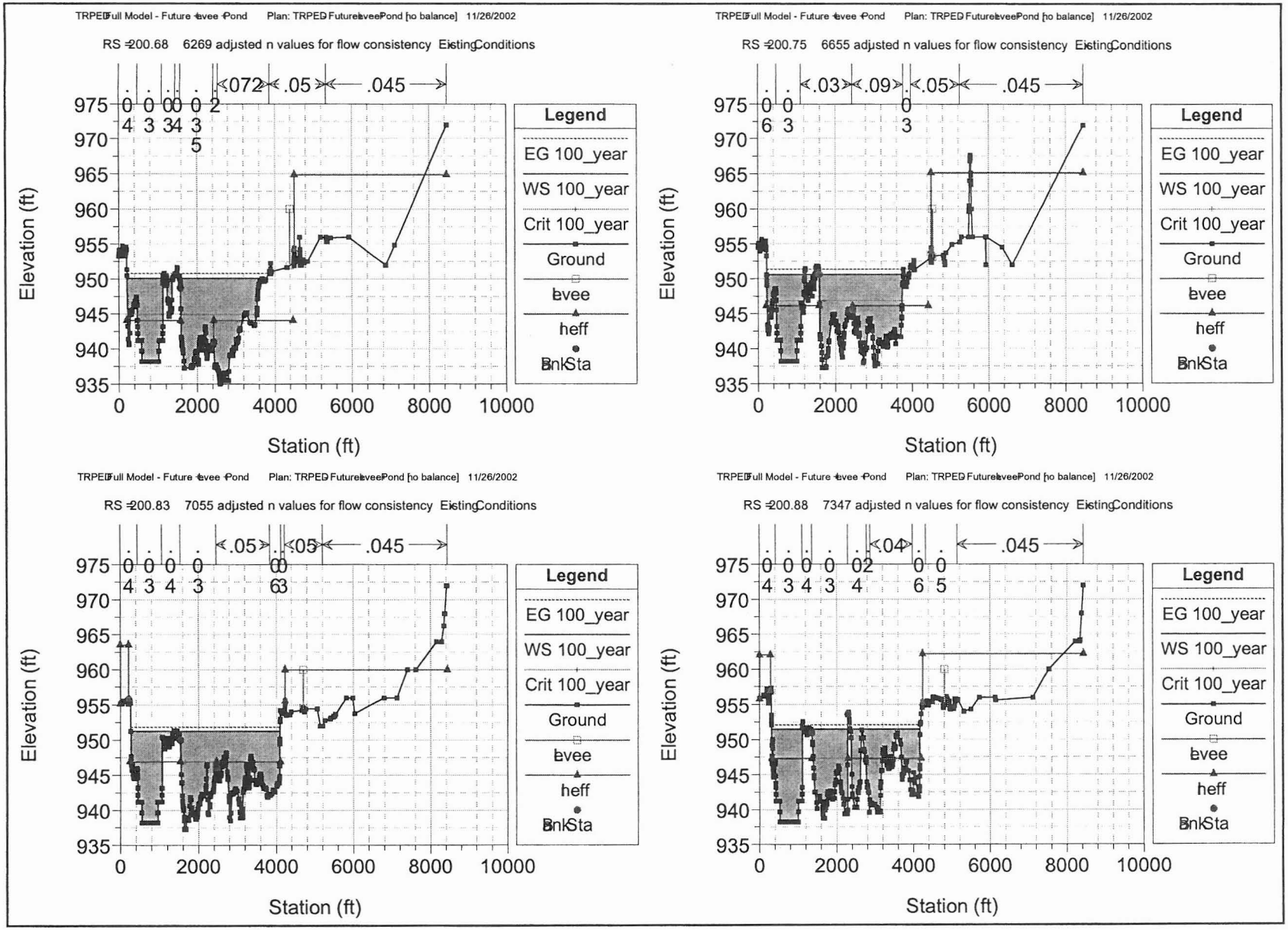
G-iii

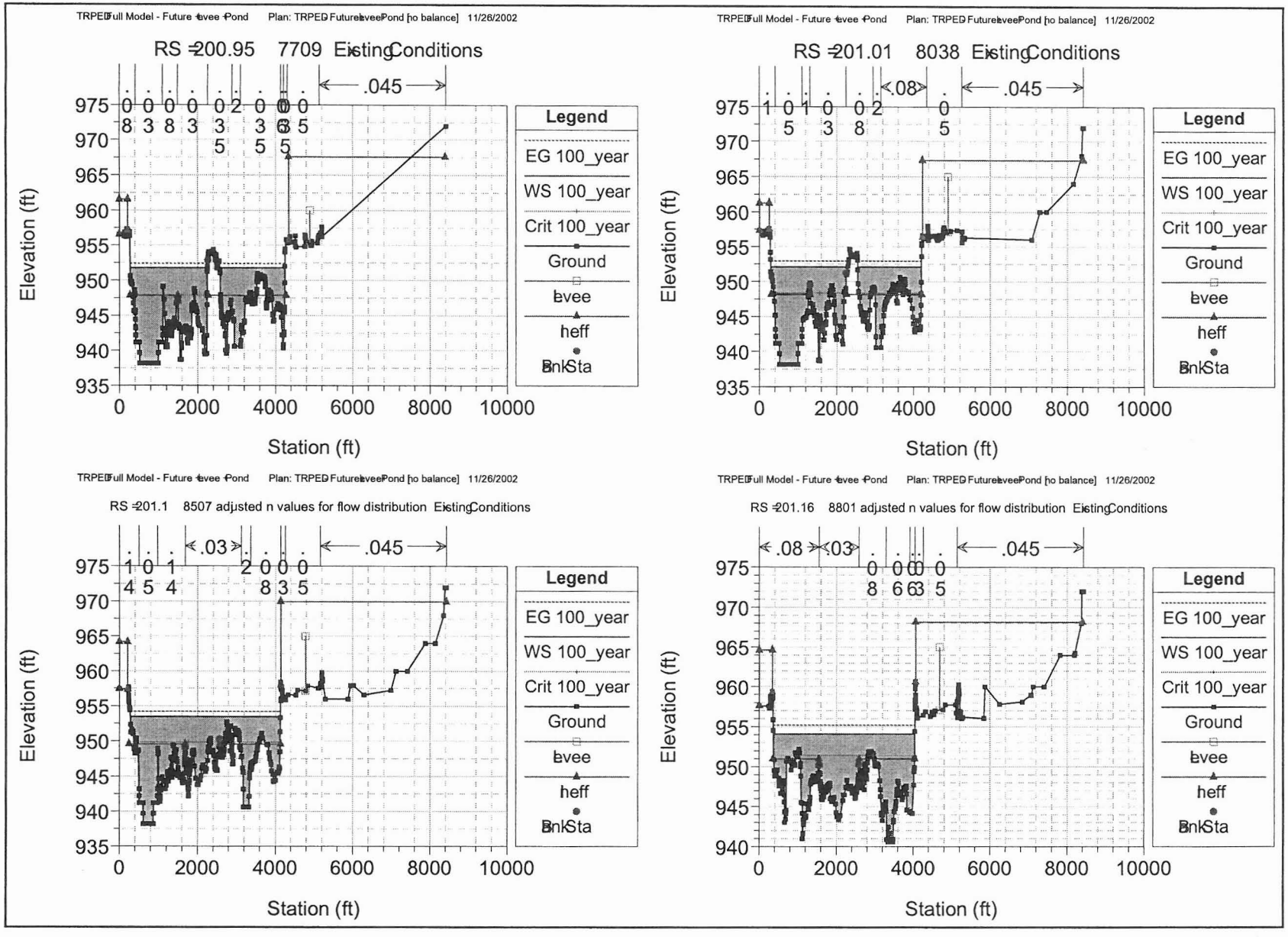
Cross Section Plots for the Salt

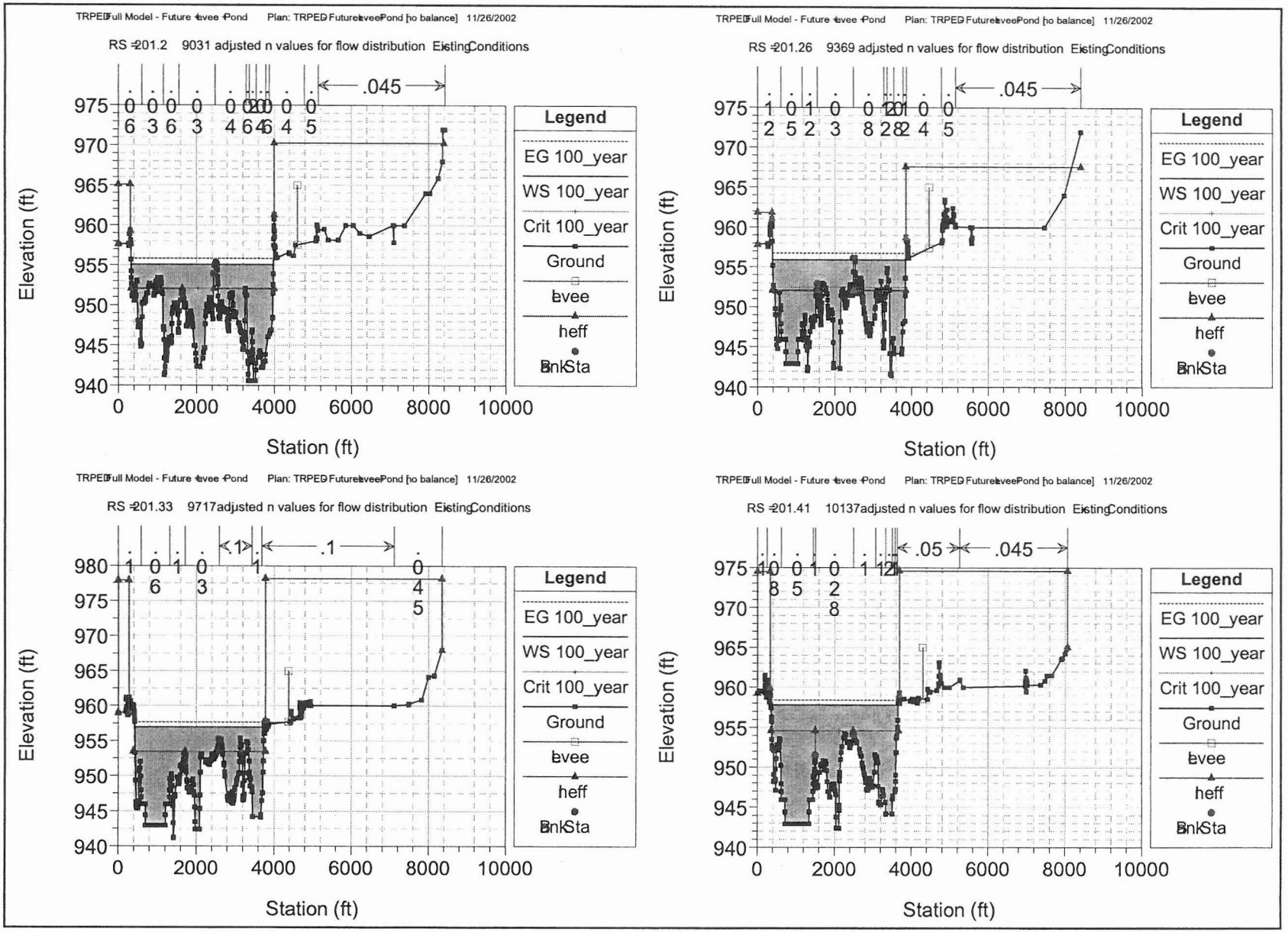

TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 99.55 317 Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 99.69 1078 increased n inf rob for flow consistency Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 99.86 1966 adjust n for flow consistency Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 99.98 2581 Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
Elevation (ft)
Station (ft)

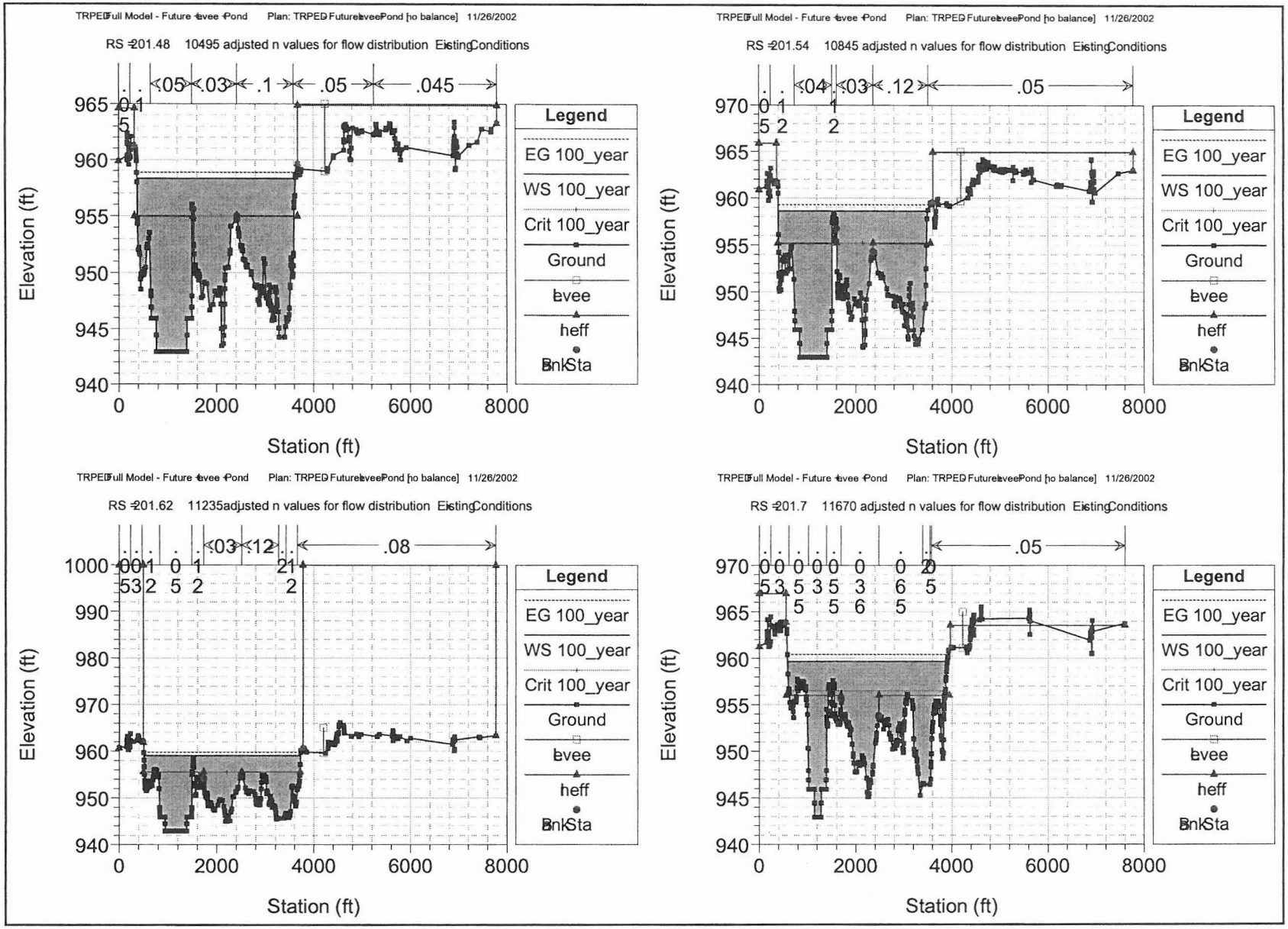

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 200.02 2804 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 200.11 3269 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 200.22 3846 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 200.31 4311 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Heff
Bnk Sta

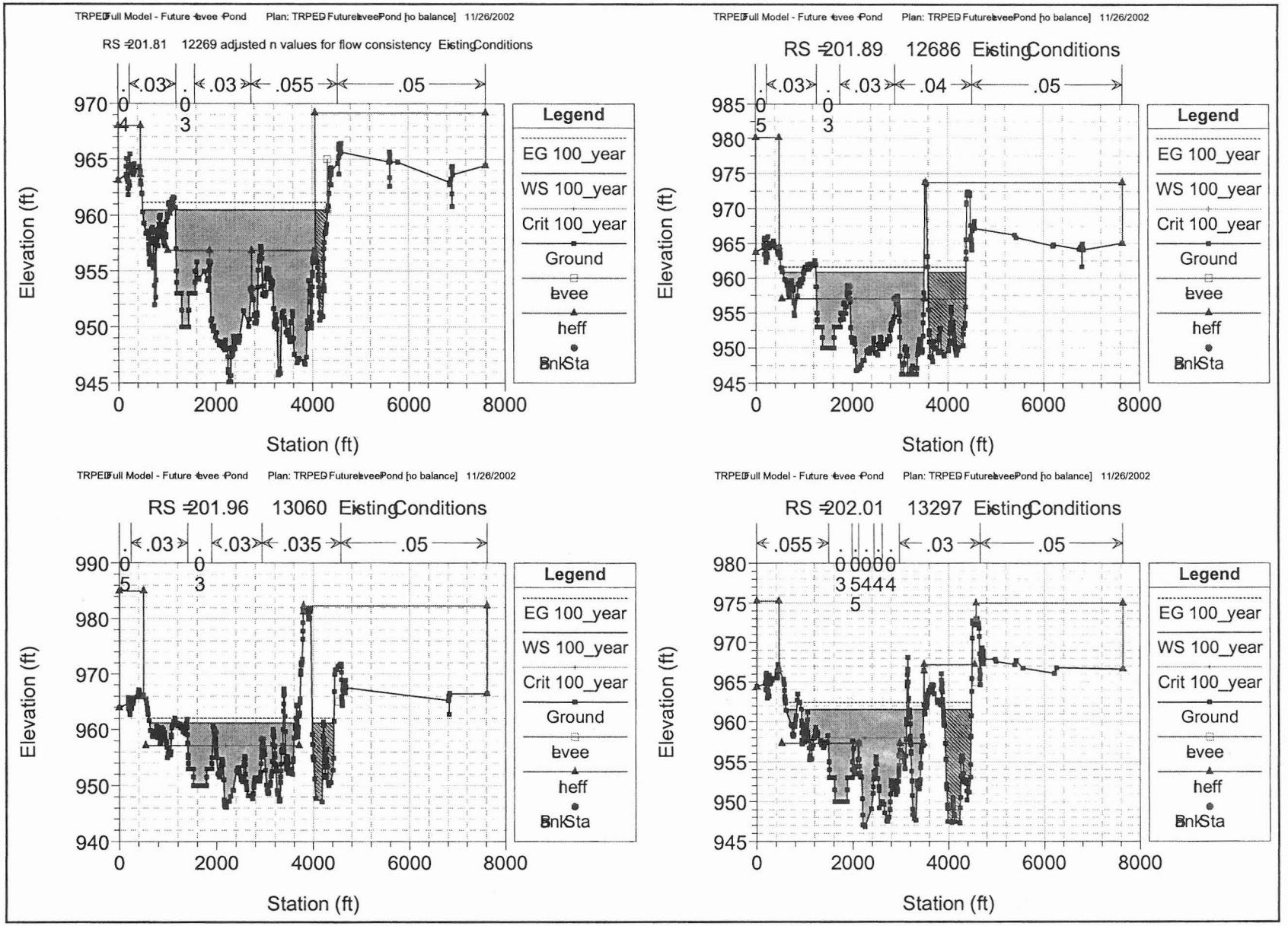

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 200.4 4785 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 200.47 5186 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 200.52 5420 Existing Conditions
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 200.6 5838 Existing Conditions
.072
.05
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta

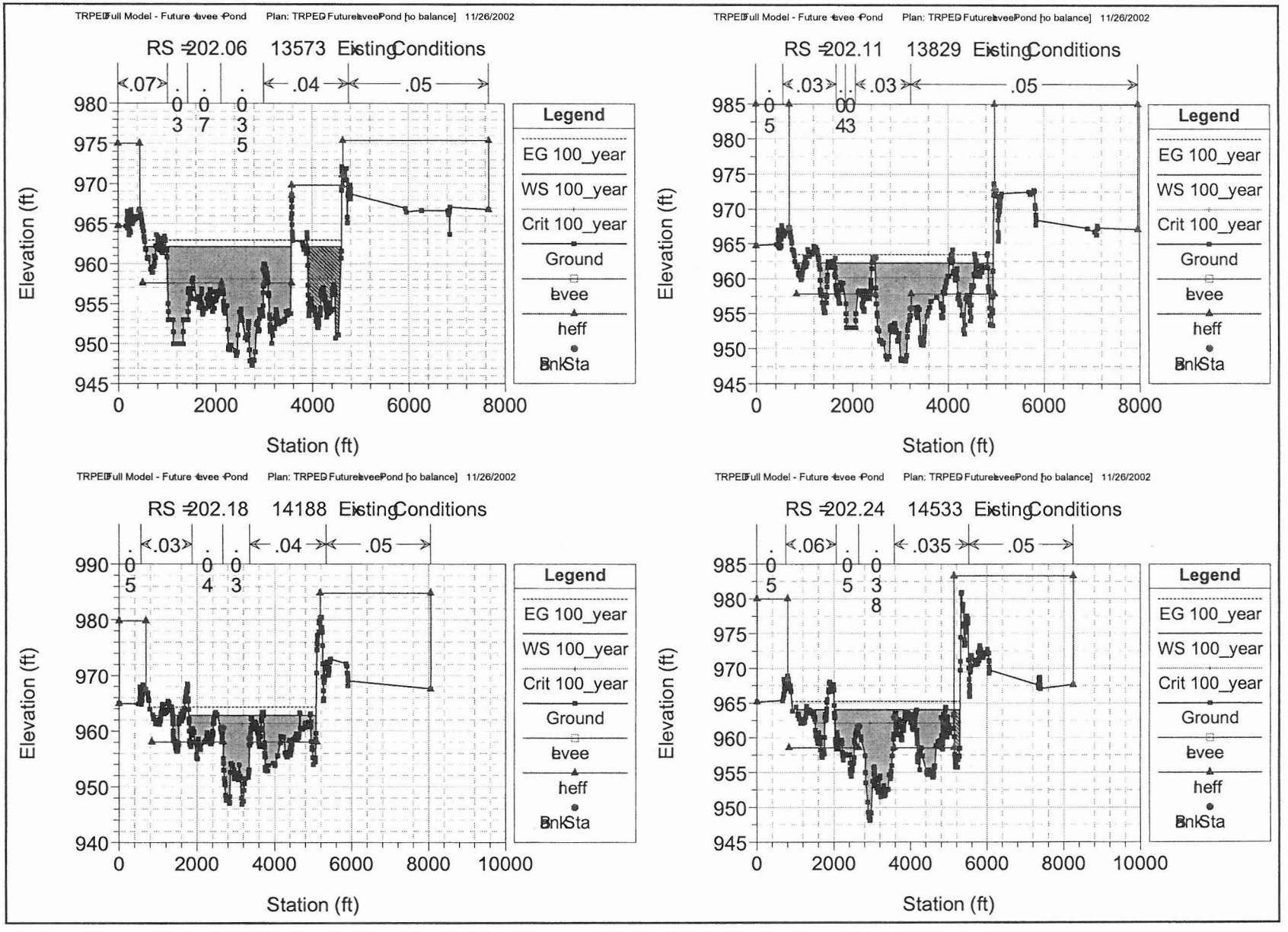

TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 200.68 6269 adjusted n values for flow consistency Existing Conditions
.072
.05
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 200.75 6655 adjusted n values for flow consistency Existing Conditions
.03
.09
.05
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 200.83 7055 adjusted n values for flow consistency Existing Conditions
.05
.05
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 200.88 7347 adjusted n values for flow consistency Existing Conditions
.04
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
Elevation (ft)
Station (ft)

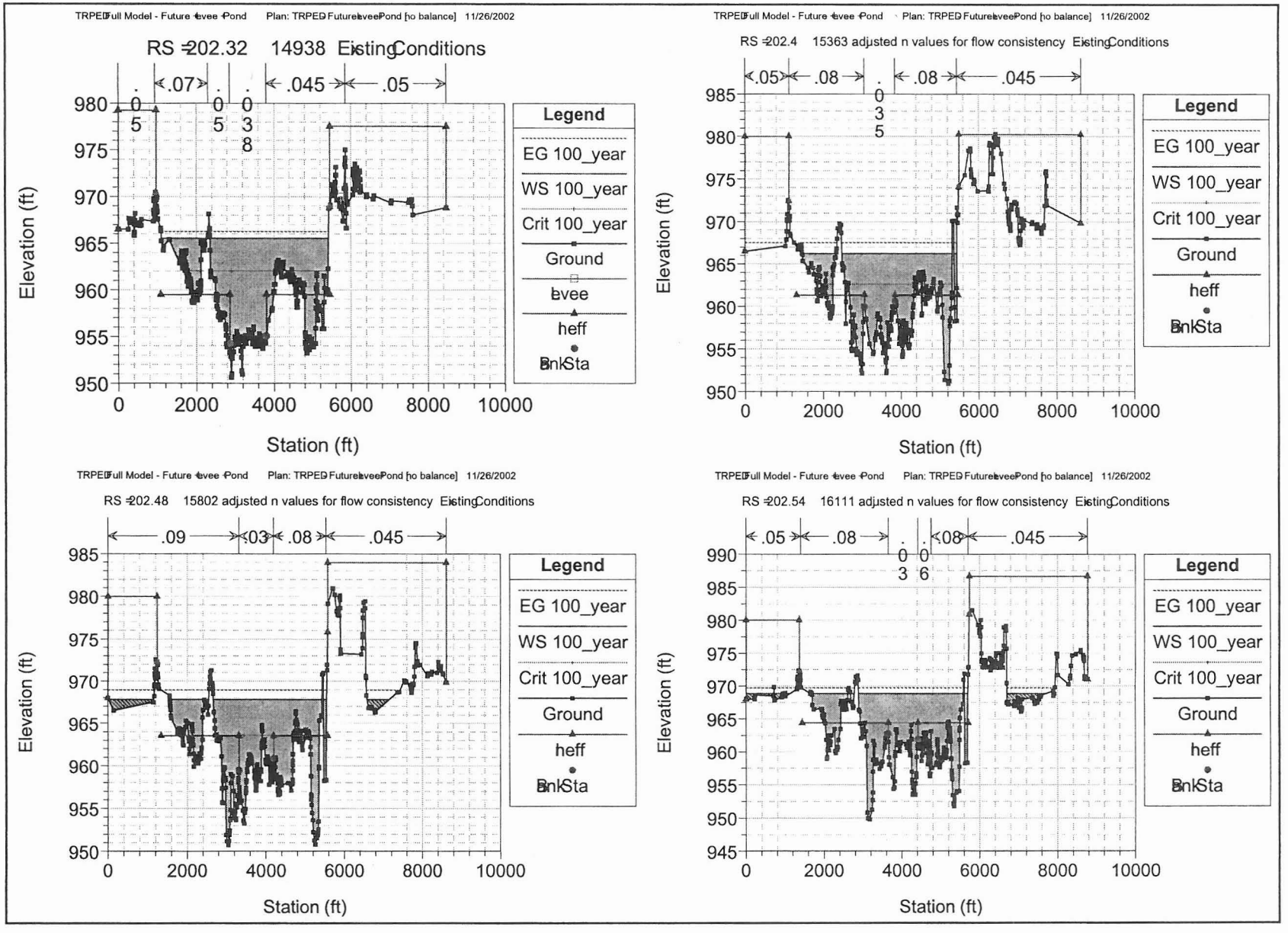

TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 200.95 7709 Existing Conditions
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 201.01 8038 Existing Conditions
.08
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 201.1 8507 adjusted n values for flow distribution Existing Conditions
.03
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 201.16 8801 adjusted n values for flow distribution Existing Conditions
.08
.03
.045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta

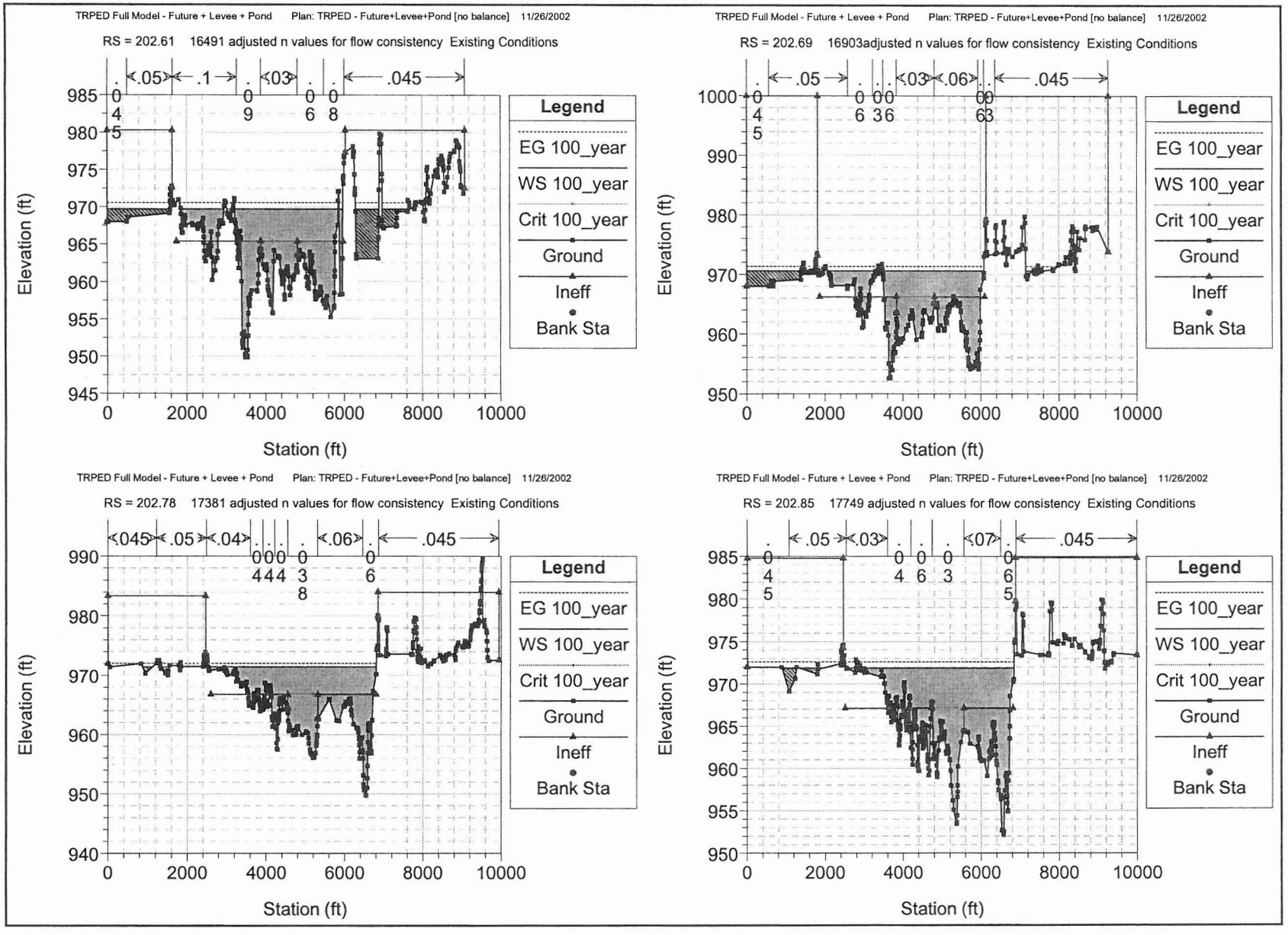

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS 201.2 9031 adjusted n values for flow distribution Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS 201.26 9369 adjusted n values for flow distribution Existing Conditions
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS 201.33 9717 adjusted n values for flow distribution Existing Conditions
.1
.1
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS 201.41 10137 adjusted n values for flow distribution Existing Conditions
.05
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)

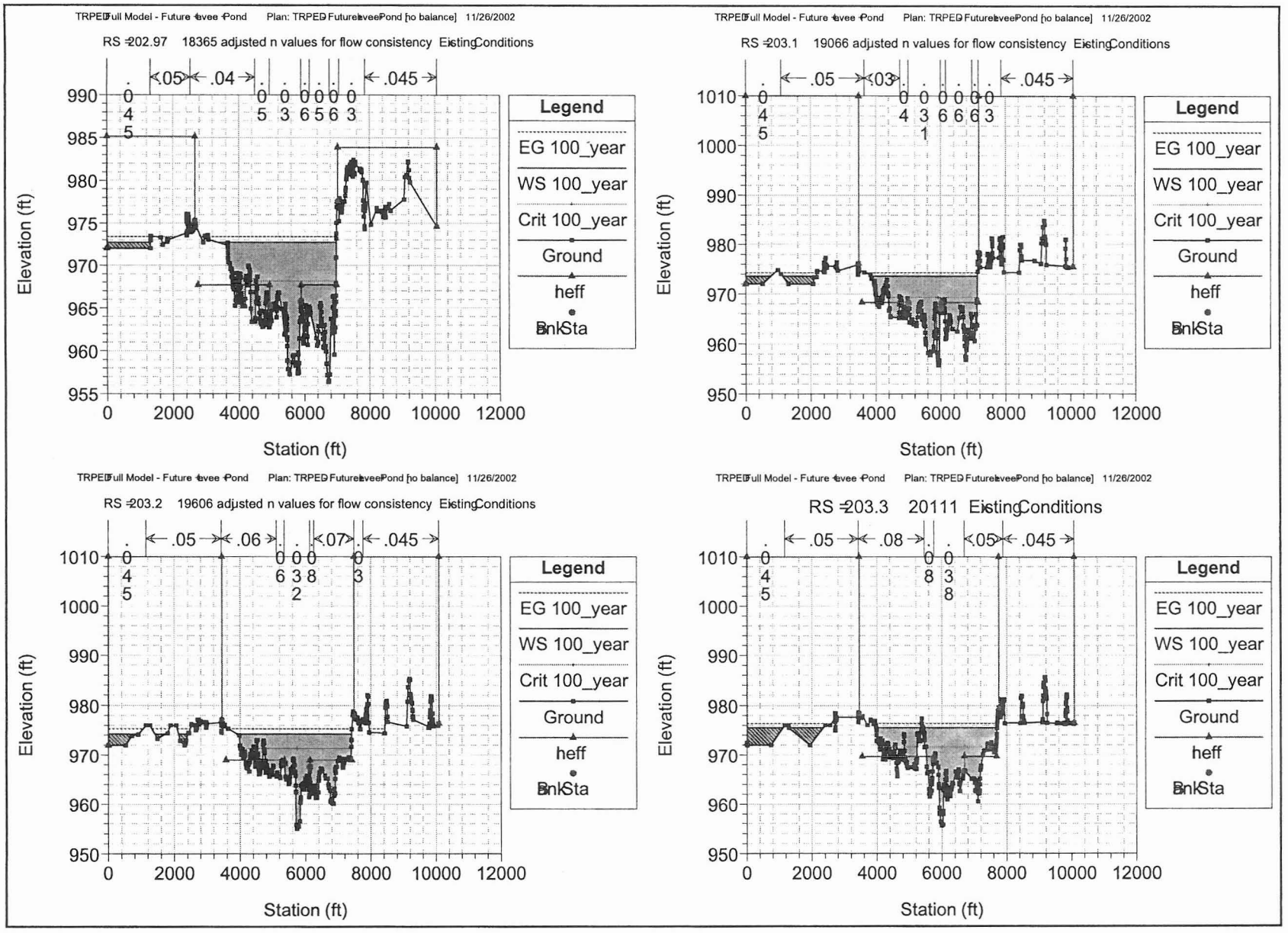

TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 201.48 10495 adjusted n values for flow distribution EistingConditions
.05 .03 .1 .05 .045
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 201.54 10845 adjusted n values for flow distribution EistingConditions
.04 .03 .12 .05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 201.62 11235adjusted n values for flow distribution EistingConditions
.03 .12 .08
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 201.7 11670 adjusted n values for flow distribution EistingConditions
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta

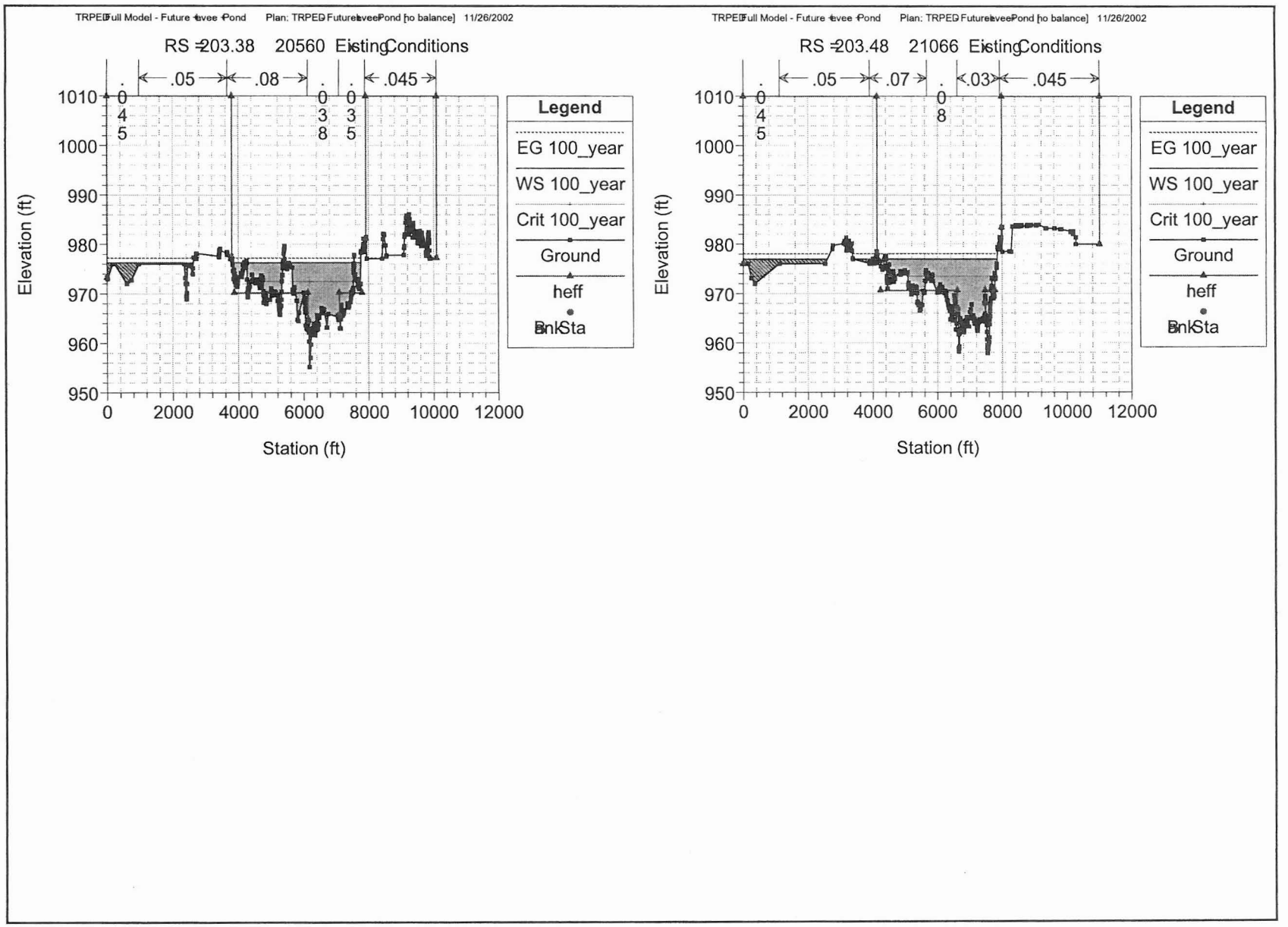

TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 201.81 12269 adjusted n values for flow consistency Existing Conditions
.03 .03 .055 .05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 201.89 12686 Existing Conditions
.03 .03 .04 .05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 201.96 13060 Existing Conditions
.03 .03 .035 .05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS = 202.01 13297 Existing Conditions
.055 .03 .05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
Heff
Bnk Sta


TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 202.06 13573 Existing Conditions
.07
.03
.07
.035
.04
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 202.11 13829 Existing Conditions
.05
.0043
.03
.03
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 202.18 14188 Existing Conditions
.05
.04
.03
.04
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 202.24 14533 Existing Conditions
.05
.038
.05
.035
.06
.05
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
BnkSta


TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 202.32 14938 Existing Conditions
.07
.045
.05
.05
.038
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Levee
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 202.4 15363 adjusted n values for flow consistency Existing Conditions
.05
.08
.08
.045
.035
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 202.48 15802 adjusted n values for flow consistency Existing Conditions
.09
.03
.08
.045
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
heff
Bnk Sta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED FutureLeveePond [no balance] 11/26/2002
RS 202.54 16111 adjusted n values for flow consistency Existing Conditions
.05
.08
.08
.045
.036
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
heff
Bnk Sta
Elevation (ft)
Station (ft)

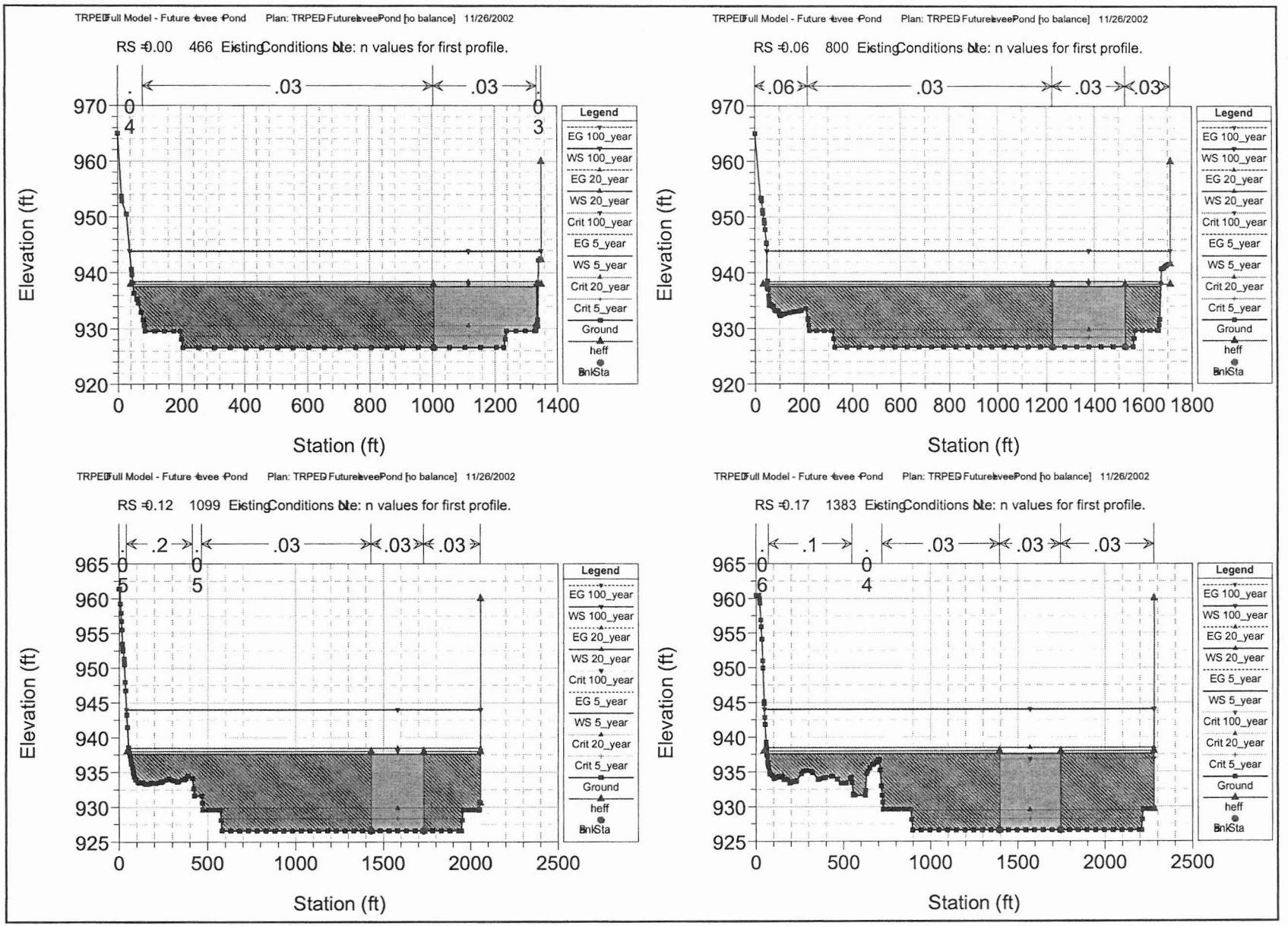

TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 202.61 16491 adjusted n values for flow consistency Existing Conditions
.05 .1 .03 .045
0 4 5
0 9
0 6 8
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 202.69 16903adjusted n values for flow consistency Existing Conditions
.05 .03 .06 .045
0 4 5
0 6 36
00 63
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 202.78 17381 adjusted n values for flow consistency Existing Conditions
.045 .05 .04 .06 .045
0 4 4 4 3 8
0 6
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 202.85 17749 adjusted n values for flow consistency Existing Conditions
.05 .03 .07 .045
0 4 5
0 4 6 3
0 6 5
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
Ineff
Bank Sta

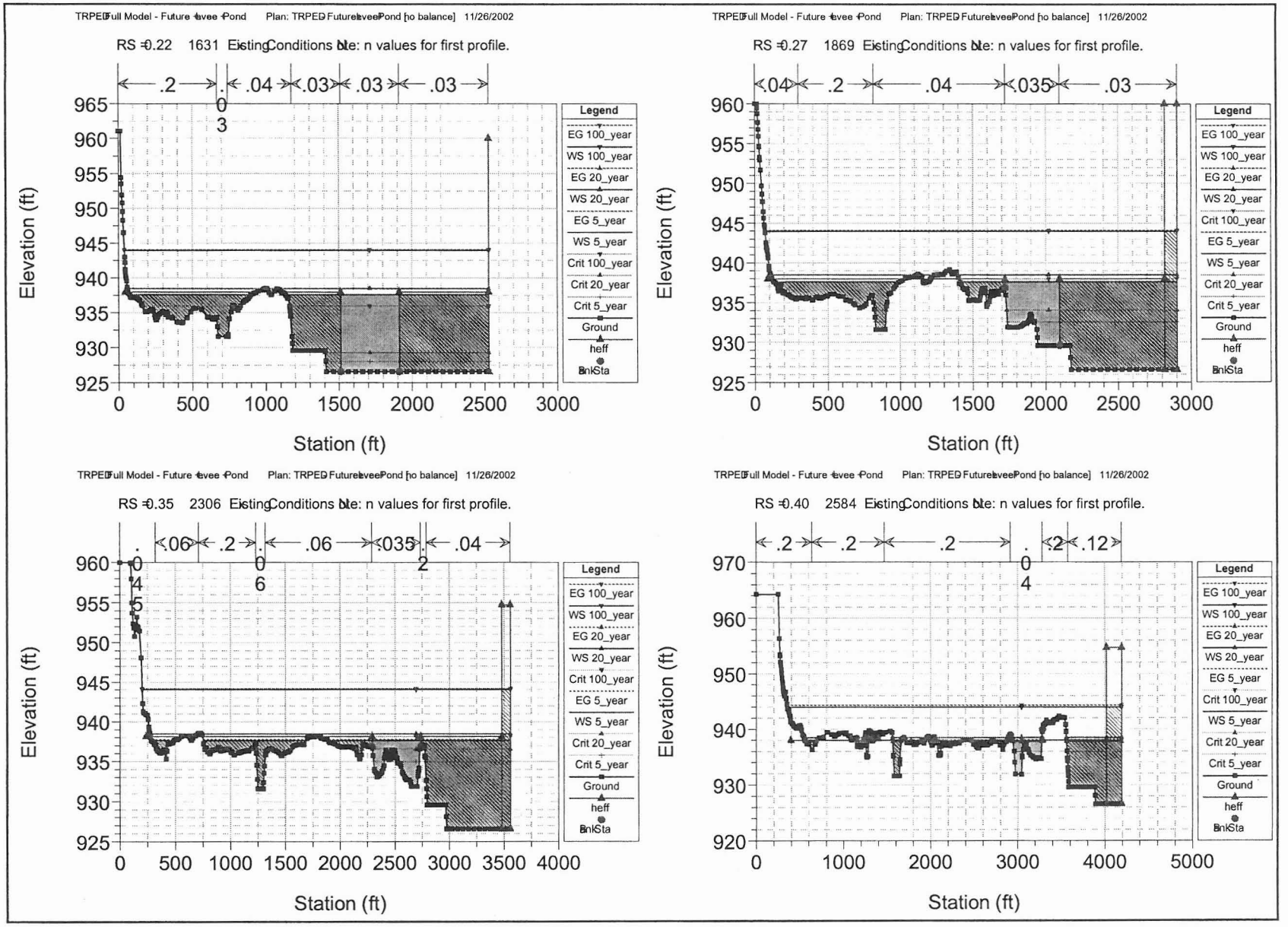

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS 202.97 18365 adjusted n values for flow consistency Existing Conditions
.05 .04 .045
0 4 5
0 5 0 3 0 6 0 5 0 6 0 3
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS 203.1 19066 adjusted n values for flow consistency Existing Conditions
.05 .03 .045
0 4 5
0 4 0 3 0 1 0 6 0 6 0 6 0 3
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS 203.2 19606 adjusted n values for flow consistency Existing Conditions
.05 .06 .07 .045
0 4 5
0 6 0 3 0 2 0 8 0 3
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
heff
BnkSta
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS 203.3 20111 Existing Conditions
.05 .08 .05 .045
0 4 5
0 8 0 3 8
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
heff
BnkSta
Elevation (ft)
Station (ft)

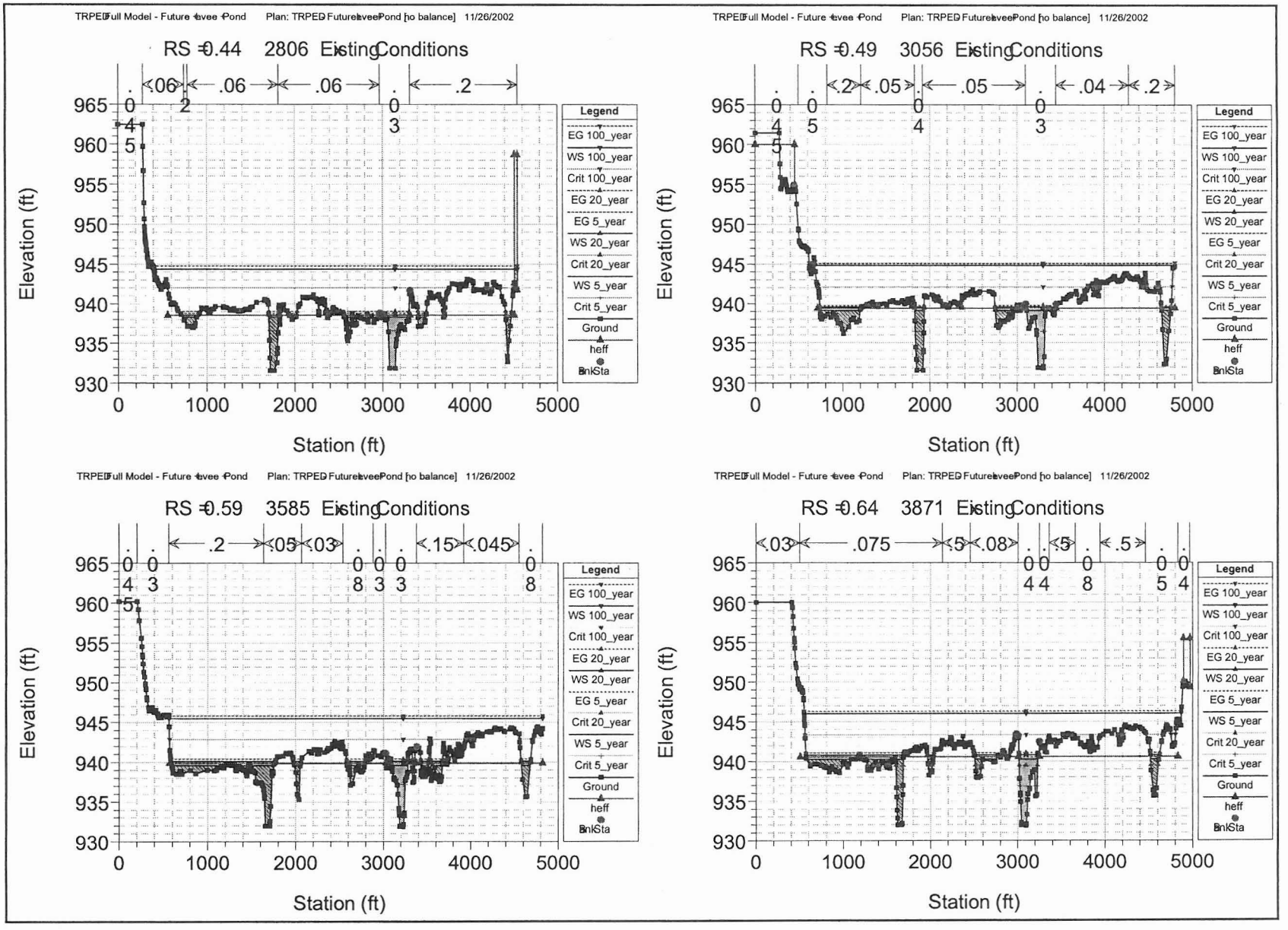

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 203.38 20560 Existing Conditions
.05
.08
.045
.045
.035
.038
1010
1000
990
980
970
960
950
Elevation (ft)
0
2000
4000
6000
8000
10000
12000
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
heff
Bnk Sta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 203.48 21066 Existing Conditions
.05
.07
.03
.045
.045
.08
1010
1000
990
980
970
960
950
Elevation (ft)
0
2000
4000
6000
8000
10000
12000
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
Ground
heff
Bnk Sta

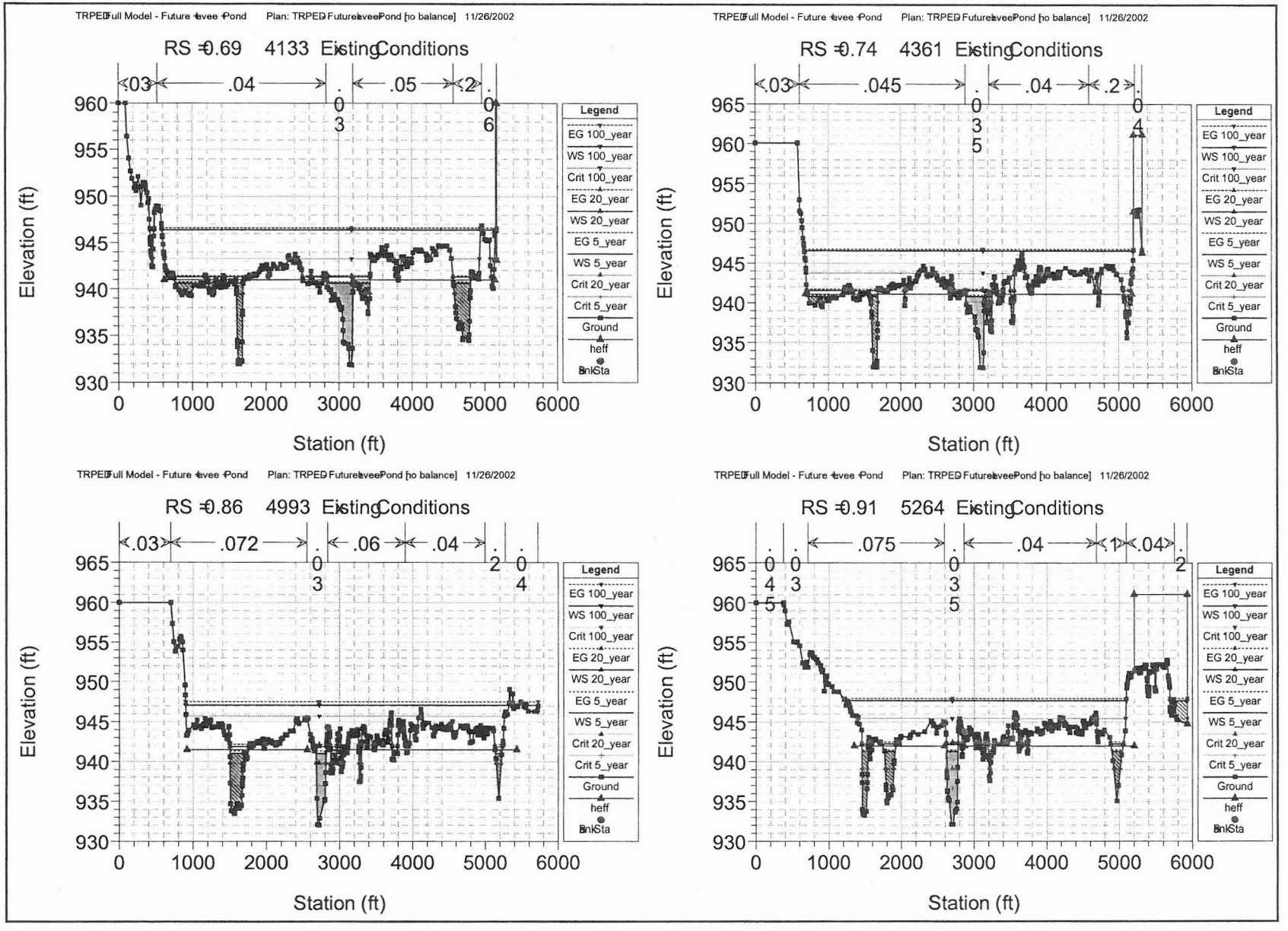
G-iv

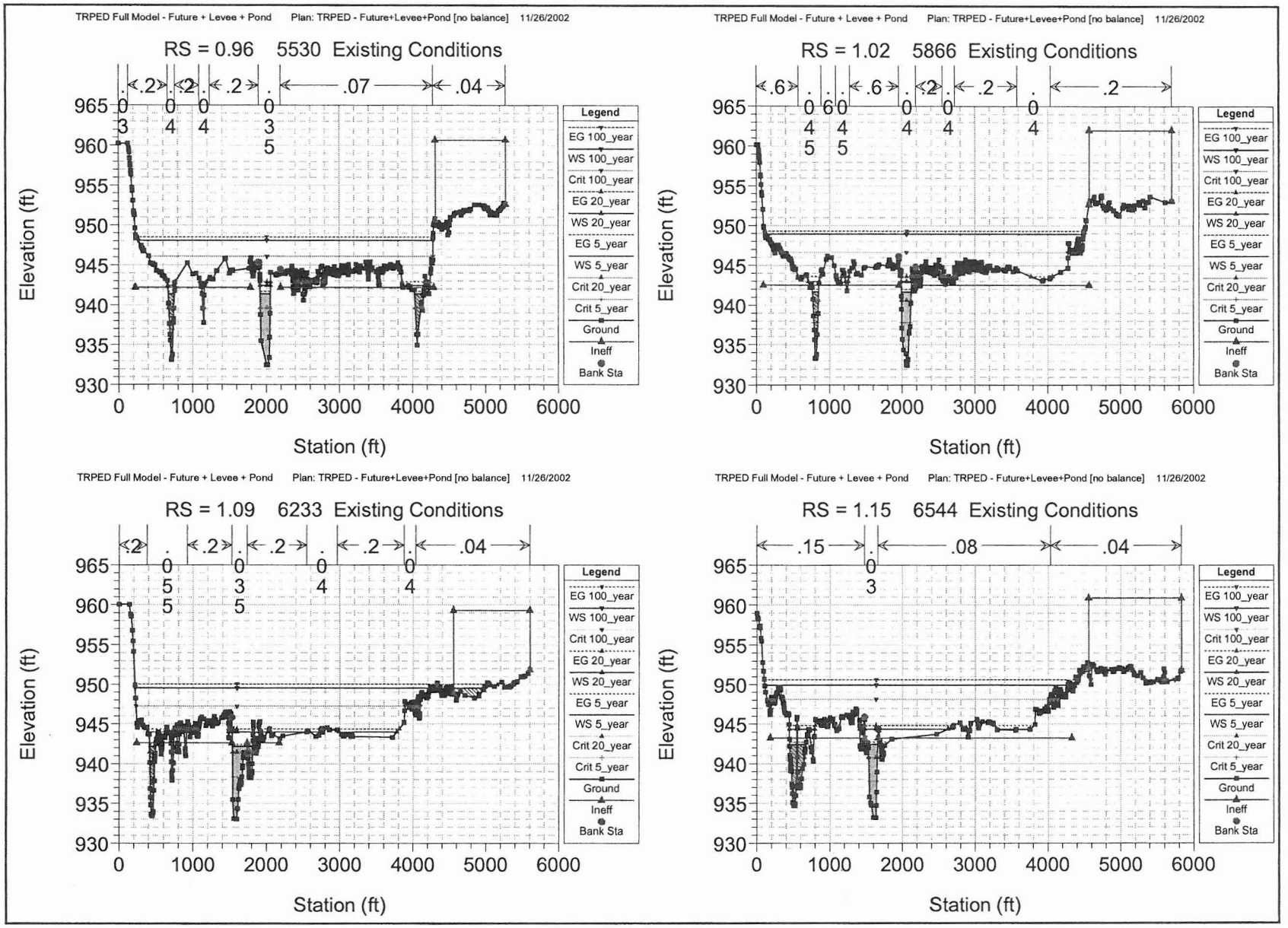
Cross Section Plots for the Upper Gila

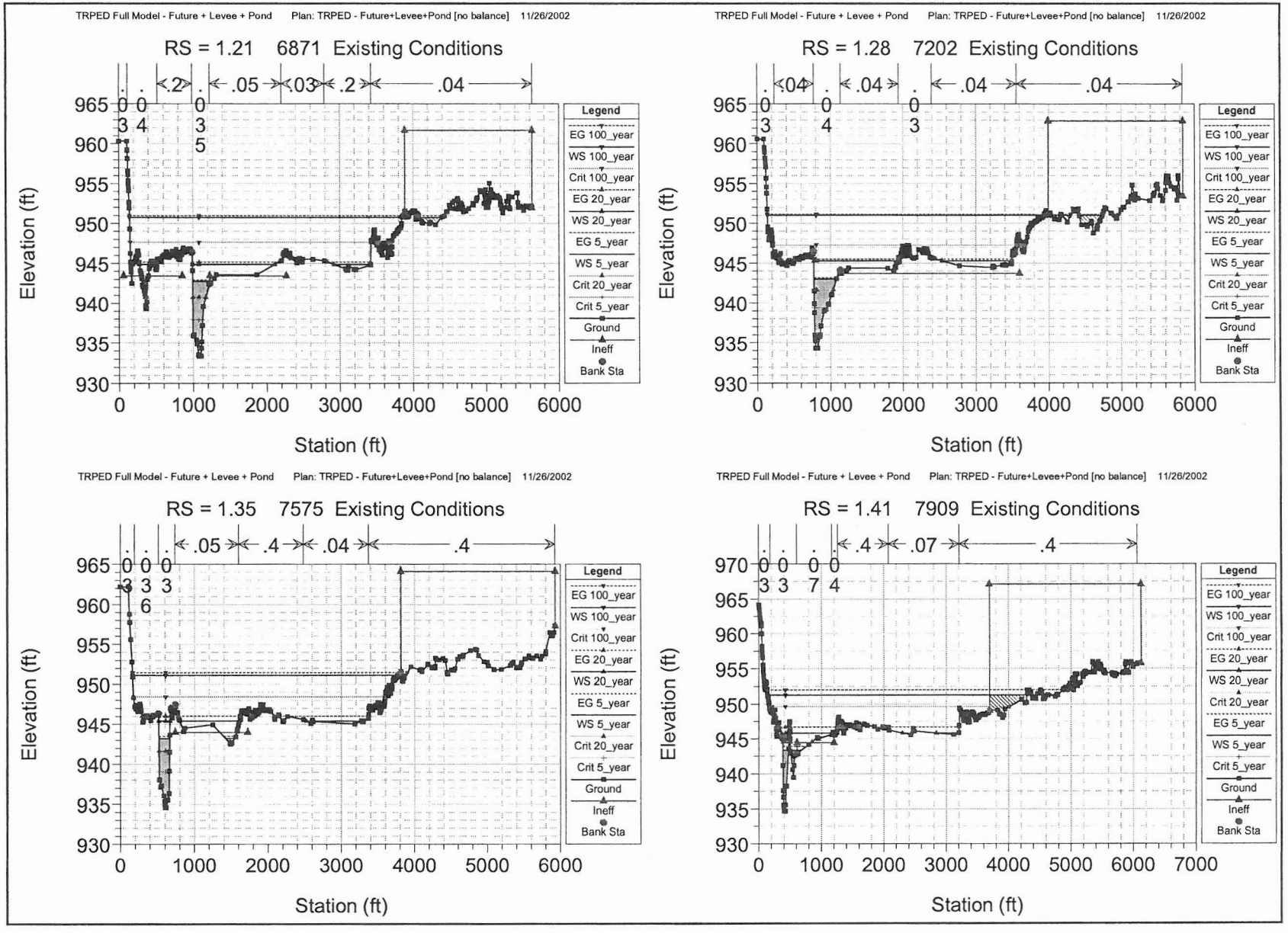

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.00 466 Existing Conditions Note: n values for first profile.
.04
.03
.03
.03
Elevation (ft)
970
960
950
940
930
920
0
200
400
600
800
1000
1200
1400
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.06 800 Existing Conditions Note: n values for first profile.
.06
.03
.03
.03
Elevation (ft)
970
960
950
940
930
920
0
200
400
600
800
1000
1200
1400
1600
1800
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.12 1099 Existing Conditions Note: n values for first profile.
.05
.2
.05
.03
.03
.03
Elevation (ft)
965
960
955
950
945
940
935
930
925
0
500
1000
1500
2000
2500
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.17 1383 Existing Conditions Note: n values for first profile.
.06
.1
.04
.03
.03
.03
Elevation (ft)
965
960
955
950
945
940
935
930
925
0
500
1000
1500
2000
2500
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 100_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta

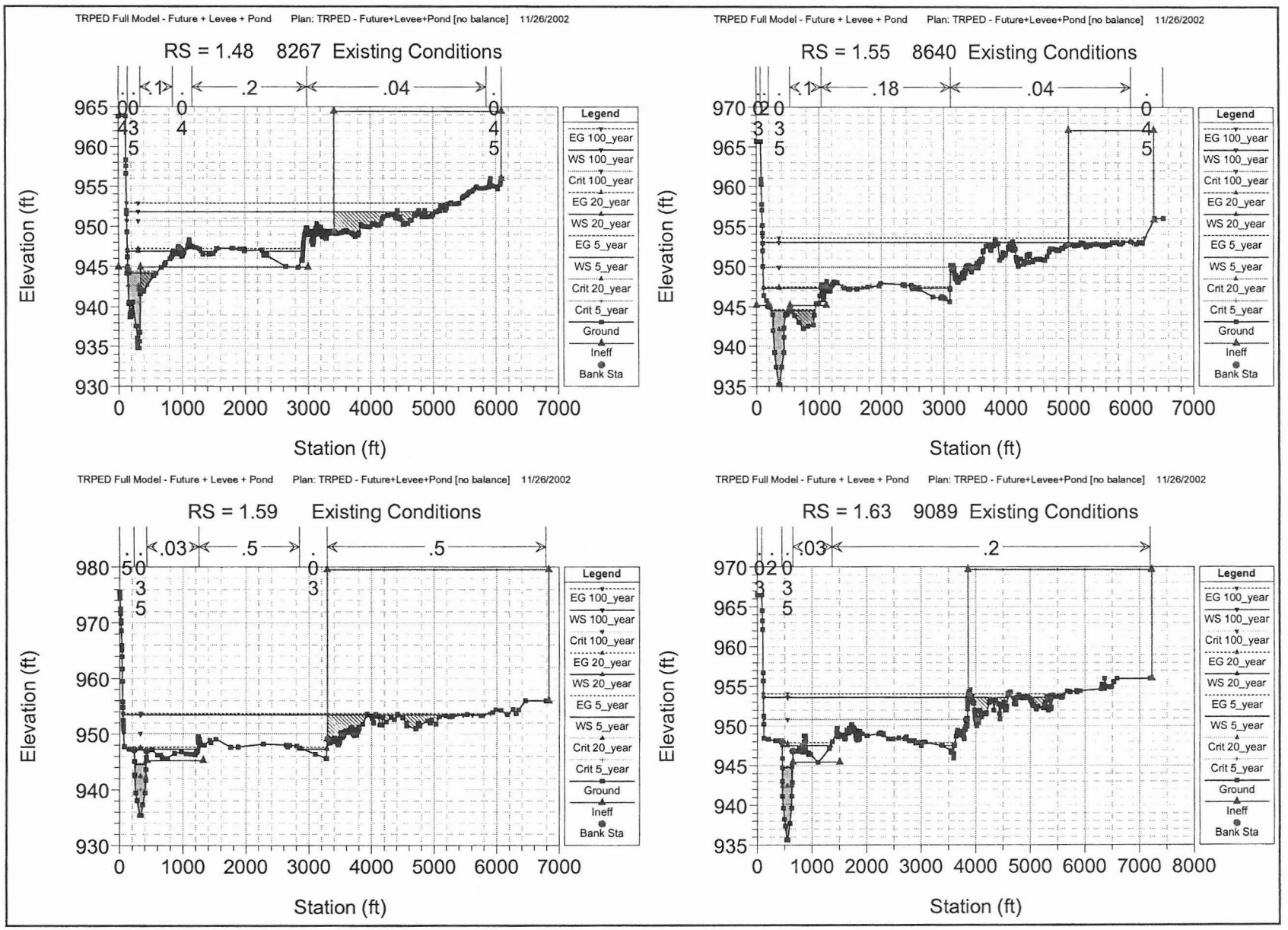

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.22 1631 Existing Conditions Note: n values for first profile.
.2 .04 .03 .03 .03
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 100_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.27 1869 Existing Conditions Note: n values for first profile.
.04 .2 .04 .035 .03
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.35 2306 Existing Conditions Note: n values for first profile.
.06 .2 .06 .035 .04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
Crit 100_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.40 2584 Existing Conditions Note: n values for first profile.
.2 .2 .2 .2 .12
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
EG 20_year
WS 20_year
EG 5_year
Crit 100_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta

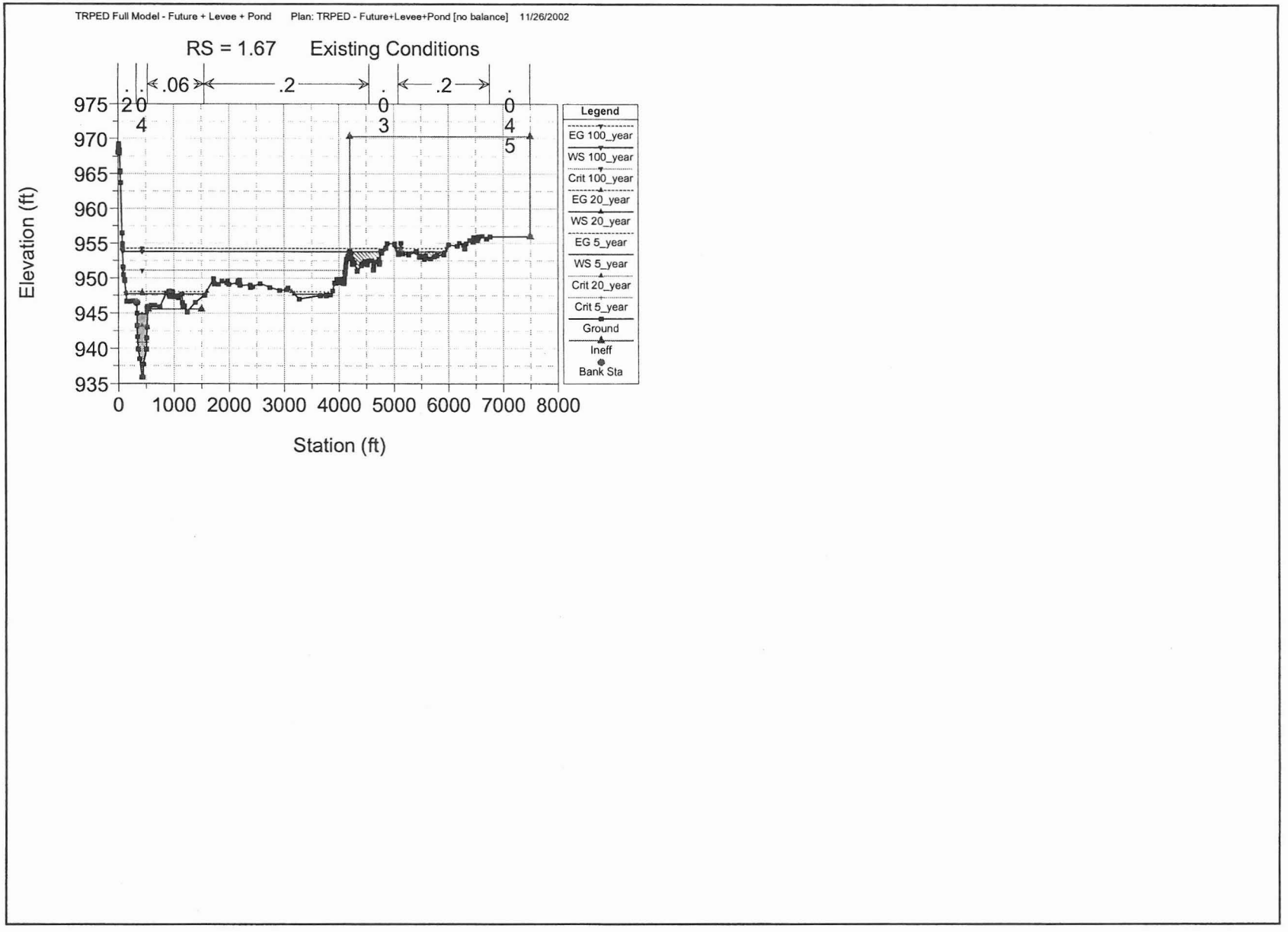

TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.44 2806 Existing Conditions
.06 .06 .06 .2
0.045 0.03
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
EG 5_year
WS 20_year
Crit 20_year
WS 5_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.49 3056 Existing Conditions
.2 .05 .05 .04 .2
0.045 0.05 0.04 0.03
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.59 3585 Existing Conditions
.2 .05 .03 .15 .045
0.045 0.03 0.08 0.03 0.03 0.08
Elevation (ft)
Station (ft)
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.64 3871 Existing Conditions
.03 .075 .5 .08 .5 .5
0.045 0.04 0.08 0.05
Elevation (ft)
Station (ft)


TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.69 4133 Existing Conditions
.03 .04 .03 .05 .2 .06
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.74 4361 Existing Conditions
.03 .045 .035 .04 .2 .04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.86 4993 Existing Conditions
.03 .072 .03 .06 .04 .2 .04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta
TRPED Full Model - Future Levee Pond Plan: TRPED Future Levee Pond [no balance] 11/26/2002
RS = 0.91 5264 Existing Conditions
.045 .03 .075 .035 .04 .1 .04 .2
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
heff
BnkSta


TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 0.96 5530 Existing Conditions
.2 .2 .2 .07 .04
0.03 0.04 0.04 0.035
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.02 5866 Existing Conditions
.6 .6 .2 .2 .2
0.045 0.06 0.045 0.04 0.04 0.04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.09 6233 Existing Conditions
.2 .2 .2 .2 .2 .04
0.055 0.035 0.04 0.04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.15 6544 Existing Conditions
.15 .08 .04
0.03
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.21 6871 Existing Conditions
.2
.05
.03
.2
.04
0.034
0.035
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.28 7202 Existing Conditions
.04
.04
.04
.04
0.034
0.043
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.35 7575 Existing Conditions
.05
.4
.04
.4
0.033
0.036
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.41 7909 Existing Conditions
.4
.07
.4
0.033
0.074
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.48 8267 Existing Conditions
.1
.2
.04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.55 8640 Existing Conditions
.1
.18
.04
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.59 Existing Conditions
.03
.5
.5
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta
TRPED Full Model - Future + Levee + Pond Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.63 9089 Existing Conditions
.03
.2
Elevation (ft)
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta


TRPED Full Model - Future + Levee + Pond
Plan: TRPED - Future+Levee+Pond [no balance] 11/26/2002
RS = 1.67 Existing Conditions
.06
.2
.2
.04
.03
.045
Elevation (ft)
975
970
965
960
955
950
945
940
935
0
1000
2000
3000
4000
5000
6000
7000
8000
Station (ft)
Legend
EG 100_year
WS 100_year
Crit 100_year
EG 20_year
WS 20_year
EG 5_year
WS 5_year
Crit 20_year
Crit 5_year
Ground
Ineff
Bank Sta

APPENDIX H

Hydraulic Comparison Between HEC-RAS and HEC-6T Models

Water Surface Elevation Comparison 10/29/2002

HEC-RAS vs HEC-6T

	HEC-RAS			HEC-6T			DIFFERENCE		
XSECT	WS5	WS20	WS100	WS5	WS20	WS100	WS5	WS20	WS100
195.16	903.68	907.15	913.24	903.73	907.24	913.33	0.05	0.09	0.09
195.20	903.99	907.55	913.69	904.04	907.60	913.72	0.05	0.05	0.03
195.22	904.31	907.88	914.13	904.37	907.87	914.09	0.06	-0.01	-0.04
195.28	904.43	908.01	914.30	904.48	907.98	914.28	0.05	-0.03	-0.02
195.34	905.00	908.54	914.93	905.02	908.51	914.96	0.02	-0.03	0.03
195.45	905.25	908.99	915.35	905.23	908.96	915.37	-0.02	-0.03	0.02
195.55	906.08	910.05	916.13	906.06	910.13	916.17	-0.02	0.08	0.04
195.65	906.62	910.75	916.65	906.58	910.66	916.58	-0.04	-0.09	-0.07
195.77	907.16	911.89	917.80	907.16	911.90	917.77	0.00	0.01	-0.03
195.86	908.43	912.88	918.73	908.43	912.96	918.81	0.00	0.08	0.08
195.98	909.01	913.68	919.54	909.04	913.76	919.56	0.03	0.08	0.02
196.08	909.44	914.69	920.12	909.46	914.69	920.05	0.02	0.00	-0.07
196.14	911.66	915.98	921.79	911.64	915.95	921.74	-0.02	-0.03	-0.05
196.23	912.43	916.40	922.31	912.45	916.38	922.28	0.02	-0.02	-0.03
196.32	912.84	916.82	922.60	912.87	916.82	922.58	0.03	0.00	-0.02
196.38	913.56	917.29	922.80	913.55	917.28	922.77	-0.01	-0.01	-0.03
196.44	913.85	917.56	922.92	913.86	917.56	922.90	0.01	0.00	-0.02
196.50	914.07	917.85	923.05	914.08	917.86	923.01	0.01	0.01	-0.04
196.57	914.37	918.45	923.34	914.44	918.53	923.37	0.07	0.08	0.03
196.63	914.78	919.04	923.63	914.85	919.10	923.67	0.07	0.06	0.04
196.69	915.01	919.57	924.09	915.07	919.62	924.10	0.06	0.05	0.01
196.75	915.19	919.92	924.46	915.25	919.99	924.50	0.06	0.07	0.04
196.81	915.47	920.17	924.72	915.45	920.20	924.70	-0.02	0.03	-0.02
196.87	915.63	920.32	924.89	915.55	920.27	924.81	-0.08	-0.05	-0.08
196.94	915.92	920.63	925.23	915.96	920.67	925.22	0.04	0.04	-0.01
196.99	916.51	921.11	925.70	916.54	921.20	925.73	0.03	0.09	0.03
197.05	917.05	921.67	926.20	917.08	921.74	926.26	0.03	0.07	0.06
197.09	917.40	922.10	926.69	917.43	922.13	926.73	0.03	0.03	0.04
197.14	917.81	922.24	926.88	917.88	922.28	926.94	0.07	0.04	0.06
197.16	918.07	922.39	927.02	918.07	922.44	927.07	0.00	0.05	0.05
197.18	918.24	922.49	927.08	918.23	922.55	927.14	-0.01	0.06	0.06
197.23	918.28	922.47	927.10	918.25	922.49	927.14	-0.03	0.02	0.04
197.28	918.62	922.77	927.41	918.61	922.84	927.47	-0.01	0.07	0.06
197.33	918.68	922.98	927.59	918.64	923.06	927.64	-0.04	0.08	0.05
197.38	919.15	923.48	928.45	919.19	923.55	928.50	0.04	0.07	0.05
197.42	919.72	924.02	928.82	919.72	924.10	928.89	0.00	0.08	0.07
197.48	920.16	924.57	929.41	920.15	924.59	929.47	-0.01	0.02	0.06
197.53	921.10	925.48	930.25	921.15	925.57	930.29	0.05	0.09	0.04
197.58	921.42	925.90	930.63	921.48	925.96	930.67	0.06	0.06	0.04
197.64	921.75	926.37	931.19	921.82	926.44	931.18	0.07	0.07	-0.01
197.70	921.90	926.72	931.52	921.98	926.80	931.53	0.08	0.08	0.01
197.75	922.17	927.12	931.89	922.23	927.18	931.93	0.06	0.06	0.04
197.81	922.33	927.23	931.95	922.36	927.29	931.97	0.03	0.06	0.02
197.87	922.65	927.50	932.25	922.69	927.56	932.30	0.04	0.06	0.05
197.92	923.03	927.88	932.63	923.04	927.94	932.69	0.01	0.06	0.06
197.95	923.28	928.09	932.86	923.28	928.14	932.92	0.00	0.05	0.06
197.98	923.20	928.17	932.92	923.21	928.24	933.00	0.01	0.07	0.08
198.03	923.79	928.36	933.07	923.83	928.42	933.13	0.04	0.06	0.06
198.08	925.17	928.67	933.39	925.19	928.67	933.44	0.02	0.00	0.05
198.15	925.77	929.08	933.76	925.77	929.10	933.80	0.00	0.02	0.04
198.20	926.76	929.49	934.20	926.80	929.52	934.25	0.04	0.03	0.05

Water Surface Elevation Comparison
HEC-RAS vs HEC-6T

	HEC-RAS			HEC-6T			DIFFERENCE		
XSECT	WS5	WS20	WS100	WS5	WS20	WS100	WS5	WS20	WS100
198.26	927.33	929.78	934.58	927.32	929.83	934.61	-0.01	0.05	0.03
198.33	927.87	929.96	934.89	927.90	929.93	934.91	0.03	-0.03	0.02
198.40	928.42	930.43	935.34	928.43	930.44	935.36	0.01	0.01	0.02
198.45	929.10	931.20	936.39	929.12	931.19	936.44	0.02	-0.01	0.05
198.49	929.41	931.59	936.82	929.39	931.55	936.82	-0.02	-0.04	0.00
198.54	929.62	931.82	937.14	929.59	931.80	937.19	-0.03	-0.02	0.05
198.60	929.87	932.09	937.34	929.85	932.06	937.36	-0.02	-0.03	0.02
198.65	930.34	932.50	937.74	930.33	932.48	937.72	-0.01	-0.02	-0.02
198.70	930.71	932.87	938.07	930.70	932.86	938.10	-0.01	-0.01	0.03
198.76	930.98	933.08	938.27	930.97	933.09	938.27	-0.01	0.01	0.00
198.80	931.34	933.39	938.58	931.39	933.38	938.66	0.05	-0.01	0.08
198.83	931.59	933.74	938.80	931.55	933.68	938.86	-0.04	-0.06	0.06
198.88	931.77	933.96	939.02	931.75	933.93	939.11	-0.02	-0.03	0.09
198.93	932.17	934.35	939.41	932.16	934.32	939.50	-0.01	-0.03	0.09
198.97	932.45	934.61	939.53	932.48	934.62	939.61	0.03	0.01	0.08
198.99	932.92	935.13	940.04	932.94	935.12	940.03	0.02	-0.01	-0.01
199.02	933.21	935.32	940.15	933.24	935.30	940.16	0.03	-0.02	0.01
199.06	933.48	935.87	940.77	933.53	935.84	940.73	0.05	-0.03	-0.04
199.11	933.76	936.43	941.64	933.79	936.37	941.56	0.03	-0.06	-0.08
199.18	934.01	936.82	942.03	933.94	936.76	941.96	-0.07	-0.06	-0.07
199.21	934.59	937.40	942.74	934.52	937.33	942.65	-0.07	-0.07	-0.09
199.31	934.97	937.89	943.29	934.89	937.82	943.21	-0.08	-0.07	-0.08
199.38	935.19	938.46	943.84	935.21	938.48	943.81	0.02	0.02	-0.03
199.47	937.52	940.14	944.92	937.50	940.14	944.87	-0.02	0.00	-0.05
199.48				937.65	940.05	944.94			
199.55	938.64	941.29	946.26	938.67	941.26	946.22	0.03	-0.03	-0.04
199.69	939.39	942.89	947.66	939.41	942.82	947.63	0.02	-0.07	-0.03
199.86	940.03	944.20	948.66	940.04	944.12	948.57	0.01	-0.08	-0.09
199.98	940.30	944.56	948.90	940.29	944.49	948.83	-0.01	-0.07	-0.07
200.02	940.46	944.83	949.26	940.46	944.76	949.20	0.00	-0.07	-0.06
200.11	940.66	945.14	949.54	940.67	945.06	949.49	0.01	-0.08	-0.05
200.22	940.99	945.62	950.05	941.02	945.60	950.08	0.03	-0.02	0.03
200.31	941.17	945.99	950.41	941.16	945.95	950.41	-0.01	-0.04	0.00
200.40	941.41	946.37	950.88	941.42	946.33	950.85	0.01	-0.04	-0.03
200.47	941.62	946.71	951.15	941.62	946.67	951.12	0.00	-0.04	-0.03
200.52	941.75	946.88	951.31	941.75	946.84	951.28	0.00	-0.04	-0.03
200.60	942.05	947.26	951.65	942.11	947.29	951.68			
200.68	942.66	947.80	952.00	942.71	947.78	951.96	0.05	-0.02	-0.04
200.75	944.51	948.54	952.46	944.53	948.52	952.51	0.02	-0.02	0.05
200.83	946.18	949.50	953.35	946.19	949.45	953.29	0.01	-0.05	-0.06
200.88	946.43	949.80	953.58	946.42	949.75	953.51	-0.01	-0.05	-0.07
200.95	946.87	950.19	953.85	946.86	950.22	953.82	-0.01	0.03	-0.03
201.01	947.86	950.98	954.38	947.86	950.99	954.35	0.00	0.01	-0.03
201.10	949.54	952.15	955.19	949.52	952.23	955.26	-0.02	0.08	0.07
201.16	950.79	953.01	956.05	950.78	952.97	956.01	-0.01	-0.04	-0.04
201.20	950.94	953.21	956.24	950.89	953.22	956.19	-0.05	0.01	-0.05
201.26	951.80	953.79	956.73	951.80	953.82	956.67	0.00	0.03	-0.06
201.33	953.37	954.77	957.54	953.40	954.86	957.57	0.03	0.09	0.03
201.41	954.49	955.93	958.92	954.51	955.96	958.83	0.02	0.03	-0.09
201.48	954.90	956.52	959.53	954.96	956.60	959.52	0.06	0.08	-0.01
201.54	955.18	956.94	959.97	955.13	956.90	959.91	-0.05	-0.04	-0.06

Water Surface Elevation Comparison
HEC-RAS vs HEC-6T

10/29/2002

	HEC-RAS			HEC-6T			DIFFERENCE		
XSECT	WS5	WS20	WS100	WS5	WS20	WS100	WS5	WS20	WS100
201.62	955.47	957.40	960.53	955.43	957.38	960.50	-0.04	-0.02	-0.03
201.70	955.77	957.97	961.13	955.78	958.05	961.19	0.01	0.08	0.06
201.81	956.20	958.82	962.04	956.16	958.77	961.98	-0.04	-0.05	-0.06
201.89	956.33	959.05	962.29	956.30	958.97	962.21	-0.03	-0.08	-0.08
201.96	956.53	959.39	962.76	956.57	959.33	962.74	0.04	-0.06	-0.02
202.01	956.71	959.69	962.99	956.75	959.62	962.91	0.04	-0.07	-0.08
202.06	956.91	960.23	963.54	956.89	960.21	963.53	-0.02	-0.02	-0.01
202.11	957.10	960.55	964.09	957.03	960.47	964.05	-0.07	-0.08	-0.04
202.18	957.36	961.03	964.53	957.30	961.01	964.48	-0.06	-0.02	-0.05
202.24	957.64	961.64	965.09	957.70	961.71	965.12	0.06	0.07	0.03
202.32	958.68	962.77	966.03	958.72	962.82	966.09	0.04	0.05	0.06
202.40	959.76	963.54	966.58	959.79	963.62	966.67	0.03	0.08	0.09
202.48	962.34	965.00	967.94	962.35	965.04	968.00	0.01	0.04	0.06
202.54	963.35	965.87	968.95	963.35	965.83	968.93	0.00	-0.04	-0.02
202.61	964.27	966.63	969.75	964.25	966.66	969.79	-0.02	0.03	0.04
202.69	965.40	967.39	970.65	965.38	967.36	970.69	-0.02	-0.03	0.04
202.78	966.05	968.15	971.52	966.14	968.11	971.58	0.09	-0.04	0.06
202.85	966.32	968.62	971.94	966.30	968.60	971.98	-0.02	-0.02	0.04
202.97	966.93	969.39	972.76	966.91	969.32	972.74	-0.02	-0.07	-0.02
203.10	967.56	970.24	973.59	967.58	970.22	973.56	0.02	-0.02	-0.03
203.20	968.05	971.00	974.26	968.04	971.04	974.31	-0.01	0.04	0.05
203.30	968.97	972.32	975.56	969.04	972.33	975.59	0.07	0.01	0.03
203.38	969.50	973.09	976.34	969.55	973.05	976.32	0.05	-0.04	-0.02
203.48	969.91	973.69	976.97	969.87	973.64	976.87	-0.04	-0.05	-0.10
-0.01				937.77	940.69	945.64			
0.00	938.64	941.29	946.26	938.61	941.27	946.17	-0.03	-0.02	-0.09
0.06	938.72	941.32	946.44	938.69	941.30	946.40	-0.03	-0.02	-0.04
0.12	938.86	941.35	946.62	938.82	941.34	946.60	-0.04	-0.01	-0.02
0.17	939.02	941.37	946.82	938.99	941.37	946.79	-0.03	0.00	-0.03
0.22	939.09	941.40	946.94	939.05	941.40	946.92	-0.04	0.00	-0.02
0.27	939.20	941.43	947.07	939.16	941.42	947.04	-0.04	-0.01	-0.03
0.35	939.31	941.46	947.19	939.28	941.45	947.17	-0.03	-0.01	-0.02
0.40	939.36	941.48	947.25	939.33	941.47	947.24	-0.03	-0.01	-0.01
0.44	939.48	941.51	947.32	939.42	941.48	947.27	-0.06	-0.03	-0.05
0.49	939.76	941.55	947.43	939.78	941.54	947.37	0.02	-0.01	-0.06
0.53	940.05	941.61	947.48	940.06	941.61	947.43	0.01	0.00	-0.05
0.59	940.15	941.71	947.63	940.11	941.73	947.58	-0.04	0.02	-0.05
0.64	940.64	941.94	947.82	940.69	941.92	947.81	0.05	-0.02	-0.01
0.69	940.91	942.12	947.99	940.91	942.04	947.92	0.00	-0.08	-0.07
0.74	941.04	942.22	948.07	941.05	942.15	948.01	0.01	-0.07	-0.06
0.80	941.24	942.38	948.17	941.24	942.31	948.14	0.00	-0.07	-0.03
0.86	941.23	942.45	948.32	941.18	942.39	948.29	-0.05	-0.06	-0.03
0.91	941.49	942.75	948.58	941.45	942.71	948.55	-0.04	-0.04	-0.03
0.96	941.61	942.87	948.81	941.56	942.79	948.82	-0.05	-0.08	0.01
1.02	941.85	943.34	949.39	941.84	943.31	949.45	-0.01	-0.03	0.06
1.09	942.32	944.22	949.90	942.29	944.16	949.92	-0.03	-0.06	0.02
1.15	942.56	944.51	950.22	942.51	944.44	950.18	-0.05	-0.07	-0.04
1.21	942.90	944.97	950.93	942.86	944.89	950.85	-0.04	-0.08	-0.08
1.28	943.15	945.35	951.18	943.16	945.31	951.10	0.01	-0.04	-0.08
1.35	943.33	945.47	951.25	943.26	945.41	951.20	-0.07	-0.06	-0.05
1.41	943.45	945.83	951.40	943.42	945.86	951.39	-0.03	0.03	-0.01

Water Surface Elevation Comparison
HEC-RAS vs HEC-6T

	HEC-RAS			HEC-6T			DIFFERENCE		
XSECT	WS5	WS20	WS100	WS5	WS20	WS100	WS5	WS20	WS100
1.48	944.27	946.90	951.93	944.29	946.99	951.98	0.02	0.09	0.05
1.55	944.57	947.34	953.03	944.58	947.40	953.02	0.01	0.06	-0.01
1.59	944.68	947.37	953.52	944.67	947.34	953.44	-0.01	-0.03	-0.08
1.63	944.80	947.56	953.61	944.80	947.54	953.55	0.00	-0.02	-0.06
1.67	944.90	947.73	953.82	944.91	947.74	953.82	0.01	0.01	0.00
						MAX	0.09	0.09	0.09
						MIN	-0.08	-0.09	-0.10

Velocity Comparison
HEC-RAS vs HEC-6T

	HEC-RAS			HEC-6T			DIFFERENCE		
XSECT	VEL5	VEL20	VEL100	VEL5	VEL20	VEL100	VEL5	VEL20	VEL100
195.16	4.67	6.48	9.18	4.63	6.41	9.12	-0.04	-0.07	-0.06
195.20	4.56	6.06	8.86	4.52	6.03	8.86	-0.04	-0.03	0.00
195.22	4.34	6.02	8.76	4.33	6.03	8.80	-0.01	0.01	0.04
195.28	4.99	6.56	8.92	4.93	6.60	8.94	-0.06	0.04	0.02
195.34	3.79	6.79	8.66	3.79	6.84	8.65	0.00	0.05	-0.01
195.45	4.78	7.40	8.81	4.77	7.39	8.81	-0.01	-0.01	0.00
195.55	4.84	7.42	9.15	4.88	7.47	9.13	0.04	0.05	-0.02
195.65	5.91	9.07	11.23	5.95	9.04	11.14	0.04	-0.03	-0.09
195.77	7.28	8.30	10.00	7.23	8.32	9.95	-0.05	0.02	-0.05
195.86	4.77	7.40	9.24	4.79	7.42	9.27	0.02	0.02	0.03
195.98	4.19	6.35	7.83	4.14	6.32	7.77	-0.05	-0.03	-0.06
196.08	9.45	9.60	13.03	9.40	9.61	12.97	-0.05	0.01	-0.06
196.14	6.21	6.38	8.21	6.24	6.32	8.20	0.03	-0.06	-0.01
196.23	3.89	5.25	5.70	3.86	5.25	5.71	-0.03	0.00	0.01
196.32	5.07	5.48	4.81	5.03	5.54	4.88	-0.04	0.06	0.07
196.38	4.38	6.26	5.54	4.40	6.21	5.55	0.02	-0.05	0.01
196.44	3.86	6.49	5.79	3.84	6.52	5.81	-0.02	0.03	0.02
196.50	3.95	7.08	6.63	3.92	7.12	6.67	-0.03	0.04	0.04
196.57	3.92	6.55	6.36	3.88	6.62	6.36	-0.04	0.07	0.00
196.63	3.23	6.21	7.51	3.21	6.27	7.45	-0.02	0.06	-0.06
196.69	2.72	5.07	6.68	2.69	5.08	6.72	-0.03	0.01	0.04
196.75	3.33	4.93	6.57	3.29	4.98	6.59	-0.04	0.05	0.02
196.81	3.73	5.42	7.35	3.71	5.38	7.35	-0.02	-0.04	0.00
196.87	4.64	6.44	8.41	4.69	6.50	8.45	0.05	0.06	0.04
196.94	4.98	6.45	8.22	4.97	6.46	8.24	-0.01	0.01	0.02
196.99	4.73	6.39	8.04	4.74	6.36	8.09	0.01	-0.03	0.05
197.05	4.37	5.87	7.75	4.36	5.79	7.80	-0.01	-0.08	0.05
197.09	4.51	4.46	6.53	4.46	4.50	6.52	-0.05	0.04	-0.01
197.14	3.78	4.48	6.26	3.75	4.55	6.30	-0.03	0.07	0.04
197.16	4.11	5.22	7.51	4.08	5.19	7.56	-0.03	-0.03	0.05
197.18	3.81	5.30	8.00	3.84	5.31	8.01	0.03	0.01	0.01
197.23	4.72	6.63	8.90	4.73	6.67	8.90	0.01	0.04	0.00
197.28	3.79	6.55	9.11	3.80	6.50	9.12	0.01	-0.05	0.01
197.33	5.31	7.55	10.51	5.35	7.60	10.55	0.04	0.05	0.04
197.38	5.76	7.71	9.46	5.71	7.75	9.52	-0.05	0.04	0.06
197.42	6.17	8.40	10.54	6.14	8.36	10.53	-0.03	-0.04	-0.01
197.48	7.01	8.71	10.45	6.95	8.73	10.40	-0.06	0.02	-0.05
197.53	5.23	7.67	9.40	5.22	7.66	9.41	-0.01	-0.01	0.01
197.58	5.12	7.78	9.64	5.05	7.77	9.60	-0.07	-0.01	-0.04
197.64	4.01	6.70	8.14	3.99	6.66	8.16	-0.02	-0.04	0.02
197.70	4.24	6.35	7.91	4.17	6.35	7.95	-0.07	0.00	0.04
197.75	3.78	5.09	6.89	3.75	5.13	6.91	-0.03	0.04	0.02
197.81	4.51	6.03	8.27	4.45	6.00	8.23	-0.06	-0.03	-0.04
197.87	4.72	5.81	7.87	4.70	5.85	7.92	-0.02	0.04	0.05
197.92	4.50	5.20	7.36	4.48	5.18	7.36	-0.02	-0.02	0.00
197.95	4.37	4.74	6.92	4.35	4.74	6.93	-0.02	0.00	0.01
197.98	7.07	5.74	8.05	7.03	5.79	8.12	-0.04	0.05	0.07
198.03	8.25	6.00	8.77	8.19	6.00	8.83	-0.06	0.00	0.06
198.08	6.08	6.54	9.25	6.03	6.55	9.28	-0.05	0.01	0.03
198.15	6.25	5.62	8.59	6.25	5.63	8.60	0.00	0.01	0.01
198.20	5.73	5.69	8.84	5.68	5.70	8.82	-0.05	0.01	-0.02

Velocity Comparison
HEC-RAS vs HEC-6T

	HEC-RAS			HEC-6T			DIFFERENCE		
XSECT	VEL5	VEL20	VEL100	VEL5	VEL20	VEL100	VEL5	VEL20	VEL100
198.26	5.67	5.69	8.89	5.63	5.67	8.94	-0.04	-0.02	0.05
198.33	5.16	6.44	9.14	5.15	6.48	9.13	-0.01	0.04	-0.01
198.40	5.56	6.64	10.36	5.51	6.68	10.43	-0.05	0.04	0.07
198.45	4.74	5.53	8.75	4.74	5.56	8.81	0.00	0.03	0.06
198.49	4.49	5.70	8.29	4.48	5.71	8.36	-0.01	0.01	0.07
198.54	4.54	5.90	7.90	4.55	5.93	7.92	0.01	0.03	0.02
198.60	5.05	5.84	8.12	5.08	5.91	8.15	0.03	0.07	0.03
198.65	4.93	5.56	7.71	4.96	5.64	7.71	0.03	0.08	0.00
198.70	4.48	5.27	7.60	4.50	5.29	7.68	0.02	0.02	0.08
198.76	4.36	5.57	7.75	4.35	5.52	7.71	-0.01	-0.05	-0.04
198.80	4.30	5.46	7.39	4.28	5.49	7.46	-0.02	0.03	0.07
198.83	4.59	6.04	8.54	4.59	6.08	8.62	0.00	0.04	0.08
198.88	4.90	6.15	8.47	4.96	6.18	8.46	0.06	0.03	-0.01
198.93	4.58	5.86	8.11	4.61	5.87	8.17	0.03	0.01	0.06
198.97	5.15	6.99	9.71	5.12	7.02	9.75	-0.03	0.03	0.04
198.99	4.86	6.56	9.10	4.89	6.56	9.14	0.03	0.00	0.04
199.02	4.10	6.64	9.05	4.09	6.67	9.13	-0.01	0.03	0.08
199.06	3.70	5.91	8.39	3.69	5.95	8.43	-0.01	0.04	0.04
199.11	3.23	5.08	7.19	3.20	5.10	7.24	-0.03	0.02	0.05
199.18	5.11	6.86	9.56	5.17	6.78	9.49	0.06	-0.08	-0.07
199.21	3.53	5.25	7.95	3.60	5.21	7.88	0.07	-0.04	-0.07
199.31	3.94	6.18	8.61	4.00	6.11	8.62	0.06	-0.07	0.01
199.38	8.06	9.03	9.85	8.04	9.06	9.87	-0.02	0.03	0.02
199.47	5.04	7.24	9.53	5.07	7.23	9.55	0.03	-0.01	0.02
199.48				4.07	7.60	8.93			
199.55	5.13	9.75	10.99	5.13	9.73	10.98	0.00	-0.02	-0.01
199.69	4.35	8.35	8.82	4.33	8.33	8.73	-0.02	-0.02	-0.09
199.86	3.27	5.45	6.46	3.25	5.43	6.52	-0.02	-0.02	0.06
199.98	3.74	6.61	8.20	3.74	6.63	8.28	0.00	0.02	0.08
200.02	3.28	5.88	7.03	3.29	5.93	7.07	0.01	0.05	0.04
200.11	3.41	5.84	7.40	3.41	5.89	7.48	0.00	0.05	0.08
200.22	2.94	5.56	7.04	2.94	5.58	7.12	0.00	0.02	0.08
200.31	3.40	6.02	7.48	3.40	6.07	7.54	0.00	0.05	0.06
200.40	3.38	5.98	6.88	3.39	6.02	6.96	0.01	0.04	0.08
200.47	3.43	5.82	6.84	3.42	5.86	6.91	-0.01	0.04	0.07
200.52	3.46	5.83	6.73	3.46	5.86	6.80	0.00	0.03	0.07
200.60	4.01	6.13	6.76	3.98	6.13	6.81			
200.68	6.95	7.41	8.41	6.93	7.47	8.46	-0.02	0.06	0.05
200.75	8.61	8.63	9.88	8.67	8.69	9.89	0.06	0.06	0.01
200.83	4.30	6.42	7.38	4.29	6.41	7.42	-0.01	-0.01	0.04
200.88	4.87	6.50	7.47	4.88	6.53	7.51	0.01	0.03	0.04
200.95	6.76	8.14	9.05	6.80	8.11	9.04	0.04	-0.03	-0.01
201.01	6.61	7.58	8.76	6.60	7.62	8.75	-0.01	0.04	-0.01
201.10	7.47	8.28	9.62	7.52	8.26	9.64	0.05	-0.02	0.02
201.16	4.42	5.25	6.92	4.43	5.31	6.88	0.01	0.06	-0.04
201.20	6.31	6.32	8.29	6.35	6.31	8.32	0.04	-0.01	0.03
201.26	7.83	7.11	9.17	7.88	7.17	9.15	0.05	0.06	-0.02
201.33	6.41	7.89	10.65	6.44	7.89	10.63	0.03	0.00	-0.02
201.41	4.02	5.80	7.45	3.98	5.84	7.49	-0.04	0.04	0.04
201.48	3.93	5.51	7.42	3.88	5.53	7.47	-0.05	0.02	0.05
201.54	4.36	6.67	8.88	4.40	6.70	8.91	0.04	0.03	0.03

Velocity Comparison
HEC-RAS vs HEC-6T

	HEC-RAS			HEC-6T			DIFFERENCE		
XSECT	VEL5	VEL20	VEL100	VEL5	VEL20	VEL100	VEL5	VEL20	VEL100
201.62	3.98	6.70	8.60	4.04	6.77	8.60	0.06	0.07	0.00
201.70	4.24	7.44	9.27	4.23	7.44	9.31	-0.01	0.00	0.04
201.81	3.24	5.84	7.98	3.24	5.89	8.02	0.00	0.05	0.04
201.89	3.35	5.98	8.16	3.36	5.96	8.13	0.01	-0.02	-0.03
201.96	3.45	6.30	7.75	3.44	6.31	7.78	-0.01	0.01	0.03
202.01	3.63	6.97	8.89	3.61	7.04	8.93	-0.02	0.07	0.04
202.06	4.11	7.28	9.44	4.11	7.28	9.41	0.00	0.00	-0.03
202.11	4.48	8.15	9.47	4.52	8.23	9.46	0.04	0.08	-0.01
202.18	4.47	8.08	9.41	4.52	8.07	9.46	0.05	-0.01	0.05
202.24	5.53	7.70	8.69	5.50	7.70	8.64	-0.03	0.00	-0.05
202.32	4.81	6.49	7.73	4.79	6.46	7.76	-0.02	-0.03	0.03
202.40	8.34	8.89	11.22	8.35	8.94	11.23	0.01	0.05	0.01
202.48	6.79	8.36	11.07	6.78	8.40	11.04	-0.01	0.04	-0.03
202.54	5.97	7.47	10.12	5.96	7.50	10.08	-0.01	0.03	-0.04
202.61	6.31	7.09	9.73	6.33	7.09	9.80	0.02	0.00	0.07
202.69	4.77	6.55	8.61	4.80	6.51	8.65	0.03	-0.04	0.04
202.78	3.95	6.26	7.69	3.88	6.31	7.72	-0.07	0.05	0.03
202.85	4.53	6.80	8.86	4.54	6.85	8.89	0.01	0.05	0.03
202.97	4.25	6.37	8.13	4.30	6.36	8.19	0.05	-0.01	0.06
203.10	4.19	6.52	8.16	4.19	6.49	8.24	0.00	-0.03	0.08
203.20	5.49	8.71	10.56	5.45	8.77	10.53	-0.04	0.06	-0.03
203.30	4.06	6.88	8.75	4.03	6.94	8.71	-0.03	0.06	-0.04
203.38	3.92	6.79	8.70	3.86	6.84	8.74	-0.06	0.05	0.04
203.48	3.96	7.09	9.51	3.96	7.10	9.42	0.00	0.01	-0.09
-0.01				2.88	0.99	3.68			
0.00	2.14	1.44	5.12	2.15	1.43	5.06	0.01	-0.01	-0.06
0.06	2.60	1.67	5.69	2.61	1.68	5.71	0.01	0.01	0.02
0.12	2.78	1.96	5.91	2.83	1.99	5.96	0.05	0.03	0.05
0.17	2.09	1.59	4.82	2.11	1.62	4.87	0.02	0.03	0.05
0.22	2.41	1.54	4.68	2.41	1.59	4.70	0.00	0.05	0.02
0.27	2.03	1.32	3.99	2.06	1.35	4.04	0.03	0.03	0.05
0.35	1.73	1.15	3.27	1.73	1.17	3.28	0.00	0.02	0.01
0.40	2.53	1.67	3.90	2.54	1.72	3.92	0.01	0.05	0.02
0.44	3.60	2.14	4.61	3.66	2.15	4.65	0.06	0.01	0.04
0.49	4.06	2.54	4.37	4.09	2.60	4.40	0.03	0.06	0.03
0.53	2.98	2.43	5.02	2.97	2.42	5.07	-0.01	-0.01	0.05
0.59	4.50	3.33	5.00	4.49	3.31	5.02	-0.01	-0.02	0.02
0.64	3.60	3.49	5.39	3.56	3.51	5.43	-0.04	0.02	0.04
0.69	2.80	2.89	4.03	2.78	2.91	4.06	-0.02	0.02	0.03
0.74	3.14	3.29	4.09	3.15	3.33	4.15	0.01	0.04	0.06
0.80	2.53	3.18	5.04	2.52	3.20	5.05	-0.01	0.02	0.01
0.86	4.28	5.15	6.35	4.28	5.19	6.35	0.00	0.04	0.00
0.91	3.48	4.58	5.79	3.52	4.64	5.85	0.04	0.06	0.06
0.96	3.98	5.77	7.27	3.99	5.79	7.31	0.01	0.02	0.04
1.02	4.41	6.52	7.54	4.43	6.52	7.52	0.02	0.00	-0.02
1.09	3.90	5.27	8.55	3.94	5.32	8.56	0.04	0.05	0.01
1.15	4.14	5.91	9.98	4.16	5.96	10.00	0.02	0.05	0.02
1.21	3.15	4.65	5.99	3.18	4.71	5.99	0.03	0.06	0.00
1.28	2.95	3.95	3.84	2.96	4.00	3.83	0.01	0.05	-0.01
1.35	3.96	6.62	7.31	3.97	6.58	7.28	0.01	-0.04	-0.03
1.41	5.94	7.81	10.22	5.95	7.86	10.24	0.01	0.05	0.02

Velocity Comparison
HEC-RAS vs HEC-6T

	HEC-RAS			HEC-6T			DIFFERENCE		
XSECT	VEL5	VEL20	VEL100	VEL5	VEL20	VEL100	VEL5	VEL20	VEL100
1.48	3.45	5.08	11.53	3.46	5.13	11.57	0.01	0.05	0.04
1.55	3.04	3.66	8.14	3.00	3.71	8.12	-0.04	0.05	-0.02
1.59	3.29	5.01	6.75	3.27	5.09	6.81	-0.02	0.08	0.06
1.63	3.24	5.06	8.19	3.23	5.11	8.15	-0.01	0.05	-0.04
1.67	3.48	5.13	8.57	3.48	5.21	8.55	0.00	0.08	-0.02
						MAX	0.07	0.08	0.08
						MIN	-0.07	-0.08	-0.09

APPENDIX I

Bed Material Gradation

1st Sample Set

PROJECT: TRES RIOS

10 <-- Number of samples

		Depth			GRAVEL (in)				SAND (sieve no.)						FINES	Atterberg Limits		Field Data		Classification	
Lab No.	Hole No.	Top	Bot	3.0	1.5	3/4	3/8	4	8	16	30	50	100	200	LL	PI	M.C.	Density		
272	SS01-01	0	1	100	100	95	93	90	88	79	47	17	9	2		N/P			SP	POORLY GRADED SAND
273	SS02-02	0	1	100	80	58	39	30	24	16	8	3	1	1		N/P			GW	WELL GRADED GRAVEL WITH SAND
274	SS02-03	0	1	100	90	73	58	48	43	39	32	19	8	2		N/P			GP	POORLY GRADED GRAVEL WITH SAND
275	SS02-04	0	1	100	100	88	80	74	69	65	60	54	43	26		N/P			SM	SILTY SAND WITH GRAVEL
276	SS02-05	0	1	100	98	77	62	54	49	44	36	27	21	16		N/P			GM	SILTY GRAVEL WITH SAND
277	SS02-06	0	1	100	97	92	89	88	87	86	81	61	18	8		N/P			SP-SM	POORLY GRADED SAND WITH SILT
278	SS02-07	0	1	100	98	94	92	92	92	91	83	40	13	2		N/P			SP	POORLY GRADED SAND
279	SS02-08	0	1	100	71	59	48	44	41	38	33	20	6	2		N/P			GP	POORLY GRADED GRAVEL WITH SAND
280	SS02-09	0	1	100	79	56	42	31	25	18	10	6	3	1		N/P			GW	WELL GRADED GRAVEL WITH SAND
281	SS02-10	0	1	100	71	55	40	31	26	22	17	11	7	5		N/P			GW-GM	WELL GRADED GRAVEL WITH SILT AND SAND

2nd Sample Set

PROJECT: TRES RIOS

Standard MA's Classification

(ASTM - D 2487)

13 ber of samples

		Depth		GRAVEL (in)				SAND (sieve no.)						FINES	Atterberg Limits	Field Data				
Lab No.	Hole No.	Top	Bot	3.0	1.5	3/4	3/8	4	8	16	30	50	100	200	LL	PI	M.C.	Density		
304	SS12-02			100	100	91	76	64	59	52	43	32	21	13		N/P			SM	SILTY SAND WITH GRAVEL
304 A	SS13-02			100	85	63	44	35	32	28	17	8	5	2		N/P			GP	POORLY GRADED GRAVEL WITH SAND
304 B	SS14-02			100	74	58	44	34	25	15	4	1	1	1		N/P			GP	POORLY GRADED GRAVEL WITH SAND
304 E	SS15-02			100	85	57	40	31	27	23	18	11	6	3		N/P			GP	POORLY GRADED GRAVEL WITH SAND
304 F	SS16-02			100	95	88	77	64	52	36	22	10	4	2		N/P			SP	POORLY GRADED SAND WITH GRAVEL
304 D	SS17-02			100	93	67	51	40	39	32	20	11	7	6		N/P			GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND
304 C	SS18-02			100	90	70	54	45	38	27	10	2	2	1		N/P			GP	POORLY GRADED GRAVEL WITH SAND
304 K	SS19-02			100	74	35	22	19	18	17	15	12	7	2		N/P			GP	POORLY GRADED GRAVEL WITH SAND
304 G	SS21-02			100	73	56	43	36	33	29	17	5	1	1		N/P			GP	POORLY GRADED GRAVEL WITH SAND
304 H	SS22-02			100	85	60	44	37	34	30	22	13	9	3		N/P			GP	POORLY GRADED GRAVEL WITH SAND
304 I	SS23-02			100	87	61	51	45	42	37	23	10	2	1		N/P			GP	POORLY GRADED GRAVEL WITH SAND
304 L	SS12A-02			100	87	67	54	45	39	31	21	13	11	3		N/P			GP	POORLY GRADED GRAVEL WITH SAND

Note: SS= surface samples.

