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DESIGN REPORT
FOR
QUEEN CREEK CHANNEL
POWER ROAD TO SOSSAMAN ROAD
QUEEN CREEK, ARIZONA

June 20, 2002
Revised: December 20, 2002

Coe & Van Loo Consultants, Inc.
4550 North 12th Street
Phoenix, Arizona 85014

CVL Project No. #00-0044-03-04

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FOR
QUEEN CREEK CHANNEL
POWER ROAD TO SOSSAMAN ROAD
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Registered Professional Engineer (Civil)
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CVL Project No. #00-0044-03-04

CVL

Design Report
for
Queen Creek Channel
Power Road to Sossaman Road

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1.0 INTRODUCTION

1.1. Scope

Coe and Van Loo Consultants, Inc. (CVL) has been contracted by Ryland Homes, Inc. to provide engineering services for channel improvements within the Queen Creek Wash from Sossaman Road to Power Road. The channel improvements are part of Sossaman Estates, a proposed 340-acre single-family residential subdivision located on the northeast corner of Power Road and Ocotillo Road. After the improvements are complete and a Letter of Map Revision (LOMR) has been obtained, the FEMA floodplain will be relocated to within the channel banks and flood insurance will no longer be required.

1.2. Location

The Queen Creek Wash Channel Improvements project is located in the southeast portion of Maricopa County within the Town of Queen Creek, Arizona. The site location can further be described to be within the north half of Section 18 and the south half of Section 7, Township 2 South, Range 7 East of the Gila and Salt River Meridian. The project limits extend from Sossaman Road at the east end to Power Road at the west end (see Figures 1 and 2).

1.3. Background

Queen Creek Wash is designated as FEMA floodplain Zone A (see Figure 3). This is defined as being a special flood hazard area inundated by the 100-year flood with no base flood elevations determined. In order to remove a portion of the proposed Sossaman Estates out of the floodplain, it is proposed that improvements be designed and constructed within the Queen Creek Wash. The improvements shall be designed to reduce the floodplain limits such that the 100-year flow will remain within the channel banks, thus allowing for optimal land development and safe floodplain mitigation.

2.0 DATA COLLECTION

2.1. Survey/Mapping

Topographic mapping for the project has been provided by Aerial Mapping Company (AMC) for the west half and Coe & Van Loo Consultants, Inc. (CVL) for the east half. AMC flew the entire west half of the section to include the development of Sossaman Estates, whereas, CVL provided spot elevations for a 300-foot wide swath for the east half. CVL provided additional spot elevations to tie into the AMC section. All topographic mapping was provided on the Town of Queen Creek Datum.

2.2. Existing Data and Reports

Other studies have been performed on Queen Creek Wash within the study area. The *Queen Creek/Sanokai Wash Hydraulic Master Plan* (HMP) was completed in September 2000 (Reference 1). This study was prepared by Huitt-Zollars for the Flood Control District of Maricopa County (FCD) to assess the hydraulic conveyance of Queen Creek and Sanokai Wash and to provide guidelines for adjacent development. Another study that is being prepared concurrently with this project is the *Queen Creek Wash, Power Road to Hawes Road, Pre-Design Report* by Dibble & Associates (Reference 2). The intent of the Dibble study is to provide design of the wash improvements from Hawes Road to Sossaman Road and to review *this* study and design (Power Road to Sossaman Road).

3.0 HYDROLOGY

Hydrology for the Queen Creek Channel Improvement Project between Power Road and Sossaman Road has been obtained from other studies. The latest study to analyze hydrology for this reach is the *Queen Creek Wash – Power Road Pre-Design Report* (Reference 3). Currently, this report is being reviewed by the Flood Control District of Maricopa County (FCD). This hydrology will be submitted to FEMA as part of a Condition Letter of Map Revision (CLOMR) for *this* project and for Dibble's study area (Sossaman Road to Hawes Road). Excerpts from Reference 2 are included in Appendix A.

On June 12, 2002, Reference 2 was submitted to the Town of Queen Creek and the Flood Control District of Maricopa County (FCD). In addition, the full appendices and results are included in the report entitled *Queen Creek Wash – Hawes Road to Power Road – Revised Hydrology Technical Memorandum #1* (Reference 3). These reports include significant modifications to the original sediment transport and flow models which had been previously accepted by the FCD in the HMP. Consequently, the overall concept and design of the proposed Queen Creek Wash Project has been significantly improved to reduce the immediate impact to the Wash's plant and wildlife habitat and to enhance the long-term resource value of the corridor.

Reference 2 includes a new and vital evaluation of the existing Sanokai flood retarding structure (SFRS) that controls the Sanokai flow into Queen Creek. Previously input as a coded hydrograph without runoff parameters, the SFRS and the actual impact of the upstream Sanokai Watershed on the downstream reaches of the Queen Creek Wash was undetermined. The results show that the SFRS has a major impact on the combined hydrograph of the downstream reaches. The study indicates a substantial flow reduction for the 100-year, 6-hour storm from the previous 3,242 cfs at the Sossaman Road crossing down to 2,839 cfs.

4.0 CHANNEL DESIGN

4.1. Design Constraints

Several factors were considered in the design process for the Queen Creek Wash Channel Improvements project. Issues involving funding, right-of-way limits, 404 permitting requirements, MCDOT projects within the area maintenance access, and aesthetics were examined in addition to hydraulic function of the channel. In addition, the improved channel must be designed to be stable with respect to sediment transport and to remove the existing continuous berms on both sides of the wash while providing capacity for the 100-year flow rate.

4.2. Horizontal Alignment

With heavy vegetation in the existing channel banks and the 404 mitigation plan requirements, a horizontal channel alignment that would preserve the natural environment of the area as much as possible. This was done by widening the channel cross-section and altering the centerline such that areas of heavy vegetation could be protected. A meandering channel reach as characterized by natural wash systems was the goal of the horizontal alignment design. The construction drawings show the proposed design.

4.3. Vertical Alignment

Two sediment conditions have been considered which have established two vertical alignment models for the reach. The first vertical alignment model (Proposed Condition Hydraulic Model, Appendix C) is based on the existing sediment condition, which is considered stable according to West Consultants, Inc. as documented in Reference 2. The channel design plans are based on this existing sediment condition. The vertical alignment for the flow line follows the existing alignment with an existing slope of approximately 0.028 ft/ft for as much as is practical, although much of the reach is already close to the equilibrium slope of 0.0021 ft/ft. This considers the meandering proposed cross-section that has been designed to maintain as much vegetation as possible.

The second vertical alignment model (Future Condition Hydraulics Model, Appendix D) for the reach is designed based on a future sediment condition that occurs when the upstream sediment supply is exhausted. The sediment transport analysis indicates degradation of the reach would continue until an equilibrium slope of 0.0021 ft/ft is achieved. The system will neither aggrade or degrade once the equilibrium slope is achieved. A buried 1.5-foot cutoff wall

(used as a grade control structure) is designed at station 44 + 60 to allow for equilibrium slope for the entire reach.

4.4. Hydraulic Analysis

4.4.1. Proposed Condition Hydraulic Model

As was mentioned in the previous section, the proposed condition hydraulic model is based on the existing sediment condition. No drop structures are considered for this condition because the existing flow line is maintained for most of the project reach.

The 100-year flow is contained in the widened cross-sections at an average depth of approximately 4.5 feet deep, at a velocity, which ranges primarily from 4 ft/s to 6 ft/s. Freeboard for the project reach is at least 1 foot from the 100-year water surface elevation to the top of bank. The 'n' value selected for this project reach is 0.028 based on the trees and vegetation which are to remain in addition to the proposed vegetation shown on the CVL landscape plans.

4.4.2. Future Condition Hydraulic Model

This hydraulic model is based on the future sediment condition. The sediment transport analysis prepared by West Consultants, Inc. indicates that the proposed channel will experience degradation until it reaches a near existing slope. The proposed grade control structure will allow for future equilibrium slope, and during small frequent storms, the grade control structure will protect the channel from excessive scour.

The section immediately downstream of the grade control structure to approximately station 23+00 is where most of the degradation will occur. The proposed cross-section mentioned in Section 4.4.1 will degrade a maximum of 1.5 feet near the grade control structure.

The 100-year flow is contained in the future condition cross-sections at an average depth of approximately 4.5 feet deep at a velocity which ranges primarily from 4 ft/s to 5.5 ft/s. Freeboard for the future condition is at least 1 foot from the 100-year water surface elevation to the top of bank.

5.0 SEDIMENT TRANSPORT ANALYSIS

A sediment transport analysis for the Queen Creek Channel was performed with the assistance of West Consultants, Inc., in order to quantify the scour and deposition within the proposed channel reach. It was noted in Reference 2 that the project reach is considered to be relatively stable in its current configuration. Further, erosion is expected to be less than 1 foot with the exception of large scour values due to the existing bridge at Power Road. The replacement of this bridge reduces the scour to approximately 2 feet for the 100-year flood.