Ricker Atkinson McBee & Assoc., Inc.
2105 S. Hardy Drive, Suite 13
Tempe, AZ 85282-1924

Geotechnical Engineering
Construction Materials Testing
Phone (480) 921-8100
Fax (480) 921-4081

LABORATORY TEST RESULTS

Client: West Consultants, Inc.
Attn: Gary Freeman
2151 E. Broadway Rd., Suite 116
Tempe, AZ 85282-1705

Project No.: L08365
Report Date: 22-Nov-02
Lab No.: 12026

Project: **Misc. Laboratory Testing**
Location:
Sample Source: Gila East Sample #1

Sampled By: Client
Date Sampled:
Submitted By: Client
Date Submitted: 20-Nov-02

Material: Soil
Supplier:

Test Method(s): Sieve Analysis (ASTM C117, C136)

Results:

Sieve Size	Percent Passing	Minimum	Maximum
	100		
	100		
3"	100		
2"	100		
1-1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
1/4"	100		
#4	100		
#8	100		
#10	100		
#16	100		
#30	100		
#40	100		
#50	99		
#100	89		
#200	42		

Remarks:

Distribution: Addressee (1)

Respectfully submitted,

Shawn C. Morman, E.I.T.
Technical Services Director

Ricker Atkinson McBee & Assoc., Inc. *Geotechnical Engineering*
2105 S. Hardy Drive, Suite 13 *Construction Materials Testing*
Tempe, AZ 85282-1924 **Phone (480) 921-8100**
Fax (480) 921-4081

LABORATORY TEST RESULTS

Client:	West Consultants, Inc.	Project No.:	L08365
	Attn: Gary Freeman	Report Date:	22-Nov-02
	2151 E. Broadway Rd., Suite 116	Lab No.:	12027
	Tempe, AZ 85282-1705		
Project:	**Misc. Laboratory Testing**	Sampled By:	Client
Location:		Date Sampled:	
		Submitted By:	Client
Sample Source:	Gila River West Sample #2	Date Submitted:	20-Nov-02
Material:	Soil	Supplier:	
Test Method(s):	Sieve Analysis (ASTM C117, C136)		

Results:

Sieve Size	Percent Passing	Minimum	Maximum
	100		
	100		
3"	100		
2"	100		
1-1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
1/4"	100		
#4	100		
#8	100		
#10	100		
#16	99		
#30	99		
#40	98		
#50	97		
#100	78		
#200	24		

Remarks:

Distribution: Addressee (1)

Respectfully submitted,

Shawn C. Morman, E.I.T.
Technical Services Director

Ricker Atkinson McBee & Assoc., Inc.
2105 S. Hardy Drive, Suite 13
Tempe, AZ 85282-1924

Geotechnical Engineering
Construction Materials Testing
Phone (480) 921-8100
Fax (480) 921-4081

LABORATORY TEST RESULTS

Client:	West Consultants, Inc.	Project No.:	L08365
	Attn: Gary Freeman	Report Date:	22-Nov-02
	2151 E. Broadway Rd., Suite 116	Lab No.:	12028
	Tempe, AZ 85282-1705		
Project:	**Misc. Laboratory Testing**	Sampled By:	Client
Location:		Date Sampled:	
		Submitted By:	Client
Sample Source:	Santa Cruz Sample #3	Date Submitted:	20-Nov-02
Material:	Soil	Supplier:	
Test Method(s):	Sieve Analysis (ASTM C117, C136)		

Results:

Sieve Size	Percent Passing	Minimum	Maximum
	100		
	100		
3"	100		
2"	100		
1-1/2"	100		
1"	95		
3/4"	87		
1/2"	80		
3/8"	79		
1/4"	77		
#4	75		
#8	72		
#10	71		
#16	69		
#30	66		
#40	64		
#50	62		
#100	56		
#200	47		

Remarks:

Distribution: Addressee (1)

Respectfully submitted,

Shawn C. Morman, E.I.T.
Technical Services Director

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Fax (480) 921-4081

LABORATORY TEST RESULTS

Client:	West Consultants, Inc.	Project No.:	L08365
	Attn: Gary Freeman	Report Date:	22-Nov-02
	2151 E. Broadway Rd., Suite 116	Lab No.:	12029
	Tempe, AZ 85282-1705		
Project:	**Misc. Laboratory Testing**	Sampled By:	Client
Location:		Date Sampled:	
		Submitted By:	Client
Sample Source:	Santa Cruz Pushed Out Sample #4	Date Submitted:	20-Nov-02
Material:	Soil	Supplier:	
Test Method(s):	Sieve Analysis (ASTM C117, C136)		

Results:

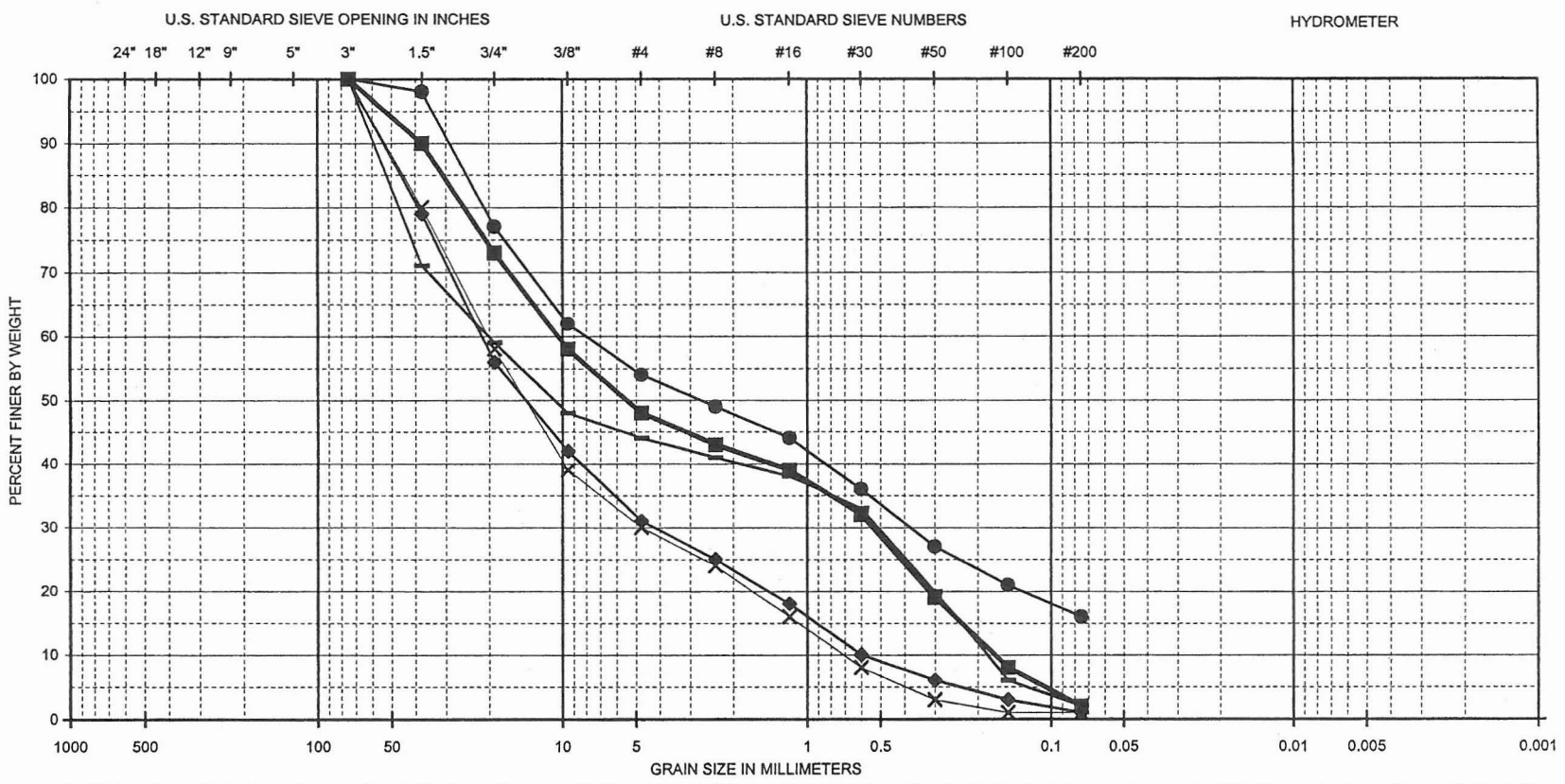
Sieve Size	Percent Passing	Minimum	Maximum
	100		
	100		
3"	100		
2"	100		
1-1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	100		
1/4"	100		
#4	100		
#8	99		
#10	99		
#16	98		
#30	95		
#40	91		
#50	83		
#100	57		
#200	46		

Remarks:

Distribution: Addressee (1)

Respectfully submitted,

Shawn C. Morman, E.I.T.
Technical Services Director



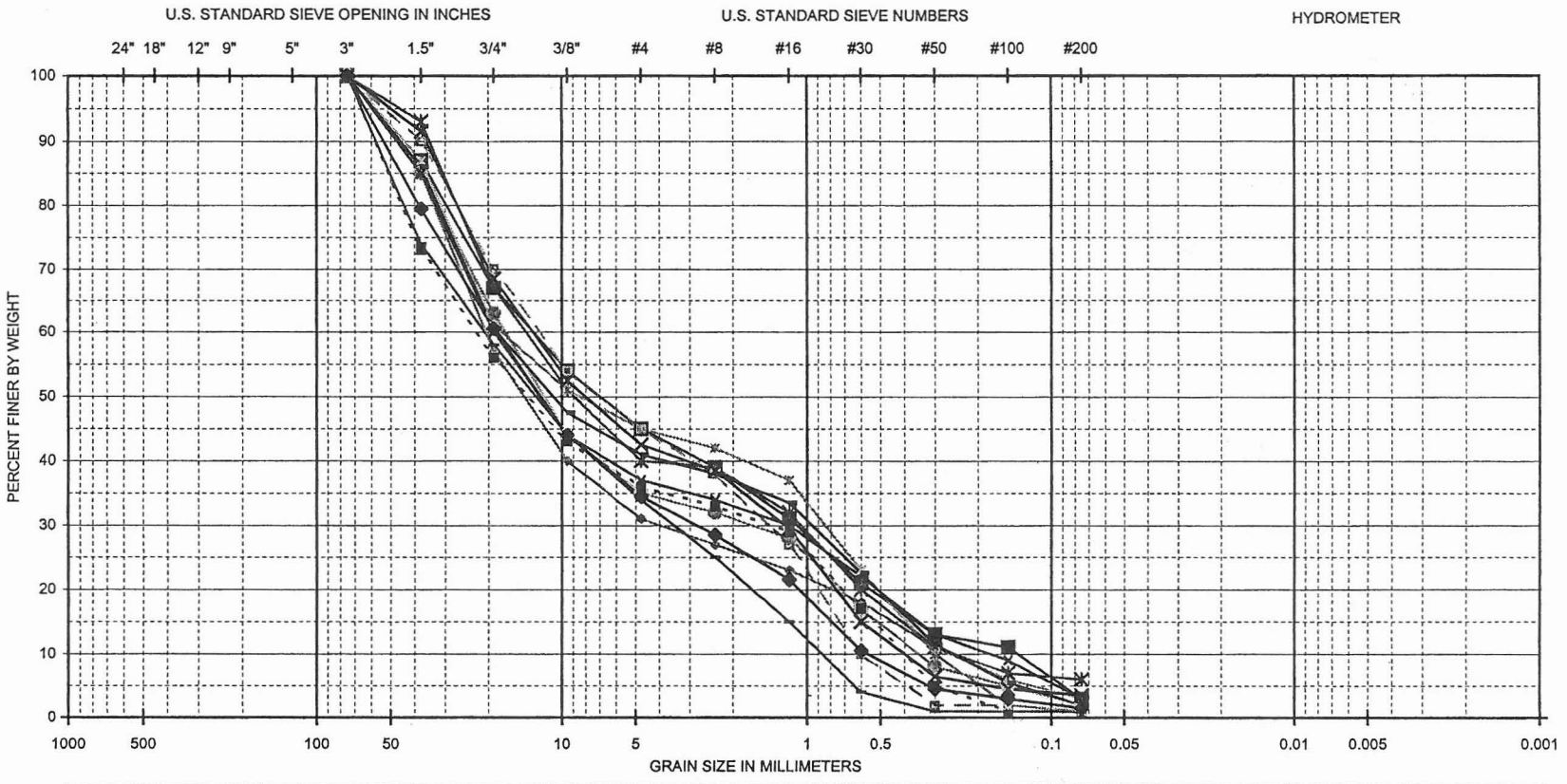
BOULDERS		COBBLES		GRAVEL					SAND					SILT				CLAY	
MEDIUM	SMALL	LARGE	SMALL	VERY COARSE	COARSE	MEDIUM	FINE	VERY FINE	VERY COARSE	COARSE	MEDIUM	FINE	VERY FINE	COARSE	MEDIUM	FINE	VERY FINE	COARSE	MEDIUM

Sieve — Labels between log scales — SS2 — SS3 — SS5 — SS8 — SS9

Tres Rios North Levee PED

WEST Consultants, Inc.

U.S. ARMY CORPS OF ENGINEERS
Los Angeles District



BOULDERS		COBBLES		GRAVEL					SAND					SILT				CLAY	
MEDIUM	SMALL	LARGE	SMALL	VERY COARSE	COARSE	MEDIUM	FINE	VERY FINE	VERY COARSE	COARSE	MEDIUM	FINE	VERY FINE	COARSE	MEDIUM	FINE	VERY FINE	COARSE	MEDIUM

Sieve
Labels between log scales
SS12A-02
SS13-02
SS14-02
SS15-02
SS17-02
SS18-02
SS21-02
SS22-02
SS23-02
SS13&SS14
SS17-SS18
SS22&SS23

Tres Rios North Levee PED

WEST Consultants, Inc.

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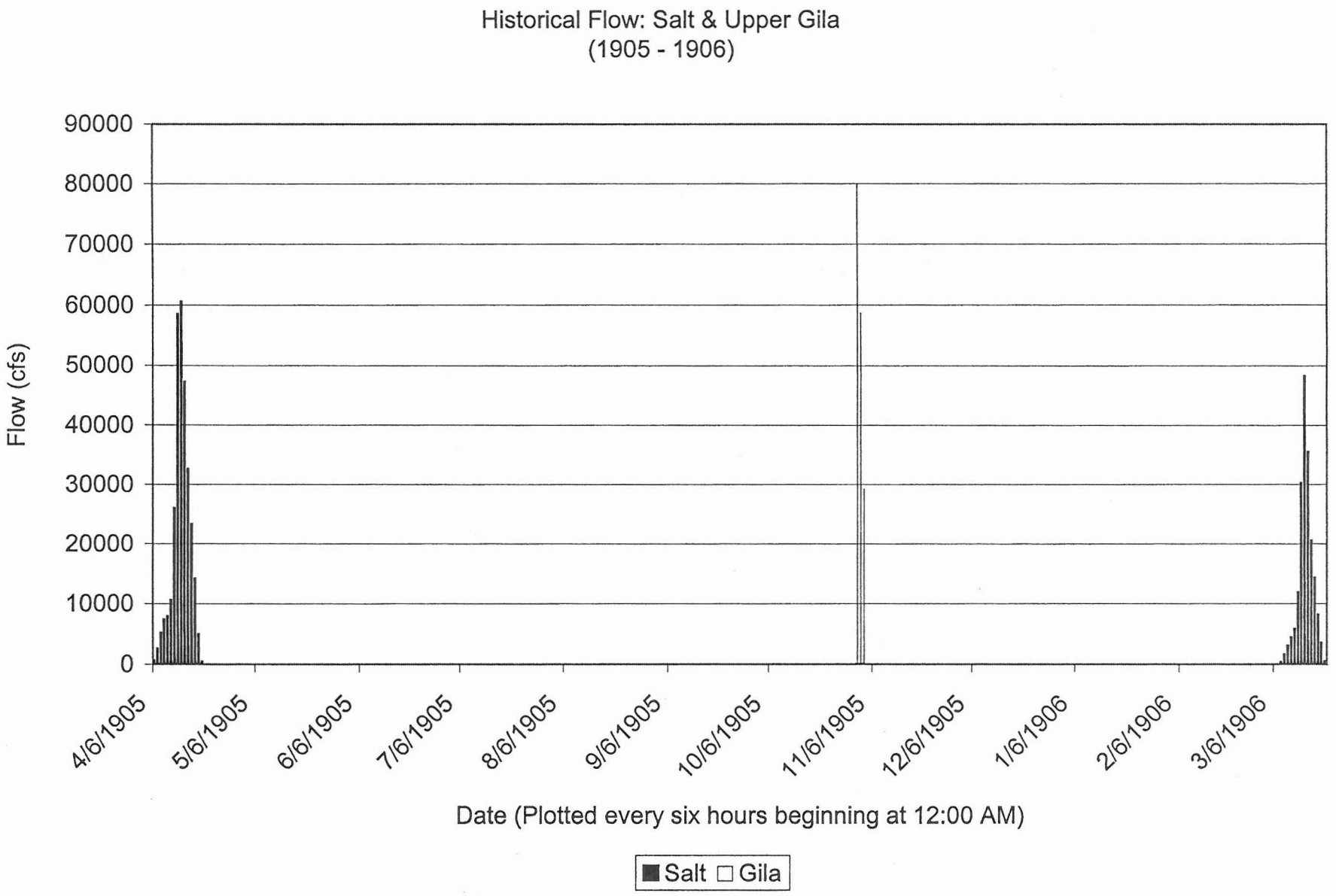
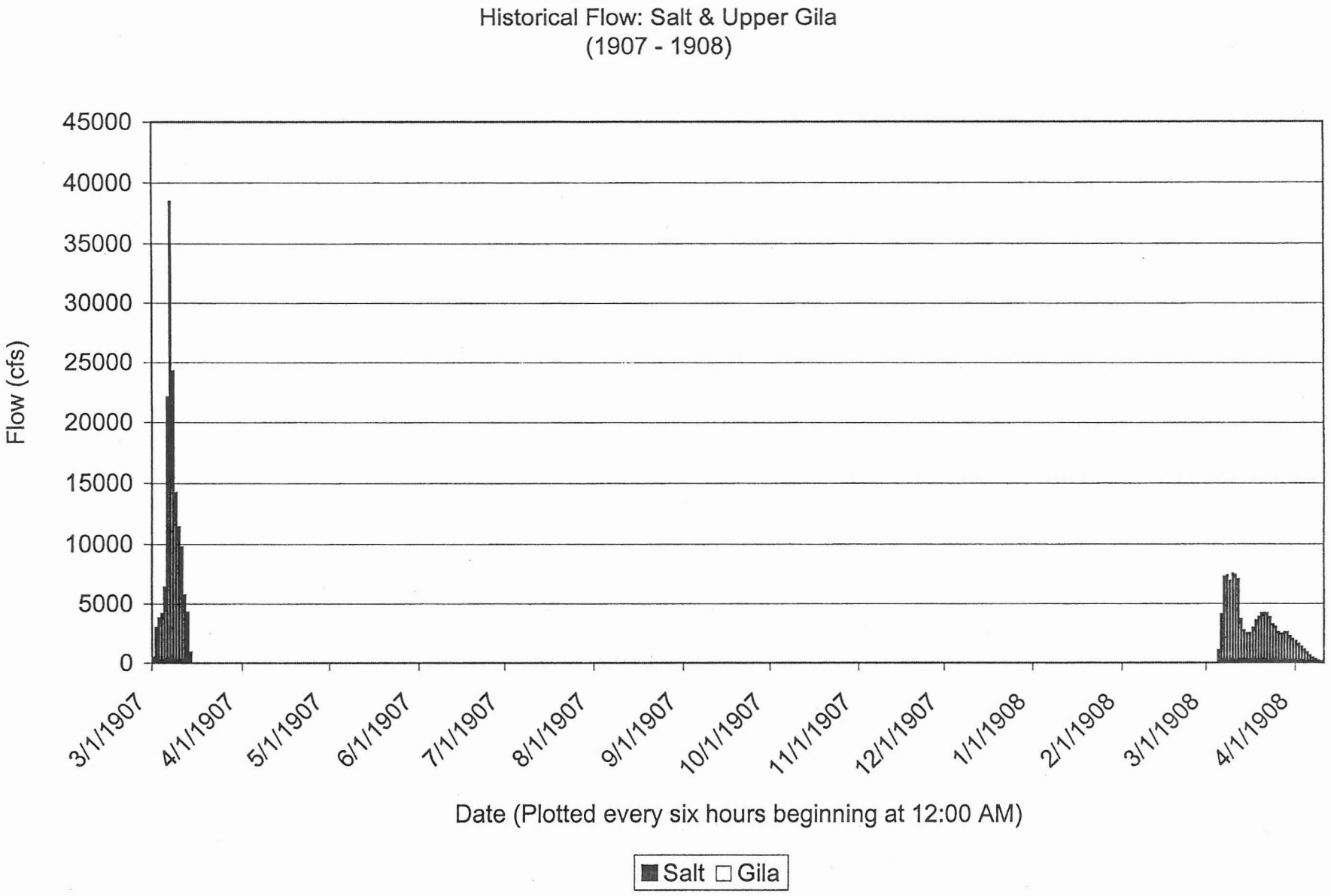
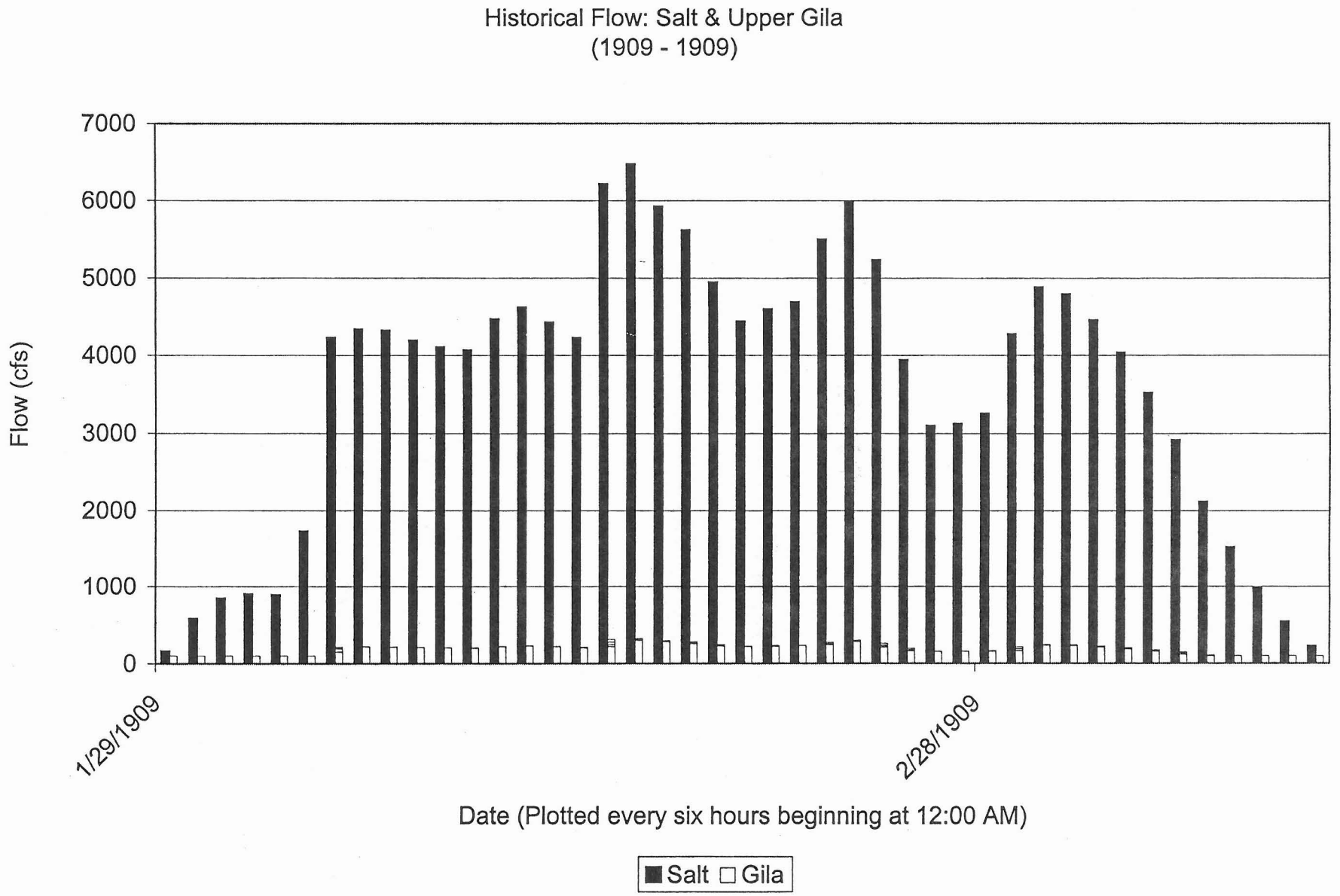
Los Angeles District

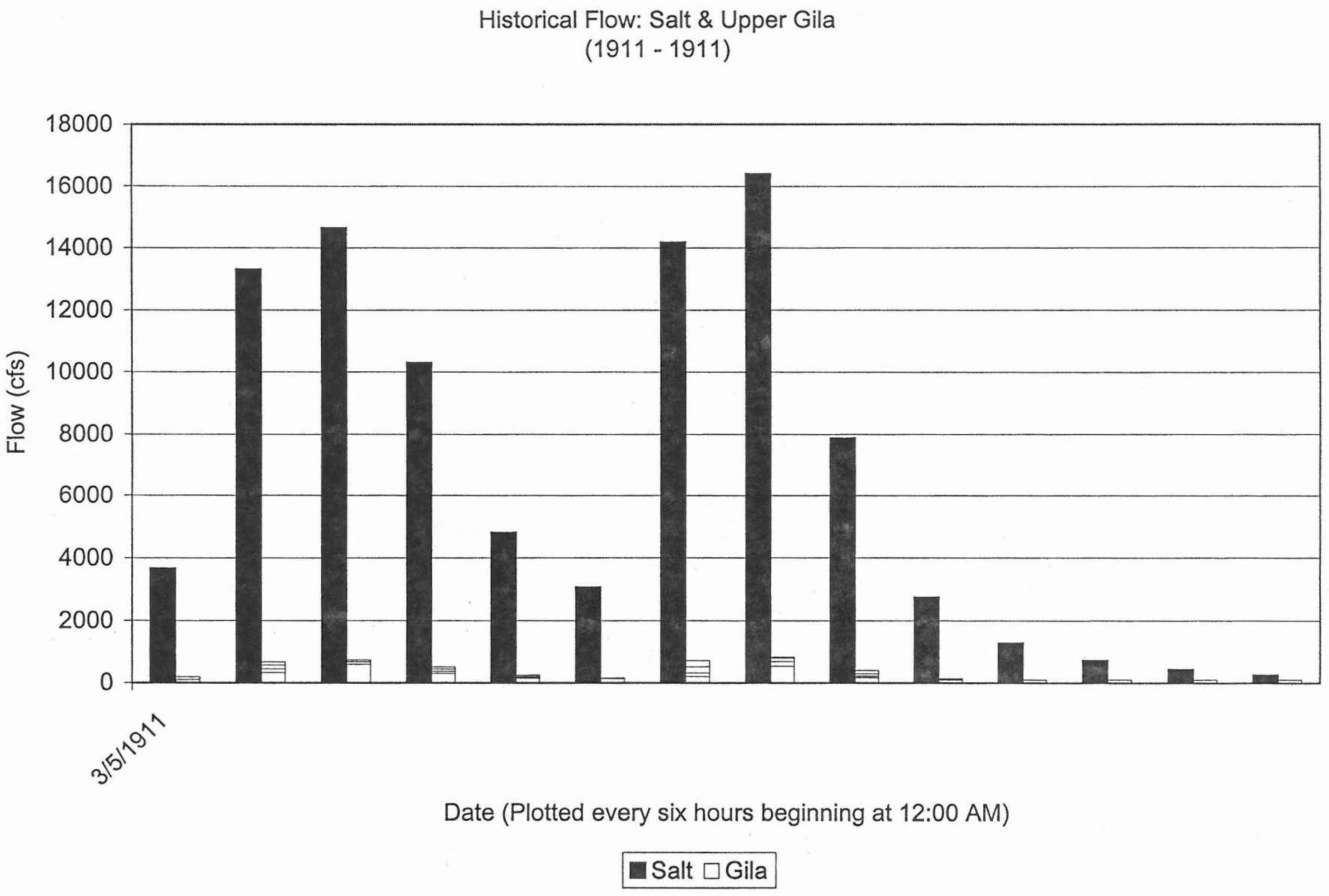
APPENDIX J

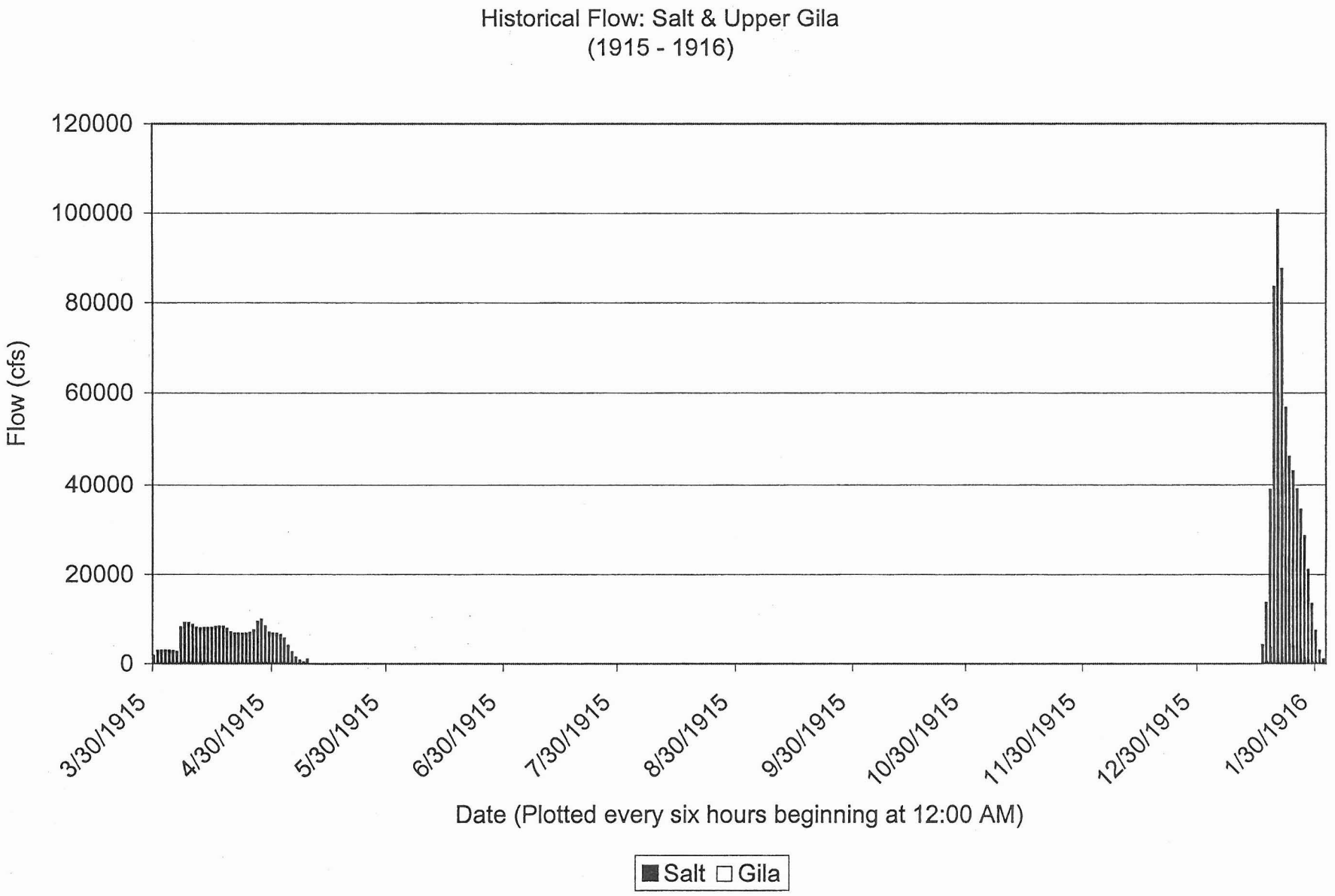
Hydrographs for the Salt and Upper Gila Rivers

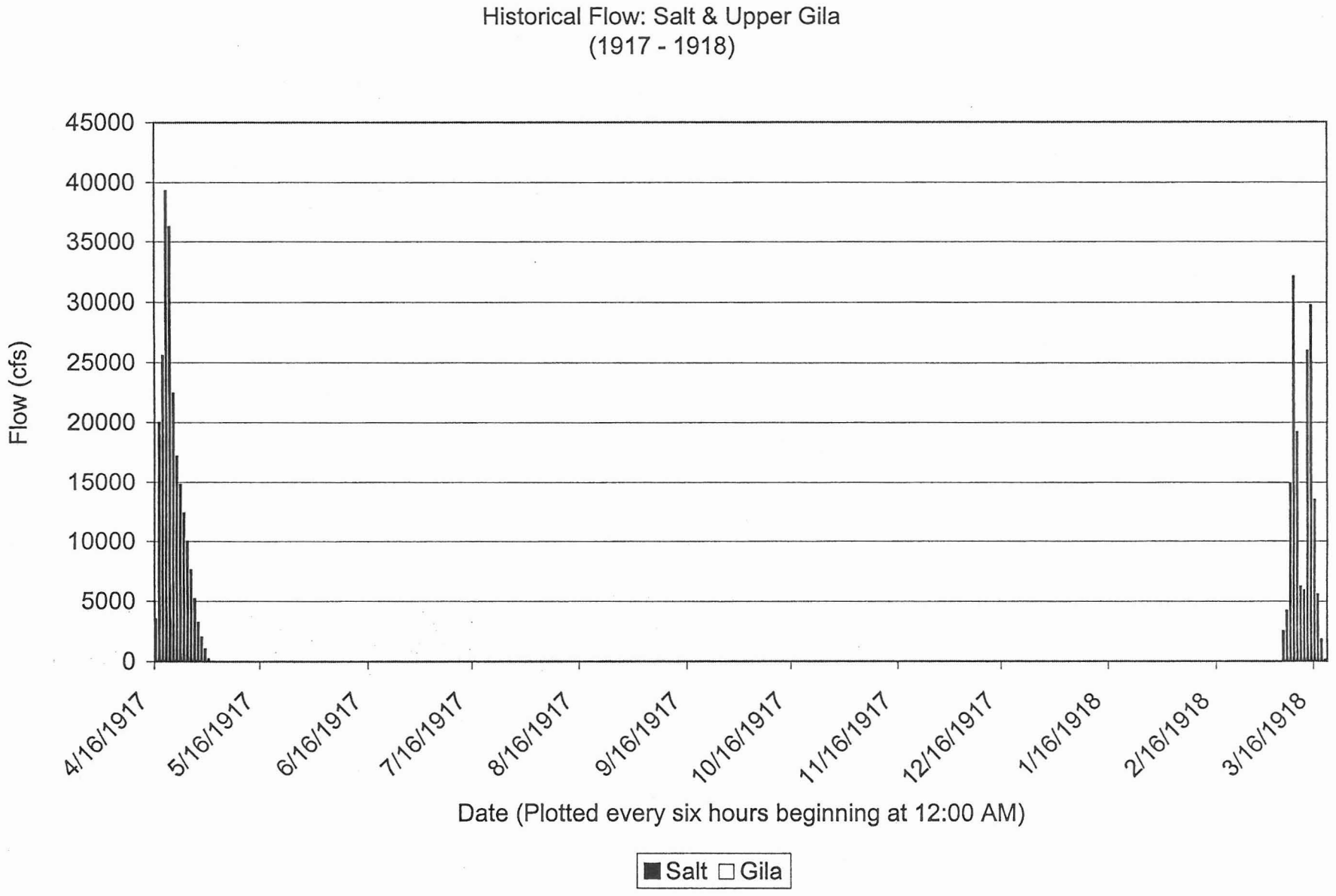

Historical Flow: Salt & Upper Gila
(1905 - 1906)
Flow (cfs)
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
4/6/1905
5/6/1905
6/6/1905
7/6/1905
8/6/1905
9/6/1905
10/6/1905
11/6/1905
12/6/1905
1/6/1906
2/6/1906
3/6/1906
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

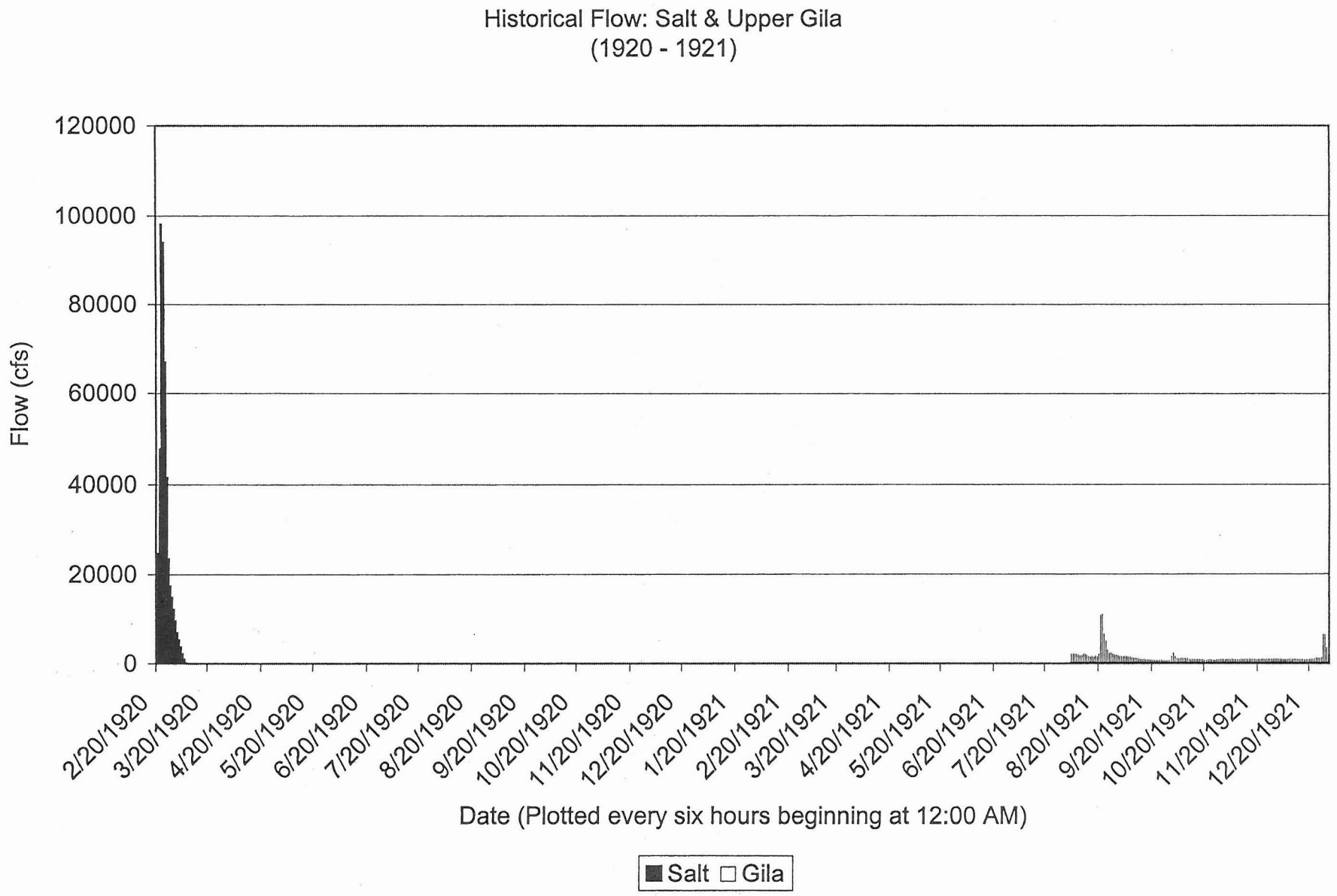

Historical Flow: Salt & Upper Gila
(1907 - 1908)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Flow (cfs)
3/1/1907
4/1/1907
5/1/1907
6/1/1907
7/1/1907
8/1/1907
9/1/1907
10/1/1907
11/1/1907
12/1/1907
1/1/1908
2/1/1908
3/1/1908
4/1/1908
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

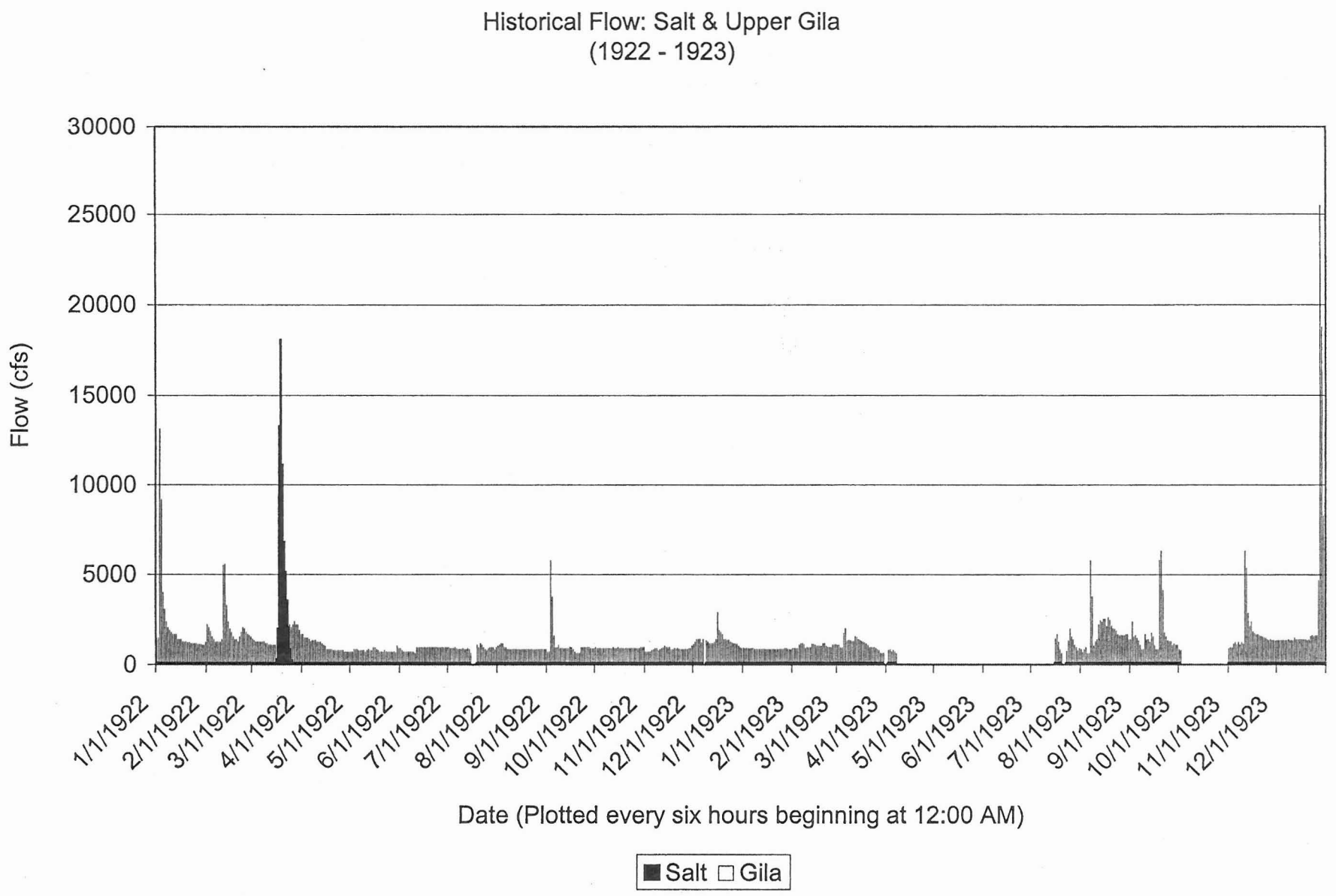

Historical Flow: Salt & Upper Gila
(1909 - 1909)
Flow (cfs)
7000
6000
5000
4000
3000
2000
1000
0
1/29/1909
2/28/1909
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

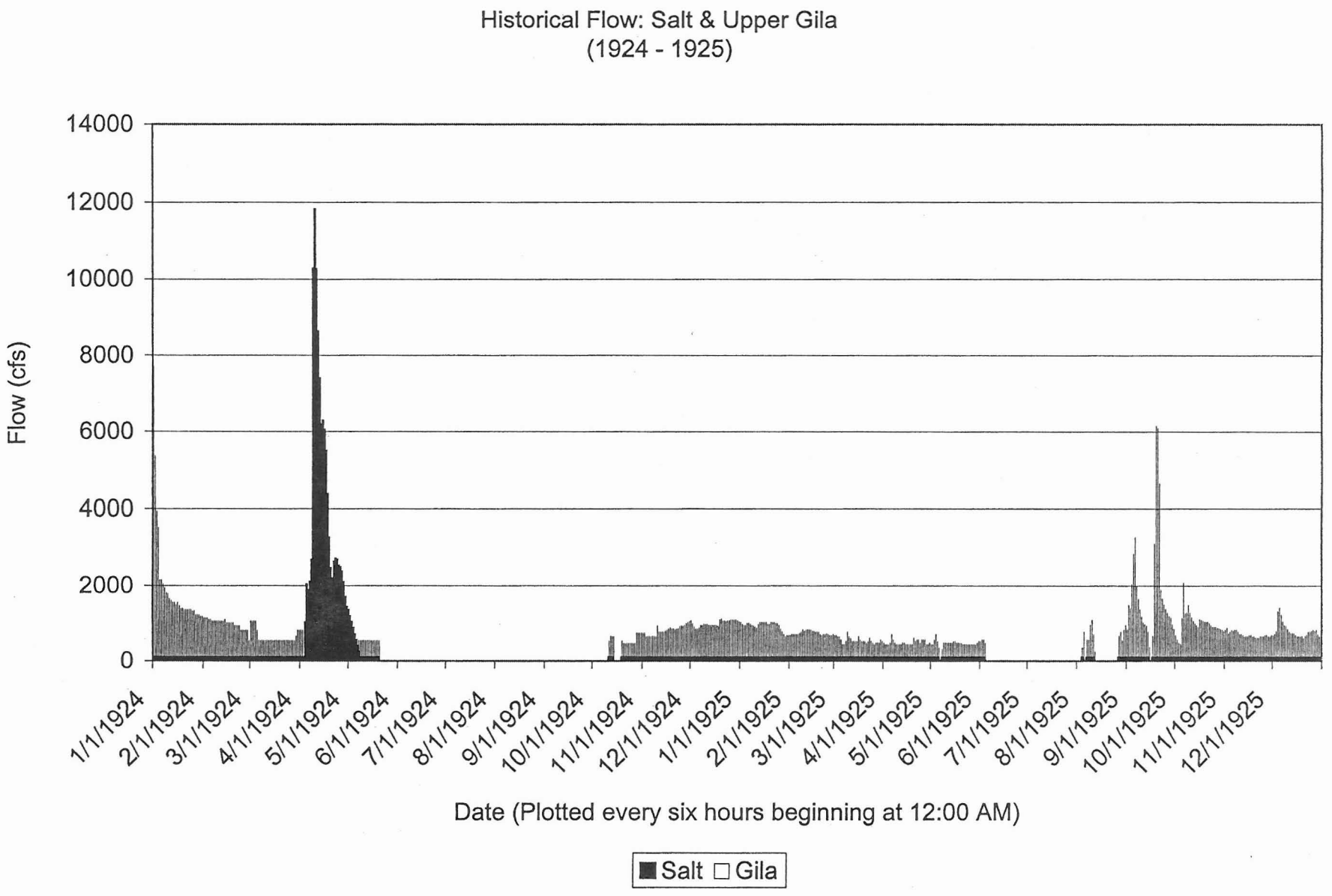

Historical Flow: Salt & Upper Gila
(1911 - 1911)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Flow (cfs)
3/5/1911
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

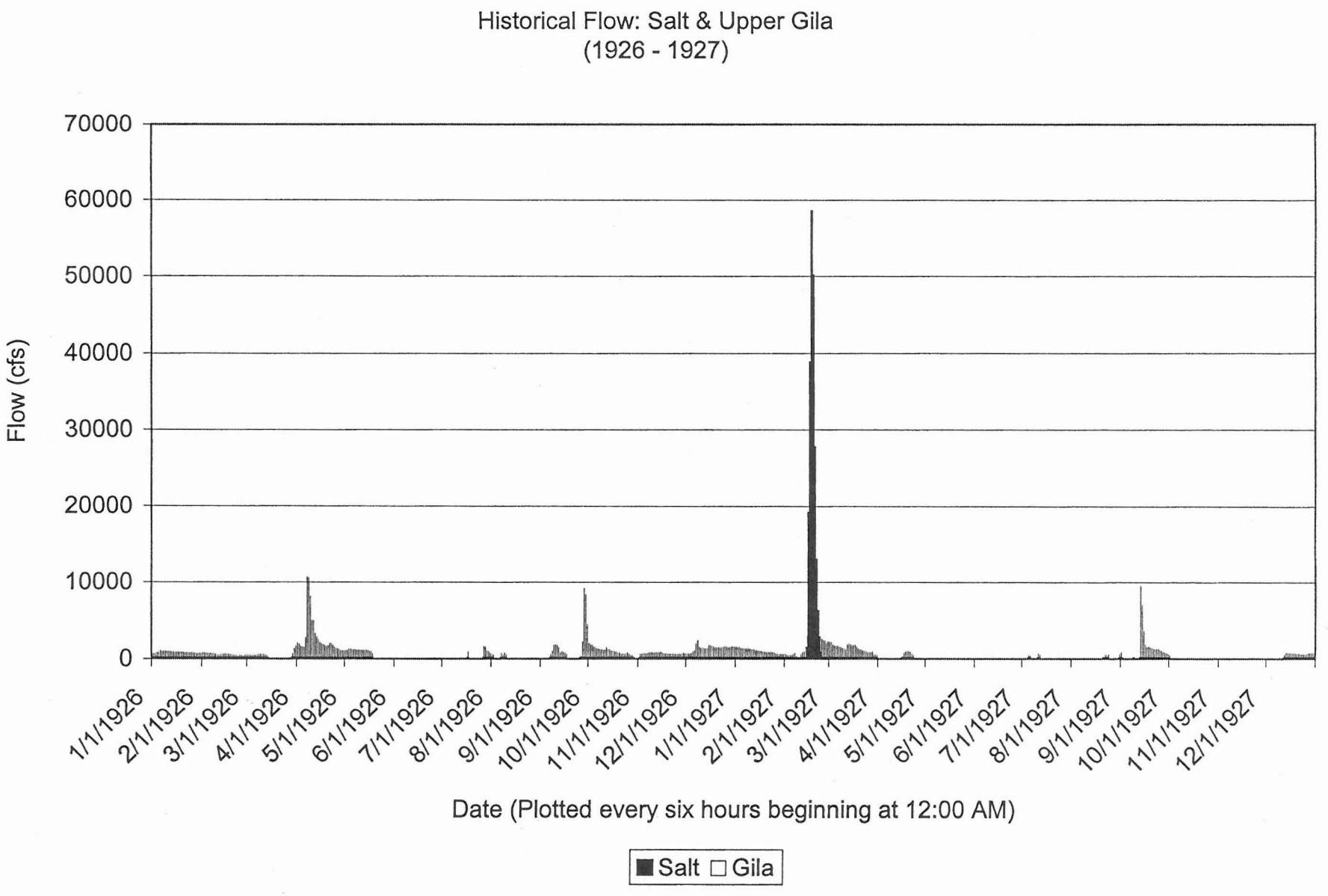

Historical Flow: Salt & Upper Gila
(1915 - 1916)
120000
100000
80000
60000
40000
20000
0
Flow (cfs)
3/30/1915
4/30/1915
5/30/1915
6/30/1915
7/30/1915
8/30/1915
9/30/1915
10/30/1915
11/30/1915
12/30/1915
1/30/1916
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

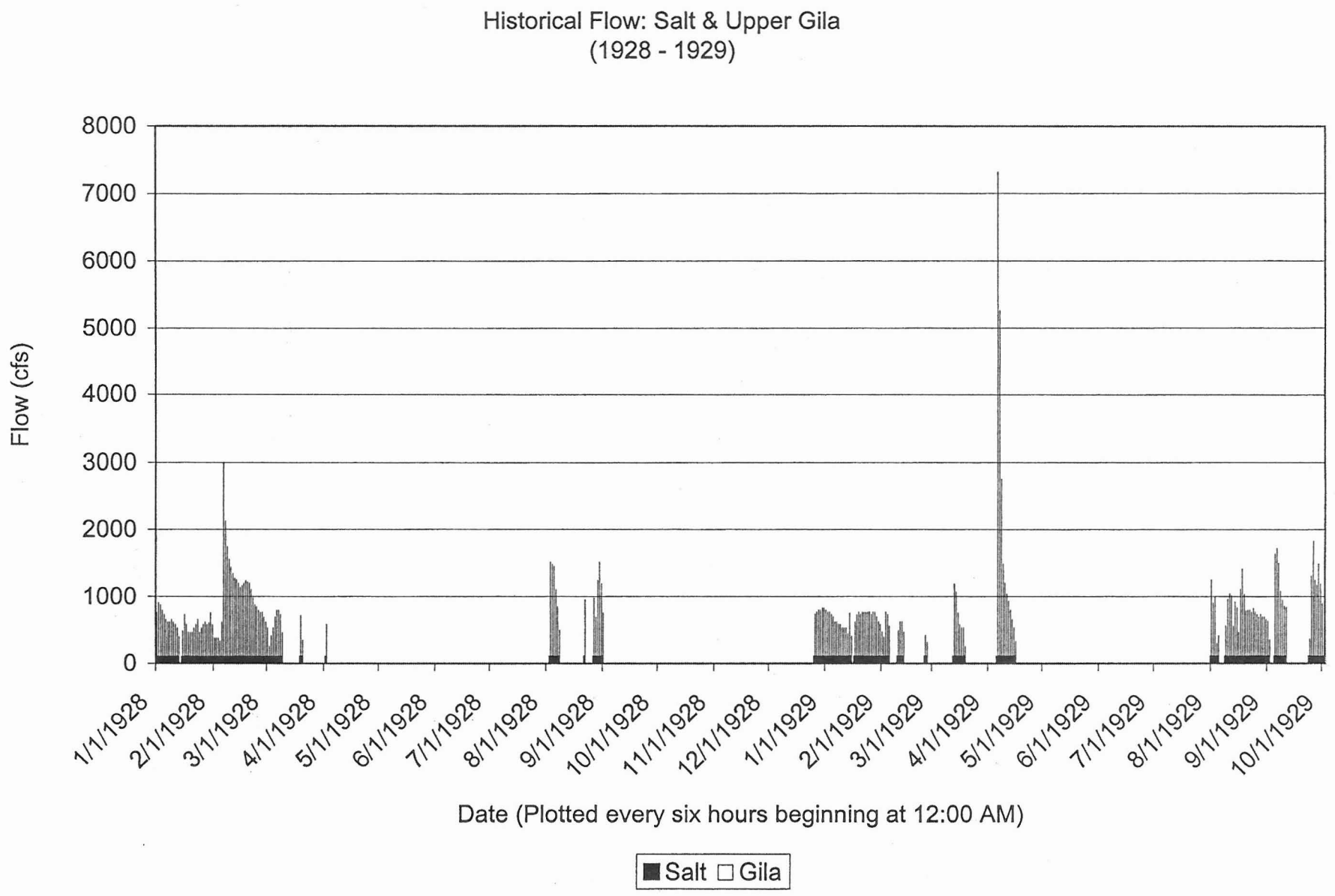

Historical Flow: Salt & Upper Gila
(1917 - 1918)
Flow (cfs)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
4/16/1917
5/16/1917
6/16/1917
7/16/1917
8/16/1917
9/16/1917
10/16/1917
11/16/1917
12/16/1917
1/16/1918
2/16/1918
3/16/1918
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

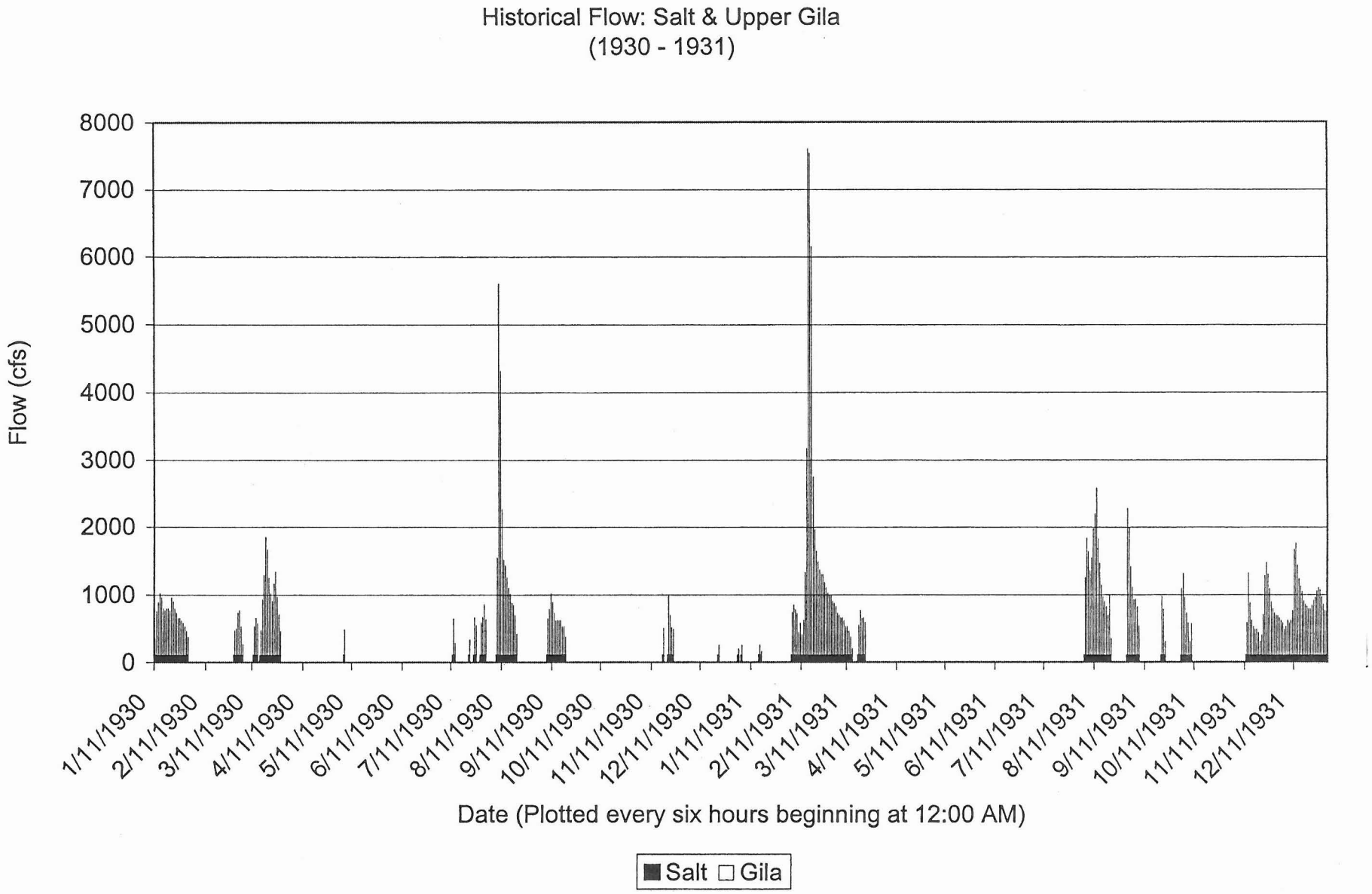

Historical Flow: Salt & Upper Gila
(1920 - 1921)
120000
100000
80000
60000
40000
20000
0
Flow (cfs)
2/20/1920
3/20/1920
4/20/1920
5/20/1920
6/20/1920
7/20/1920
8/20/1920
9/20/1920
10/20/1920
11/20/1920
12/20/1920
1/20/1921
2/20/1921
3/20/1921
4/20/1921
5/20/1921
6/20/1921
7/20/1921
8/20/1921
9/20/1921
10/20/1921
11/20/1921
12/20/1921
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

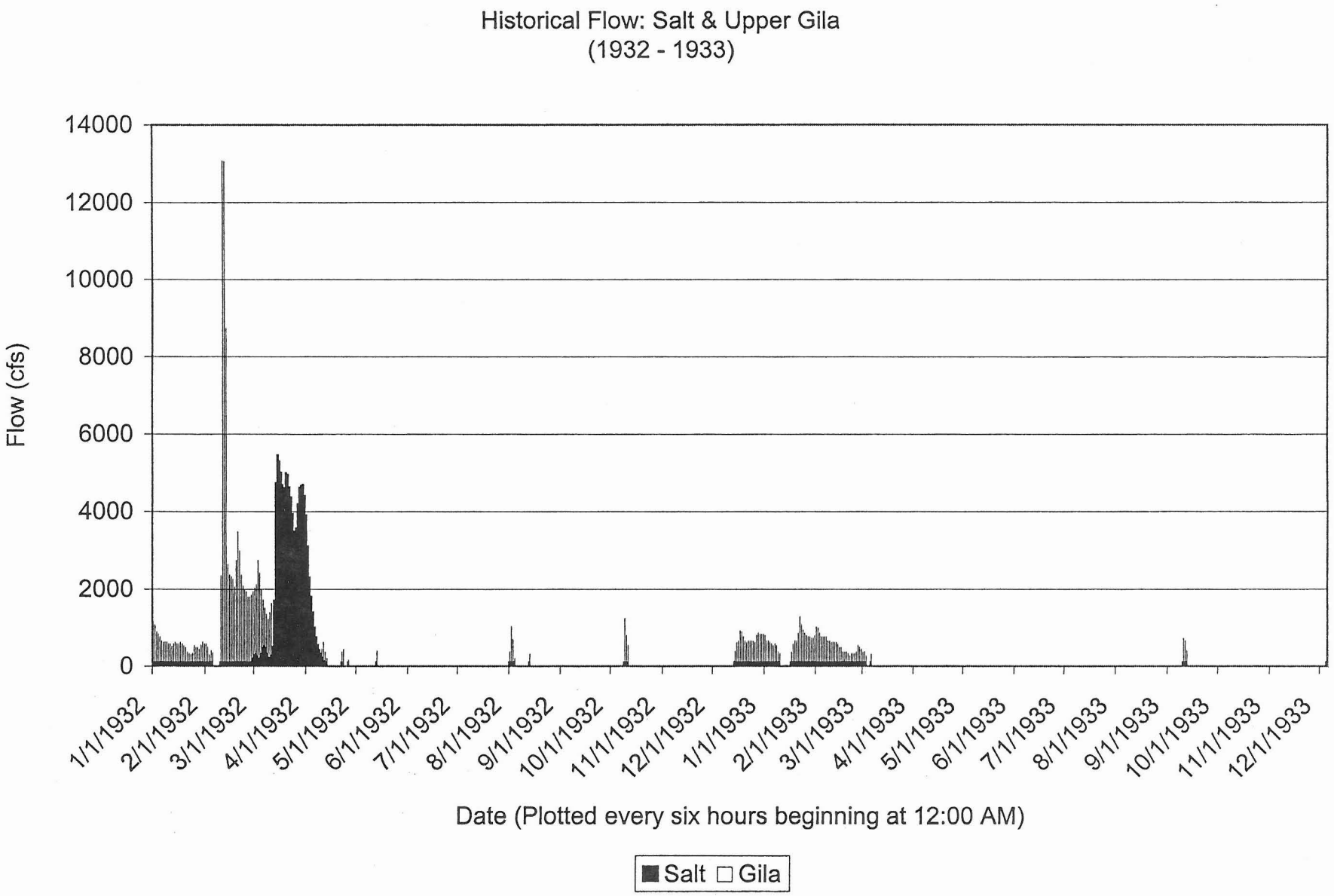

Historical Flow: Salt & Upper Gila
(1922 - 1923)
Flow (cfs)
30000
25000
20000
15000
10000
5000
0
1/1/1922
2/1/1922
3/1/1922
4/1/1922
5/1/1922
6/1/1922
7/1/1922
8/1/1922
9/1/1922
10/1/1922
11/1/1922
12/1/1922
1/1/1923
2/1/1923
3/1/1923
4/1/1923
5/1/1923
6/1/1923
7/1/1923
8/1/1923
9/1/1923
10/1/1923
11/1/1923
12/1/1923
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

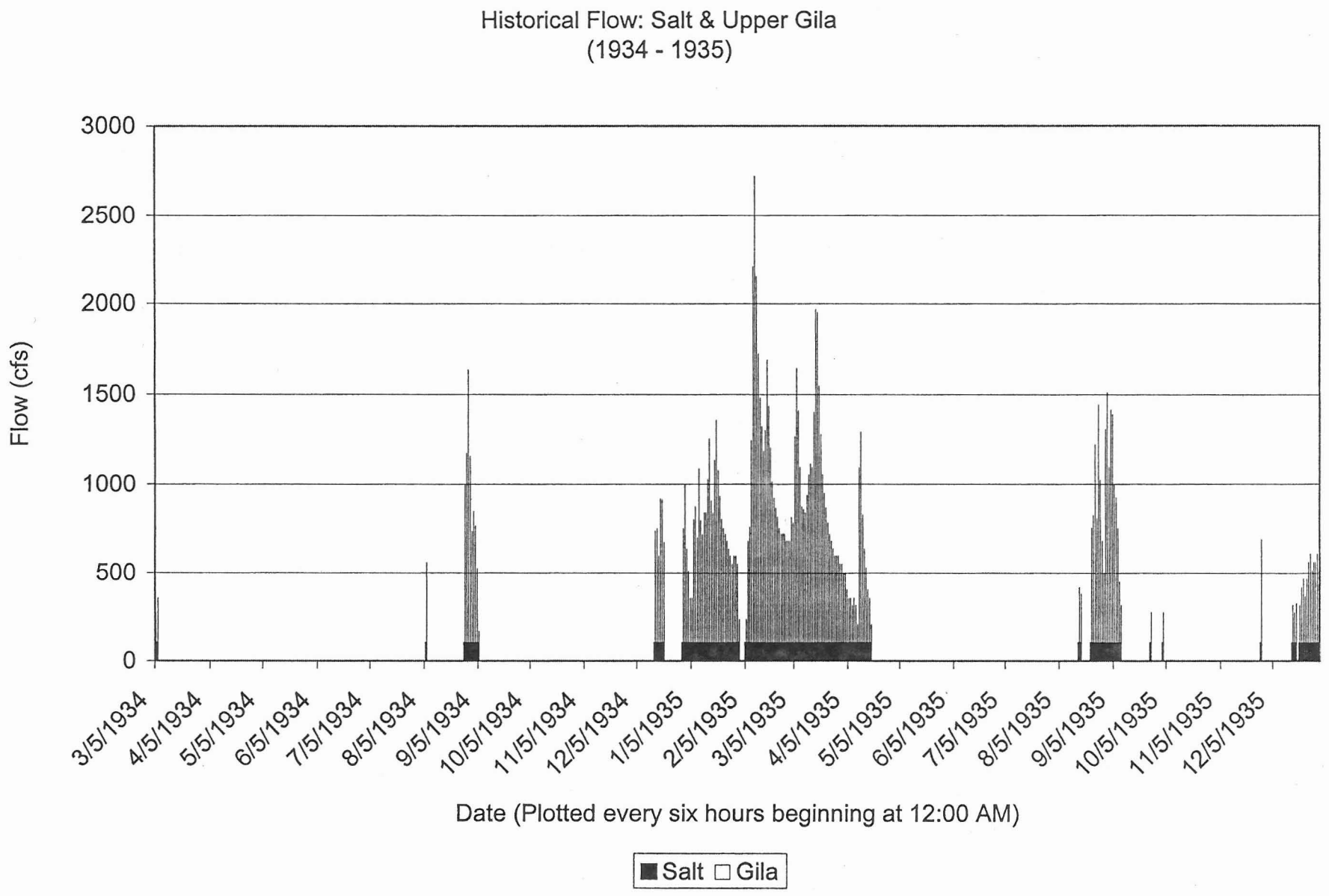

Historical Flow: Salt & Upper Gila
(1924 - 1925)
Flow (cfs)
14000
12000
10000
8000
6000
4000
2000
0
1/1/1924
2/1/1924
3/1/1924
4/1/1924
5/1/1924
6/1/1924
7/1/1924
8/1/1924
9/1/1924
10/1/1924
11/1/1924
12/1/1924
1/1/1925
2/1/1925
3/1/1925
4/1/1925
5/1/1925
6/1/1925
7/1/1925
8/1/1925
9/1/1925
10/1/1925
11/1/1925
12/1/1925
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

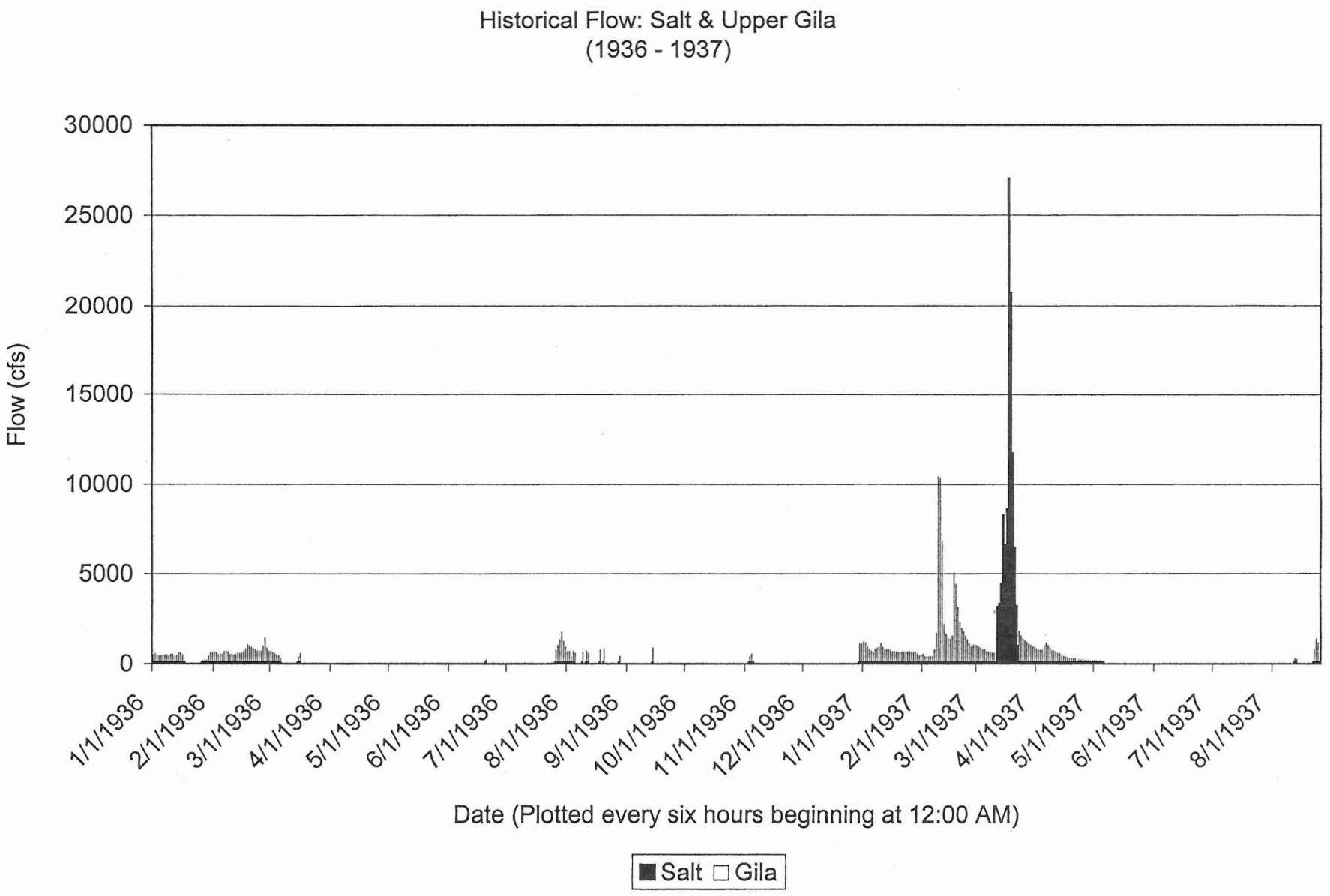

Historical Flow: Salt & Upper Gila
(1926 - 1927)
Flow (cfs)
70000
60000
50000
40000
30000
20000
10000
0
1/1/1926
2/1/1926
3/1/1926
4/1/1926
5/1/1926
6/1/1926
7/1/1926
8/1/1926
9/1/1926
10/1/1926
11/1/1926
12/1/1926
1/1/1927
2/1/1927
3/1/1927
4/1/1927
5/1/1927
6/1/1927
7/1/1927
8/1/1927
9/1/1927
10/1/1927
11/1/1927
12/1/1927
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

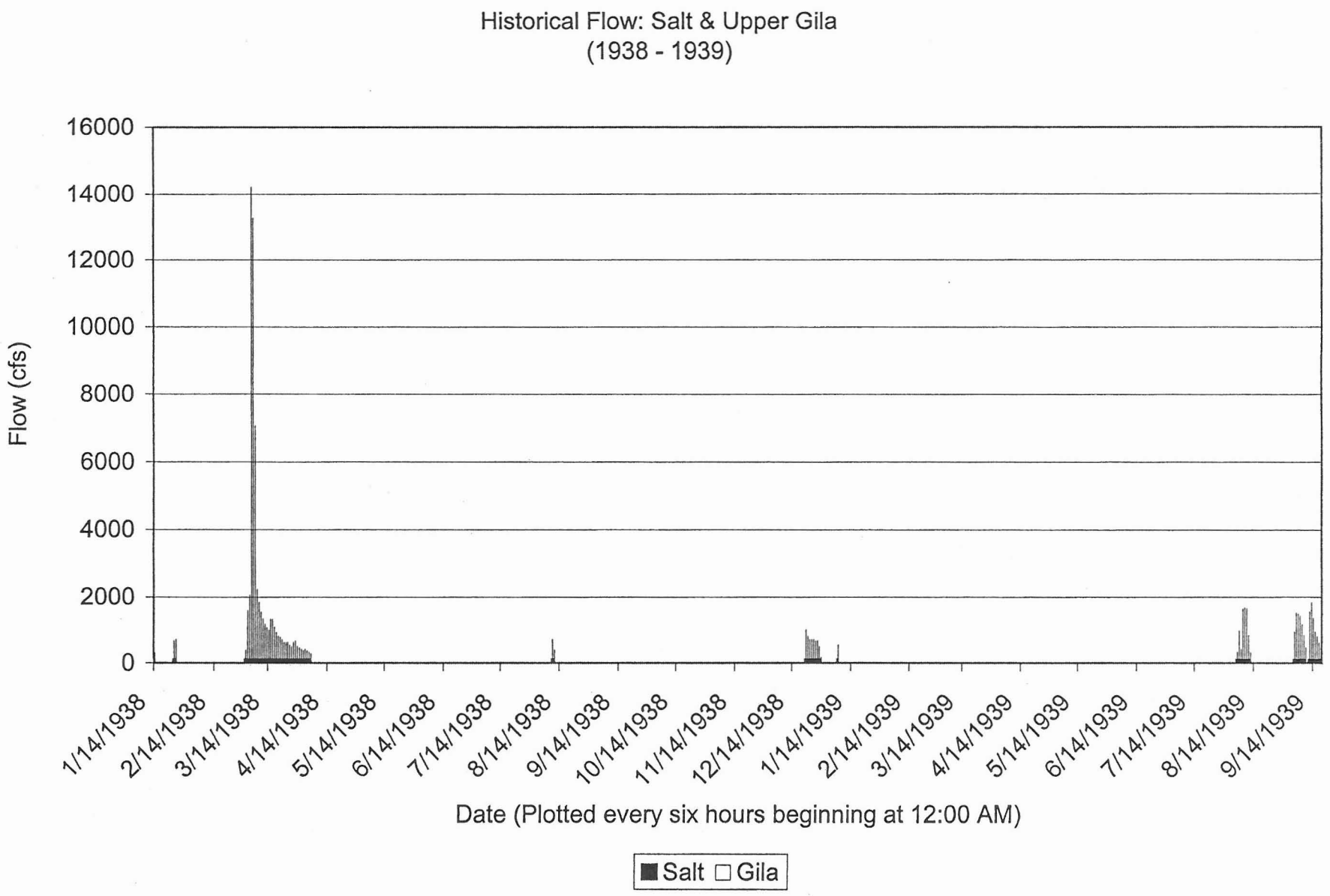

Historical Flow: Salt & Upper Gila
(1928 - 1929)
Flow (cfs)
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1928
2/1/1928
3/1/1928
4/1/1928
5/1/1928
6/1/1928
7/1/1928
8/1/1928
9/1/1928
10/1/1928
11/1/1928
12/1/1928
1/1/1929
2/1/1929
3/1/1929
4/1/1929
5/1/1929
6/1/1929
7/1/1929
8/1/1929
9/1/1929
10/1/1929
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

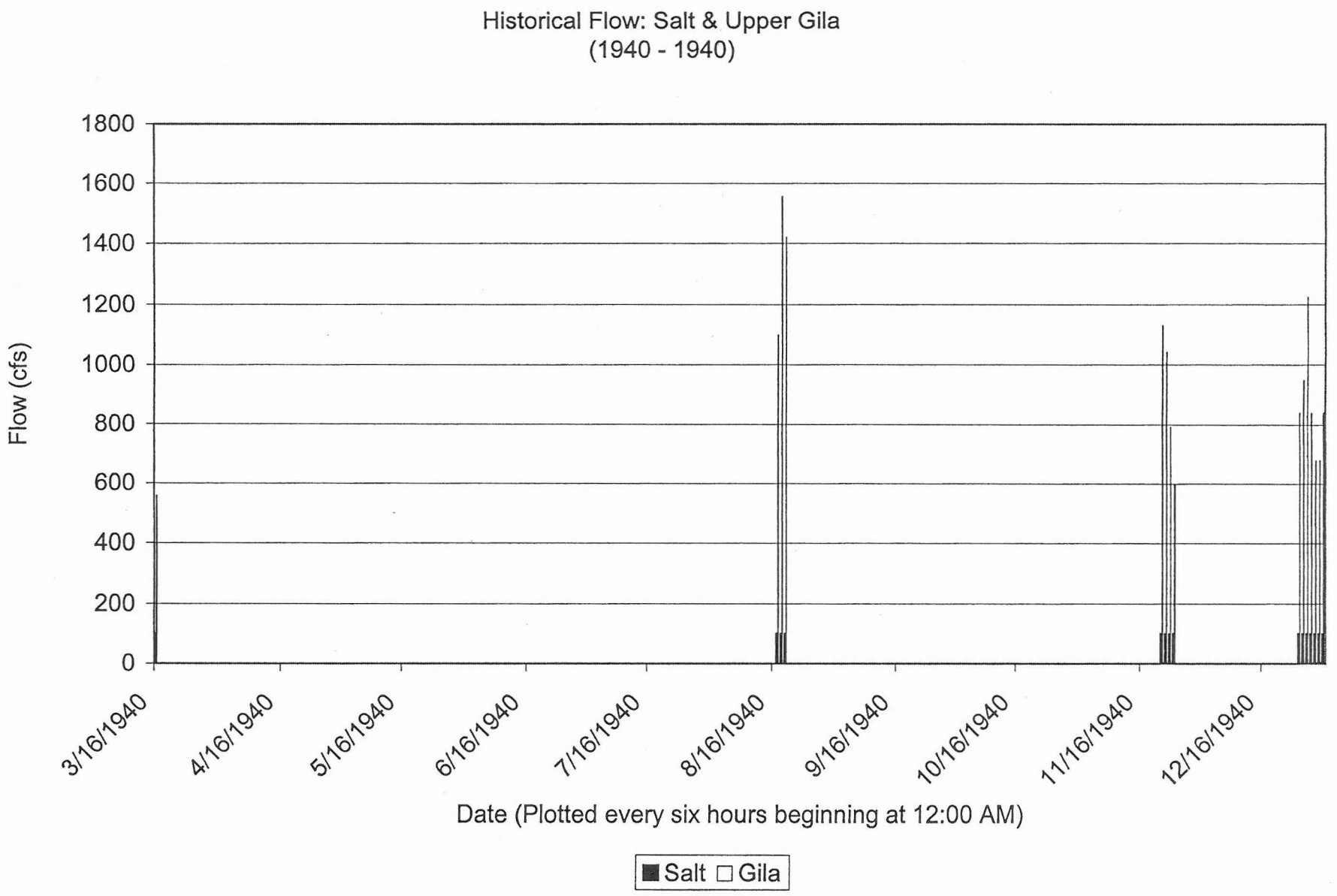

Historical Flow: Salt & Upper Gila
(1930 - 1931)
Flow (cfs)
8000
7000
6000
5000
4000
3000
2000
1000
0
1/11/1930
2/11/1930
3/11/1930
4/11/1930
5/11/1930
6/11/1930
7/11/1930
8/11/1930
9/11/1930
10/11/1930
11/11/1930
12/11/1930
1/11/1931
2/11/1931
3/11/1931
4/11/1931
5/11/1931
6/11/1931
7/11/1931
8/11/1931
9/11/1931
10/11/1931
11/11/1931
12/11/1931
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

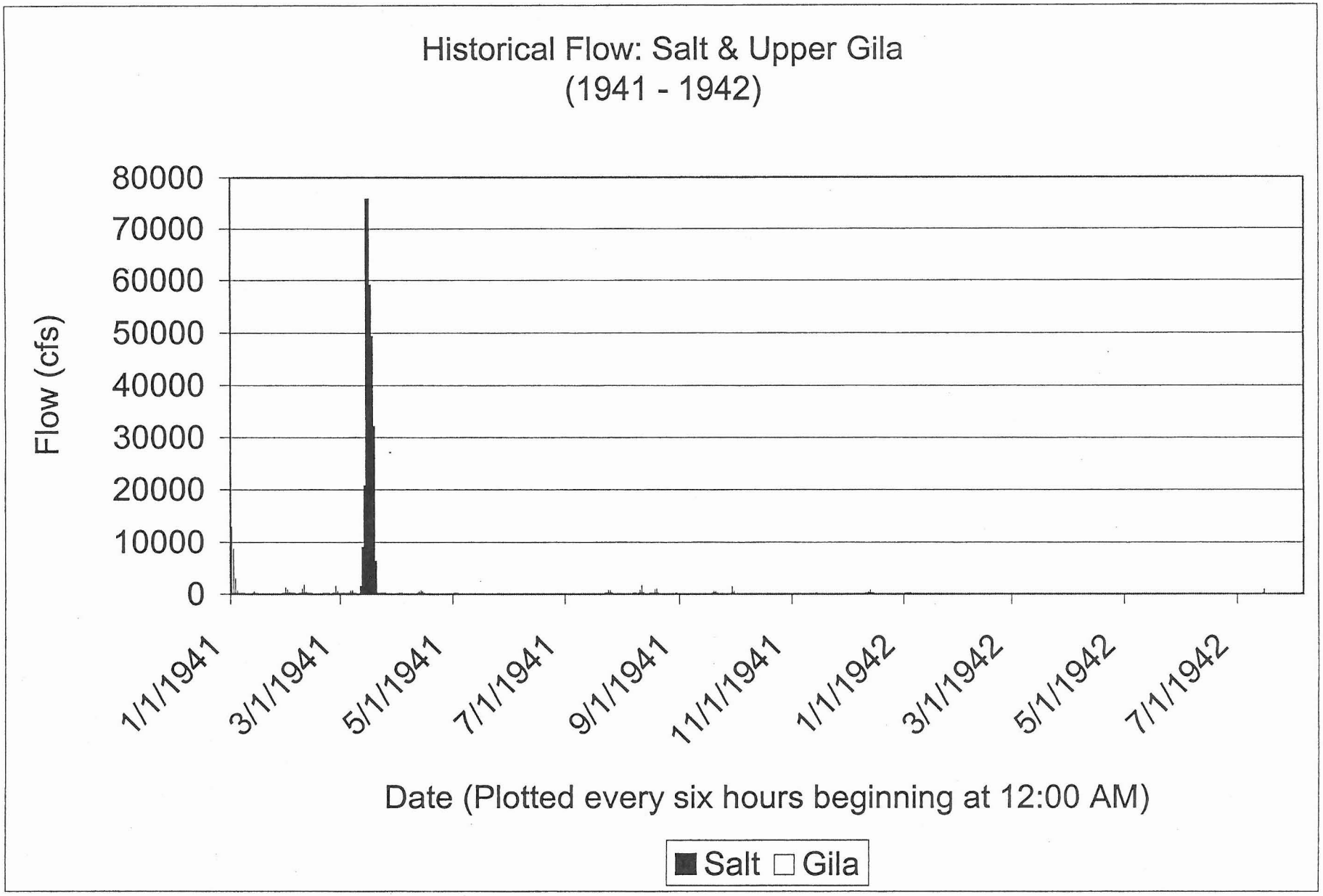

Historical Flow: Salt & Upper Gila
(1932 - 1933)
Flow (cfs)
14000
12000
10000
8000
6000
4000
2000
0
1/1/1932
2/1/1932
3/1/1932
4/1/1932
5/1/1932
6/1/1932
7/1/1932
8/1/1932
9/1/1932
10/1/1932
11/1/1932
12/1/1932
1/1/1933
2/1/1933
3/1/1933
4/1/1933
5/1/1933
6/1/1933
7/1/1933
8/1/1933
9/1/1933
10/1/1933
11/1/1933
12/1/1933
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

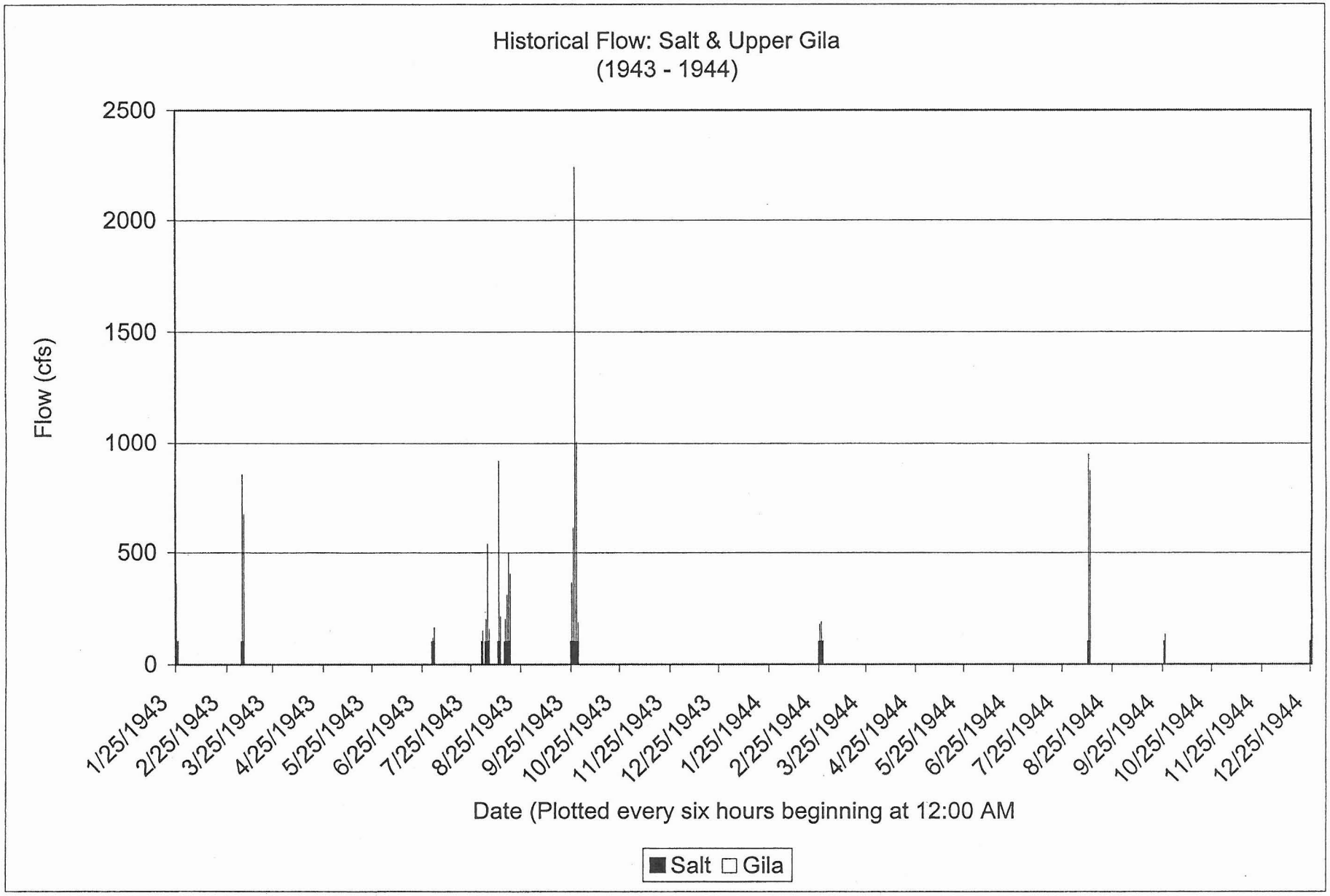

Historical Flow: Salt & Upper Gila
(1934 - 1935)
Flow (cfs)
3000
2500
2000
1500
1000
500
0
3/5/1934
4/5/1934
5/5/1934
6/5/1934
7/5/1934
8/5/1934
9/5/1934
10/5/1934
11/5/1934
12/5/1934
1/5/1935
2/5/1935
3/5/1935
4/5/1935
5/5/1935
6/5/1935
7/5/1935
8/5/1935
9/5/1935
10/5/1935
11/5/1935
12/5/1935
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

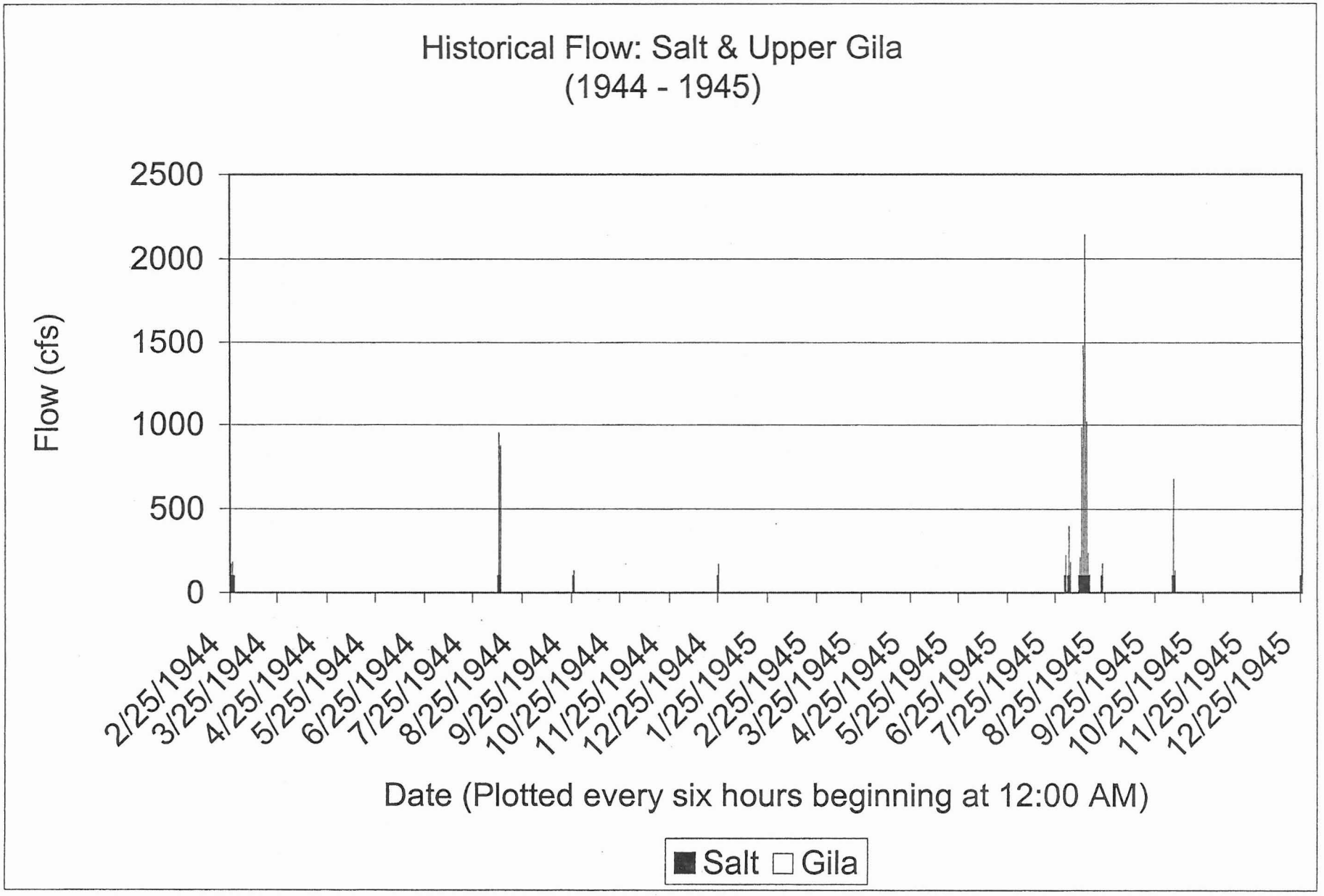

Historical Flow: Salt & Upper Gila
(1936 - 1937)
Flow (cfs)
30000
25000
20000
15000
10000
5000
0
1/1/1936
2/1/1936
3/1/1936
4/1/1936
5/1/1936
6/1/1936
7/1/1936
8/1/1936
9/1/1936
10/1/1936
11/1/1936
12/1/1936
1/1/1937
2/1/1937
3/1/1937
4/1/1937
5/1/1937
6/1/1937
7/1/1937
8/1/1937
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

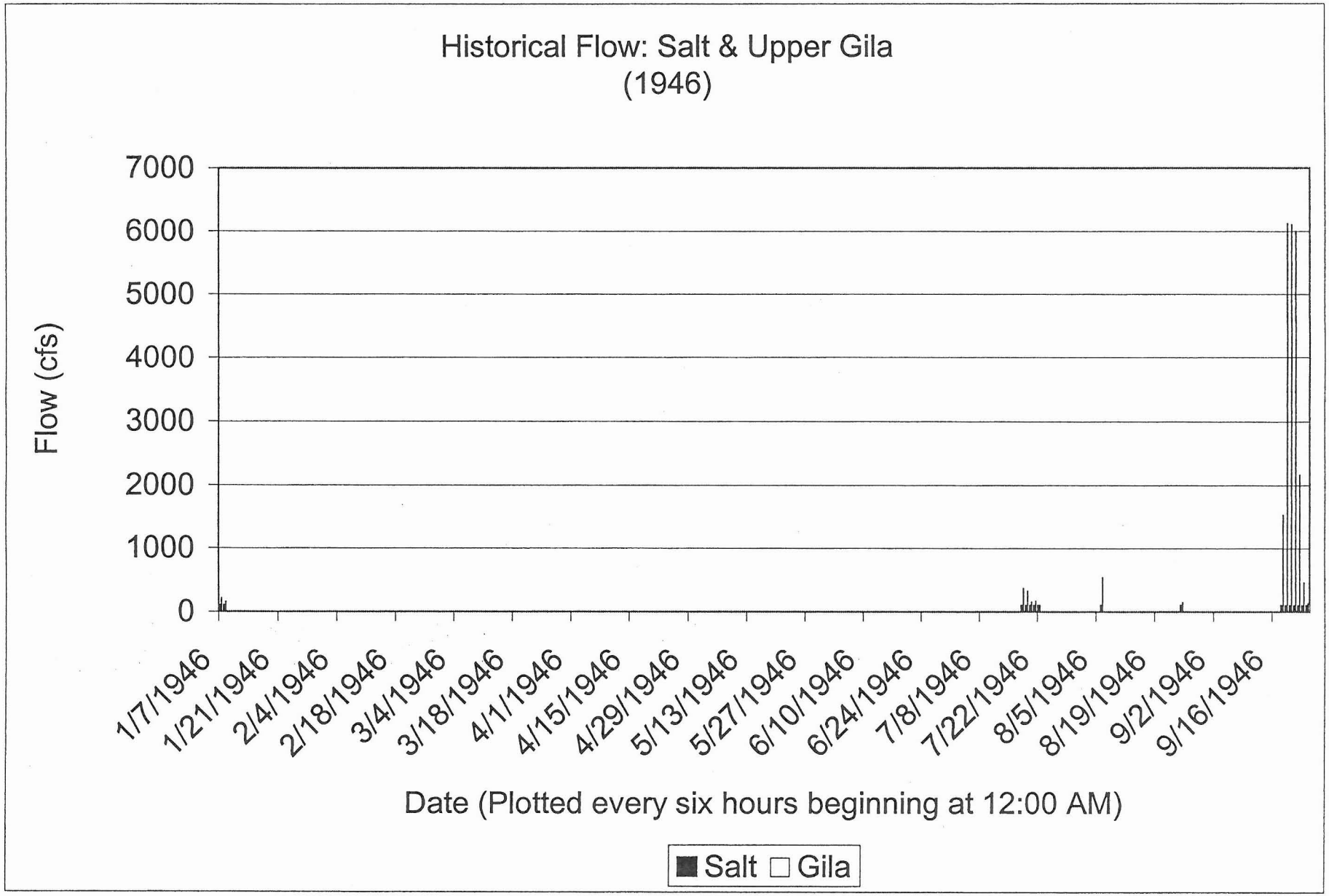

Historical Flow: Salt & Upper Gila
(1938 - 1939)
Flow (cfs)
16000
14000
12000
10000
8000
6000
4000
2000
0
1/14/1938
2/14/1938
3/14/1938
4/14/1938
5/14/1938
6/14/1938
7/14/1938
8/14/1938
9/14/1938
10/14/1938
11/14/1938
12/14/1938
1/14/1939
2/14/1939
3/14/1939
4/14/1939
5/14/1939
6/14/1939
7/14/1939
8/14/1939
9/14/1939
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

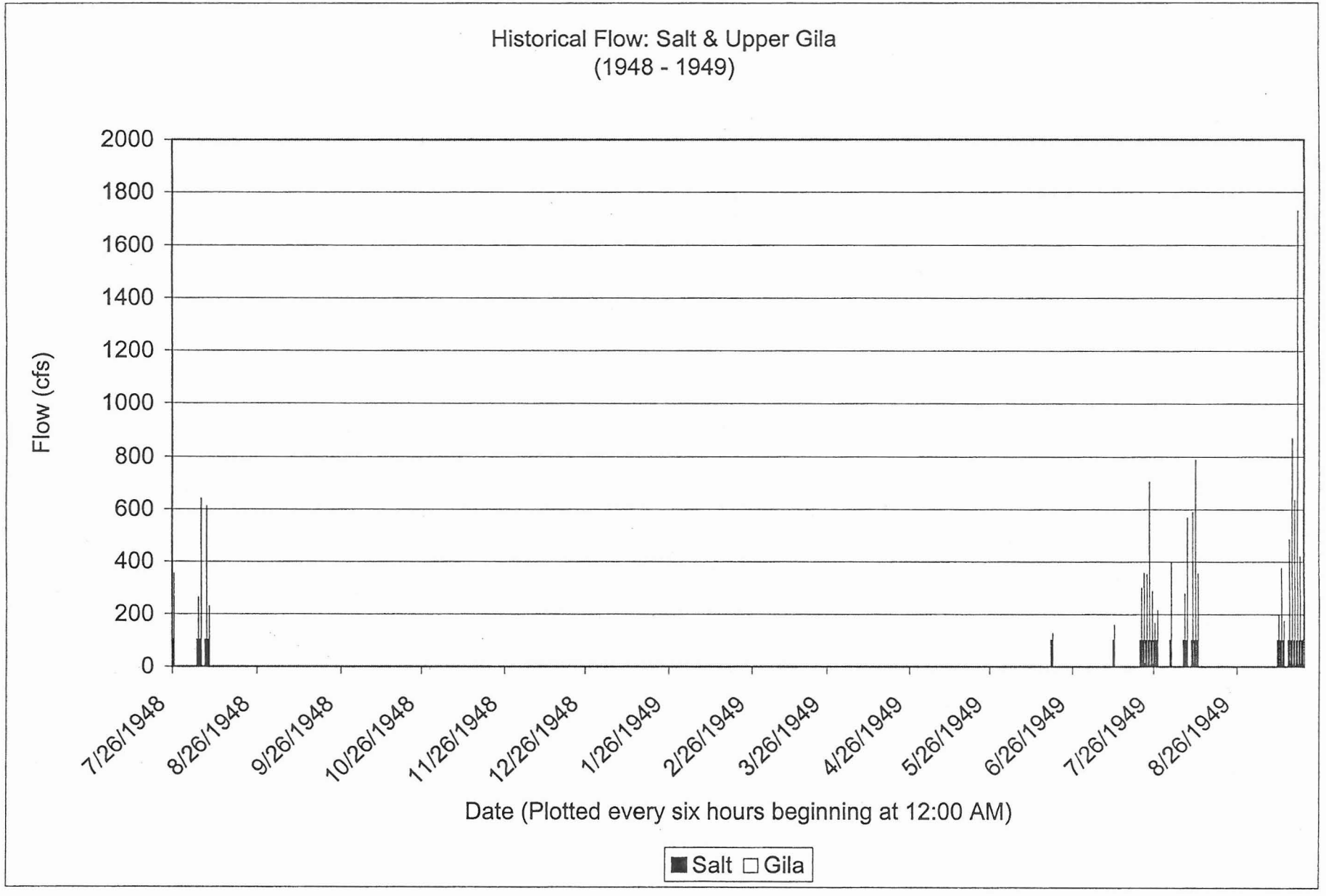

Historical Flow: Salt & Upper Gila
(1940 - 1940)
Flow (cfs)
1800
1600
1400
1200
1000
800
600
400
200
0
3/16/1940
4/16/1940
5/16/1940
6/16/1940
7/16/1940
8/16/1940
9/16/1940
10/16/1940
11/16/1940
12/16/1940
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

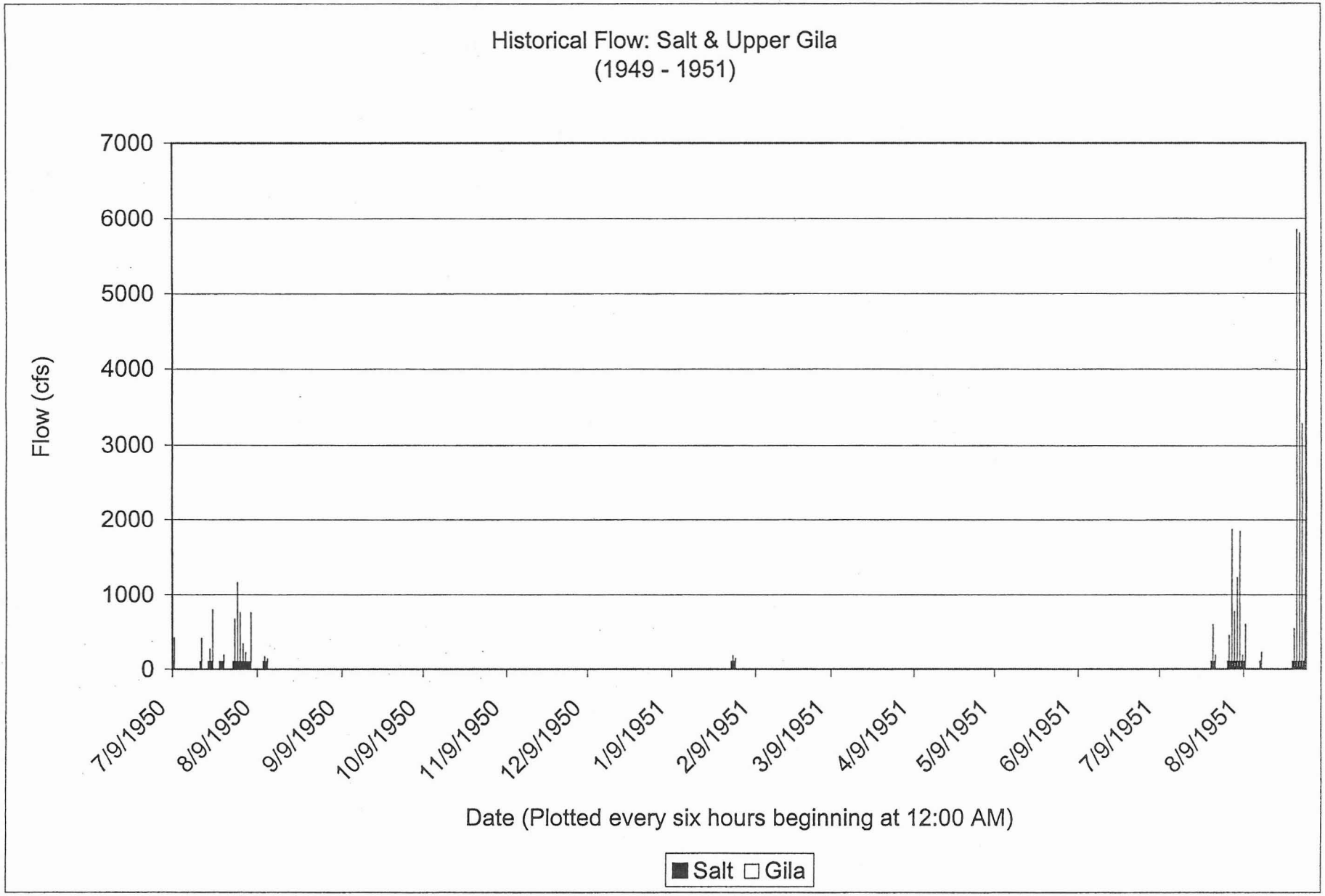

Historical Flow: Salt & Upper Gila
(1941 - 1942)
Flow (cfs)
80000
70000
60000
50000
40000
30000
20000
10000
0
1/1/1941
3/1/1941
5/1/1941
7/1/1941
9/1/1941
11/1/1941
1/1/1942
3/1/1942
5/1/1942
7/1/1942
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

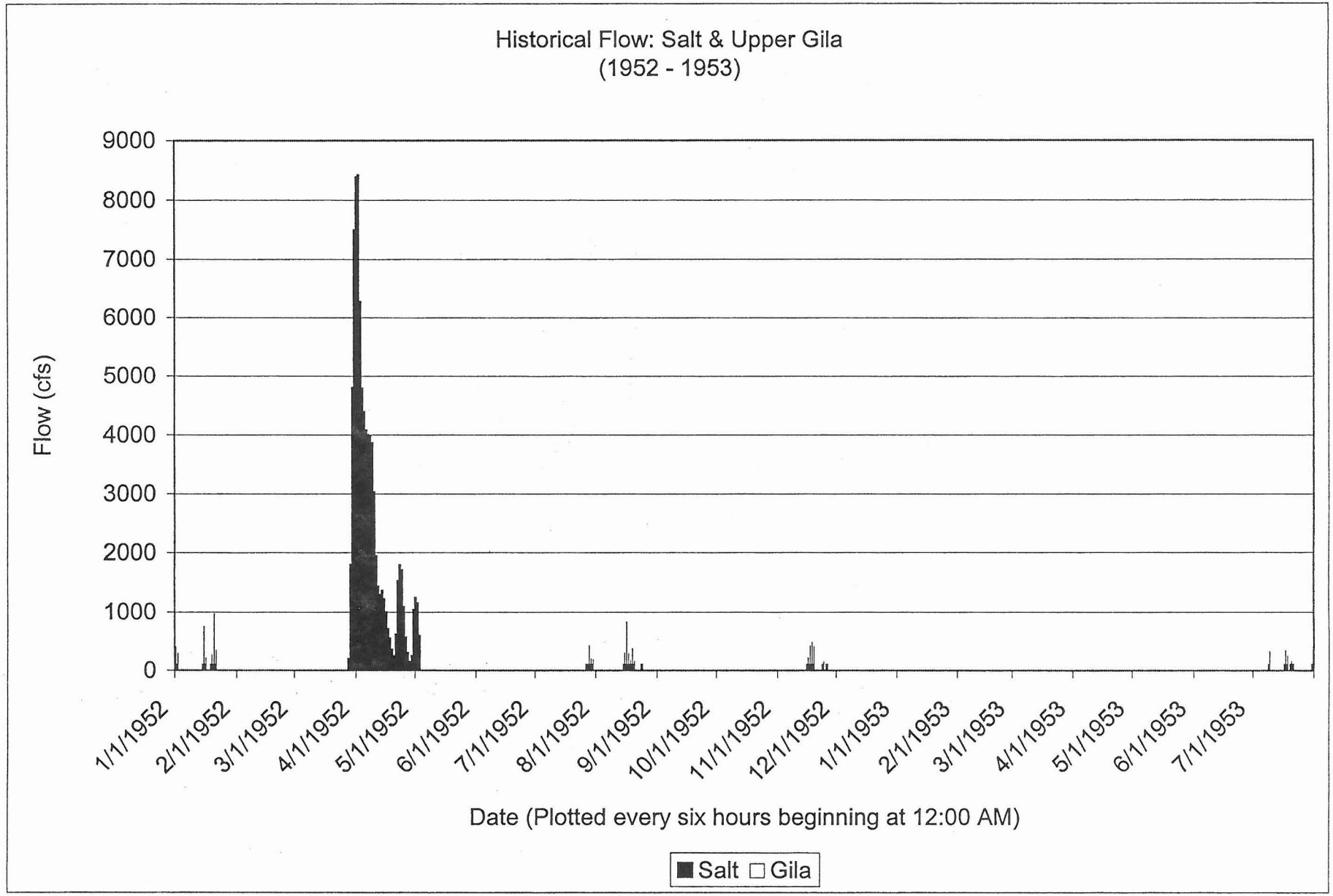

Historical Flow: Salt & Upper Gila
(1943 - 1944)
Flow (cfs)
2500
2000
1500
1000
500
0
1/25/1943
2/25/1943
3/25/1943
4/25/1943
5/25/1943
6/25/1943
7/25/1943
8/25/1943
9/25/1943
10/25/1943
11/25/1943
12/25/1943
1/25/1944
2/25/1944
3/25/1944
4/25/1944
5/25/1944
6/25/1944
7/25/1944
8/25/1944
9/25/1944
10/25/1944
11/25/1944
12/25/1944
Date (Plotted every six hours beginning at 12:00 AM
Salt
Gila

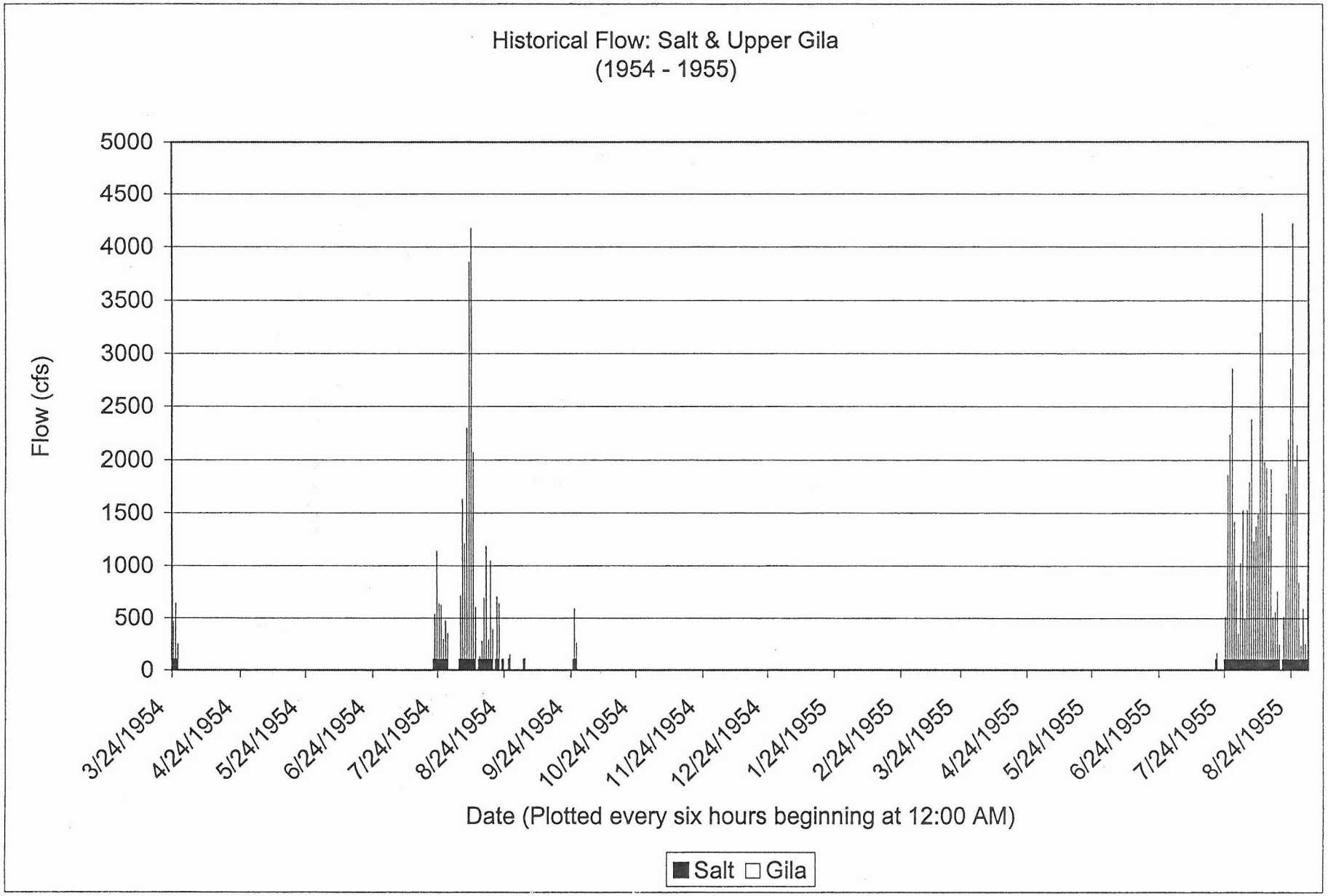

Historical Flow: Salt & Upper Gila
(1944 - 1945)
Flow (cfs)
2500
2000
1500
1000
500
0
2/25/1944
3/25/1944
4/25/1944
5/25/1944
6/25/1944
7/25/1944
8/25/1944
9/25/1944
10/25/1944
11/25/1944
12/25/1944
1/25/1945
2/25/1945
3/25/1945
4/25/1945
5/25/1945
6/25/1945
7/25/1945
8/25/1945
9/25/1945
10/25/1945
11/25/1945
12/25/1945
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

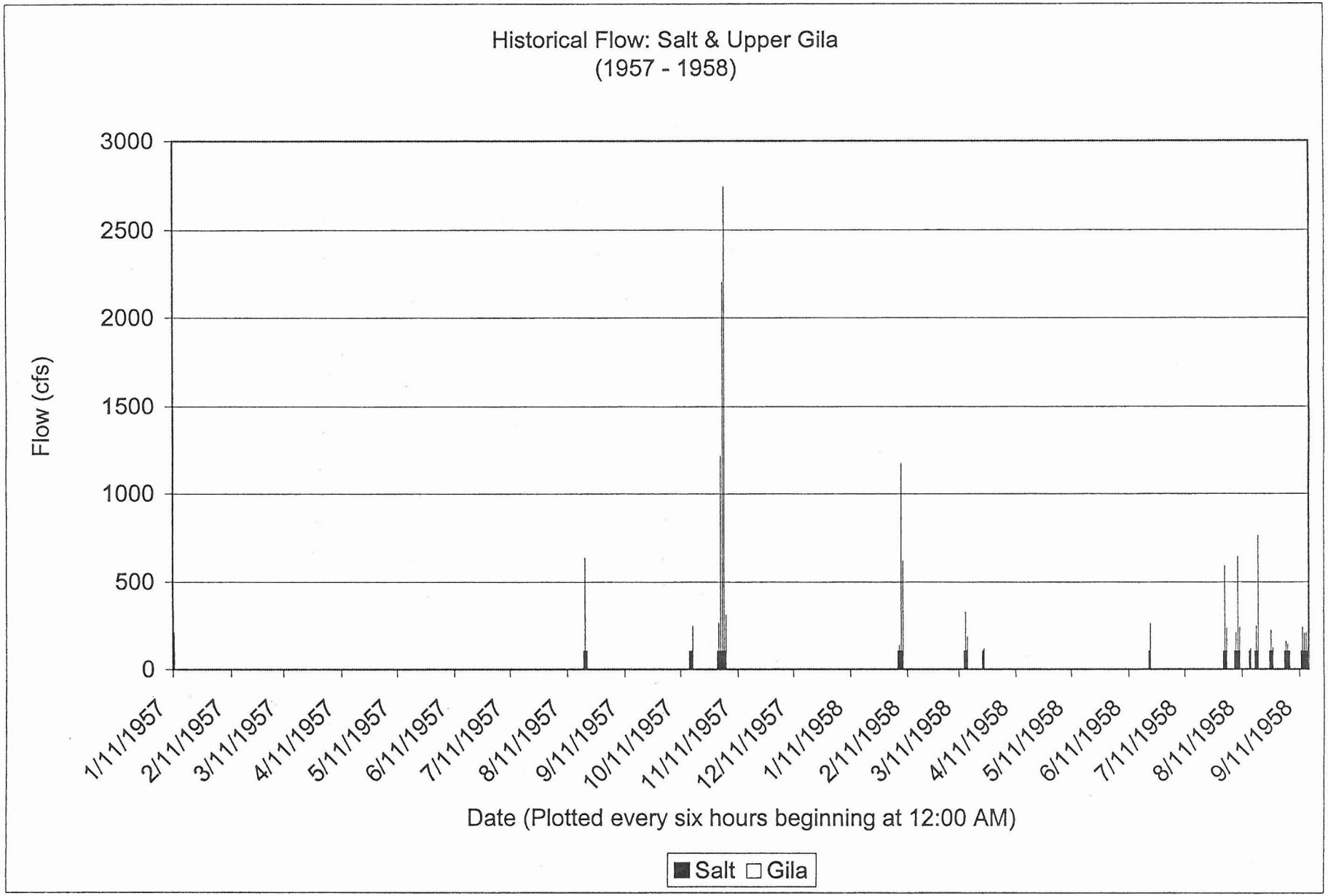

Historical Flow: Salt & Upper Gila
(1946)
Flow (cfs)
7000
6000
5000
4000
3000
2000
1000
0
1/7/1946
1/21/1946
2/4/1946
2/18/1946
3/4/1946
3/18/1946
4/1/1946
4/15/1946
4/29/1946
5/13/1946
5/27/1946
6/10/1946
6/24/1946
7/8/1946
7/22/1946
8/5/1946
8/19/1946
9/2/1946
9/16/1946
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

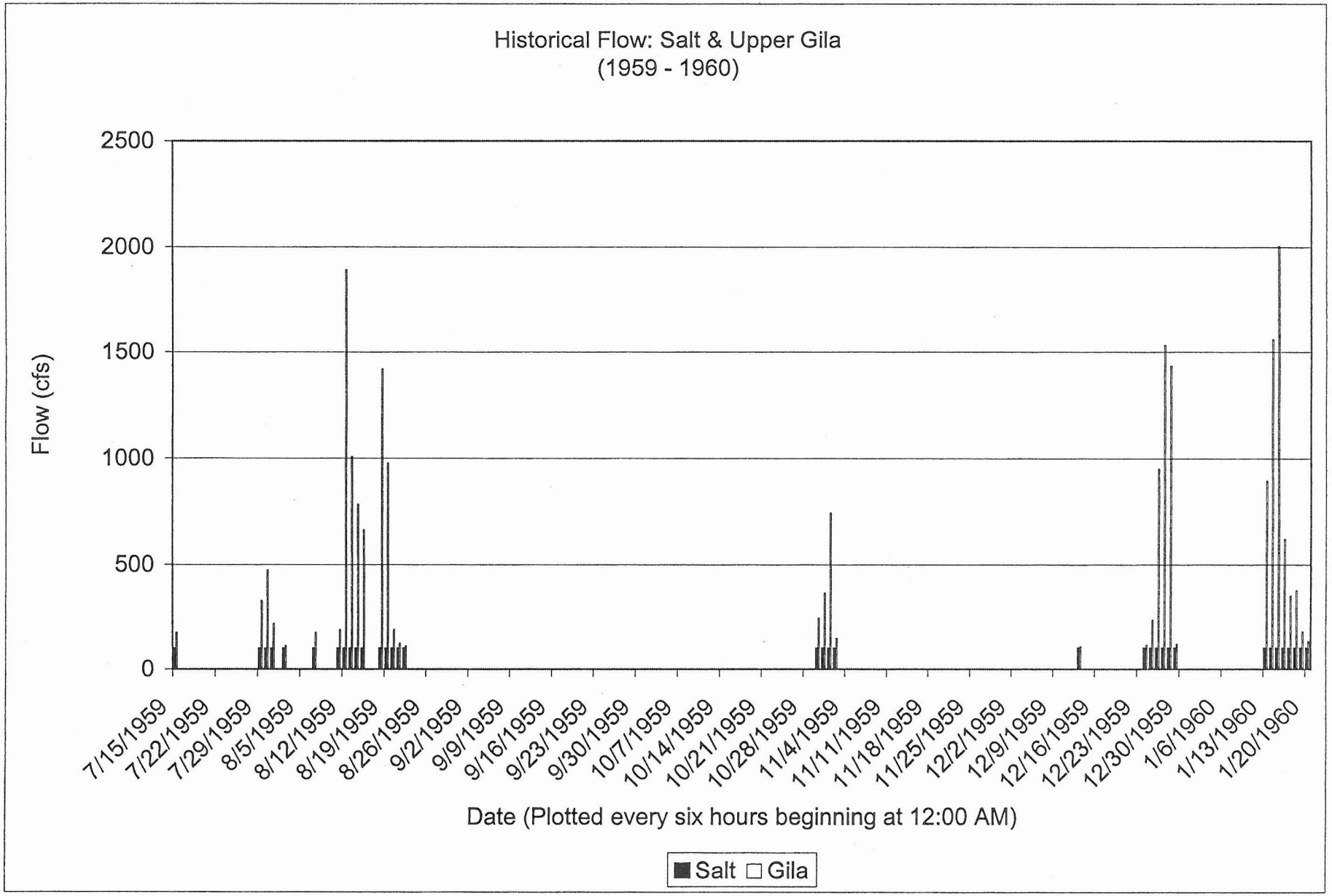

Historical Flow: Salt & Upper Gila
(1948 - 1949)
Flow (cfs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
7/26/1948
8/26/1948
9/26/1948
10/26/1948
11/26/1948
12/26/1948
1/26/1949
2/26/1949
3/26/1949
4/26/1949
5/26/1949
6/26/1949
7/26/1949
8/26/1949
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

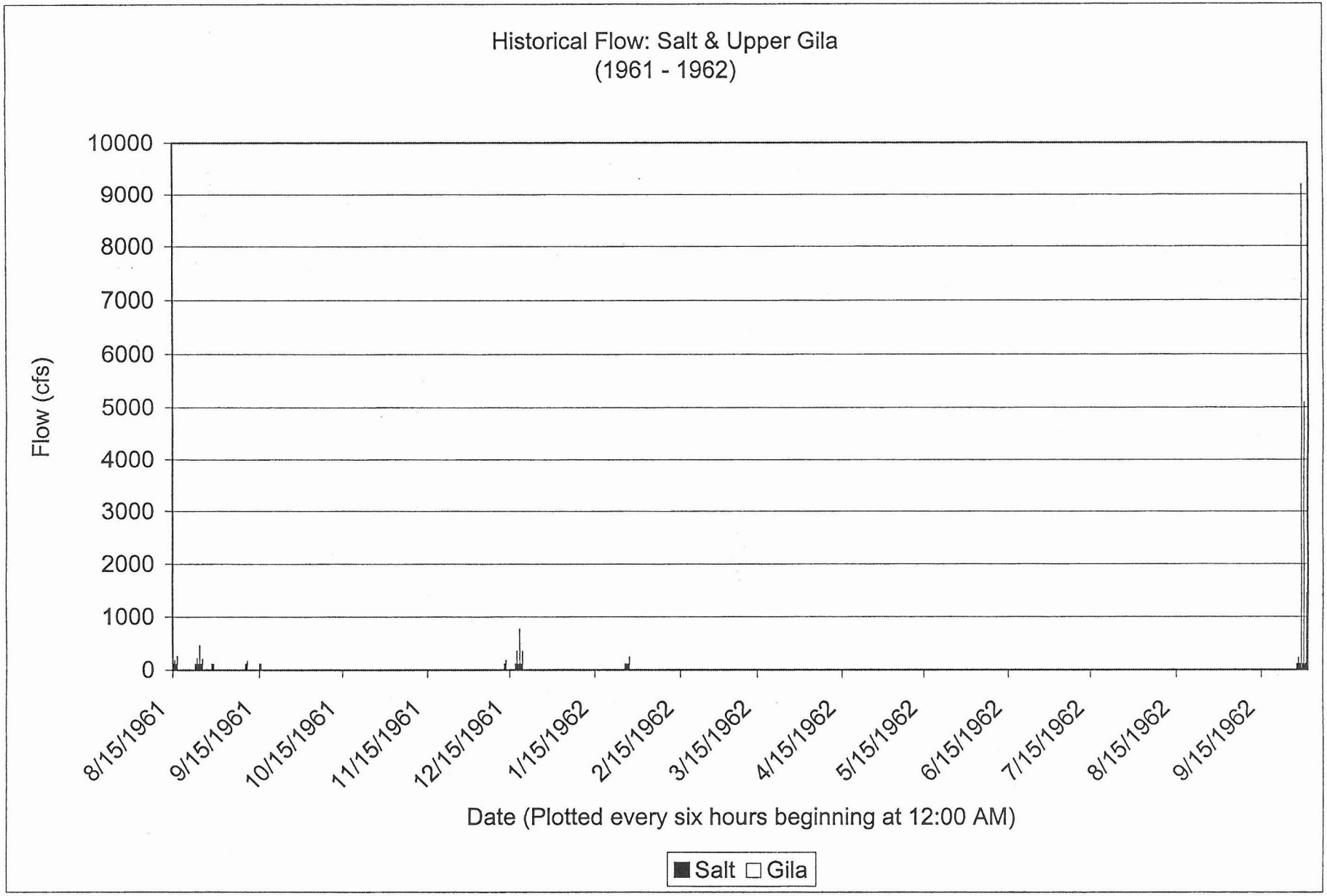

Historical Flow: Salt & Upper Gila
(1949 - 1951)
Flow (cfs)
7000
6000
5000
4000
3000
2000
1000
0
7/9/1950
8/9/1950
9/9/1950
10/9/1950
11/9/1950
12/9/1950
1/9/1951
2/9/1951
3/9/1951
4/9/1951
5/9/1951
6/9/1951
7/9/1951
8/9/1951
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

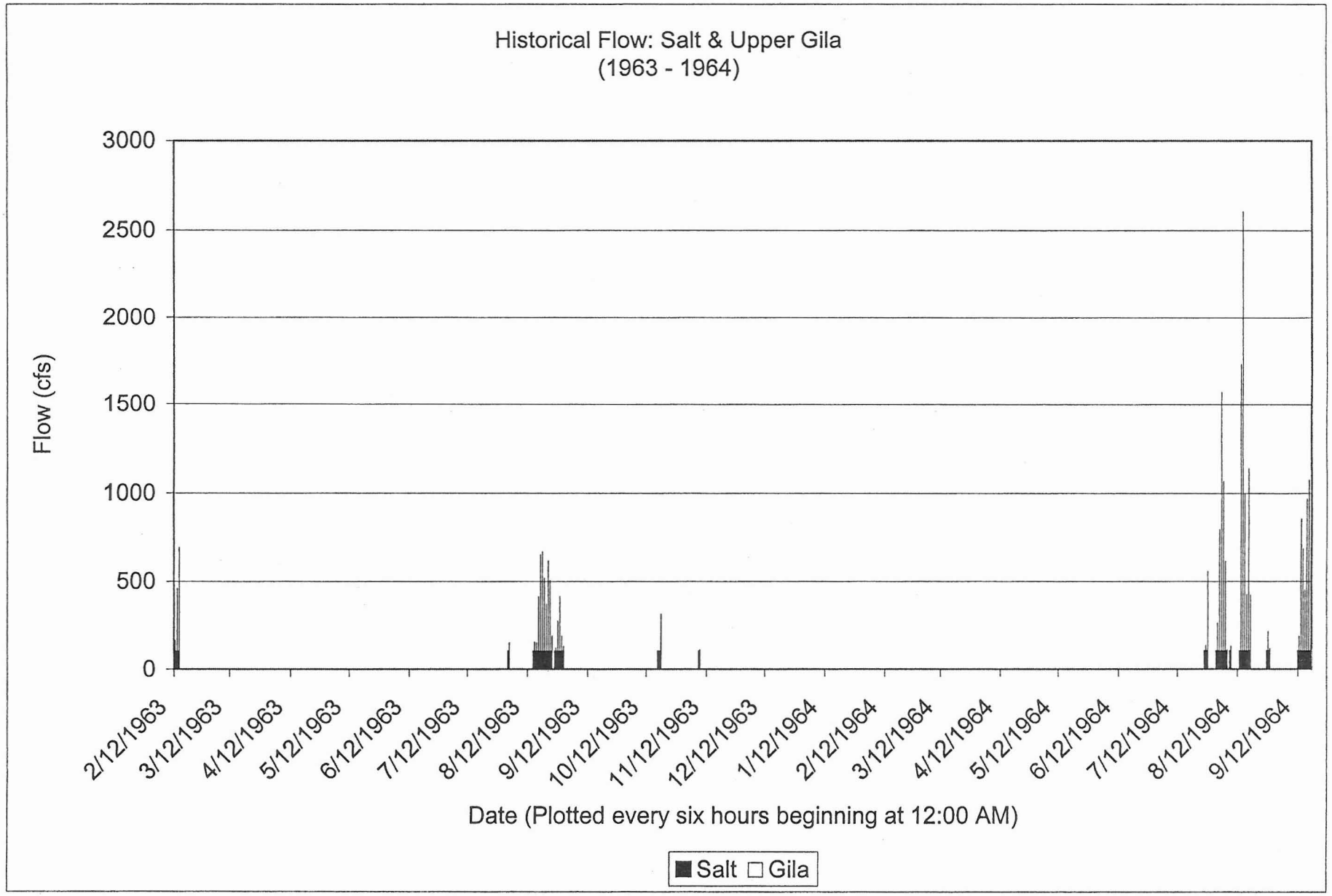

Historical Flow: Salt & Upper Gila
(1952 - 1953)
Flow (cfs)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1952
2/1/1952
3/1/1952
4/1/1952
5/1/1952
6/1/1952
7/1/1952
8/1/1952
9/1/1952
10/1/1952
11/1/1952
12/1/1952
1/1/1953
2/1/1953
3/1/1953
4/1/1953
5/1/1953
6/1/1953
7/1/1953
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

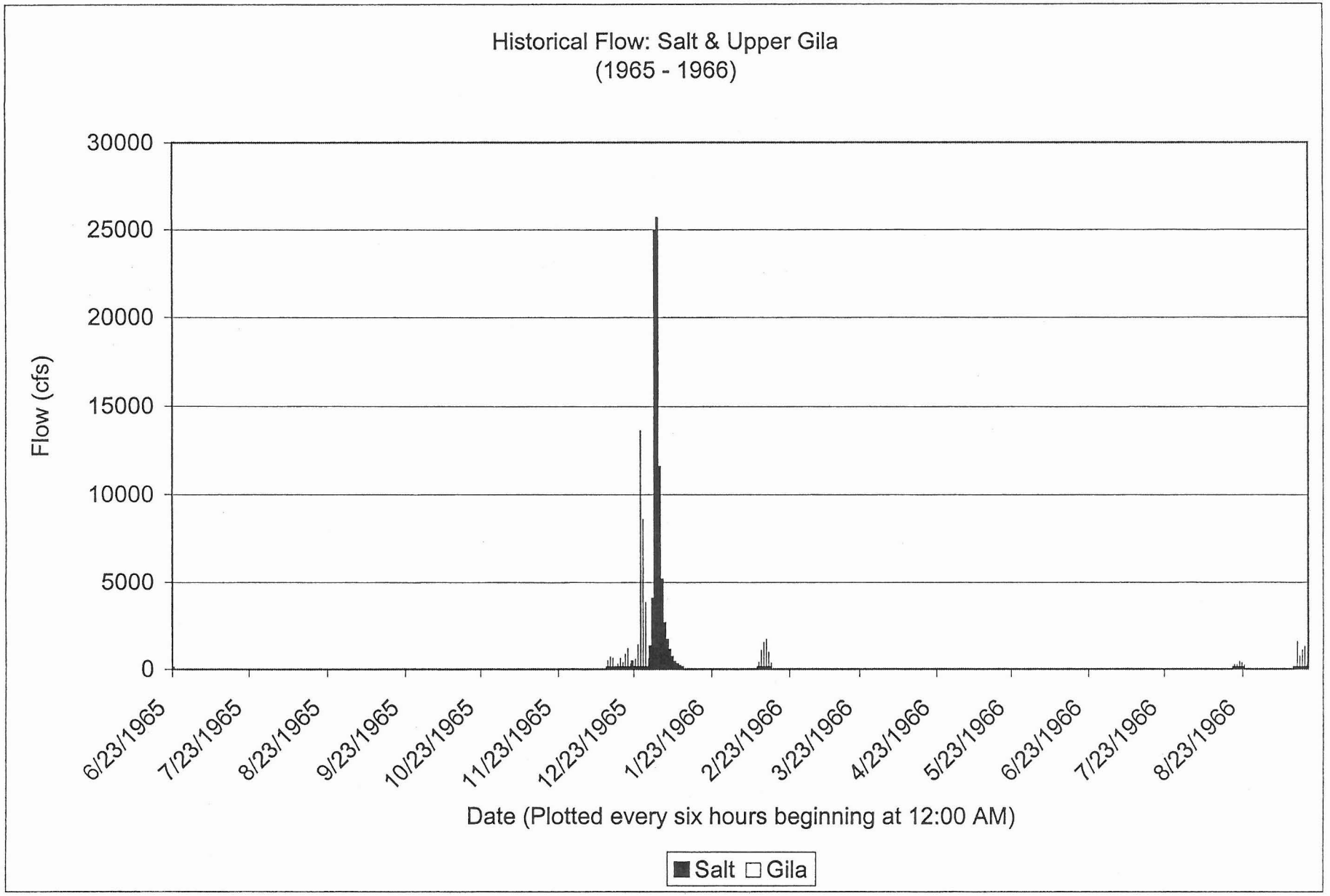

Historical Flow: Salt & Upper Gila
(1954 - 1955)
Flow (cfs)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
3/24/1954
4/24/1954
5/24/1954
6/24/1954
7/24/1954
8/24/1954
9/24/1954
10/24/1954
11/24/1954
12/24/1954
1/24/1955
2/24/1955
3/24/1955
4/24/1955
5/24/1955
6/24/1955
7/24/1955
8/24/1955
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

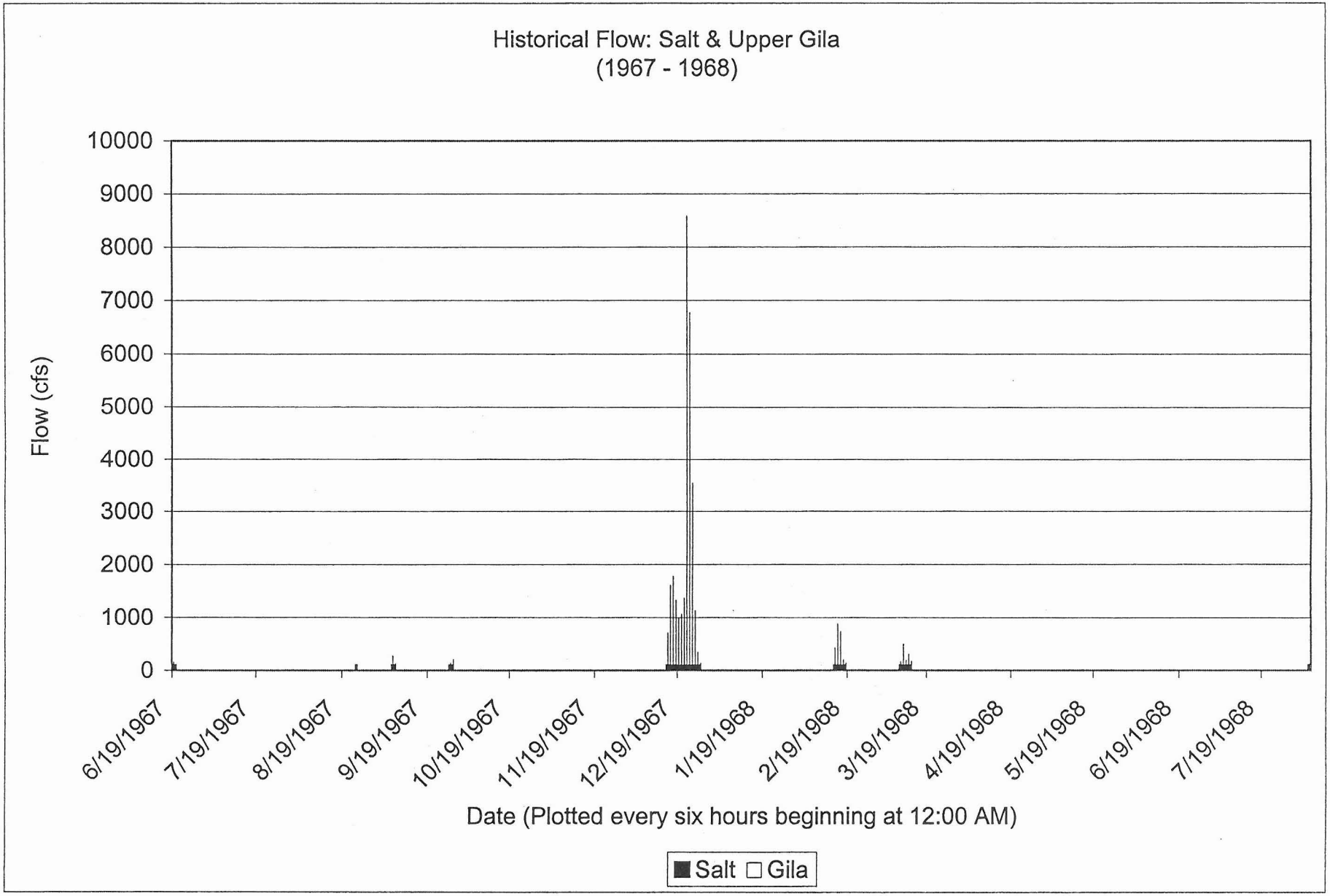

Historical Flow: Salt & Upper Gila
(1957 - 1958)
Flow (cfs)
3000
2500
2000
1500
1000
500
0
1/11/1957
2/11/1957
3/11/1957
4/11/1957
5/11/1957
6/11/1957
7/11/1957
8/11/1957
9/11/1957
10/11/1957
11/11/1957
12/11/1957
1/11/1958
2/11/1958
3/11/1958
4/11/1958
5/11/1958
6/11/1958
7/11/1958
8/11/1958
9/11/1958
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

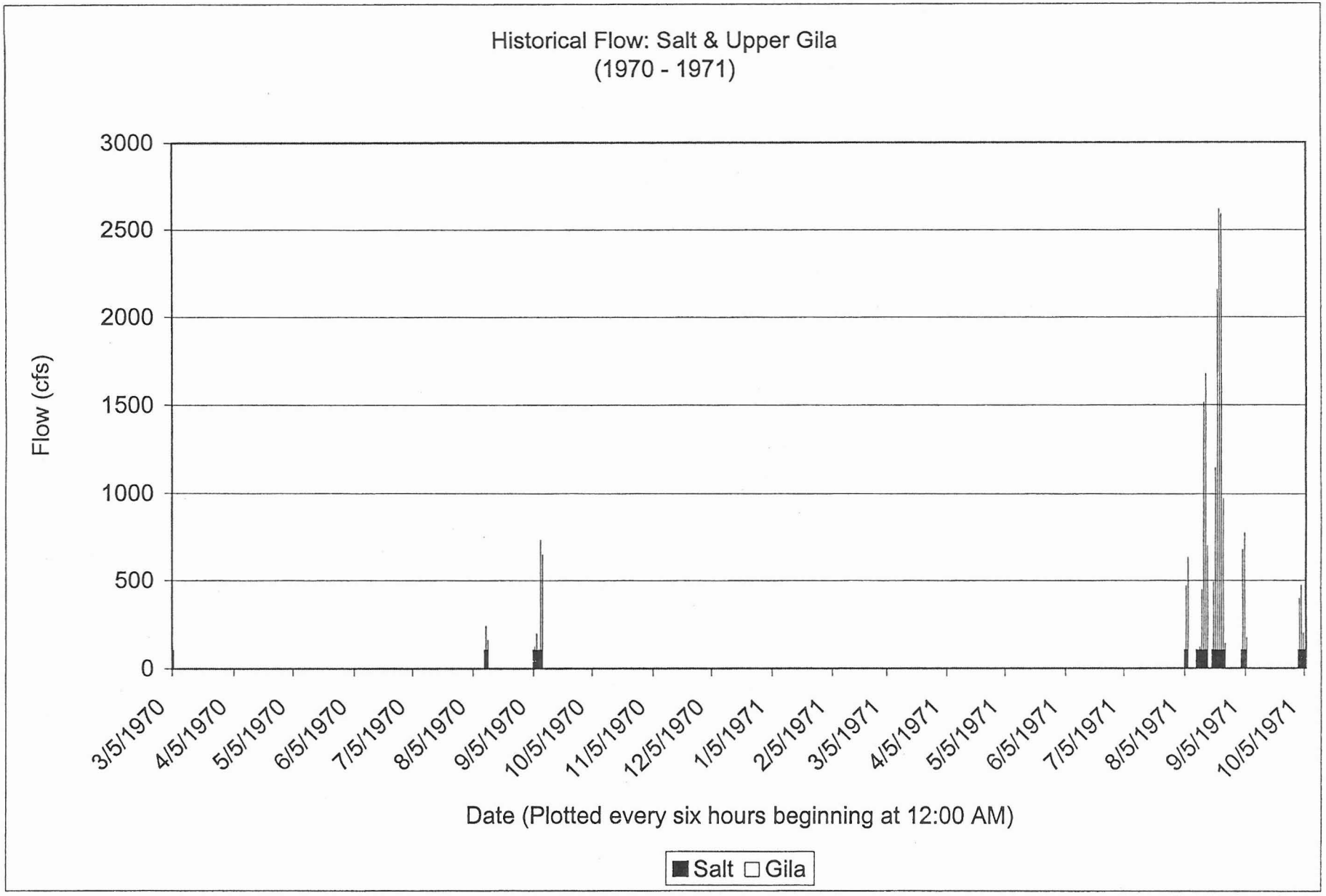

Historical Flow: Salt & Upper Gila
(1959 - 1960)
Flow (cfs)
2500
2000
1500
1000
500
0
7/15/1959
7/22/1959
7/29/1959
8/5/1959
8/12/1959
8/19/1959
8/26/1959
9/2/1959
9/9/1959
9/16/1959
9/23/1959
9/30/1959
10/7/1959
10/14/1959
10/21/1959
10/28/1959
11/4/1959
11/11/1959
11/18/1959
11/25/1959
12/2/1959
12/9/1959
12/16/1959
12/23/1959
12/30/1959
1/6/1960
1/13/1960
1/20/1960
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

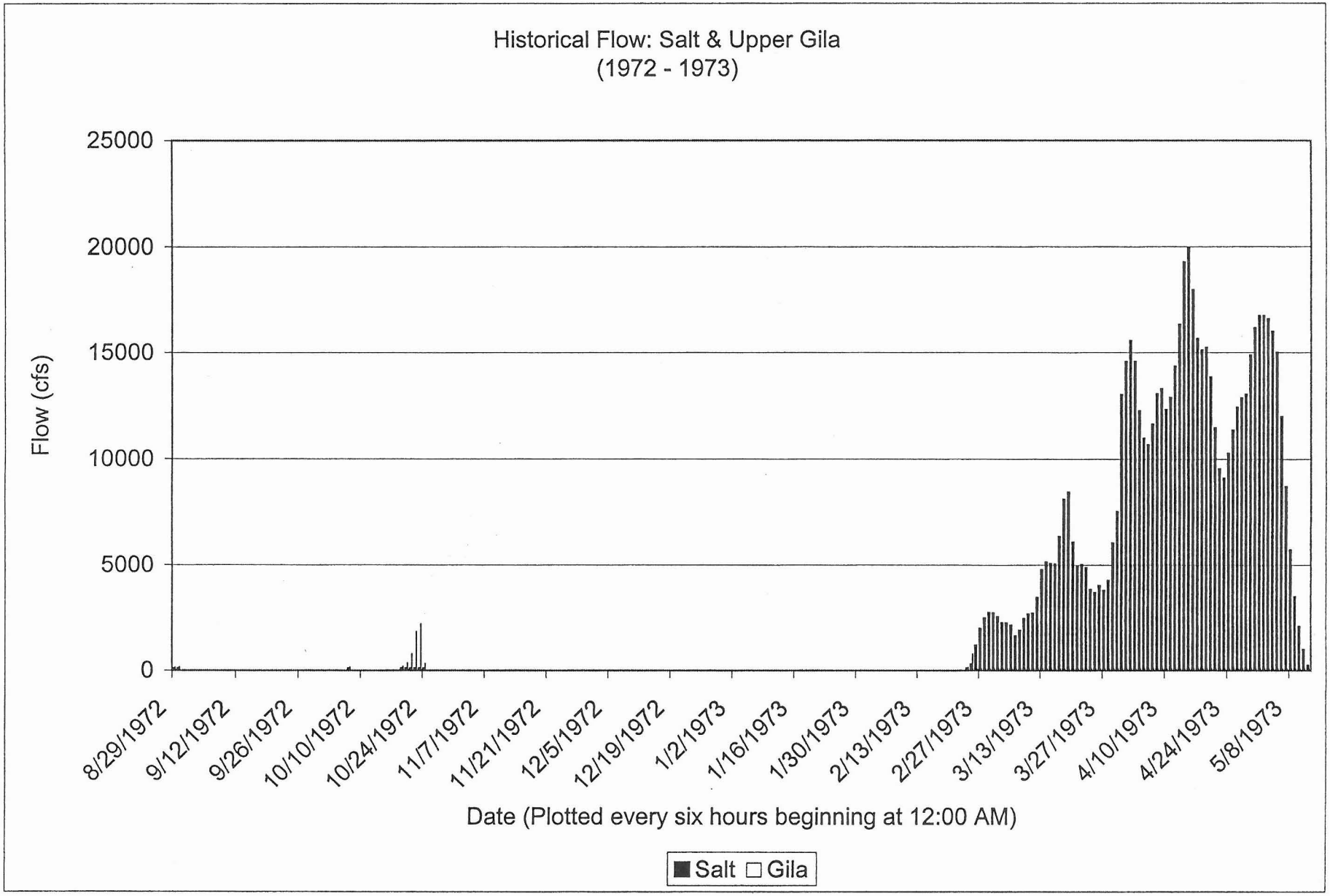

Historical Flow: Salt & Upper Gila
(1961 - 1962)
Flow (cfs)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
8/15/1961
9/15/1961
10/15/1961
11/15/1961
12/15/1961
1/15/1962
2/15/1962
3/15/1962
4/15/1962
5/15/1962
6/15/1962
7/15/1962
8/15/1962
9/15/1962
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

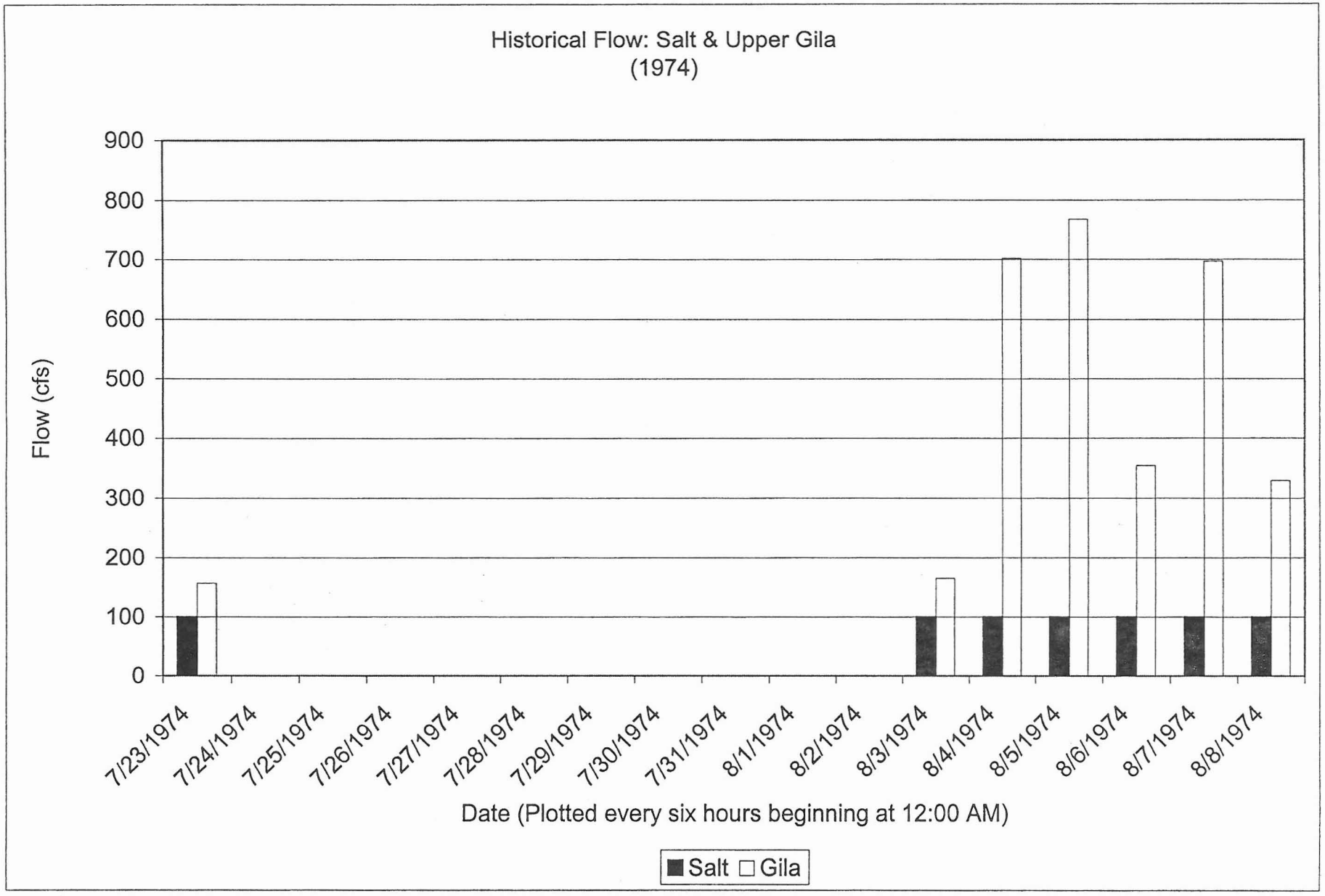

Historical Flow: Salt & Upper Gila
(1963 - 1964)
Flow (cfs)
3000
2500
2000
1500
1000
500
0
2/12/1963
3/12/1963
4/12/1963
5/12/1963
6/12/1963
7/12/1963
8/12/1963
9/12/1963
10/12/1963
11/12/1963
12/12/1963
1/12/1964
2/12/1964
3/12/1964
4/12/1964
5/12/1964
6/12/1964
7/12/1964
8/12/1964
9/12/1964
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

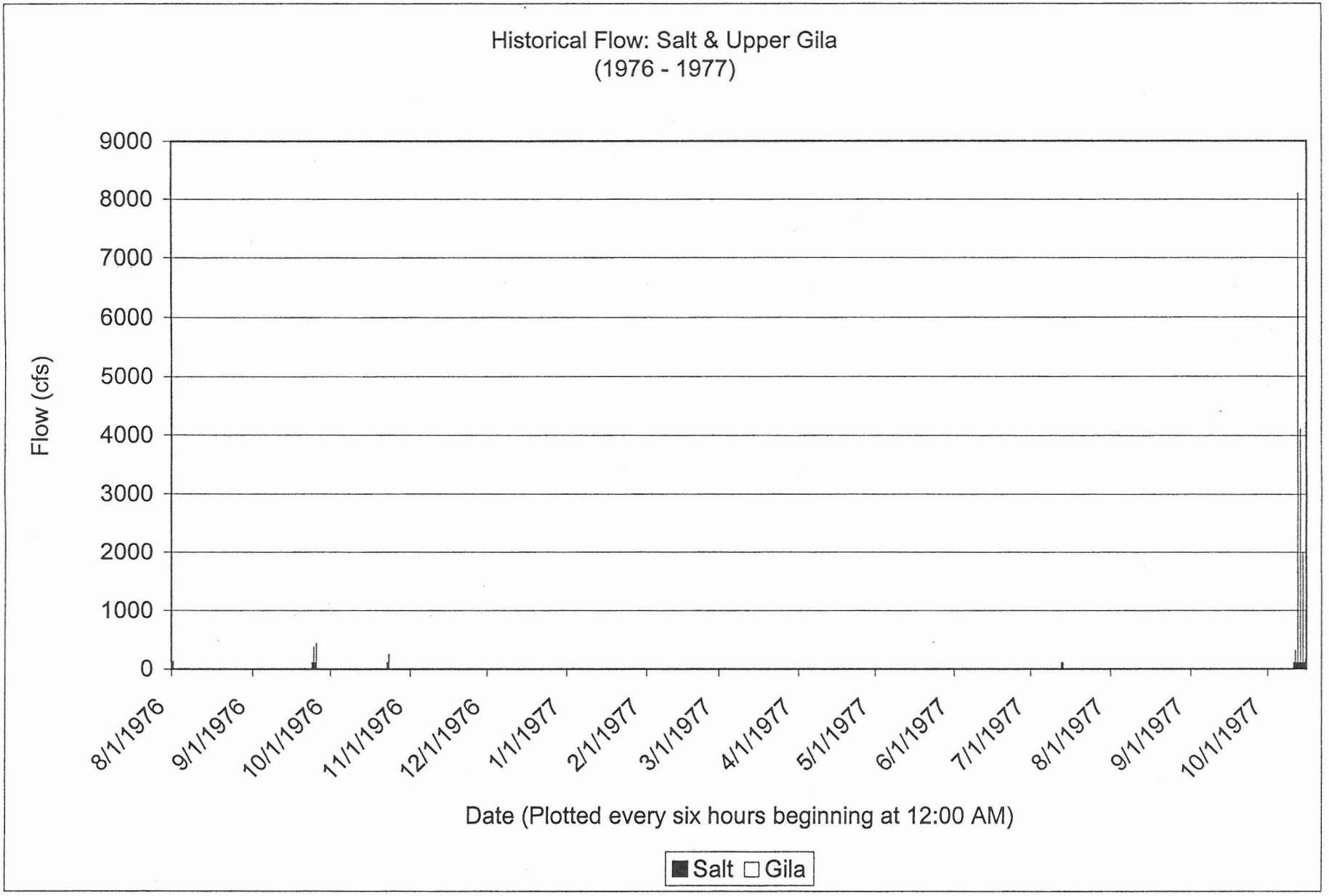

Historical Flow: Salt & Upper Gila
(1965 - 1966)
30000
25000
20000
15000
10000
5000
0
Flow (cfs)
6/23/1965
7/23/1965
8/23/1965
9/23/1965
10/23/1965
11/23/1965
12/23/1965
1/23/1966
2/23/1966
3/23/1966
4/23/1966
5/23/1966
6/23/1966
7/23/1966
8/23/1966
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

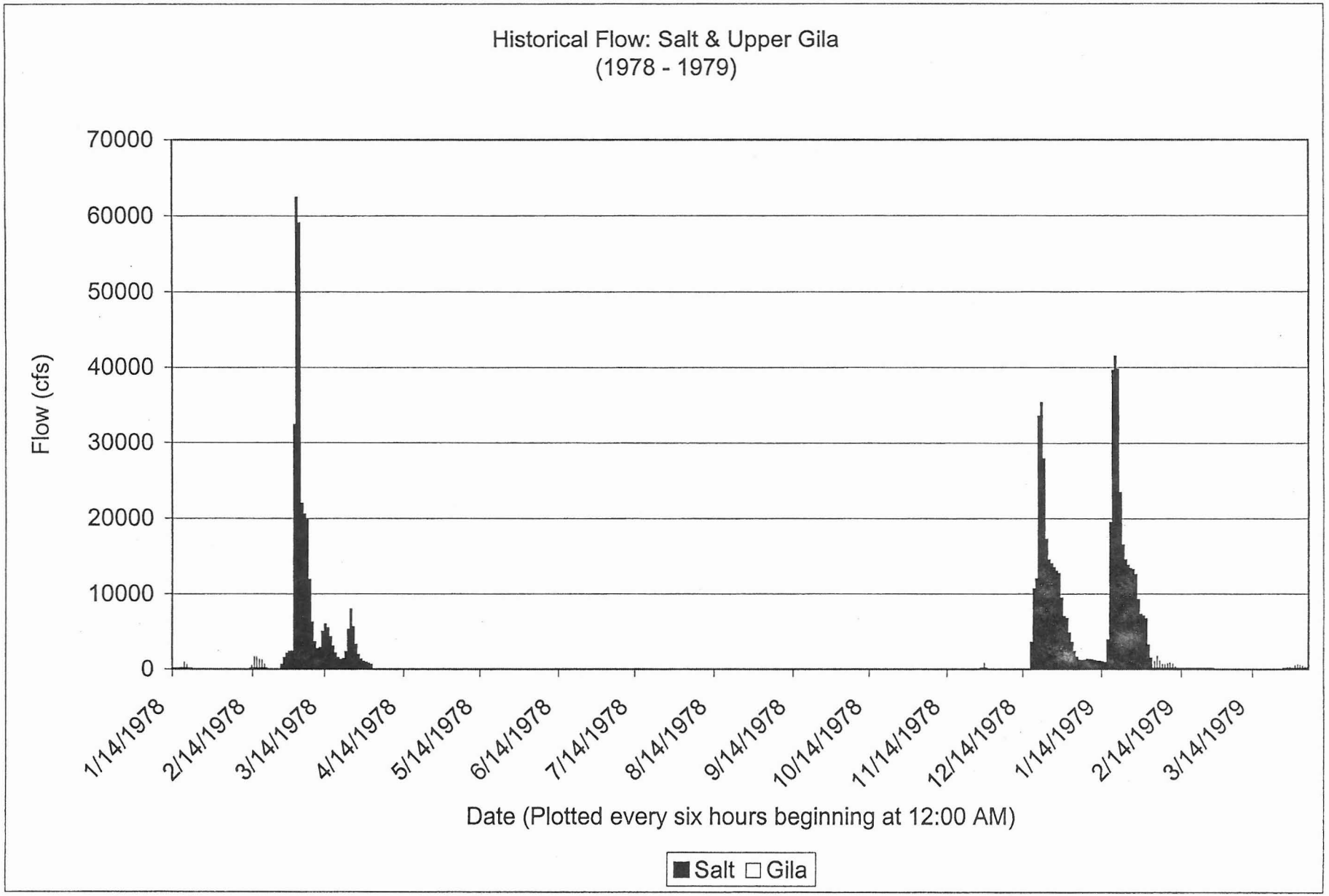

Historical Flow: Salt & Upper Gila
(1967 - 1968)
Flow (cfs)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
6/19/1967
7/19/1967
8/19/1967
9/19/1967
10/19/1967
11/19/1967
12/19/1967
1/19/1968
2/19/1968
3/19/1968
4/19/1968
5/19/1968
6/19/1968
7/19/1968
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

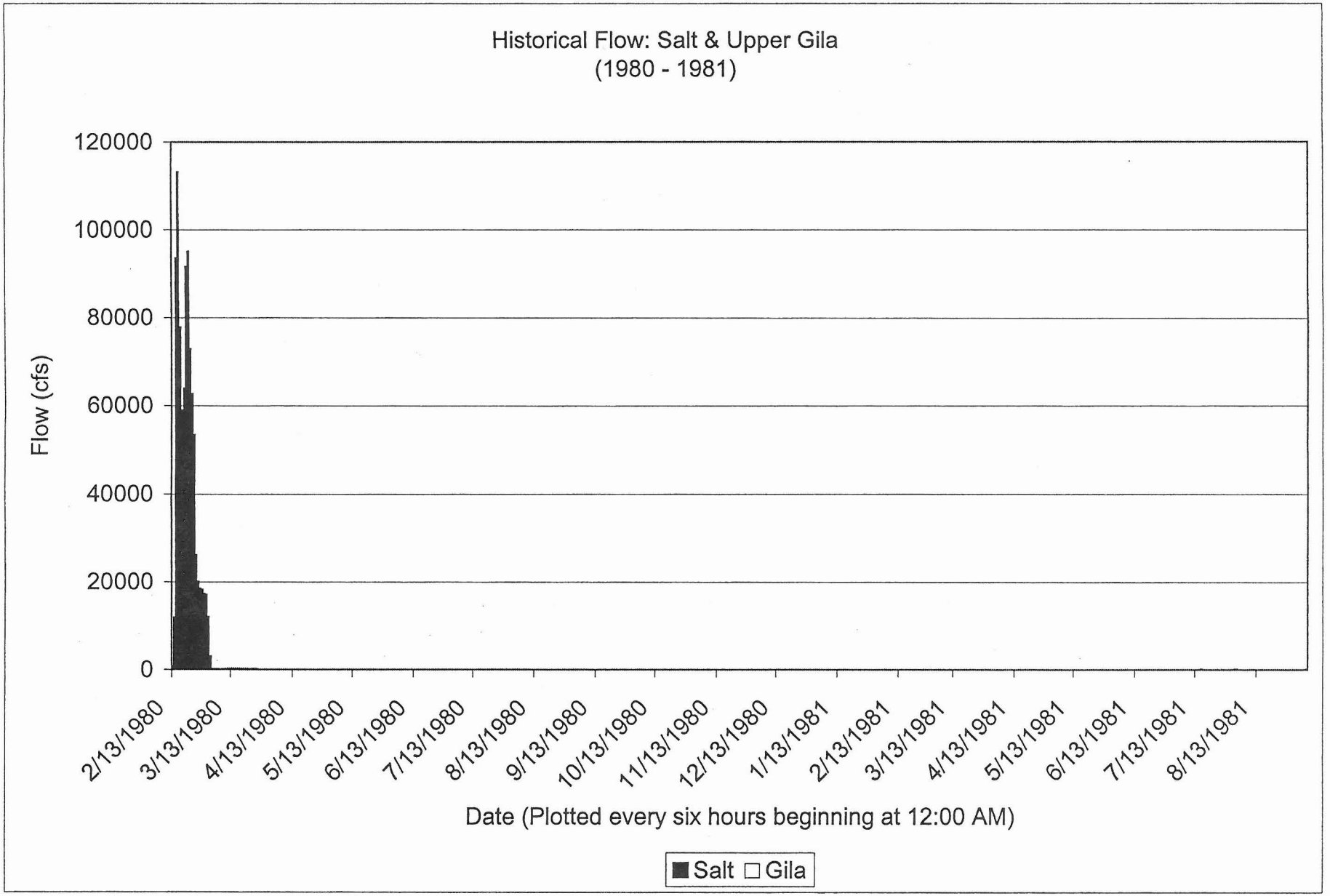

Historical Flow: Salt & Upper Gila
(1970 - 1971)
Flow (cfs)
3000
2500
2000
1500
1000
500
0
3/5/1970
4/5/1970
5/5/1970
6/5/1970
7/5/1970
8/5/1970
9/5/1970
10/5/1970
11/5/1970
12/5/1970
1/5/1971
2/5/1971
3/5/1971
4/5/1971
5/5/1971
6/5/1971
7/5/1971
8/5/1971
9/5/1971
10/5/1971
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

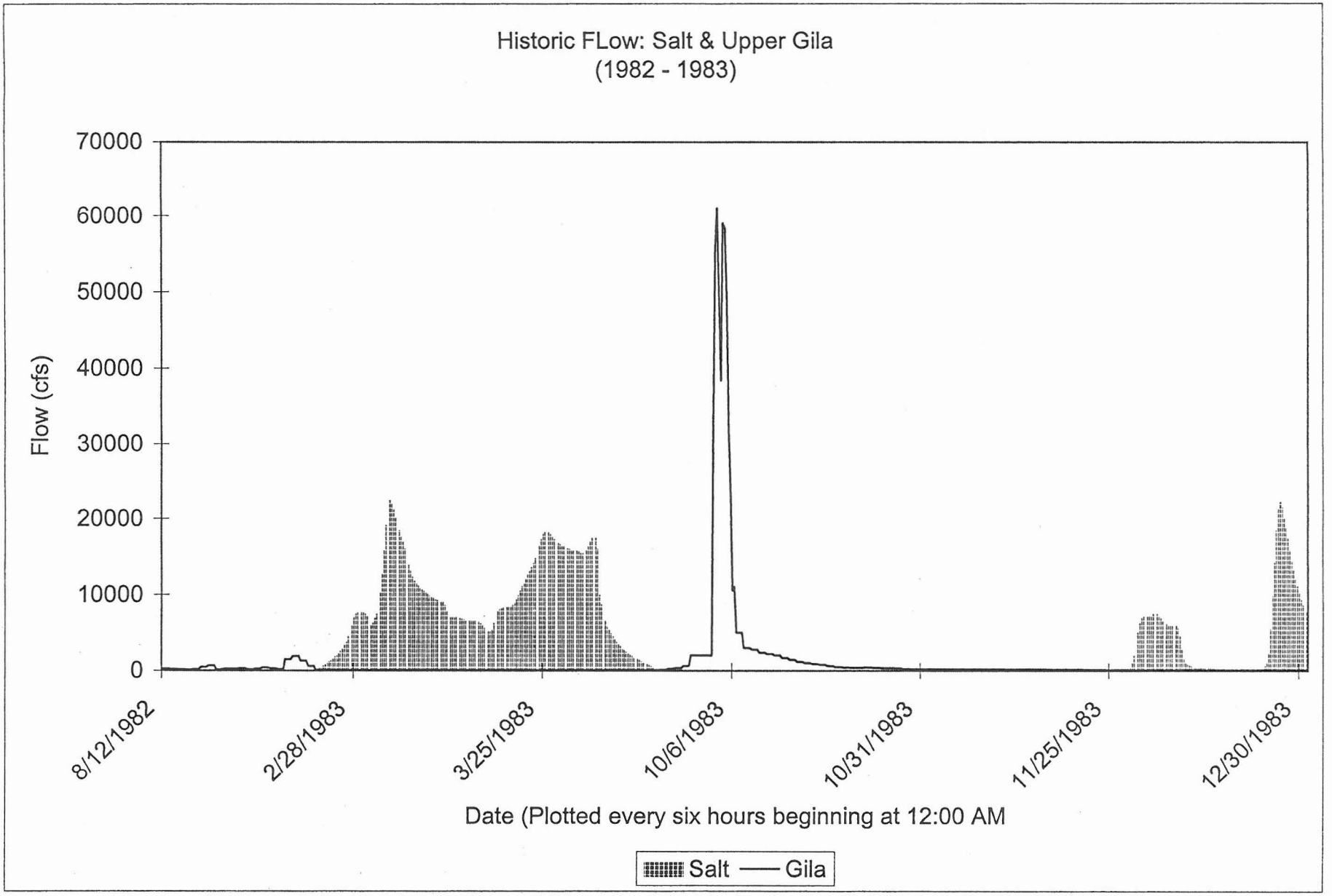

Historical Flow: Salt & Upper Gila
(1972 - 1973)
25000
20000
15000
10000
5000
0
Flow (cfs)
8/29/1972
9/12/1972
9/26/1972
10/10/1972
10/24/1972
11/7/1972
11/21/1972
12/5/1972
12/19/1972
1/2/1973
1/16/1973
1/30/1973
2/13/1973
2/27/1973
3/13/1973
3/27/1973
4/10/1973
4/24/1973
5/8/1973
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

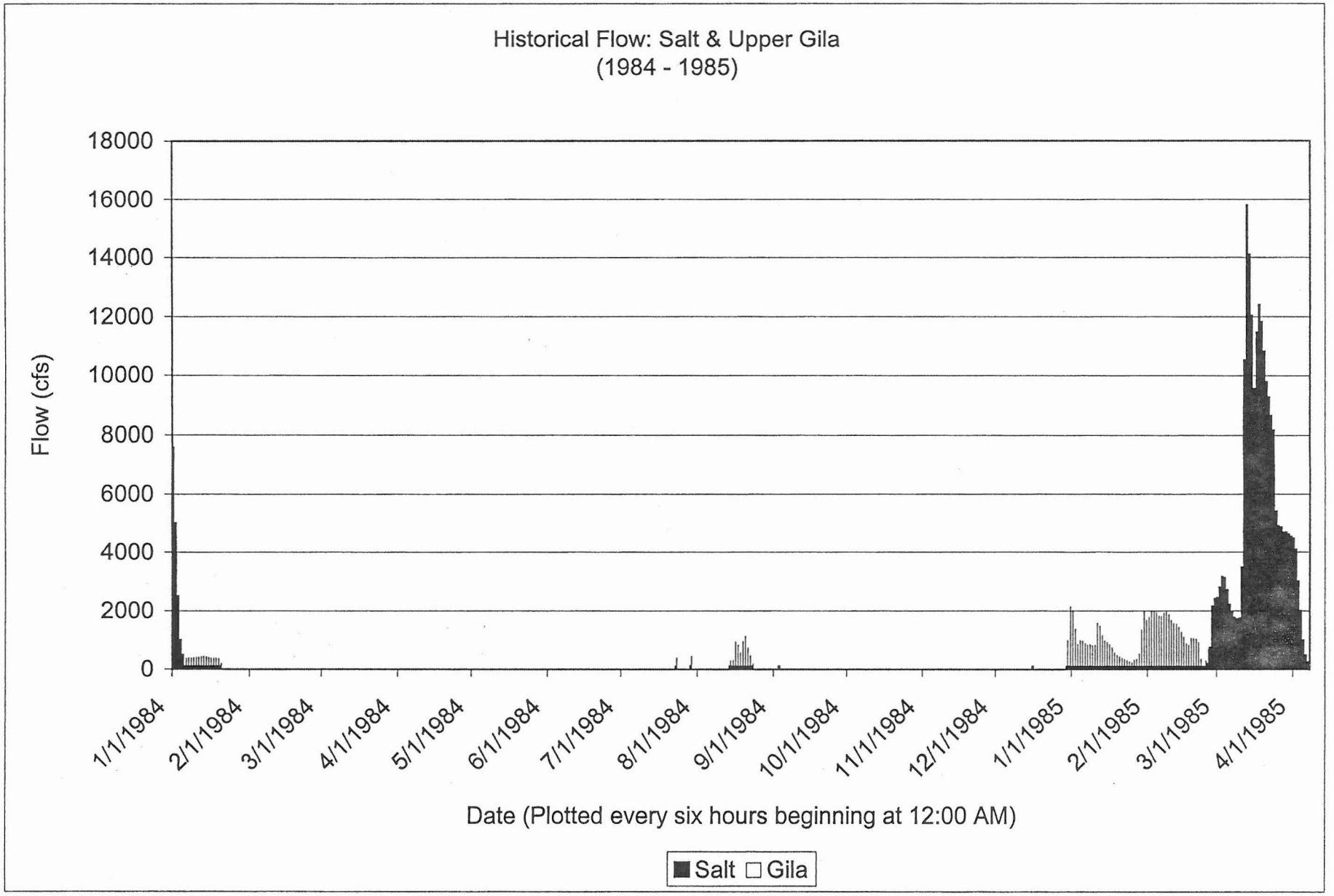

Historical Flow: Salt & Upper Gila
(1974)
Flow (cfs)
900
800
700
600
500
400
300
200
100
0
7/23/1974
7/24/1974
7/25/1974
7/26/1974
7/27/1974
7/28/1974
7/29/1974
7/30/1974
7/31/1974
8/1/1974
8/2/1974
8/3/1974
8/4/1974
8/5/1974
8/6/1974
8/7/1974
8/8/1974
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

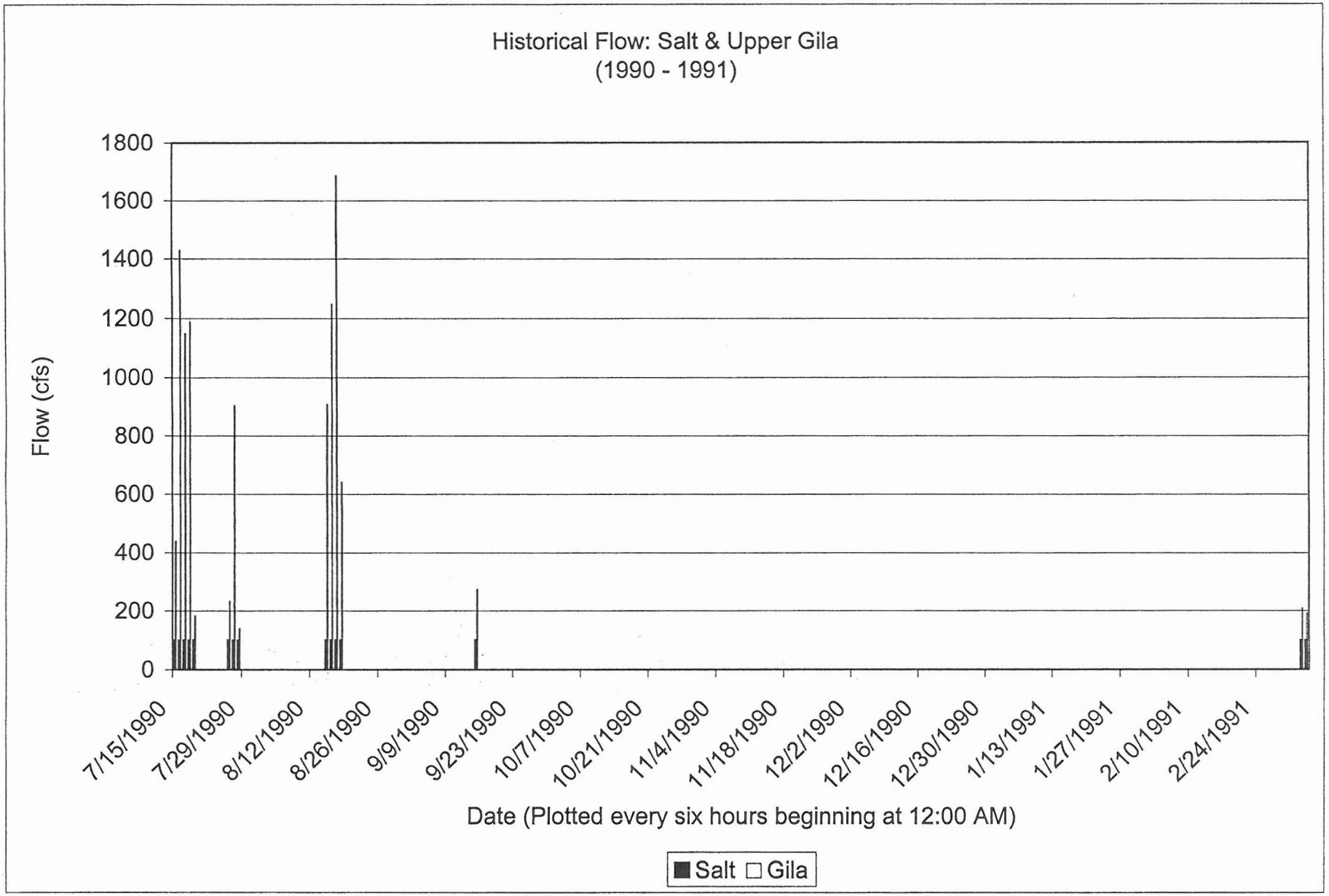

Historical Flow: Salt & Upper Gila
(1976 - 1977)
Flow (cfs)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
8/1/1976
9/1/1976
10/1/1976
11/1/1976
12/1/1976
1/1/1977
2/1/1977
3/1/1977
4/1/1977
5/1/1977
6/1/1977
7/1/1977
8/1/1977
9/1/1977
10/1/1977
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila

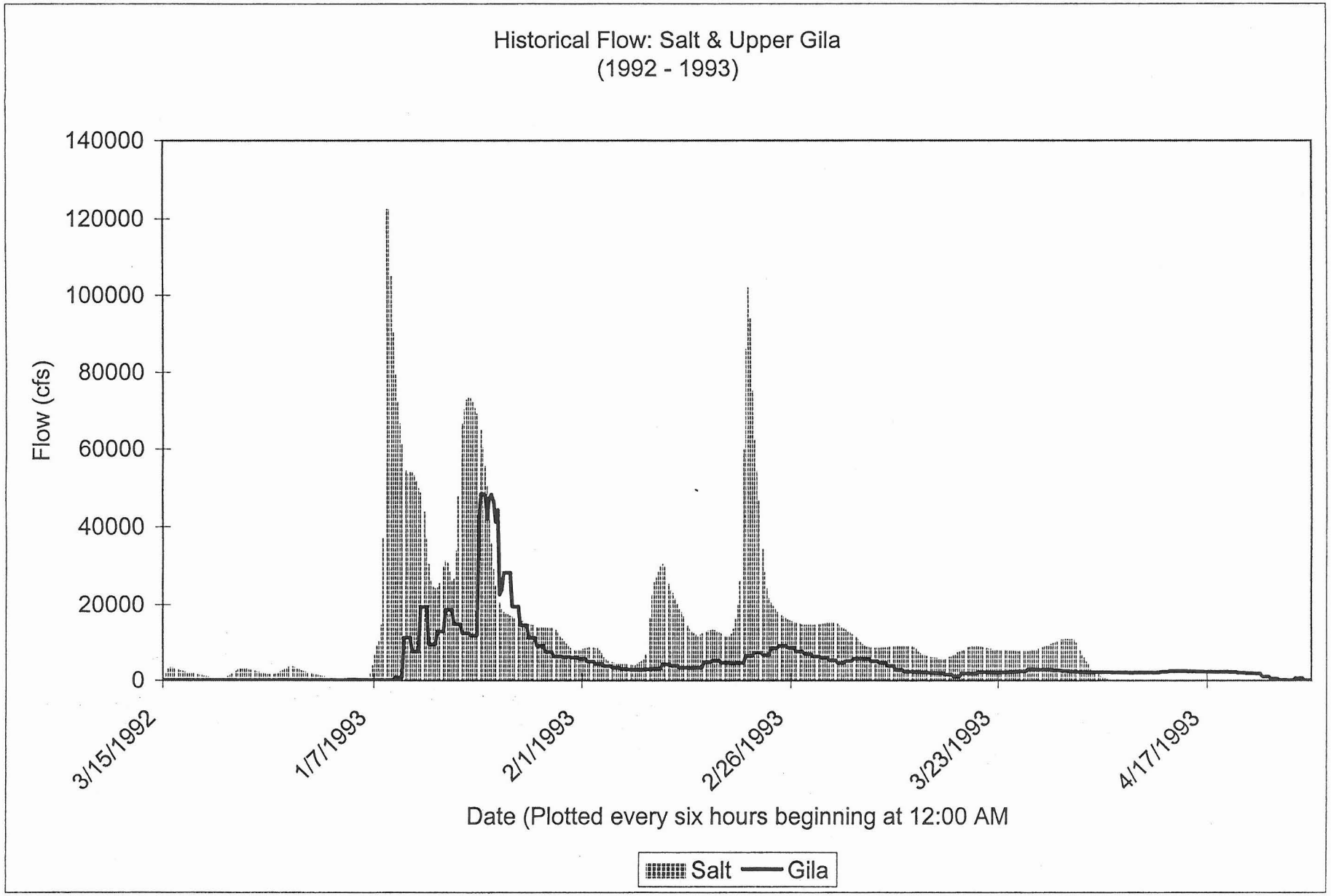

Historical Flow: Salt & Upper Gila
(1978 - 1979)
70000
60000
50000
40000
30000
20000
10000
0
Flow (cfs)
1/14/1978
2/14/1978
3/14/1978
4/14/1978
5/14/1978
6/14/1978
7/14/1978
8/14/1978
9/14/1978
10/14/1978
11/14/1978
12/14/1978
1/14/1979
2/14/1979
3/14/1979
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila


Historical Flow: Salt & Upper Gila
(1980 - 1981)
Flow (cfs)
120000
100000
80000
60000
40000
20000
0
2/13/1980
3/13/1980
4/13/1980
5/13/1980
6/13/1980
7/13/1980
8/13/1980
9/13/1980
10/13/1980
11/13/1980
12/13/1980
1/13/1981
2/13/1981
3/13/1981
4/13/1981
5/13/1981
6/13/1981
7/13/1981
8/13/1981
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila


Historic FLow: Salt & Upper Gila
(1982 - 1983)
70000
60000
50000
40000
30000
20000
10000
0
Flow (cfs)
8/12/1982
2/28/1983
3/25/1983
10/6/1983
10/31/1983
11/25/1983
12/30/1983
Date (Plotted every six hours beginning at 12:00 AM
Salt
Gila


Historical Flow: Salt & Upper Gila
(1984 - 1985)
Flow (cfs)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1/1/1984
2/1/1984
3/1/1984
4/1/1984
5/1/1984
6/1/1984
7/1/1984
8/1/1984
9/1/1984
10/1/1984
11/1/1984
12/1/1984
1/1/1985
2/1/1985
3/1/1985
4/1/1985
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila


Historical Flow: Salt & Upper Gila
(1990 - 1991)
Flow (cfs)
1800
1600
1400
1200
1000
800
600
400
200
0
7/15/1990
7/29/1990
8/12/1990
8/26/1990
9/9/1990
9/23/1990
10/7/1990
10/21/1990
11/4/1990
11/18/1990
12/2/1990
12/16/1990
12/30/1990
1/13/1991
1/27/1991
2/10/1991
2/24/1991
Date (Plotted every six hours beginning at 12:00 AM)
Salt
Gila


Historical Flow: Salt & Upper Gila
(1992 - 1993)
140000
120000
100000
80000
60000
40000
20000
0
Flow (cfs)
3/15/1992
1/7/1993
2/1/1993
2/26/1993
3/23/1993
4/17/1993
Date (Plotted every six hours beginning at 12:00 AM
Salt
Gila

APPENDIX K

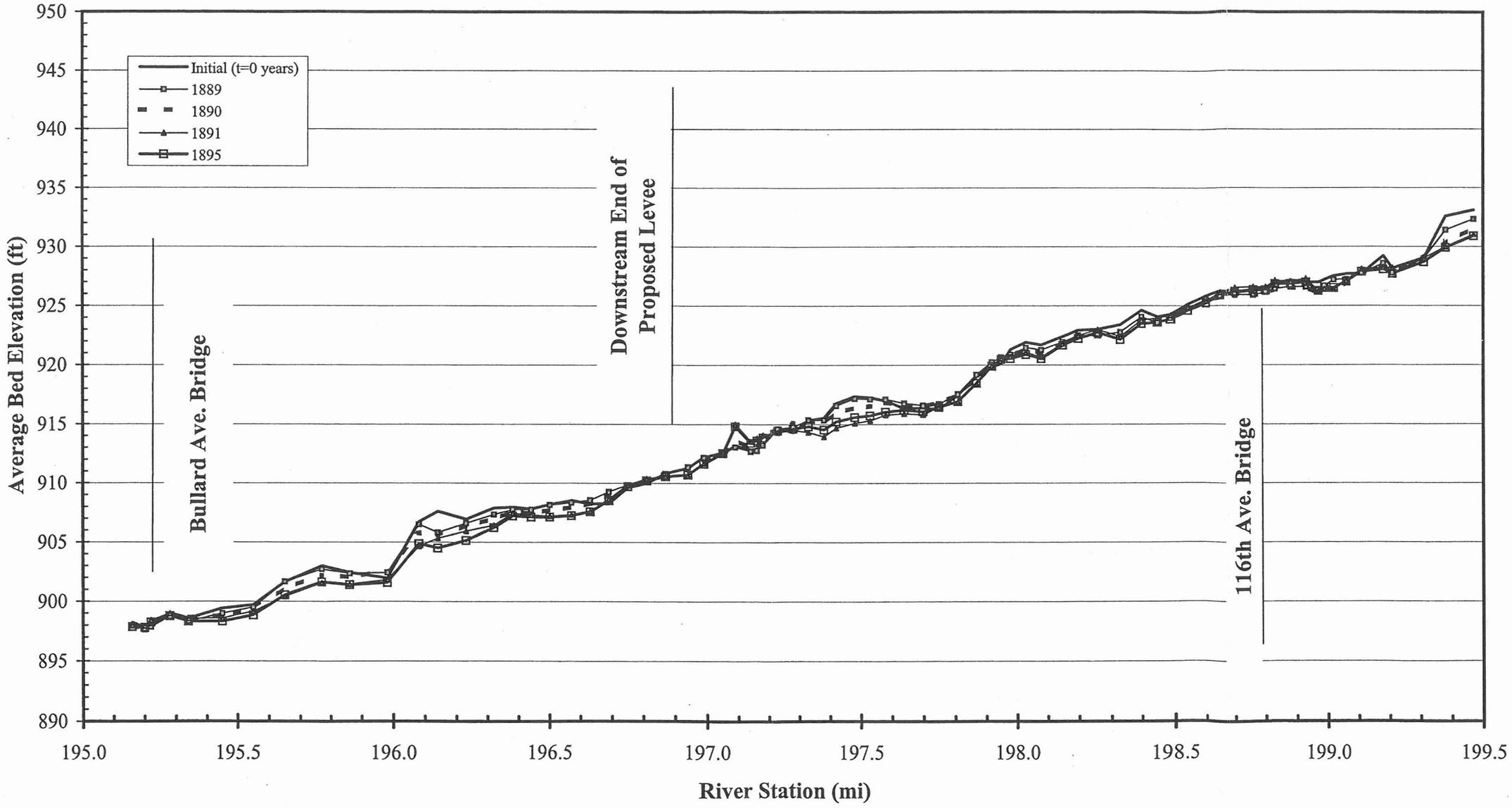
Sediment Transport HEC-6T Model Results

i. Existing Condition
ii. Sensitivity Analysis (Manning's and Inflow Load)
iii. Comparison of Existing and Levee Conditions
iv. Comparison of Levee and Levee + Pond Conditions