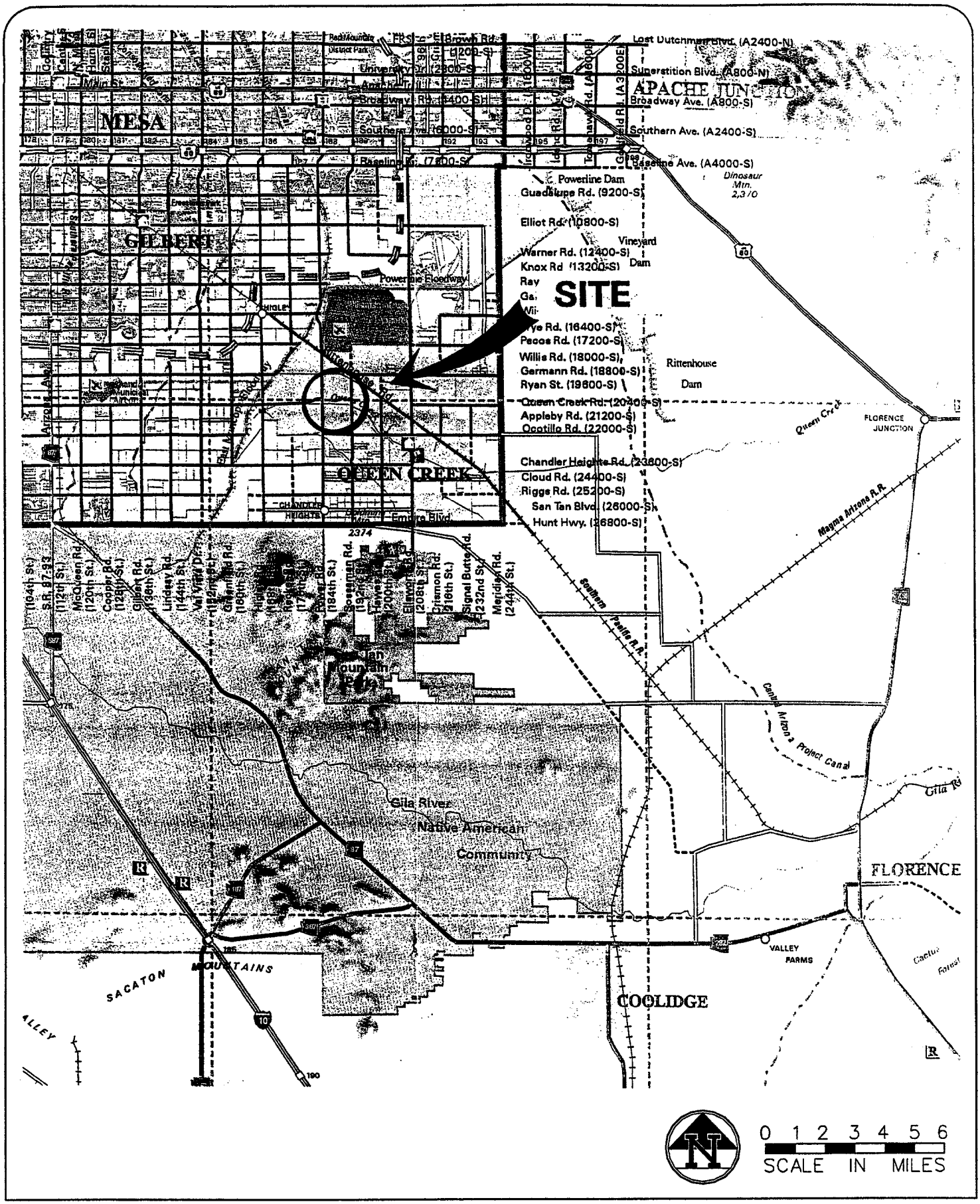
An explanation of the analysis procedure and the results can be found in Reference 2 along with a disk with the sediment transport analysis.

6.0 REFERENCES

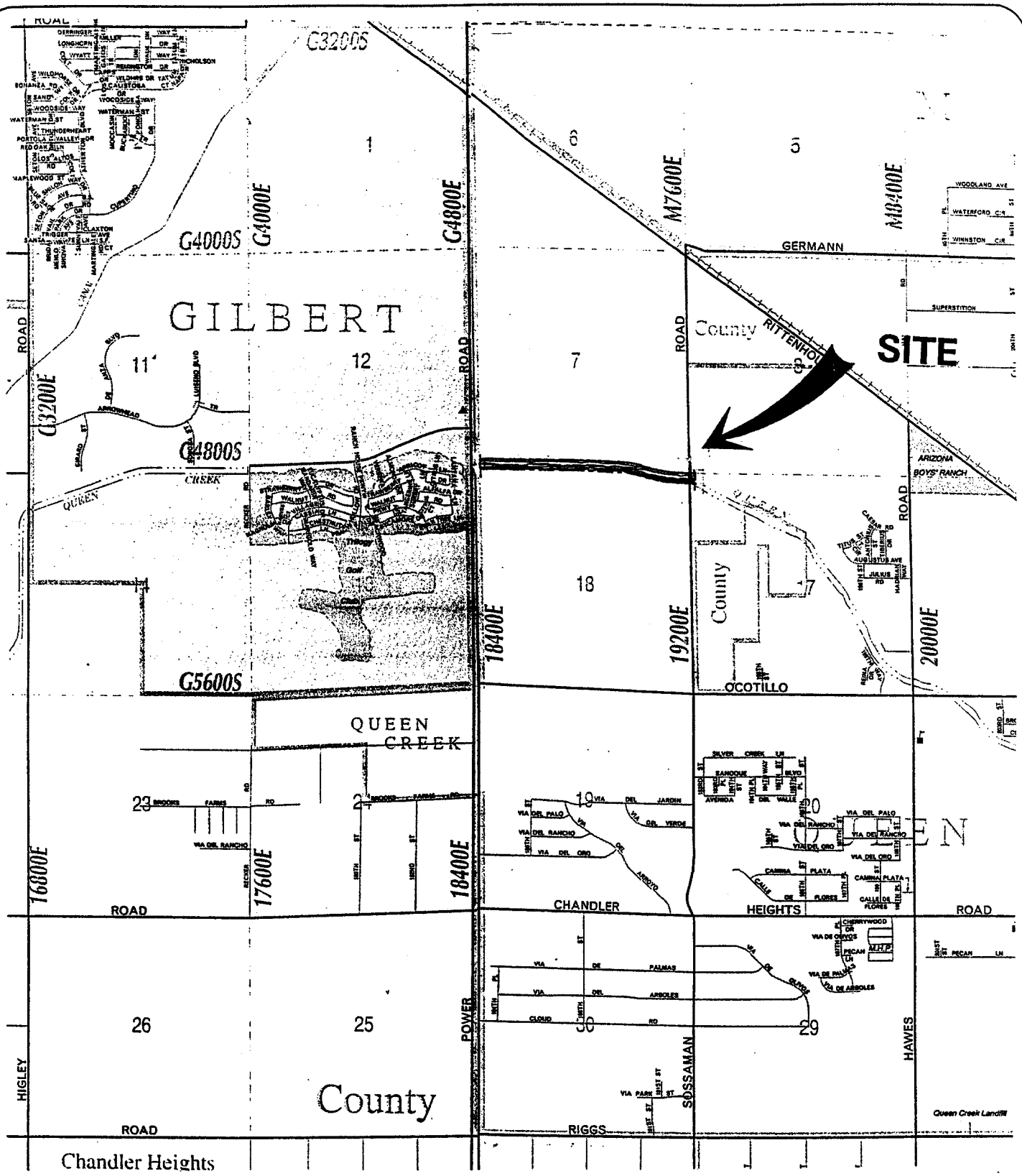
1. Huitt-Zollars, *Queen Creek/Sanokai Wash Hydraulic Master Plan*, FCD 98-26, November 2000.
2. Dibble & Associates, *Queen Creek Wash, Power Road to Hawes Road, Pre-Design Report*, June, 2002.
3. Coe & Van Loo Consultants, Inc., *Master Drainage Report for Power Ranch P.A.D.*, October 17, 1996.
4. Coe & Van Loo Consultants, Inc., *Master Drainage Report for Sossaman Estates*, 2nd Revision, October 15, 1999.

FIGURES

CVL



VICINITY MAP	QUEEN CREEK CHANNEL POWER ROAD TO SOSSAMAN ROAD	JOB NO 000044-01
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE	FIGURE 1



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SCALE IN MILES

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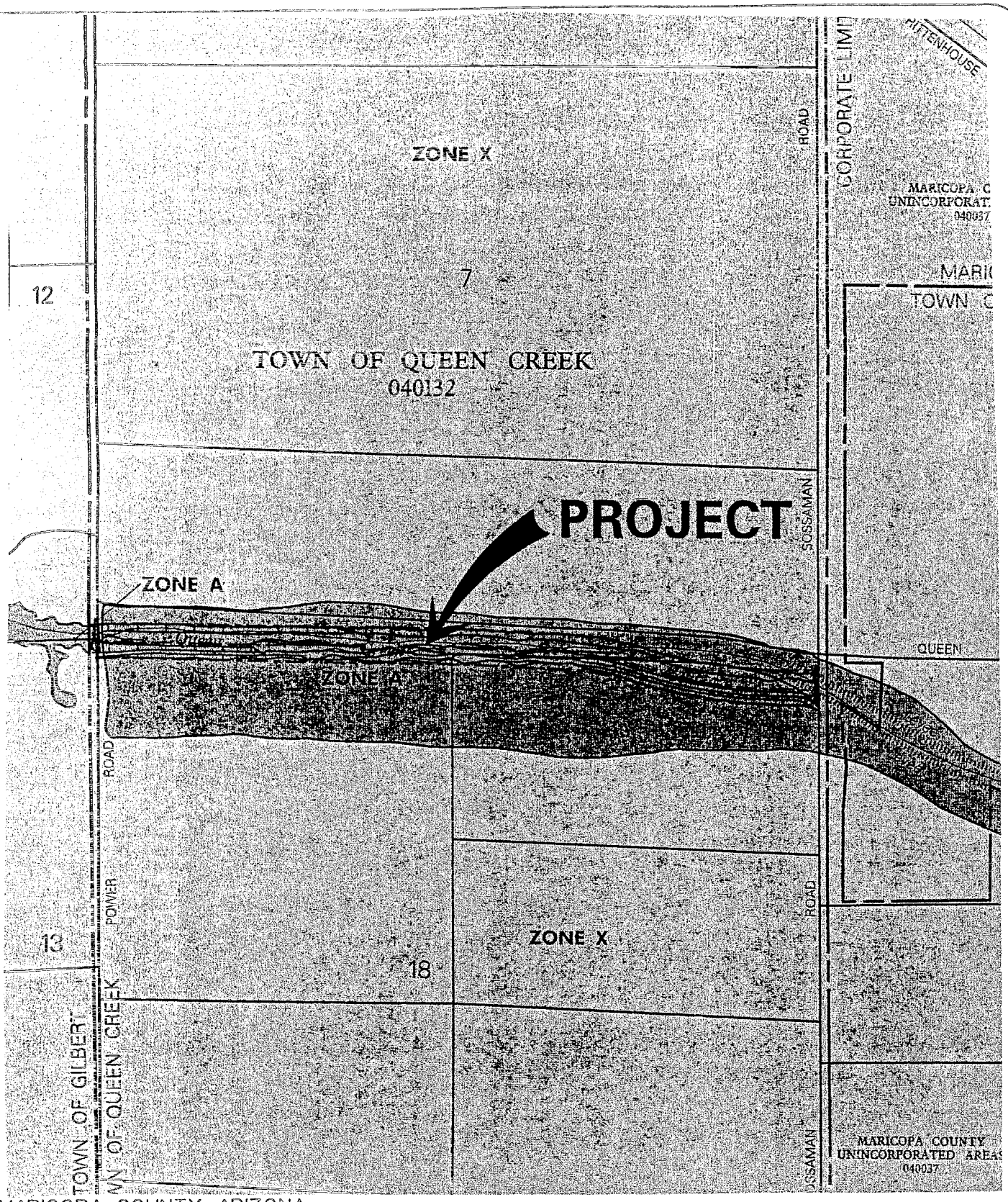
LOCATION MAP	QUEEN CREEK CHANNEL POWER ROAD TO SOSSAMAN ROAD	JOB NO 000044-01
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE	FIGURE 2



MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS
MAP NUMBER 04013C2695 G. REV. JULY 19, 2001

1000' 500' 0 1000'
SCALE IN FEET

FLOOD INSURANCE RATE MAP	QUEEN CREEK CHANNEL POWER ROAD TO SOSSAMAN ROAD	JOB NO 000044-01
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE	FIGURE 3

APPENDICES

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APPENDIX A

Hydrology
(Excerpts from References 1 & 2)

CVL

QUEEN CREEK WASH
POWER ROAD TO HAWES ROAD
Contract No.:2000D03

PRE-DESIGN REPORT

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Since 1962

June 2002

QUEEN CREEK WASH
POWER ROAD TO HAWES ROAD

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Seal applies to Chapter V- *Sediment Transport and Scour,* and Chapter IX- *Sossaman Road to Power Road Channel Review.*

QUEEN CREEK WASH
POWER ROAD TO HAWES ROAD
PRE-DESIGN REPORT

I. INTRODUCTION

A. General

This pre-design report is prepared for the Town of Queen Creek as part of the Queen Creek Wash Improvement project in Queen Creek, Arizona. The project consists of design of wash improvements from Hawes Road to Sossaman Road, as well as review of the design performed by Coe & Van Loo (CVL) for Ryland Homes for the reach from Sossaman Road to Power Road. The project stems from the *Queen Creek and Sanokai Wash Hydraulic Master Plan* (HMP), completed in September, 2000. The Flood Control District of Maricopa County (FCDMC), in cooperation with the towns of Gilbert and Queen Creek, conducted the HMP study as a means to assure 100-year level flood protection for future developments adjacent to Queen Creek and Sanokai Washes. The existing Queen Creek Wash through the project reach cannot fully contain the 100-year runoff. The recommended improvements will provide 100-year flow capacity in the wash, as well as enhance the community with recreational opportunities. The improvements include a bridge at Sossaman Road, a paved pathway system, and equestrian access. This report presents the design sequence and results for the project. The project location is shown on **Figure 1**.

B. Study Area

The study area includes Queen Creek Wash and adjacent properties between Hawes Road and Sossaman Road. Most of this land is owned by companies planning to eventually develop the land as residential housing. In order for the adjacent land to be developed, Queen Creek Wash must first be improved to provide 100-year capacity.

In addition to the developer-owned land, there are 2 small "islands" of unincorporated Maricopa County land adjacent to the wash. These islands consist of approximately 10 residences in all.

II. DATA COLLECTION

A. Existing Data and Reports

The FCDMC provided both a hydrology (HEC-1) model and a hydraulic (HEC-RAS) model for the watershed. During the evaluation of these models, discrepancies were found to be present in both models that required attention. These discrepancies, and their respective corrections, are discussed later in the text of this document.

The FCDMC supplied 2 HEC-1 models of the area, "existing conditions" and "future conditions". Both of these models were developed as part of the HMP. The "existing conditions" model reflects the hydrologic characteristics of the watershed as it was when the model was assembled. The future conditions model attempts to account for future land uses and development within the watershed. The base hydrology model used for this study is the