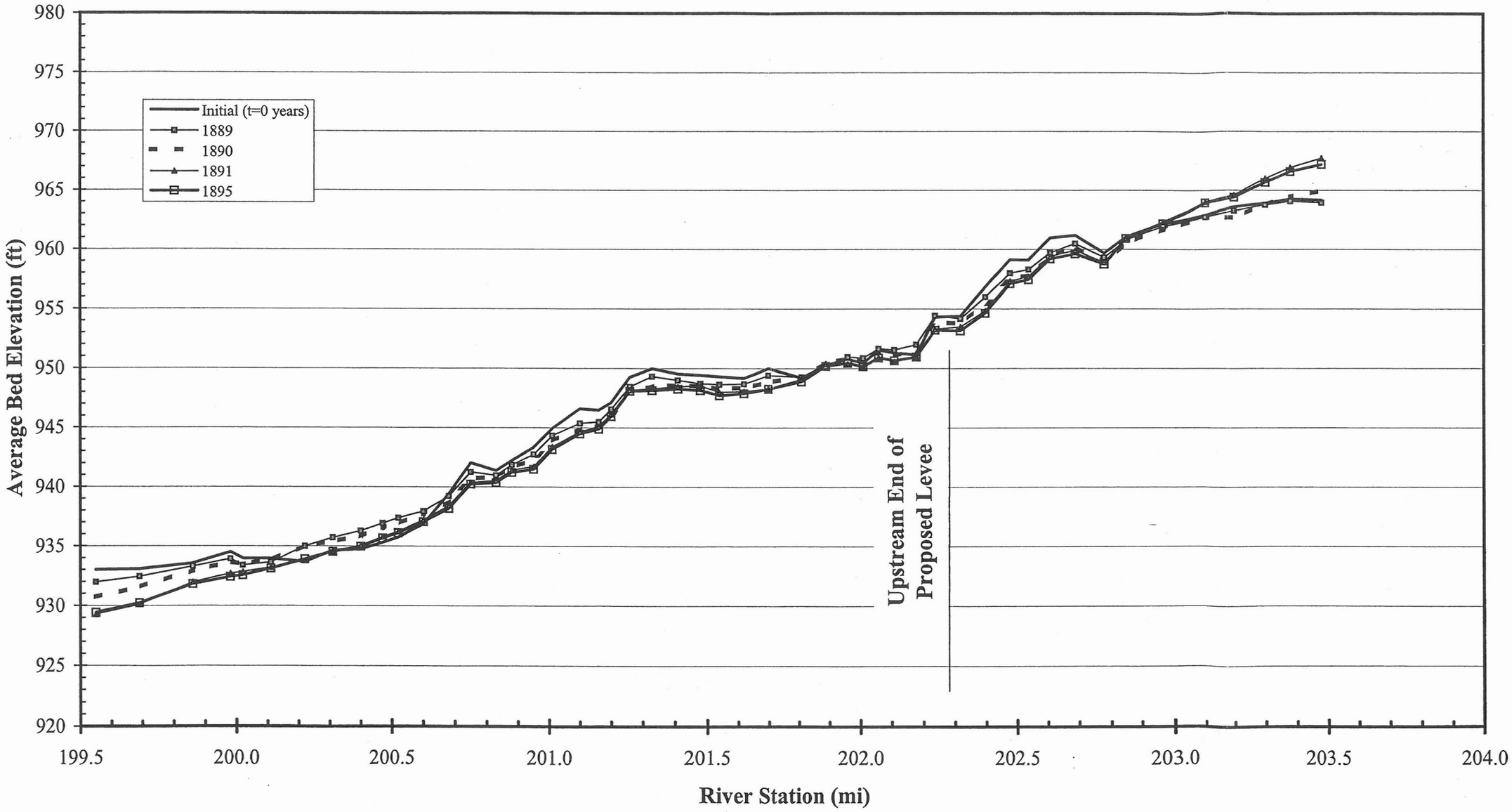
K-i

Existing Condition

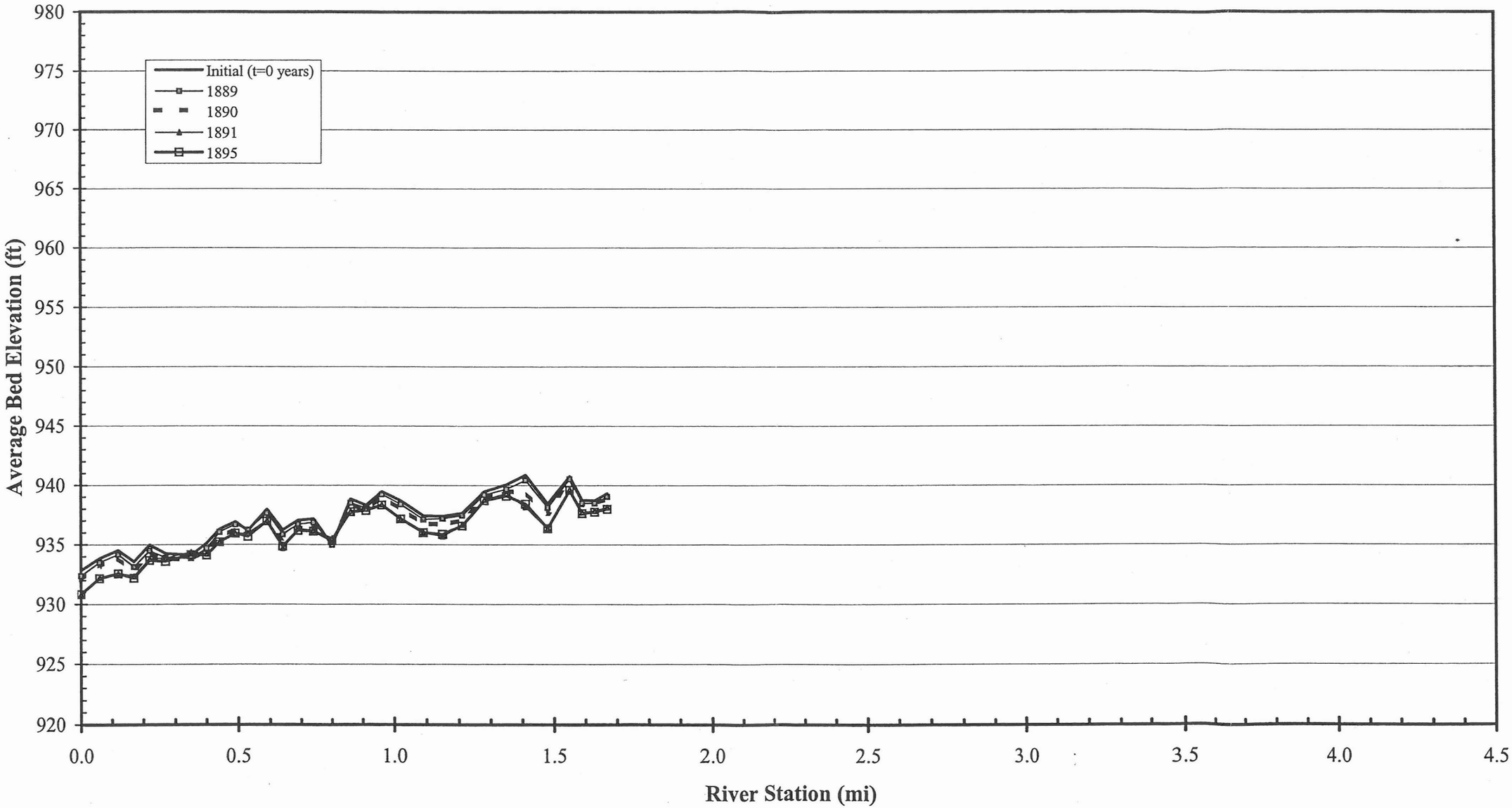
Tres Rios PED
Average Bed Elevations for the 105-Year Simulation (1898-1895)
Existing Conditions - Lower Gila



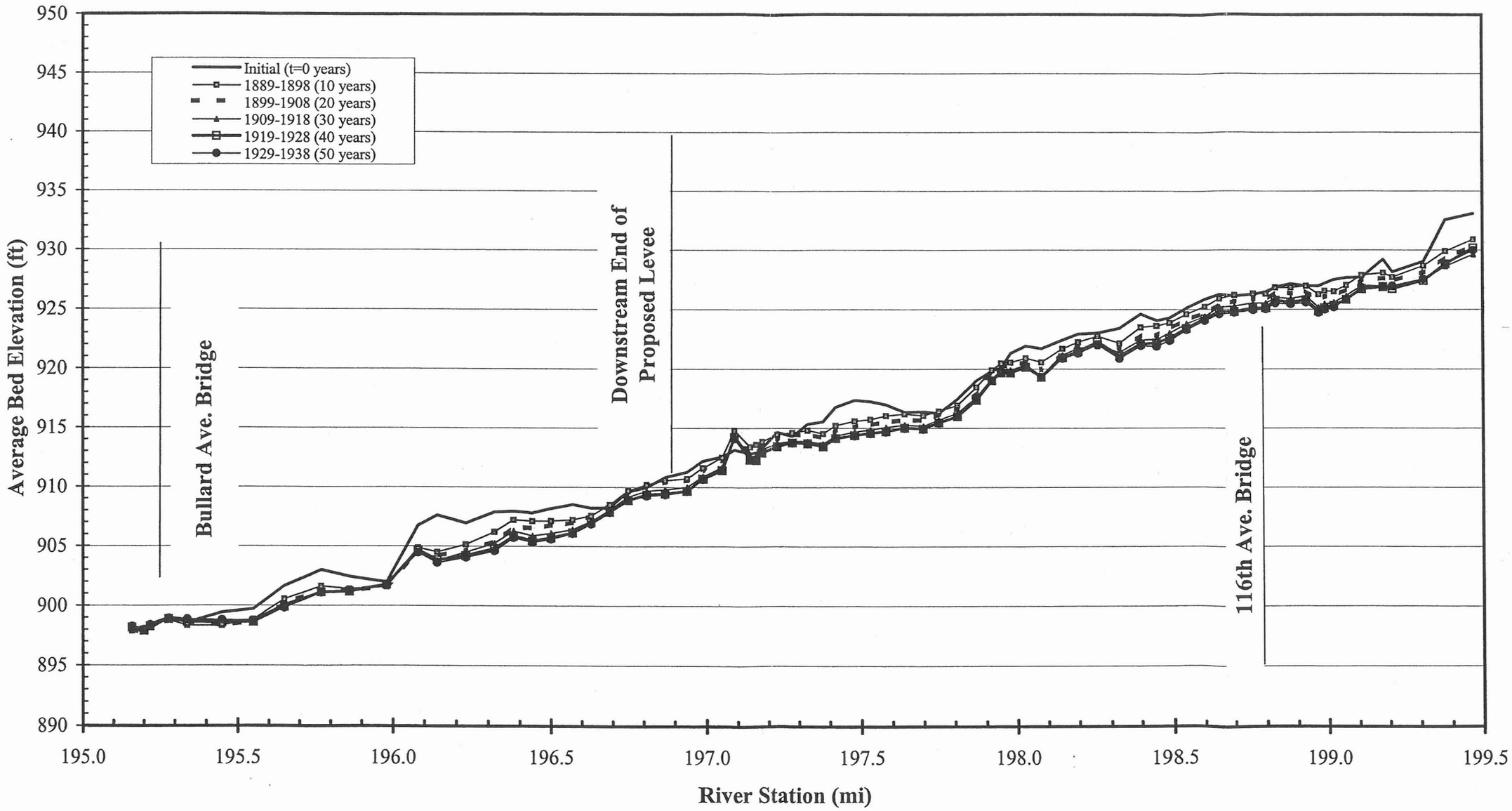
Tres Rios PED
Average Bed Elevations for the 105-Year Simulation (1898-1895)
Existing Conditions - Salt River



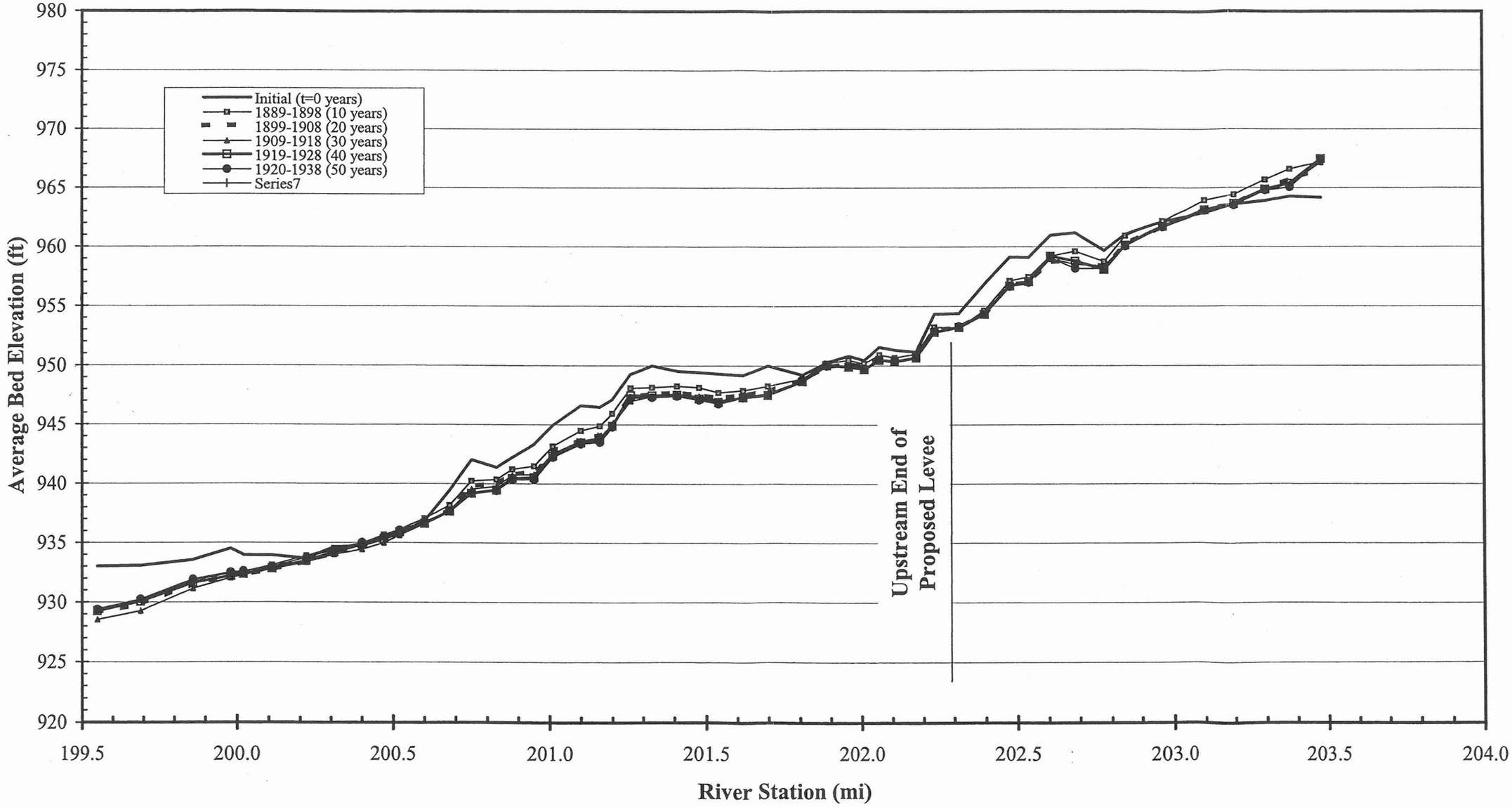
Tres Rios PED
Average Bed Elevations for the 105-Year Simulation (1898-1895)
Existing Conditions - Upper Gila



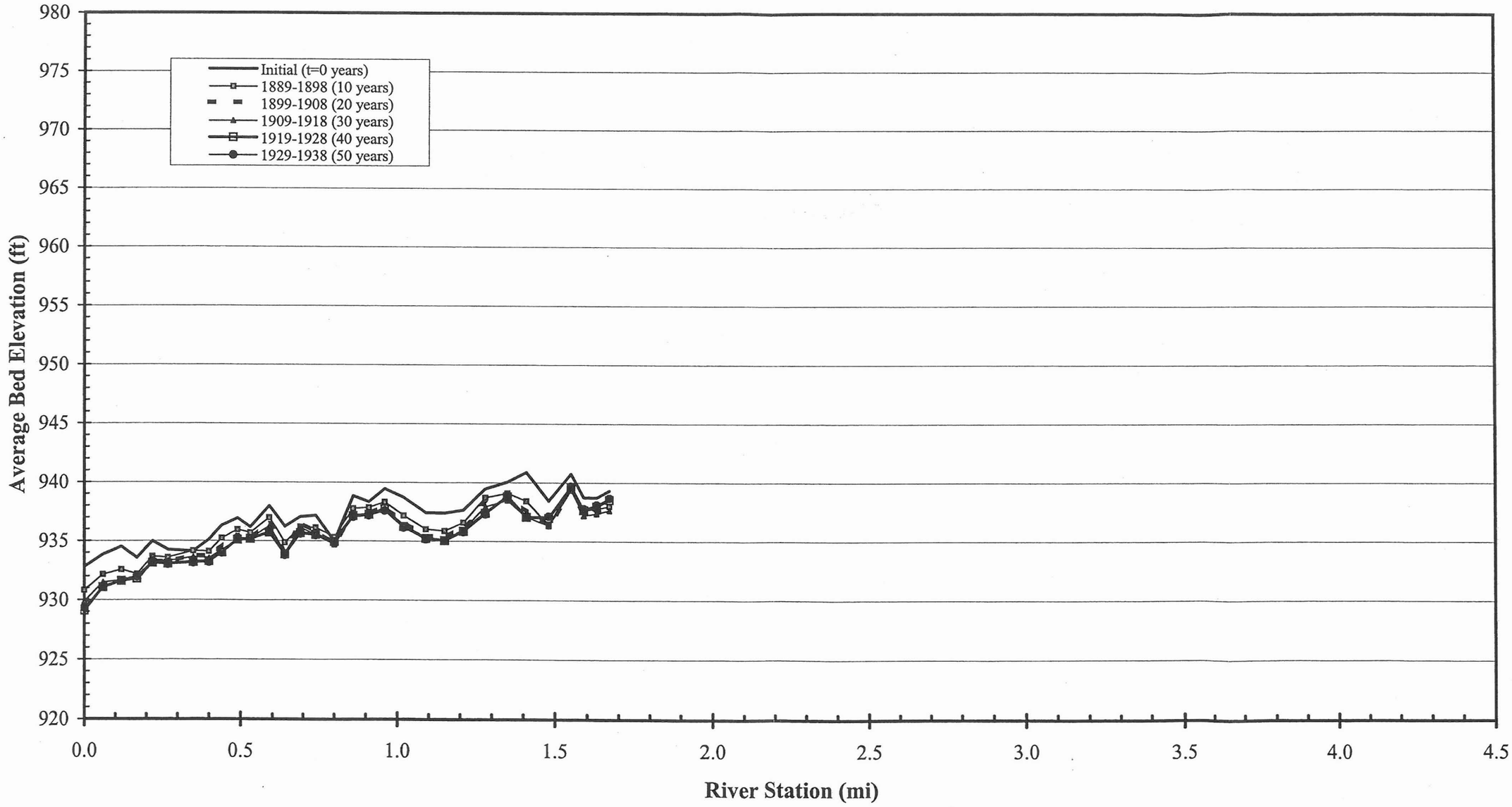
Tres Rios PED
Average Bed Elevations for the 105-Year Simulation (1898-1938)
Existing Conditions - Lower Gila



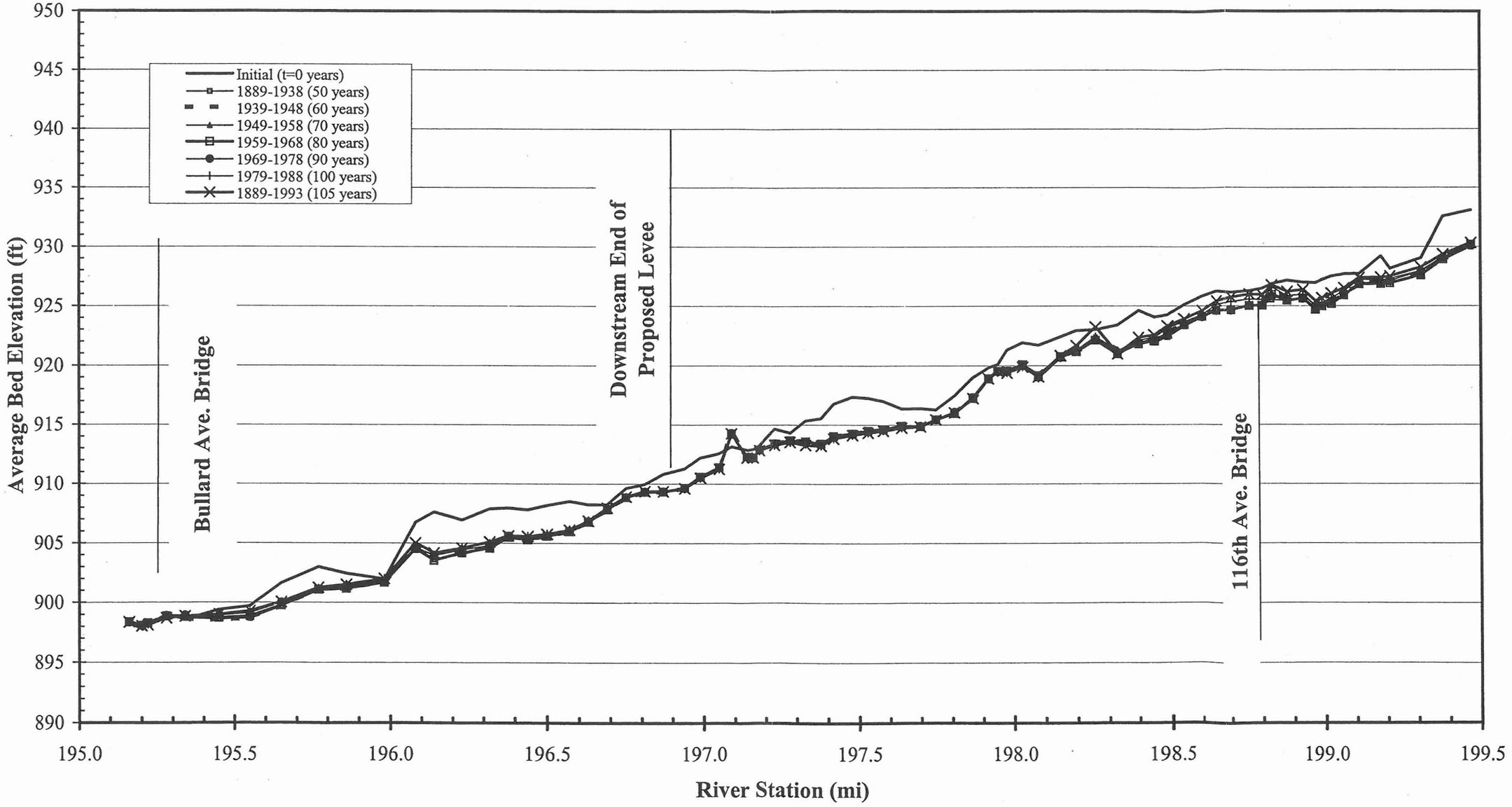
Tres Rios PED
Average Bed Elevations for the 105-Year Simulation (1898-1938)
Existing Conditions - Salt River



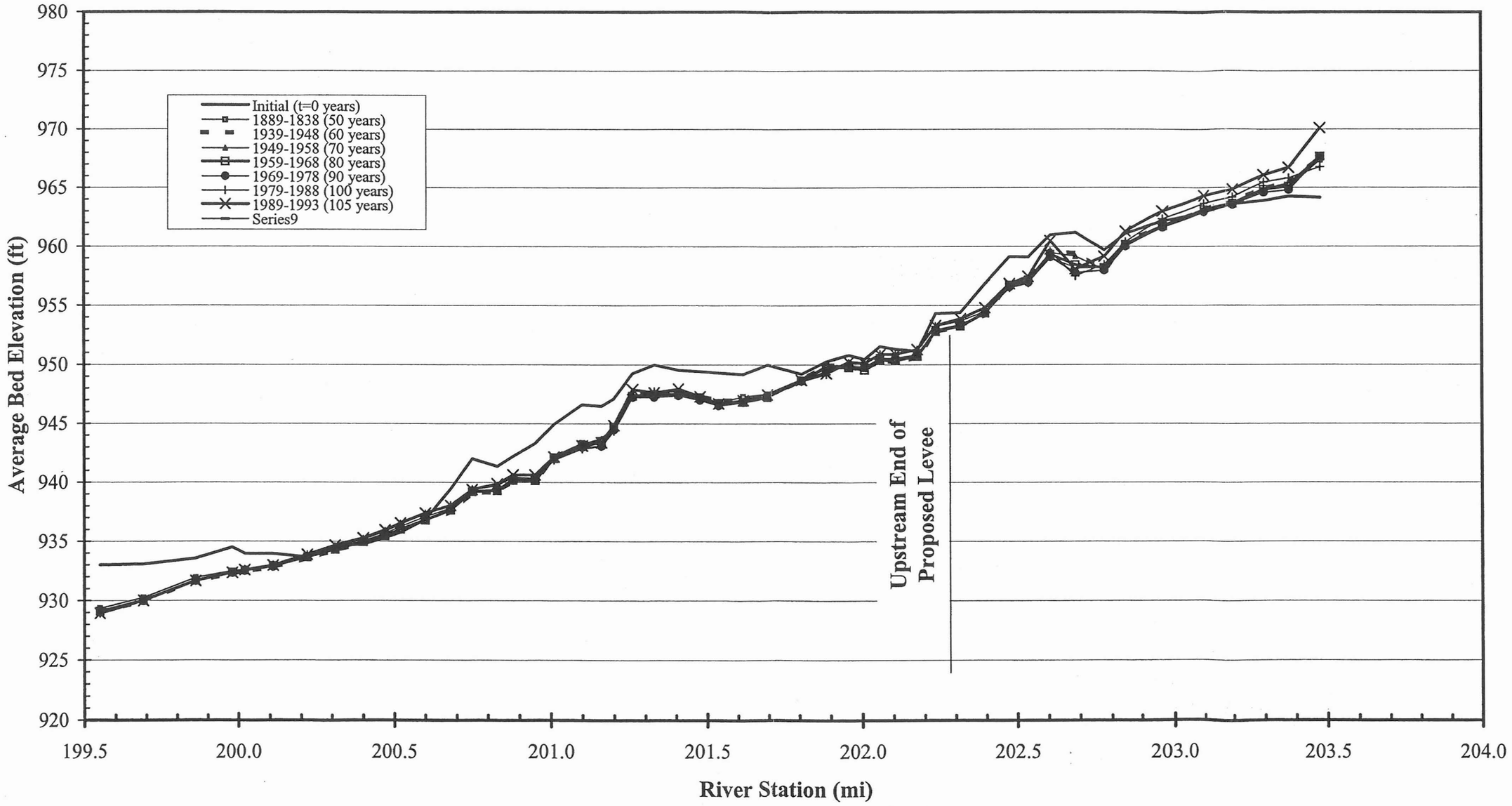
Tres Rios PED
Average Bed Elevations for the 105-Year Simulation (1898-1938)
Existing Conditions - Upper Gila



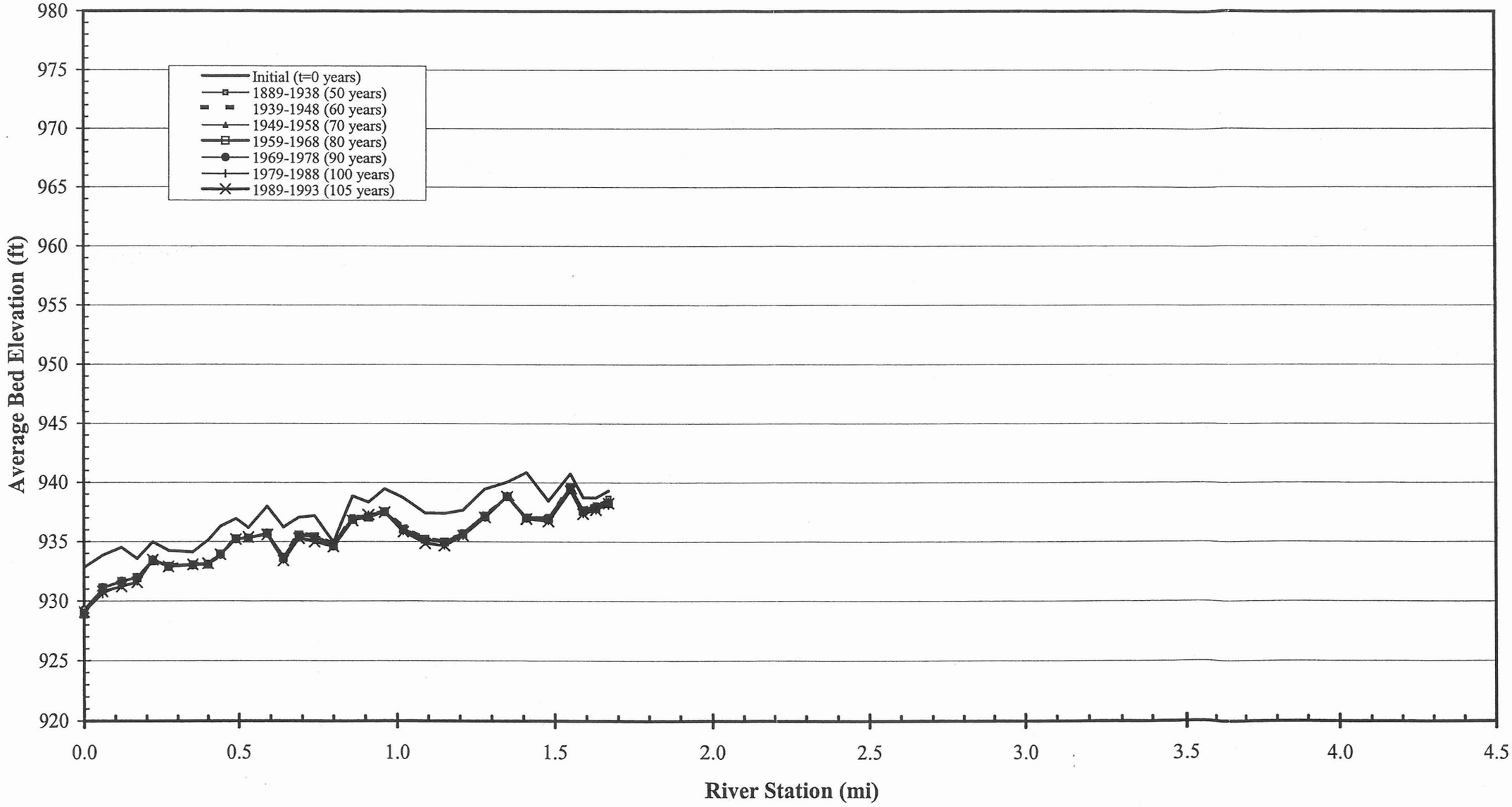
Tres Rios PED
Average Bed Elevations for the 105-Year Simulation (1898-1993)
Existing Conditions - Lower Gila



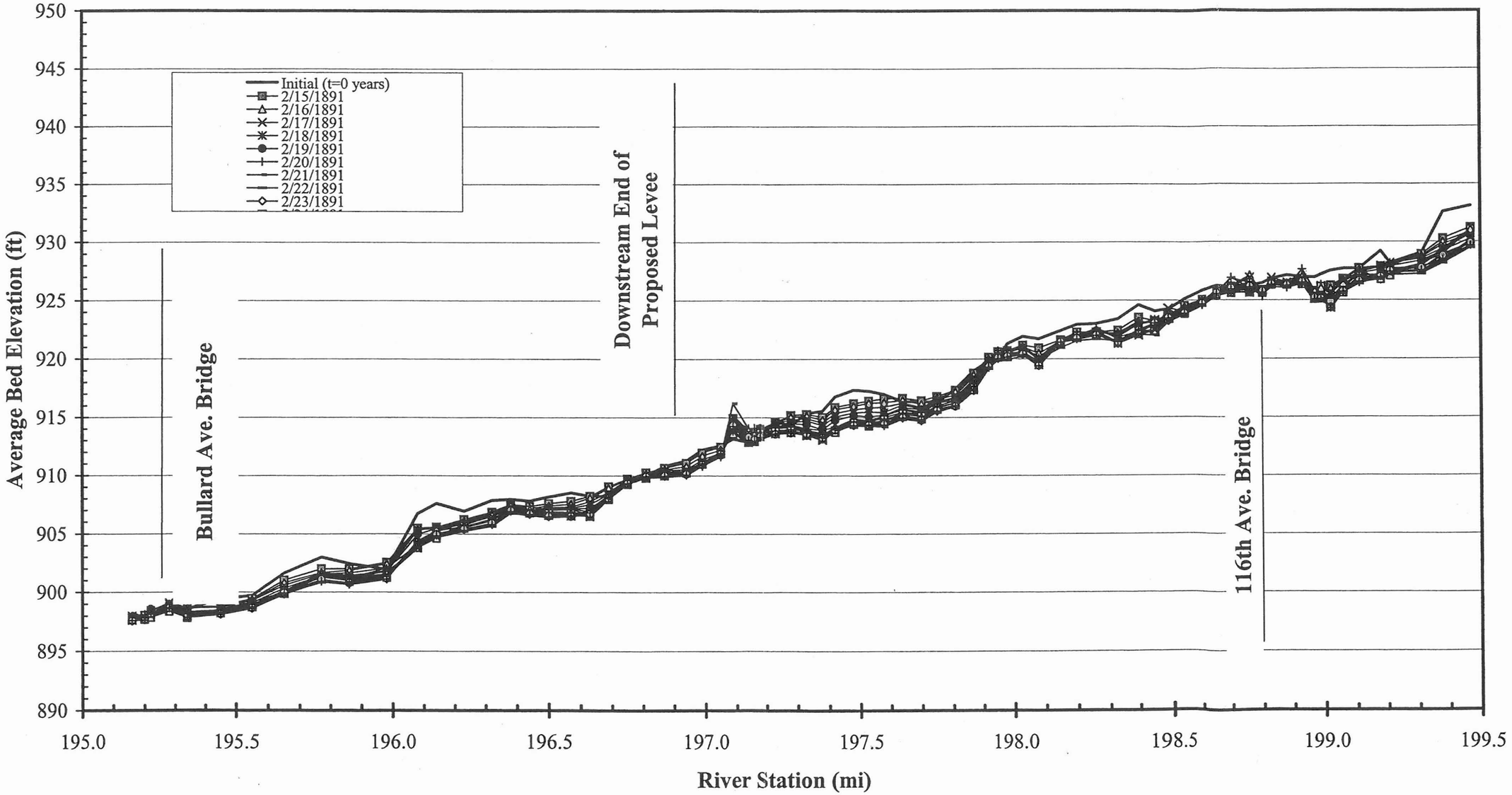
Tres Rios PED
Average Bed Elevations for the 105-Year Simulation (1898-1993)
Existing Conditions - Salt River



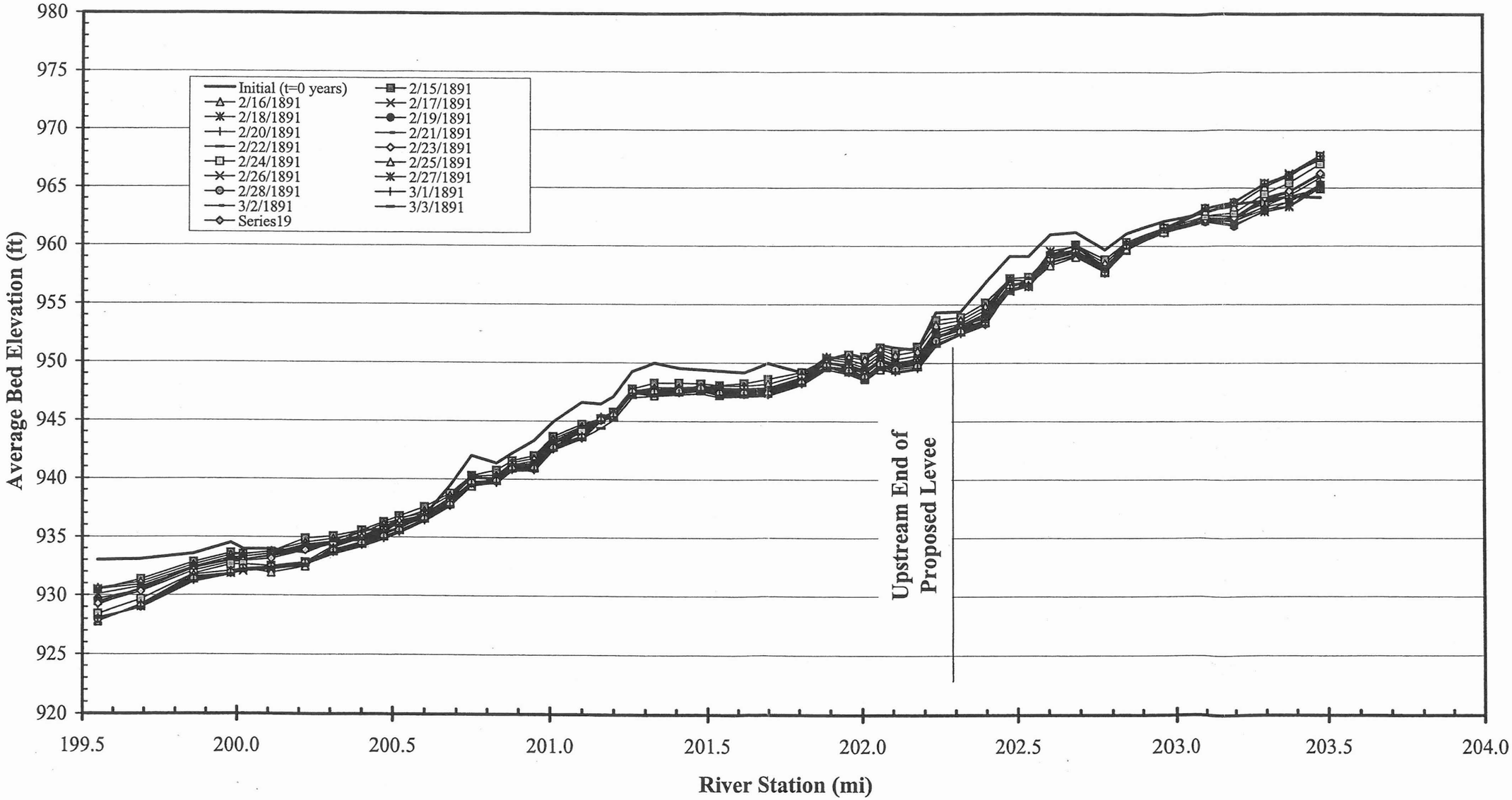
Tres Rios PED
Average Bed Elevations for the 105-Year Simulation (1898-1993)
Existing Conditions - Upper Gila



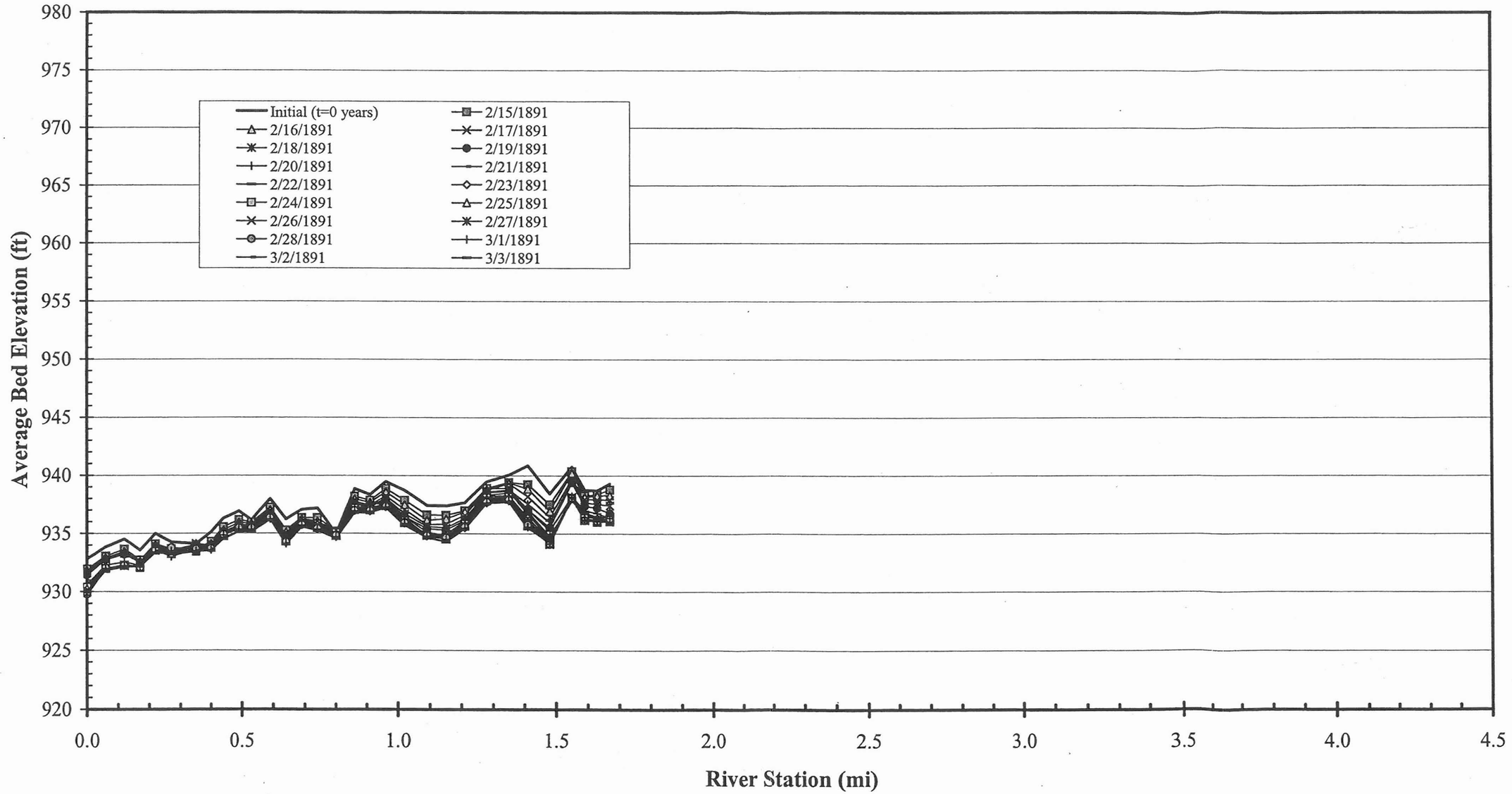
Tres Rios PED
Average Bed Elevations During 1891 Event
Existing Conditions - Lower Gila



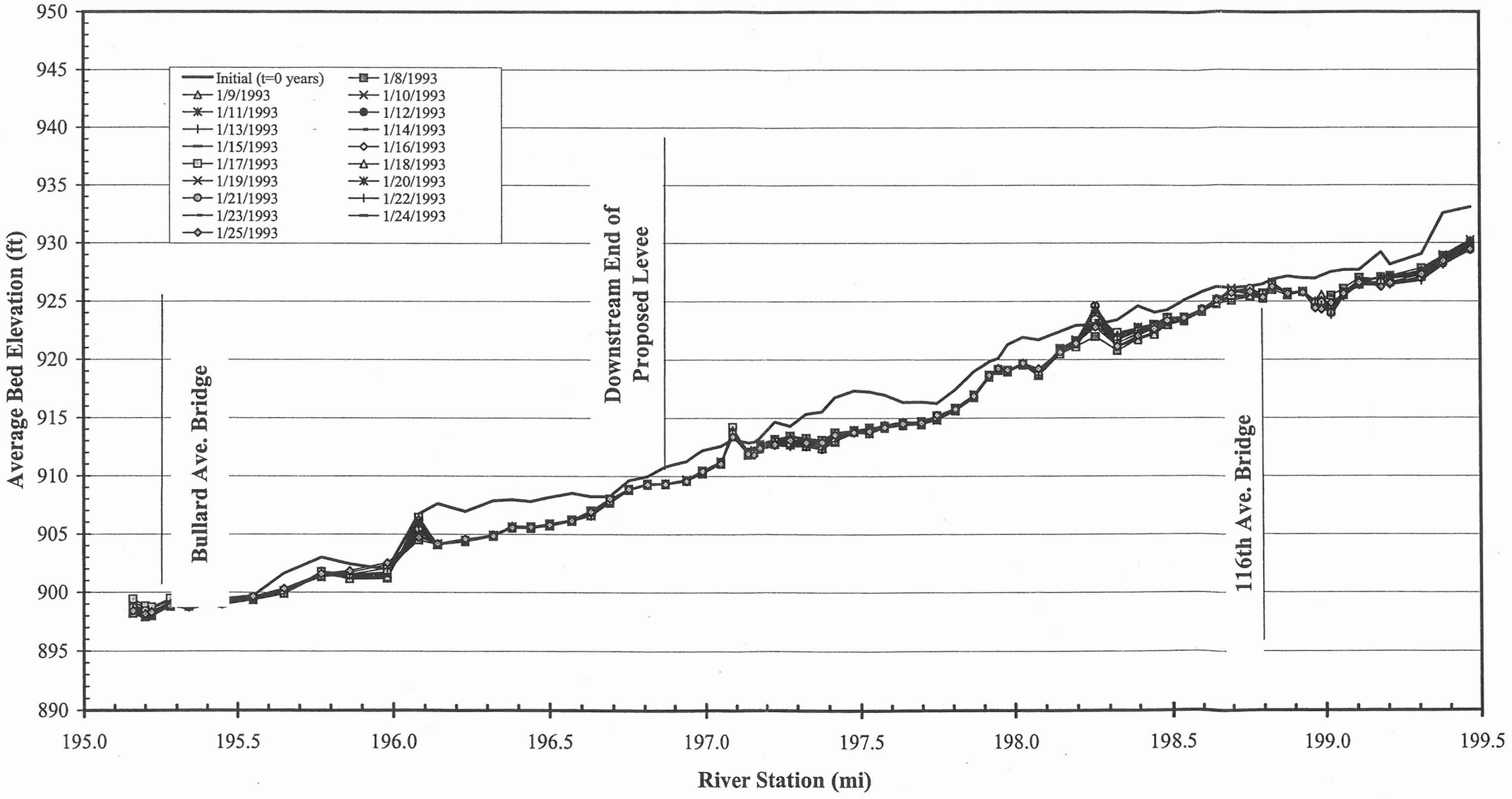
Tres Rios PED
Average Bed Elevations During 1891 Event
Existing Conditions - Salt River



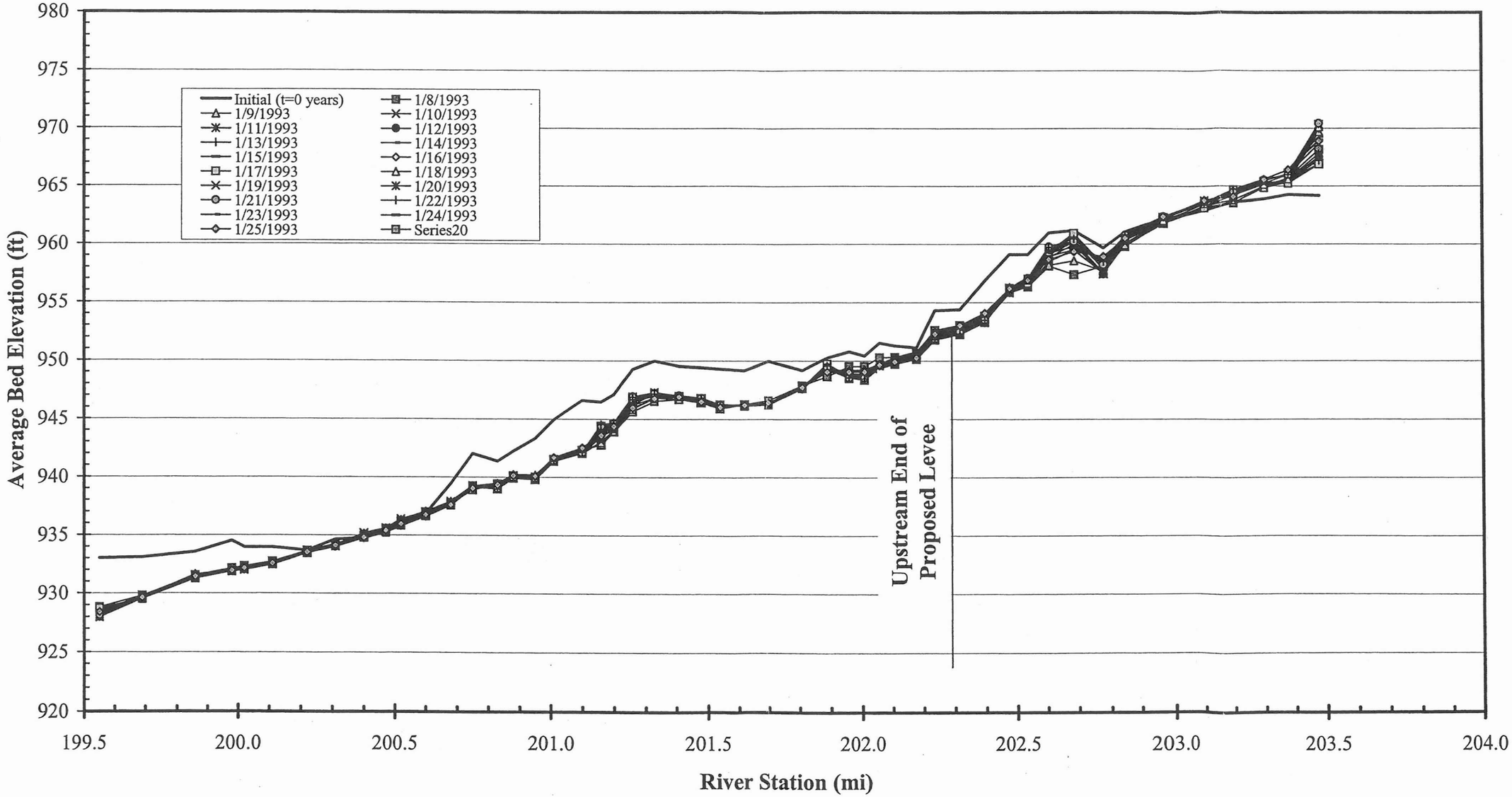
Tres Rios PED
Average Bed Elevations During 1891 Event
Existing Conditions - Upper Gila



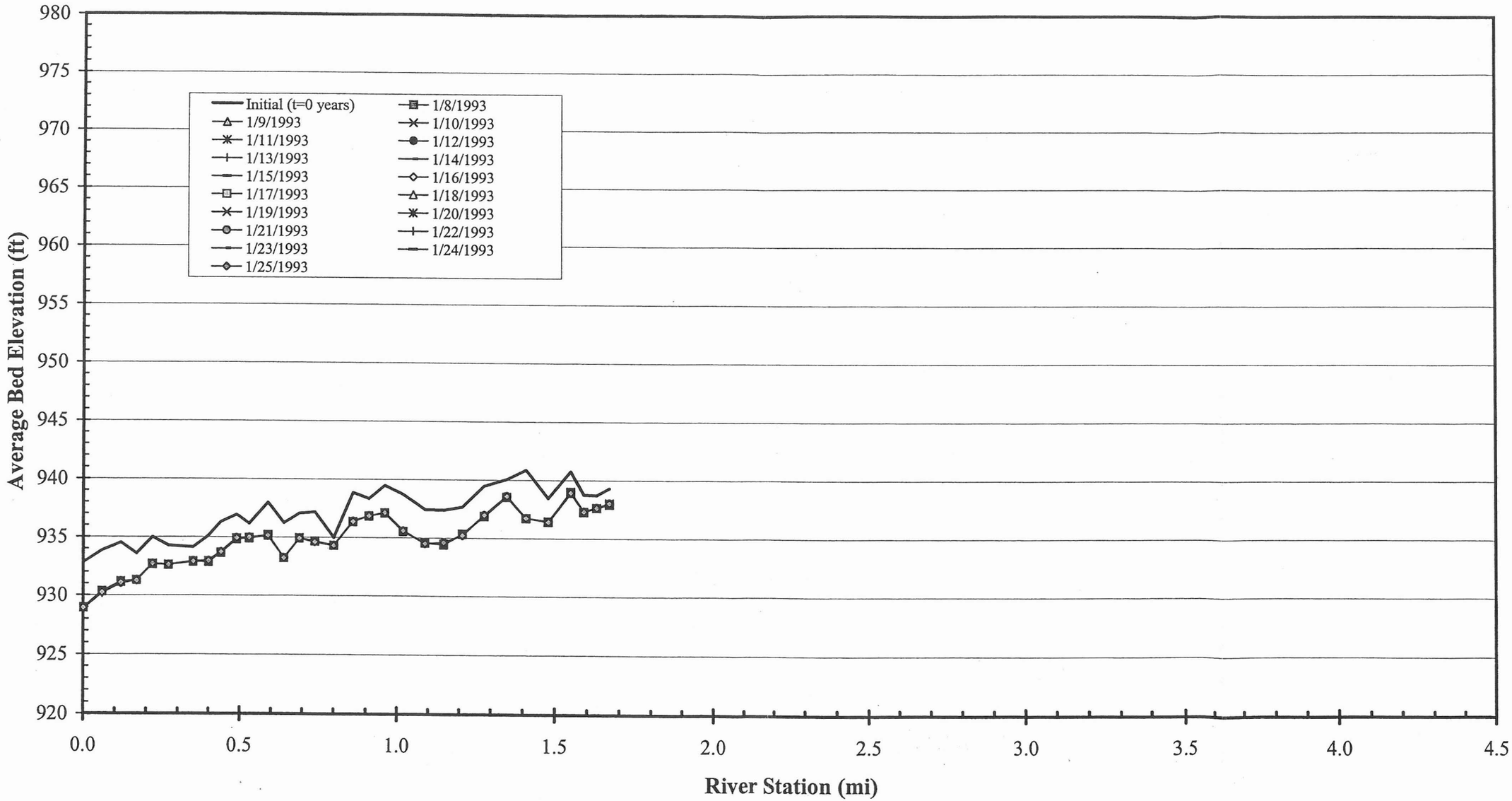
Tres Rios PED
Average Bed Elevations During 1993 Event
Existing Conditions - Lower Gila



Tres Rios PED
Average Bed Elevations During 1993 Event
Existing Conditions - Salt River



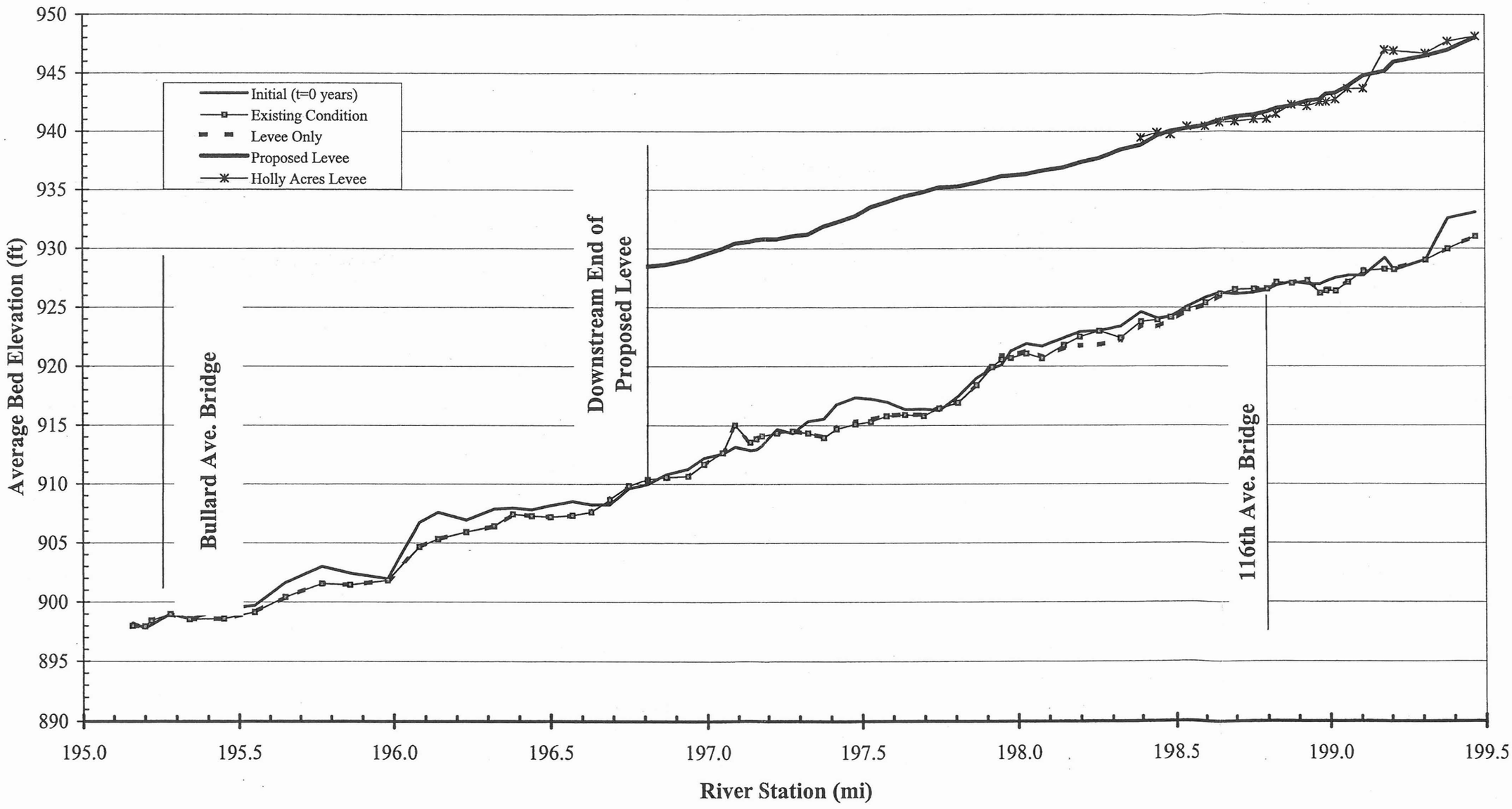
Tres Rios PED
Average Bed Elevations During 1993 Event
Existing Conditions - Upper Gila



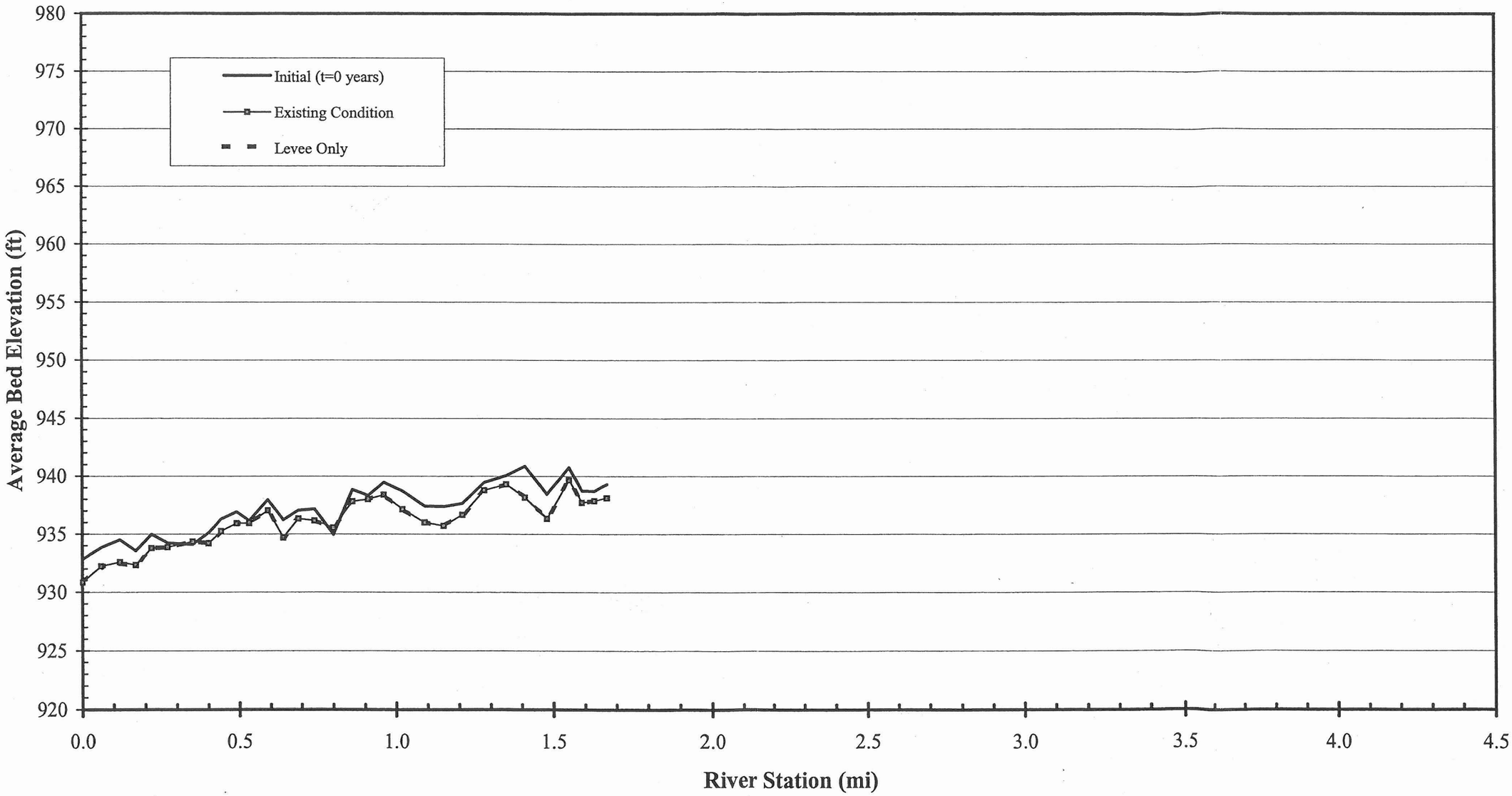
K-iv

Comparison of Levee and Levee + Pond Conditions

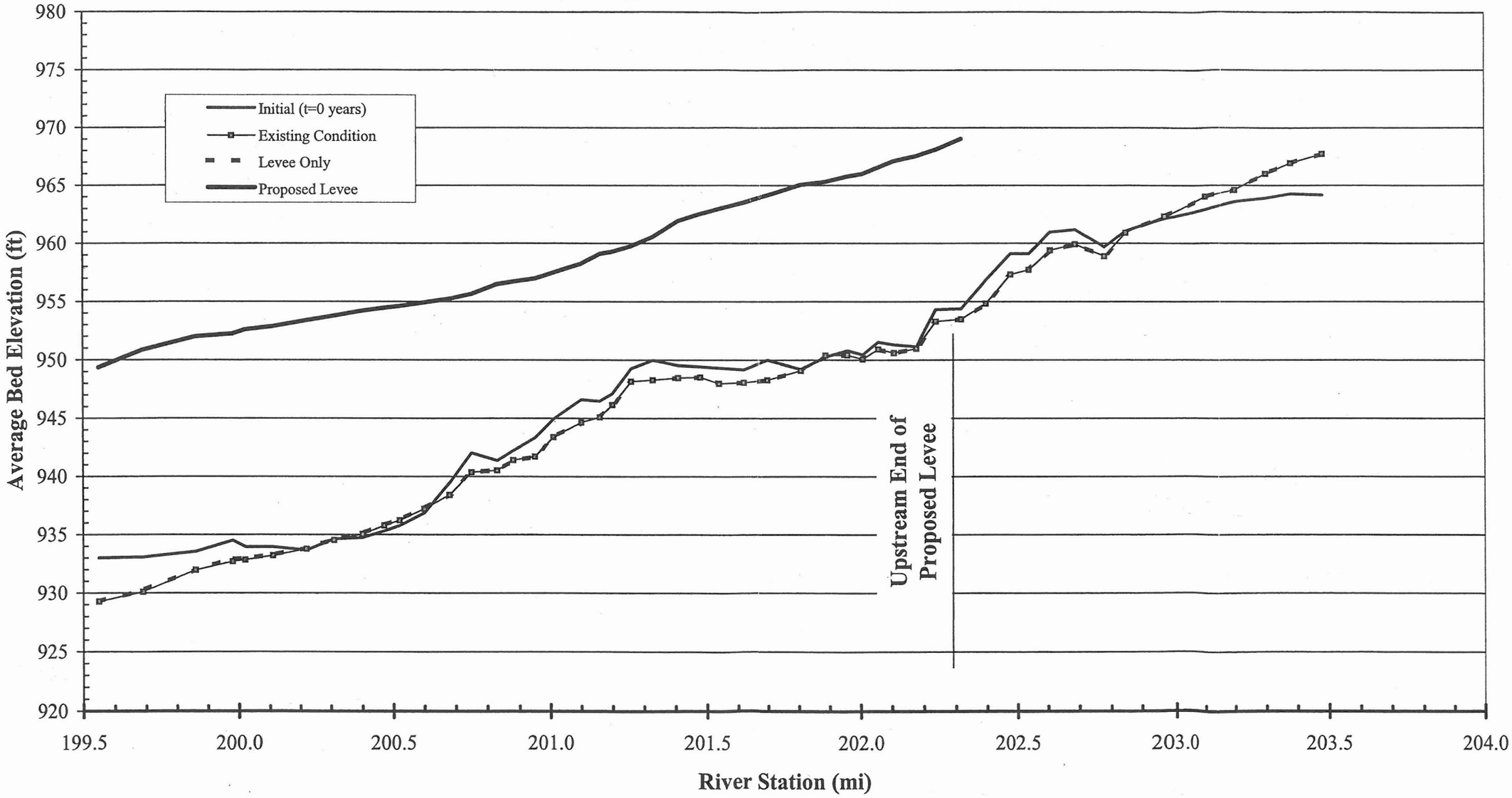
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Existing Vs Levee Only - Lower Gila



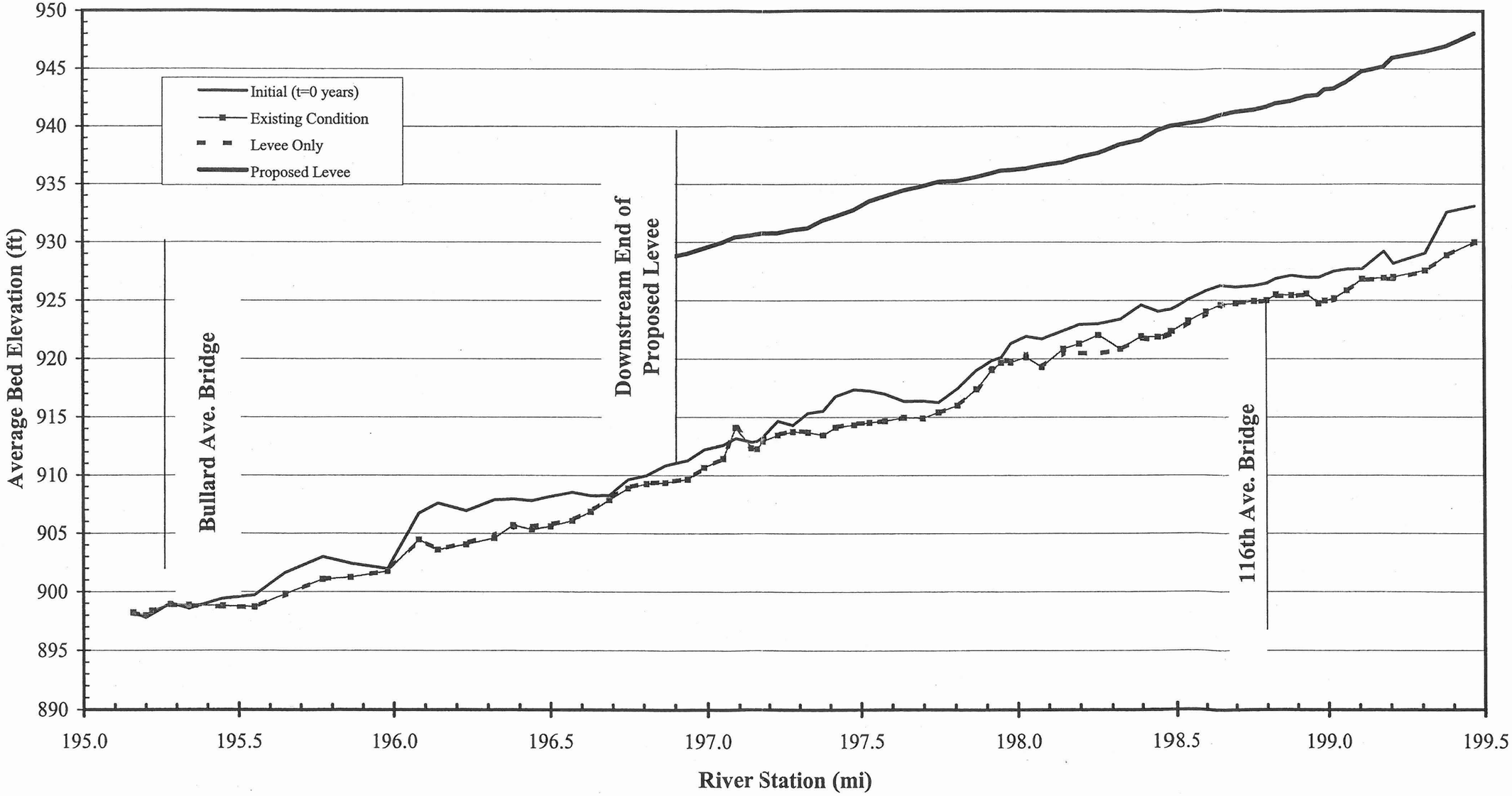
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Existing Vs Levee Only - Upper Gila



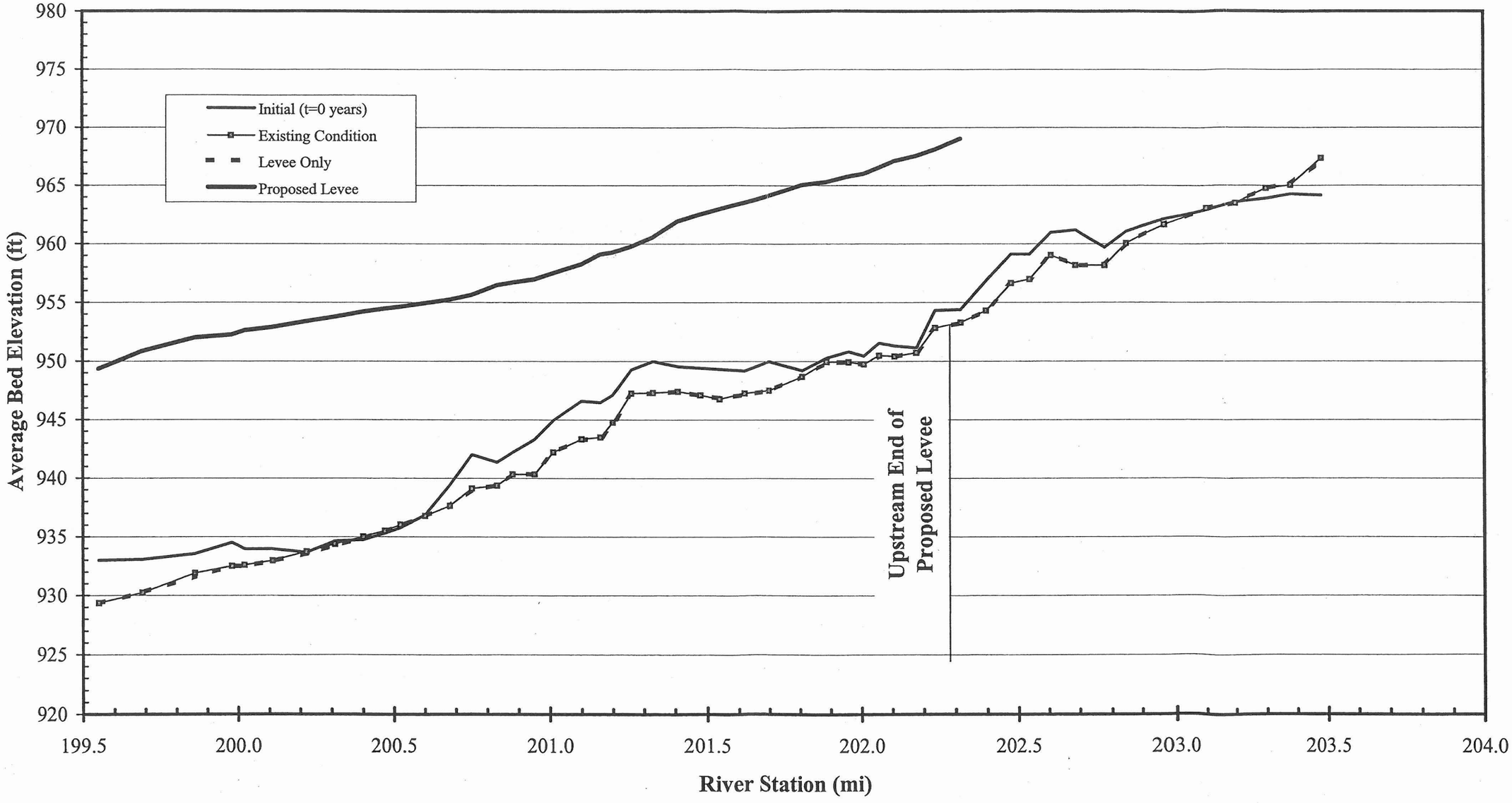
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Existing Vs Levee Only - Salt River



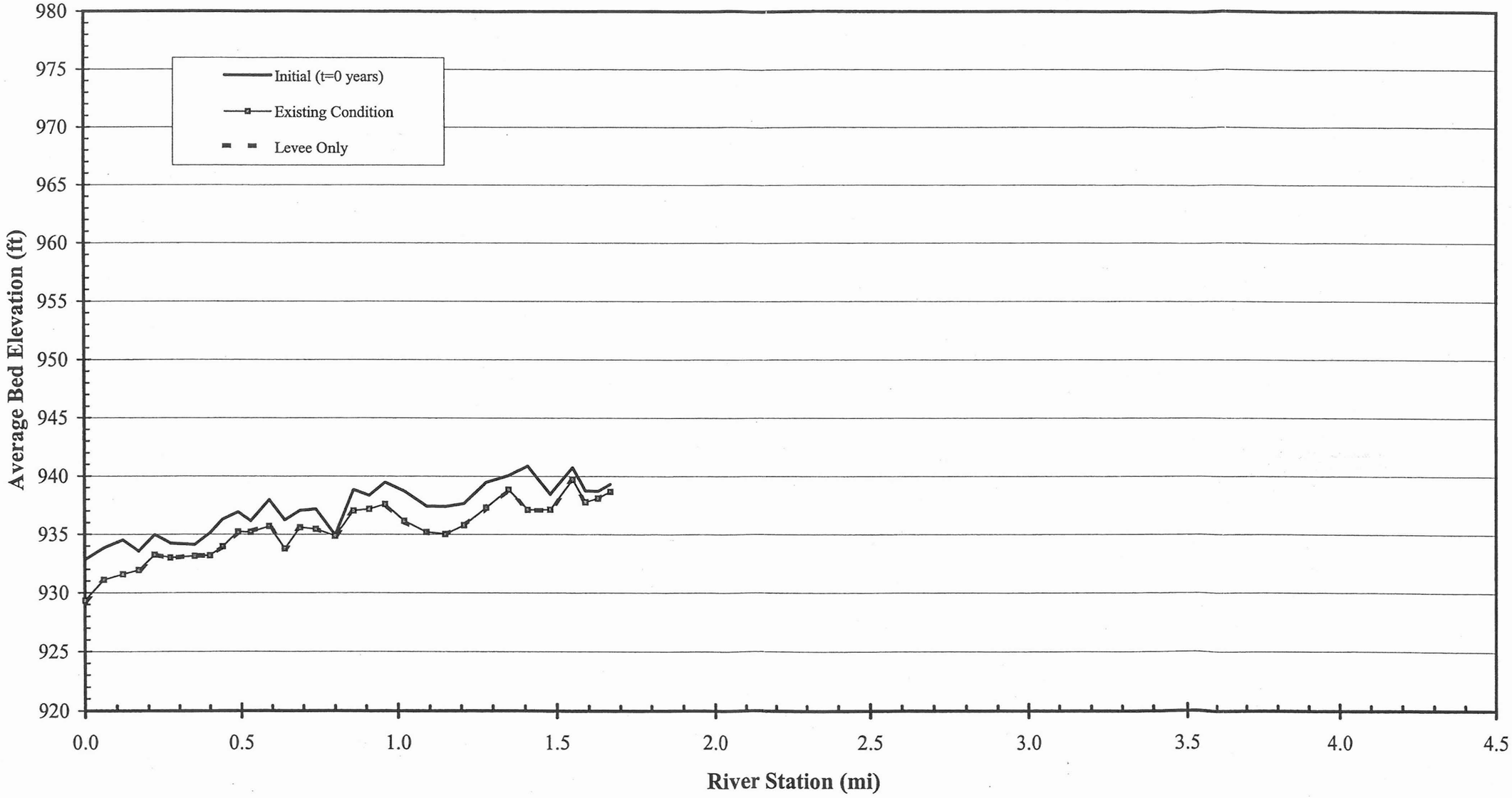
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Existing Vs Levee Only - Lower Gila



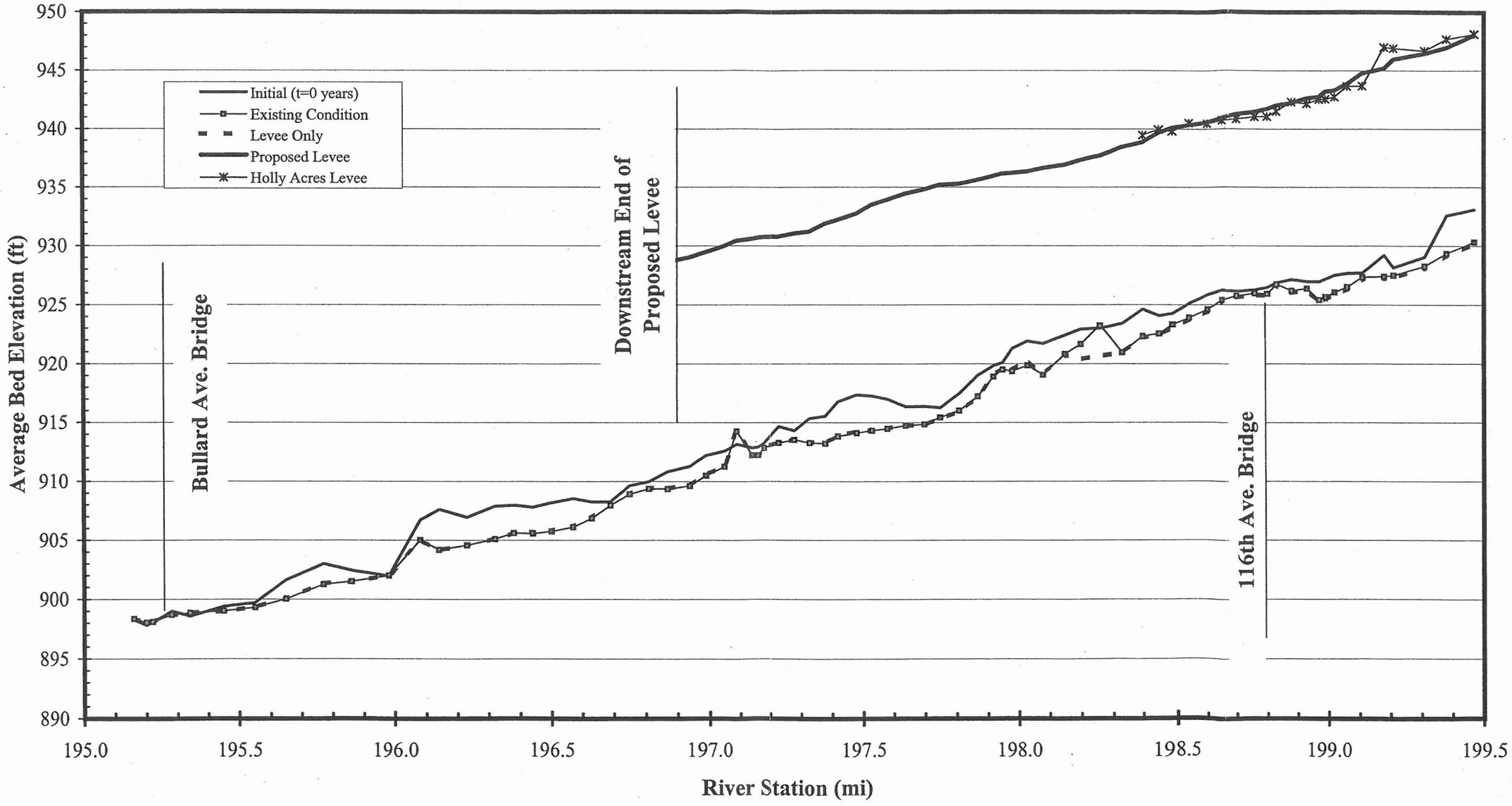
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Existing Vs Levee Only - Salt River



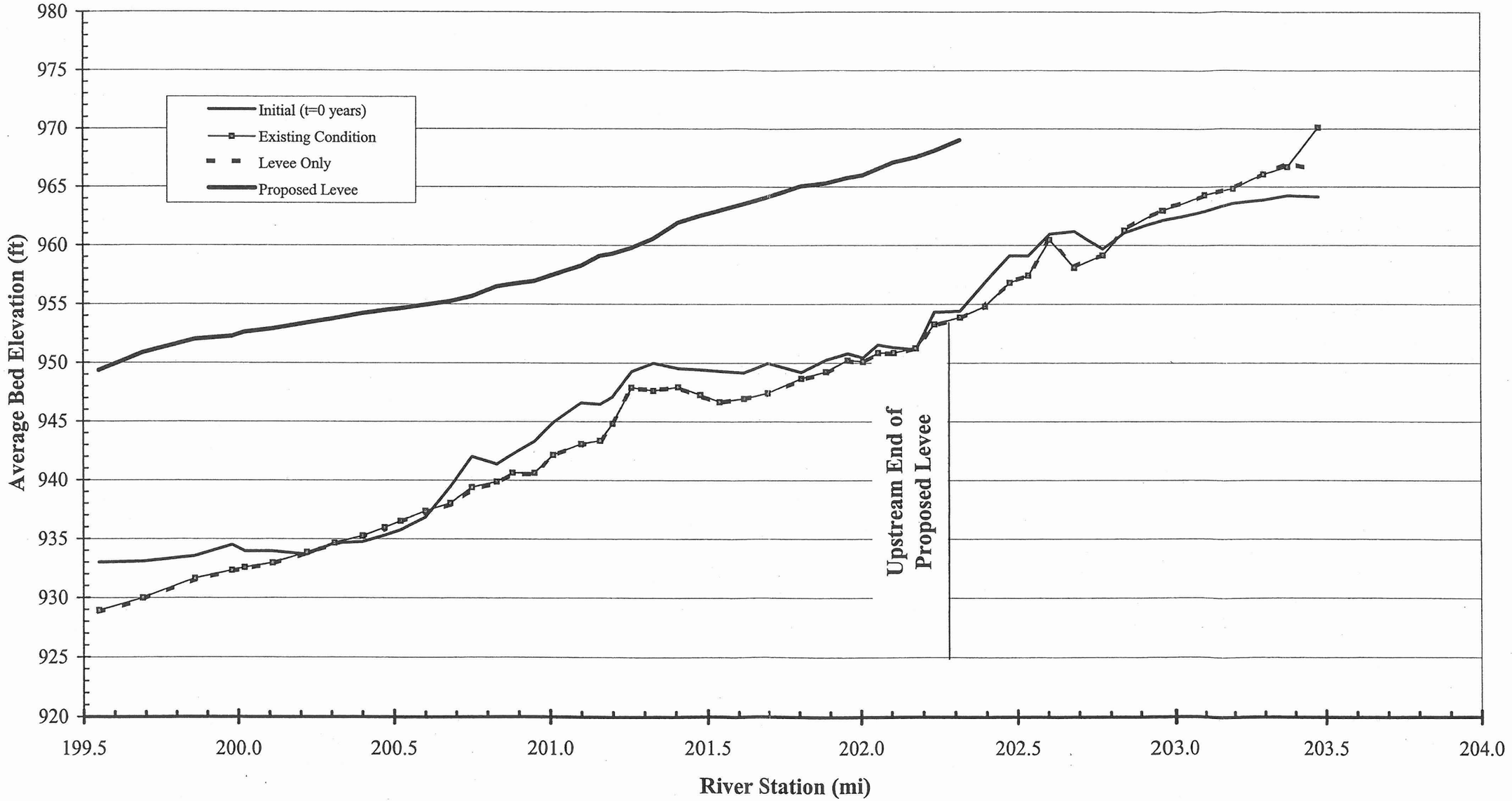
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Existing Vs Levee Only - Upper Gila



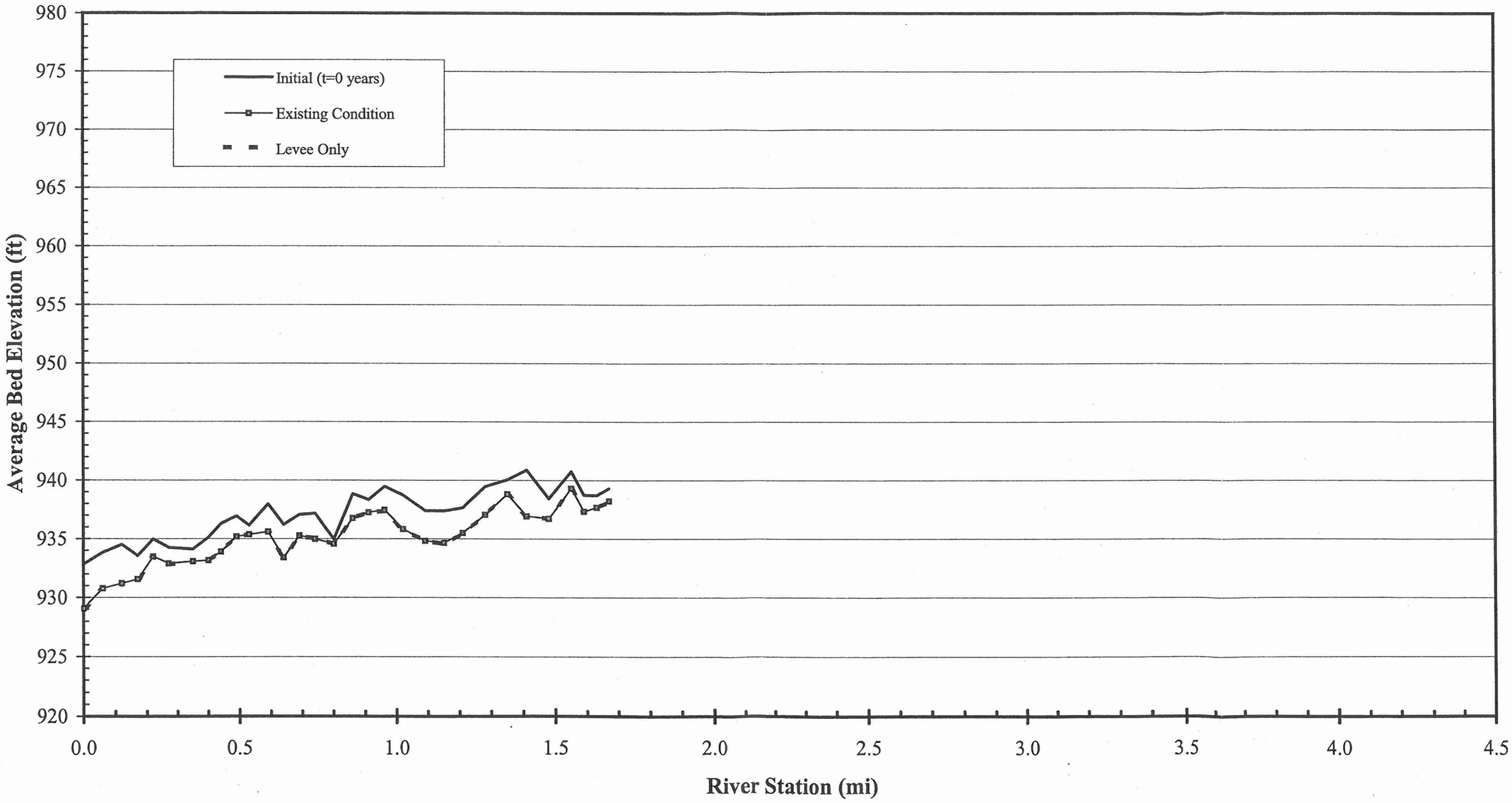
Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Existing Vs Levee Only - Lower Gila



Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Existing Vs Levee Only - Salt River



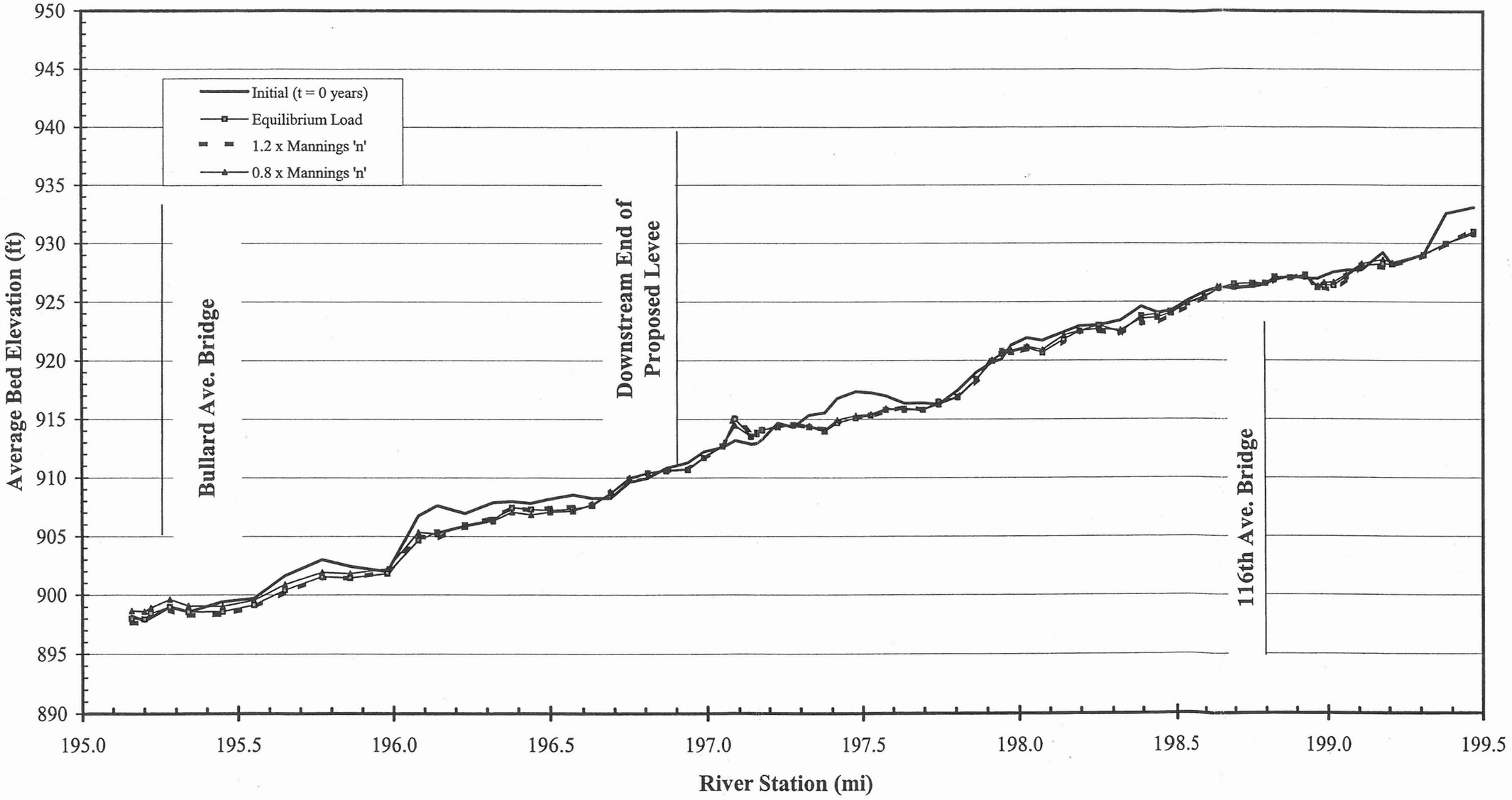
Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Existing Vs Levee Only - Upper Gila



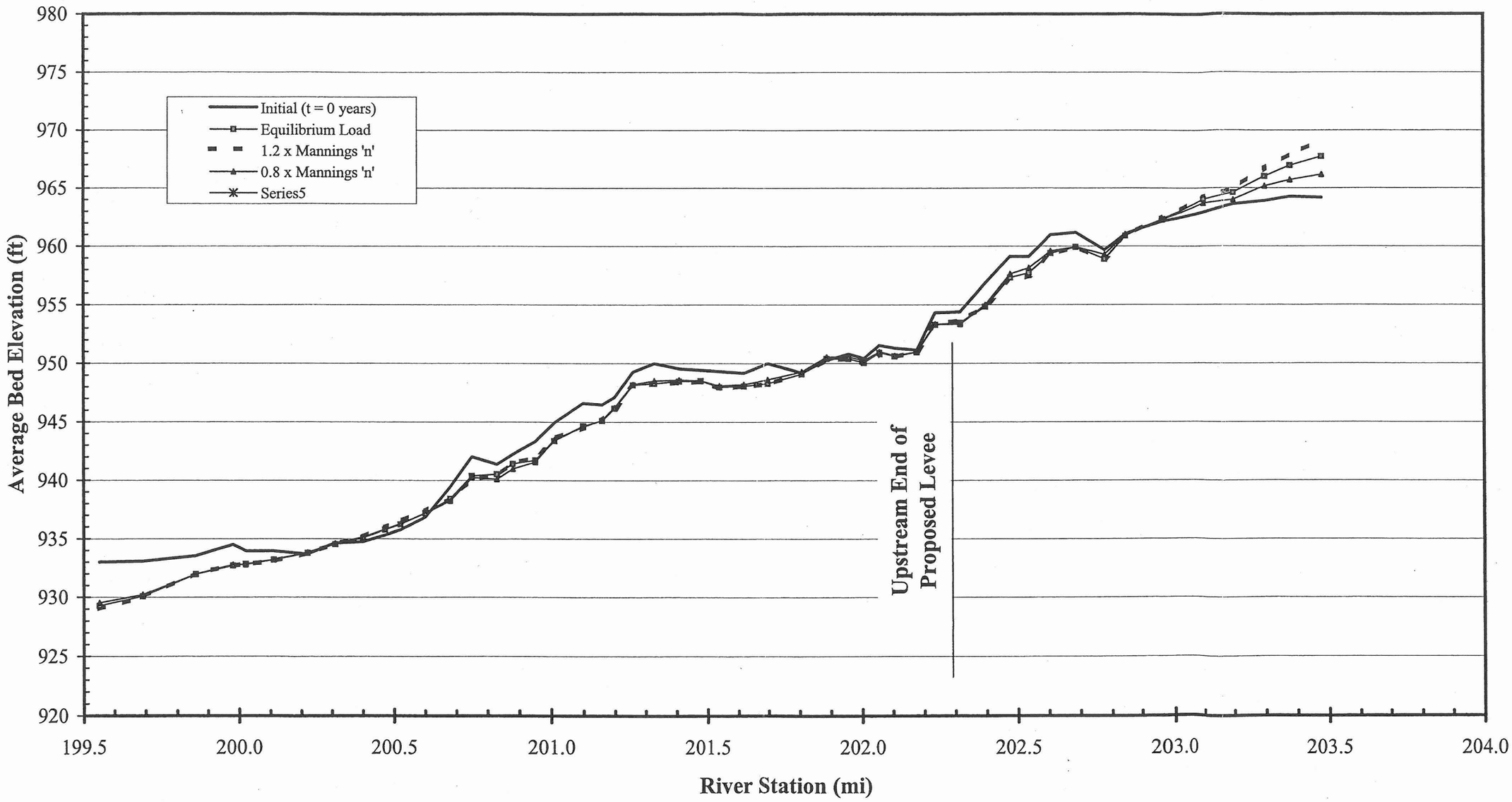
K-iii

Comparison of Existing and Levee Conditions

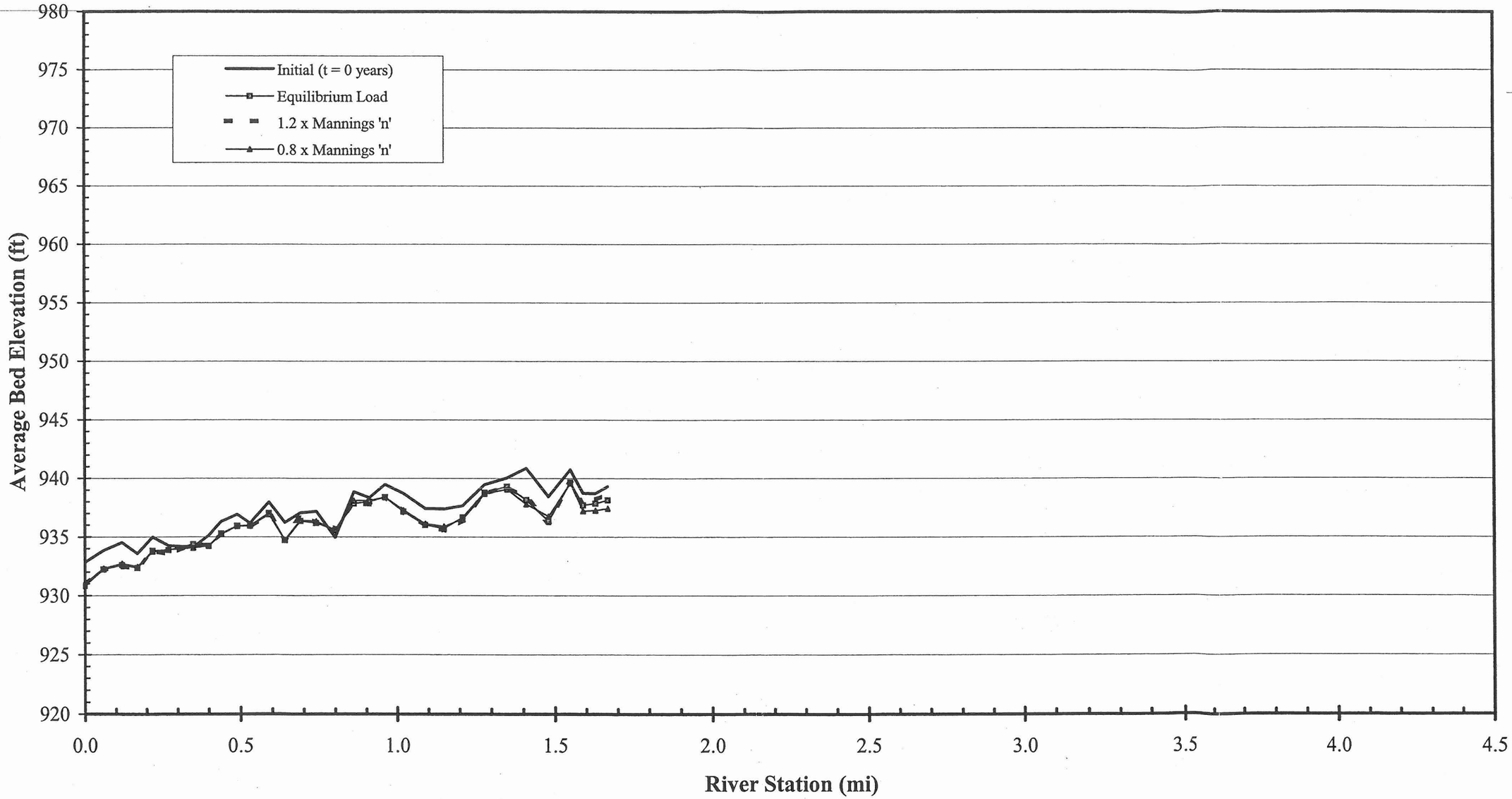
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Sensitivity to Mannings 'n' - Existing Conditions - Lower Gila