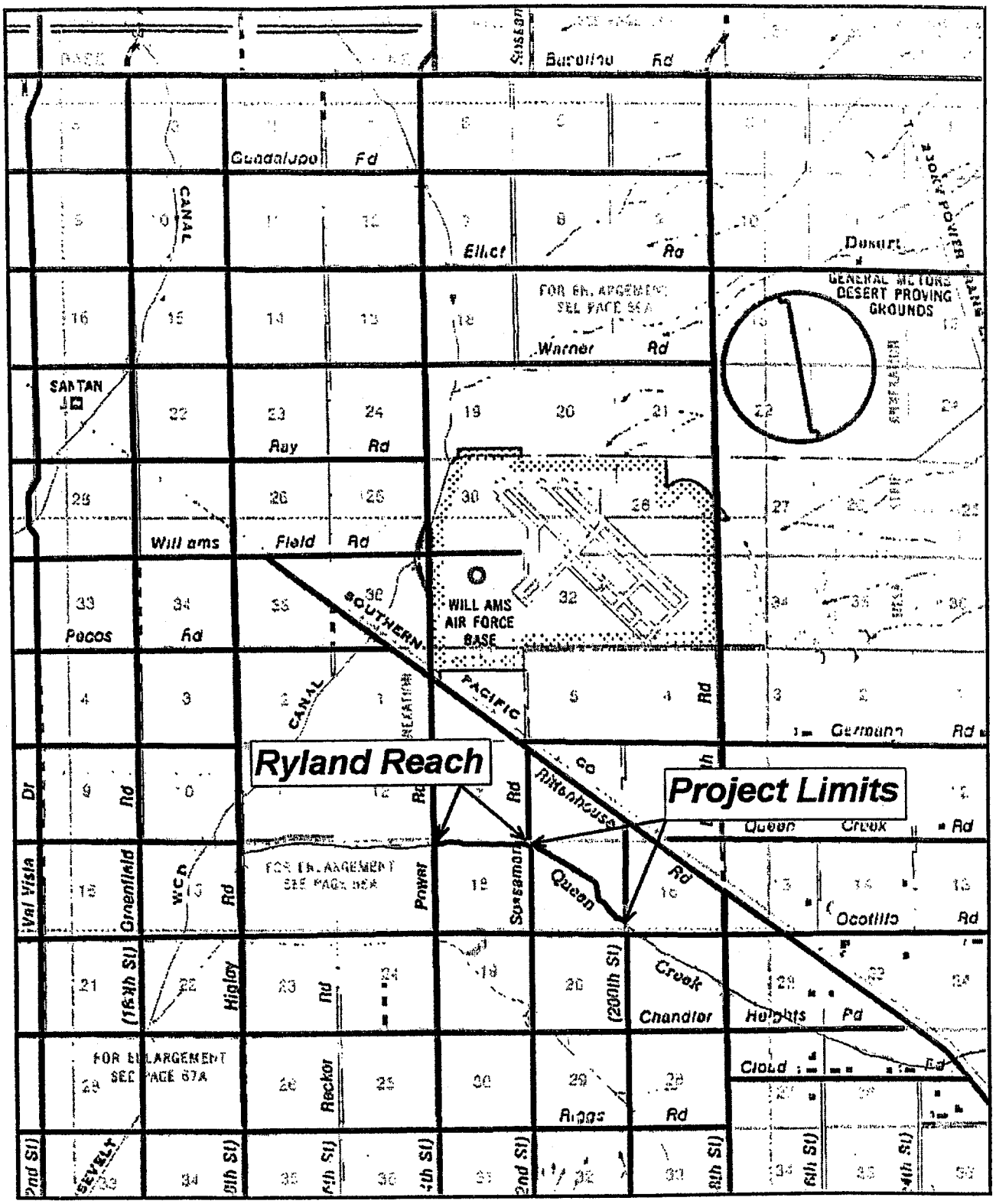


Figure 1- Project Location

"future conditions" model. This model includes approximately 95 square miles of watershed, which contributes runoff to both Queen Creek Wash and Sanokai Wash. The "existing conditions" model was not considered in the analysis.

The base hydraulic model used for this study was a HEC-RAS model compiled by FCDMC, which included portions of original HEC-2 and/or HEC-RAS model assembled by the following entities: Wood & Associates, (now Wood-Patel), Coe & Van Loo, FCDMC, Collins-Pina (now Tetratech). This compilation model extends from the Southern-Pacific Rail Road (SPRR) on the upstream end, to the East Maricopa Floodway (EMF) on the downstream end.

B. Mapping and Utilities

At project startup, FCDMC supplied all of the aerial mapping that had been performed to date in the project area. This mapping was generated as part of other hydrologic or hydraulic studies performed in the area. The HEC-RAS and HEC-2 models that were pasted together to form the compilation HEC-RAS model supplied by FCDMC were created from this mapping. Two different sources generated this mapping- the reach from the EMF to Hawes Road was performed by Kenney Aerial Mapping (KAM), while the reach from Hawes Road to the Maricopa County line was generated by Aerial Mapping Company (AMC). This mapping was reportedly based on National Geodetic Vertical Datum of 1929 (NGVD '29).

Evaluation of this mapping and comparison with the survey being performed as part of this project showed that the mapping provided by FCDMC was not on NGVD '29 as reported, and in fact, had vertical control errors that would render it useless until corrected. Certain elevation reference marks (ERM's) in the Queen Creek/Gilbert area appear to be stamped with erroneous elevations. Some of these ERM's were used for the vertical control for the FCDMC mapping. This introduced a "tilt" or a "vertical skew" in the mapping. Once this was discovered, the vertical control points that were used for the FCDMC mapping were resurveyed and a "correction factor" was calculated for each set of mapping. The original mapping companies then corrected the mapping based on the correction factors. It should be noted that a decision was made to use North American Vertical Datum of 1988 (NAVD '88) for this project.

A full report of the mapping errors and corrections, produced by Bob Phillips of GPS Services, can be found in **Appendix A.**

In addition to the FCDMC mapping, a 500' swath of new mapping was generated along Queen Creek Wash from Sossaman Rd. to Hawes Rd. to be used for design of the wash improvements. The new mapping was also based on NAVD '88 datum. A digital photo was also generated, which can be overlain with the mapping CAD file.

Utility companies in the area were contacted and petitioned for their utility quad maps for the area. Utility companies include Queen Creek Water Company, Queen Creek Irrigation District, SRP, Qwest, and Cable America. The Town of Queen Creek supplied all of the sewer drawings for the area.

C. Sediment Sampling

Soil samples were taken from 15 different locations along the Wash between Power Road and Ellsworth Road. Test pits were excavated to a depth of 3 feet, and representative samples were

extracted from the pit. Ten samples were taken from bed material, and 5 samples were taken from bank material. The results of the laboratory tests on these samples are included in **Appendix B.**

III. HYDROLOGY

A. Introduction

The HEC-1 model for the Queen Creek/Sanokai watershed was provided by FCDMC. This model includes the contributory area downstream from the Sanokai Detention Dike, also called the Sanokai Flood Retarding Structure (FRS). The FRS upstream area was input as a coded hydrograph with no runoff parameters. It does not, however accurately model the contributory area upstream from the FRS. The outlet structure under the FRS drains into Queen Creek Wash, and has a major impact on the flow within Queen Creek Wash. The HMP itself states that this outflow should be studied in greater detail for any future studies. This project constitutes a "future study" referred to by the HMP.

Following is a discussion regarding project hydrology, and specifically, hydrology for the area upstream of the FRS. Refer to the report entitled *Queen Creek Wash – Hawes Road to Power Road – Revised Hydrology – Technical Memorandum #1* for the full appendices and results of the study.

B. Existing Hydrology

A HEC-1 hydrology model of the Queen Creek area was assembled for FCDMC as part of the *Queen Creek Area Drainage Master Study* (ADMS). Hydrology was performed for Sanokai Wash as part of the *Sanokai Wash Flood Insurance Study* (FIS). Although each of these models employed different unit hydrograph methods, they were combined, with slight modifications, for the *Queen Creek/Sanokai Wash Hydraulic Master Plan* (HMP). The resulting model may be thought of as 1 model with 2 distinct "sides"- the Queen Creek side and the Sanokai Wash side. Each "side" in the combined model maintains its own unit hydrograph method.

Subbasins contributing to the Sanokai Wash watershed in the HEC-1 model employ Time-Area data (UA records) in conjunction with the Clark Unit Hydrograph Method to generate runoff hydrographs. The Clark Unit Hydrograph Method uses 2 variables in the hydrograph transformation process; T_c (time of concentration) & R (a storage coefficient). The variable T_c is unique to a specific subbasin and storm frequency.

Subbasins contributing to the Queen Creek Wash watershed in the HEC-1 model use unit hydrograph data (UI records) to generate runoff hydrographs. This unit hydrograph information is unique to a specific subbasin, but not specific to storm duration or frequency. In other words, different frequency storm models may be run using the same UI records, by simply varying the precipitation depth in the model.

The most upstream point of the Queen Creek Wash side of the model is at the Sanokai Flood Retarding Structure (FRS). The FRS has a 4-barrel, 72-inch reinforced concrete pipe outlet. The runoff passed through this outlet is the inflow to the Queen Creek Wash side of the HEC-1 hydrology model. For the Queen Creek ADMS, and thus the Queen Creek/Sanokai Wash HMP,

this hydrograph was not "generated" by the model, but rather hard-coded in the model (using QI records) with no documentation to support the numbers.

To quote the Queen Creek/Sanokai Wash HMP, "*The input hydrograph used in the Queen Creek ADMS for outflow from the Sanokai Detention Dike was used without modification. Research revealed that no background information on the development of the outflow hydrograph (exists) and an analysis necessary to reevaluate the input hydrograph was outside the scope of this study. The input hydrograph, however, has a significant impact on peak flows within Queen Creek and should be reevaluated in future hydrologic studies.*" The purpose of this study, in part, is to report on this "reevaluated hydrograph".

Information provided by the United States Bureau of Reclamation (USBR) indicates that there was a hydrology model created when the FRS was constructed in 1980. This USBR model uses the 100-year, 6-hour storm. There are 3 subbasins in the USBR model upstream of the FRS that drain to the 4-barrel 72" outlet at Queen Creek Wash. These 3 subbasins in the USBR hydrology model are named "Whitlow Ranch Dam", "Sanokai", and "Queen Creek". The hydrographs from these 3 basins are combined in the USBR model, and routed through the FRS outlet structure. The resulting hydrograph is the hydrograph that the Queen Creek ADMS model attempts to approximate with the hard coded "QI" records discussed above.

Other than the information provided in the USBR model, not much is known regarding these 3 basins. No subbasin delineation maps were provided by USBR, and though it was requested, the drainage report could not be produced either.

Some investigation was conducted to discover more about these subbasins. Nothing was found on the Sanokai subbasin or the Queen Creek subbasin. However, information was discovered on the web site of the Army Corps of Engineers (COE) regarding Whitlow Ranch Dam. Whitlow Ranch Dam is a structure constructed by the COE in 1960 to provide flood protection to farmland and developed areas downstream. It is located just east of the community of Queen Valley, approximately 50 miles southeast of Phoenix, and 7 miles northeast of Florence Junction. The Whitlow Ranch Dam subbasin from the USBR hydrology model appears to be the area that drains to this flood control basin. According to the COE, the dam crest is 110' above the invert of the 66" outlet pipe. When the water surface elevation in the basin is at the crest of the dam, 1007 cfs exits the basin through the outlet pipe. Outflow from the Whitlow Dam usually percolates into the alluvial plain below the dam, and rarely travels more than a few miles downstream. Only runoff from very large and infrequent storms will actually make its way from Whitlow Dam to the FRS and eventually to the East Maricopa Floodway (EMF) and the Gila River.

C. Methodology

Two issues needed to be addressed in the hydrology model- (1) the hard coded hydrograph at the FRS outlet needs to be confirmed or revised, and (2) the model needs to be converted from the 100-year precipitation to run several storm frequencies for the sediment transport analysis. These 2 issues are hereafter referred to as **calibration** and **conversion**, respectively.

1. Calibration Model:

The USBR was contacted to obtain information on the FRS outlet structure and its associated hydrology. The USBR provided photocopies of some excerpts from their original hydrology model. The software used for the original USBR model is unknown, however, the provided excerpts list the information necessary to recreate these subbasins using the COE's HEC-1 software package. The pertinent information includes subbasin area, Soil Conservation Service (SCS) curve number, precipitation depth, and basin lag time. Using this information, a HEC-1 "calibration model" was assembled for each of the 3 contributing subbasins. The HEC-1 model employs the SCS dimensionless unit graph method (UD record) to generate runoff, and the SCS curve number loss rate method (LS record) to calculate runoff losses.

Three iterations were made in route to the final calibration model. First, the rainfall depths and SCS curve numbers reported in the USBR hydrology model were used in conjunction with the standard 6-hour SCS dimensionless distribution for spillway and freeboard hydrographs to reproduce the peak discharges and volumes from the USBR model. When compared with the isopluvial maps shown in the NOAA Atlas II, however, the USBR rainfall depths seemed low. Rainfall depth values were read directly from the isopluvial in the NOAA Atlas II, and then spatially reduced based on the ratios described in the FCDMC hydrology manual. These rainfall values were used in the 2nd calibration model, along with the same SCS curve numbers and 6-hour dimensionless rainfall distribution. Finally, the 3rd calibration model was modified to use the standard SCS 24-hour Type II rainfall distribution to be consistent with the Queen Creek ADMS model.

The logic of the HEC-1 model is as follows:
Hydrographs from subbasins "Sanokai" and "Queen Creek" are first generated, and then combined together upstream from the FRS. This combined hydrograph is then hydrologically routed through the FRS 4-72" outlet structure using a stage-storage-discharge relationship for the FRS. The result is the "inflow" hydrograph to Queen Creek Wash at the FRS.

The "Whitlow Ranch" subbasin from the USBR model has been excluded from contributing to the hydrograph entering Queen Creek Wash through the FRS in the calibration HEC-1 model. The Whitlow Dam basin outlet pipe has a maximum discharge of 1007 cfs. This only occurs when the basin is absolutely full. Because this runoff is controlled through the Dam, the peak from the Whitlow Ranch hydrograph does not coincide in time with the peak from the Sanokai or the Queen Creek subbasins. As discussed above, most of the flow that comes through the Whitlow Dam percolates into the surrounding alluvial plain, and never reaches the FRS. For these reasons, the Whitlow Ranch subbasin was excluded from the hydrograph combination that occurs just upstream from the FRS in the HEC-1 model.

The combined hydrograph was routed through the FRS by way of a storage routing step in the HEC-1 model. A stage-storage-discharge relationship for the FRS and its outlet was developed for this routing. Utilizing construction plans provided by USBR, and data collected on a site visit, an HY-8 model was developed to model the 4 barrel 72" outlet. Output from this HY-8 model was used for the stage-discharge relationship in the HEC-1 storage routing step. Stage-storage data was found on the documentation provided by the USBR.

Results from each iteration of the HEC-1 calibration model for peak discharge (Q) were compared with the reported values from the USBR model. The results of this comparison may be observed in **Table 1**, under subsection D- "Results".

Once the calibration model was complete, the hydrograph at Queen Creek Wash and the FRS was written out from the model using the "tape 21" method in HEC-1. The hard-coded hydrograph in the Queen Creek/Sanokai Wash HMP model (HY337) was replaced with this hydrograph generated by the calibration HEC-1 model. The result is a hydrology model that accurately models the hydrograph entering Queen Creek Wash through the FRS.

These steps were repeated for each frequency storm. The point rainfall values were read from the NOAA Atlas II isopluvial maps, those values were then reduced based on the recommended ratios in the FCDMC Hydrology Manual, and the calibration HEC-1 model was run using the reduced point rainfall depths. The hydrograph entering Queen Creek Wash through the FRS was written out to "tape 21". This hydrograph was then inserted in the HMP HEC-1 model in place of the undocumented hydrograph "HY337".

2. Model Conversion:

The Queen Creek/Sanokai Wash HMP model uses the 100-year, 24-hour storm. As discussed above, the sediment transport study being conducted as part of this project requires the 2-year, 5-year, 10-year, 25-year, 50-year, and the 100-year storm hydrographs. Recall that the HMP model has 2 distinct "sides", each of which employs a different method to calculate runoff. Also recall that the Queen Creek side uses unit hydrograph input that is not unique to storm duration or frequency. This means that different frequency storms can be modeled for the Queen Creek side of the model, by simply varying the value of the point rainfall depth.

The point rainfall depth of each required frequency storm was estimated from the isopluvial maps in the FCDMC hydrology manual. These rainfall depths were reduced based on the drainage area and input into the modified HMP HEC-1 model on the JD records. In addition to the watershed point rainfall depth modification, the hard coded hydrograph entering Queen Creek Wash at the FRS was modified per storm frequency.

Because the Sanokai Wash side of the HMP model uses the Clark Unit Hydrograph Method, and therefore T_c, which is specific to storm frequency, varying the rainfall depths is not a valid method to model the Sanokai Wash watershed for storms of different frequencies. The work required to update all of the subbasins contributing to the Sanokai Wash watershed for valid modeling of different frequency storms is beyond the scope of this project and study. It is important to note that the revised HEC-1 models generated for this study are valid for analysis of Queen Creek Wash only.

D. Results

1. Calibration Model:

Table 1 shows the 100-year peak discharges at key points in the calibration models. The 1st calibration is an attempt to reproduce the 6-hour storm USBR hydrology using the same parameters used in the USBR model. The resulting Queen Creek and Sanokai subbasin peak discharges are within 5% of the USBR values and the 100-year peak discharge out of the FRS is

within 12% of the USBR value. The 2nd and 3rd Calibration runs were intended to investigate the effect of modeling the FRS watershed using methods and storms employed in the HMP model for consistency with the modeling downstream of the FRS. The 2nd Calibration utilized published rainfall data from NOAA Atlas II and the 3rd Calibration utilized the same 24-hour rainfall distribution used in the HMP model. The changed rainfall resulted in higher peak runoff rates within each subbasin, but produced peak discharges into and out of the FRS within 4% of the USBR reported values.

Table 1 - HEC-1 Model Calibration Peak Discharge Comparison

Model Description:	USBR Model	1st Calibration	2nd Calibration	3rd Calibration
Model Name:	n/a	1calibr8.dat	2calibr8.dat	3calibr8.dat
Point of Interest	Q_{peak}	Q_{peak}	Q_{peak}	Q_{peak}
Whitlow Dam Subbasin	28,781 cfs	25,000 cfs	27,814 cfs	38,241 cfs
Queen Creek Subbasin	8,852 cfs	8,380 cfs	8,336 cfs	10,712 cfs
Sanokai Subbasin	5,575 cfs	5,704 cfs	5,166 cfs	6,722 cfs
Into FRS	17,000 cfs	13,954 cfs	13,386 cfs	17,138 cfs
Out of FRS	1,113 cfs	977 cfs	969 cfs	1,063 cfs

Table 2 shows the 100-year volume of runoff at key points in the calibration models. Recall that calibration models 1 and 2 use the 100-year, 6-hour storm, as does the original USBR hydrology model. The volume of runoff impounded by the FRS as predicted by calibration model 1 is within 5% of the USBR model. The volume predicted by calibration model 2 is within 8% of the USBR model. As expected, calibration model 3, which uses the 24-hour storm, predicts volumes much higher than the USBR model. The runoff predicted by calibration model 3 to be impounded behind the FRS is 44% higher than the USBR model value.

Table 2 – HEC-1 Model Calibration Volume Comparison

Model Description:	USBR Model	1st Calibration	2nd Calibration	3rd Calibration
Model Name:	n/a	1calibr8.dat	2calibr8.dat	3calibr8.dat
Point of Interest	**Volume**	**Volume**	**Volume**	**Volume**
Whitlow Dam Subbasin	10,989 ac-ft	10,990 ac-ft	12,214 ac-ft	19,198 ac-ft
Queen Creek Subbasin	5,147 ac-ft	5,148 ac-ft	5,121 ac-ft	7,853 ac-ft
Sanokai Subbasin	2,916 ac-ft	2,916 ac-ft	2,639 ac-ft	4,269 ac-ft
Impounded by FRS	8,424 ac-ft	8,064 ac-ft	7,760 ac-ft	12,122 ac-ft

Based on these comparisons of peak discharge and volume, calibration model 3 is judged to be acceptable for use in this project.