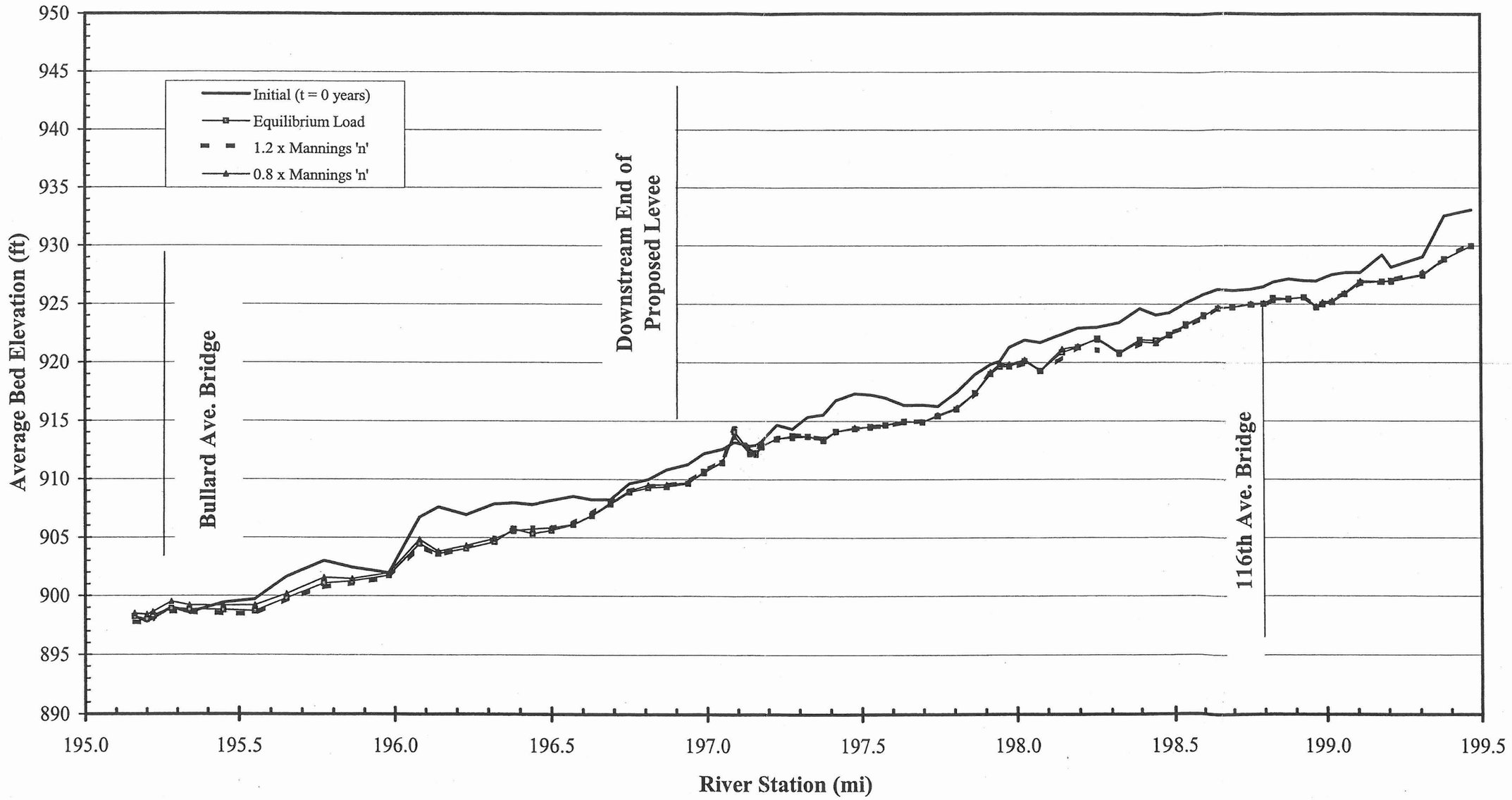
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Sensitivity to Mannings 'n' - Existing Conditions - Salt River



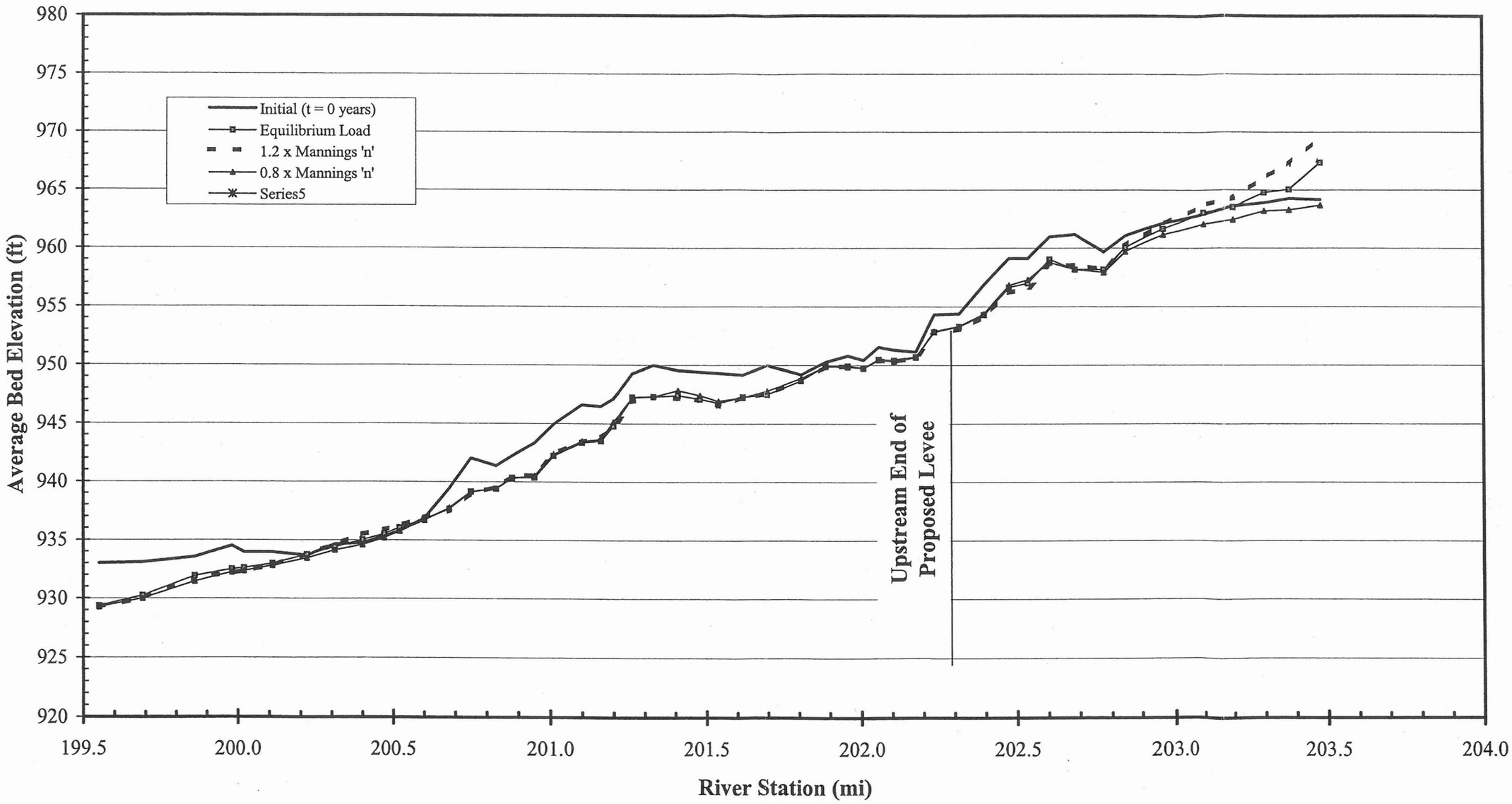
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Sensitivity to Mannings 'n' - Existing Conditions - Upper Gila



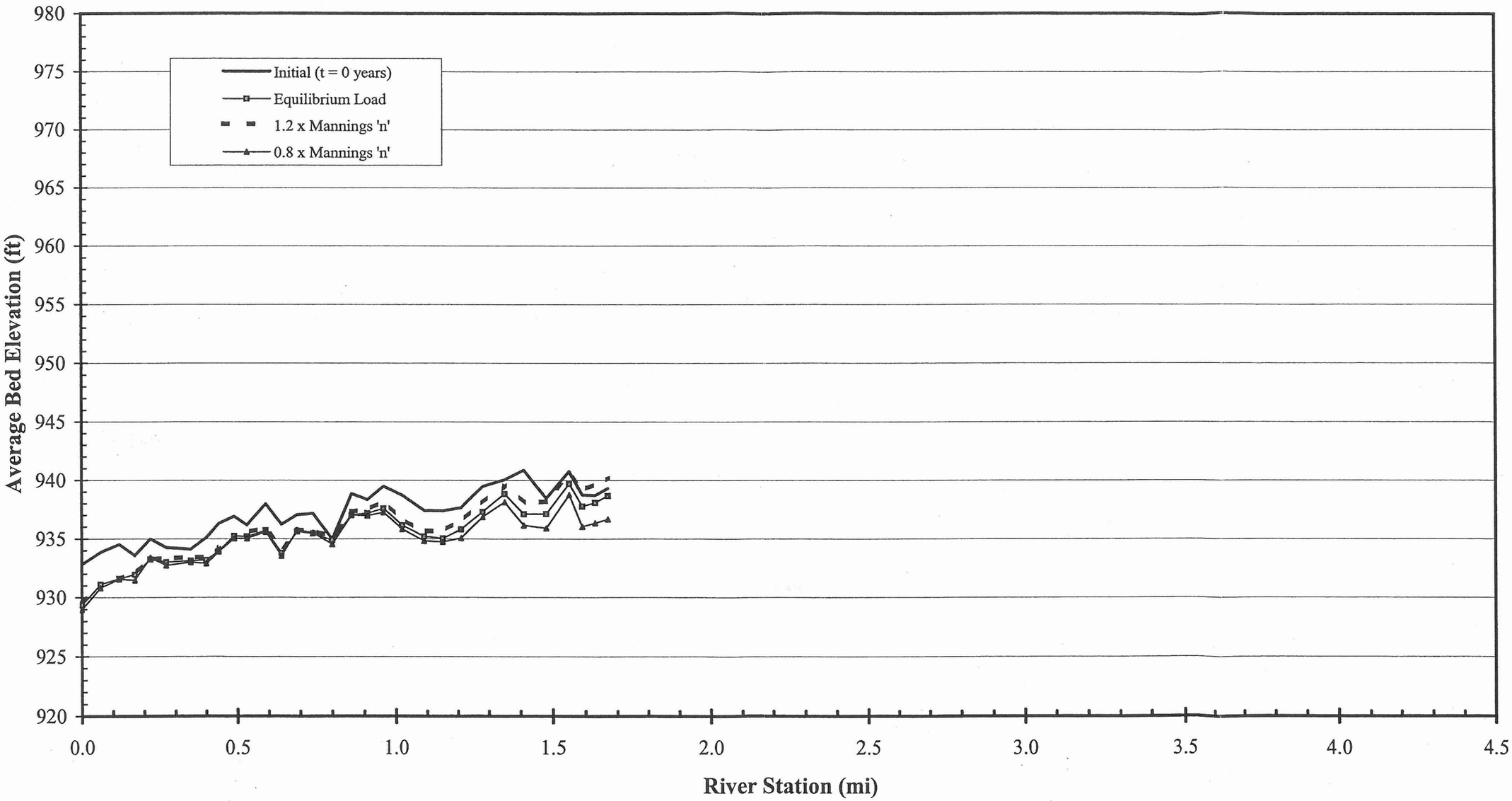
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Sensitivity to Mannings 'n' - Existing Conditions - Lower Gila



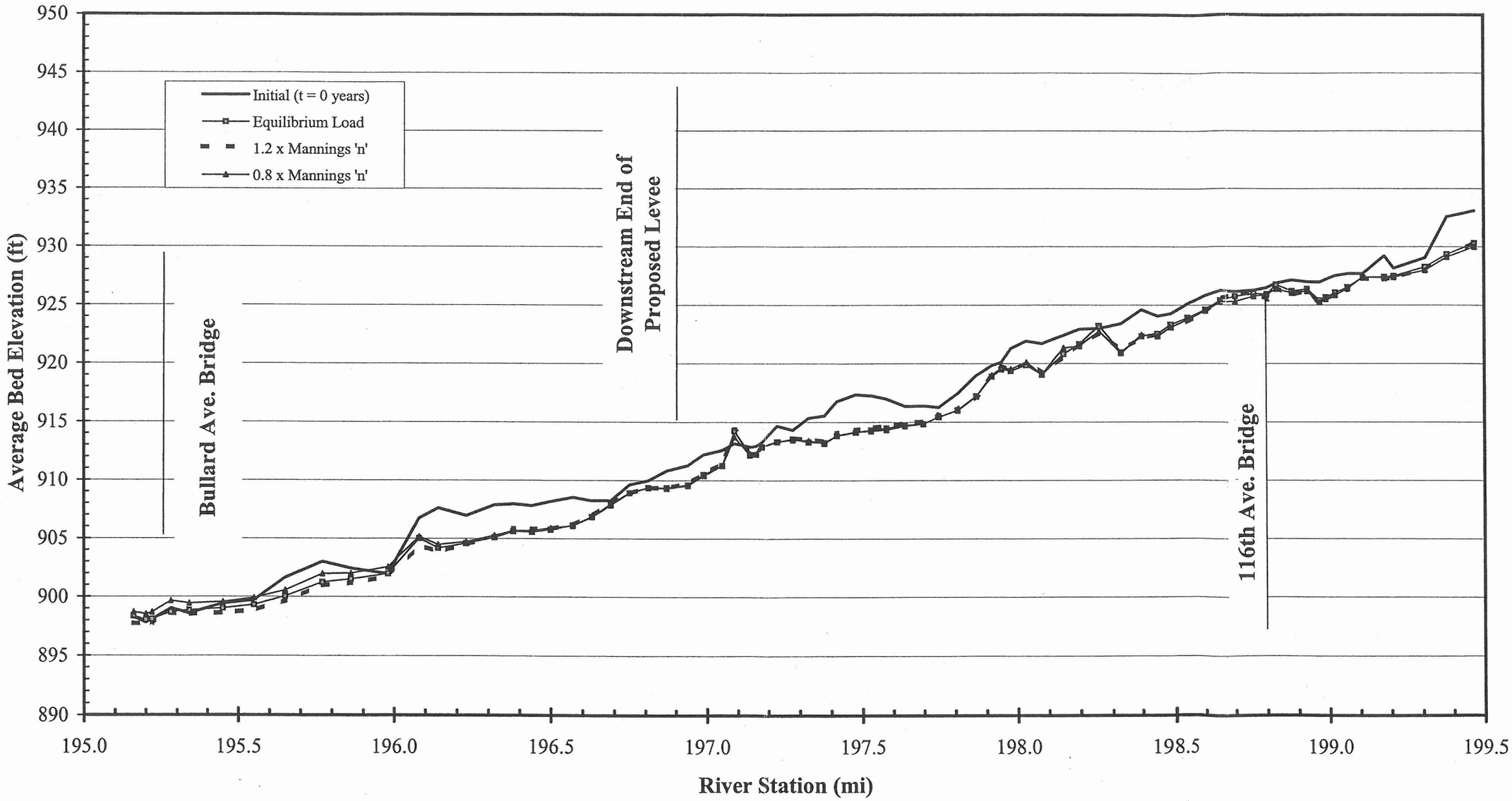
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Sensitivity to Mannings 'n' - Existing Conditions - Salt River



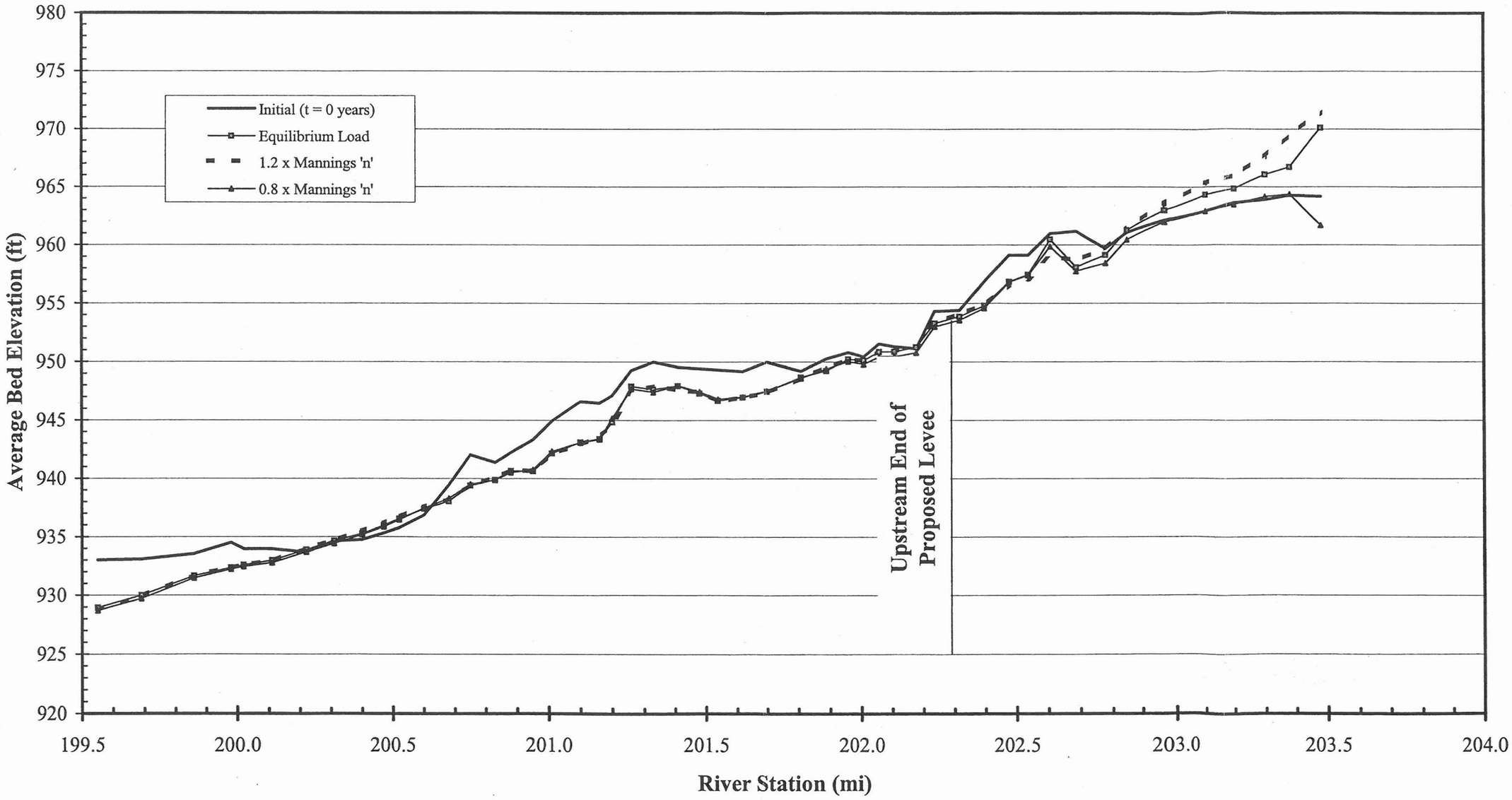
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Sensitivity to Mannings 'n' - Existing Conditions - Upper Gila



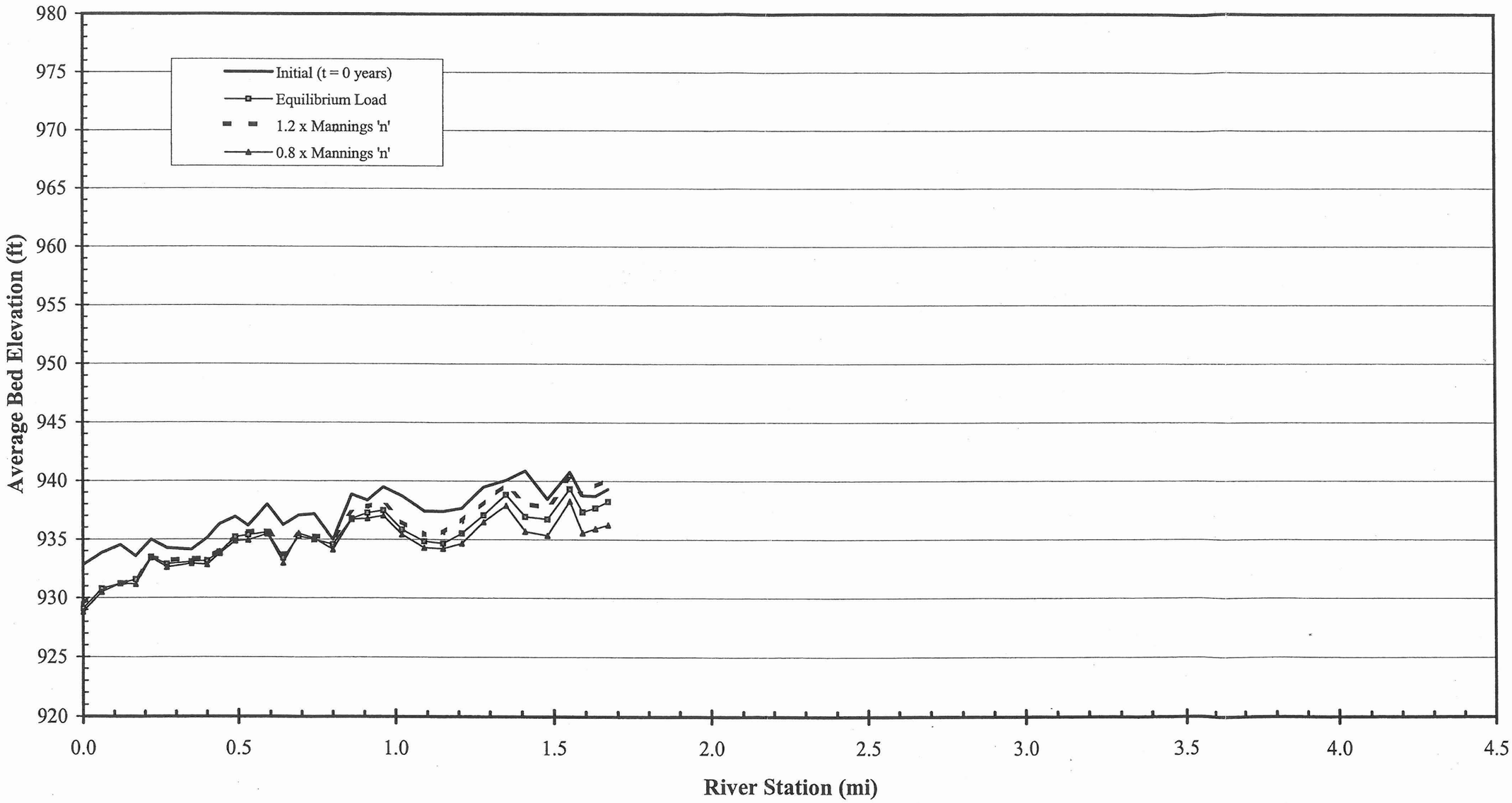
Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Sensitivity to Mannings 'n' - Existing Conditions - Lower Gila



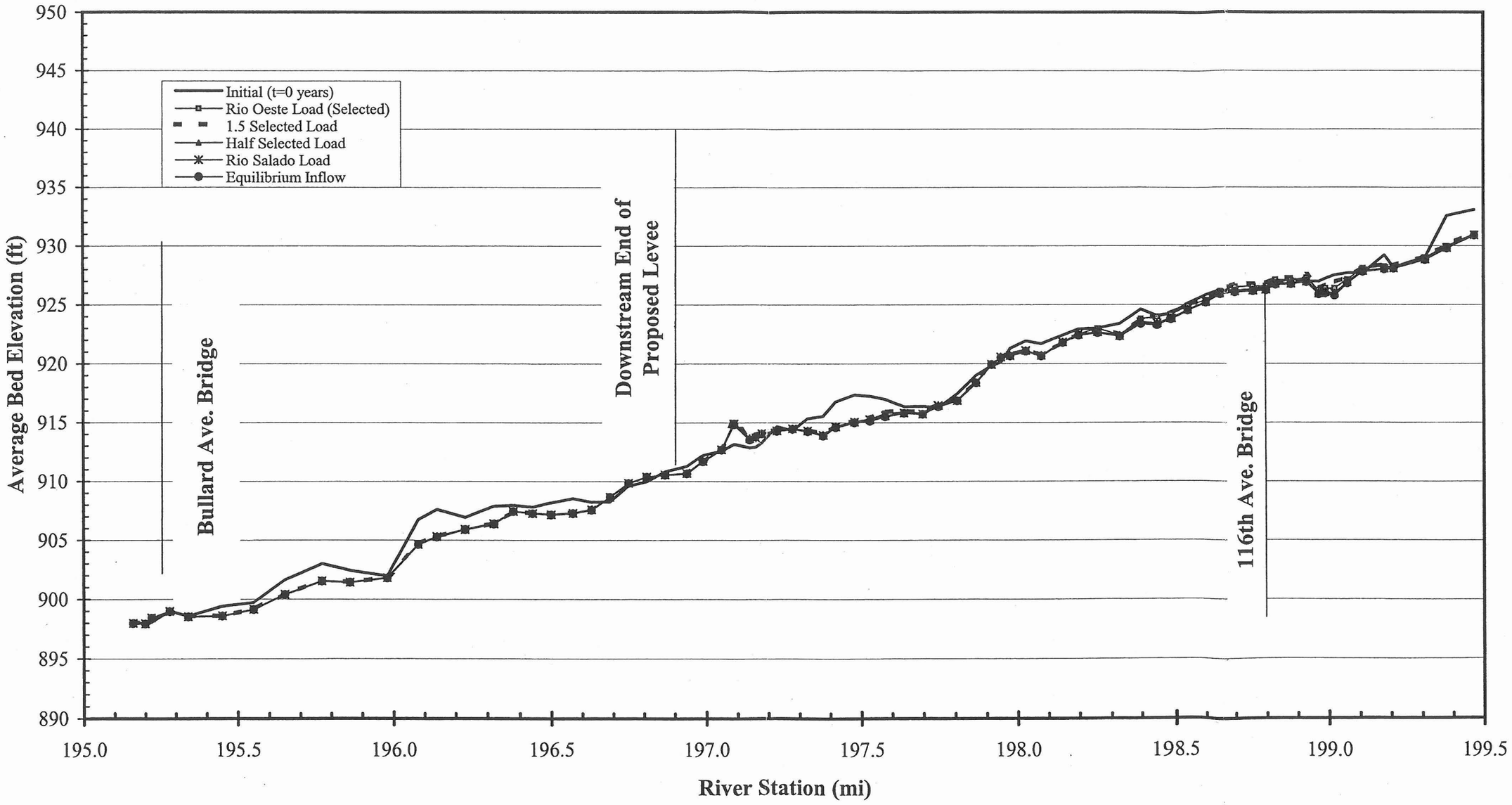
Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Sensitivity to Mannings 'n' - Existing Conditions - Salt River



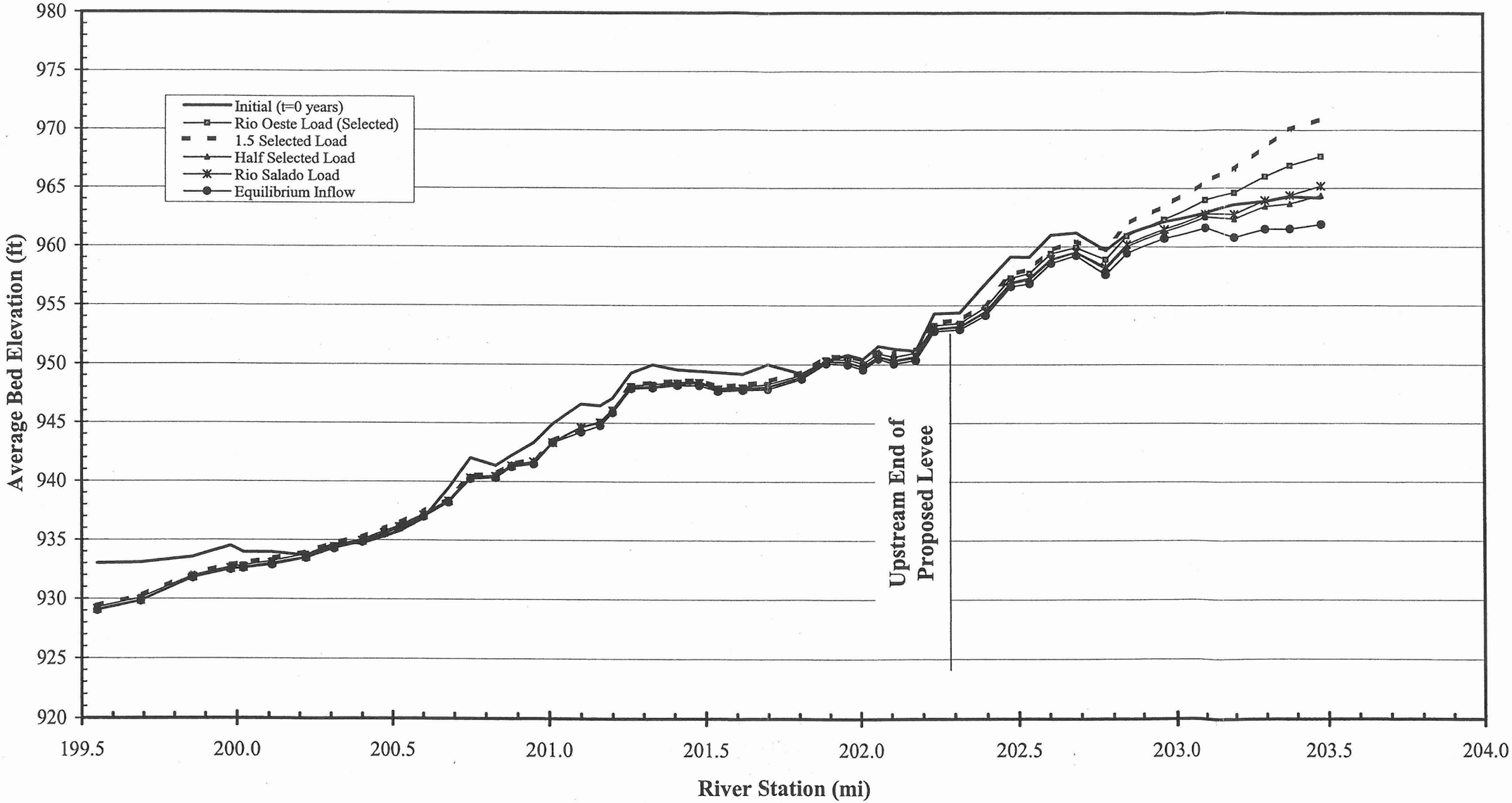
Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Sensitivity to Mannings 'n' - Existing Conditions - Upper Gila



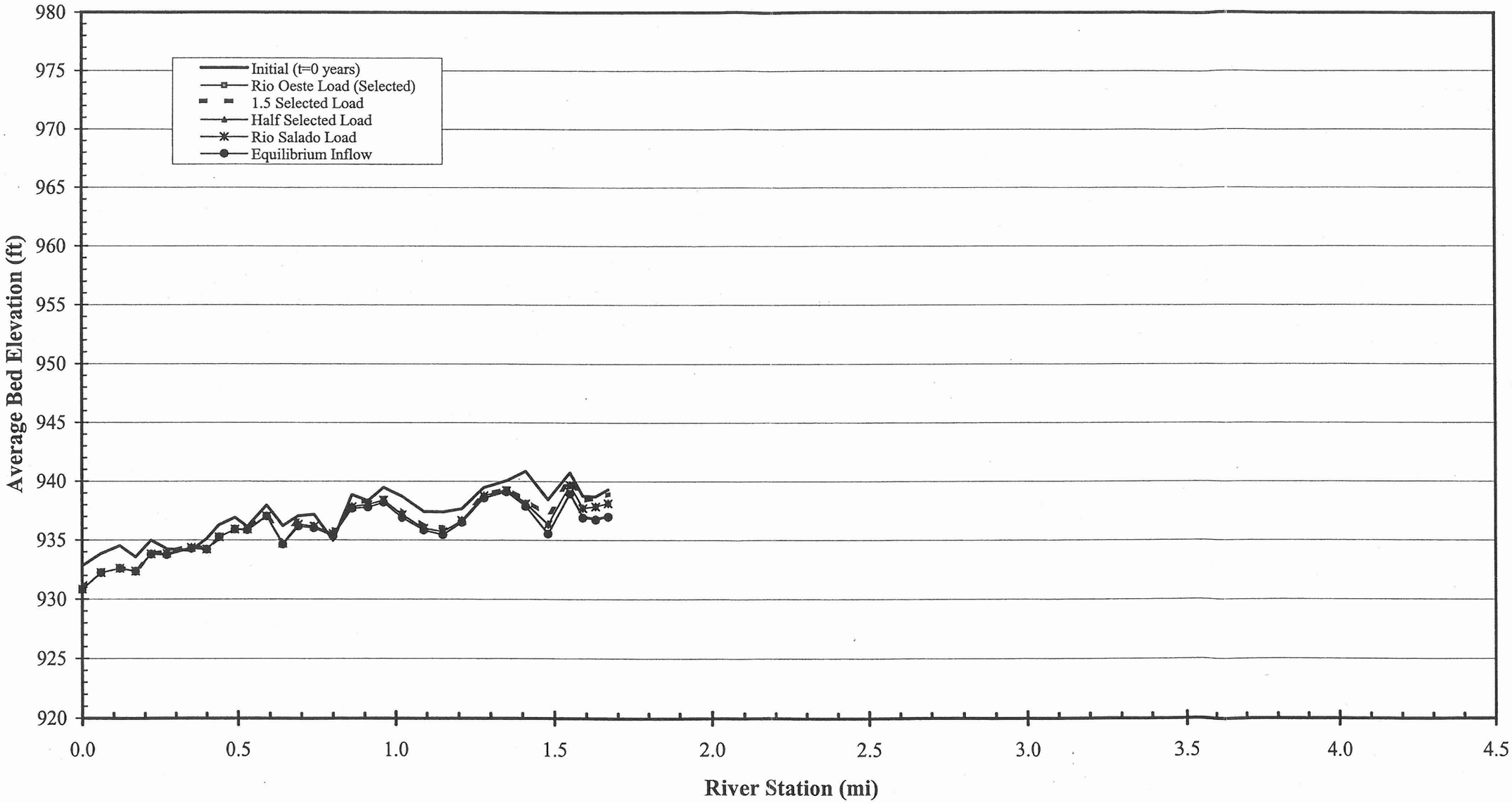
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Sensitivity to Inflowing Load - Existing Conditions - Lower Gila



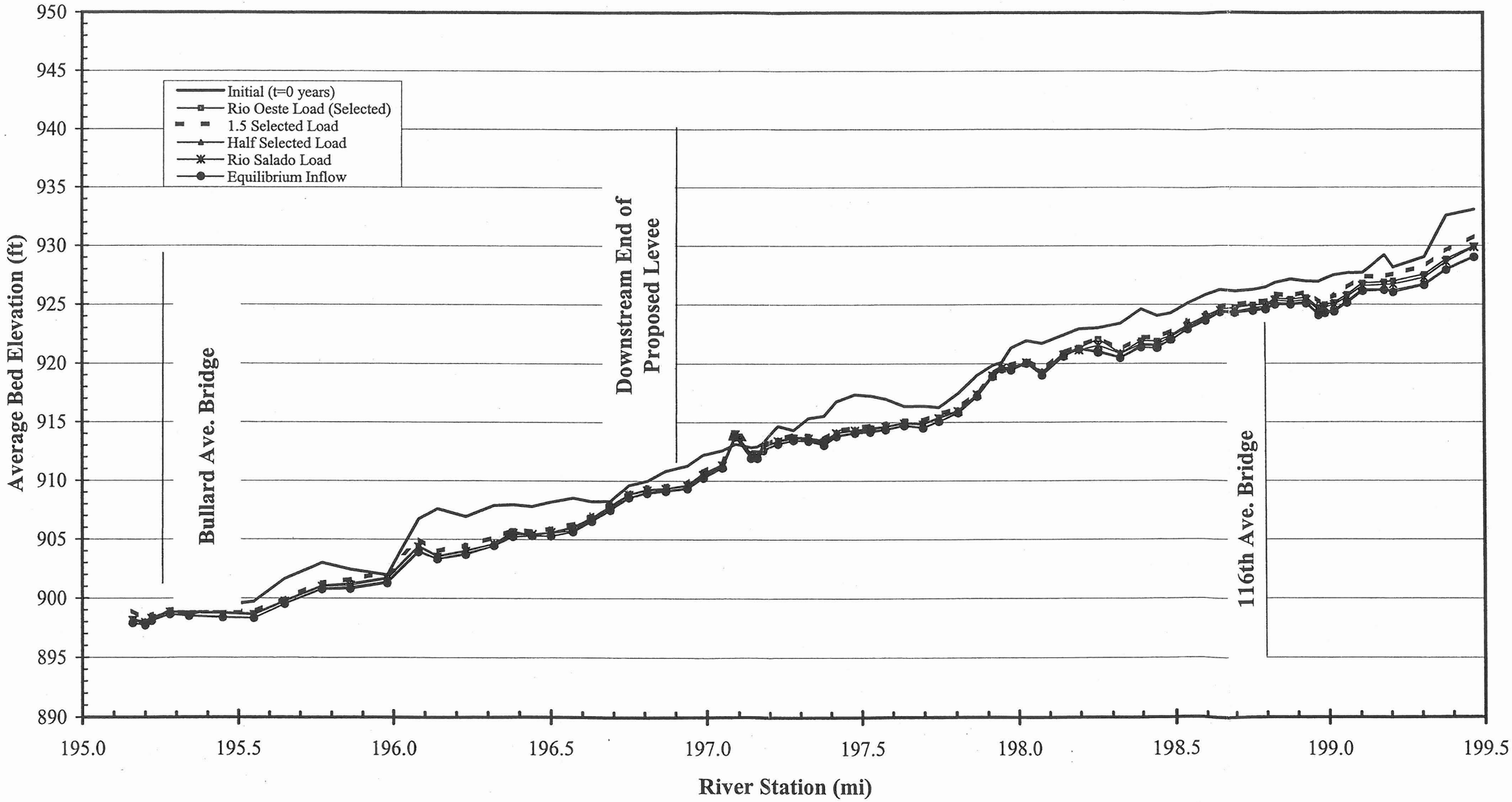
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Sensitivity to Inflowing Load - Existing Conditions - Salt River



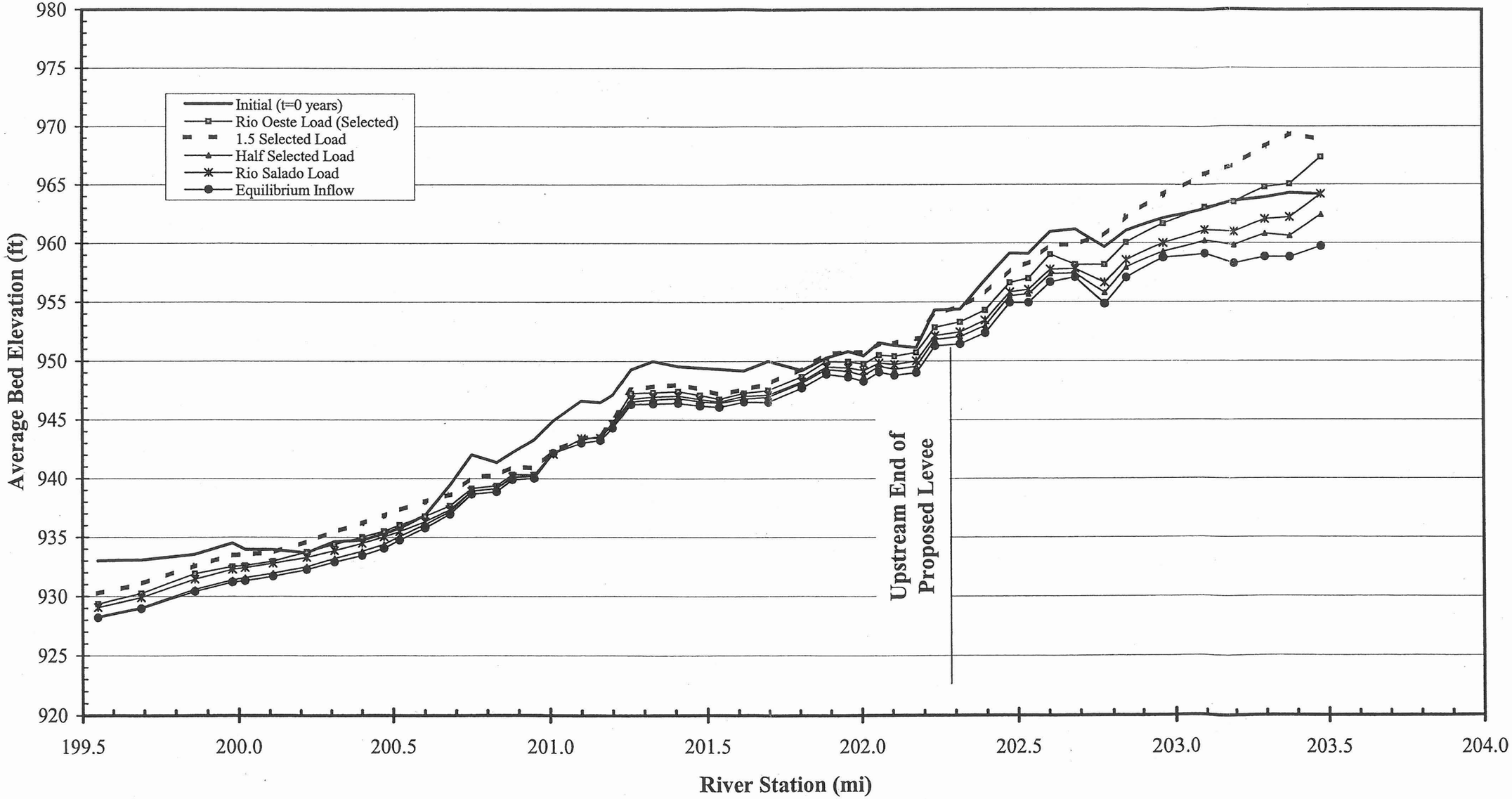
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Sensitivity to Inflowing Load - Existing Conditions - Upper Gila



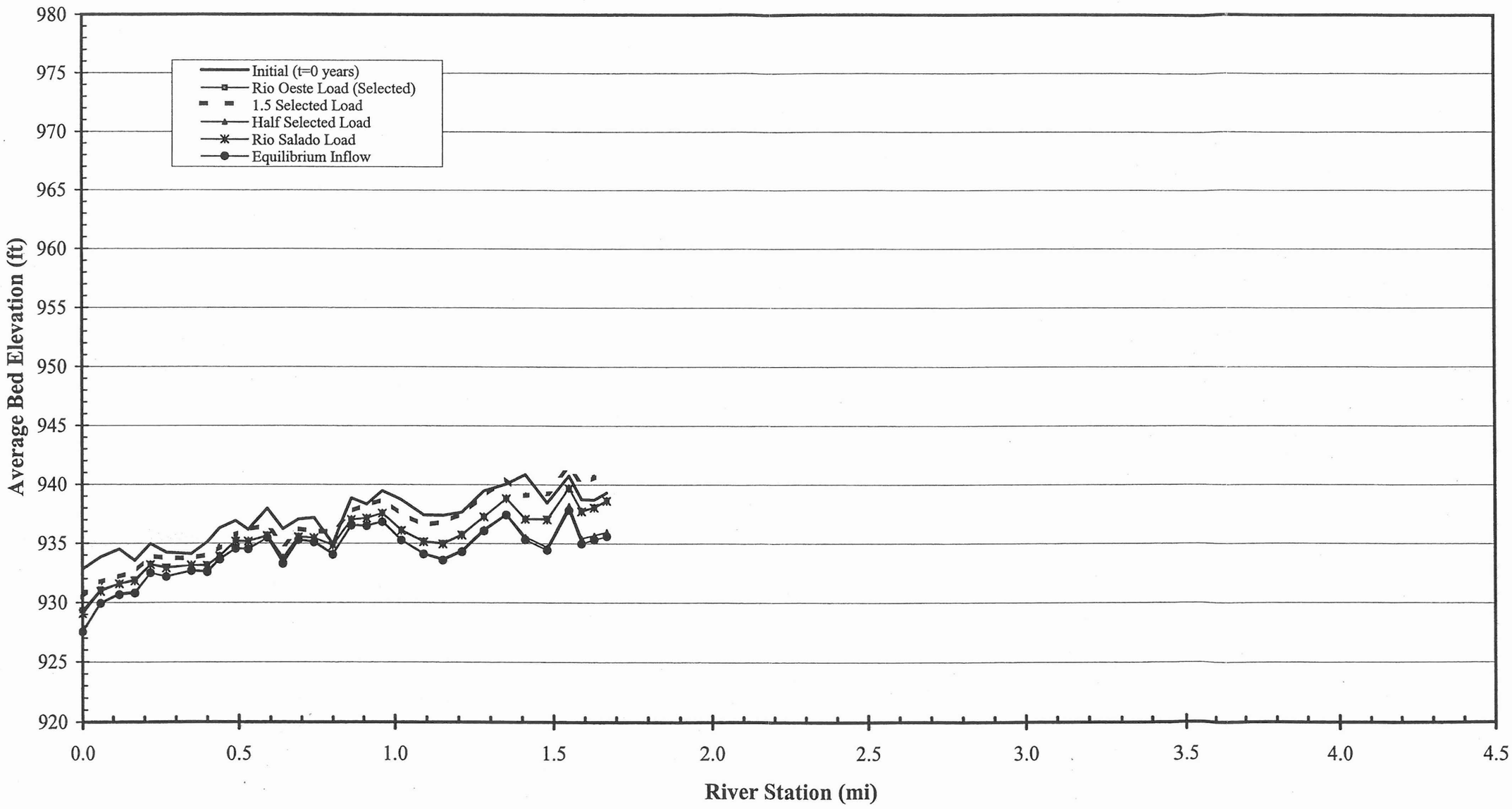
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Sensitivity to Inflowing Load - Existing Conditions - Lower Gila



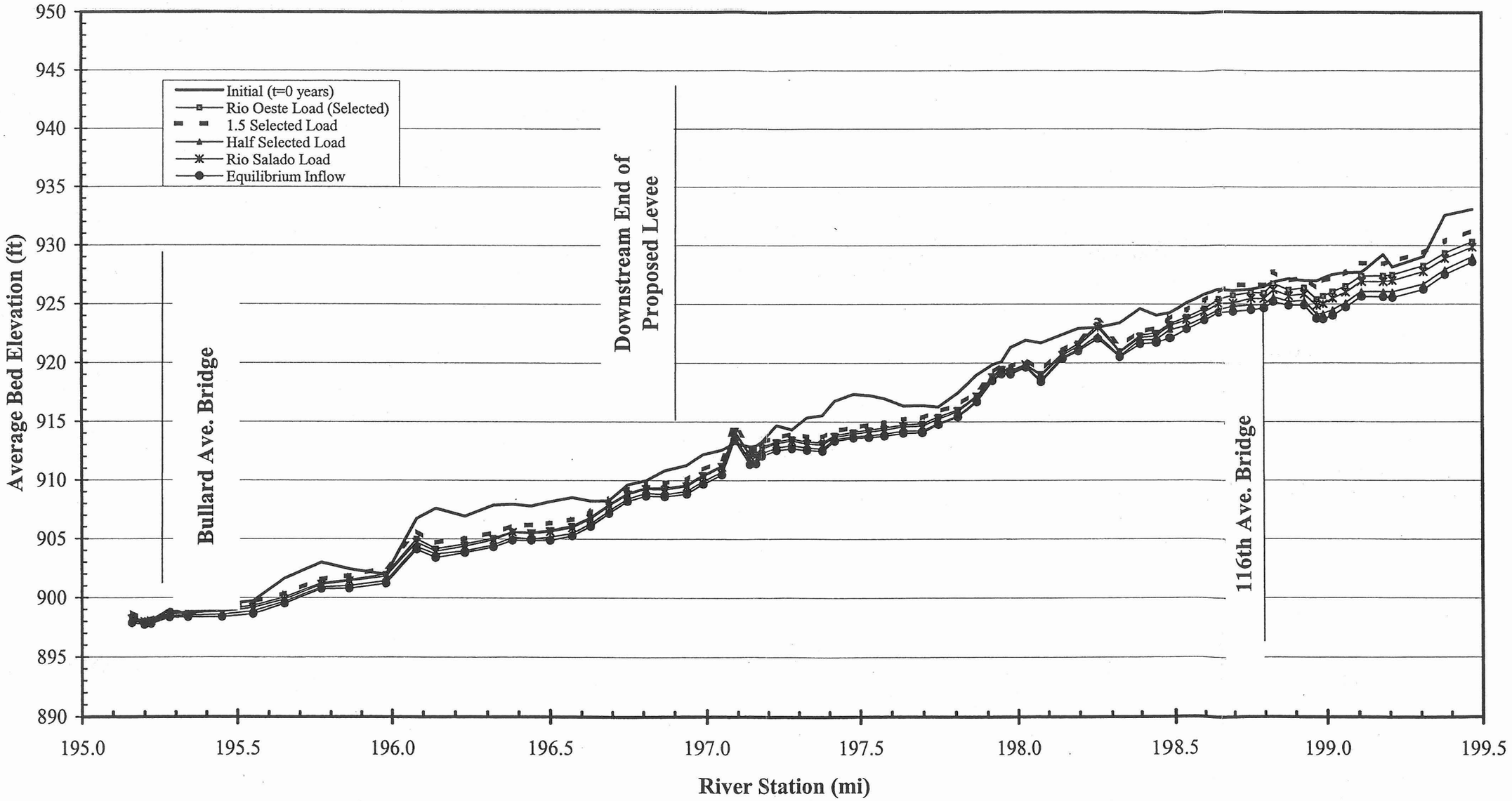
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Sensitivity to Inflowing Load - Existing Conditions - Salt River



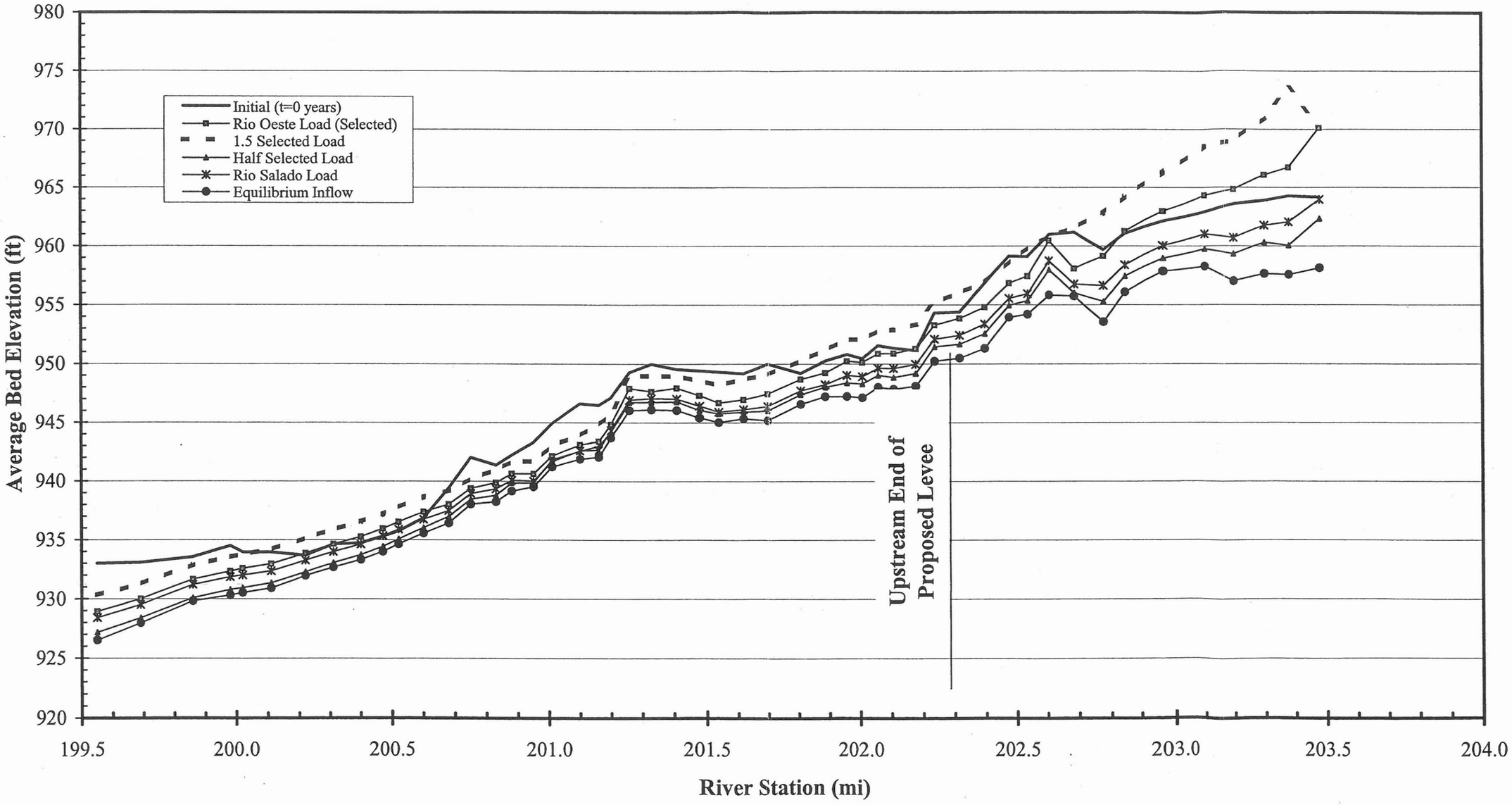
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Sensitivity to Inflowing Load - Existing Conditions - Upper Gila



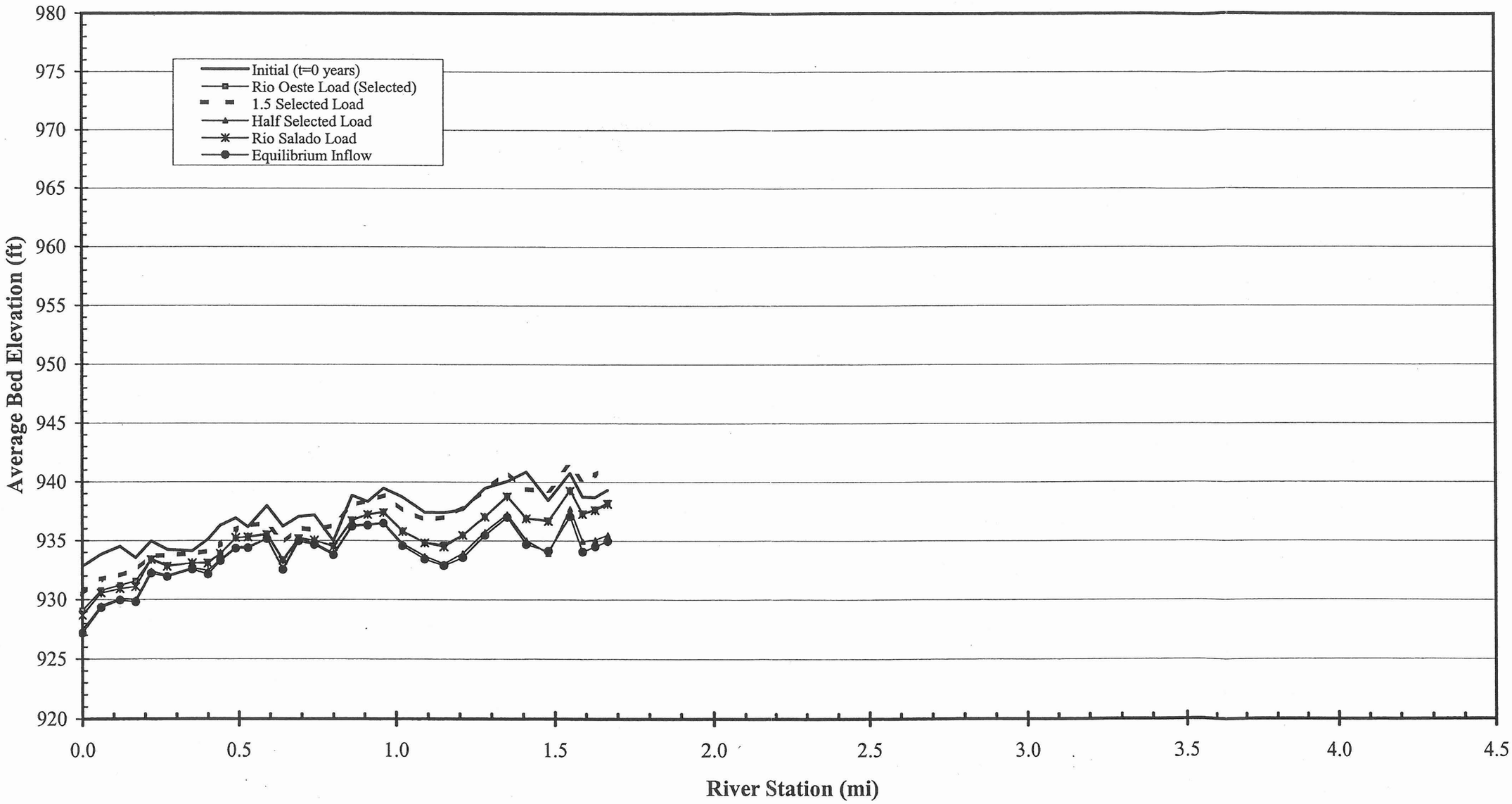
Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Sensitivity to Inflowing Load - Existing Conditions - Lower Gila



Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Sensitivity to Inflowing Load - Existing Conditions - Salt River



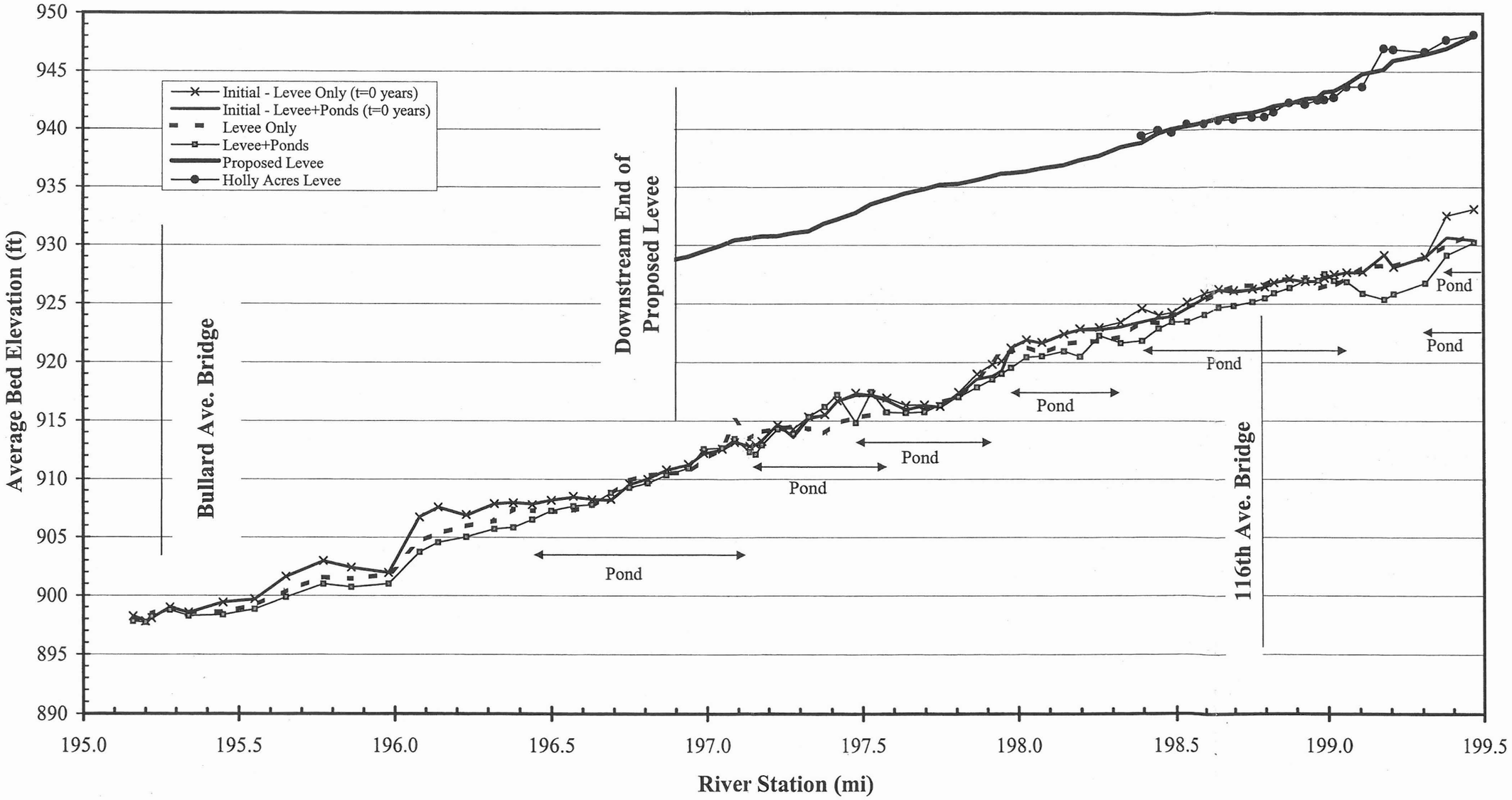
Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Sensitivity to Inflowing Load - Existing Conditions - Upper Gila



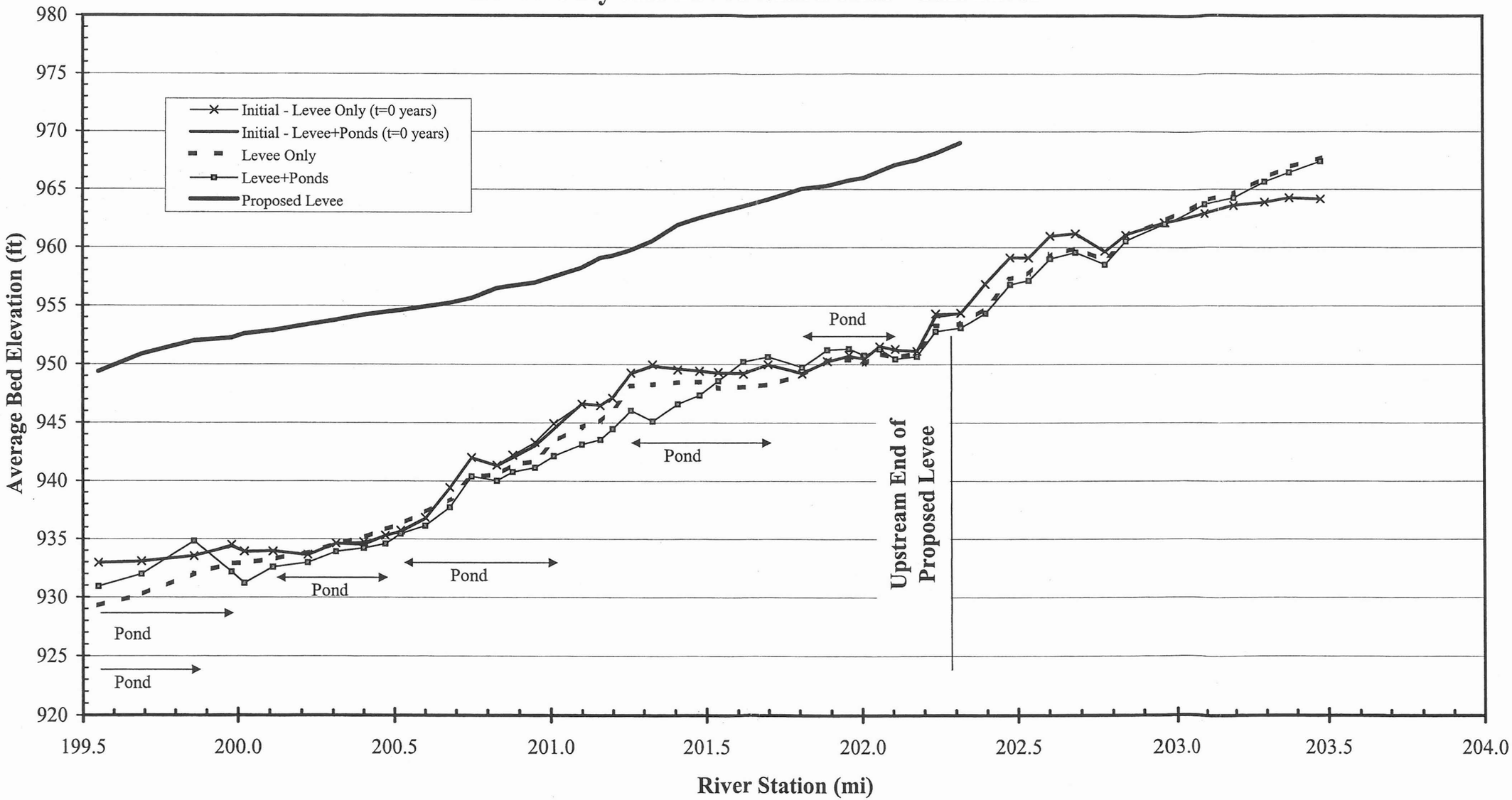
K-ii

Sensitivity Analysis
(Manning's and Inflow Load)

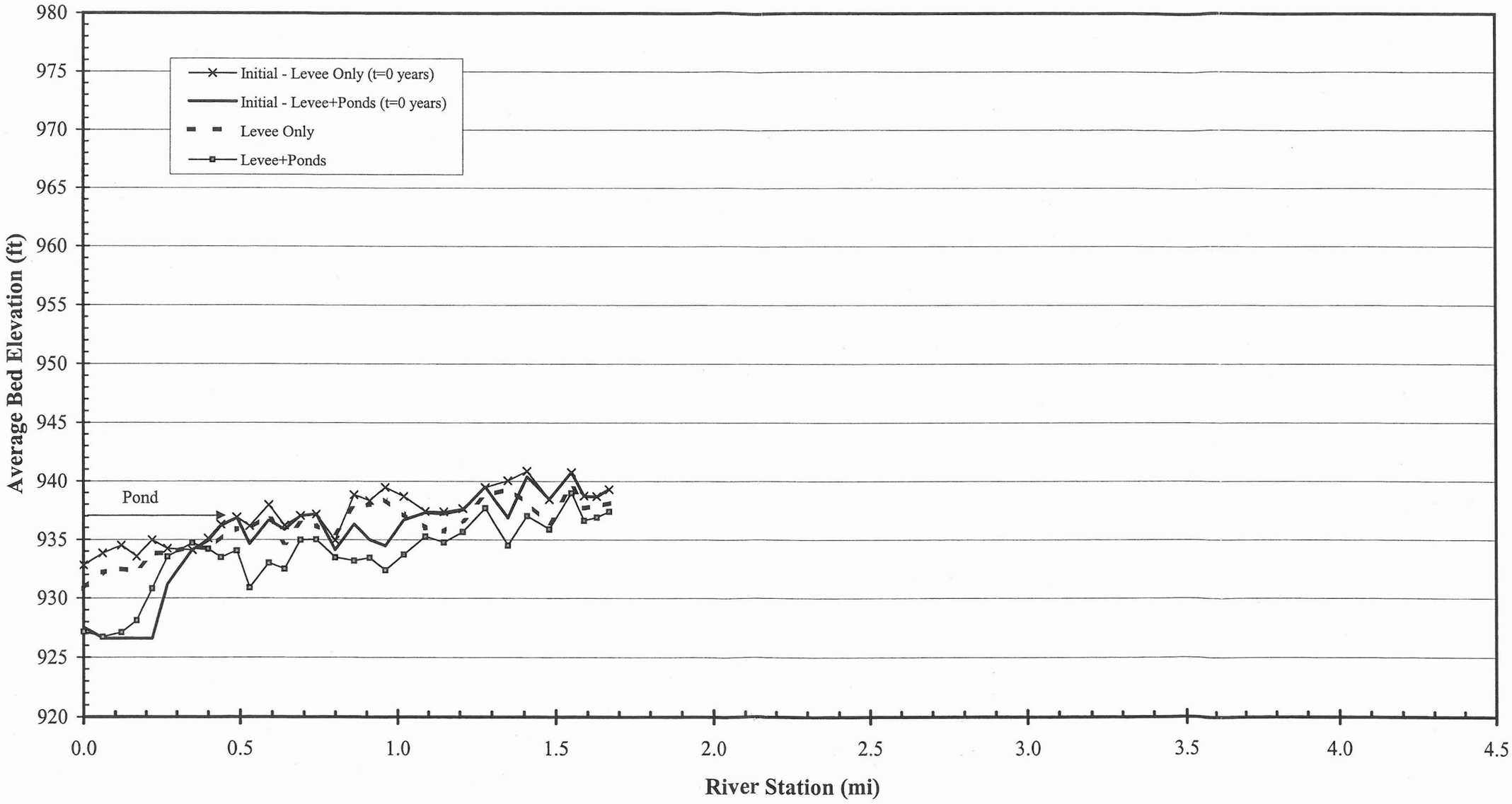
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Levee Only and Levee with Ponds - Lower Gila



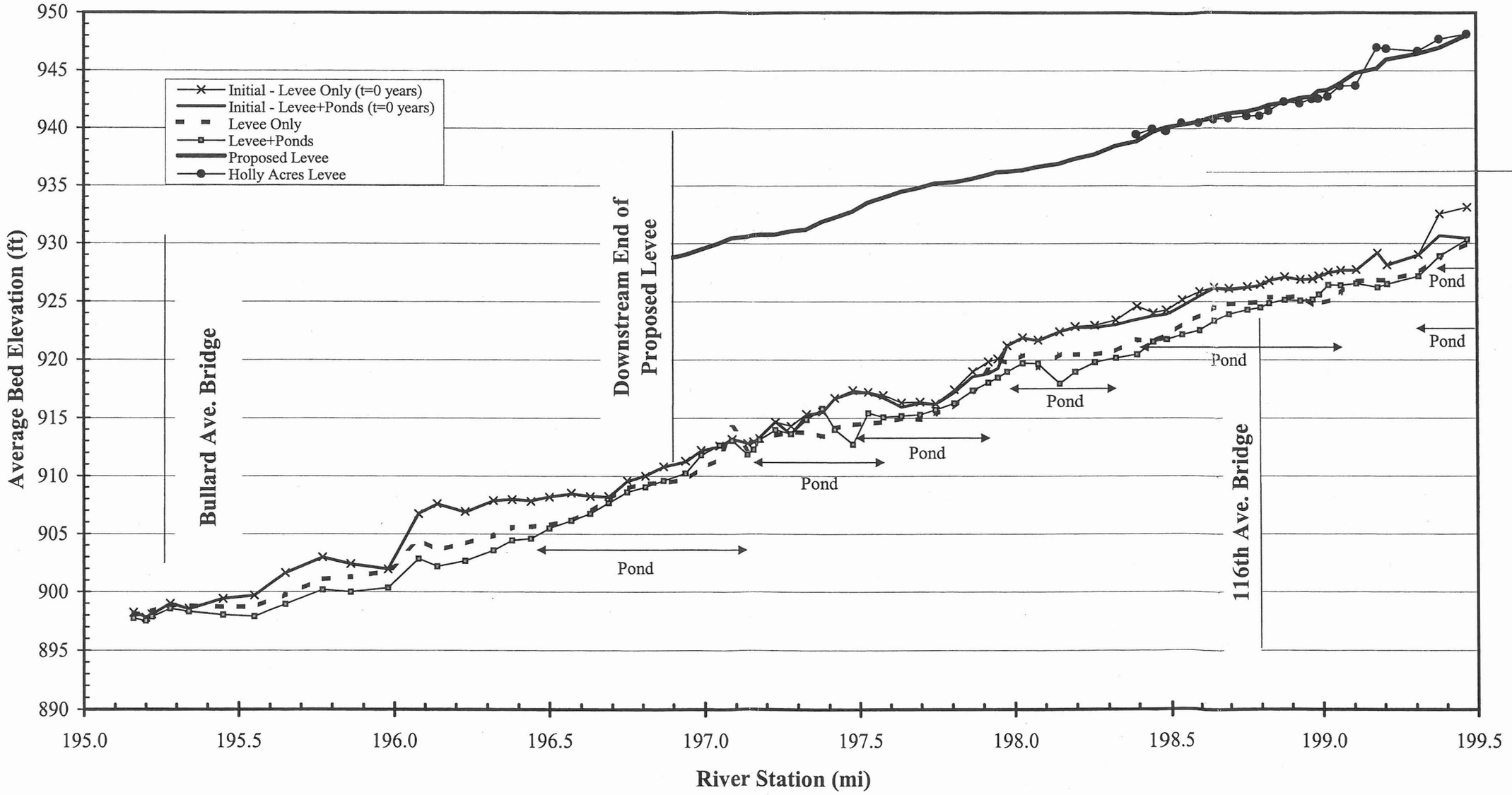
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Levee Only and Levee with Ponds - Salt River



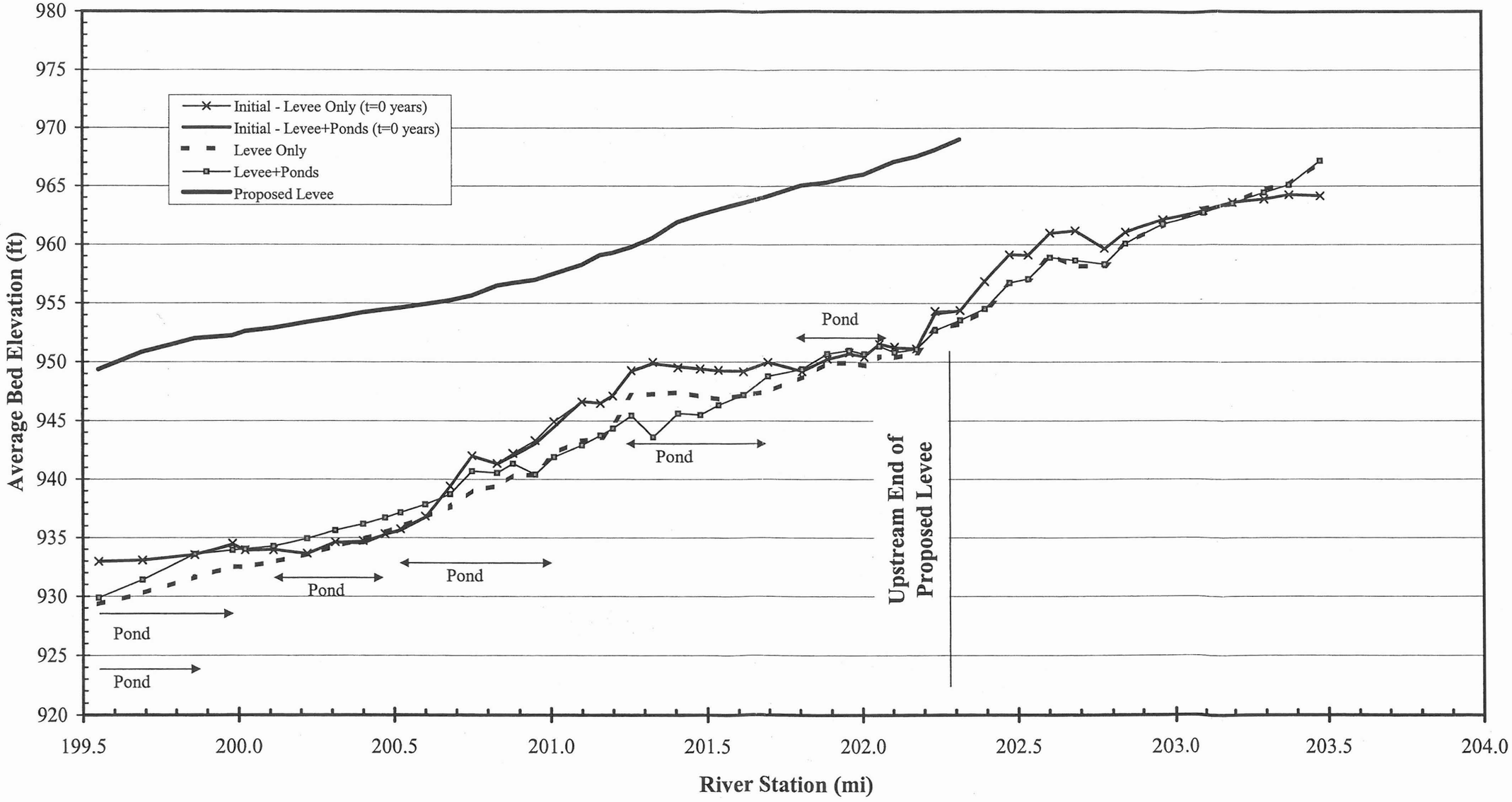
Tres Rios PED
Average Bed Elevation Comparison After 2 Years (1891)
Levee Only and Levee with Ponds - Upper Gila



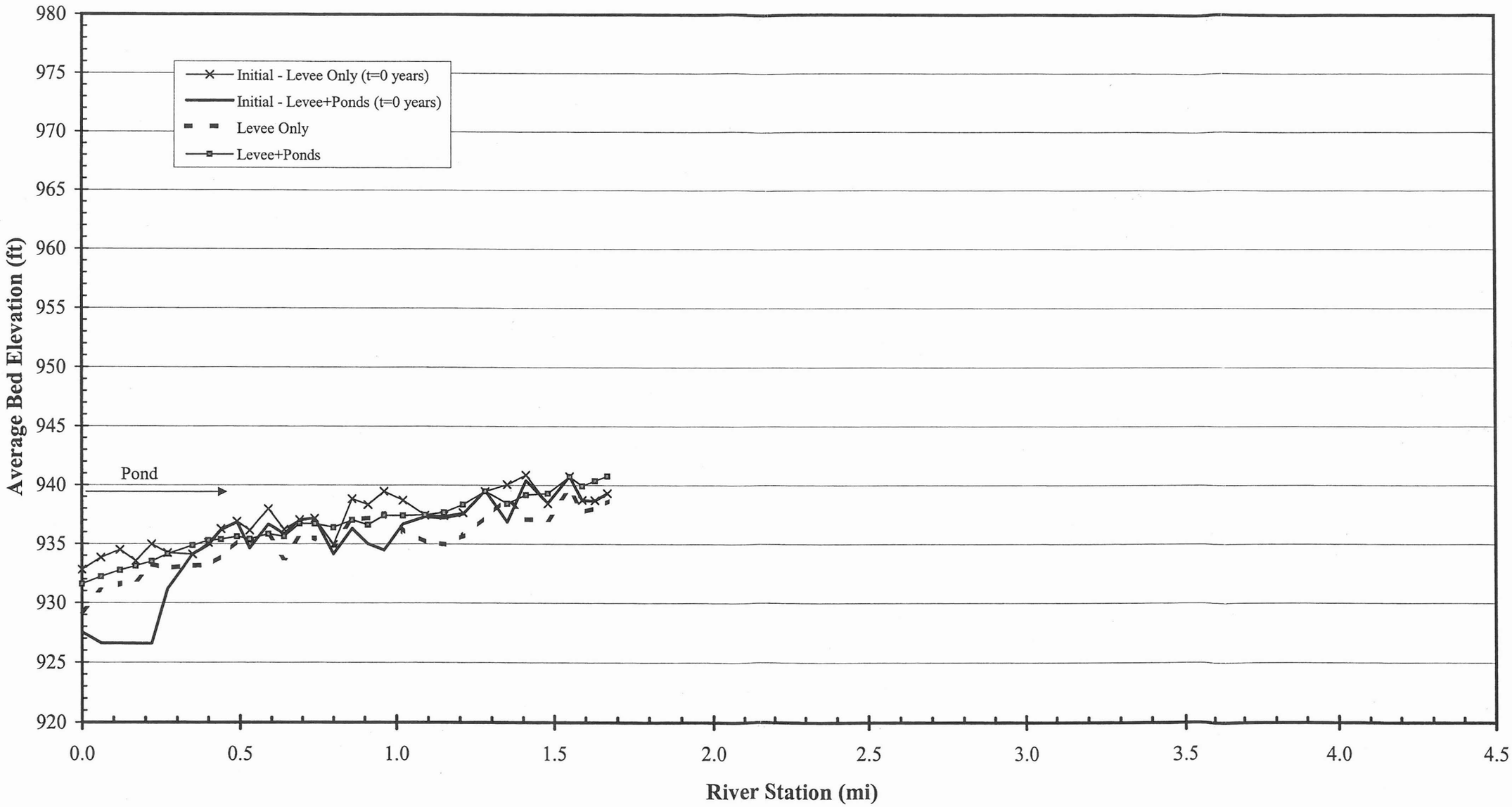
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Levee Only and Levee with Ponds - Lower Gila



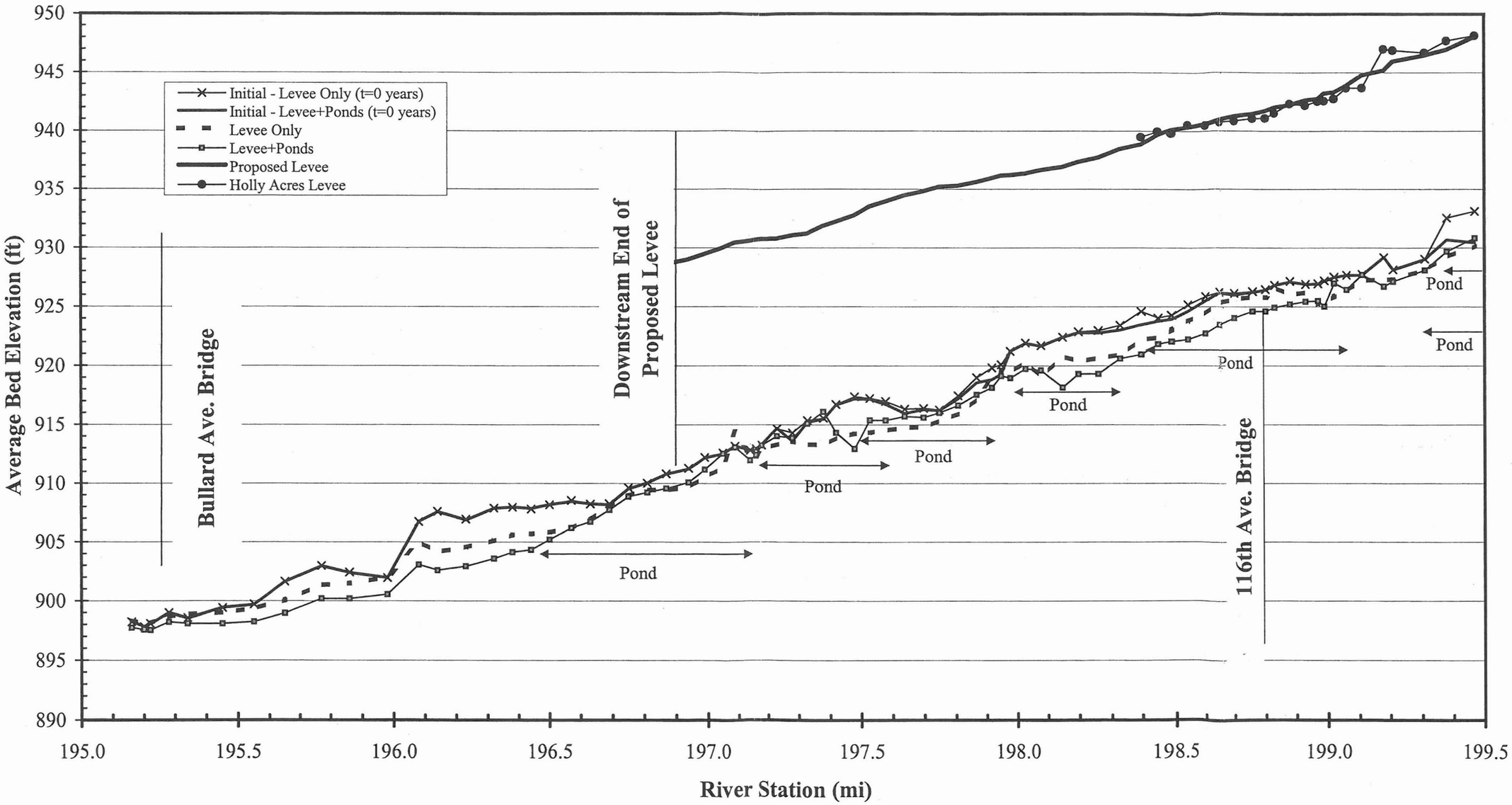
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Levee Only and Levee with Ponds - Salt River



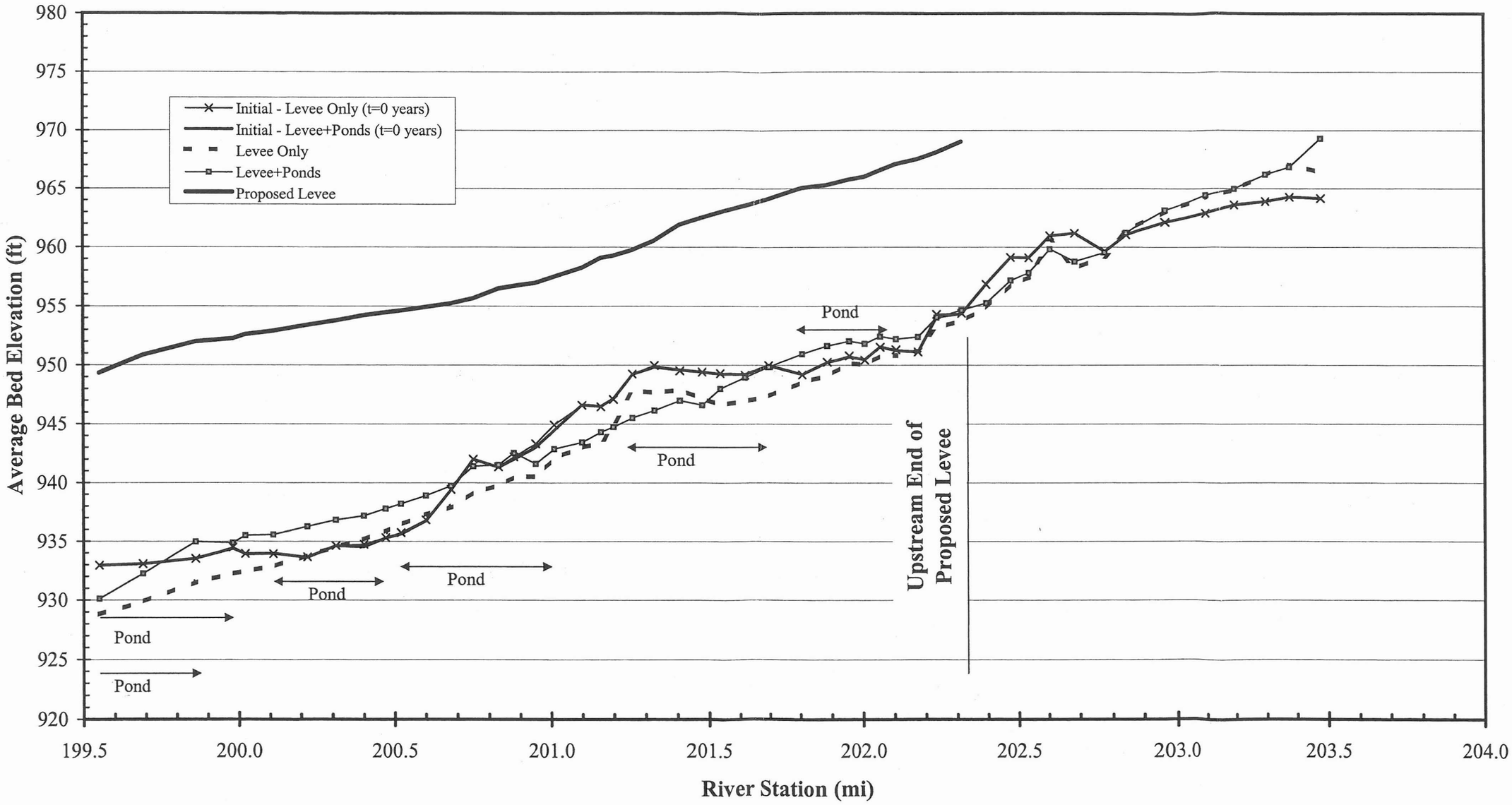
Tres Rios PED
Average Bed Elevation Comparison After 50 Years
Levee Only and Levee with Ponds - Upper Gila



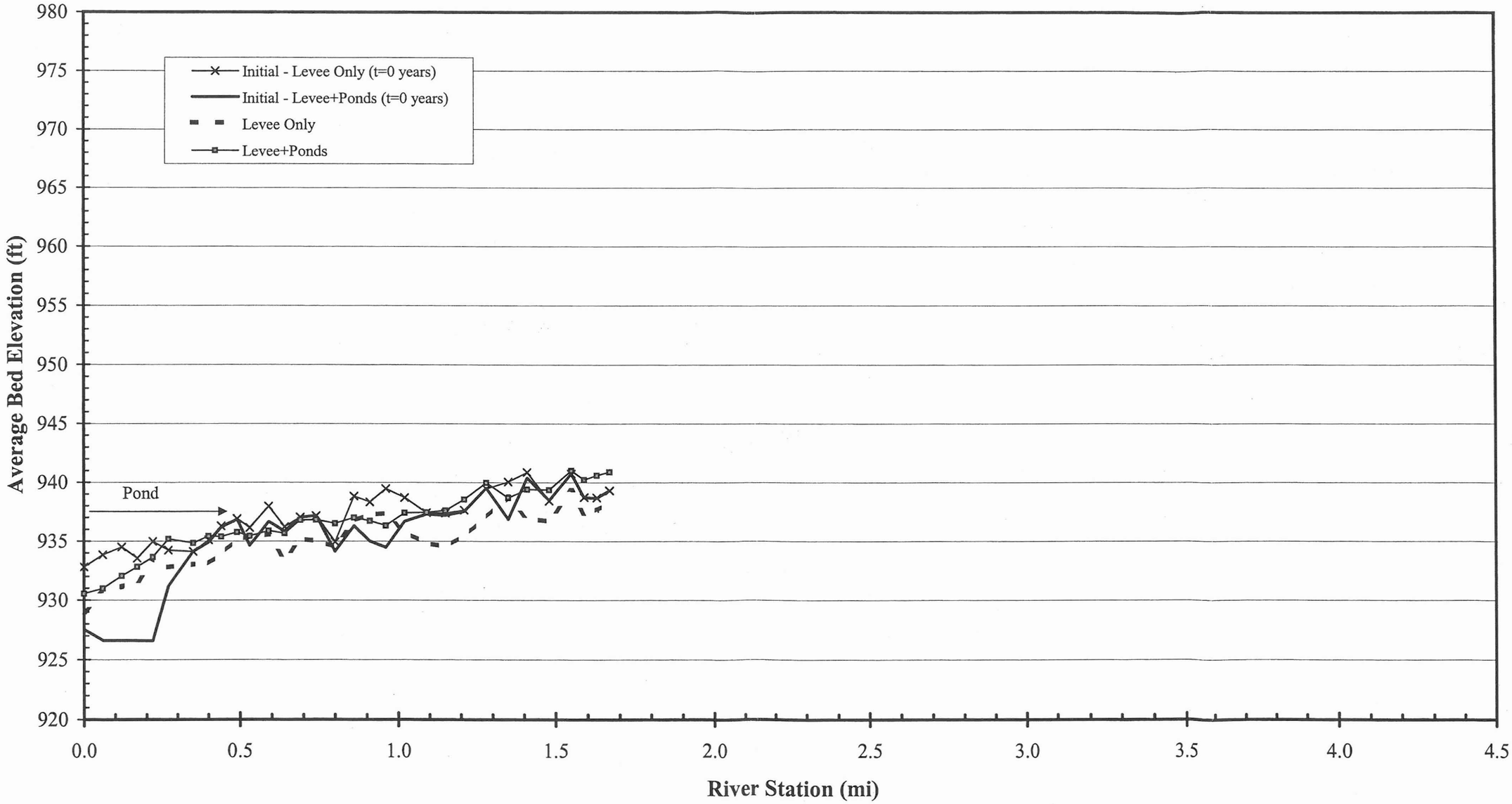
Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Levee Only and Levee with Ponds - Lower Gila



Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Levee Only and Levee with Ponds - Salt River



Tres Rios PED
Average Bed Elevation Comparison After 105 Years
Levee Only and Levee with Ponds - Upper Gila



APPENDIX L

Post-Sediment
HEC-RAS Model Results

i. Existing Condition
ii. Levee Only Condition
iii. Levee + Pond Condition
iv. Comparison of Initial and Post-Sediment Cross Sections for Levee + Pond Condition

L-i

Existing Condition

HEC-RAS Plan: After Sed. River: Gila Reach: Lower Gila Profile: 100_year

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)	
Lower Gila	195.16	100_year	227000.00	889.32	913.20	906.86	914.44	0.001660	9.03	25633.88	1802.00	0.41
Lower Gila	195.2	100_year	227000.00	889.53	913.54	907.18	914.78	0.001611	9.24	25667.28	1787.09	0.41
Lower Gila	195.21		Bridge									
Lower Gila	195.22	100_year	227000.00	889.60	914.52	907.33	915.64	0.001386	8.91	26933.67	1791.45	0.39
Lower Gila	195.28	100_year	227000.00	890.69	914.81	907.68	915.83	0.001295	8.49	28264.58	1917.75	0.37
Lower Gila	195.34	100_year	227000.00	889.82	915.37	908.39	916.24	0.001160	8.17	30928.69	2260.36	0.35
Lower Gila	195.45	100_year	227000.00	892.28	915.81	908.72	916.57	0.001046	7.86	33455.06	2573.84	0.34
Lower Gila	195.55	100_year	227000.00	894.55	916.39	909.64	917.19	0.001100	8.15	32549.44	2491.63	0.35
Lower Gila	195.65	100_year	227000.00	896.03	916.83	910.99	917.79	0.000979	9.31	31514.44	2549.62	0.40
Lower Gila	195.77	100_year	227000.00	896.09	917.46	910.65	918.33	0.000974	8.81	31986.74	2711.09	0.39
Lower Gila	195.86	100_year	227000.00	896.57	918.10	912.01	918.93	0.001028	8.69	33709.40	3166.96	0.38
Lower Gila	195.98	100_year	227000.00	898.00	918.72	912.95	919.50	0.001341	7.98	34743.00	3589.26	0.34
Lower Gila	196.08	100_year	227000.00	898.93	919.57	913.15	920.51	0.001319	10.62	43441.37	3173.98	0.49
Lower Gila	196.14	100_year	227000.00	901.37	920.34	913.97	921.02	0.000706	8.41	47362.53	4498.76	0.37
Lower Gila	196.23	100_year	227000.00	899.52	920.85	914.33	921.26	0.000518	6.51	53031.13	5277.88	0.28
Lower Gila	196.32	100_year	227000.00	901.67	921.21	915.48	921.53	0.000590	5.56	52852.97	5889.83	0.24
Lower Gila	196.38	100_year	227000.00	903.13	921.43	915.66	921.83	0.000573	6.60	51763.56	6324.42	0.29
Lower Gila	196.44	100_year	227000.00	903.57	921.59	916.61	922.00	0.000593	6.60	52118.41	6631.62	0.29
Lower Gila	196.5	100_year	227000.00	903.89	921.75	916.52	922.24	0.000712	7.12	49496.79	6522.22	0.31
Lower Gila	196.57	100_year	227000.00	904.08	922.08	917.20	922.53	0.001007	6.79	50099.24	6688.64	0.30
Lower Gila	196.63	100_year	227000.00	904.69	922.43	917.96	922.94	0.001163	7.08	48386.36	6477.06	0.31
Lower Gila	196.69	100_year	227000.00	905.40	922.75	918.32	923.31	0.001157	7.18	46792.34	6560.34	0.33
Lower Gila	196.75	100_year	227000.00	905.59	923.18	918.90	923.71	0.001323	7.13	47790.29	6655.69	0.33
Lower Gila	196.81	100_year	227000.00	905.96	923.50	919.18	924.14	0.001085	7.83	45121.63	6291.23	0.36
Lower Gila	196.87	100_year	227000.00	906.24	923.75	918.67	924.44	0.000939	8.22	44558.16	6204.56	0.38
Lower Gila	196.94	100_year	227000.00	906.59	924.08	919.17	924.76	0.001119	8.15	43171.69	6270.70	0.38
Lower Gila	196.99	100_year	227000.00	906.28	924.53	919.87	925.21	0.001293	7.80	41459.30	6101.98	0.36
Lower Gila	197.05	100_year	227000.00	907.73	924.96	920.56	925.60	0.001285	7.79	43048.65	5603.13	0.37
Lower Gila	197.09	100_year	227000.00	907.71	925.31	921.24	925.99	0.001422	8.26	39805.73	5479.40	0.44
Lower Gila	197.14	100_year	227000.00	908.08	925.72	921.45	926.32	0.001225	7.22	39783.66	5352.07	0.34
Lower Gila	197.16	100_year	227000.00	908.04	925.90	921.26	926.66	0.001265	8.56	40543.15	5418.02	0.40
Lower Gila	197.18	100_year	227000.00	909.19	926.05	921.55	926.84	0.001257	8.62	42517.22	5509.75	0.41
Lower Gila	197.23	100_year	227000.00	909.47	926.23	921.59	927.00	0.001296	8.42	44614.50	5746.47	0.41
Lower Gila	197.28	100_year	227000.00	909.70	926.48	921.71	927.34	0.001275	8.85	42262.38	5444.13	0.43
Lower Gila	197.33	100_year	227000.00	910.05	926.82	920.96	927.65	0.001235	8.83	44449.86	5048.25	0.42
Lower Gila	197.38	100_year	227000.00	910.32	927.31	922.29	928.01	0.001384	8.22	41516.95	5571.12	0.38
Lower Gila	197.42	100_year	227000.00	910.54	927.57	922.36	928.40	0.001272	8.84	43014.24	5590.77	0.41
Lower Gila	197.48	100_year	227000.00	910.66	927.97	921.93	928.73	0.001348	8.63	44813.09	5564.39	0.40
Lower Gila	197.53	100_year	227000.00	910.98	928.42	924.01	929.13	0.001176	8.29	45832.31	5467.38	0.38
Lower Gila	197.58	100_year	227000.00	911.28	928.68	923.48	929.43	0.000983	8.60	44024.42	5073.35	0.40
Lower Gila	197.64	100_year	227000.00	911.59	929.01	925.51	929.69	0.000909	8.04	43318.50	5389.29	0.37
Lower Gila	197.7	100_year	227000.00	911.47	929.28	926.00	929.99	0.000978	8.37	40456.80	5397.59	0.38
Lower Gila	197.75	100_year	227000.00	911.87	929.61	926.34	930.29	0.000943	8.09	39622.23	5855.35	0.37
Lower Gila	197.81	100_year	227000.00	912.10	929.82	925.73	930.59	0.001024	8.60	38513.80	4961.69	0.40
Lower Gila	197.87	100_year	227000.00	912.49	930.20	926.06	930.89	0.001006	7.94	38343.24	4731.84	0.38
Lower Gila	197.92	100_year	227000.00	912.97	930.55	926.51	931.23	0.001007	7.84	38095.86	4525.14	0.40
Lower Gila	197.952	100_year	227000.00	913.26	930.78	926.58	931.51	0.001008	7.82	37857.85	4553.73	0.41
Lower Gila	197.98	100_year	227000.00	912.80	930.96	925.01	931.68	0.001144	8.30	41071.95	4528.42	0.43
Lower Gila	198.03	100_year	227000.00	914.18	931.20	927.01	931.88	0.001181	8.28	40656.39	4358.72	0.43
Lower Gila	198.08	100_year	227000.00	914.40	931.43	927.33	932.24	0.001264	9.01	37835.96	4270.80	0.45
Lower Gila	198.15	100_year	227000.00	914.50	931.75	927.58	932.55	0.001205	8.56	43202.88	4036.90	0.45
Lower Gila	198.2	100_year	227000.00	914.66	932.23	928.67	933.03	0.001276	8.64	43824.34	4220.80	0.46
Lower Gila	198.26	100_year	227000.00	914.84	932.58	928.61	933.52	0.001508	8.70	40916.16	4248.57	0.49
Lower Gila	198.33	100_year	227000.00	916.23	933.03	928.79	933.88	0.000959	8.21	32935.75	3460.34	0.41
Lower Gila	198.4	100_year	227000.00	917.85	933.37	929.64	934.33	0.001284	8.04	29862.73	3234.15	0.42
Lower Gila	198.45	100_year	227000.00	918.78	933.90	930.31	934.78	0.001239	8.49	31587.03	3489.62	0.44
Lower Gila	198.49	100_year	227000.00	919.38	934.14	930.51	935.17	0.001436	9.22	29079.97	3294.84	0.49
Lower Gila	198.54	100_year	227000.00	919.46	934.55	930.01	935.52	0.001381	9.07	30706.23	3646.27	0.48
Lower Gila	198.6	100_year	227000.00	920.10	934.88	931.01	935.93	0.001462	9.13	29665.45	3204.94	0.49
Lower Gila	198.65	100_year	227000.00	921.05	935.36	931.71	936.42	0.001385	8.69	29718.24	3144.51	0.48
Lower Gila	198.7	100_year	227000.00	921.39	935.74	931.51	936.79	0.001445	8.87	29511.91	2951.47	0.49
Lower Gila	198.76	100_year	227000.00	921.38	936.09	932.01	937.18	0.001452	8.95	29518.21	4587.46	0.49
Lower Gila	198.8	100_year	227000.00	921.61	936.64	932.21	937.68	0.001952	8.12	27849.39	3686.22	0.43
Lower Gila	198.83	100_year	227000.00	921.97	936.98	932.71	938.09	0.001612	9.50	29541.70	3655.10	0.52
Lower Gila	198.88	100_year	227000.00	922.07	937.43	932.73	938.40	0.001727	8.98	31670.97	3907.04	0.47
Lower Gila	198.93	100_year	227000.00	922.25	937.82	933.21	938.85	0.001673	8.97	29941.70	3408.84	0.46
Lower Gila	198.97	100_year	227000.00	923.60	938.20	933.51	939.29	0.002131	9.54	30336.86	3157.98	0.46
Lower Gila	198.99	100_year	227000.00	923.81	938.56	934.04	939.84	0.002052	9.44	28762.24	3288.52	0.46
Lower Gila	199.02	100_year	227000.00	923.84	938.81	934.27	940.11	0.002684	9.51	29595.71	3508.65	0.46
Lower Gila	199.06	100_year	227000.00	923.97	939.26	934.51	940.53	0.002804	8.72	27633.42	2965.49	0.43
Lower Gila	199.11	100_year	227000.00	924.72	940.15	934.61	941.04	0.001898	7.95	31904.59	3744.98	0.39
Lower Gila	199.18	100_year	227000.00	923.60	940.67	935.51	941.59	0.001921	9.23	32383.55	3447.31	0.44
Lower Gila	199.19		Mult Open									
Lower Gila	199.21	100_year	227000.00	925.95	942.32	936.01	943.12	0.001294	8.16	34255.81	3005.65	0.37
Lower Gila	199.31	100_year	227000.00	926.90	942.90	936.63	943.75	0.001056	8.38	35785.66	3433.49	0.38
Lower Gila	199.38	100_year	227000.00	927.36	943.48	937.05	944.23	0.001272	7.85	38863.49	3982.43	0.36
Lower Gila	199.47	100_year	227000.00	927.93	943.95	938.53	944.69	0.001178	8.37	40157.54	3995.94	0.40

HEC-RAS Plan: After Sed. River: Salt Reach: Salt Profile: 100_year

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)	
Salt	199.55	100_year	162000.00	928.40	943.69	940.01	944.69	0.001074	9.87	30385.39	2307.34	0.45
Salt	199.69	100_year	162000.00	928.93	944.64	941.01	945.48	0.000910	9.04	30167.51	3770.81	0.41
Salt	199.86	100_year	162000.00	928.86	945.63	941.27	946.30	0.000903	7.47	27672.28	3543.74	0.35
Salt	199.98	100_year	162000.00	930.08	946.04	942.18	946.95	0.000972	8.93	27244.96	3427.68	0.42
Salt	200.02	100_year	162000.00	930.16	946.41	942.33	947.16	0.000953	8.11	27428.68	3386.53	0.38
Salt	200.11	100_year	162000.00	931.27	946.84	943.14	947.68	0.001161	8.43	25623.11	3343.71	0.40
Salt	200.22	100_year	162000.00	932.56	947.68	943.71	948.41	0.001299	7.77	30160.71	3643.23	0.37
Salt	200.31	100_year	162000.00	933.05	948.27	945.01	948.98	0.001090	8.05	30736.81	3420.16	0.38
Salt	200.4	100_year	162000.00	933.40	948.87	945.51	949.48	0.000955	7.53	31127.01	3647.21	0.36
Salt	200.47	100_year	162000.00	933.25	949.27	945.81	949.92	0.001025	7.68	28643.83	3334.23	0.37
Salt	200.52	100_year	162000.00	934.12	949.54	946.20	950.16	0.000951	7.28	27902.98	3323.78	0.35
Salt	200.6	100_year	162000.00	934.33	950.07	944.92	950.64	0.001267	7.24	29212.86	3603.56	0.36
Salt	200.68	100_year	162000.00	935.82	950.58	945.17	951.22	0.001221	8.05	32078.55	3582.26	0.40
Salt	200.75	100_year	162000.00	935.97	951.01	947.01	951.71	0.001142	8.65	34984.88	3661.09	0.44
Salt	200.83	100_year	162000.00	935.83	951.53	948.01	952.14	0.000939	7.82	31691.63	3835.37	0.40
Salt	200.88	100_year	162000.00	936.45	951.80	948.01	952.42	0.001015	7.86	29930.33	3813.44	0.41
Salt	200.95	100_year	162000.00	936.81	952.18	948.98	952.79	0.001038	8.12	32917.14	3691.37	0.42
Salt	201.01	100_year	162000.00	936.40	952.54	949.50	953.15	0.001150	7.97	31893.06	3688.80	0.44
Salt	201.1	100_year	162000.00	936.58	953.13	950.62	953.79	0.001552	8.52	35339.10	3853.73	0.47
Salt	201.16	100_year	162000.00	938.25	953.66	951.50	954.14	0.000841	6.81	32769.69	3676.80	0.37
Salt	201.2	100_year	162000.00	938.91	953.81	951.79	954.44	0.001541	8.39	29053.75	3563.76	0.49
Salt	201.26	100_year	162000.00	939.22	954.40	952.31	955.05	0.001893	7.85	26640.64	3364.18	0.52
Salt	201.33	100_year	162000.00	939.22	955.04	953.85	955.84	0.002478	9.41	26978.98	3335.80	0.61
Salt	201.41	100_year	162000.00	939.48	956.10	955.06	956.86	0.002364	8.42	24776.50	3252.79	0.52
Salt	201.48	100_year	162000.00	939.64	956.95	955.27	957.71	0.002467	8.39	24988.29	3207.78	0.47
Salt	201.54	100_year	162000.00	940.17	957.55	955.75	958.39	0.001467	9.31	26007.34	3108.33	0.50
Salt	201.62	100_year	162000.00	940.76	958.11	956.31	959.00	0.001516	9.64	26554.48	3210.95	0.51
Salt	201.7	100_year	162000.00	941.24	958.95	956.36	959.77	0.001934	9.29	28454.82	3307.68	0.48
Salt	201.81	100_year	162000.00	942.14	959.85	957.94	960.79	0.001463	9.50	24919.02	2795.60	0.50
Salt	201.89	100_year	162000.00	943.02	960.39	958.33	961.32	0.001206	8.56	22661.01	2662.20	0.45
Salt	201.96	100_year	162000.00	943.95	960.95	958.77	961.94	0.002291	8.63	21022.54	2954.79	0.46
Salt	202.01	100_year	162000.00	944.33	961.43	959.02	962.51	0.002287	9.00	22139.13	2776.54	0.47
Salt	202.06	100_year	162000.00	945.15	962.10	958.61	963.10	0.001952	9.41	24592.24	2902.39	0.49
Salt	202.11	100_year	162000.00	946.34	962.72	959.06	963.52	0.001255	9.13	27679.13	3804.85	0.47
Salt	202.18	100_year	162000.00	947.18	963.16	959.48	963.98	0.001295	9.25	26040.16	3813.66	0.47
Salt	202.24	100_year	162000.00	947.69	963.76	960.06	964.54	0.002042	8.42	25161.67	3855.29	0.46
Salt	202.32.5	100_year	162000.00	948.57	964.61	960.38	965.35	0.001983	8.40	26951.85	3858.82	0.45
Salt	202.4	100_year	162000.00	948.89	965.44	962.65	966.31	0.002332	9.87	30575.94	3743.61	0.53
Salt	202.48	100_year	162000.00	950.37	966.41	963.76	967.23	0.001959	9.75	32169.11	3701.83	0.56
Salt	202.54	100_year	162000.00	951.10	967.03	964.31	967.89	0.002134	10.20	30295.64	3642.89	0.58
Salt	202.61	100_year	162000.00	951.81	968.02	965.51	968.74	0.002234	9.19	29952.84	3800.49	0.58
Salt	202.69	100_year	162000.00	953.64	968.78	966.61	969.37	0.001064	7.83	32190.10	3659.59	0.42
Salt	202.78	100_year	162000.00	954.31	969.33	966.71	970.27	0.002876	9.83	23823.64	3514.16	0.54
Salt	202.85	100_year	162000.00	954.53	970.26	967.51	971.34	0.002654	10.92	24698.81	3319.80	0.65
Salt	202.97	100_year	162000.00	955.76	971.84	969.10	972.88	0.002331	10.10	23248.10	3309.59	0.60
Salt	203.1	100_year	162000.00	955.92	973.47	971.28	974.63	0.002559	10.46	22109.12	3282.16	0.61
Salt	203.2	100_year	162000.00	957.32	974.91	972.06	976.21	0.002897	11.54	24532.12	3634.94	0.64
Salt	203.3	100_year	162000.00	957.96	976.50	974.66	977.80	0.003429	10.79	23059.95	3873.31	0.59
Salt	203.38	100_year	162000.00	957.43	977.89	976.43	979.46	0.003539	11.32	21764.88	3931.68	0.61
Salt	203.48	100_year	162000.00	958.05	979.23	978.31	981.25	0.003035	11.80	19814.28	3762.01	0.69

HEC-RAS Plan: After Sed. River: Gila Reach: Upper Gila Profile: 100_year

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)	
Upper Gila	0.00	100_year	65000.00	927.36	944.45	939.96	944.69	0.000302	4.59	17267.97	1314.77	0.23
Upper Gila	0.06	100_year	65000.00	927.38	944.55	939.77	944.80	0.000485	5.42	19484.86	1664.71	0.25
Upper Gila	0.12	100_year	65000.00	927.65	944.72	940.56	944.94	0.000475	5.30	22907.34	2018.06	0.25
Upper Gila	0.17	100_year	65000.00	927.43	944.84	940.26	945.04	0.000420	4.95	23230.93	2233.78	0.24
Upper Gila	0.22	100_year	65000.00	927.50	944.96	940.08	945.15	0.000529	4.94	24515.15	2491.40	0.26
Upper Gila	0.27	100_year	65000.00	928.95	945.08	940.47	945.26	0.000422	4.63	25970.42	2752.18	0.23
Upper Gila	0.35	100_year	65000.00	929.08	945.27	940.52	945.41	0.000343	4.15	28274.43	3315.59	0.21
Upper Gila	0.40	100_year	65000.00	929.50	945.38	941.21	945.52	0.000548	4.61	28800.94	3671.98	0.23
Upper Gila	0.44	100_year	65000.00	929.66	945.46	941.13	945.63	0.000417	5.14	29894.75	4180.59	0.27
Upper Gila	0.49	100_year	65000.00	929.81	945.59	940.36	945.74	0.000453	4.96	28351.50	4191.19	0.27
Upper Gila	0.53	100_year	65000.00	929.93	945.67	940.63	945.85	0.000570	5.56	29076.48	4190.13	0.30
Upper Gila	0.59	100_year	65000.00	929.65	945.85	941.24	946.04	0.000604	5.68	29870.27	4389.06	0.31
Upper Gila	0.64	100_year	65000.00	930.10	946.09	941.74	946.26	0.000801	5.63	29007.02	4329.71	0.28
Upper Gila	0.69	100_year	65000.00	929.76	946.23	942.23	946.43	0.000466	5.26	25858.16	4578.35	0.28
Upper Gila	0.74	100_year	65000.00	930.32	946.38	942.39	946.55	0.000552	4.99	25140.95	4526.06	0.26
Upper Gila	0.80	100_year	65000.00	930.47	946.56	942.70	946.74	0.000661	5.69	25694.66	4791.13	0.29
Upper Gila	0.86	100_year	65000.00	930.46	946.77	943.28	946.98	0.000718	6.15	26281.14	4566.79	0.34
Upper Gila	0.91	100_year	65000.00	930.93	947.01	943.82	947.23	0.000987	6.00	21920.43	3804.91	0.34
Upper Gila	0.96	100_year	65000.00	931.26	947.27	943.35	947.52	0.001131	6.53	23349.42	4014.64	0.36
Upper Gila	1.02	100_year	65000.00	930.95	947.69	944.34	947.97	0.001343	6.96	23800.07	4318.20	0.36
Upper Gila	1.09	100_year	65000.00	931.74	948.06	945.20	948.52	0.001349	8.61	24724.41	3872.34	0.42
Upper Gila	1.15	100_year	65000.00	932.06	948.36	946.07	948.95	0.001180	9.67	25469.55	3973.14	0.46
Upper Gila	1.21	100_year	65000.00	932.40	948.99	945.94	949.28	0.000770	6.62	21110.96	3625.19	0.32
Upper Gila	1.28	100_year	65000.00	932.68	949.27	946.29	949.50	0.000696	5.18	18964.18	3549.86	0.26
Upper Gila	1.35	100_year	65000.00	932.83	949.48	946.83	949.80	0.000959	7.34	19326.14	3486.18	0.39
Upper Gila	1.41	100_year	65000.00	932.65	949.67	948.73	950.20	0.001076	8.74	20943.08	3539.19	0.43
Upper Gila	1.48	100_year	65000.00	933.16	950.06	947.07	950.72	0.001751	9.91	22474.05	3269.58	0.48
Upper Gila	1.55	100_year	65000.00	933.71	950.69	947.84	951.30	0.001586	8.59	22995.15	3696.82	0.45
Upper Gila	1.59	100_year	65000.00	933.84	951.24	947.92	951.54	0.000776	6.82	19205.79	3225.30	0.32
Upper Gila	1.63	100_year	65000.00	934.10	951.40	948.17	951.76	0.001041	7.73	21618.62	3734.86	0.37
Upper Gila	1.67	100_year	65000.00	933.91	951.62	948.27	951.99	0.001433	7.95	25502.25	4069.32	0.38

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Levee Only Condition

HEC-RAS Plan: After Sed. River: Gila Reach: Lower Gila Profile: 100_year

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)	
Lower Gila	195.16	100_year	227000.00	889.34	913.24	906.93	914.48	0.001660	9.04	25632.93	1802.19	0.41
Lower Gila	195.2	100_year	227000.00	889.53	913.58	907.21	914.82	0.001614	9.26	25656.48	1787.28	0.41
Lower Gila	195.21		Bridge									
Lower Gila	195.22	100_year	227000.00	889.70	914.56	907.40	915.68	0.001389	8.92	26916.92	1791.42	0.39
Lower Gila	195.28	100_year	227000.00	890.77	914.85	907.77	915.87	0.001300	8.50	28233.32	1917.89	0.37
Lower Gila	195.34	100_year	227000.00	889.96	915.41	908.46	916.29	0.001166	8.19	30881.81	2260.45	0.35
Lower Gila	195.45	100_year	227000.00	892.37	915.85	908.79	916.61	0.001057	7.90	33341.93	2574.07	0.34
Lower Gila	195.55	100_year	227000.00	894.74	916.43	909.83	917.23	0.001095	8.16	32567.50	2490.06	0.35
Lower Gila	195.65	100_year	227000.00	896.10	916.87	911.07	917.83	0.000978	9.30	31533.09	2550.08	0.40
Lower Gila	195.77	100_year	227000.00	896.16	917.49	910.82	918.38	0.000985	8.85	31864.18	2711.47	0.39
Lower Gila	195.86	100_year	227000.00	896.66	918.15	912.12	918.98	0.001034	8.71	33681.66	3167.09	0.38
Lower Gila	195.98	100_year	227000.00	897.81	918.77	913.07	919.55	0.001345	8.01	34743.55	3589.26	0.35
Lower Gila	196.08	100_year	227000.00	899.05	919.63	913.15	920.56	0.001326	10.61	43360.78	3174.26	0.49
Lower Gila	196.14	100_year	227000.00	901.44	920.39	913.97	921.08	0.000704	8.41	46868.30	4499.98	0.37
Lower Gila	196.23	100_year	227000.00	900.33	920.86	914.36	921.32	0.000550	6.76	49647.96	5277.88	0.30
Lower Gila	196.32	100_year	227000.00	901.99	921.19	915.33	921.63	0.000791	6.45	45142.71	5889.78	0.28
Lower Gila	196.38	100_year	227000.00	903.15	921.48	915.66	922.02	0.000700	7.35	44356.44	6324.55	0.33
Lower Gila	196.44	100_year	227000.00	903.57	921.75	916.35	922.25	0.000912	6.80	43580.37	6631.80	0.30
Lower Gila	196.5	100_year	227000.00	903.88	922.01	916.36	922.60	0.001065	7.41	41704.10	6522.74	0.32
Lower Gila	196.57	100_year	227000.00	904.05	922.38	917.20	923.02	0.001396	7.78	42286.54	6696.49	0.34
Lower Gila	196.63	100_year	227000.00	904.64	922.94	917.58	923.49	0.001129	7.13	44391.81	6528.73	0.31
Lower Gila	196.69	100_year	227000.00	905.33	923.34	918.32	923.86	0.001312	6.71	43421.20	6613.10	0.30
Lower Gila	196.75	100_year	227000.00	905.52	923.72	919.01	924.30	0.001300	7.23	43380.56	6707.30	0.33
Lower Gila	196.81	100_year	227000.00	905.86	924.03	919.18	924.73	0.001073	7.96	40478.93	3952.98	0.36
Lower Gila	196.87	100_year	227000.00	906.16	924.24	918.67	925.06	0.001021	8.76	38888.40	3946.71	0.40
Lower Gila	196.94	100_year	227000.00	906.51	924.69	919.17	925.39	0.001046	8.10	39251.97	3979.78	0.37
Lower Gila	196.99	100_year	227000.00	906.23	925.12	919.87	925.81	0.001192	7.69	38417.57	4088.90	0.35
Lower Gila	197.05	100_year	227000.00	907.68	925.54	920.62	926.17	0.001158	7.60	41494.80	4058.49	0.35
Lower Gila	197.09	100_year	227000.00	907.66	925.85	921.24	926.52	0.001285	8.04	39009.31	4234.30	0.41
Lower Gila	197.14	100_year	227000.00	908.05	926.23	921.32	926.81	0.001098	7.00	39033.80	4228.82	0.33
Lower Gila	197.18	100_year	227000.00	908.00	926.39	921.26	927.12	0.001149	8.32	40049.30	4409.36	0.39
Lower Gila	197.18	100_year	227000.00	909.17	926.53	921.59	927.29	0.001149	8.41	42147.63	4598.06	0.40
Lower Gila	197.23	100_year	227000.00	909.46	926.70	921.64	927.43	0.001173	8.18	44794.47	4808.94	0.39
Lower Gila	197.28	100_year	227000.00	909.68	926.93	921.69	927.74	0.001153	8.58	42479.02	4658.60	0.41
Lower Gila	197.33	100_year	227000.00	910.04	927.24	920.98	928.02	0.001124	8.57	45383.77	4658.17	0.40
Lower Gila	197.38	100_year	227000.00	910.32	927.67	922.23	928.35	0.001293	8.05	41013.25	4683.19	0.37
Lower Gila	197.42	100_year	227000.00	910.55	927.90	922.36	928.73	0.001230	8.78	42182.77	4661.37	0.41
Lower Gila	197.48	100_year	227000.00	910.66	928.24	922.11	929.05	0.001387	8.79	42947.65	4443.55	0.41
Lower Gila	197.53	100_year	227000.00	910.99	928.74	924.01	929.46	0.001123	8.20	45143.92	4344.72	0.38
Lower Gila	197.58	100_year	227000.00	911.24	929.06	923.48	929.75	0.001024	8.19	44069.27	4424.02	0.37
Lower Gila	197.64	100_year	227000.00	911.53	929.34	925.51	930.00	0.000848	7.88	43390.53	4491.63	0.36
Lower Gila	197.7	100_year	227000.00	911.39	929.60	926.00	930.27	0.000891	8.11	41113.66	4690.18	0.37
Lower Gila	197.75	100_year	227000.00	911.79	929.87	926.34	930.55	0.000897	8.02	38814.63	4574.97	0.37
Lower Gila	197.81	100_year	227000.00	911.95	930.09	925.73	930.82	0.000940	8.39	39272.25	4298.10	0.39
Lower Gila	197.87	100_year	227000.00	912.30	930.43	926.06	931.11	0.000959	7.84	38652.03	4112.44	0.38
Lower Gila	197.92	100_year	227000.00	912.71	930.76	926.51	931.42	0.000974	7.76	38048.55	3893.38	0.39
Lower Gila	197.95	100_year	227000.00	912.94	930.97	926.58	931.71	0.001013	7.82	37435.65	3974.95	0.41
Lower Gila	197.98	100_year	227000.00	912.45	931.26	925.01	931.88	0.001002	7.80	43376.13	3998.16	0.40
Lower Gila	198.03	100_year	227000.00	913.89	931.40	927.02	932.09	0.001195	8.29	40283.09	3837.82	0.43
Lower Gila	198.08	100_year	227000.00	914.15	931.66	927.33	932.43	0.001172	8.73	37949.75	3771.59	0.43
Lower Gila	198.15	100_year	227000.00	914.16	931.87	927.58	932.76	0.001235	8.81	39584.05	3613.44	0.46
Lower Gila	198.2	100_year	227000.00	914.33	932.29	928.67	933.25	0.001210	9.03	36864.45	3471.31	0.46
Lower Gila	198.26	100_year	227000.00	914.89	932.57	928.57	933.67	0.001280	9.36	33711.54	3305.97	0.47
Lower Gila	198.33	100_year	227000.00	916.08	933.19	929.02	934.02	0.000928	8.14	33019.95	3288.51	0.40
Lower Gila	198.4	100_year	227000.00	917.59	933.52	929.64	934.46	0.001217	7.93	30299.60	3243.17	0.41
Lower Gila	198.45	100_year	227000.00	918.41	934.06	930.31	934.87	0.001089	8.16	32772.86	3275.33	0.41
Lower Gila	198.49	100_year	227000.00	918.92	934.26	930.51	935.21	0.001252	8.79	30071.29	3185.56	0.46
Lower Gila	198.54	100_year	227000.00	919.24	934.56	930.01	935.54	0.001397	9.16	30107.38	3234.69	0.48
Lower Gila	198.6	100_year	227000.00	919.98	934.91	931.01	935.95	0.001433	9.07	29860.23	3205.52	0.49
Lower Gila	198.65	100_year	227000.00	920.92	935.37	931.71	936.44	0.001413	8.72	29547.79	3146.27	0.48
Lower Gila	198.7	100_year	227000.00	921.31	935.80	931.51	936.82	0.001405	8.72	30040.67	3004.97	0.48
Lower Gila	198.76	100_year	227000.00	921.35	936.14	932.01	937.19	0.001381	8.83	29875.71	2941.76	0.48
Lower Gila	198.8	100_year	227000.00	921.54	936.60	932.21	937.69	0.001979	8.17	27132.23	2533.19	0.43
Lower Gila	198.83	100_year	227000.00	921.82	936.97	932.71	938.08	0.001595	9.47	29184.78	2919.62	0.51
Lower Gila	198.88	100_year	227000.00	921.98	937.41	932.77	938.39	0.001729	8.98	31337.66	2941.89	0.47
Lower Gila	198.93	100_year	227000.00	922.16	937.81	933.21	938.84	0.001656	8.96	29934.56	2945.27	0.46
Lower Gila	198.97	100_year	227000.00	923.53	938.18	933.51	939.28	0.002124	9.54	30128.36	2623.37	0.46
Lower Gila	198.99	100_year	227000.00	923.75	938.54	934.01	939.84	0.002064	9.47	28222.58	2513.37	0.46
Lower Gila	199.02	100_year	227000.00	923.78	938.79	934.25	940.10	0.002704	9.56	28857.00	2482.39	0.46
Lower Gila	199.06	100_year	227000.00	923.91	939.24	934.51	940.52	0.002832	8.77	26986.16	2189.71	0.43
Lower Gila	199.11	100_year	227000.00	924.66	940.11	934.61	941.04	0.001939	8.03	30473.50	2499.86	0.39
Lower Gila	199.18	100_year	227000.00	923.54	940.66	935.51	941.58	0.001912	9.23	32406.01	2528.73	0.44
Lower Gila	199.19		Mult Open									
Lower Gila	199.21	100_year	227000.00	925.85	942.30	936.01	943.12	0.001301	8.19	33602.56	2467.05	0.37
Lower Gila	199.31	100_year	227000.00	926.88	942.88	936.66	943.76	0.001077	8.45	34716.81	2656.41	0.39
Lower Gila	199.38	100_year	227000.00	927.32	943.47	937.05	944.24	0.001306	7.95	37180.93	2877.62	0.37
Lower Gila	199.47	100_year	227000.00	928.01	943.95	938.53	944.72	0.001208	8.46	38760.38	3038.20	0.40

HEC-RAS Plan: After Sed. River: Salt Reach: Salt Profile: 100_year

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)	
Salt	199.55	100_year	162000.00	928.39	943.72	940.01	944.72	0.001068	9.87	30298.34	2165.98	0.46
Salt	199.69	100_year	162000.00	928.93	944.64	941.01	945.51	0.000937	9.17	28812.19	2477.26	0.42
Salt	199.86	100_year	162000.00	929.06	945.66	941.28	946.34	0.000897	7.47	27196.89	2711.25	0.35
Salt	199.98	100_year	162000.00	930.07	946.07	942.15	946.99	0.000971	8.95	26792.20	2537.47	0.42
Salt	200.023	100_year	162000.00	930.17	946.43	942.30	947.20	0.000958	8.15	26770.23	2493.77	0.38
Salt	200.11	100_year	162000.00	931.27	946.87	943.12	947.72	0.001140	8.38	25568.38	2769.61	0.39
Salt	200.22	100_year	162000.00	932.55	947.71	943.70	948.44	0.001283	7.74	30255.10	3222.86	0.36
Salt	200.31	100_year	162000.00	933.02	948.29	944.67	948.99	0.001069	8.01	30878.77	3420.26	0.38
Salt	200.4	100_year	162000.00	933.42	948.88	945.51	949.49	0.000951	7.52	31150.12	3390.60	0.36
Salt	200.47	100_year	162000.00	933.16	949.28	945.81	949.92	0.001007	7.63	28834.14	3100.13	0.37
Salt	200.52	100_year	162000.00	934.02	949.54	946.14	950.16	0.000951	7.30	27820.15	3135.26	0.35
Salt	200.6	100_year	162000.00	934.31	950.07	944.87	950.64	0.001269	7.25	29179.66	3601.61	0.36
Salt	200.68	100_year	162000.00	935.81	950.57	945.19	951.21	0.001220	8.05	32027.70	3535.75	0.40
Salt	200.75	100_year	162000.00	935.93	951.01	947.01	951.70	0.001146	8.66	34924.84	3640.60	0.44
Salt	200.83	100_year	162000.00	935.83	951.53	948.01	952.13	0.000933	7.80	31769.89	3835.65	0.40
Salt	200.88	100_year	162000.00	936.46	951.80	948.01	952.42	0.001011	7.85	29982.44	3813.29	0.41
Salt	200.95	100_year	162000.00	936.74	952.17	948.98	952.78	0.001044	8.14	32875.59	3689.84	0.42
Salt	201.01	100_year	162000.00	936.27	952.54	949.50	953.15	0.001134	7.95	32034.13	3690.70	0.43
Salt	201.1	100_year	162000.00	936.48	953.12	950.62	953.78	0.001542	8.50	35393.86	3854.01	0.47
Salt	201.16	100_year	162000.00	938.14	953.65	951.50	954.13	0.000831	6.78	32879.32	3676.91	0.37
Salt	201.2	100_year	162000.00	938.76	953.80	951.79	954.42	0.001483	8.30	29386.29	3566.88	0.48
Salt	201.26	100_year	162000.00	939.32	954.37	952.31	955.05	0.002031	8.05	26087.93	3366.14	0.54
Salt	201.33	100_year	162000.00	939.15	955.07	953.85	955.86	0.002481	9.38	26980.89	3334.87	0.61
Salt	201.41	100_year	162000.00	939.42	956.12	955.06	956.88	0.002337	8.39	24874.54	3253.57	0.51
Salt	201.48	100_year	162000.00	939.53	956.96	955.27	957.72	0.002464	8.38	25003.22	3206.89	0.47
Salt	201.54	100_year	162000.00	940.13	957.56	955.75	958.40	0.001470	9.32	25991.65	3108.35	0.50
Salt	201.62	100_year	162000.00	940.67	958.12	956.31	959.01	0.001491	9.59	26692.44	3212.53	0.50
Salt	201.7	100_year	162000.00	941.17	958.95	956.36	959.77	0.001921	9.27	28517.51	3307.74	0.48
Salt	201.81	100_year	162000.00	942.07	959.84	957.94	960.78	0.001469	9.51	24890.07	2795.86	0.50
Salt	201.89	100_year	162000.00	943.02	960.39	958.33	961.31	0.001202	8.54	22723.19	2659.97	0.45
Salt	201.96	100_year	162000.00	944.02	960.94	958.77	961.94	0.002296	8.64	21004.57	2953.26	0.46
Salt	202.01	100_year	162000.00	944.39	961.42	959.02	962.52	0.002326	9.03	22034.33	2772.19	0.47
Salt	202.06	100_year	162000.00	945.19	962.11	958.66	963.11	0.001959	9.40	24608.32	2902.93	0.49
Salt	202.11	100_year	162000.00	946.46	962.74	959.17	963.53	0.001258	9.12	27710.13	3809.35	0.47
Salt	202.18	100_year	162000.00	947.24	963.18	959.56	964.00	0.001309	9.27	25980.93	3821.50	0.47
Salt	202.24	100_year	162000.00	947.66	963.78	959.85	964.56	0.002043	8.41	25188.00	3864.68	0.46
Salt	202.32	100_year	162000.00	948.51	964.64	960.55	965.37	0.001988	8.39	26976.24	3868.62	0.45
Salt	202.4	100_year	162000.00	948.95	965.47	962.65	966.34	0.002358	9.89	30511.02	3743.97	0.54
Salt	202.48	100_year	162000.00	950.45	966.44	963.76	967.27	0.001959	9.74	32197.14	3704.94	0.56
Salt	202.54	100_year	162000.00	951.14	967.07	964.31	967.93	0.002141	10.18	30359.59	3654.71	0.58
Salt	202.61	100_year	162000.00	951.79	968.05	965.51	968.76	0.002182	9.17	30195.16	3805.30	0.57
Salt	202.69	100_year	162000.00	953.80	968.82	966.61	969.43	0.001201	8.03	31039.44	3616.66	0.44
Salt	202.78	100_year	162000.00	954.38	969.46	966.71	970.37	0.002842	9.72	24031.69	3523.17	0.54
Salt	202.85	100_year	162000.00	954.58	970.36	967.51	971.44	0.002641	10.90	24769.46	3326.26	0.64
Salt	202.97	100_year	162000.00	955.84	971.94	969.23	972.96	0.002292	10.05	23380.31	3310.29	0.60
Salt	203.1	100_year	162000.00	956.00	973.54	971.39	974.68	0.002510	10.38	22260.63	3285.72	0.61
Salt	203.2	100_year	162000.00	957.40	974.98	972.15	976.24	0.002871	11.49	24666.23	3653.44	0.64
Salt	203.3	100_year	162000.00	958.06	976.52	974.70	977.82	0.003419	10.78	23078.72	3880.04	0.59
Salt	203.38	100_year	162000.00	957.48	977.90	974.73	979.49	0.003527	11.37	21664.90	3931.90	0.61
Salt	203.48	100_year	162000.00	958.02	979.22	975.06	981.35	0.003208	12.06	19232.36	3761.76	0.71

HEC-RAS Plan: After Sed. River: Gila Reach: Upper Gila Profile: 100_year

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)	
Upper Gila	0.00	100_year	65000.00	927.35	944.47	938.04	944.71	0.000301	4.66	17148.68	1316.91	0.23
Upper Gila	0.06	100_year	65000.00	927.41	944.57	939.77	944.82	0.000492	5.45	19392.41	1664.74	0.26
Upper Gila	0.12	100_year	65000.00	927.64	944.75	940.56	944.96	0.000470	5.28	23003.29	2018.18	0.25
Upper Gila	0.17	100_year	65000.00	927.48	944.86	940.26	945.06	0.000418	4.96	23278.34	2233.77	0.24
Upper Gila	0.22	100_year	65000.00	927.46	944.98	940.08	945.17	0.000520	4.91	24672.35	2491.38	0.25
Upper Gila	0.27	100_year	65000.00	928.98	945.10	940.47	945.28	0.000425	4.64	25869.91	2751.86	0.23
Upper Gila	0.35	100_year	65000.00	929.08	945.29	940.52	945.43	0.000340	4.13	28392.90	3315.63	0.21
Upper Gila	0.40	100_year	65000.00	929.53	945.40	941.21	945.54	0.000545	4.59	28879.75	3671.89	0.23
Upper Gila	0.44	100_year	65000.00	929.72	945.48	941.13	945.65	0.000416	5.14	29887.54	4178.47	0.27
Upper Gila	0.49	100_year	65000.00	929.70	945.61	940.31	945.76	0.000440	4.91	28627.63	4191.28	0.27
Upper Gila	0.53	100_year	65000.00	929.86	945.69	940.62	945.87	0.000564	5.55	29149.96	4189.83	0.30
Upper Gila	0.59	100_year	65000.00	929.66	945.86	941.34	946.06	0.000598	5.66	29994.13	4389.32	0.31
Upper Gila	0.64	100_year	65000.00	930.09	946.10	941.73	946.27	0.000788	5.60	29187.52	4329.78	0.28
Upper Gila	0.69	100_year	65000.00	929.73	946.24	942.62	946.43	0.000458	5.24	25985.47	4578.82	0.28
Upper Gila	0.74	100_year	65000.00	930.33	946.39	942.47	946.56	0.000547	4.98	25204.73	4525.95	0.26
Upper Gila	0.80	100_year	65000.00	930.44	946.57	942.80	946.75	0.000654	5.67	25798.79	4790.49	0.29
Upper Gila	0.86	100_year	65000.00	930.43	946.77	943.49	946.98	0.000720	6.16	26270.40	4567.93	0.34
Upper Gila	0.91	100_year	65000.00	930.91	947.01	943.84	947.23	0.000986	6.00	21934.86	3804.70	0.34
Upper Gila	0.96	100_year	65000.00	931.24	947.28	943.66	947.53	0.001114	6.48	23461.22	4014.79	0.36
Upper Gila	1.02	100_year	65000.00	930.93	947.69	944.45	947.96	0.001334	6.96	23804.70	4311.53	0.35
Upper Gila	1.09	100_year	65000.00	931.71	948.05	945.25	948.51	0.001353	8.63	24700.56	3872.23	0.42
Upper Gila	1.15	100_year	65000.00	932.06	948.37	943.49	948.93	0.001137	9.53	25796.83	3970.25	0.45
Upper Gila	1.21	100_year	65000.00	932.36	948.97	945.94	949.25	0.000765	6.60	21141.39	3623.80	0.32
Upper Gila	1.28	100_year	65000.00	932.67	949.24	946.35	949.48	0.000707	5.20	18867.62	3547.19	0.26
Upper Gila	1.35	100_year	65000.00	932.82	949.46	946.92	949.78	0.000958	7.33	19317.21	3483.67	0.39
Upper Gila	1.41	100_year	65000.00	932.66	949.65	946.67	950.17	0.001063	8.70	21030.09	3539.12	0.43
Upper Gila	1.48	100_year	65000.00	933.19	950.04	947.06	950.69	0.001741	9.87	22564.90	3269.15	0.48
Upper Gila	1.55	100_year	65000.00	933.67	950.63	947.79	951.28	0.001685	8.78	22489.74	3684.27	0.46
Upper Gila	1.59	100_year	65000.00	933.75	951.23	947.96	951.54	0.000805	6.85	19133.88	3224.94	0.33
Upper Gila	1.63	100_year	65000.00	934.12	951.40	948.22	951.76	0.001047	7.72	21592.58	3734.86	0.37
Upper Gila	1.67	100_year	65000.00	933.81	951.62	948.58	951.99	0.001445	7.95	25495.02	4069.40	0.38

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Levee + Pond Condition

HEC-RAS Plan: After Sed. River: Gila Reach: Lower Gila Profile: 100_year

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)	
Lower Gila	195.16	100_year	227000.00	889.18	912.71	906.38	913.95	0.001660	9.13	25583.77	1798.16	0.42
Lower Gila	195.2	100_year	227000.00	889.29	913.05	906.80	914.28	0.001596	9.18	25708.63	1782.43	0.41
Lower Gila	195.21		Bridge									
Lower Gila	195.22	100_year	227000.00	889.32	914.01	906.98	915.12	0.001379	8.90	26948.45	1787.36	0.39
Lower Gila	195.28	100_year	227000.00	890.30	914.25	907.40	915.31	0.001367	8.63	27780.01	1913.33	0.38
Lower Gila	195.34	100_year	227000.00	889.31	914.85	907.90	915.74	0.001169	8.26	30794.84	2258.30	0.36
Lower Gila	195.45	100_year	227000.00	891.54	915.28	908.25	916.06	0.001064	8.07	33103.16	2570.84	0.34
Lower Gila	195.55	100_year	227000.00	893.57	915.86	909.23	916.69	0.001104	8.36	32314.58	2485.85	0.35
Lower Gila	195.65	100_year	227000.00	895.17	916.31	909.79	917.26	0.000936	9.24	31790.54	2543.84	0.39
Lower Gila	195.77	100_year	227000.00	895.13	916.94	909.62	917.78	0.000890	8.58	32623.97	2704.92	0.37
Lower Gila	195.86	100_year	227000.00	895.61	917.51	911.01	918.32	0.000953	8.55	34036.90	3164.49	0.36
Lower Gila	195.98	100_year	227000.00	896.70	918.08	911.42	918.85	0.001232	7.92	34924.95	3570.08	0.33
Lower Gila	196.08	100_year	227000.00	897.54	918.85	913.15	919.70	0.001063	10.07	46260.86	3173.36	0.45
Lower Gila	196.14	100_year	227000.00	900.11	919.45	913.96	920.16	0.000706	8.49	46095.51	4459.77	0.37
Lower Gila	196.23	100_year	227000.00	898.98	919.89	914.17	920.41	0.000581	7.09	48538.78	5273.96	0.30
Lower Gila	196.32	100_year	227000.00	900.49	920.27	915.19	920.73	0.000767	6.51	45392.95	5887.92	0.28
Lower Gila	196.38	100_year	227000.00	901.69	920.57	915.55	921.10	0.000652	7.25	45305.21	6322.31	0.31
Lower Gila	196.44	100_year	227000.00	902.15	920.85	914.65	921.31	0.000771	6.36	43685.03	6630.78	0.27
Lower Gila	196.5	100_year	227000.00	902.89	921.07	914.98	921.58	0.000791	6.33	42132.73	6520.89	0.28
Lower Gila	196.57	100_year	227000.00	903.01	921.31	915.35	921.91	0.000971	6.24	40525.75	6644.36	0.28
Lower Gila	196.63	100_year	227000.00	903.63	921.69	915.67	922.26	0.000966	6.39	40915.36	6444.14	0.29
Lower Gila	196.69	100_year	227000.00	904.44	922.07	915.87	922.57	0.001012	5.71	42197.12	6288.75	0.26
Lower Gila	196.75	100_year	227000.00	904.73	922.34	916.11	922.90	0.000920	5.72	42871.47	6252.43	0.27
Lower Gila	196.81	100_year	227000.00	905.21	922.61	916.40	923.19	0.000777	6.42	40488.54	3826.45	0.31
Lower Gila	196.87	100_year	227000.00	905.56	922.79	916.65	923.41	0.000705	6.88	38822.36	3634.25	0.33
Lower Gila	196.94	100_year	227000.00	905.92	923.03	916.96	923.63	0.000744	6.32	38668.16	3734.41	0.30
Lower Gila	196.99	100_year	227000.00	905.40	923.19	917.47	924.01	0.000934	5.83	35106.63	3630.19	0.30
Lower Gila	197.05	100_year	227000.00	906.78	923.67	917.94	924.34	0.001202	6.53	37752.89	3832.71	0.35
Lower Gila	197.09	100_year	227000.00	906.76	924.15	918.30	924.68	0.001034	6.96	41001.13	4023.05	0.36
Lower Gila	197.14	100_year	227000.00	907.31	924.35	918.73	924.98	0.001195	6.75	36628.61	4050.51	0.33
Lower Gila	197.18	100_year	227000.00	907.39	924.60	918.89	925.29	0.001253	8.01	36998.99	4232.68	0.40
Lower Gila	197.18	100_year	227000.00	908.63	924.78	919.12	925.45	0.001113	7.57	38096.24	4138.68	0.38
Lower Gila	197.23	100_year	227000.00	909.14	924.95	919.18	925.59	0.001023	6.94	40114.04	4114.19	0.36
Lower Gila	197.28	100_year	227000.00	909.82	925.13	920.16	925.89	0.001122	7.67	35582.81	4137.76	0.41
Lower Gila	197.33	100_year	227000.00	910.23	925.48	919.65	926.15	0.000994	7.18	37655.78	4187.84	0.39
Lower Gila	197.38	100_year	227000.00	910.53	925.58	920.86	926.50	0.001042	5.78	33801.91	4001.97	0.32
Lower Gila	197.42	100_year	227000.00	910.51	925.85	920.83	926.77	0.001005	4.96	33456.84	4009.57	0.30
Lower Gila	197.48	100_year	227000.00	910.36	926.14	921.41	927.06	0.001366	7.30	30898.18	4105.84	0.48
Lower Gila	197.53	100_year	227000.00	910.68	926.90	921.81	927.49	0.001105	6.73	39768.80	4263.14	0.36
Lower Gila	197.58	100_year	227000.00	910.97	927.06	922.01	927.86	0.001160	8.48	36226.16	4227.28	0.43
Lower Gila	197.64	100_year	227000.00	911.23	927.33	922.75	928.18	0.001127	8.14	34466.65	4360.58	0.42
Lower Gila	197.7	100_year	227000.00	911.15	927.70	922.82	928.50	0.000942	8.16	34355.40	4332.20	0.41
Lower Gila	197.75	100_year	227000.00	911.61	928.02	923.04	928.80	0.001035	7.58	33212.66	4191.28	0.38
Lower Gila	197.81	100_year	227000.00	911.80	928.23	923.26	929.14	0.001101	7.76	31595.32	3584.08	0.40
Lower Gila	197.87	100_year	227000.00	912.04	928.75	923.59	929.53	0.001459	8.41	34485.62	3857.80	0.44
Lower Gila	197.92	100_year	227000.00	912.39	929.24	924.24	929.99	0.001316	8.35	37076.08	3791.28	0.45
Lower Gila	197.95	100_year	227000.00	912.70	929.49	925.16	930.40	0.001408	8.71	33661.34	3801.78	0.47
Lower Gila	197.98	100_year	227000.00	912.18	929.87	924.53	930.63	0.001274	8.53	39681.50	3887.99	0.45
Lower Gila	198.03	100_year	227000.00	913.60	930.22	925.36	930.86	0.001261	8.15	40835.13	3793.14	0.44
Lower Gila	198.08	100_year	227000.00	913.97	930.48	926.25	931.21	0.001178	8.08	36057.74	3758.52	0.42
Lower Gila	198.15	100_year	227000.00	914.23	930.68	926.89	931.44	0.000655	4.87	34884.61	3519.56	0.31
Lower Gila	198.2	100_year	227000.00	914.32	930.89	927.41	931.79	0.000837	5.81	31318.00	3209.88	0.35
Lower Gila	198.26	100_year	227000.00	914.93	931.23	927.61	932.12	0.001139	7.27	30118.45	3066.58	0.42
Lower Gila	198.33	100_year	227000.00	916.27	931.47	928.01	932.53	0.001223	8.26	27906.72	2879.90	0.45
Lower Gila	198.4	100_year	227000.00	917.97	931.78	928.81	933.09	0.001326	8.58	24866.96	2299.94	0.47
Lower Gila	198.45	100_year	227000.00	918.70	932.32	929.51	933.57	0.001424	7.66	25712.14	2445.23	0.42
Lower Gila	198.49	100_year	227000.00	919.19	933.08	930.23	933.90	0.000899	7.30	31224.84	3069.12	0.39
Lower Gila	198.54	100_year	227000.00	919.10	933.16	930.45	934.24	0.001301	8.67	27314.13	2634.27	0.47
Lower Gila	198.6	100_year	227000.00	919.79	933.65	930.78	934.60	0.001258	8.29	29196.39	2903.28	0.45
Lower Gila	198.65	100_year	227000.00	920.68	934.13	931.23	935.02	0.001155	7.90	30586.40	3049.85	0.44
Lower Gila	198.7	100_year	227000.00	920.86	934.53	931.54	935.32	0.001041	7.64	32097.74	2955.96	0.42
Lower Gila	198.76	100_year	227000.00	920.93	934.79	931.79	935.60	0.001083	7.73	31726.43	2919.36	0.42
Lower Gila	198.8	100_year	227000.00	921.17	934.97	932.14	936.04	0.001370	7.23	28377.67	2511.12	0.39
Lower Gila	198.83	100_year	227000.00	921.51	935.53	932.42	936.32	0.001089	7.71	32045.54	2909.54	0.42
Lower Gila	198.88	100_year	227000.00	921.72	935.72	932.65	936.56	0.001247	6.86	31605.71	2923.93	0.38
Lower Gila	198.93	100_year	227000.00	921.85	935.96	933.01	936.92	0.001319	6.96	29709.26	2909.87	0.39
Lower Gila	198.97	100_year	227000.00	923.42	936.13	933.11	937.33	0.001778	7.19	27135.28	2581.55	0.40
Lower Gila	198.99	100_year	227000.00	923.65	936.43	933.21	937.82	0.001911	6.94	25159.27	2508.28	0.41
Lower Gila	199.02	100_year	227000.00	924.00	936.90	933.41	938.13	0.003704	9.06	26688.32	2475.59	0.51
Lower Gila	199.06	100_year	227000.00	924.18	937.35	933.71	938.76	0.003960	9.25	27414.14	2190.23	0.49
Lower Gila	199.11	100_year	227000.00	924.56	938.16	934.96	939.61	0.003984	10.17	24456.69	2497.86	0.54
Lower Gila	199.18	100_year	227000.00	923.31	939.56	934.92	940.56	0.002193	9.61	31074.95	2447.64	0.47
Lower Gila	199.19		Mult Open									
Lower Gila	199.21	100_year	227000.00	925.67	941.13	935.30	942.01	0.001513	8.46	32327.75	2458.67	0.40
Lower Gila	199.31	100_year	227000.00	926.88	941.87	935.72	942.66	0.001071	8.08	33914.21	2669.72	0.38
Lower Gila	199.38	100_year	227000.00	927.08	942.33	936.09	943.03	0.000750	7.49	35268.27	2854.23	0.37
Lower Gila	199.47	100_year	227000.00	927.43	942.66	936.45	943.30	0.000691	6.74	36869.23	3067.74	0.35

HEC-RAS Plan: After Sed. River: Salt Reach: Salt Profile: 100_year

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)	
Salt	199.55	100_year	162000.00	928.88	942.79	938.01	943.30	0.000637	6.77	29204.48	2164.28	0.34
Salt	199.69	100_year	162000.00	929.72	943.26	939.21	943.87	0.000717	6.59	26053.17	2431.12	0.35
Salt	199.86	100_year	162000.00	931.93	943.84	940.11	944.64	0.000896	5.44	23677.35	2290.15	0.32
Salt	199.98	100_year	162000.00	932.20	944.39	940.31	945.62	0.002345	10.96	23890.28	2257.26	0.62
Salt	200.02	100_year	162000.00	932.66	944.30	943.36	946.63	0.004755	14.03	16415.66	2394.27	0.82
Salt	200.11	100_year	162000.00	933.77	947.11	942.28	947.96	0.001536	8.57	23189.13	2769.84	0.44
Salt	200.22	100_year	162000.00	934.84	948.24	942.62	948.77	0.001066	6.42	28170.81	3222.87	0.32
Salt	200.31	100_year	162000.00	935.27	948.72	942.98	949.23	0.000856	6.53	29534.85	3429.12	0.33
Salt	200.4	100_year	162000.00	935.40	949.16	943.47	949.64	0.000782	6.24	30097.94	3444.80	0.32
Salt	200.47	100_year	162000.00	935.15	949.47	944.33	950.04	0.001002	6.97	27715.69	3182.80	0.36
Salt	200.52	100_year	162000.00	935.86	949.71	944.91	950.30	0.001039	7.02	27058.41	3209.19	0.36
Salt	200.6	100_year	162000.00	935.95	950.36	945.30	950.92	0.002118	6.83	29812.99	3618.42	0.35
Salt	200.68	100_year	162000.00	937.64	950.95	945.41	951.51	0.000936	6.55	32525.91	3634.21	0.34
Salt	200.75	100_year	162000.00	937.58	951.36	946.15	951.86	0.000778	6.48	35423.72	3684.92	0.36
Salt	200.83	100_year	162000.00	937.28	951.64	947.19	952.19	0.000815	6.60	30846.68	3833.23	0.37
Salt	200.88	100_year	162000.00	937.96	951.83	947.31	952.45	0.000799	6.07	29728.54	3791.51	0.35
Salt	200.95	100_year	162000.00	938.27	952.13	947.91	952.77	0.000947	6.60	28765.26	3667.60	0.39
Salt	201.01	100_year	162000.00	937.63	952.47	948.21	953.23	0.001882	9.24	32369.95	3676.83	0.54
Salt	201.1	100_year	162000.00	938.19	953.33	949.61	954.05	0.001628	9.23	39576.05	3851.31	0.52
Salt	201.16	100_year	162000.00	939.50	953.88	951.01	954.49	0.001316	8.16	33586.33	3685.88	0.46
Salt	201.2	100_year	162000.00	940.03	954.26	952.08	954.79	0.001146	7.60	30973.62	3574.45	0.43
Salt	201.26	100_year	162000.00	940.51	954.62	952.08	955.35	0.001869	9.29	34769.31	3396.49	0.54
Salt	201.33	100_year	162000.00	940.70	955.50	953.51	955.98	0.001618	7.70	34857.88	3355.46	0.49
Salt	201.41	100_year	162000.00	941.20	956.03	954.61	956.63	0.001328	7.73	32533.74	3285.86	0.48
Salt	201.48	100_year	162000.00	941.70	956.57	955.01	957.07	0.001082	7.08	34546.07	3233.47	0.41
Salt	201.54	100_year	162000.00	943.10	956.89	955.21	957.53	0.001297	7.48	31396.91	3133.81	0.45
Salt	201.62	100_year	162000.00	944.31	957.39	955.61	958.25	0.002280	9.67	28683.39	3210.93	0.59
Salt	201.7	100_year	162000.00	944.15	958.57	956.01	959.33	0.002626	9.11	26701.60	3297.90	0.54
Salt	201.81	100_year	162000.00	945.11	959.75	957.60	961.02	0.002655	11.02	20826.04	2877.83	0.65
Salt	201.89	100_year	162000.00	945.73	960.91	957.02	961.82	0.001447	8.43	21582.88	2701.03	0.48
Salt	201.96	100_year	162000.00	946.22	961.40	958.50	962.46	0.001736	9.24	20227.01	2966.85	0.53
Salt	202.01	100_year	162000.00	946.62	961.88	959.00	962.99	0.002735	9.15	20914.80	2758.46	0.51
Salt	202.06	100_year	162000.00	947.51	962.73	959.15	963.66	0.002086	9.25	23710.93	2916.97	0.50
Salt	202.11	100_year	162000.00	948.45	963.28	959.82	964.09	0.001361	9.12	26429.19	3902.42	0.48
Salt	202.18	100_year	162000.00	948.72	963.76	960.15	964.60	0.001427	9.49	26074.19	4004.94	0.49
Salt	202.24	100_year	162000.00	949.00	964.41	961.03	965.20	0.002123	8.49	25144.22	4009.02	0.47
Salt	202.32	100_year	162000.00	949.91	965.32	961.55	966.01	0.001885	8.15	27801.77	4187.11	0.44
Salt	202.4	100_year	162000.00	950.10	966.09	961.83	966.94	0.002252	9.79	30946.84	3779.11	0.53
Salt	202.48	100_year	162000.00	951.48	967.01	963.57	967.82	0.001849	9.65	32619.57	3732.11	0.55
Salt	202.54	100_year	162000.00	952.39	967.59	964.42	968.44	0.001991	10.05	30946.11	3721.75	0.57
Salt	202.61	100_year	162000.00	952.80	968.50	965.41	969.26	0.002262	9.39	29419.91	3797.81	0.58
Salt	202.69	100_year	162000.00	954.56	969.30	966.27	969.92	0.001146	8.02	31437.05	3664.34	0.44
Salt	202.78	100_year	162000.00	954.83	969.93	966.80	970.79	0.002564	9.39	24918.19	3547.65	0.51
Salt	202.85	100_year	162000.00	955.05	970.73	967.38	971.74	0.002315	10.54	25749.59	3339.82	0.61
Salt	202.97	100_year	162000.00	956.36	972.15	969.19	973.12	0.002128	9.76	24016.98	3312.09	0.58
Salt	203.1	100_year	162000.00	956.48	973.66	971.32	974.73	0.002374	10.12	22767.43	3292.07	0.59
Salt	203.2	100_year	162000.00	957.94	974.99	972.27	976.28	0.002918	11.53	24670.63	3684.35	0.64
Salt	203.3	100_year	162000.00	958.54	976.58	974.68	977.85	0.003324	10.66	23332.55	3895.17	0.58
Salt	203.38	100_year	162000.00	958.07	977.89	975.16	979.40	0.003174	11.06	22265.37	3933.12	0.58
Salt	203.48	100_year	162000.00	958.45	979.13	975.42	981.11	0.003040	11.82	20164.01	3756.72	0.69

HEC-RAS Plan: After Sed. River: Gila Reach: Upper Gila Profile: 100_year

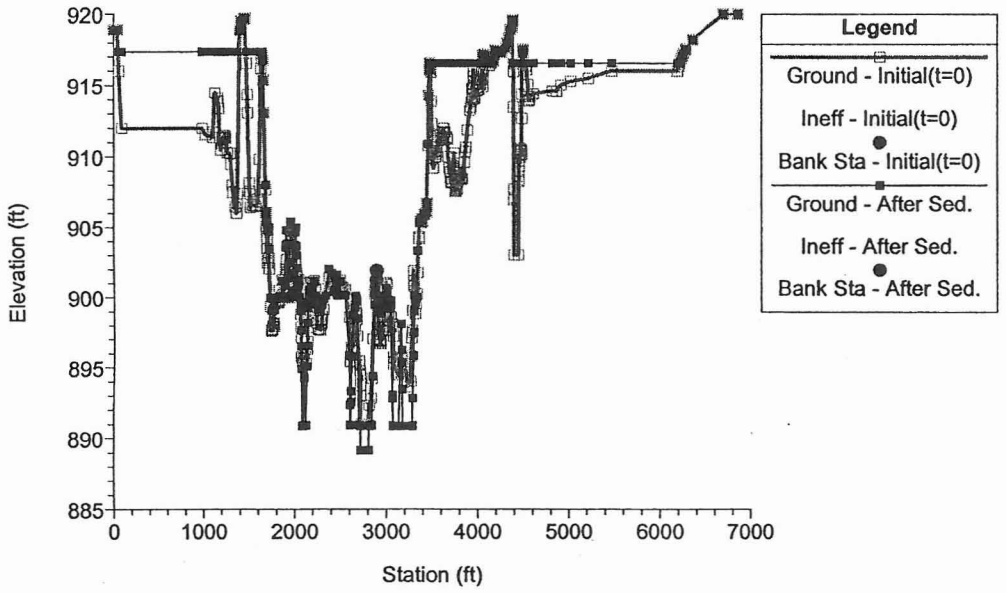
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Upper Gila	0.00	100_year	65000.00	929.96	943.06	938.00	943.30	0.000212	3.91	16711.63	1327.31	0.20
Upper Gila	0.06	100_year	65000.00	930.79	943.15	938.01	943.36	0.000233	3.95	17834.17	1663.23	0.20
Upper Gila	0.12	100_year	65000.00	932.01	943.26	938.01	943.43	0.000240	3.85	19860.51	2013.43	0.20
Upper Gila	0.17	100_year	65000.00	932.43	943.31	938.01	943.49	0.000265	3.85	20054.57	2229.86	0.21
Upper Gila	0.22	100_year	65000.00	933.15	943.34	938.27	943.60	0.000415	4.68	19252.60	2486.68	0.26
Upper Gila	0.27	100_year	65000.00	932.88	943.54	938.01	943.71	0.000484	3.94	22040.17	2723.79	0.24
Upper Gila	0.35	100_year	65000.00	933.02	943.76	938.17	943.94	0.000846	5.08	24803.47	3296.57	0.31
Upper Gila	0.40	100_year	65000.00	934.05	944.06	938.01	944.19	0.000914	4.65	29437.51	3652.41	0.28
Upper Gila	0.44	100_year	65000.00	934.07	944.18	940.14	944.40	0.000815	5.91	25983.12	4105.85	0.36
Upper Gila	0.49	100_year	65000.00	934.20	944.40	940.74	944.58	0.000755	5.65	24360.57	4134.69	0.34
Upper Gila	0.53	100_year	65000.00	934.31	944.54	940.71	944.79	0.001183	6.73	24206.78	4166.22	0.42
Upper Gila	0.59	100_year	65000.00	934.02	944.92	941.57	945.14	0.001066	6.41	26181.03	4259.00	0.40
Upper Gila	0.64	100_year	65000.00	934.53	945.34	941.23	945.52	0.001284	5.82	25378.54	4320.02	0.34
Upper Gila	0.69	100_year	65000.00	934.34	945.56	942.17	945.79	0.000753	5.63	22384.14	4533.04	0.34
Upper Gila	0.74	100_year	65000.00	934.87	945.80	942.74	945.98	0.000827	5.17	22488.22	4500.29	0.31
Upper Gila	0.80	100_year	65000.00	935.02	946.08	942.79	946.28	0.001115	6.06	22420.65	4762.91	0.36
Upper Gila	0.86	100_year	65000.00	934.82	946.43	943.13	946.64	0.001053	6.41	23755.75	4530.76	0.40
Upper Gila	0.91	100_year	65000.00	935.22	946.78	943.18	946.99	0.001263	5.83	20578.38	3801.28	0.37
Upper Gila	0.96	100_year	65000.00	935.68	947.16	944.00	947.42	0.001866	6.86	20854.31	3984.81	0.45
Upper Gila	1.02	100_year	65000.00	935.33	947.79	944.31	948.01	0.001509	6.45	22521.05	4275.57	0.37
Upper Gila	1.09	100_year	65000.00	936.13	948.28	945.44	948.61	0.001627	8.17	25209.93	3876.64	0.44
Upper Gila	1.15	100_year	65000.00	936.48	948.70	946.07	949.12	0.001461	9.17	25073.85	4068.48	0.49
Upper Gila	1.21	100_year	65000.00	936.83	949.26	946.40	949.54	0.001143	6.72	19243.46	3658.80	0.37
Upper Gila	1.28	100_year	65000.00	936.98	949.60	946.50	949.84	0.000932	5.02	17546.87	3556.59	0.29
Upper Gila	1.35	100_year	65000.00	937.13	949.92	947.13	950.22	0.001230	7.12	17968.61	3521.26	0.43
Upper Gila	1.41	100_year	65000.00	936.77	950.24	947.31	950.69	0.001392	8.74	20325.64	3541.19	0.48
Upper Gila	1.48	100_year	65000.00	937.41	950.79	948.83	951.31	0.002071	9.62	22602.36	3291.16	0.51
Upper Gila	1.55	100_year	65000.00	938.15	951.49	948.31	951.94	0.001614	8.02	25244.59	4247.15	0.44
Upper Gila	1.59	100_year	65000.00	938.26	951.90	948.63	952.25	0.001315	7.75	19503.33	3227.33	0.41
Upper Gila	1.63	100_year	65000.00	938.45	952.22	949.03	952.54	0.001285	7.54	20713.82	3738.08	0.40
Upper Gila	1.67	100_year	65000.00	938.36	952.49	948.26	952.82	0.001796	7.92	24765.87	4074.62	0.41

L-iv

Comparison of Initial and Post-Sediment Cross Sections for Levee + Pond Conditions

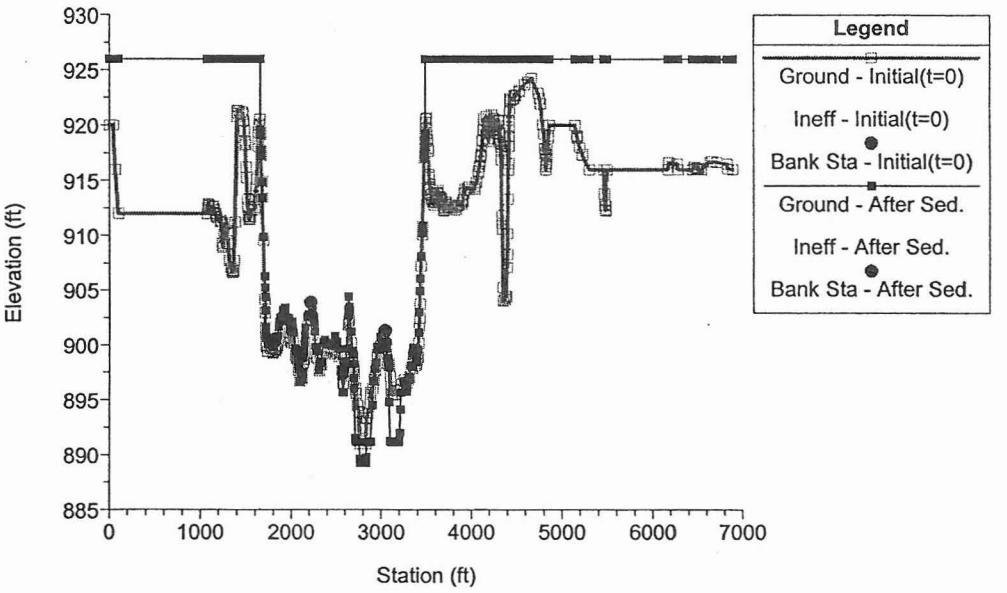
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.16



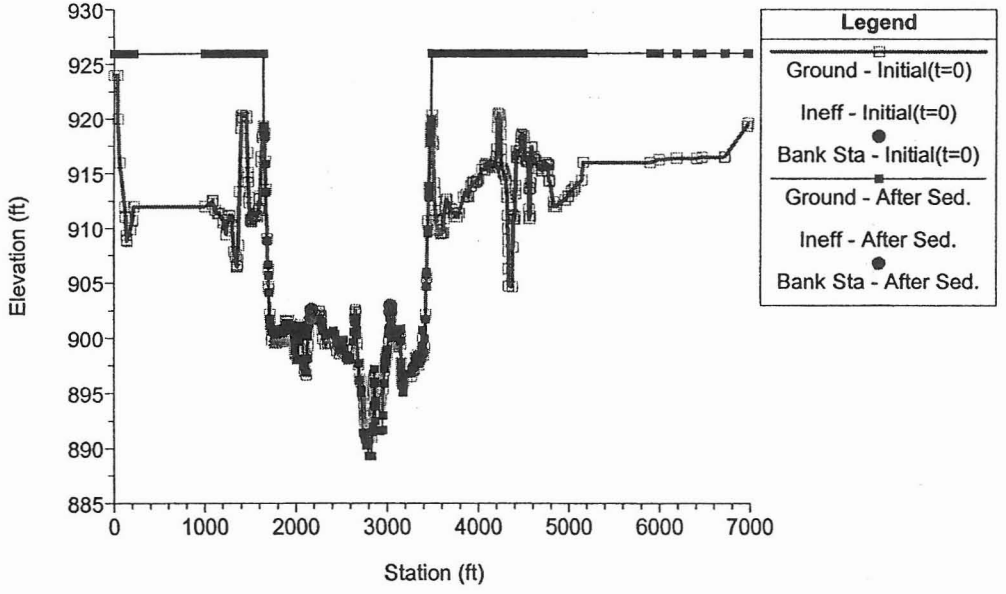
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.2



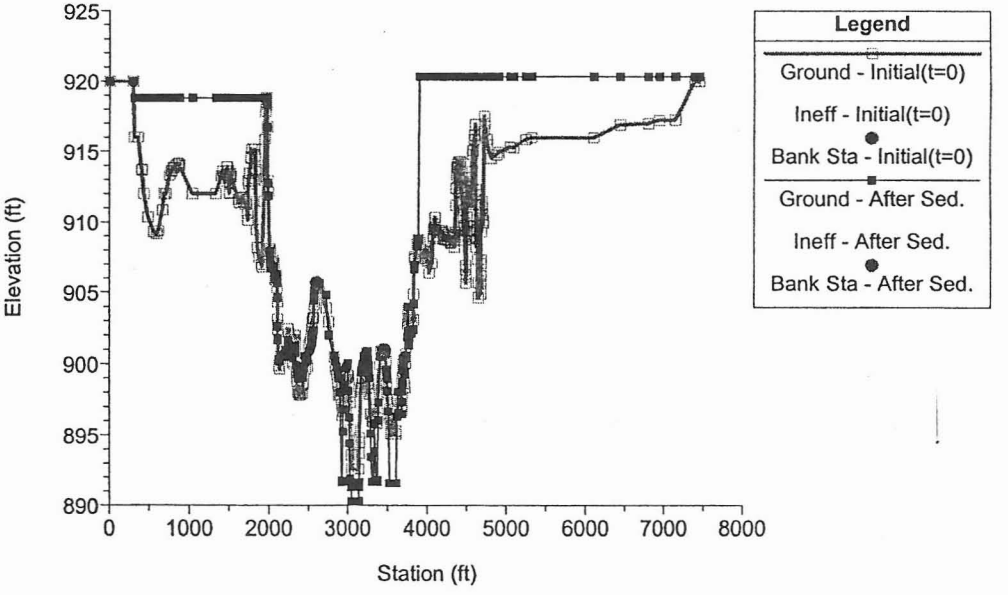
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.22



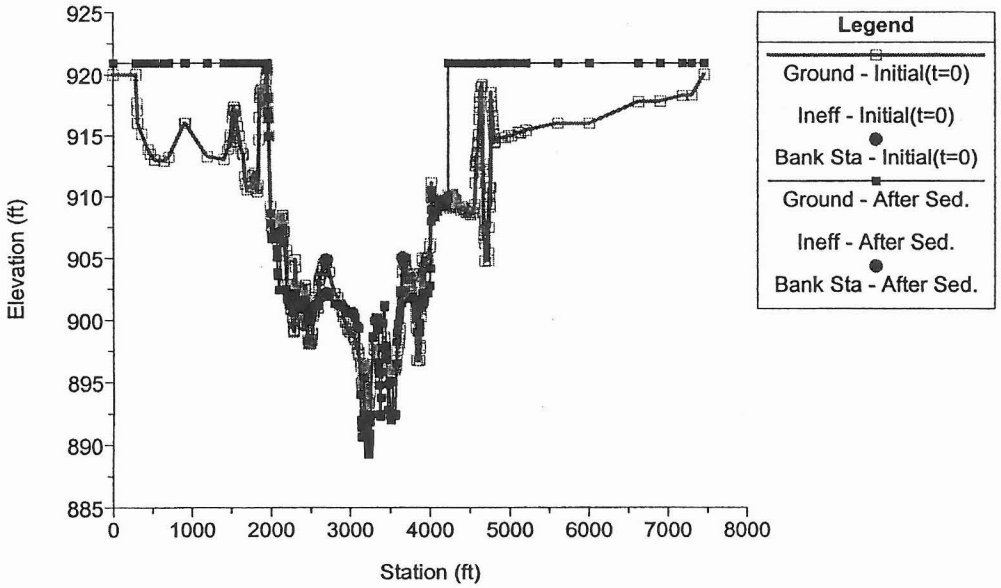
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.28



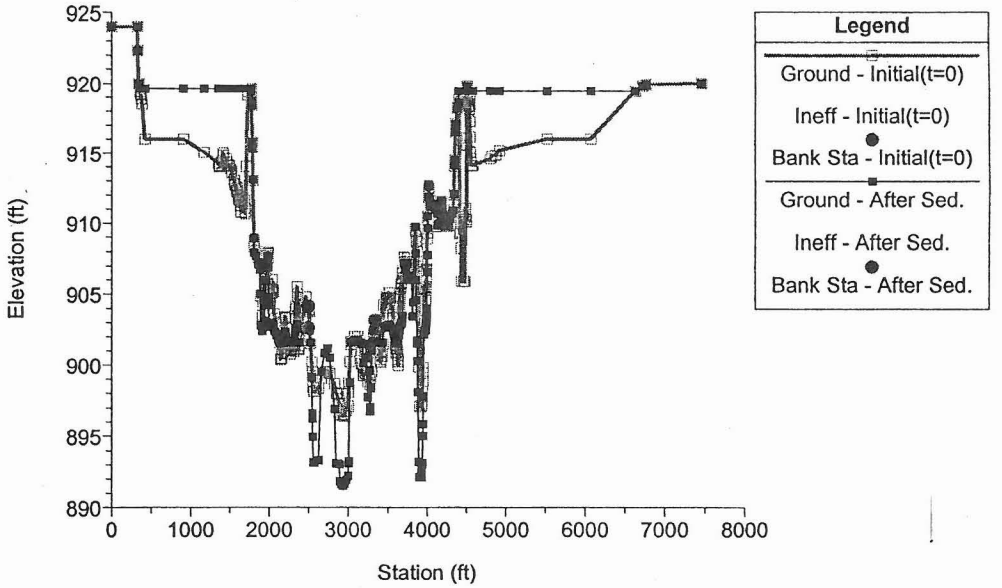
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.34



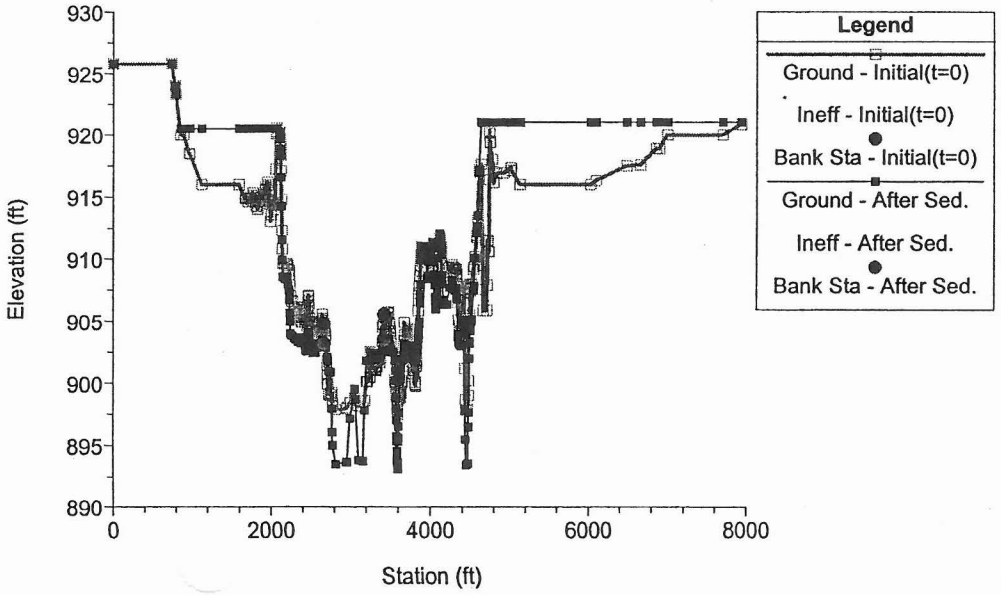
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.45



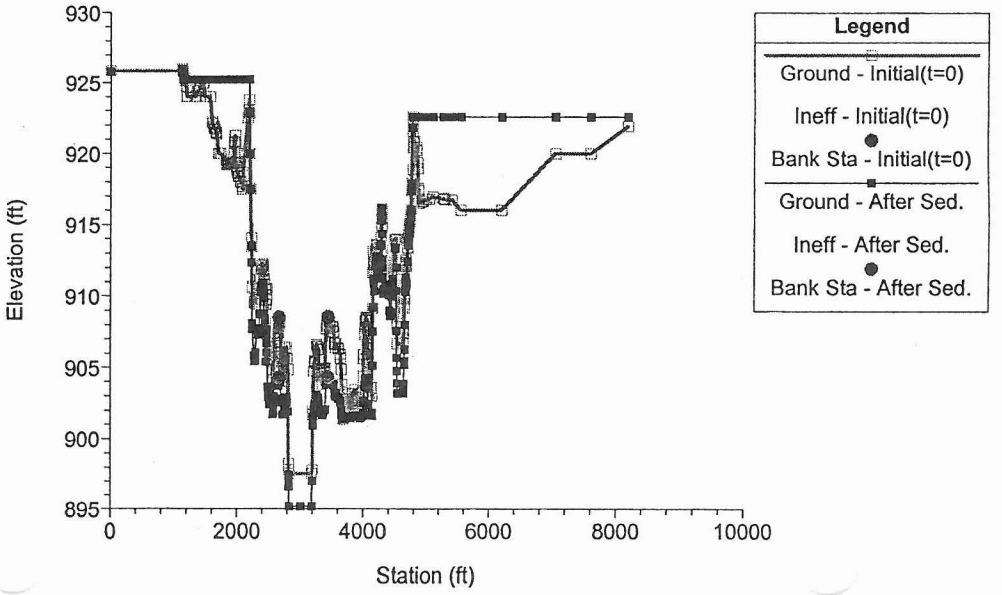
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.55



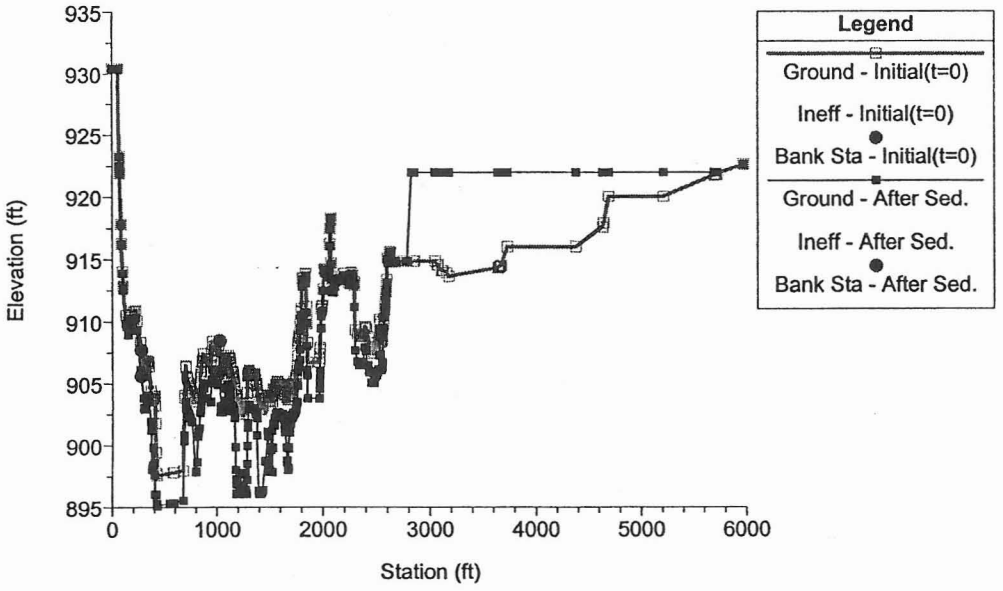
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.65



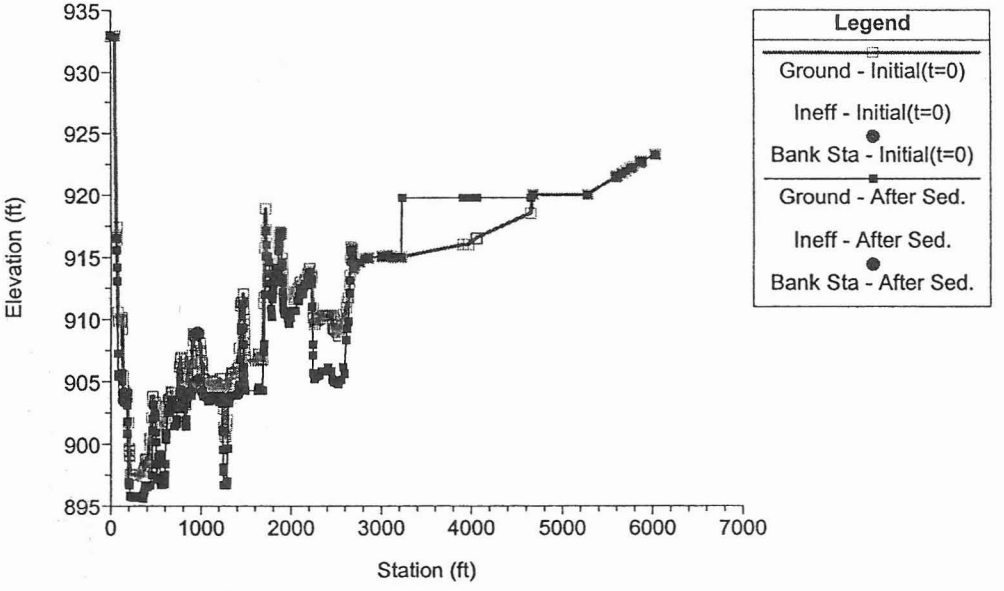
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.77



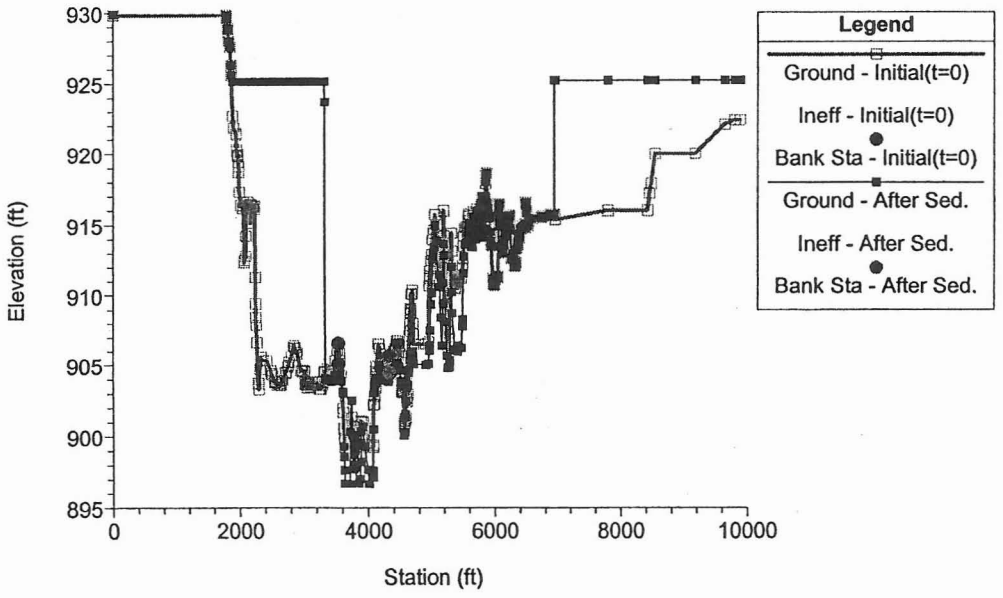
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.86



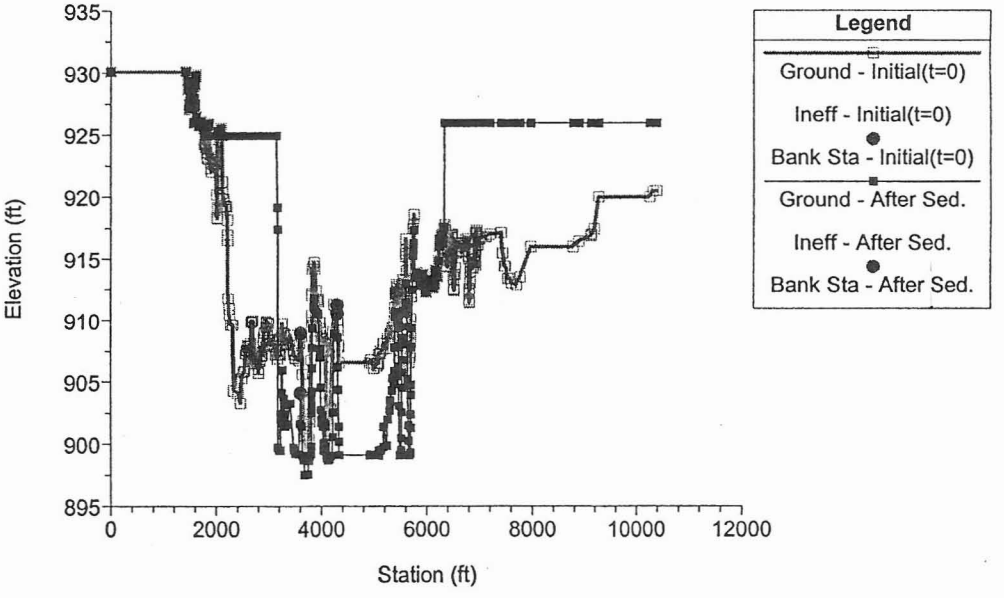
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 195.98



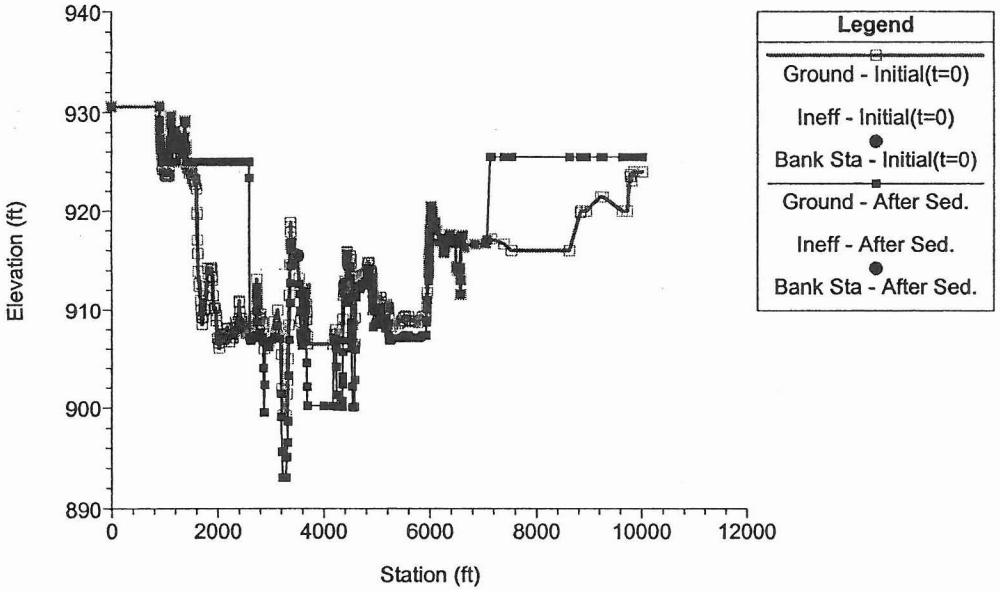
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.08



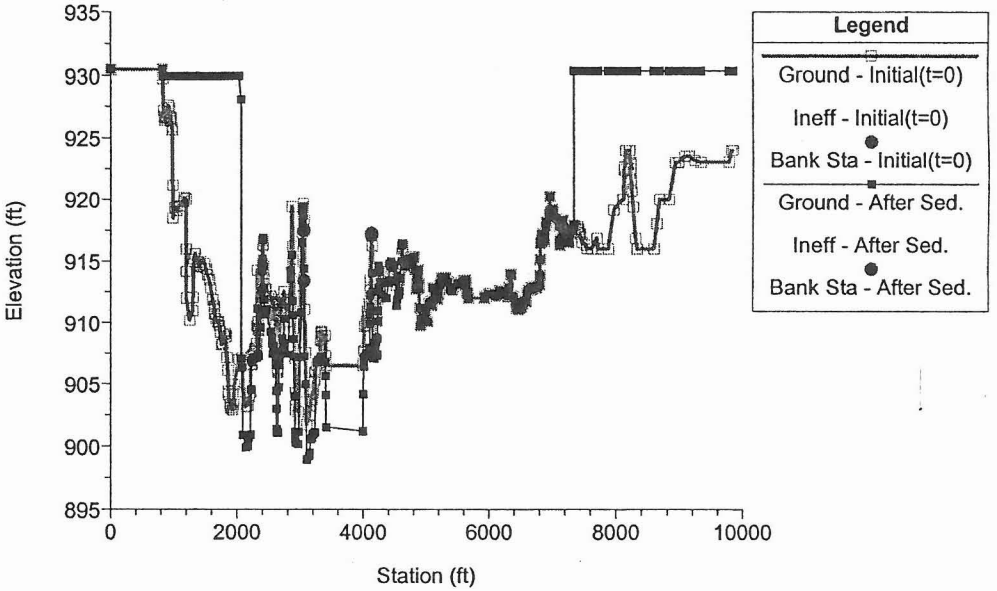
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.14



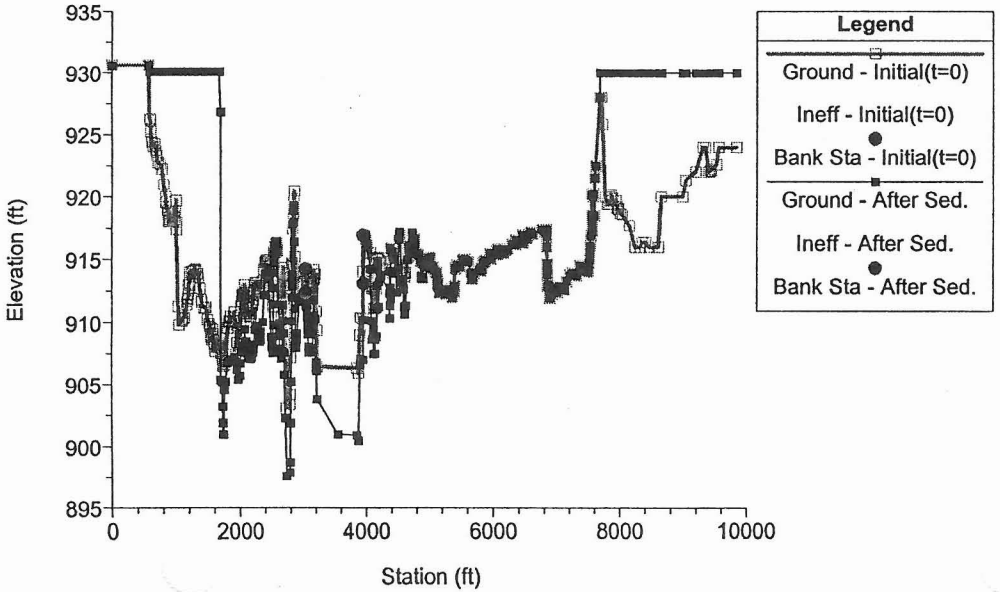
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.23



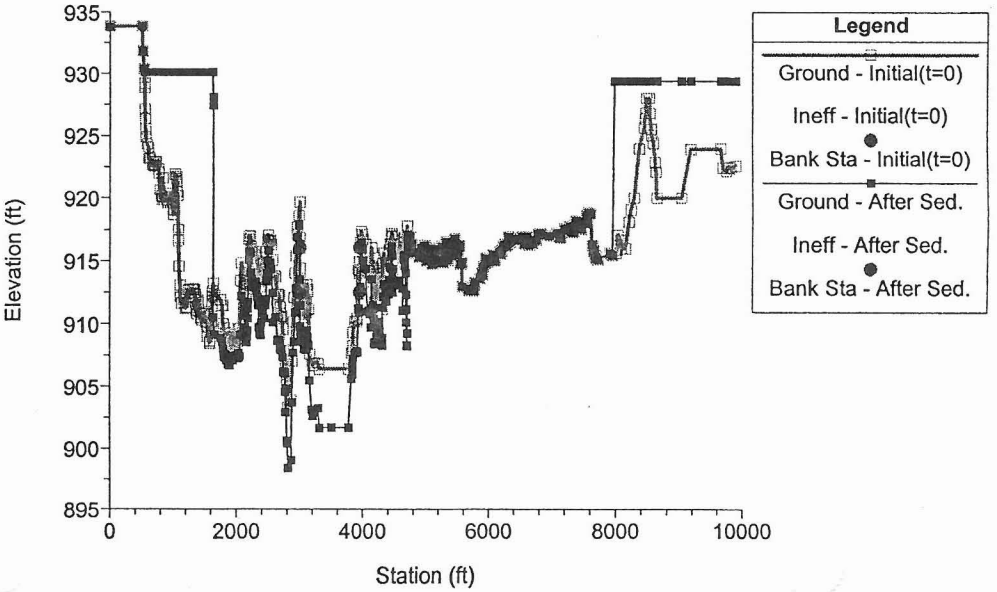
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.32



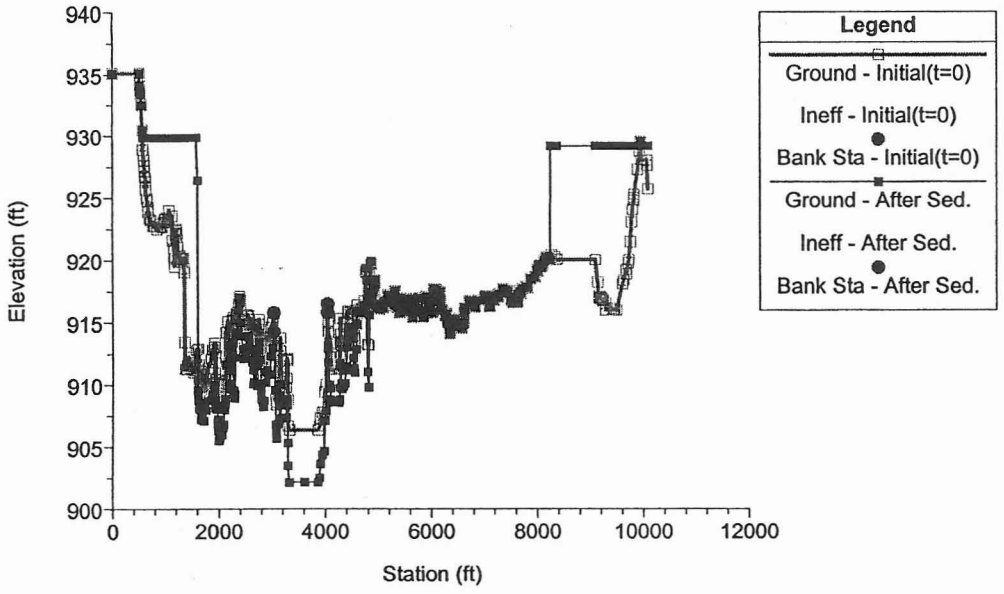
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.38



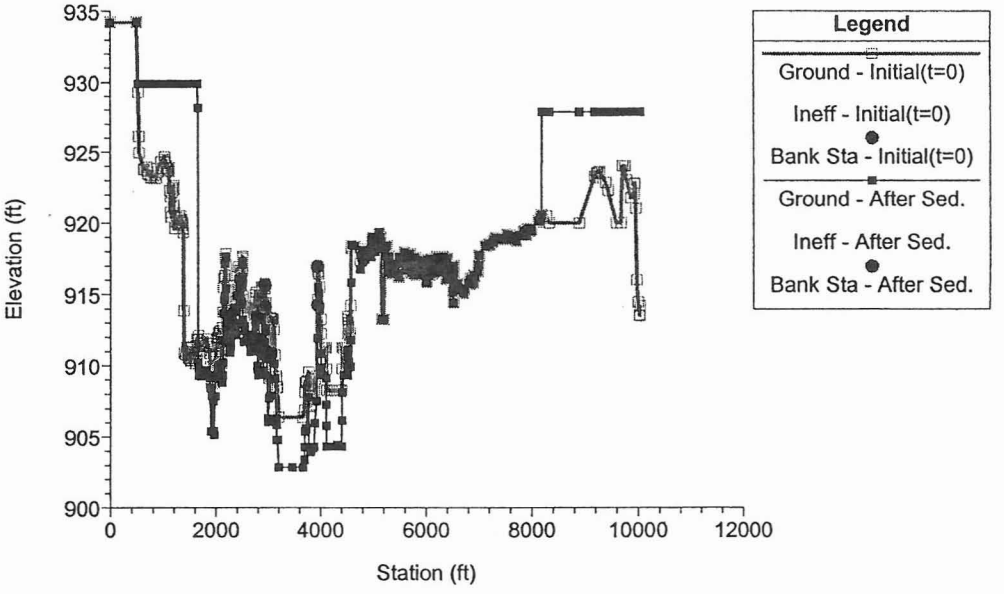
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.44



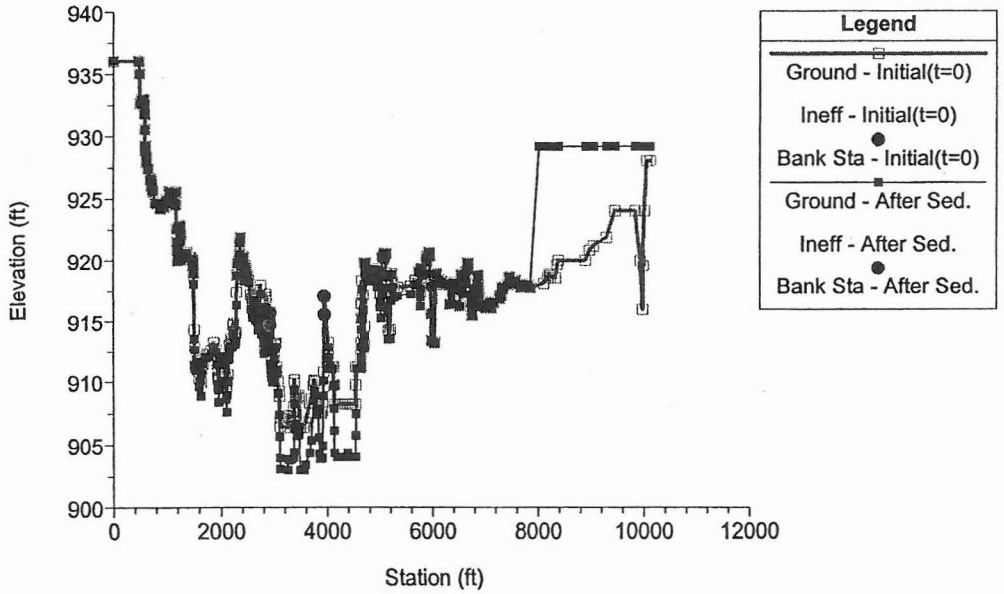
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.5



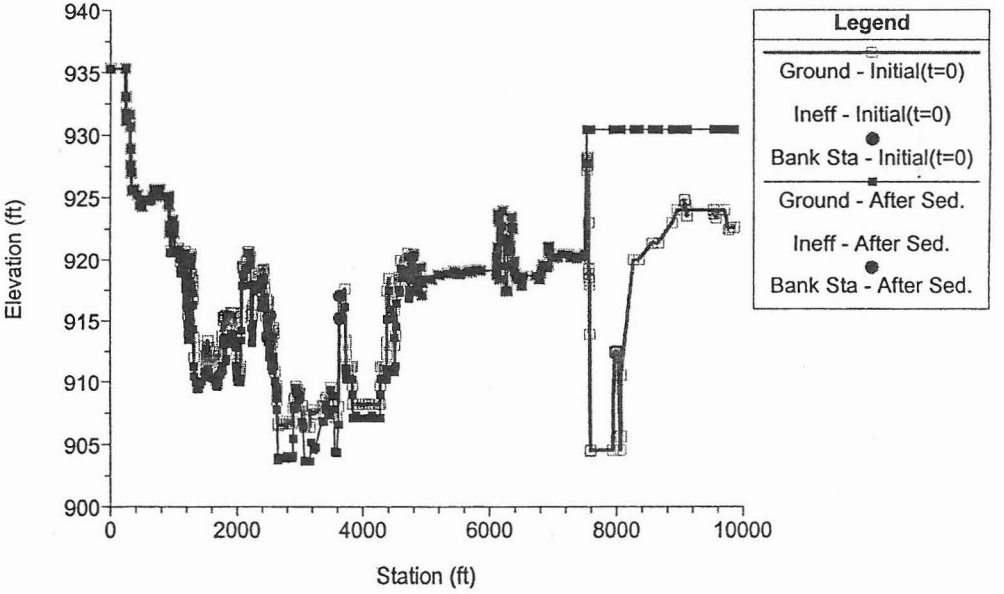
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.57



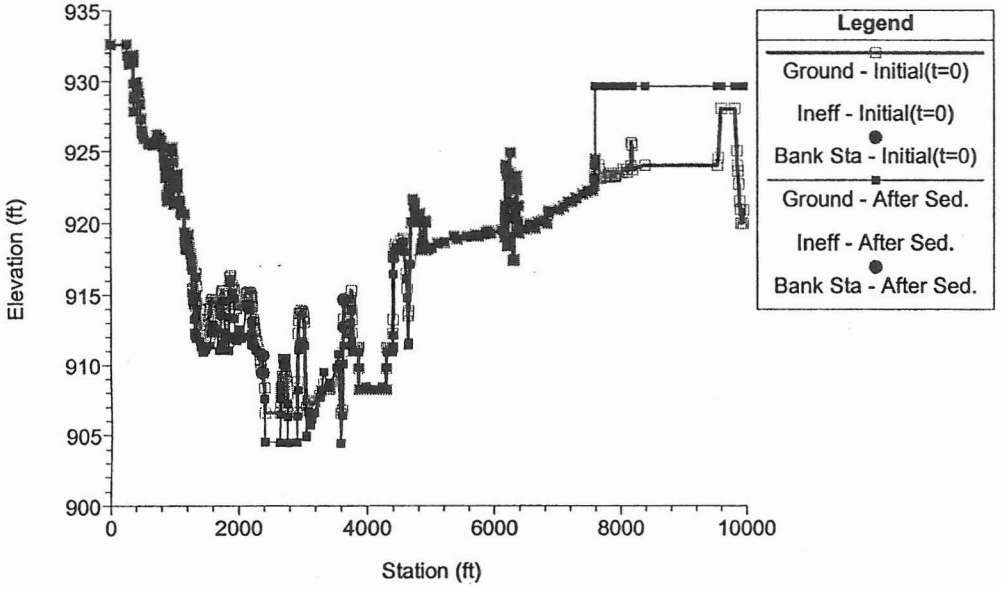
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.63



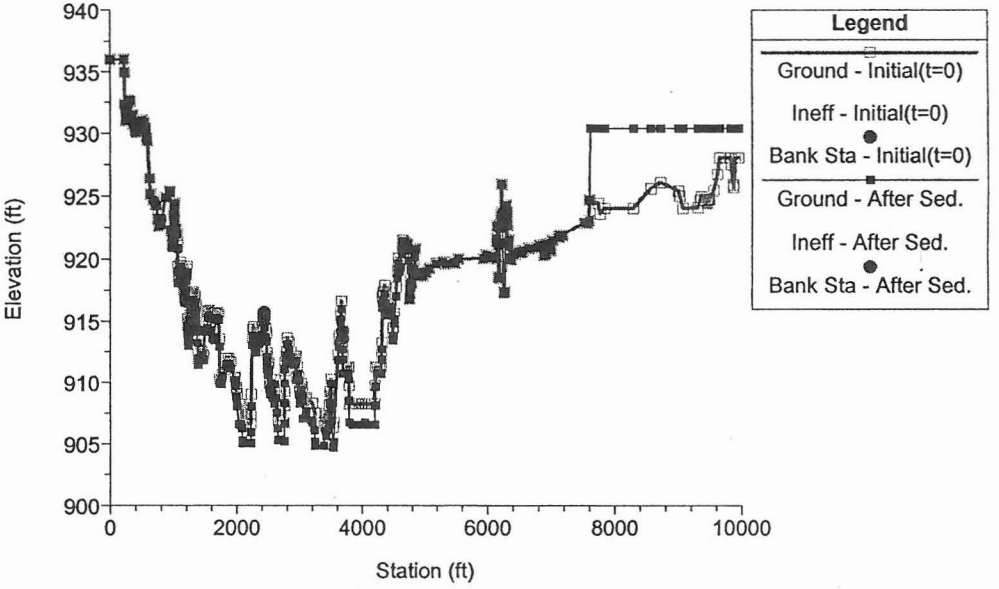
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.69