2. *Model Conversion:*

Once the calibration model was deemed acceptable, the hydrograph entering Queen Creek Wash through the FRS was inserted into the HMP model in place of the undocumented hydrograph "HY337". **Table 3** shows a comparison of 100-year peak flows as predicted by each of the models at points along Queen Creek relevant to this project. Note that the flows near the project area predicted by the revised model are approximately 400 cfs lower than those predicted by the HMP model.

Table 3 - 100-year Peak Flows: HMP Model vs. Revised Model

Location: Queen Creek @	HMP Model	Revised 100-Year Model
Sanokai FRS Outlet:	1695 cfs	1380 cfs
Hawes Road:	3242 cfs	2831 cfs
Sossaman Road:	3242 cfs	2839 cfs
Power Road:	3254 cfs	2856 cfs

Table 4 shows peak flows in the project area predicted by each of the frequency storm models developed for this study.

Table 4 - Peak Flows: All Frequencies of Revised Models

Queen Creek @	Frequency: 100-year	50-year	25-year	10-year	5-year	2-year
Sanokai FRS Outlet:	1380 cfs	1337 cfs	1274 cfs	1197 cfs	1115 cfs	1036 cfs
Hawes Road:	2831 cfs	2460 cfs	2086 cfs	1769 cfs	1381 cfs	1039 cfs
Sossaman Road:	2839 cfs	2456 cfs	2075 cfs	1762 cfs	1374 cfs	1039 cfs
Power Road:	2856 cfs	2449 cfs	2069 cfs	1757 cfs	1370 cfs	1039 cfs

IV. CHANNEL PRE-DESIGN

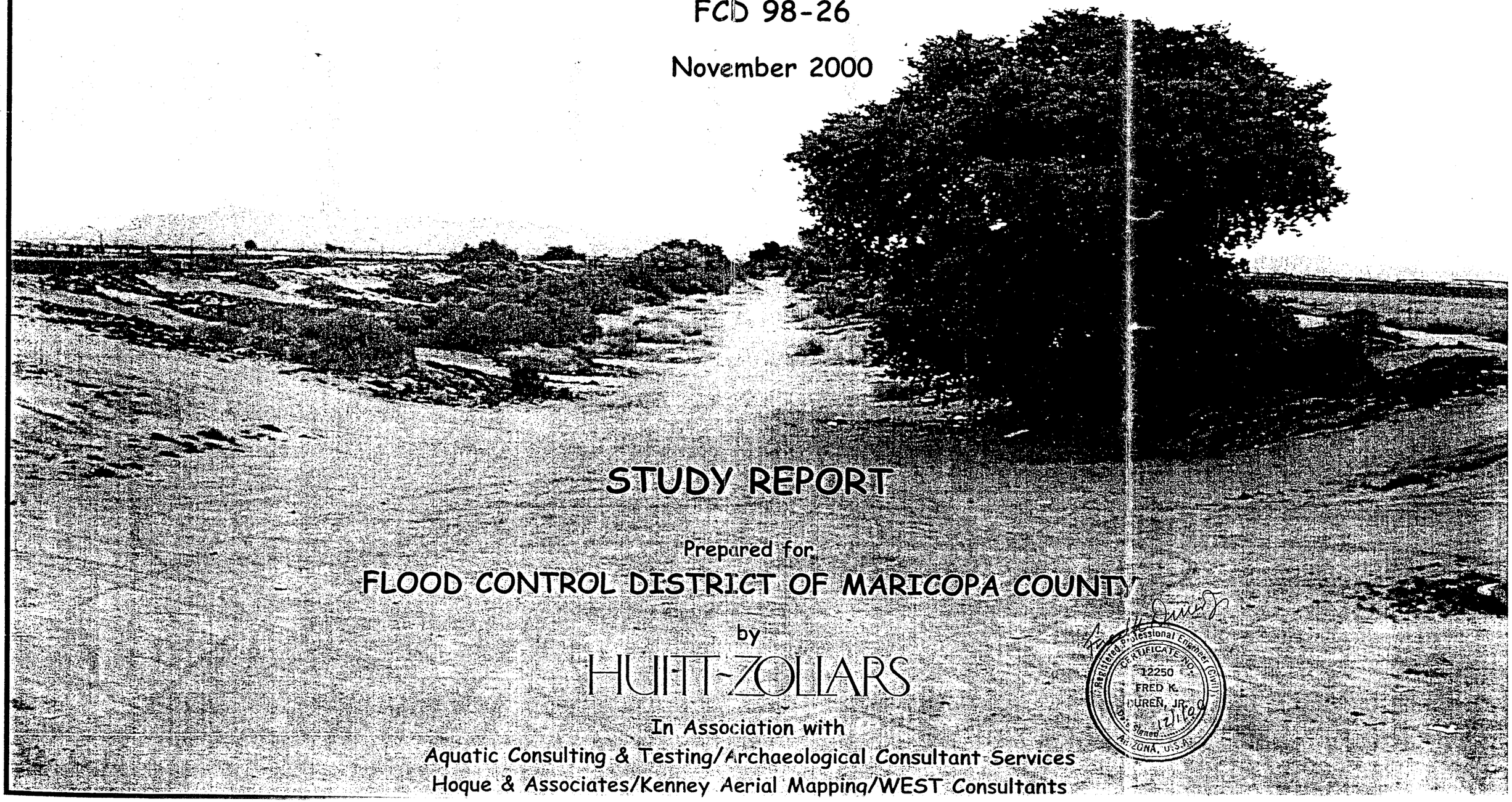
A. *Introduction*

The existing wash consists of constructed berms on both sides of the wash, and a thick, sandy bed. Existing vegetation in the wash includes mature and seedling Palo Verde and Mesquite trees, as well as other species. Most of this vegetation is concentrated along the toes of slopes. The existing vegetation in the wash may be observed on the design plan exhibits included in **Appendix E.**