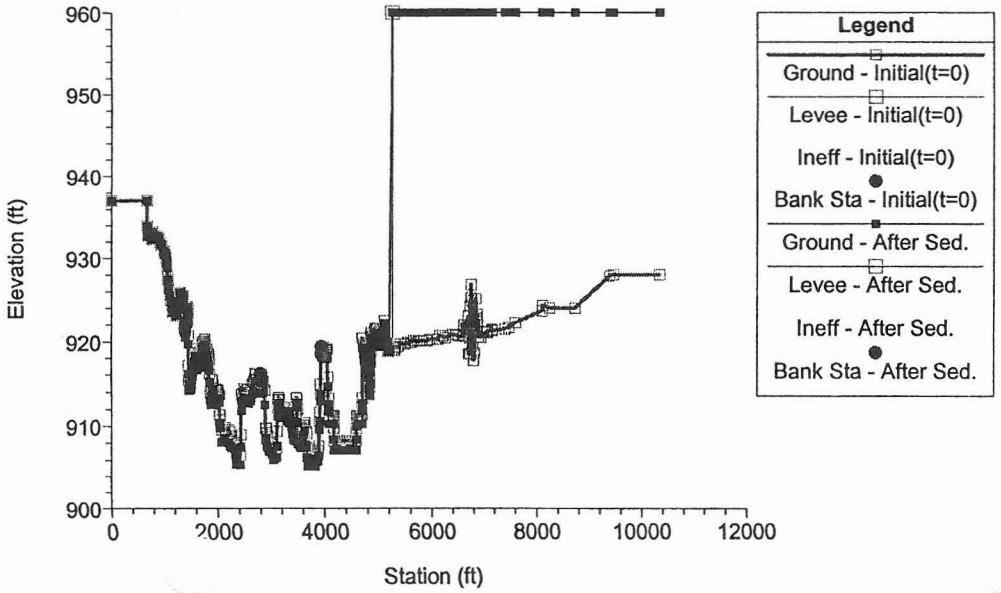
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.75



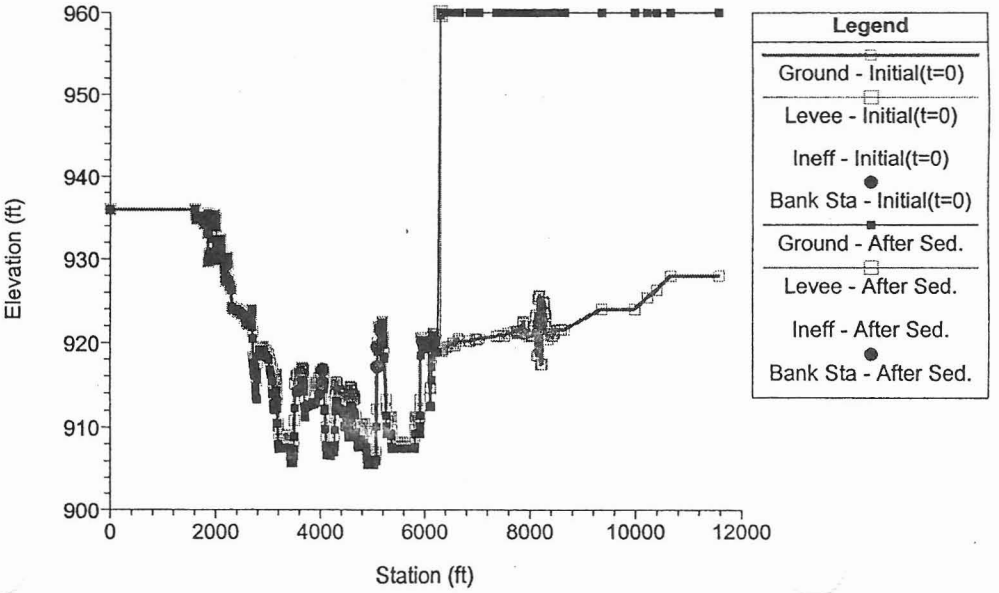
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.81



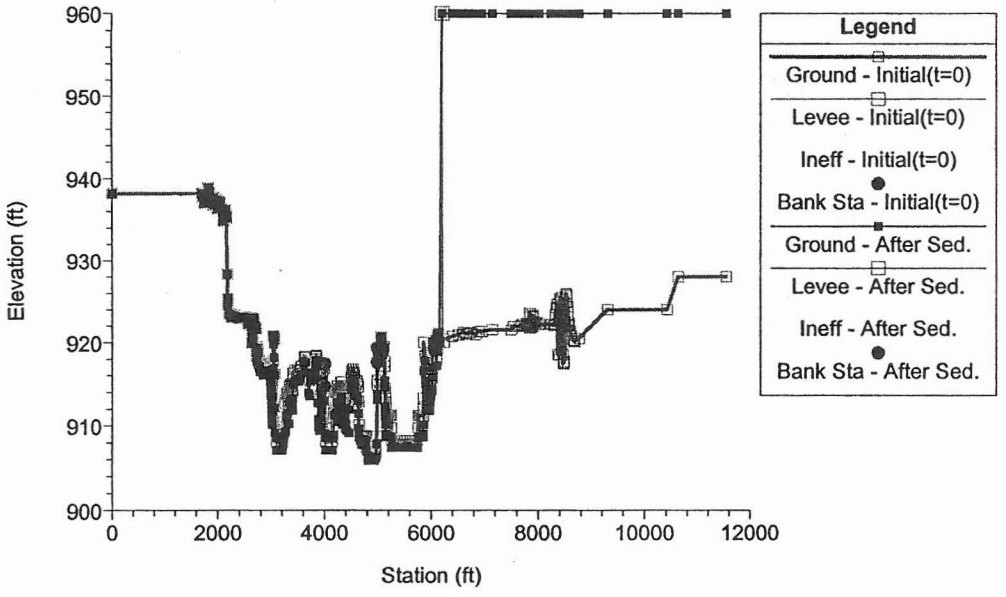
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.87



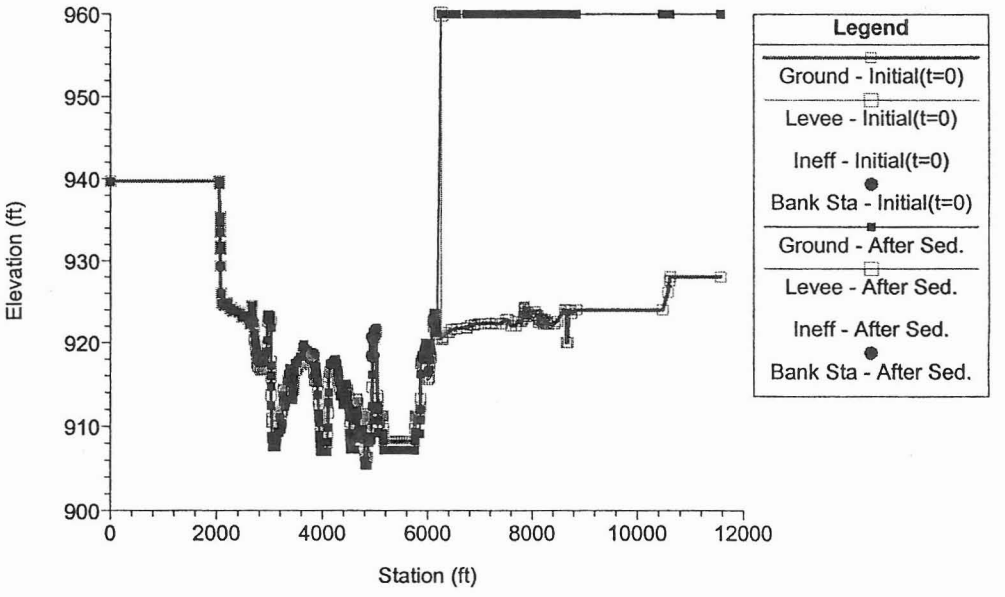
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.94



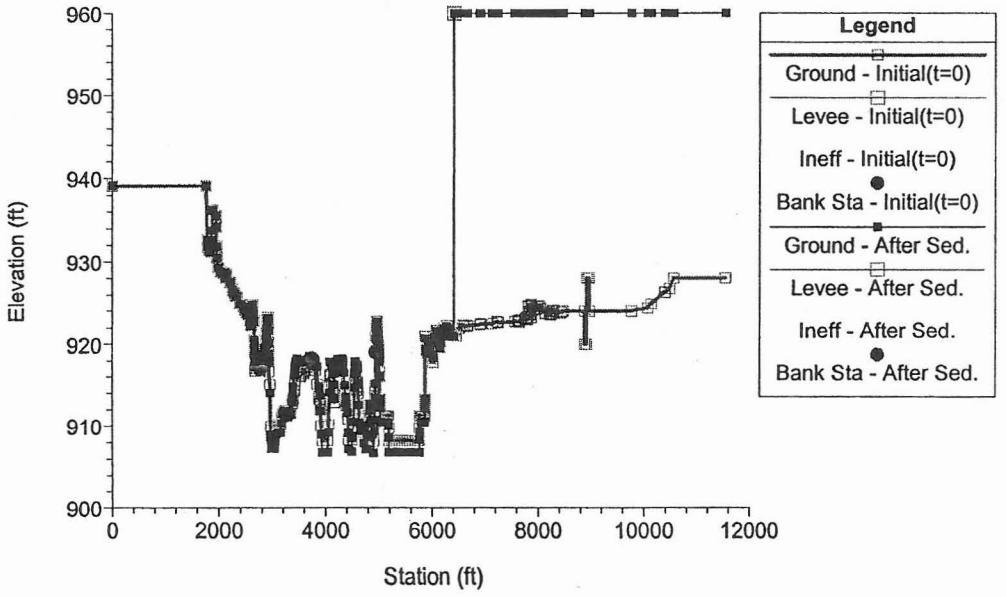
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 196.99



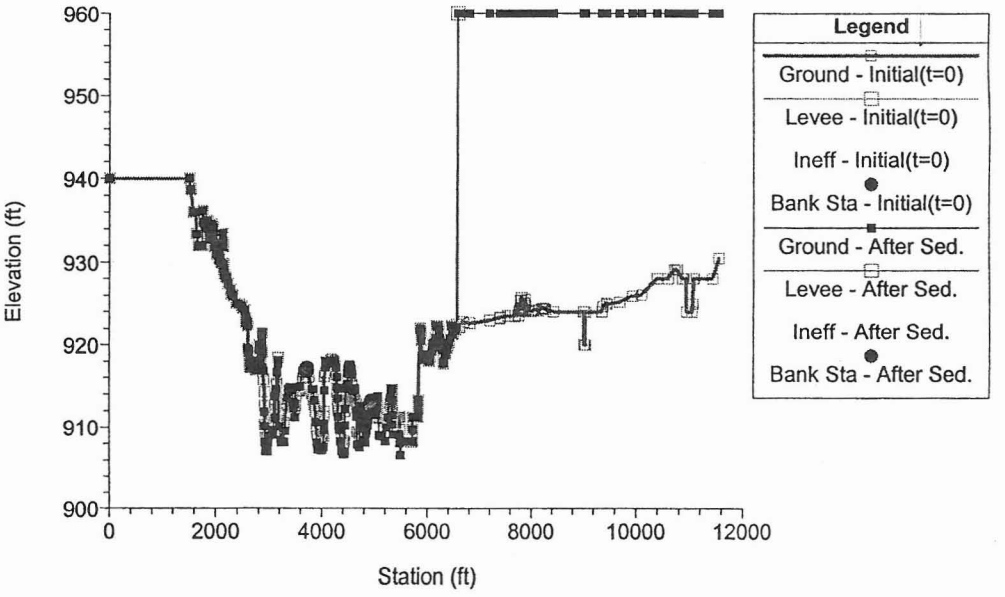
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.05



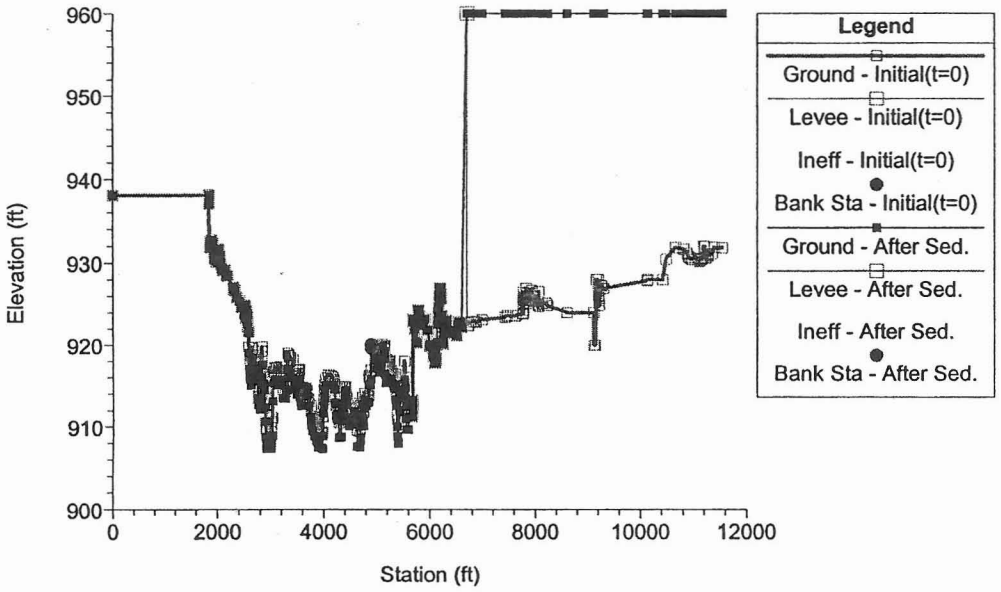
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.09



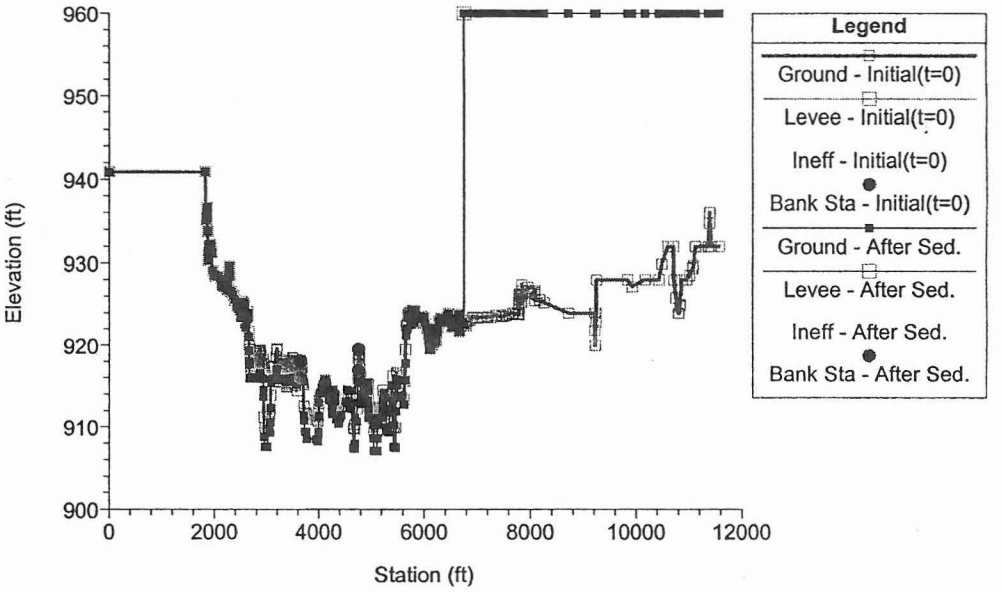
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.14



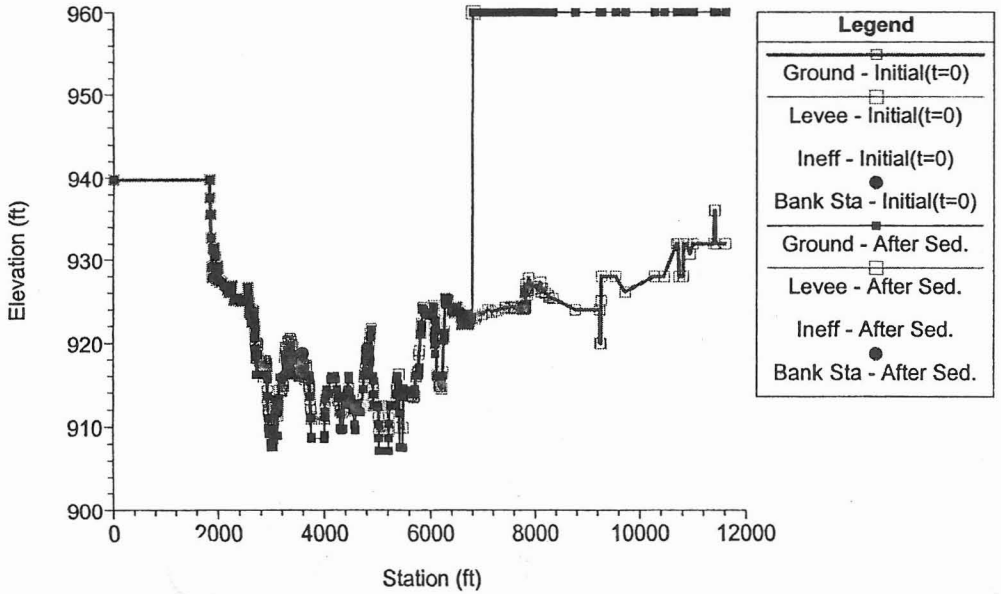
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.16



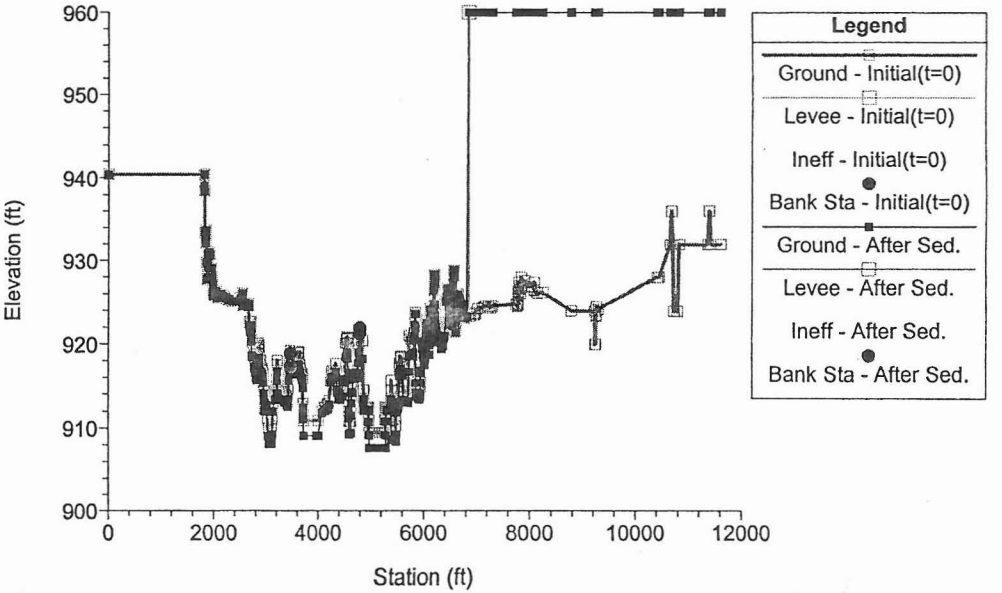
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.18



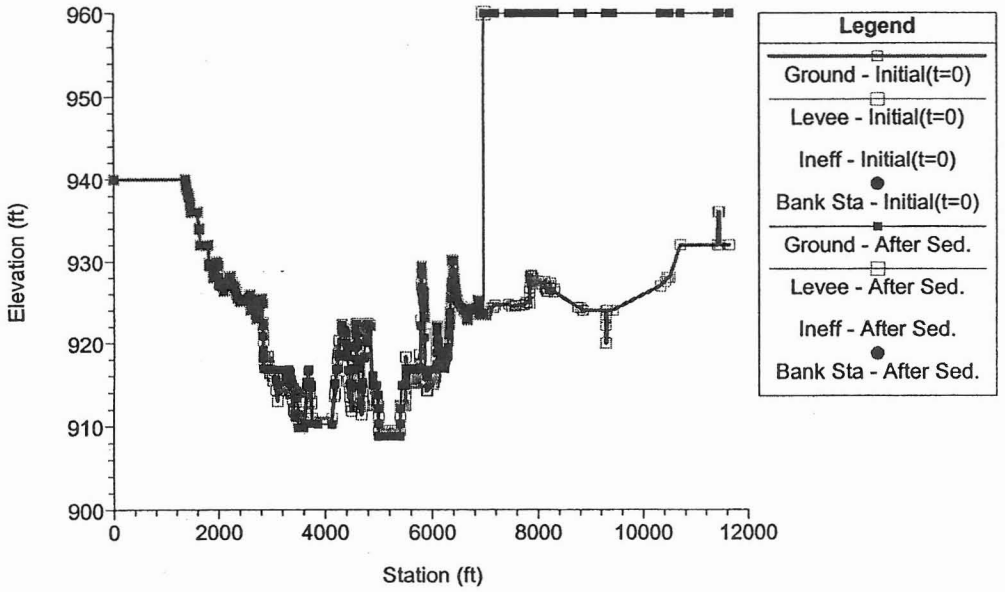
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.23



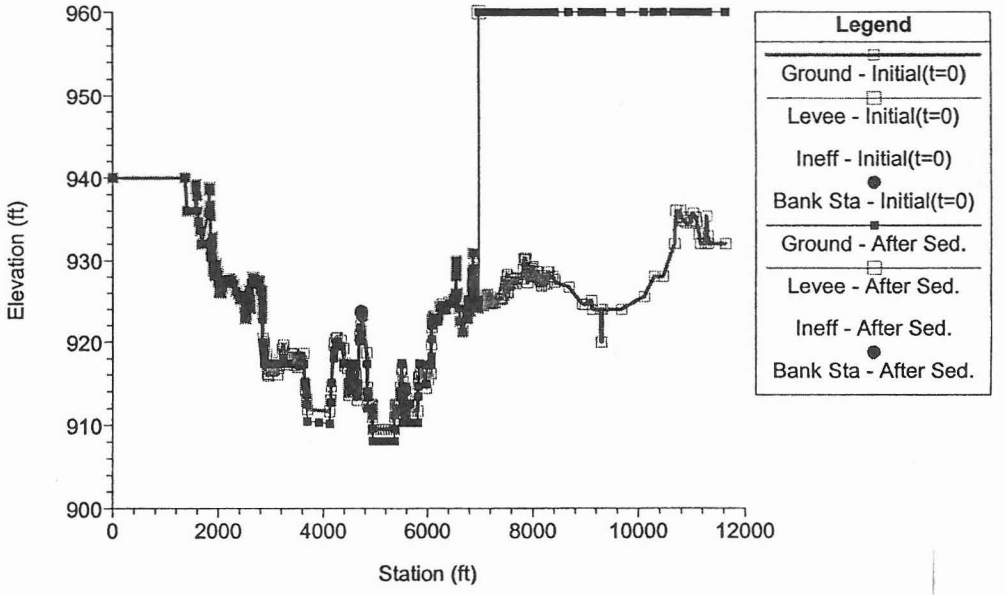
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.28



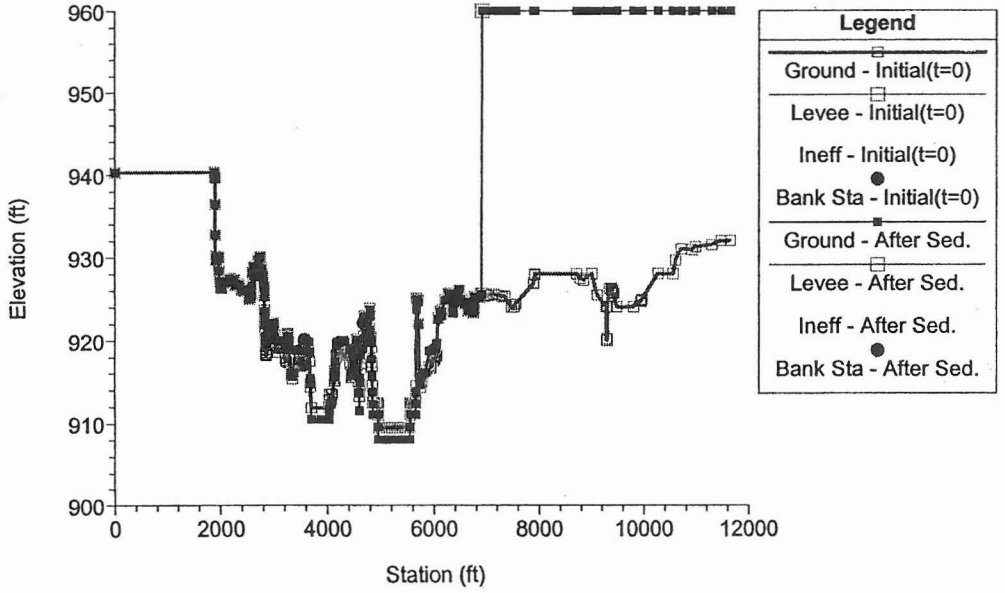
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.33



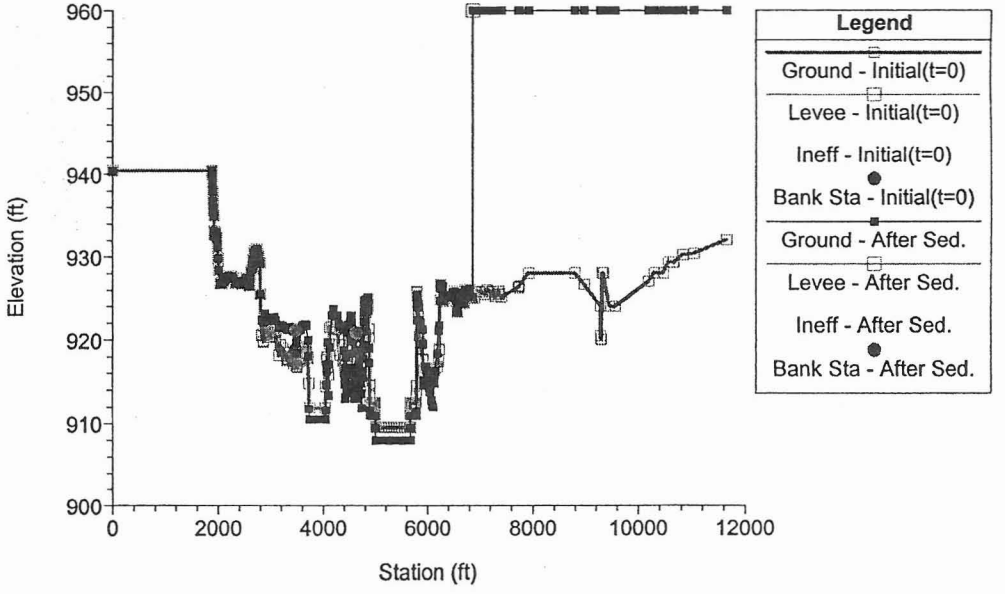
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.38



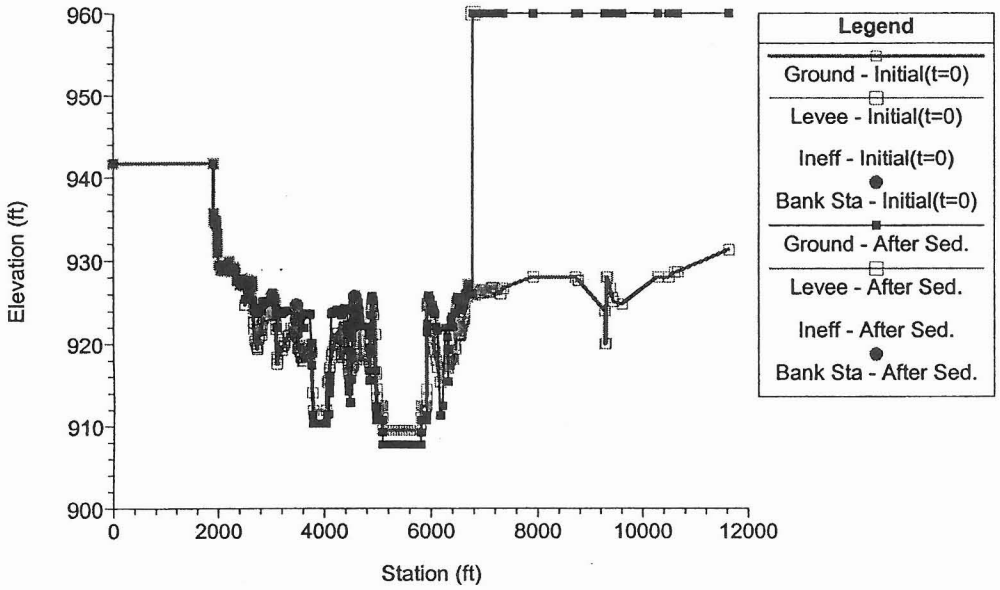
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.42



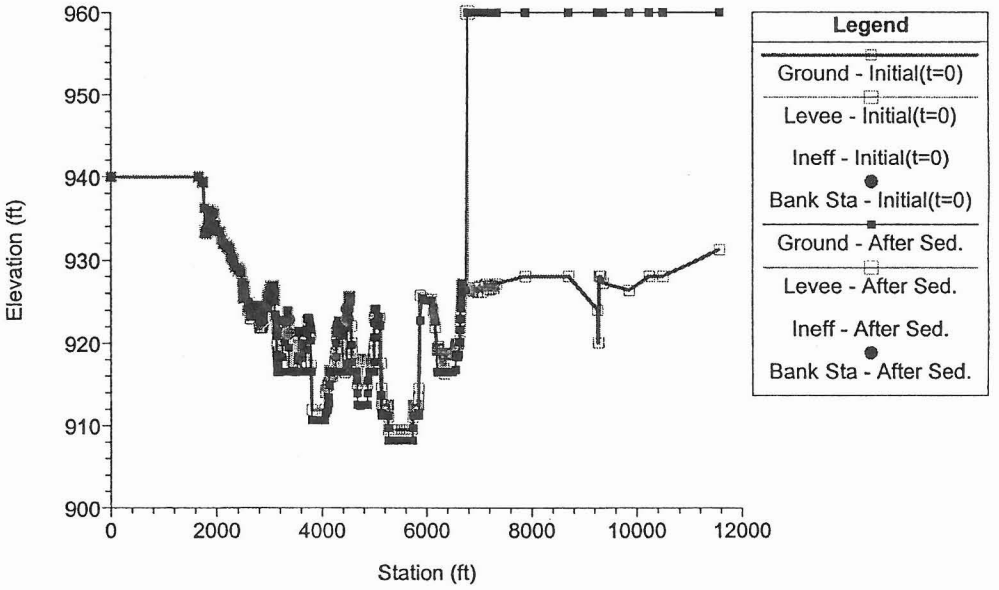
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.48



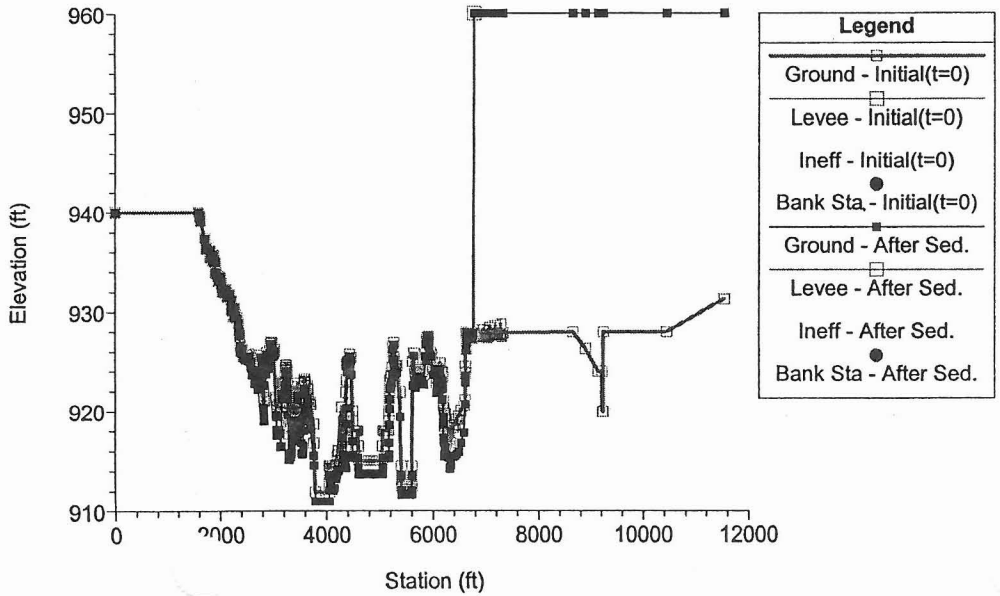
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.53



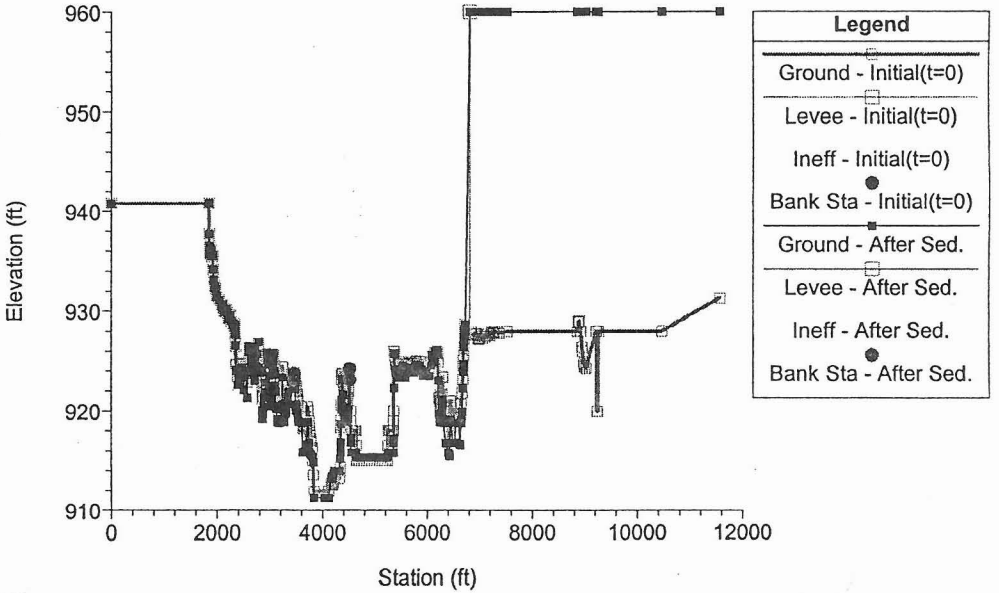
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.58



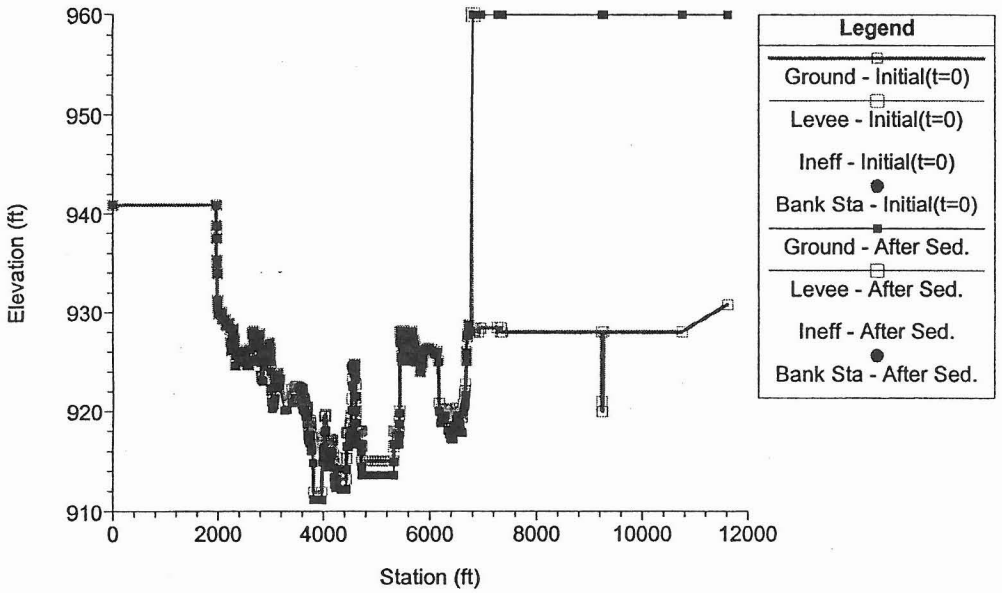
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.64



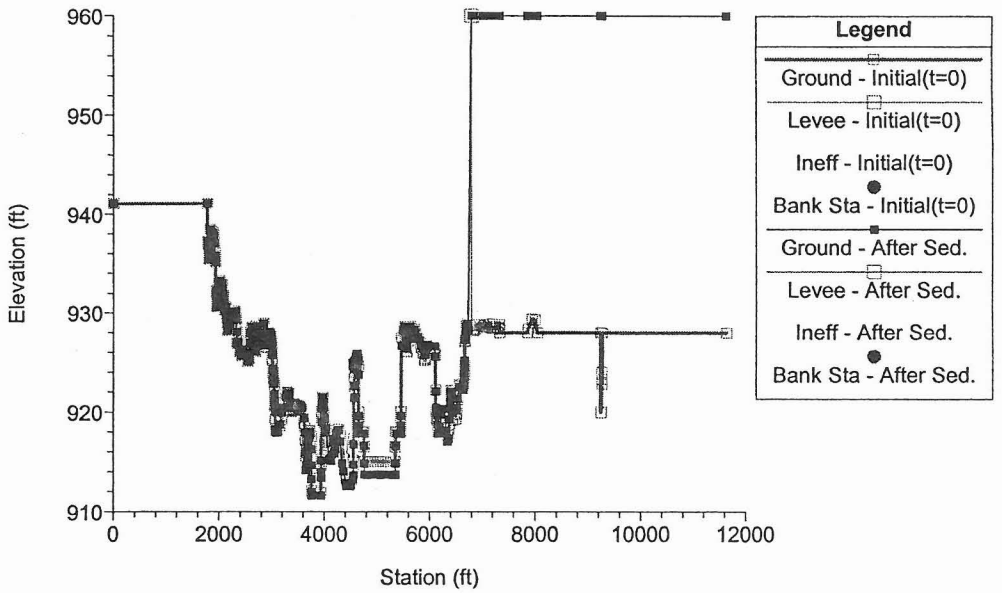
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.7



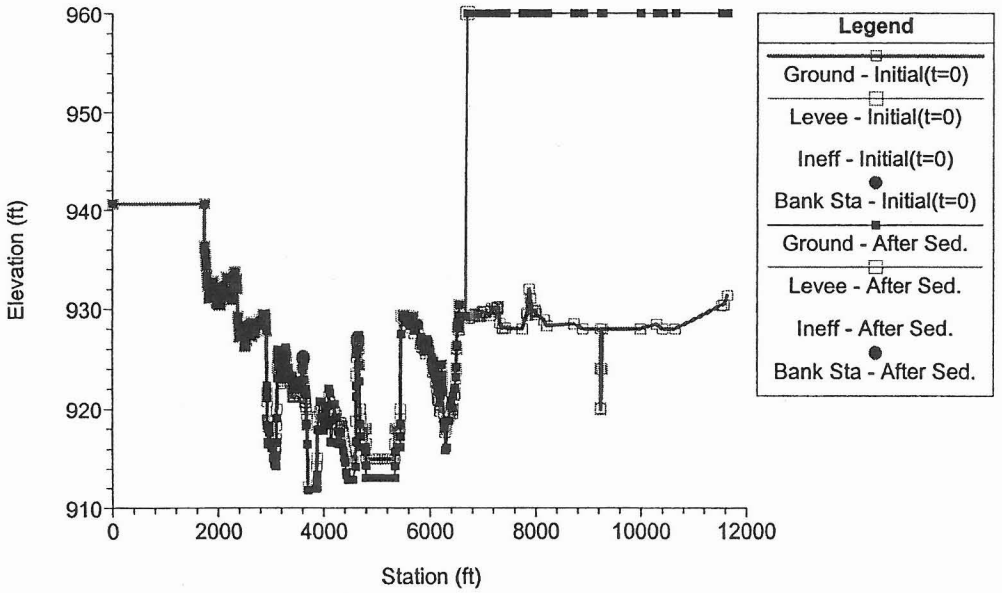
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.75



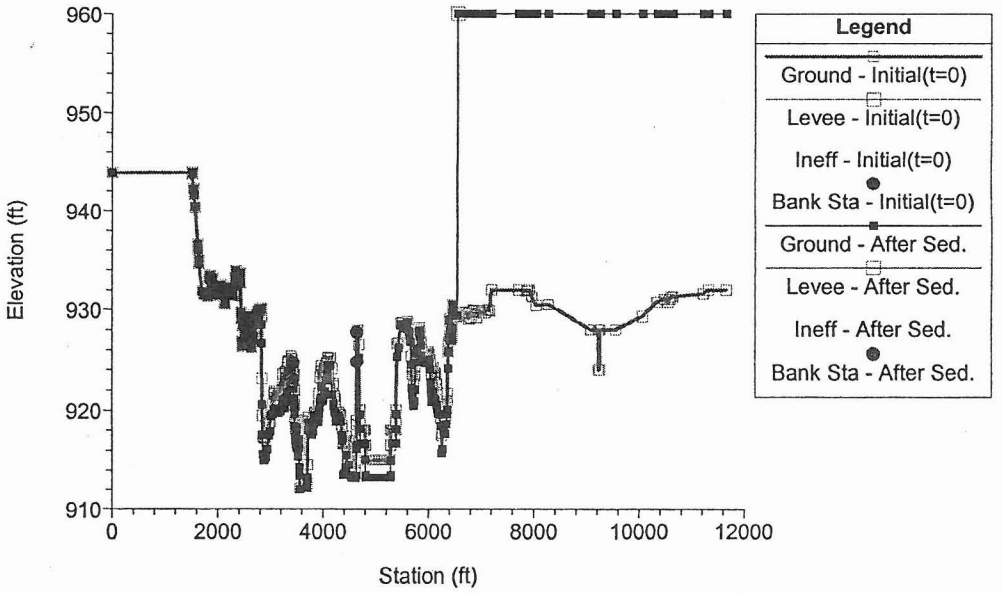
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.81



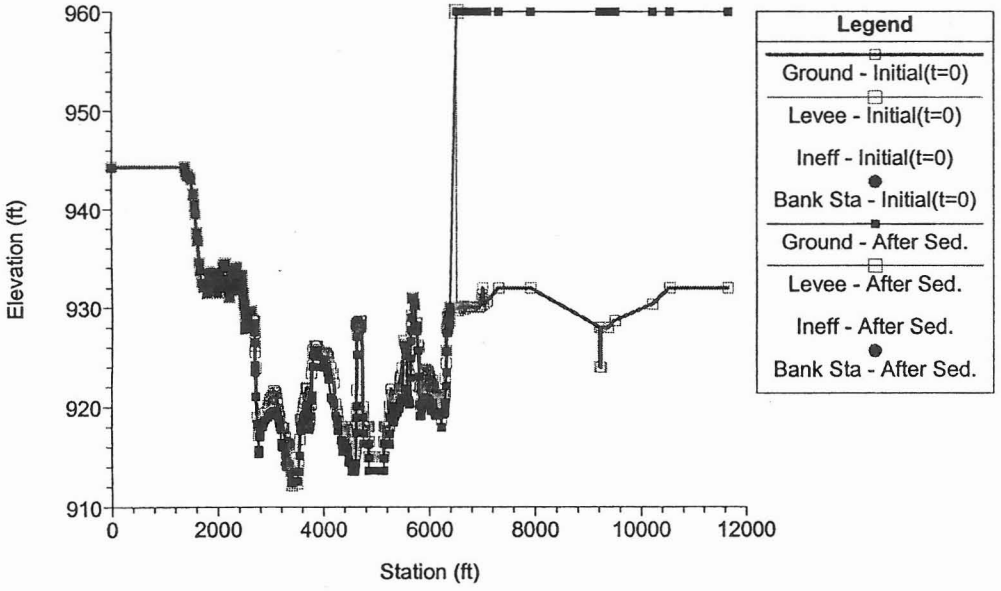
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.87



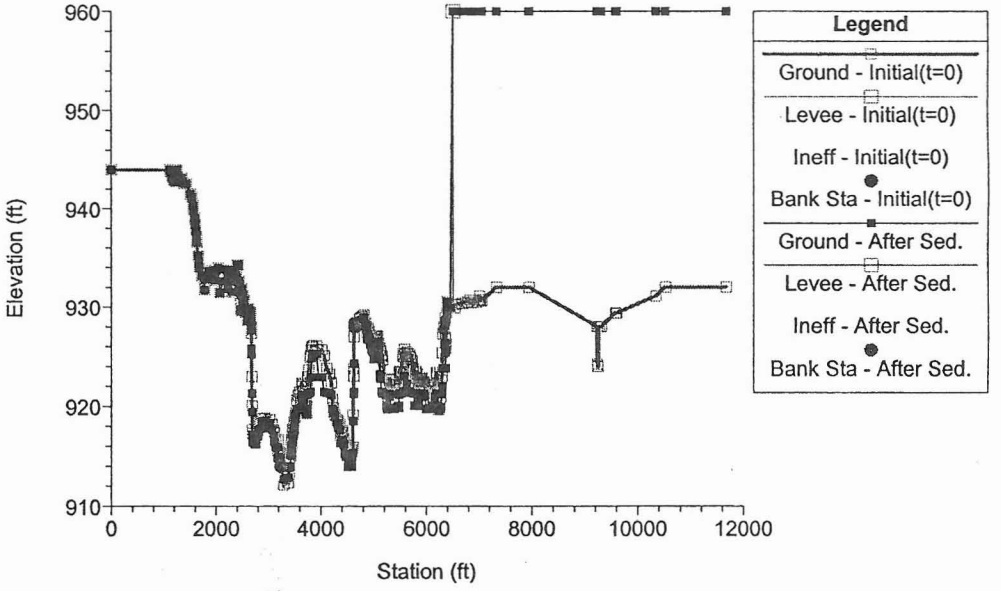
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.92



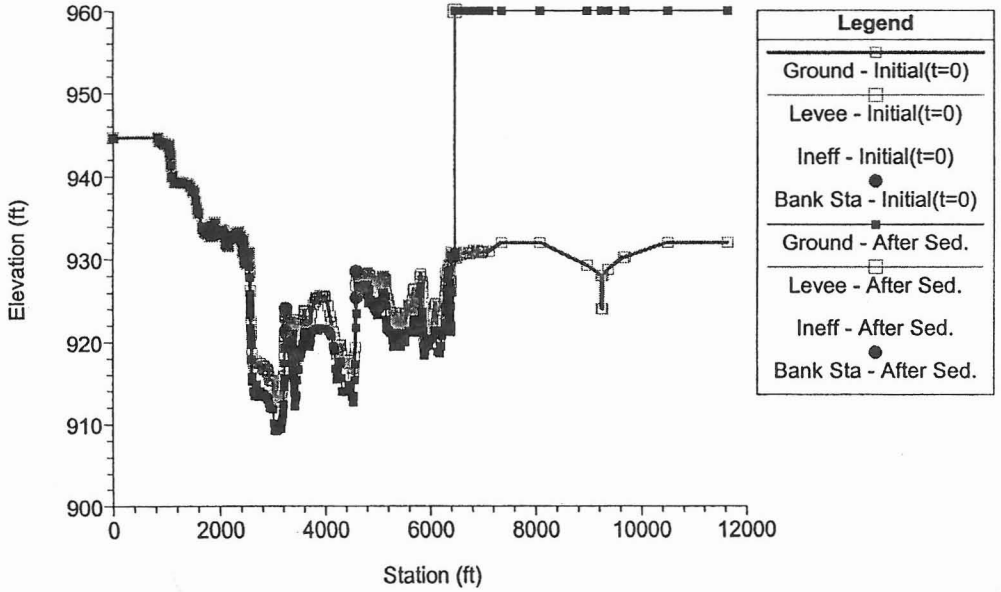
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.95



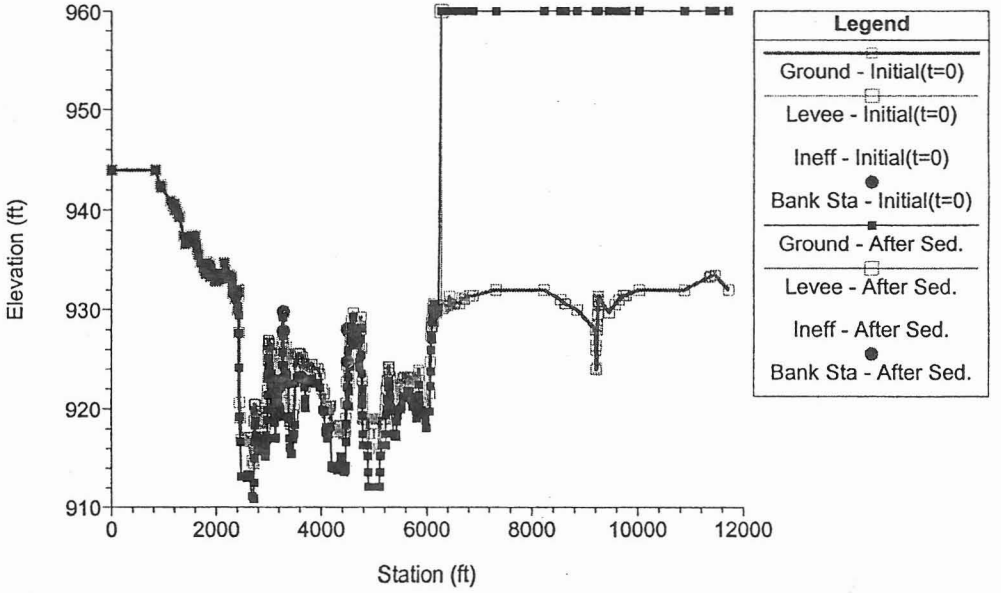
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 197.98



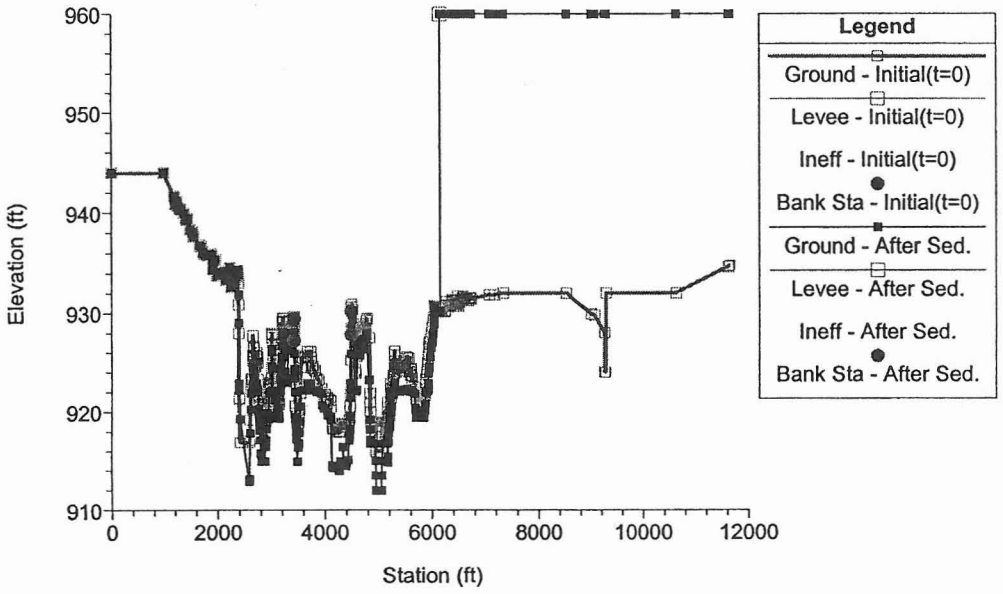
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.03



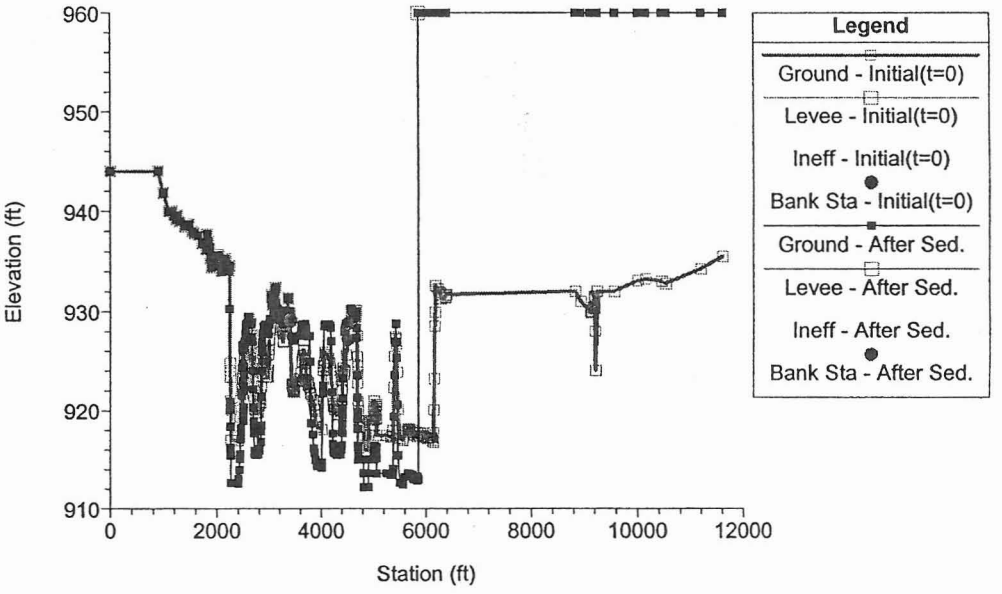
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.08



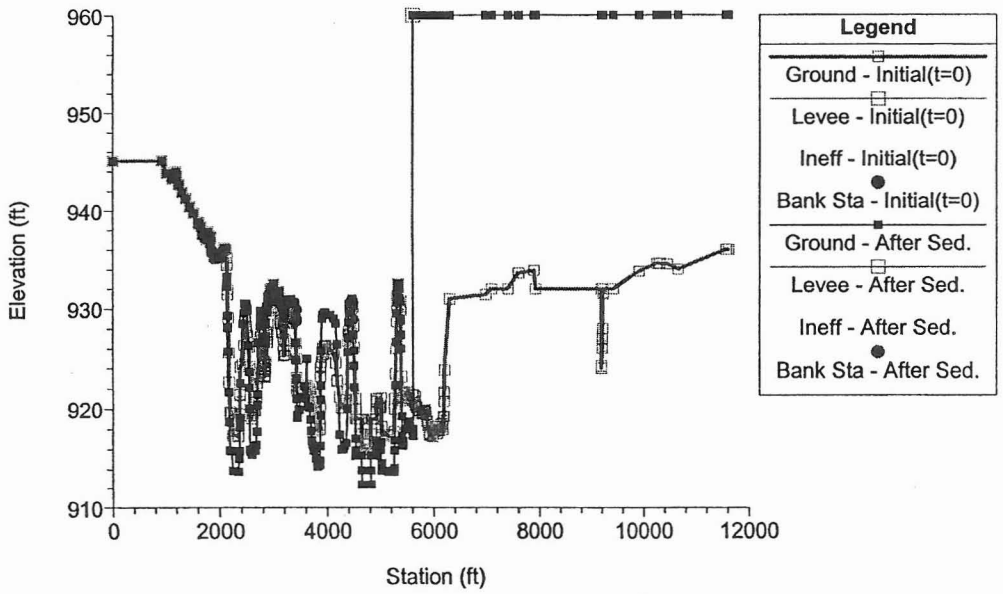
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.15



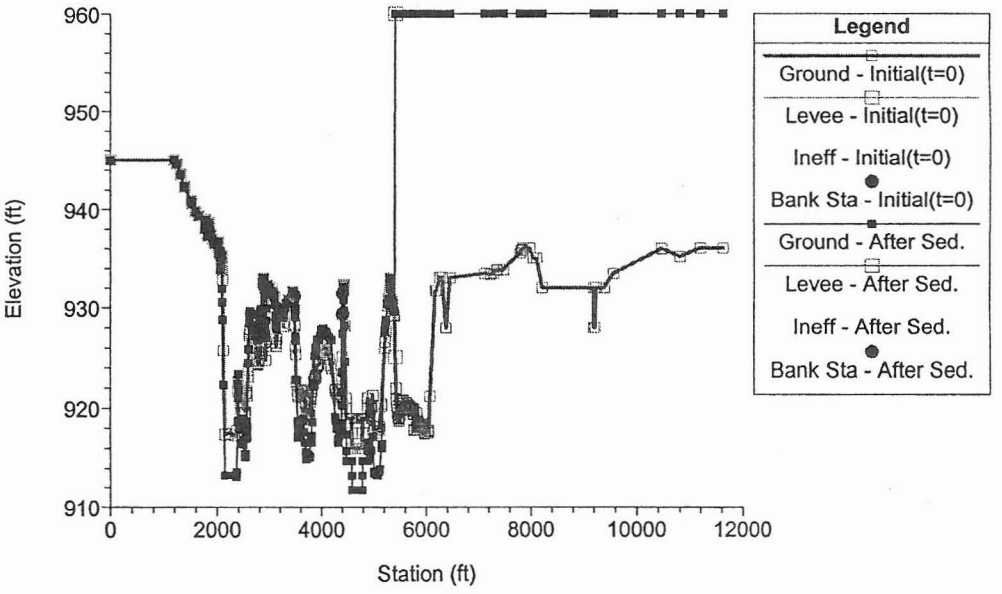
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.2



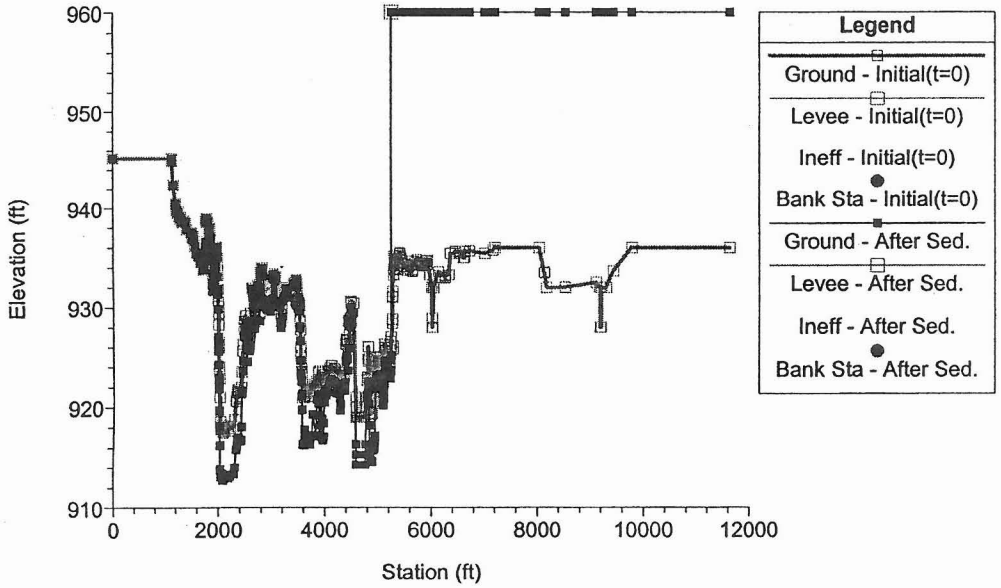
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.26



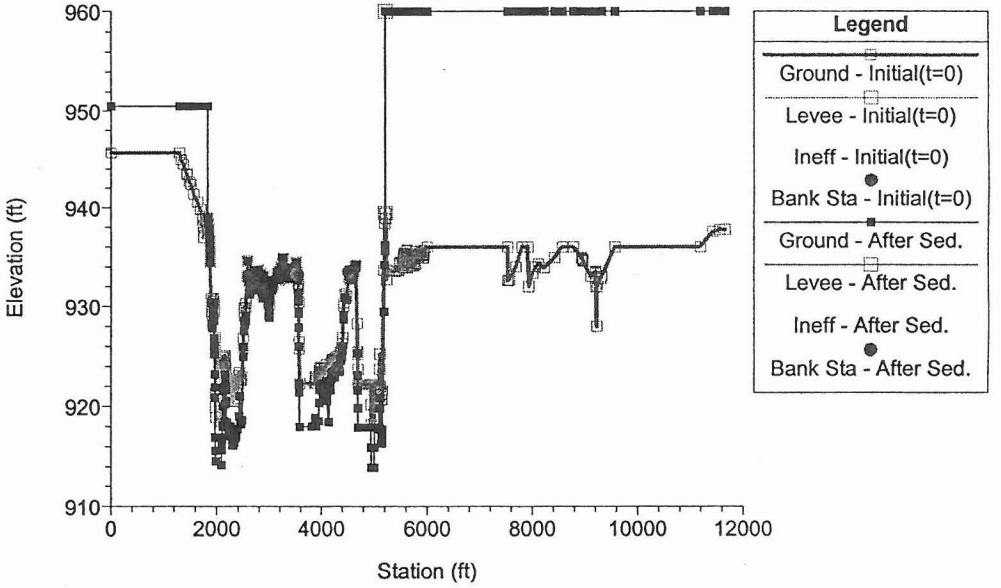
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.33



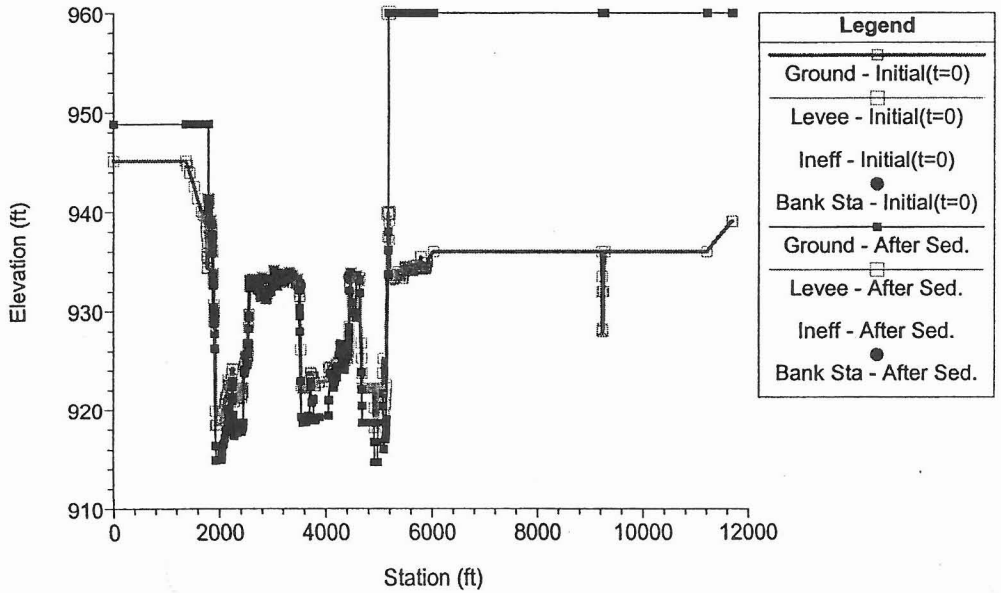
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.4



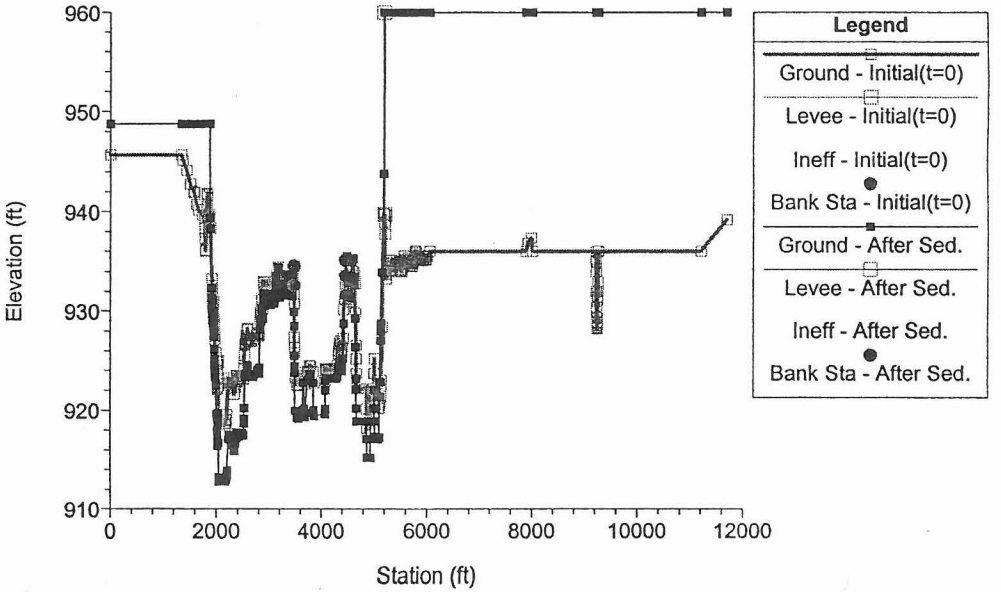
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.45



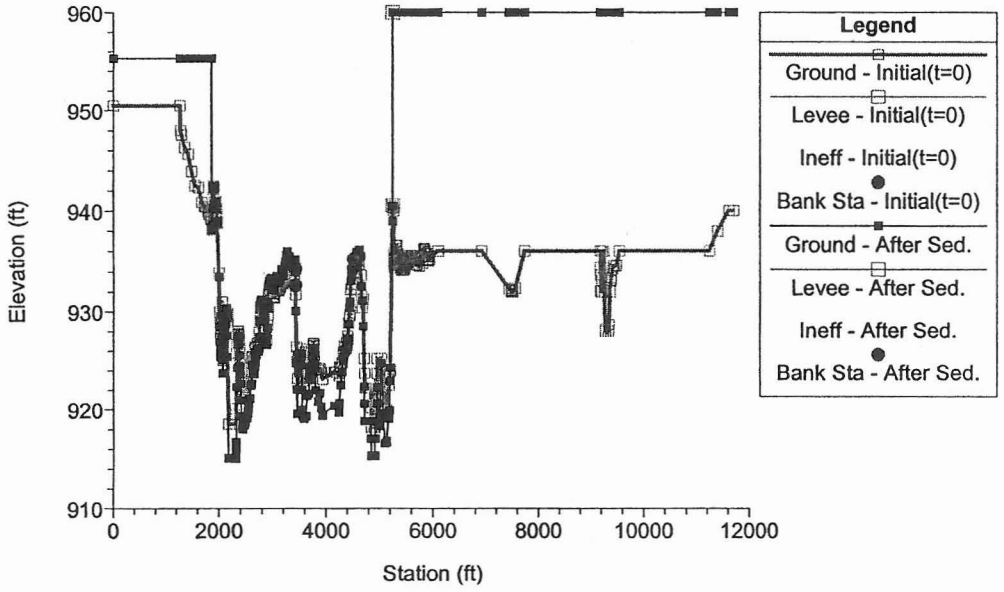
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.49



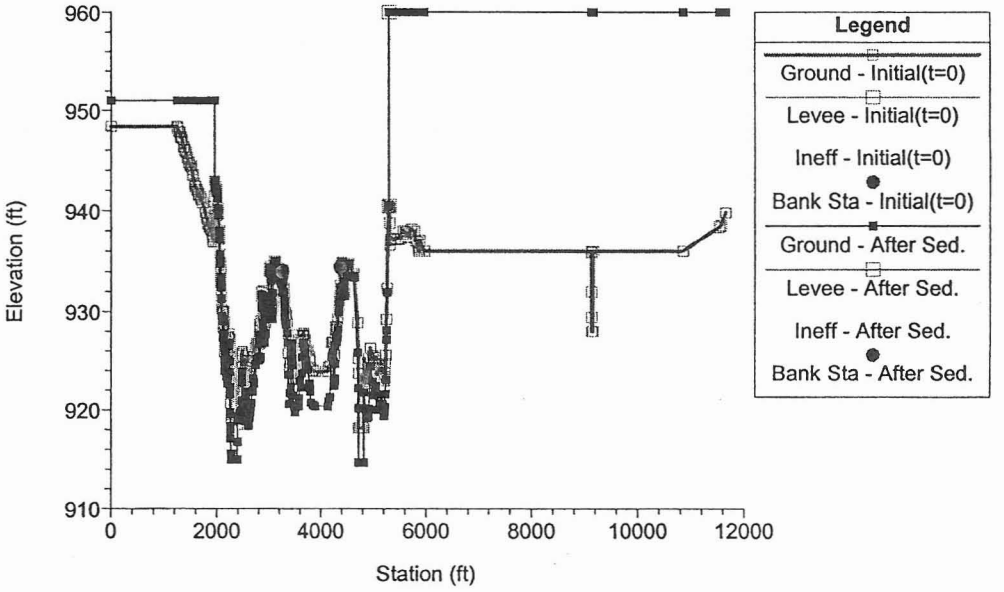
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.54



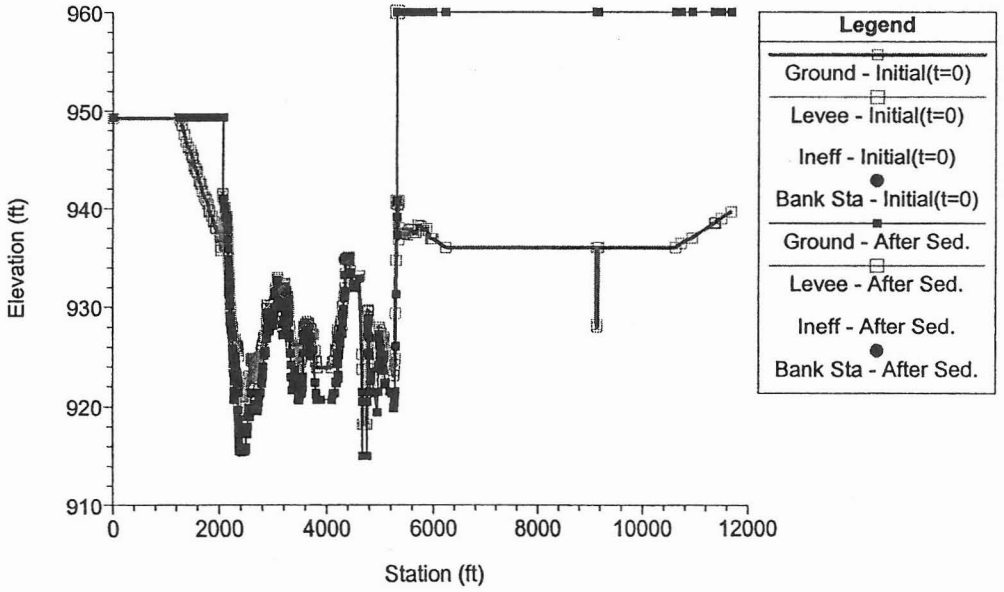
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.6



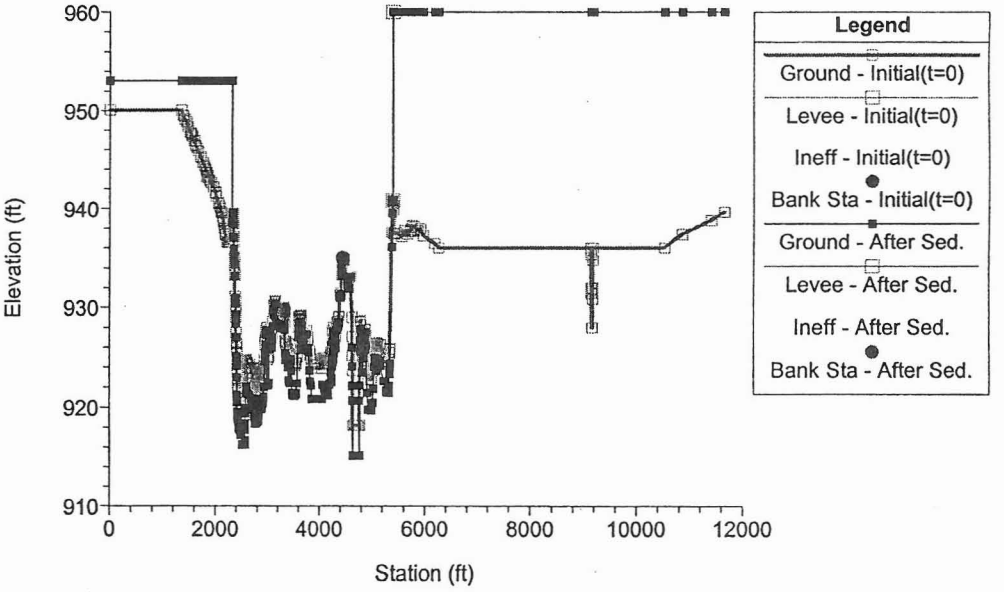
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.65



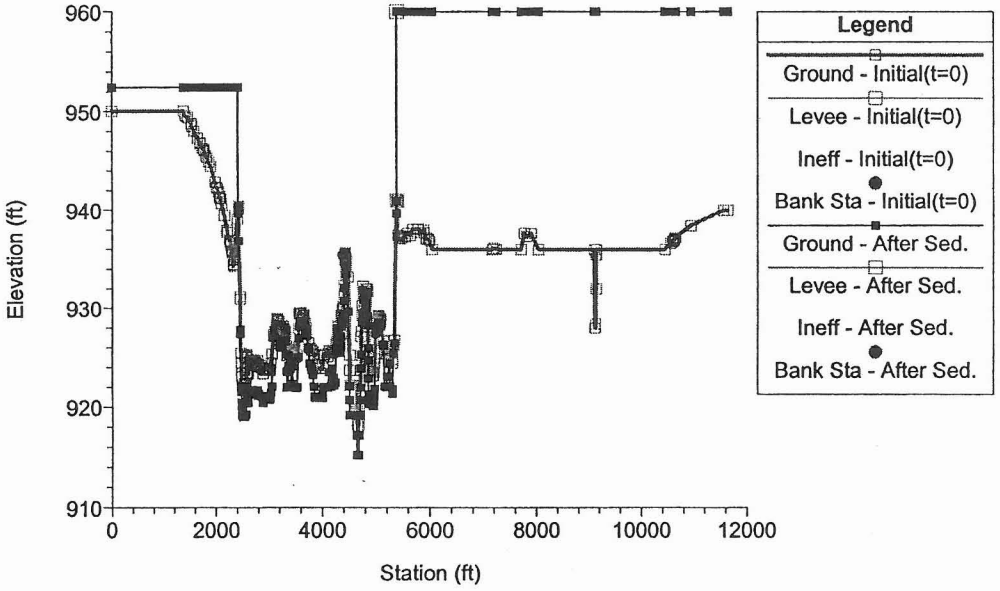
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.7



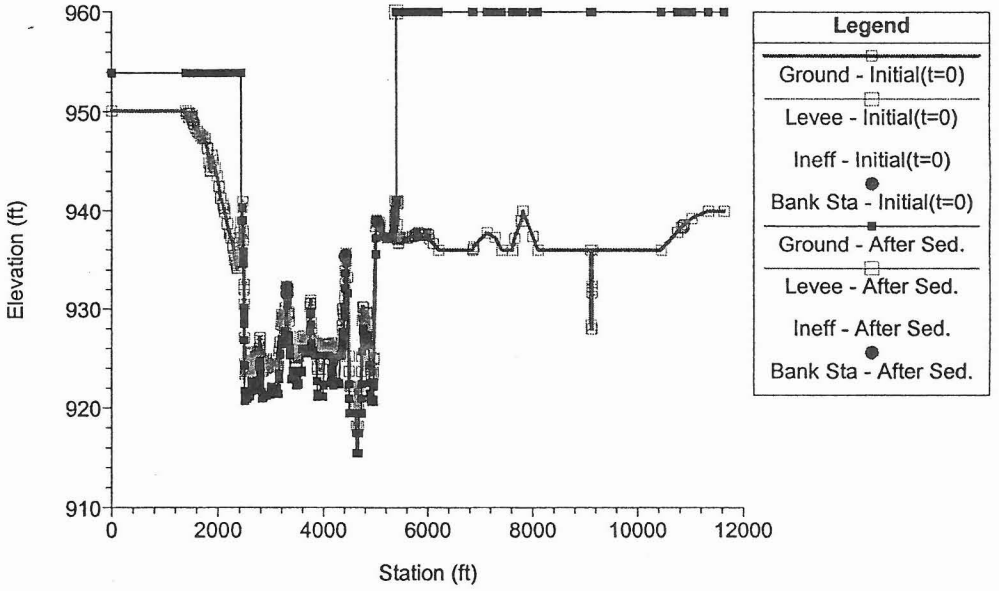
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.76



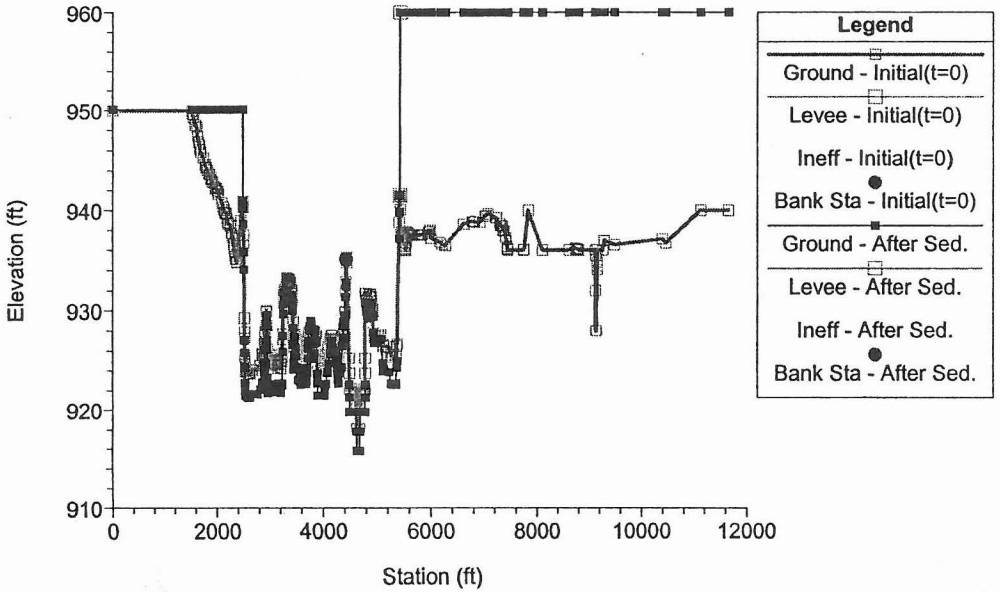
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.8



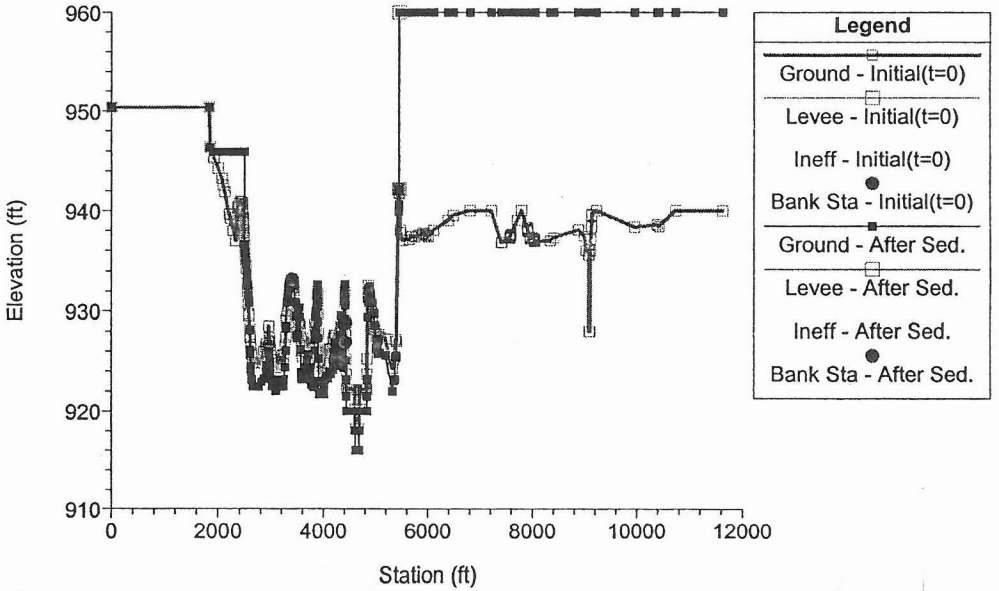
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.83



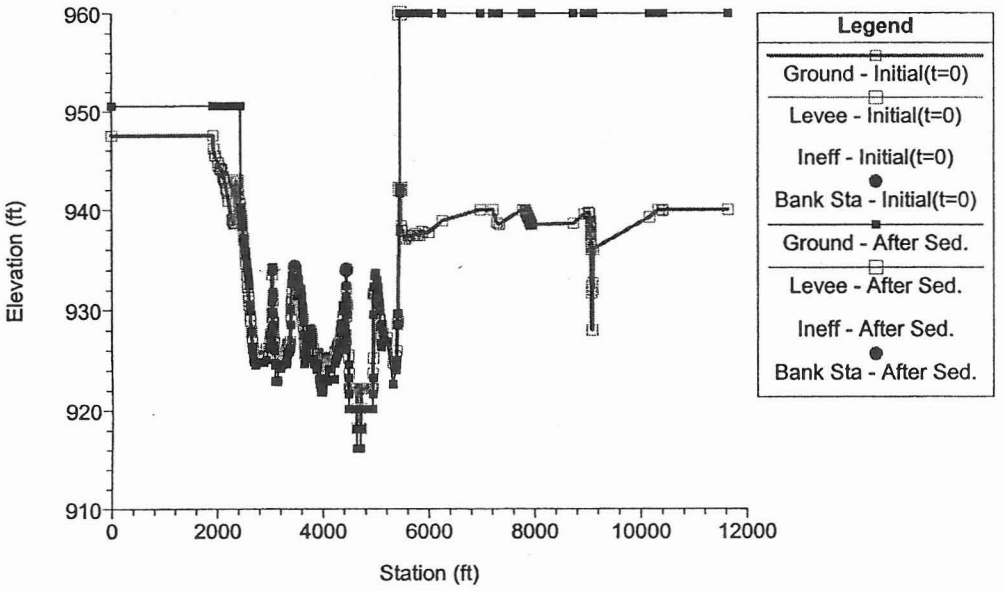
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.88



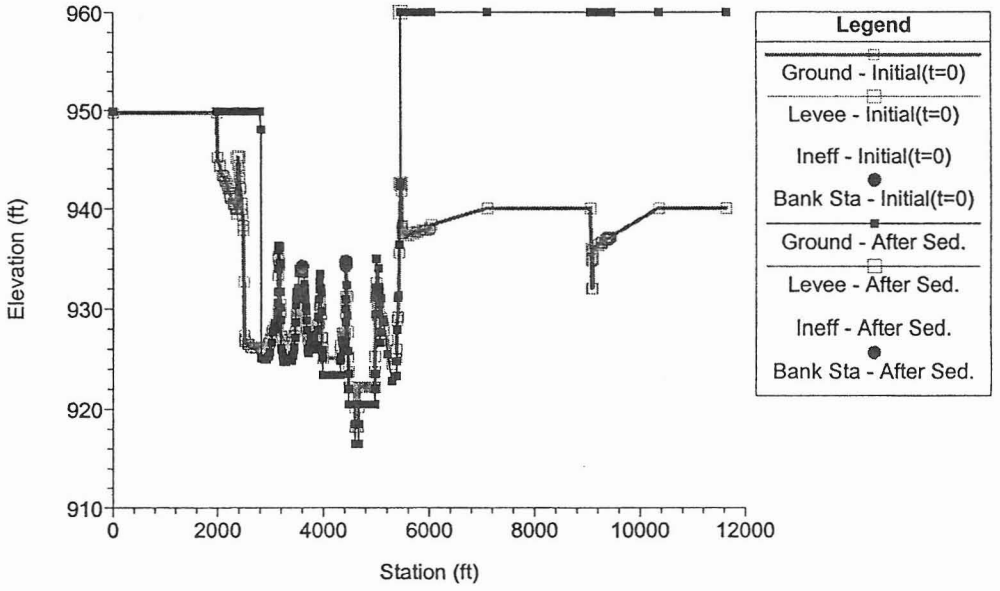
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.93



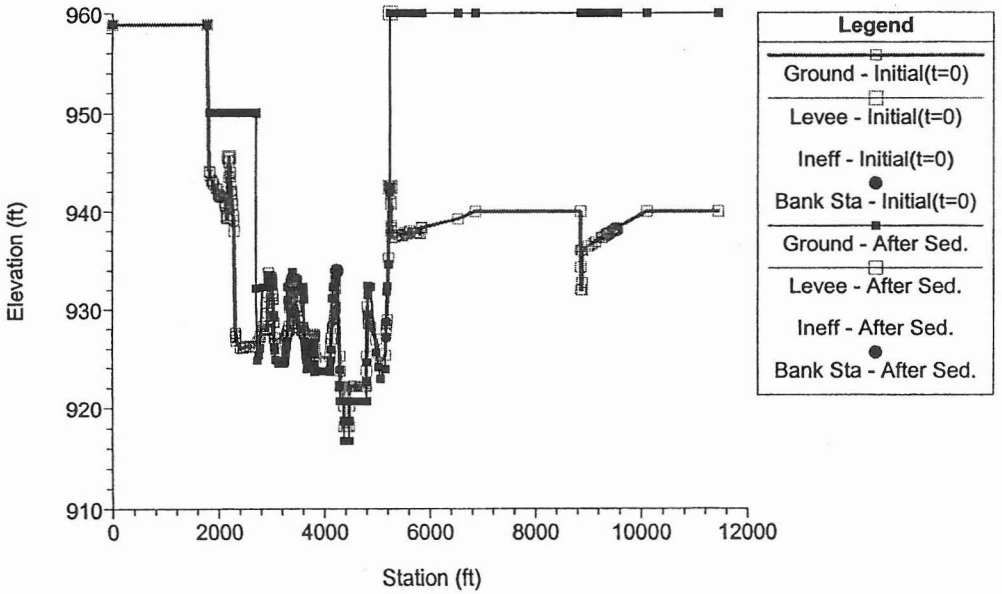
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.97



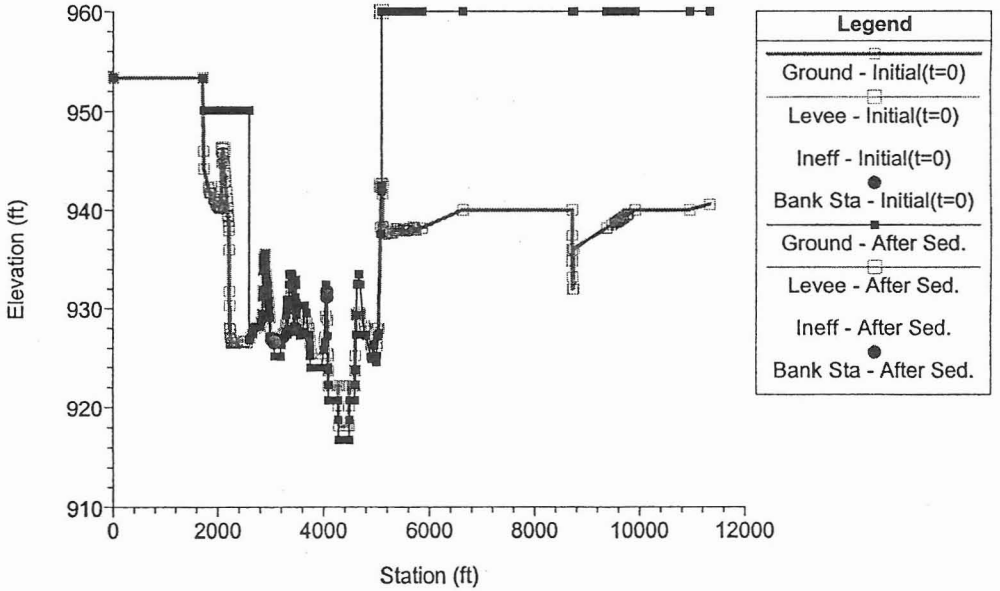
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 198.99



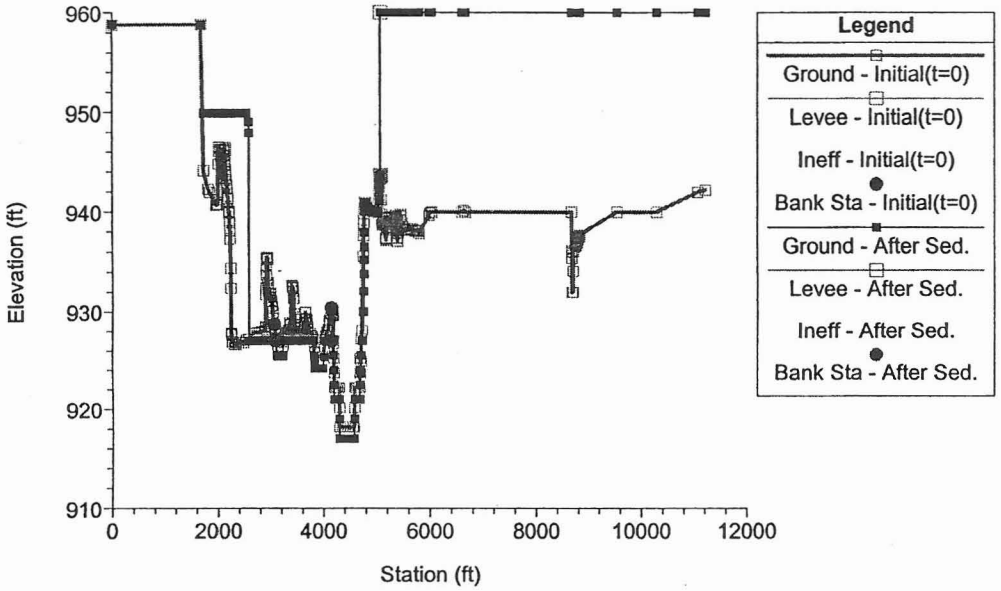
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.02



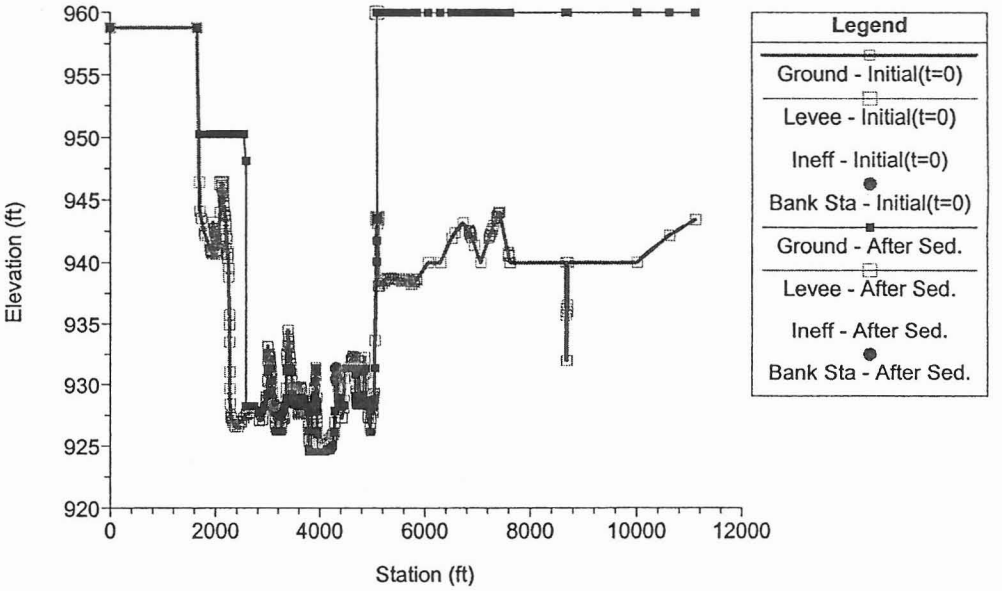
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.06



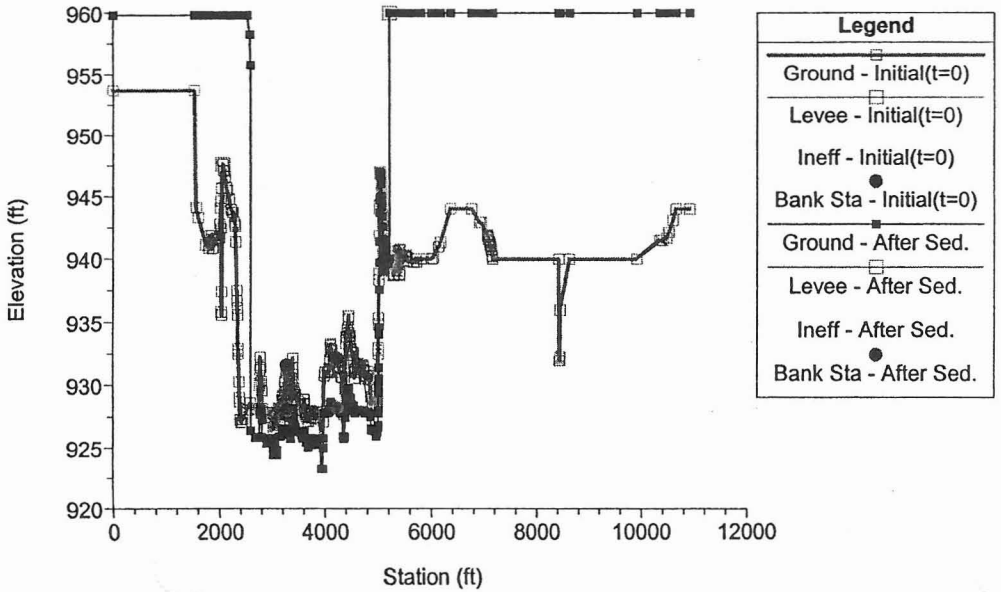
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.11



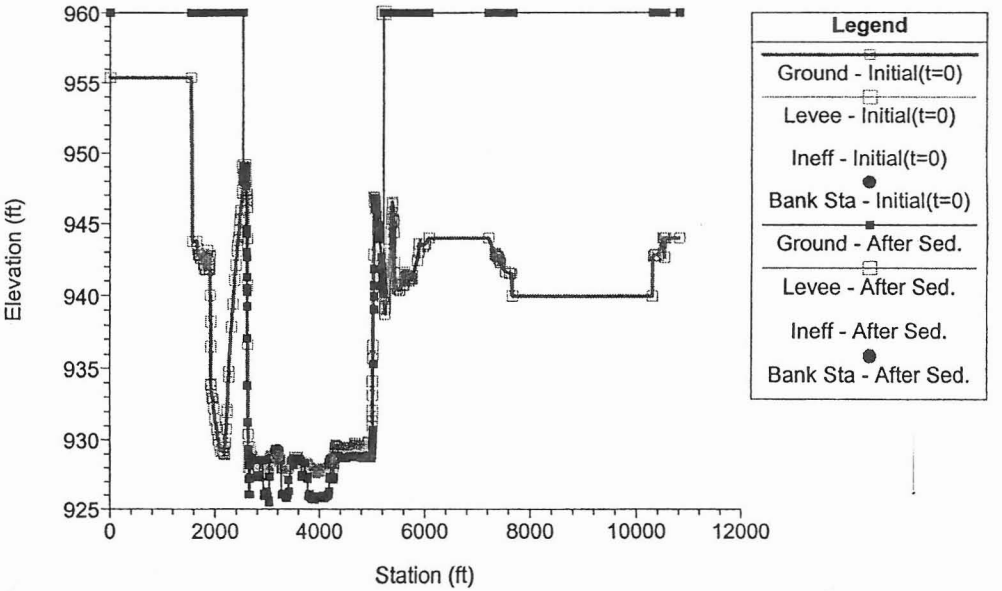
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.18



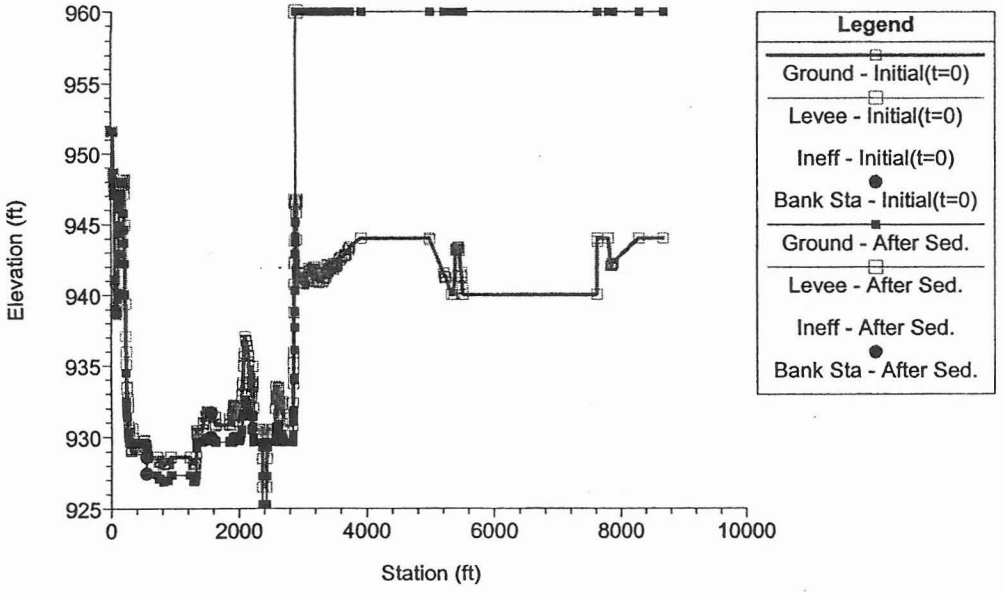
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.21



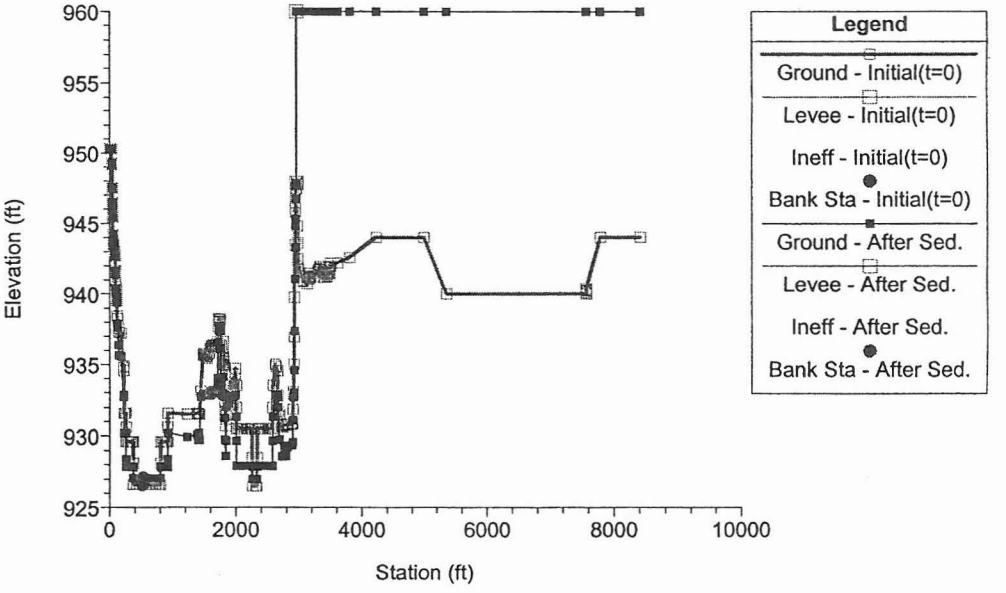
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.31