QUEEN CREEK/SANOKAI WASH HYDRAULIC MASTER PLAN

FCD 98-26

November 2000



STUDY REPORT

Prepared for

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

by

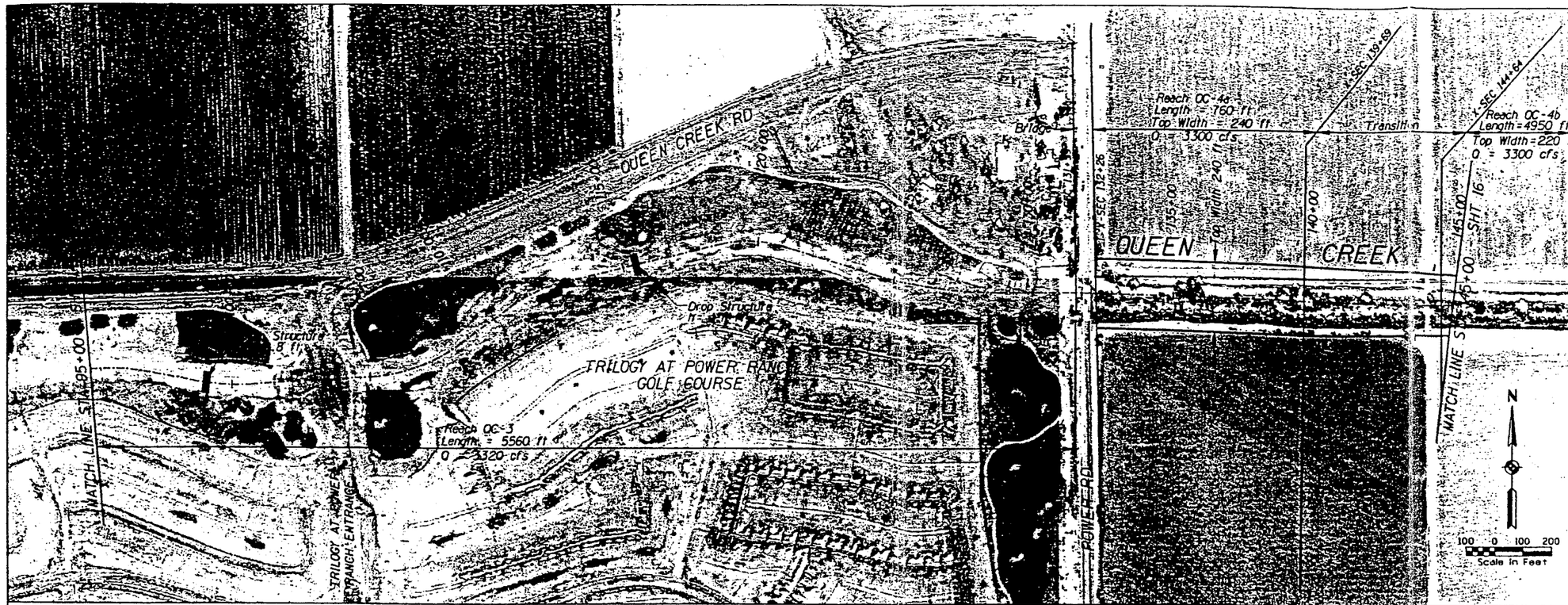
HUITT-ZOLLARS

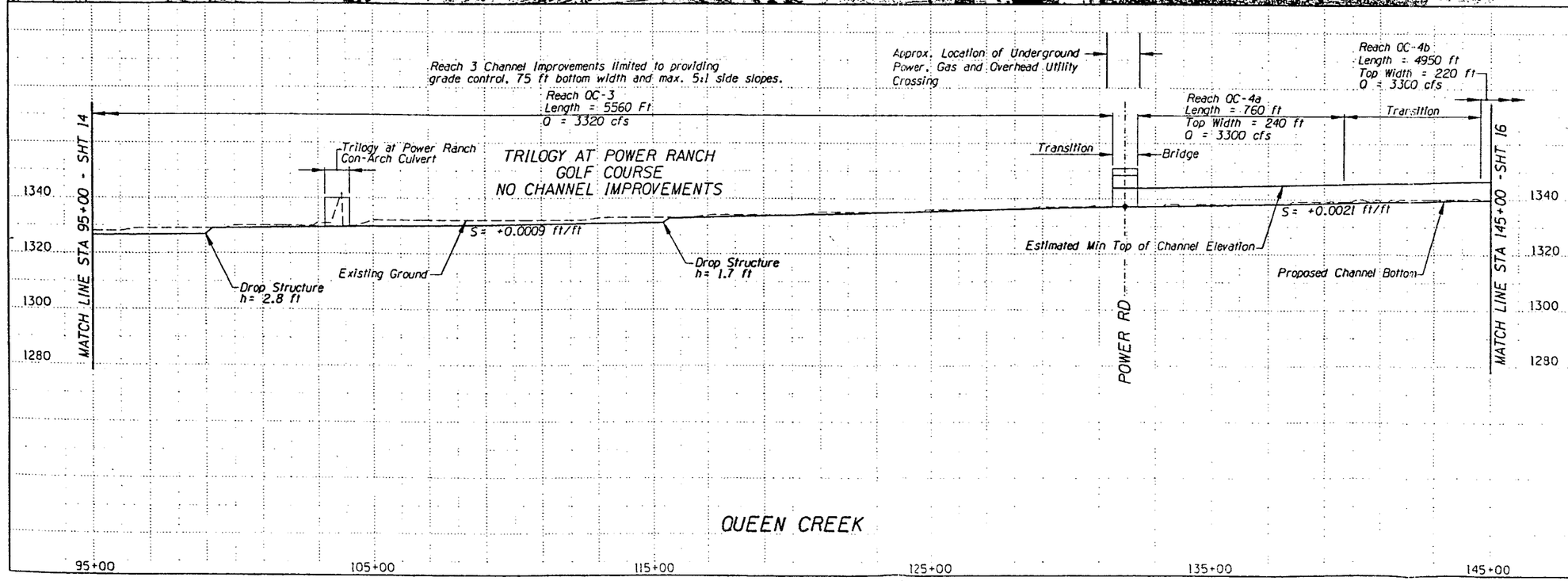
In Association with

Aquatic Consulting & Testing/Archaeological Consultant Services

Hoque & Associates/Kenney Aerial Mapping/WEST Consultants

Registered Professional Engineer (Civil)
CERTIFICATE NO. 12250
FRED K. LUREN, JR.
Date Signed 12-1-00
ARIZONA, U.S.A.





PROJECT NO. FCD 98-

Channel Properties

Reach	OC-3
Sub Reach	
Downstream Cross Section	77.86
Upstream Cross Section	131.59
Design Q100 (cfs)	3320
Downstream Invert Elevation (ft)	1322.34
Upstream Invert Elevation (ft)	1336.33
Length (ft)	5560
Avg. Channel Slope (ft/ft)	0.0025
Grade Control Drop (ft)	9.5
Manning's n-value	0.025
Bottom width (ft)	75
Ave. Depth of Flow (ft)	5.3
Design Freeboard (ft)	3.0
Left Sideslope (H:1)	5
Right Sideslope (H:1)	5
Channel Top width (ft)	n/a
Average Velocity (fps)	6.2
Average Froude Number	0.5
Type of Flow	subcritical

GENERAL NOTES:

1. Channel slopes may vary within reaches.
2. These concept plans are not for construction, but are [illegible] the scale of improvements necessary to provide flood protection [illegible] will be required to establish and develop flood control [illegible]
3. Recommendations for sedimentation basins and grade control [illegible] simplified analyses. Sizes, locations and areas for these facilities are [illegible] estimated. More detailed information and study is required to accurately identify size and locate sedimentation and erosion control features.
4. Mature cottonwood, willow, salt cedar and sycamore trees should not be removed but protected to preserve riparian habitat. See Typical Protected Cross Section.

UTILITY NOTES:

1. Utilities are generally located and are for reference purposes only.

NO.		BY	
3			
2			
1			

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

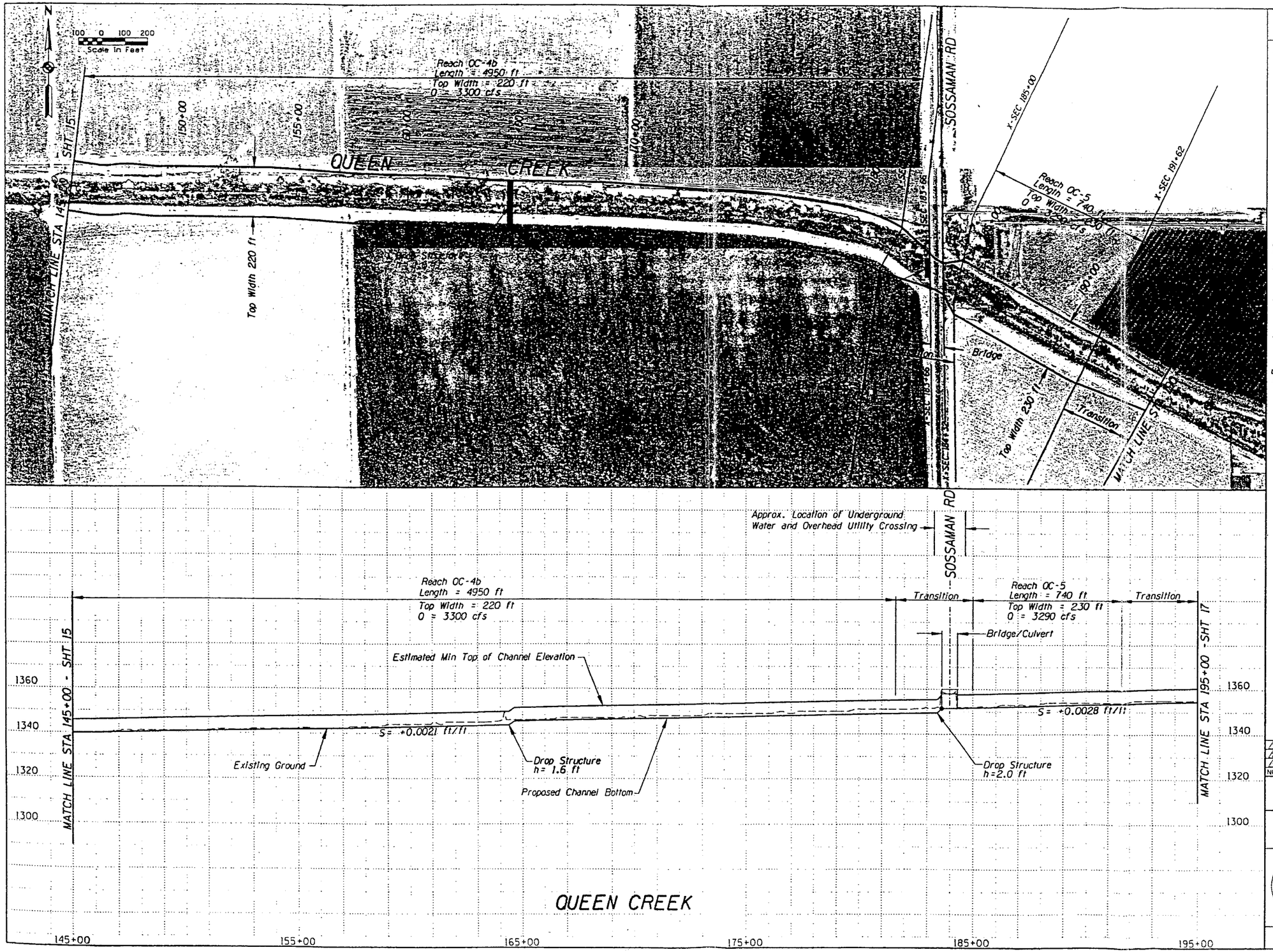
QUEEN CREEK/SANDIA WASH HYDRAULIC
MASTER PLAN FCD 98-26

	BY	DATE
DESIGNED	[illegible]	11/10/0
DRAWN	RON [illegible]	11/10/0
CHECKED	FRED [illegible]	11/10/0

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 12250 FRED K. DUREN, JR. ARIZONA U.S.A.