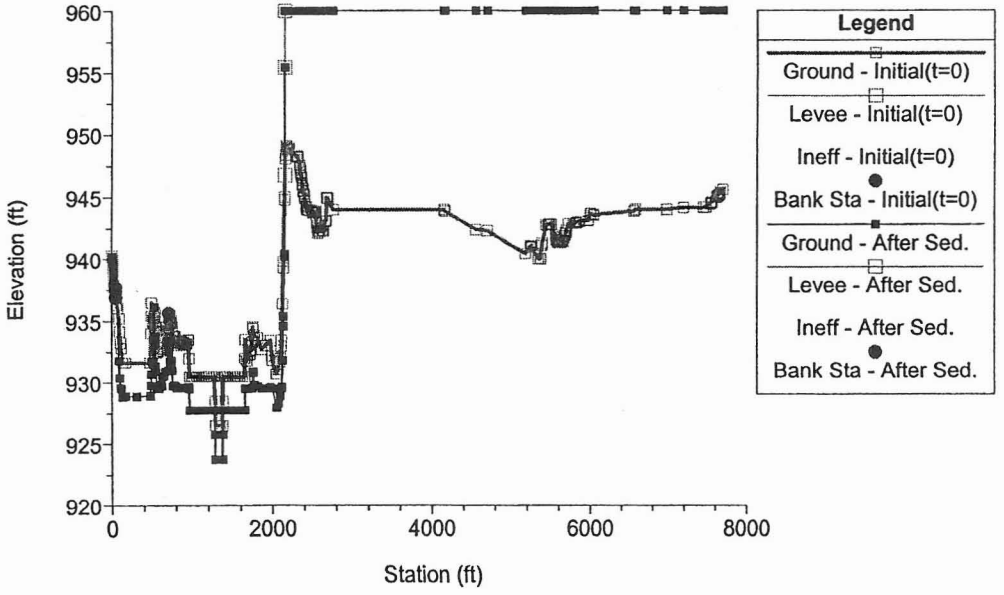
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.38



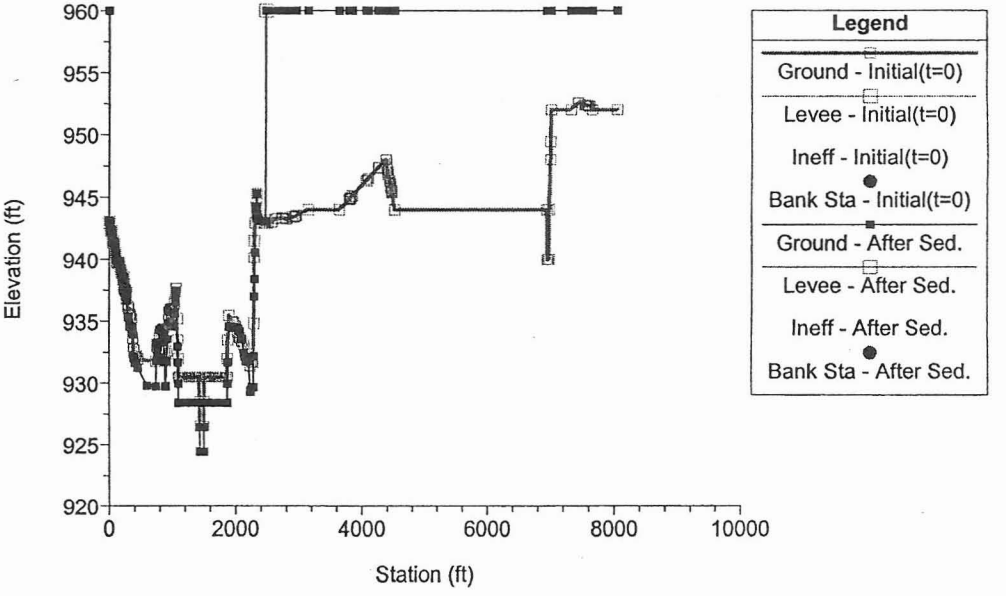
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.55



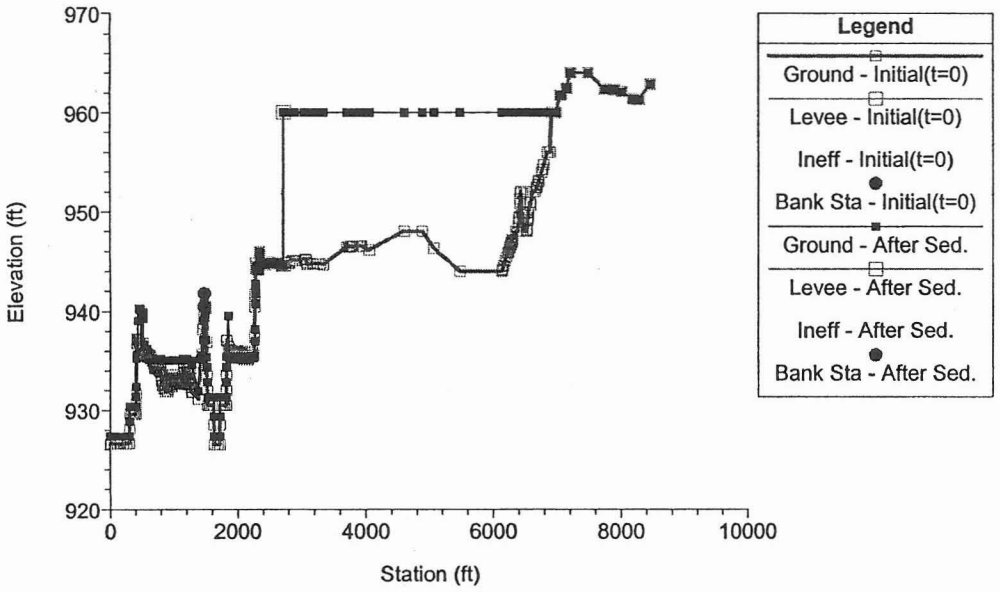
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.69



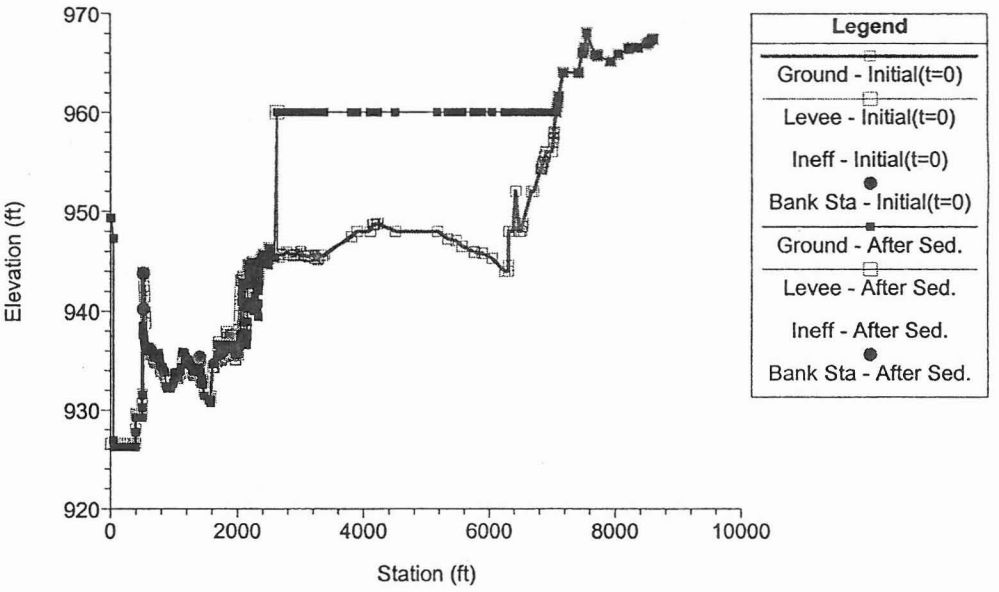
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.86



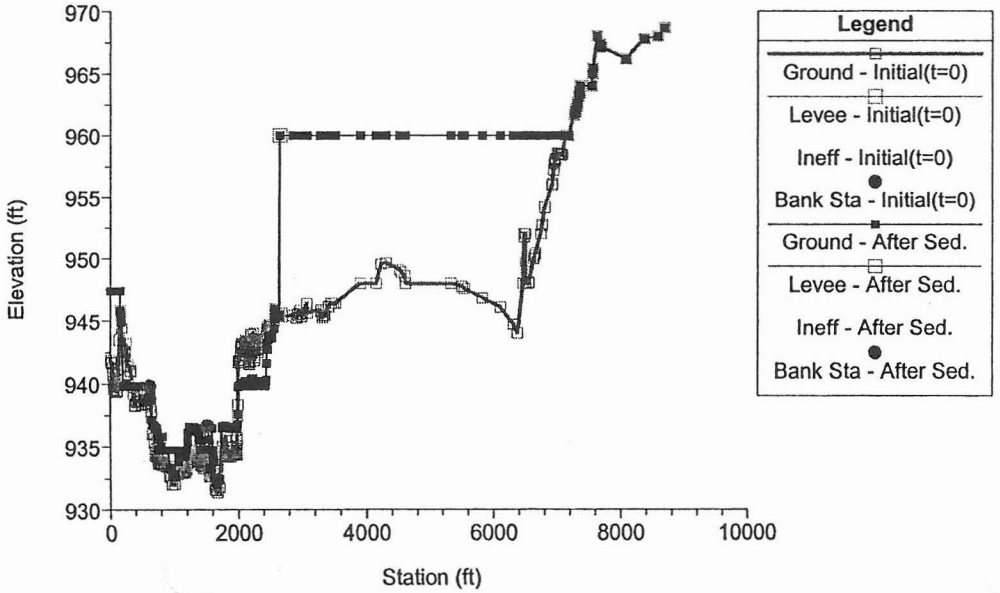
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 199.98



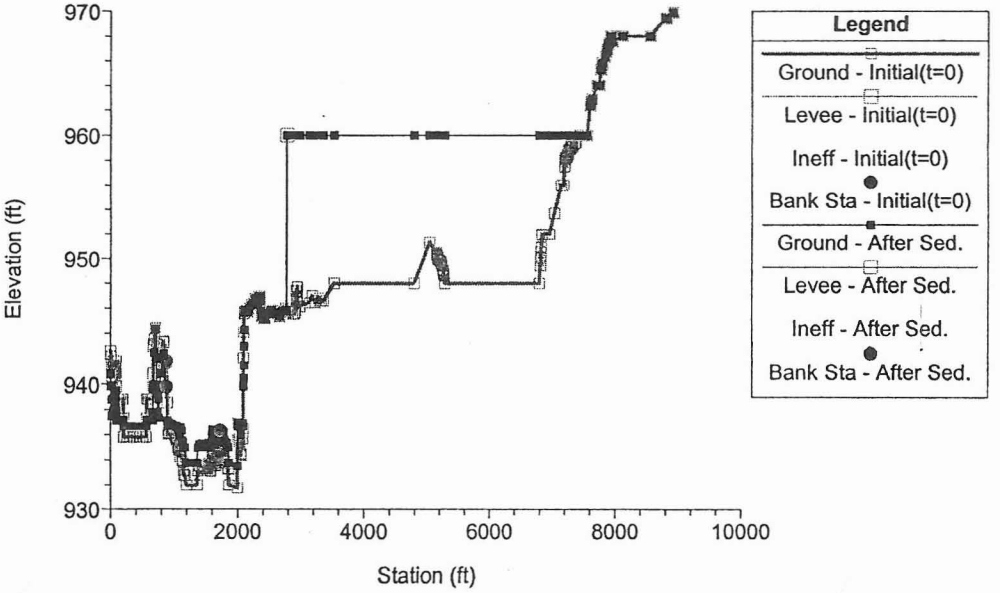
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.02



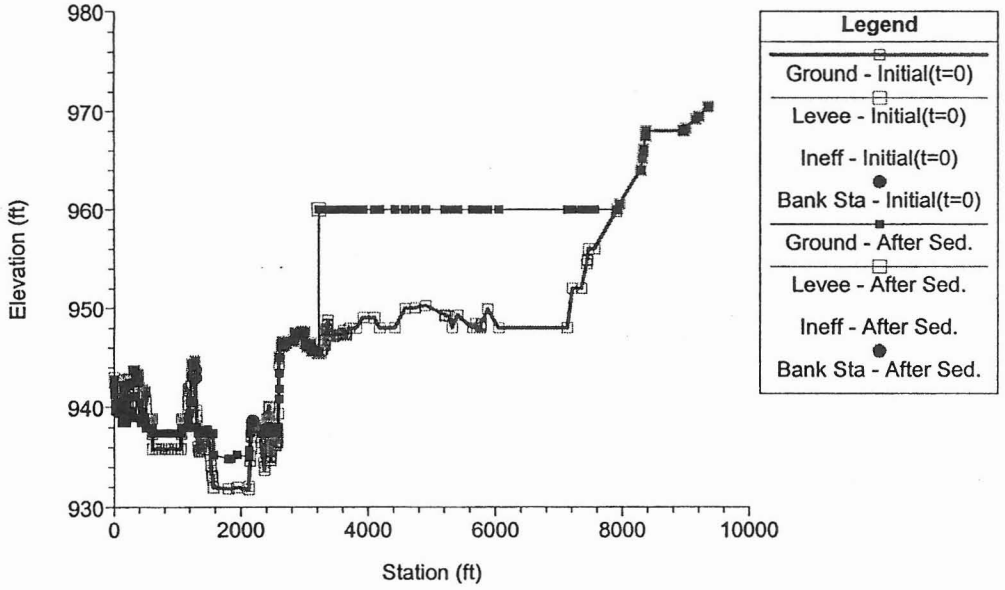
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.11



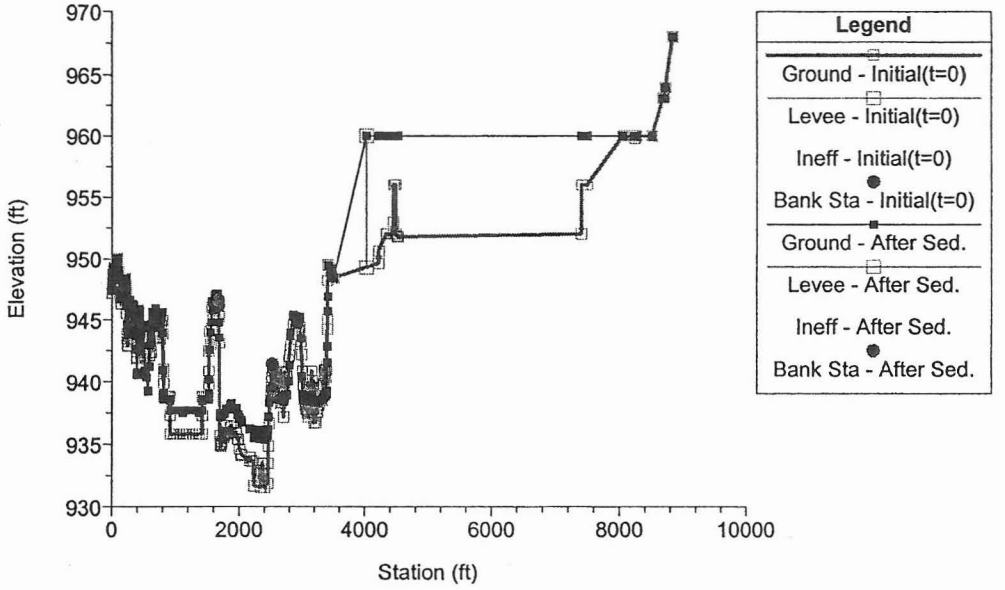
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.22



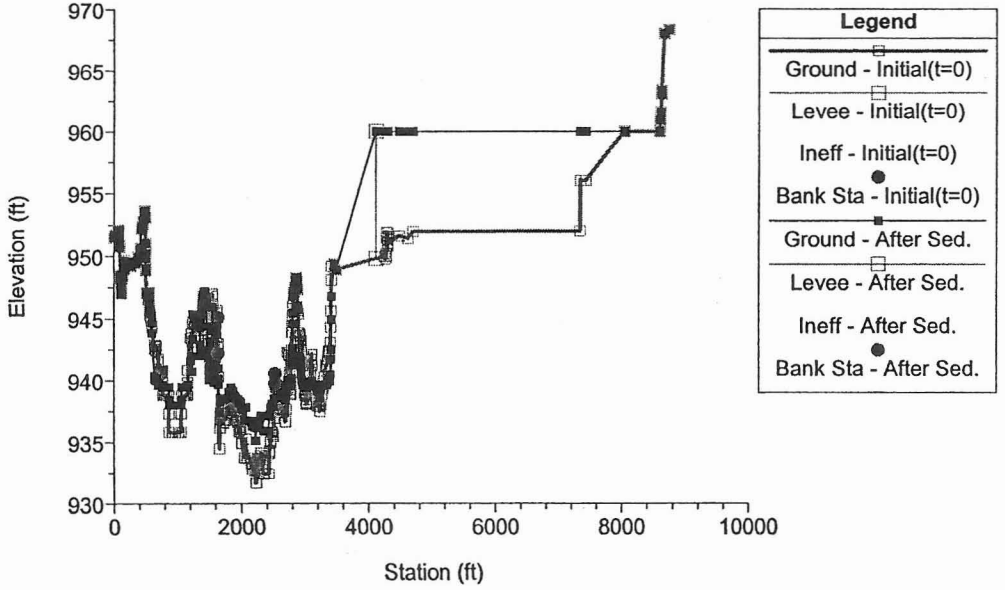
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.4



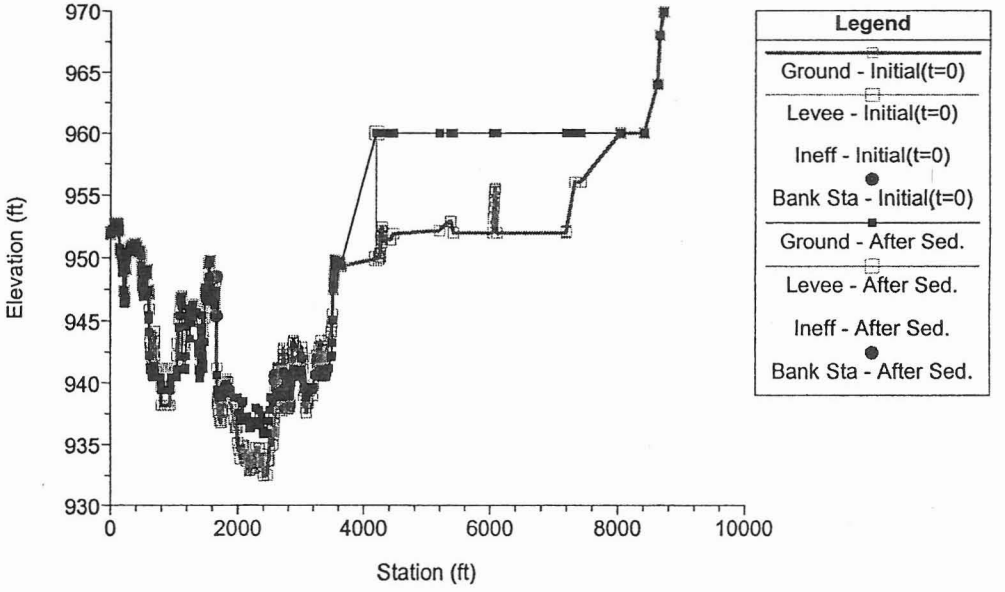
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.47



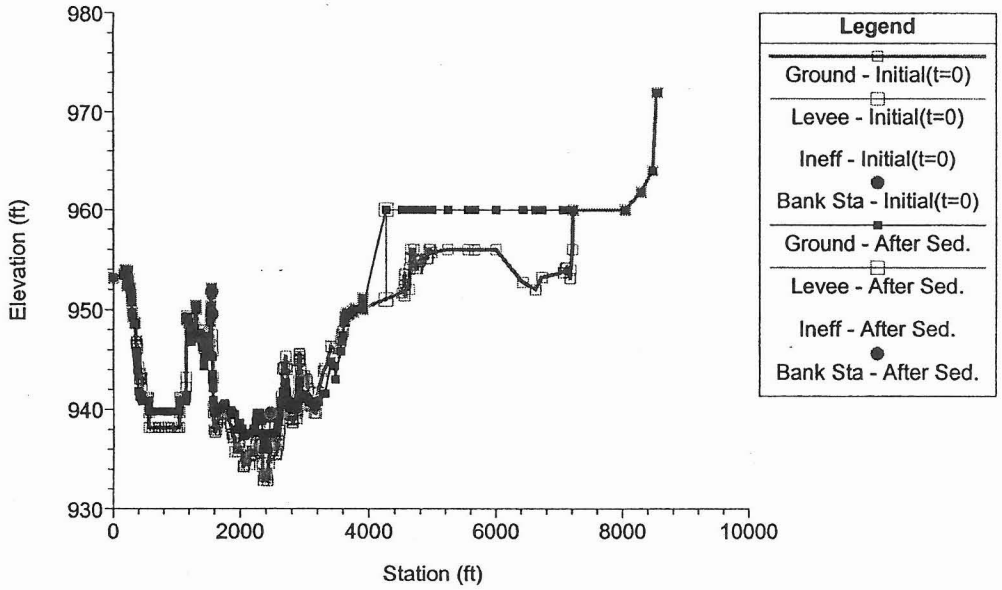
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.52



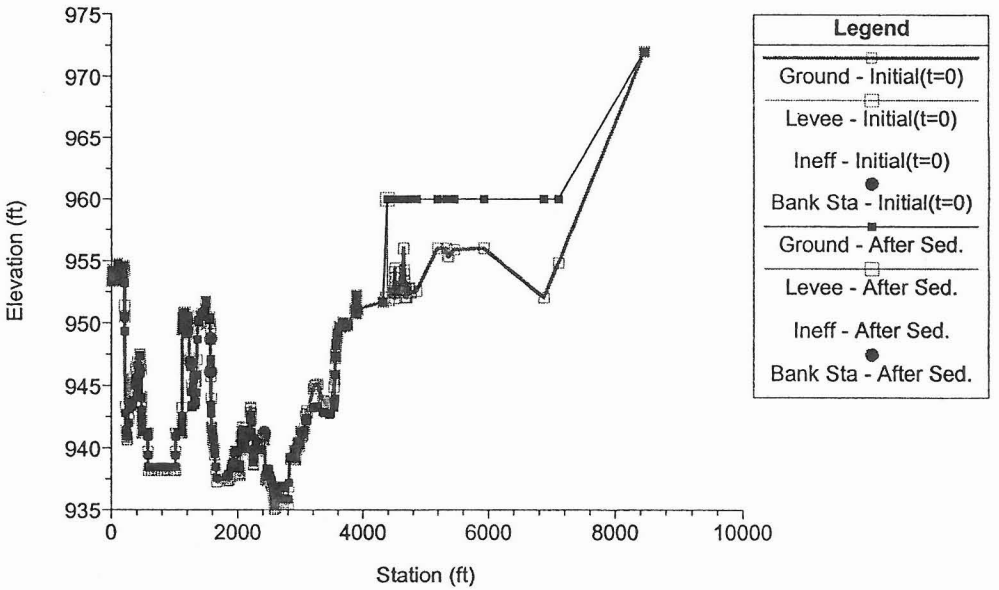
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.6



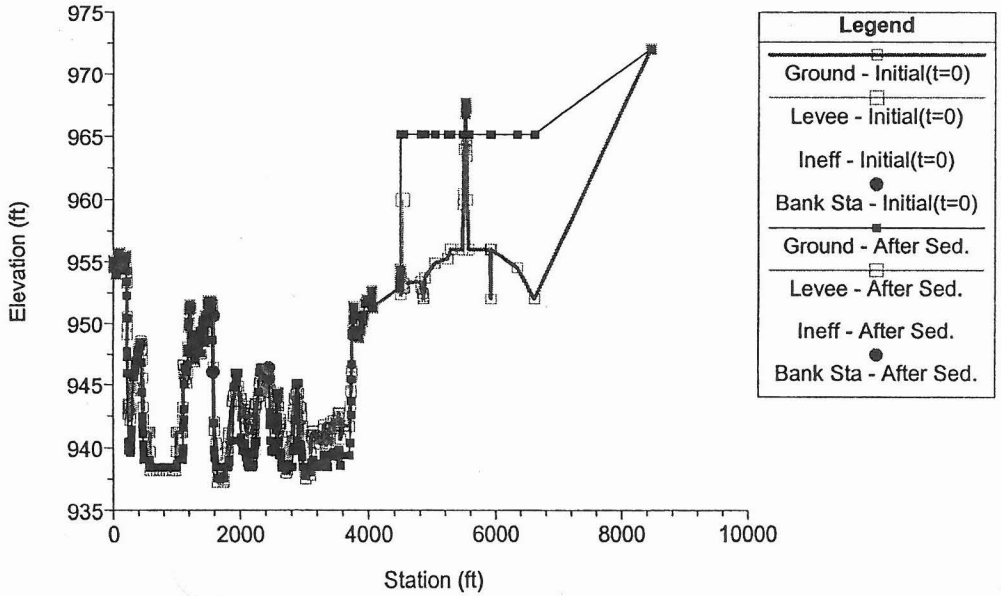
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.68



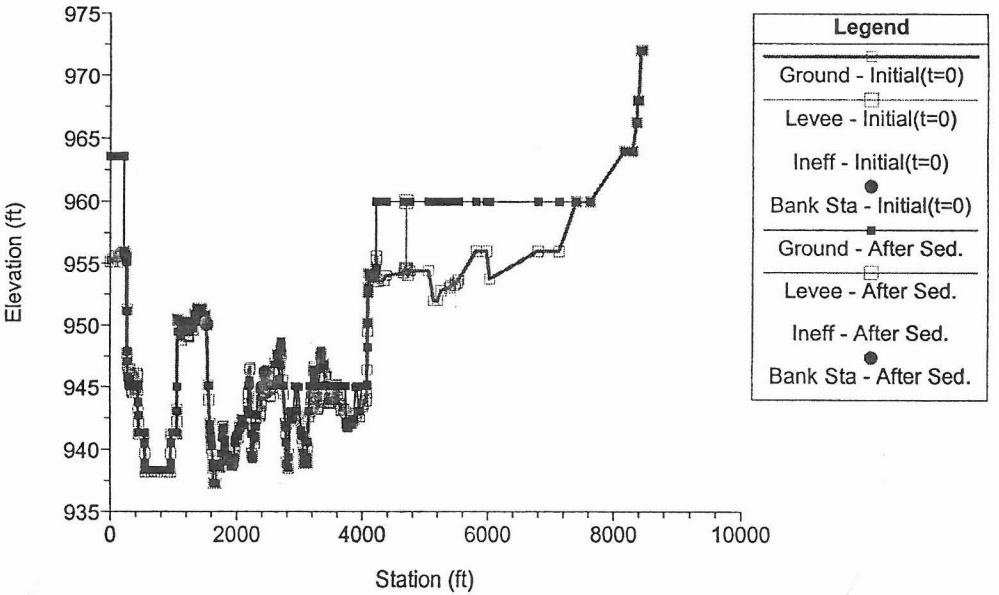
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.75



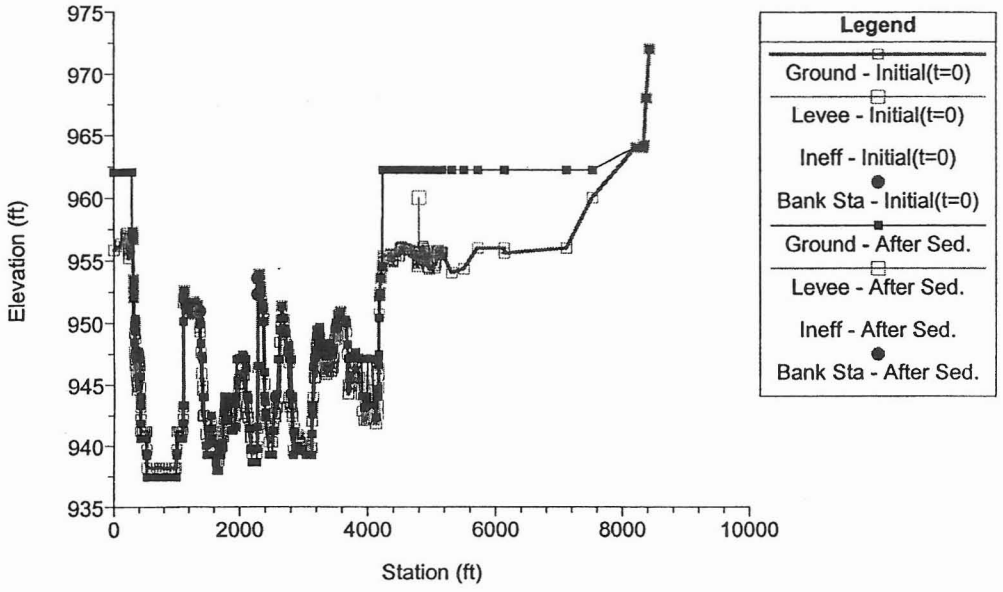
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.83



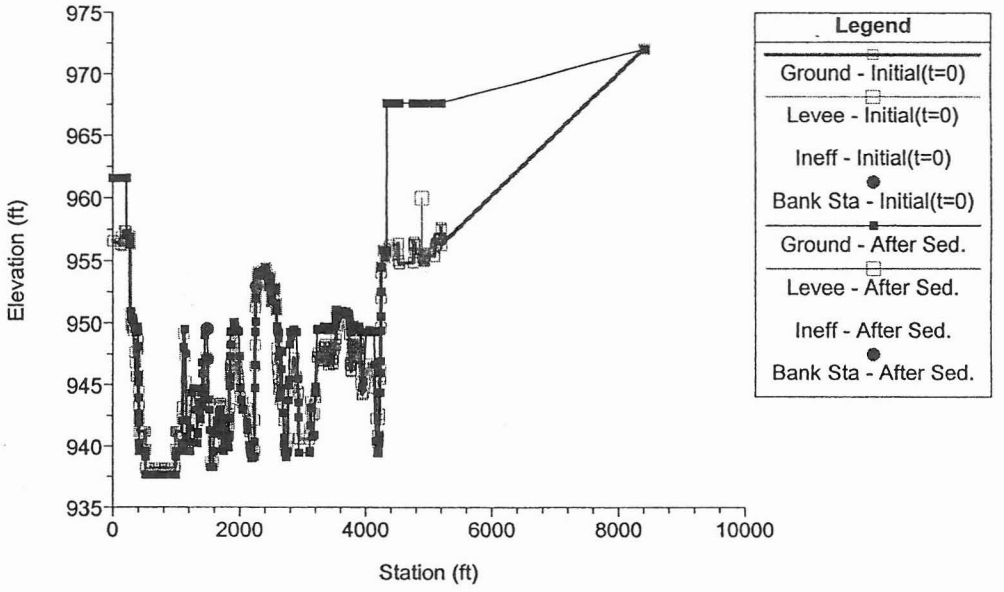
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.88



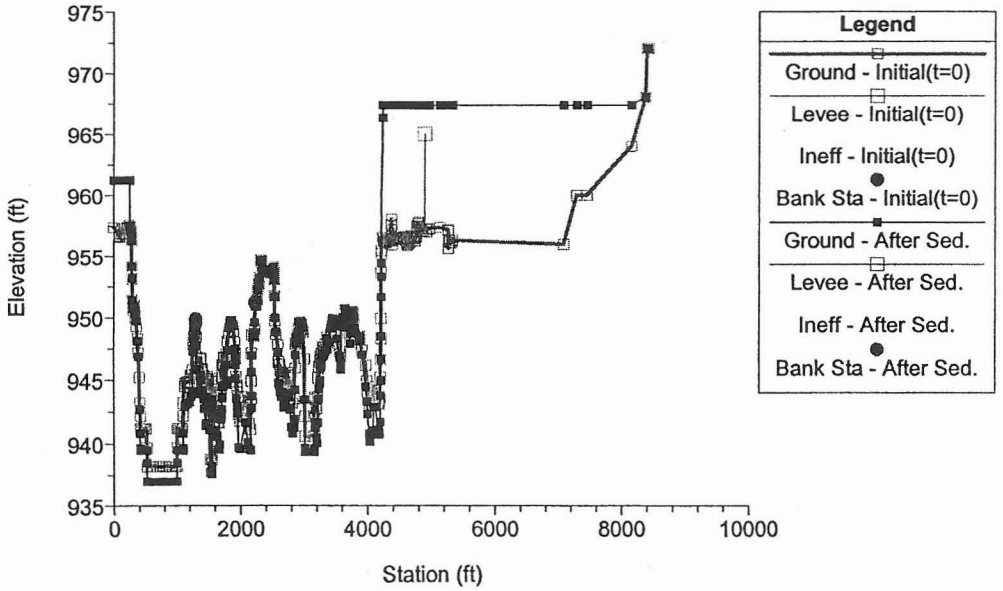
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 200.95



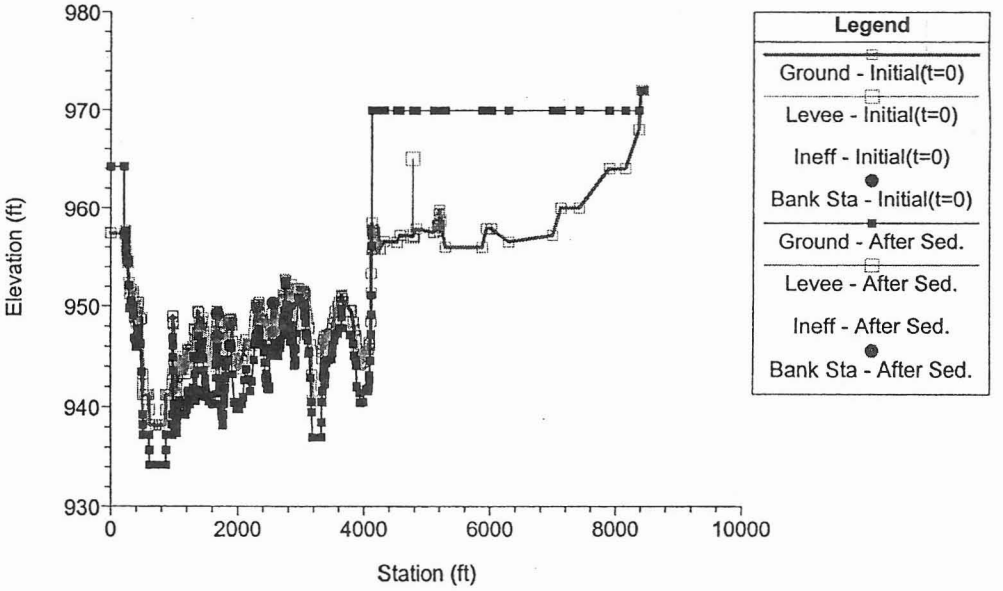
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 201.01



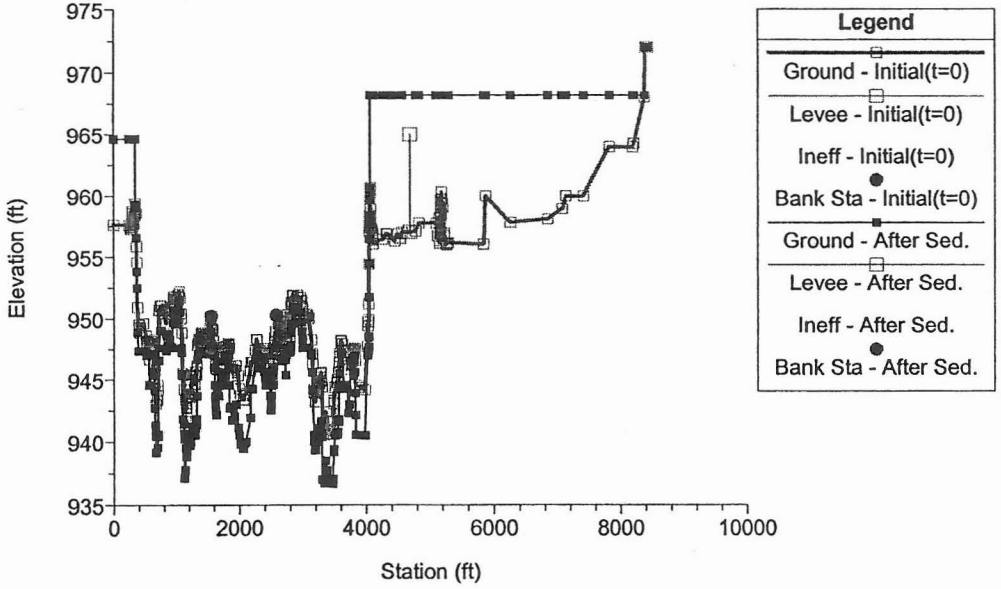
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 201.1



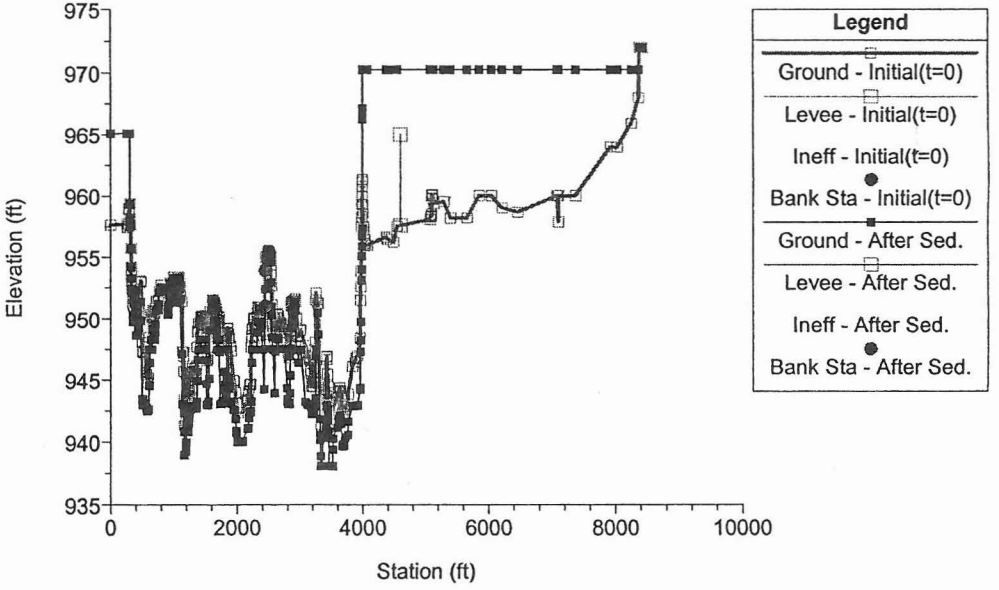
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 201.16



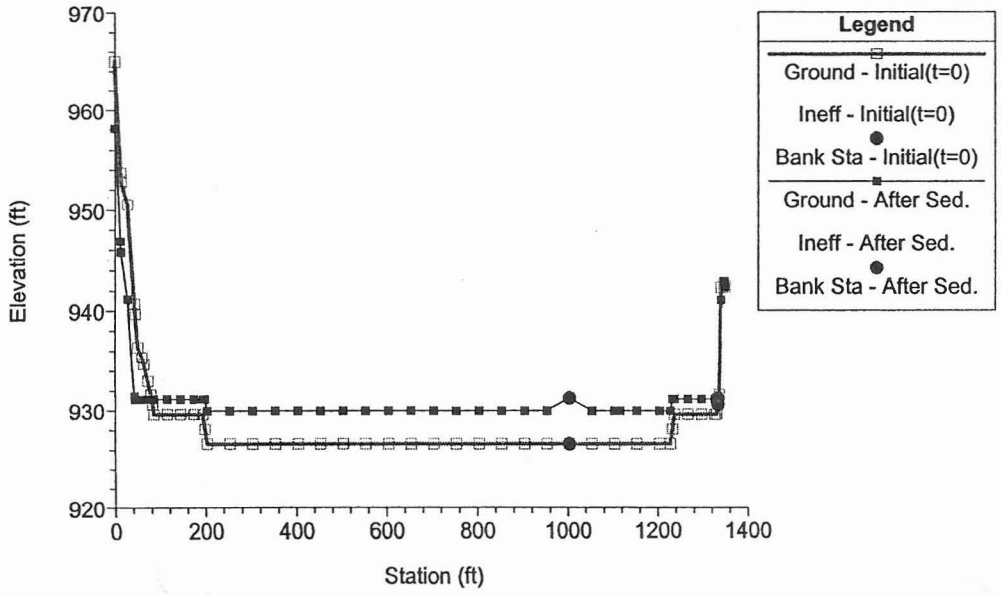
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 201.2



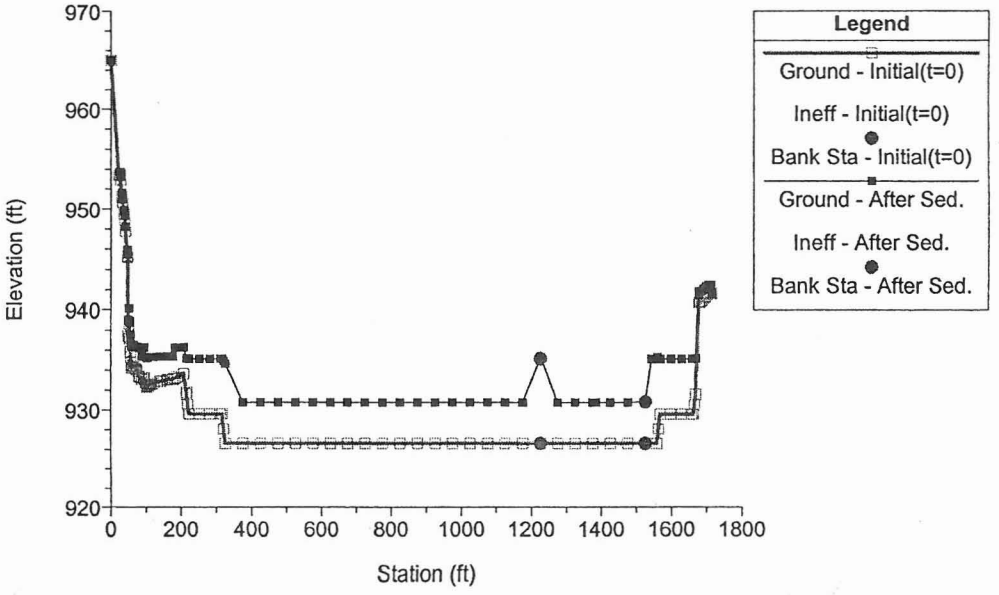
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.00



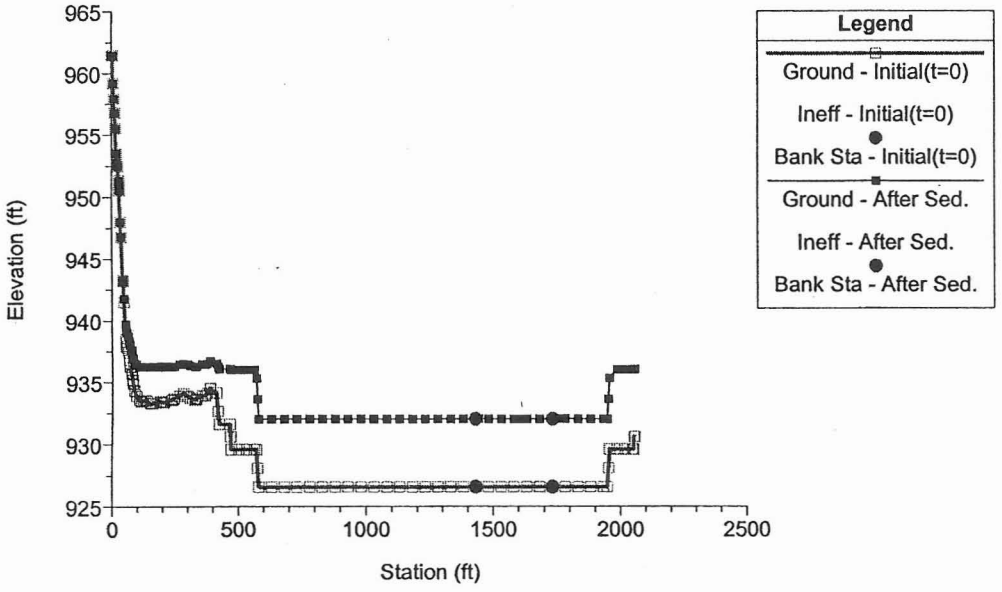
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.06



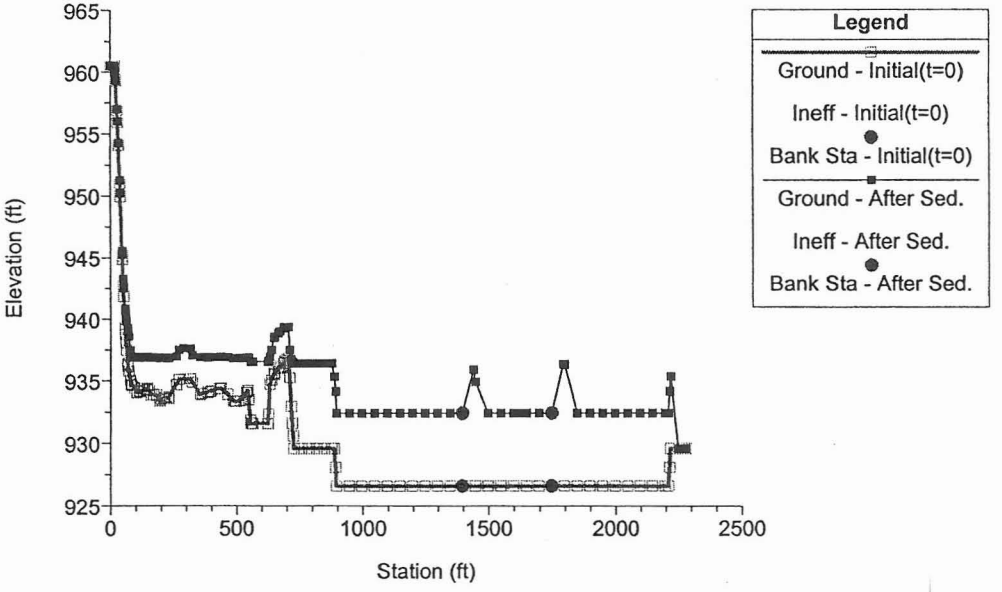
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.12



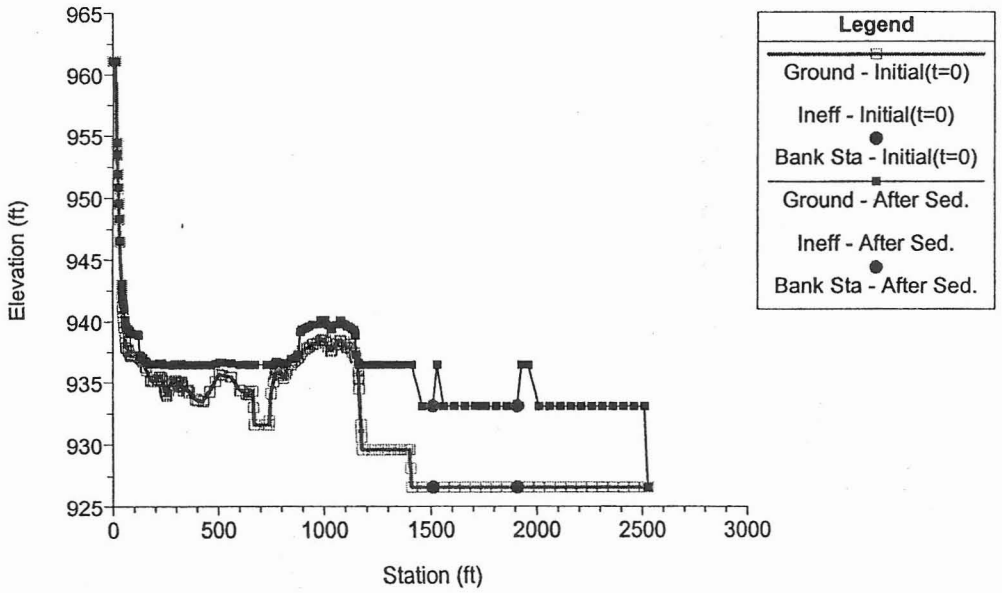
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.17



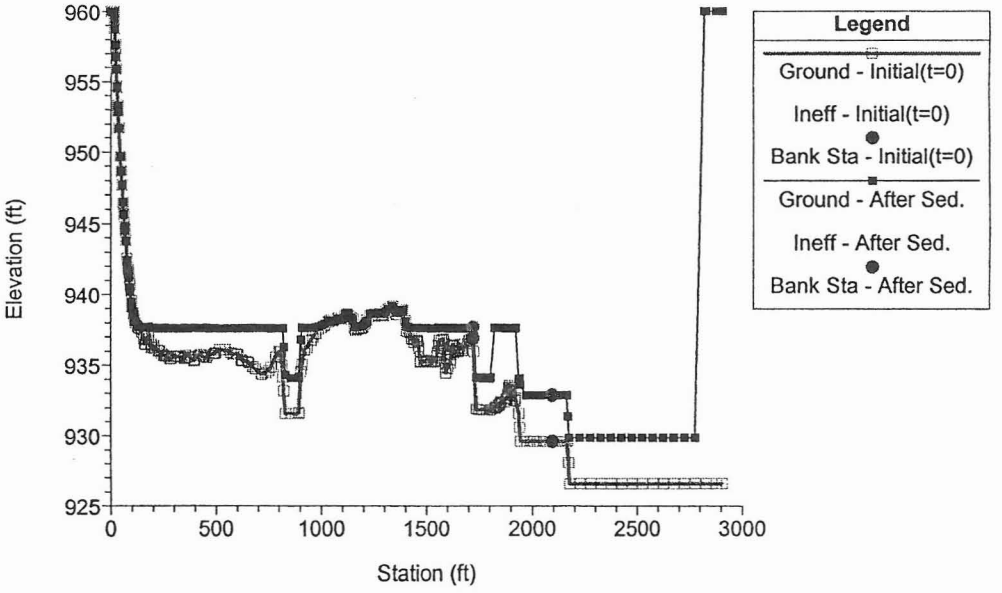
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

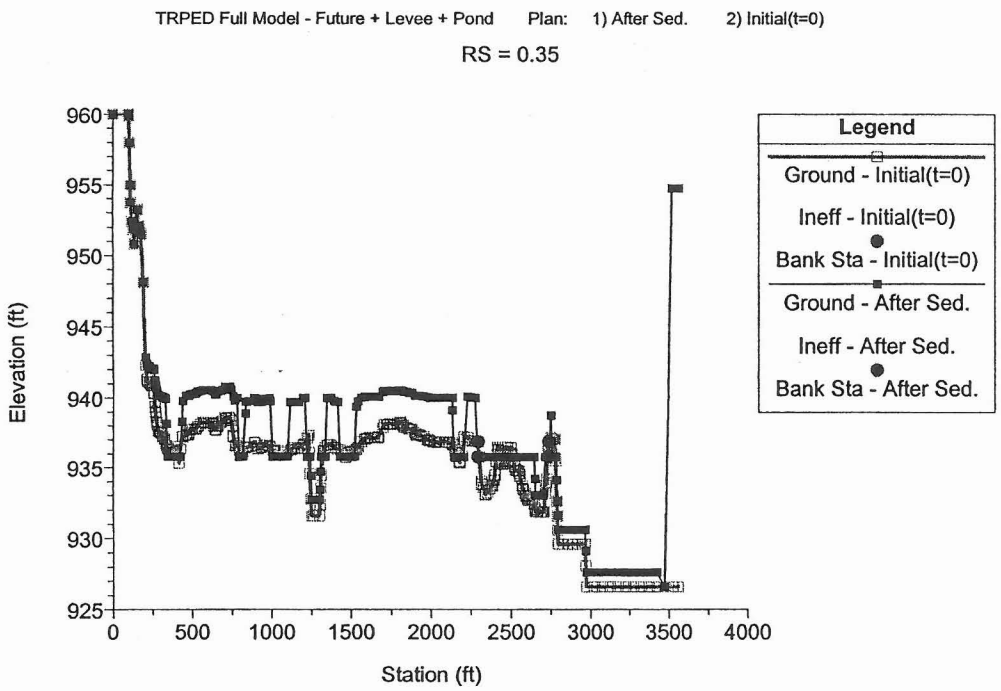
RS = 0.22

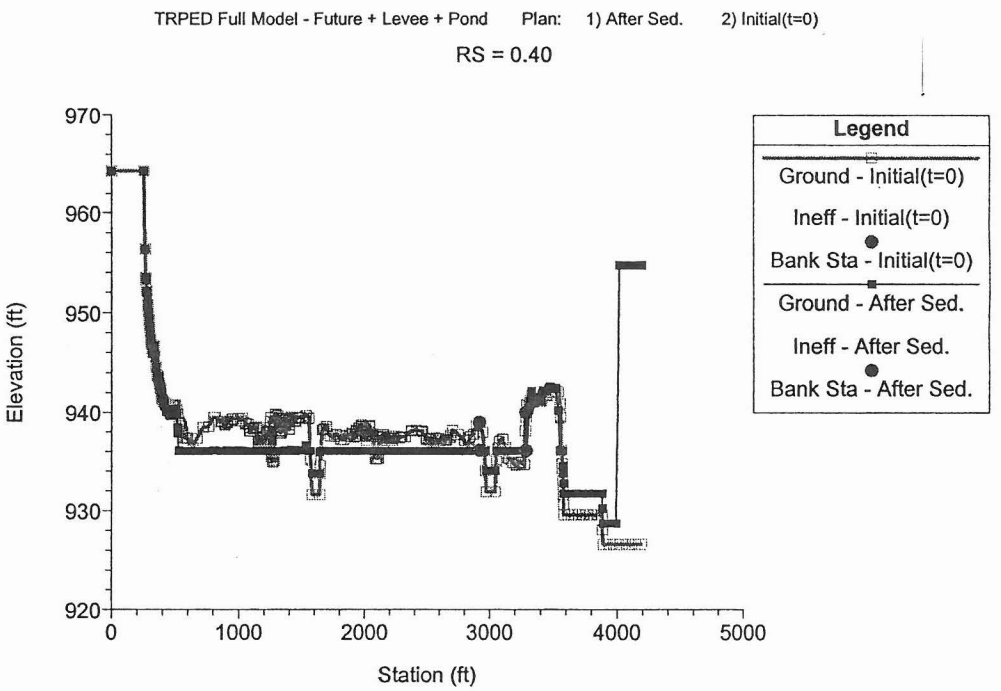


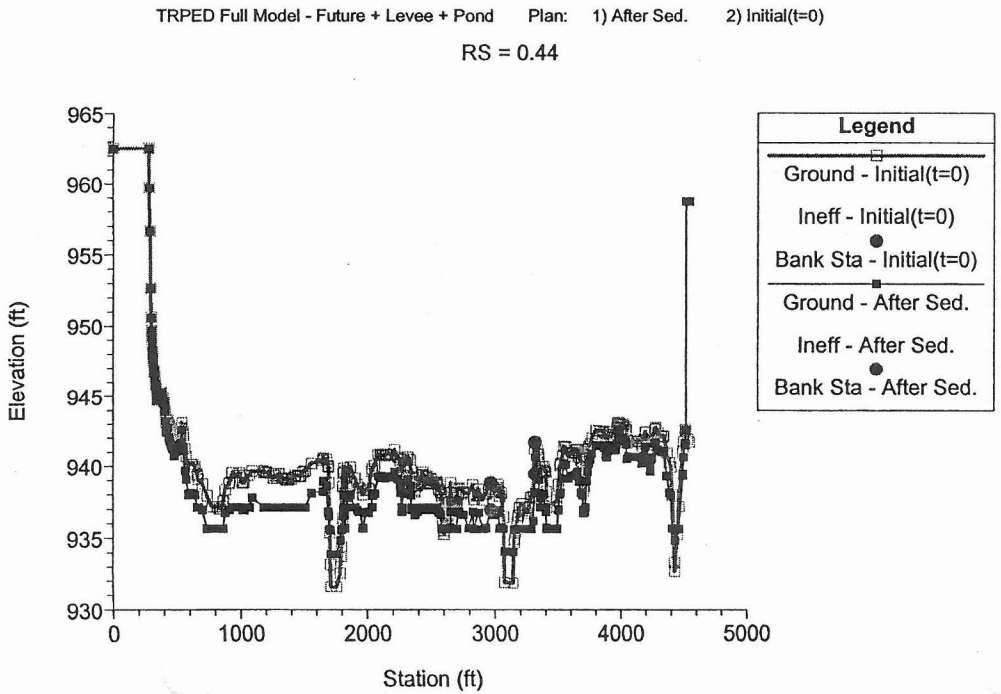
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

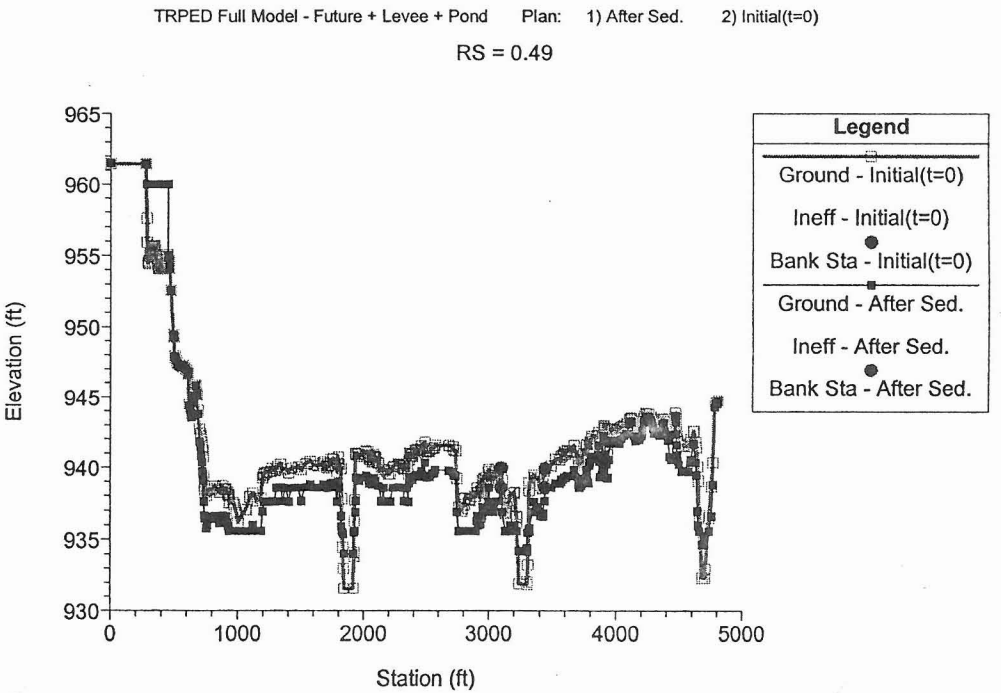
RS = 0.27




TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)
RS = 0.35
Elevation (ft)
Station (ft)
960
955
950
945
940
935
930
925
0
500
1000
1500
2000
2500
3000
3500
4000
Legend
Ground - Initial(t=0)
Ineff - Initial(t=0)
Bank Sta - Initial(t=0)
Ground - After Sed.
Ineff - After Sed.
Bank Sta - After Sed.

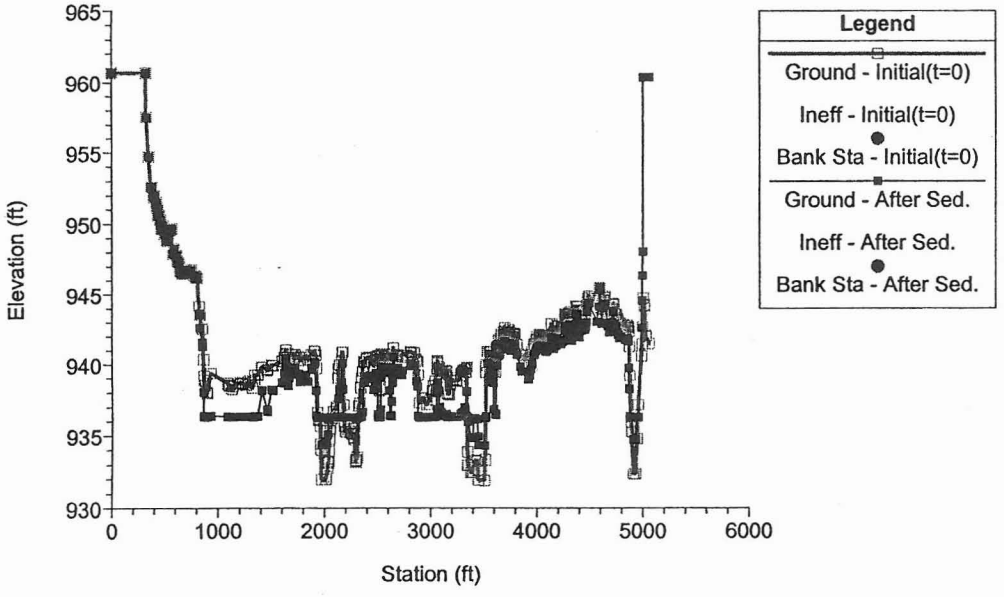

TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)
RS = 0.40
Elevation (ft)
Station (ft)
970
960
950
940
930
920
0
1000
2000
3000
4000
5000
Legend
Ground - Initial(t=0)
Ineff - Initial(t=0)
Bank Sta - Initial(t=0)
Ground - After Sed.
Ineff - After Sed.
Bank Sta - After Sed.


TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)
RS = 0.44
Elevation (ft)
Station (ft)
965
960
955
950
945
940
935
930
0
1000
2000
3000
4000
5000
Legend
Ground - Initial(t=0)
Ineff - Initial(t=0)
Bank Sta - Initial(t=0)
Ground - After Sed.
Ineff - After Sed.
Bank Sta - After Sed.


TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)
RS = 0.49
Elevation (ft)
Station (ft)
965
960
955
950
945
940
935
930
0
1000
2000
3000
4000
5000
Legend
Ground - Initial(t=0)
Ineff - Initial(t=0)
Bank Sta - Initial(t=0)
Ground - After Sed.
Ineff - After Sed.
Bank Sta - After Sed.

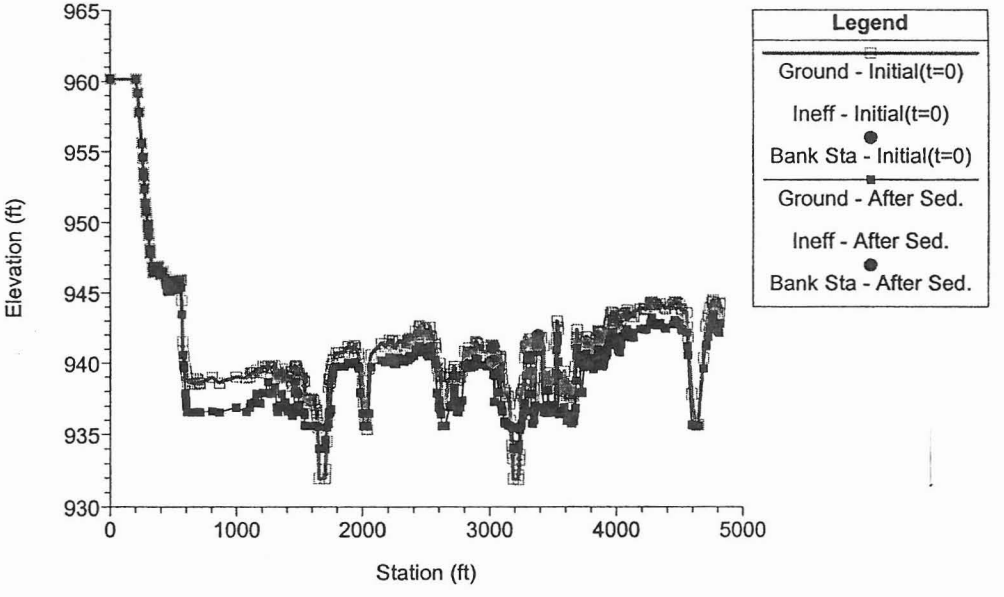
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.53



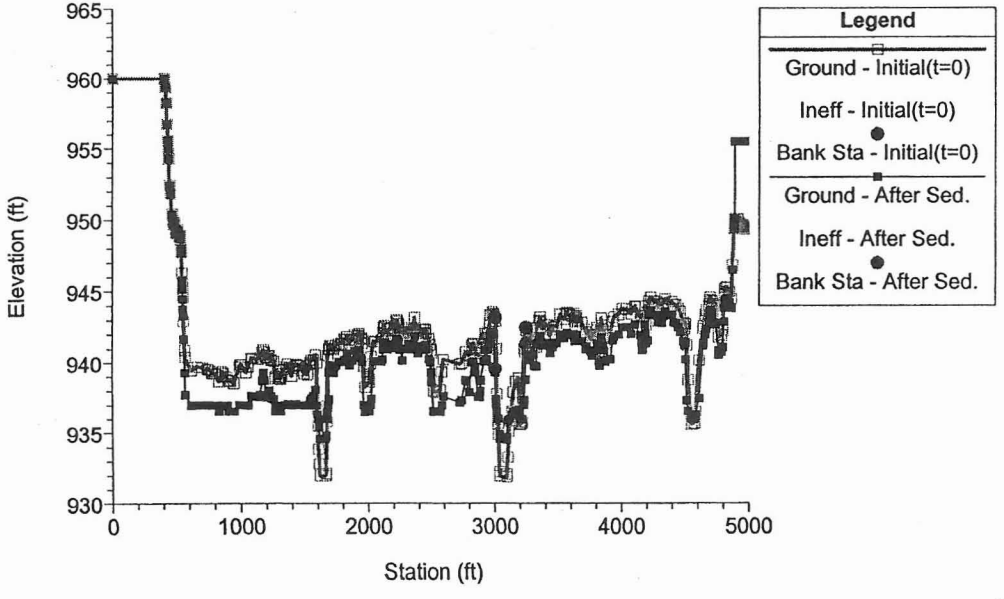
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.59



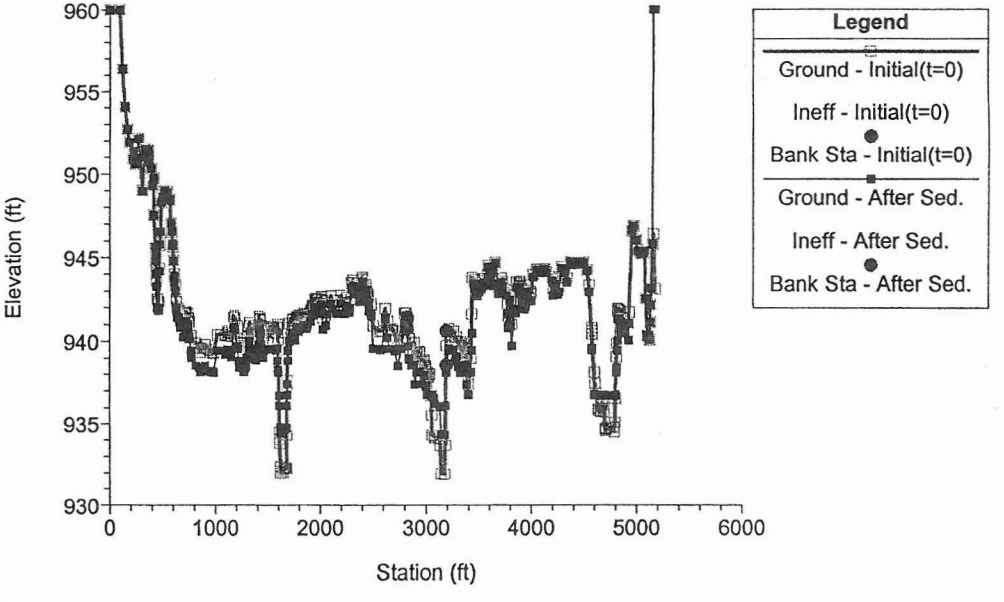
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.64



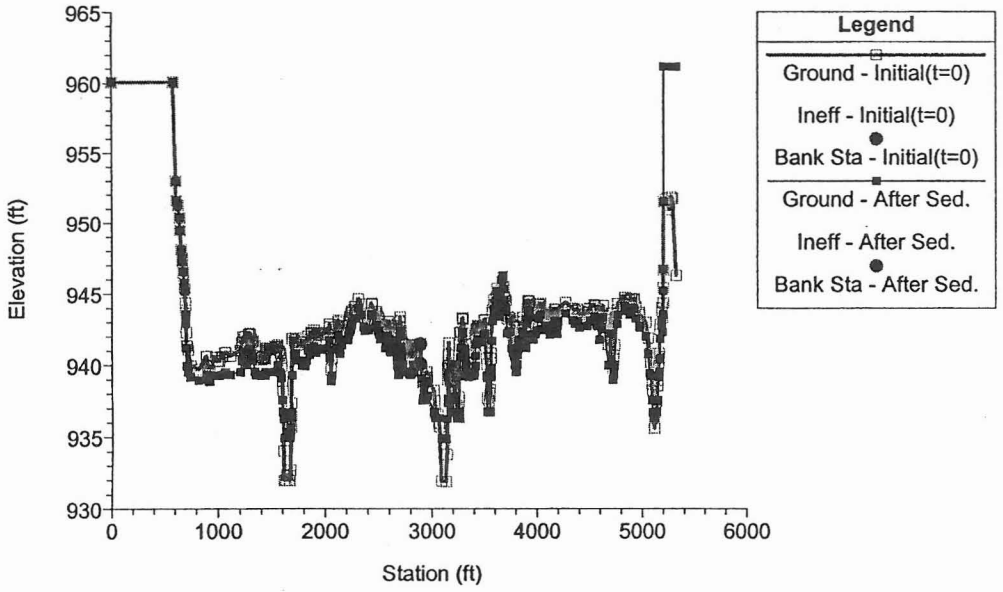
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.69



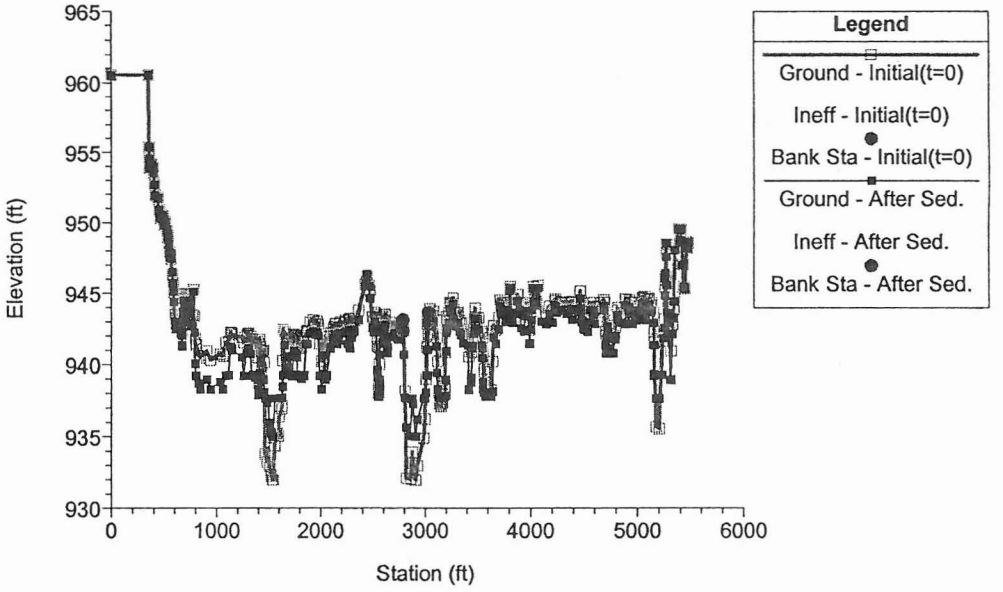
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.74



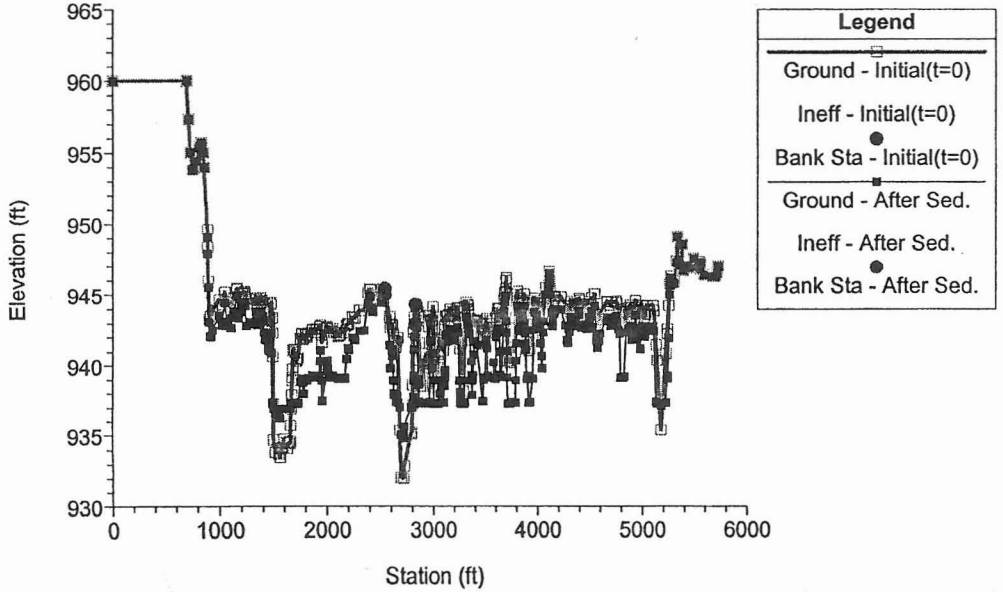
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.80



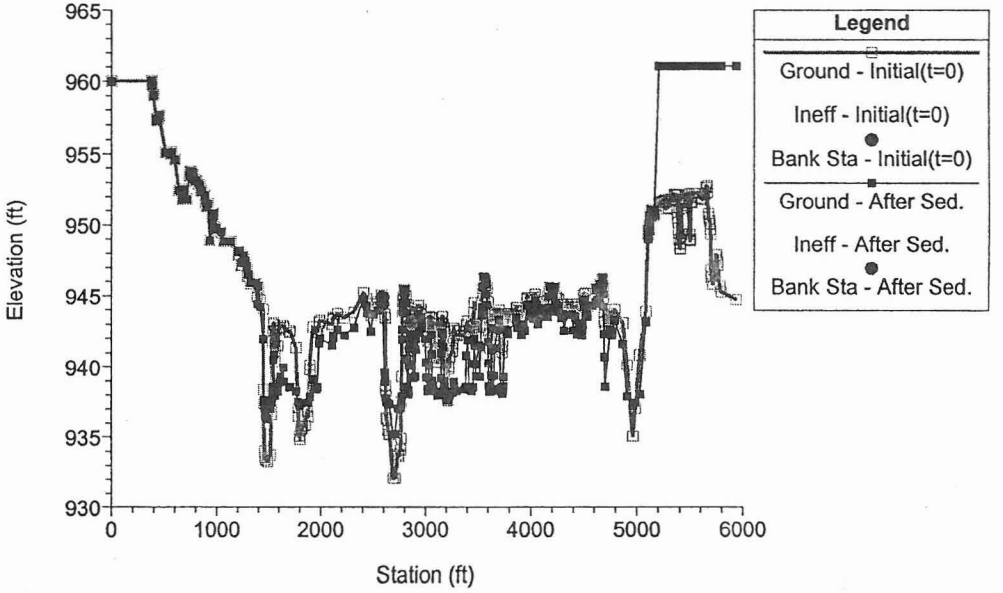
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.86



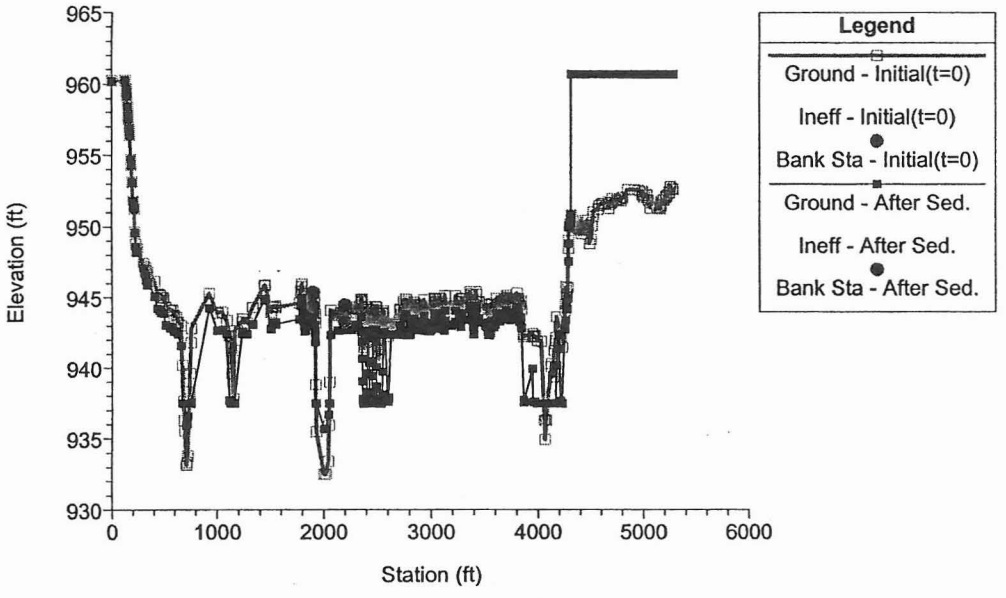
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.91



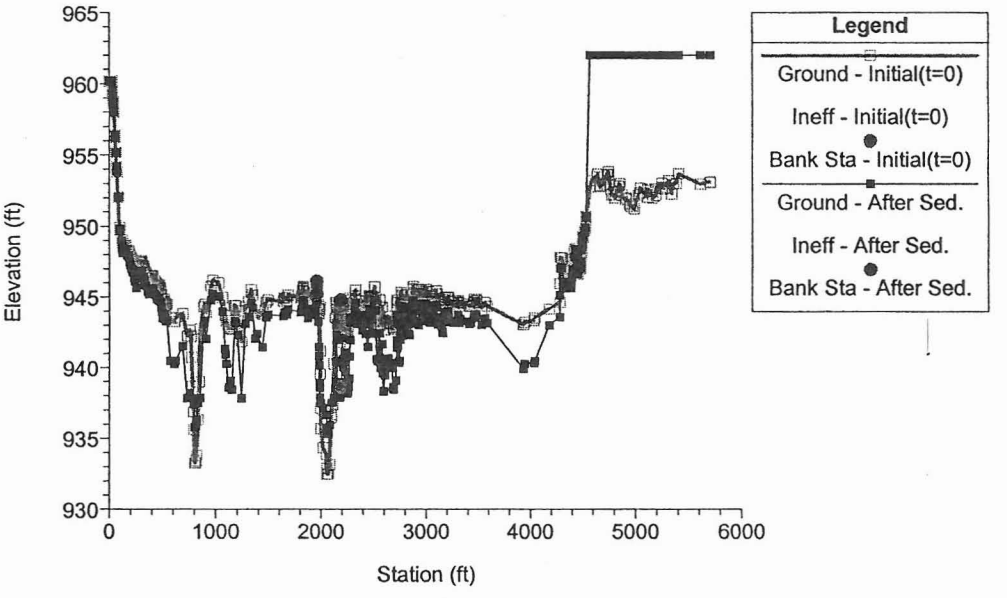
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 0.96



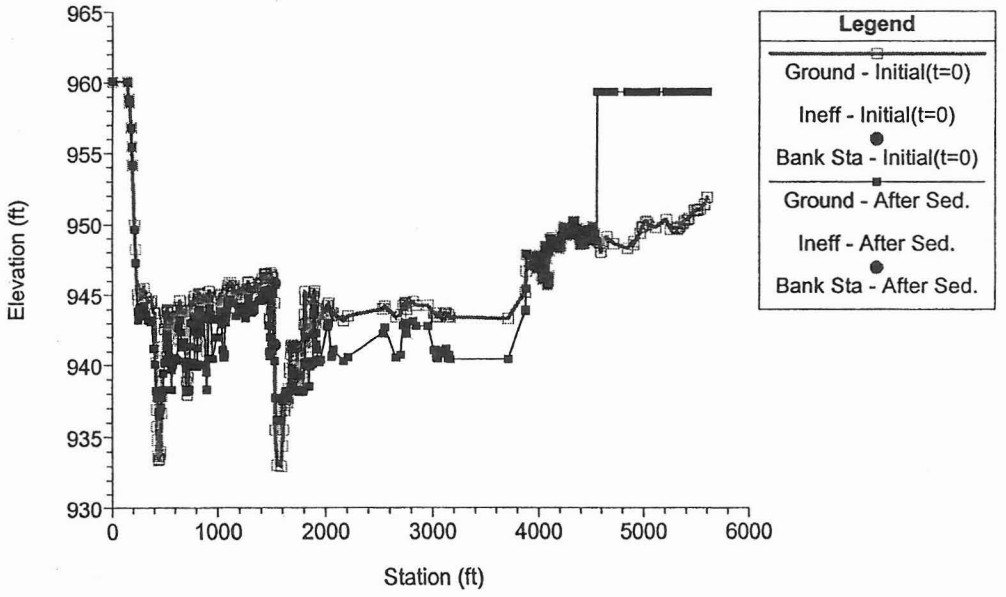
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.02



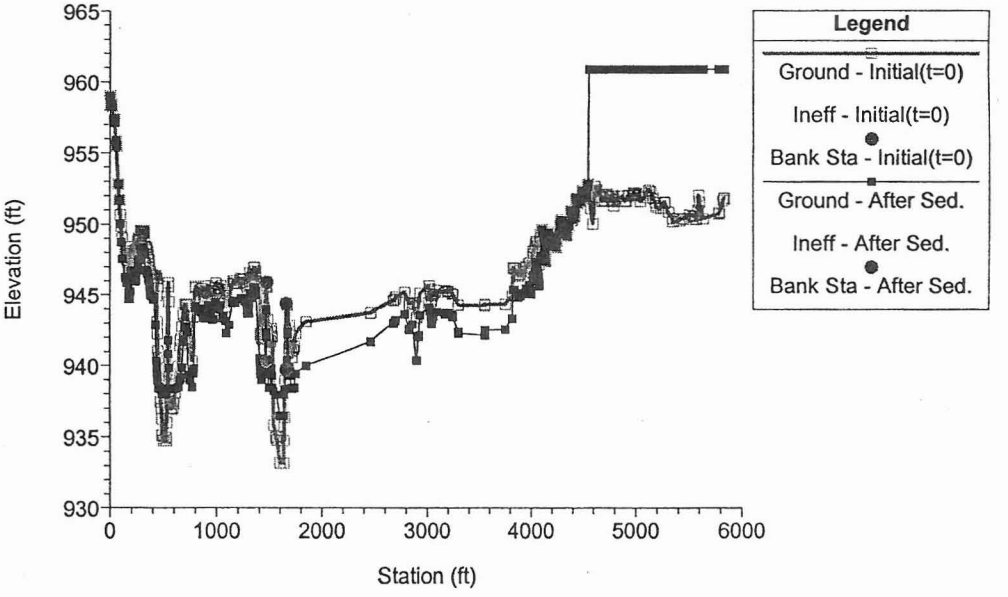
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.09



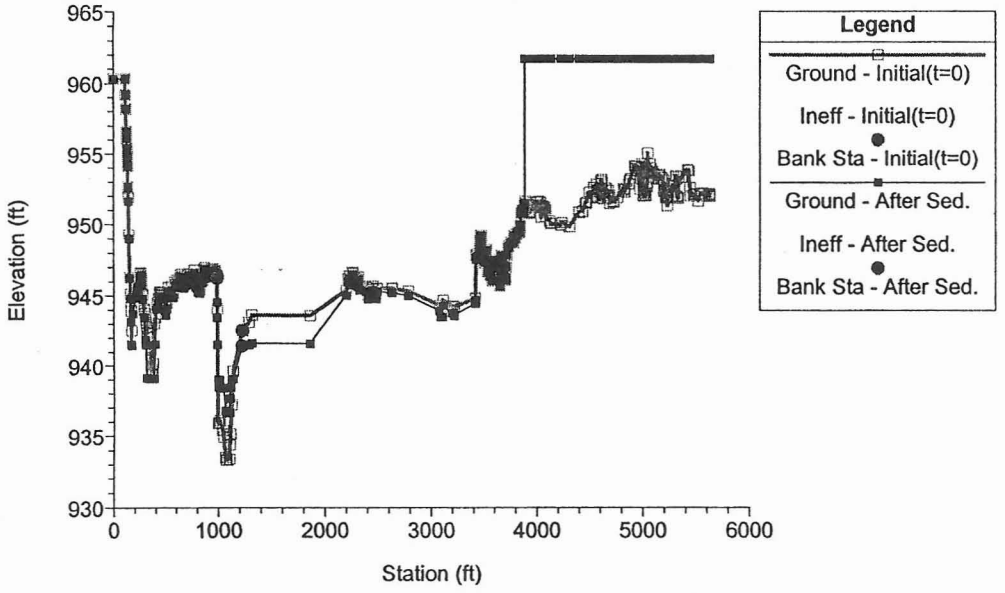
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.15



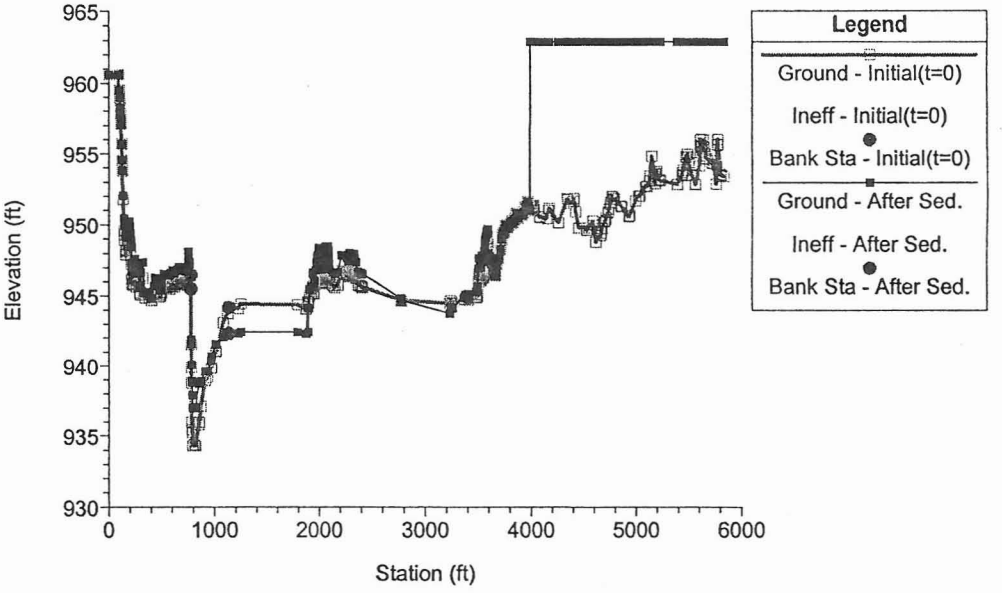
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.21



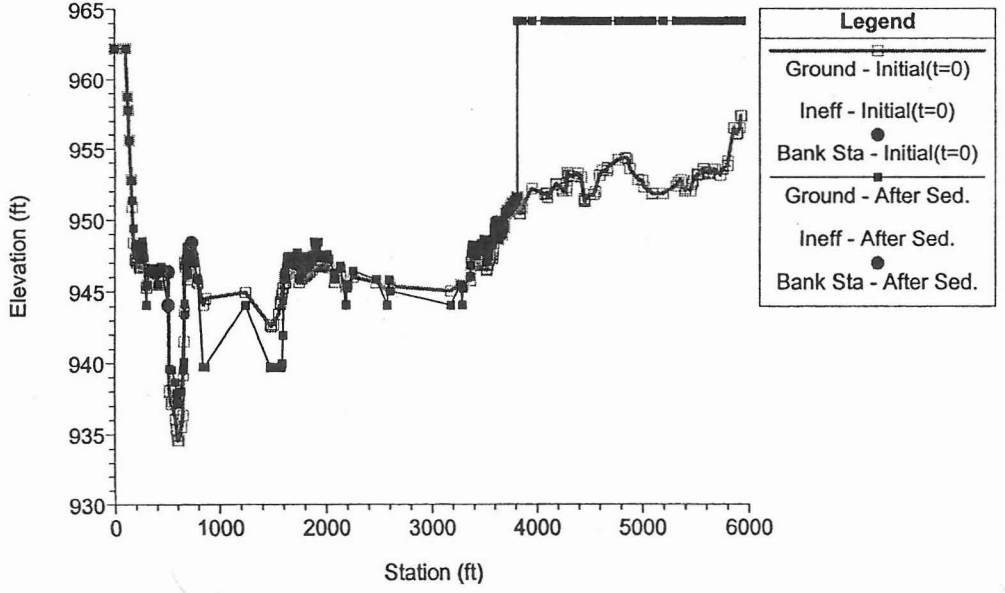
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.28



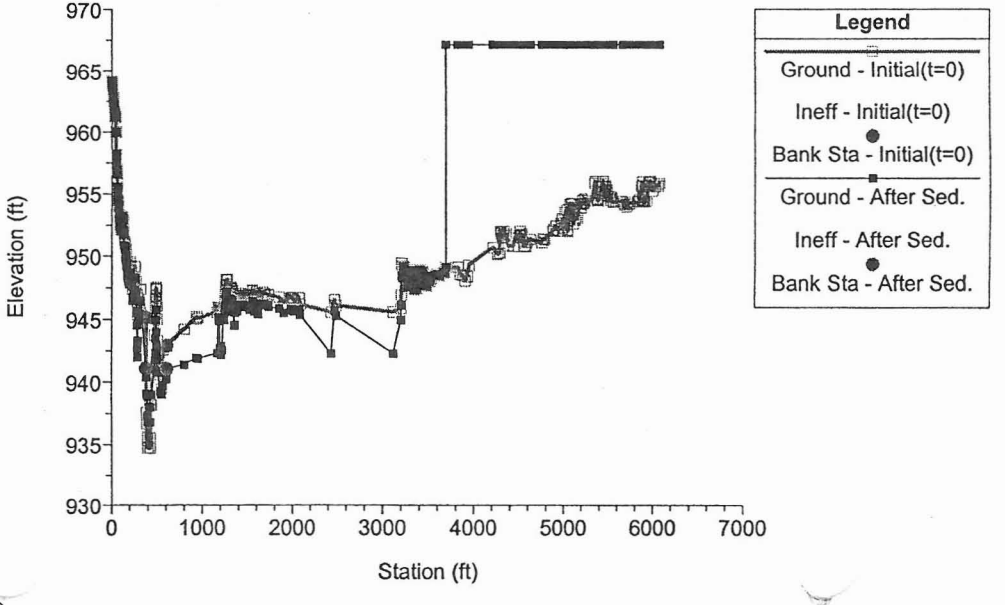
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.35



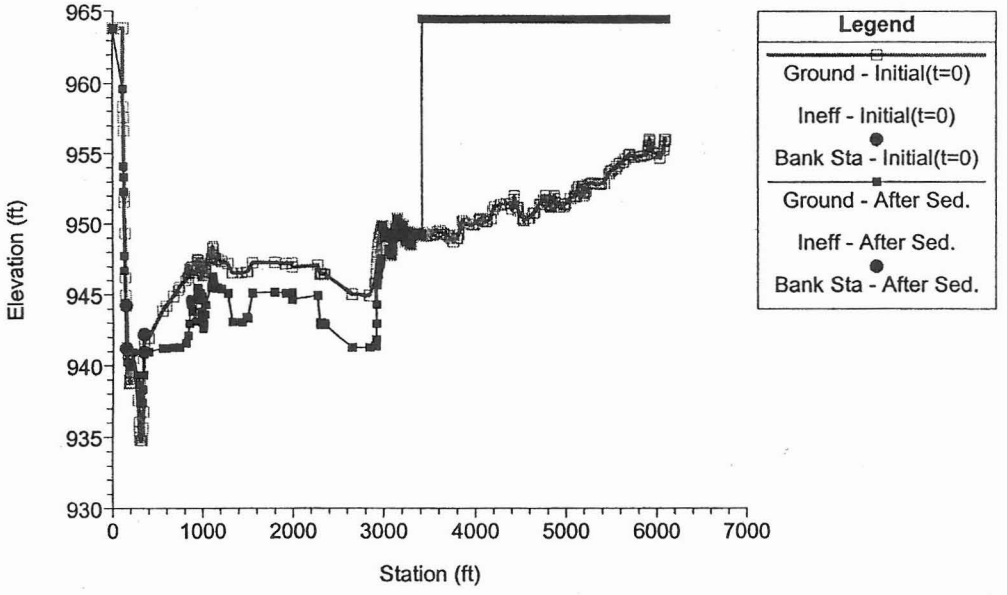
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.41



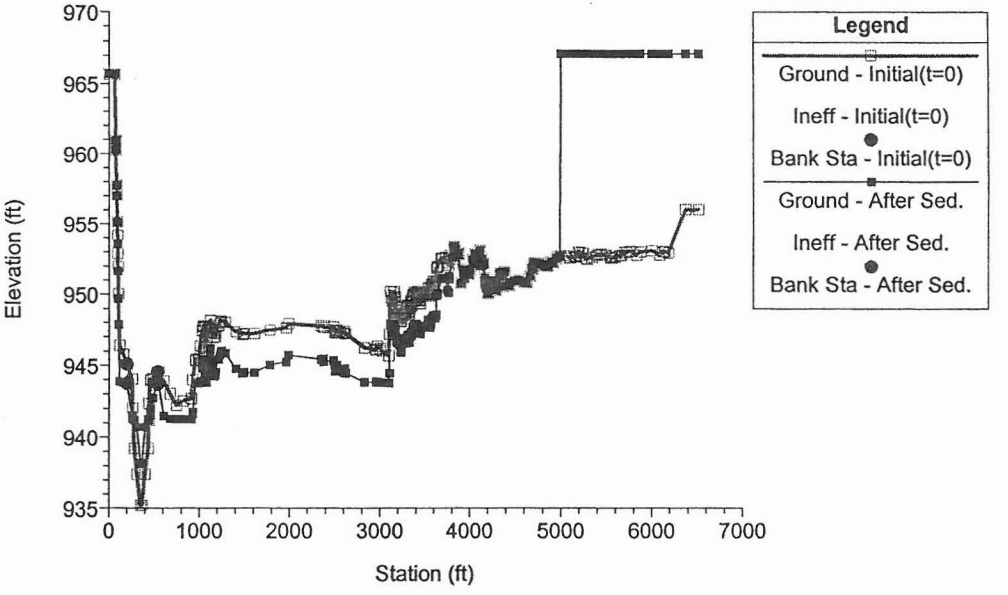
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.48



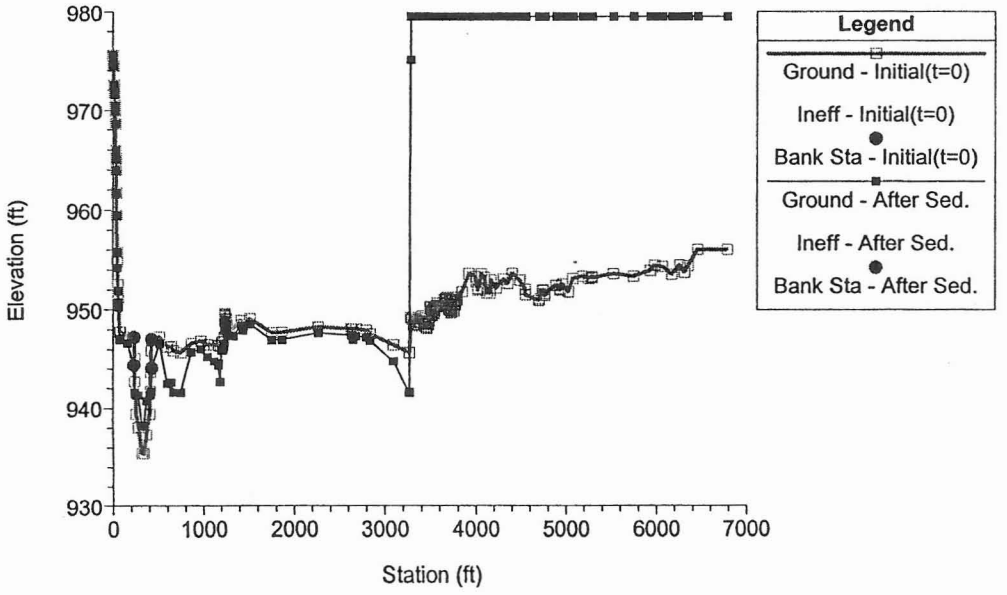
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.55



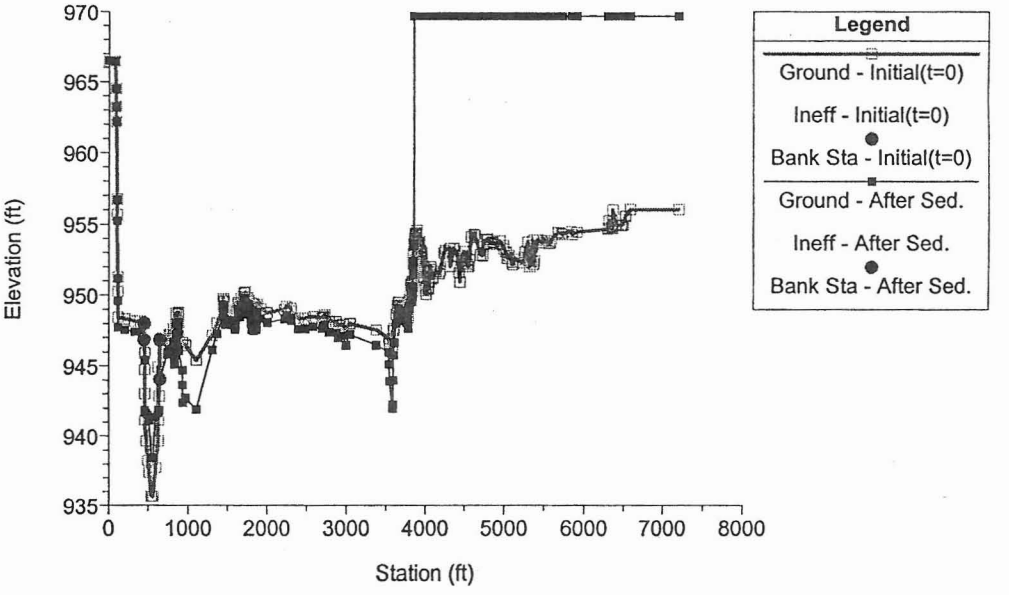
TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

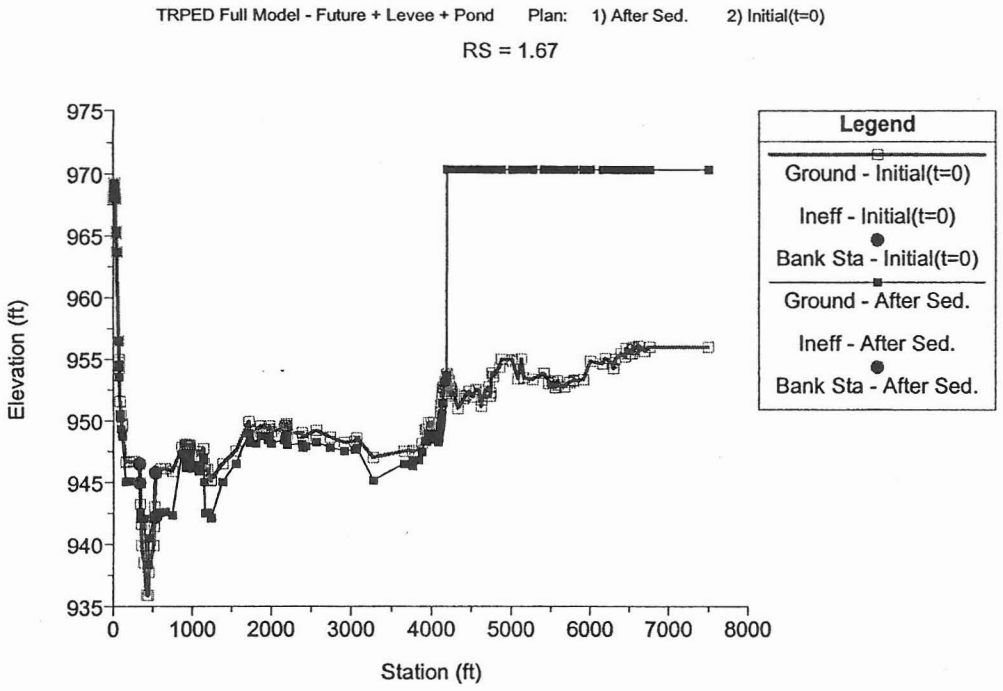
RS = 1.59



TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)

RS = 1.63




TRPED Full Model - Future + Levee + Pond Plan: 1) After Sed. 2) Initial(t=0)
RS = 1.67
Elevation (ft)
975
970
965
960
955
950
945
940
935
0
1000
2000
3000
4000
5000
6000
7000
8000
Station (ft)
Legend
Ground - Initial(t=0)
Ineff - Initial(t=0)
Bank Sta - Initial(t=0)
Ground - After Sed.
Ineff - After Sed.
Bank Sta - After Sed.