HUITT-ZOLLARS

PLAN AND PROFILE SHEET [illegible]
QUEEN CREEK [illegible]



PROJECT NO. FCD

Channel Properties

Reach	OC
Sub Reach	3
Downstream Cross Section	[illegible]
Upstream Cross Section	[illegible]
Design Q100 (cfs)	[illegible]
Downstream Invert Elevation (ft)	[illegible]
Upstream Invert Elevation (ft)	1349
Length (ft)	[illegible]
Avg. Channel Slope (ft/ft)	[illegible]
Grade Control Drop (ft)	[illegible]
Manning's n-value	[illegible]
Bottom Width (ft)	[illegible]
Ave. Depth of Flow (ft)	[illegible]
Design Freeboard (ft)	[illegible]
Left Sideslope (H:1)	[illegible]
Right Sideslope (H:1)	[illegible]
Channel Top Width (ft)	220
Average Velocity (fps)	5.0
Average Froude Number	0.5
Type of Flow	Subcritical

GENERAL NOTES:

1. Channel slopes may vary within reaches.
2. These concept plans are not for construction, but provide guidance on the scale of improvements necessary to provide flood protection. Additional study will be required to establish and develop flood control features for design.
3. Recommendations for sedimentation basins and grade control are based on simplified analyses. Sizes, locations and areas for these features are rough estimated. More detailed information and study is required to accurately identify size and locate sedimentation and erosion control features.
4. Mature cottonwood, willow, salt cedar and sycamore trees should not be removed but protected to preserve riparian habitat. See Typical Protected Cross Section.

UTILITY NOTE:

1. Utilities are generally located and are for reference purposes only.

NO.	REVISION	BY	DAT
1			
2			
3			

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

QUEEN CREEK/SANDKAI WASH HYDRAULIC MASTER PLAN - FCD 98-26

	BY	DA
DESIGNED	CHARLES JOY	11/10
DRAWN	RON WIETZEMA	11/10
CHECKED	FRED DUREN	11/10

12250 FRED K. DUREN, JR.

HUITT-ZOLLARS

PLAN AND PROFILE
QUEEN CREEK CHANNEL

SHEET 16

APPENDIX B

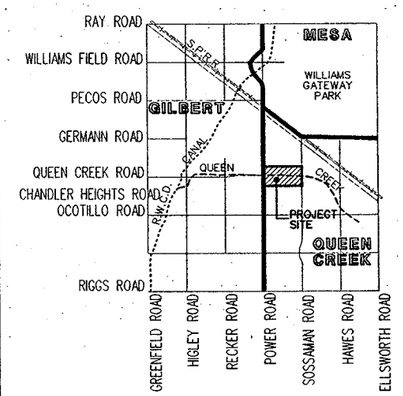
Channel Construction Plans (Based on Proposed Condition)

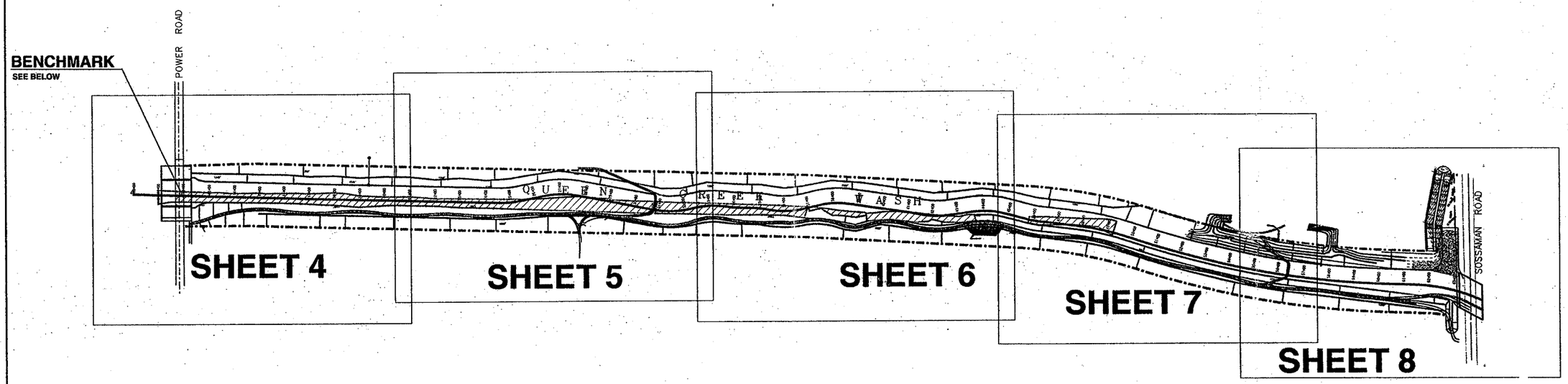
QUEEN CREEK CHANNEL

POWER ROAD TO SOSSAMAN ROAD

TOWN OF QUEEN CREEK, AZ

VICINITY MAP
N.T.S.





BENCHMARK:

BRASS CAP FLUSH
INTERSECTION OF POWER ROAD AND THE BRIDGE OVER QUEEN CREEK WASH, 10' N. OF THE S. END OF THE BRIDGE
ELEV 1354.82 - QUEEN CREEK DATUM

SHEET INDEX:

1	COVER SHEET
2	GENERAL NOTES, LEGEND
3	HORIZONTAL ALIGNMENT
4 - 8	CHANNEL PLAN & PROFILE
9 - 14	CROSS SECTIONS
15 - 16	DROP STRUCTURE, COLLECTOR CHANNEL & ACCESS ROAD DETAILS

PREPARED FOR:

RYLAND HOMES
637 S. 48TH STREET SUITE 203
TEMPE, AZ. 85281
(480) 736-4500
(480) 736-2442 (FAX)
CONTACT: JEFF GUNDERSON

ENGINEER:

COE & VAN LOO
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
(602) 264-6831
(602) 264-0928 (FAX)
CONTACT: DOUG BOTH

APPROVAL:

BY _____ DATE _____
TOWN OF QUEEN CREEK ENGINEER

CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

QUEEN CREEK CHANNEL

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY
12/15/02		

DESIGNED	S. GARCIA	
DRAWN	K. KENNY	
CHECKED	D. BOTH	
DATE	05/03/02	

COVER SHEET

13788
LES F. OLSON, JR.
ARIZONA, U.S.A.

CVL

SHEET
1 OF 16

000044-01

DATE:- Jul 19, 2000
TIME:- 10:37:55
FILE:- n:\000044\land\sd40c01.dgn

GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE COMPLETED IN ACCORDANCE WITH THE MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 1998 EDITION INCLUSIVE OF THE LATEST REVISIONS AND AMENDMENTS, THESE DESIGN PLANS, AND THE SPECIAL PROVISIONS.

2. THE MARICOPA ASSOCIATION OF GOVERNMENTS UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION, WITH THE LATEST REVISIONS AND AMENDMENTS ARE THE STANDARD DRAWINGS FOR THIS PROJECT, AND ARE AN INTEGRAL PART OF THE CONTRACT AND THESE DESIGN PLANS.

3. CONTRACTOR SHALL NOTIFY THE TOWN OF QUEEN CREEK ENGINEERING DIVISION, CONSTRUCTION SERVICES SECTION ((480) 987-9887) AT LEAST 48-HOURS IN ADVANCE OF ANY INSPECTION REQUIREMENT.

4. FOR LOCATION OF UNDERGROUND UTILITIES CALL THE BLUE STAKE CENTER ((602) 263-1100) THREE (3) WORKING DAYS BEFORE DIGGING

5. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ANY AND ALL PERMITS REQUIRED PRIOR TO CONSTRUCTION. DUST CONTROL SHALL BE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS, ORDINANCES AND REGULATIONS. THE CONTRACTOR SHALL OBTAIN A PERMIT FROM THE MARICOPA COUNTY AIR POLLUTION OFFICER ((602) 506-6010), AND AN EXCAVATION AND DIRT MOVING PERMIT FROM THE MARICOPA COUNTY ENVIRONMENTAL SERVICES DEPARTMENT PRIOR TO CONSTRUCTION.

6. THE DEVELOPER SHALL PROVIDE CONSTRUCTION STAKING REQUIRED FOR THE PROJECT.

7. THE CONTRACTOR SHALL COMPLY WITH THE PROVISIONS FOR TRAFFIC CONTROL AND BARRICADING AS PER THE CURRENT MAG STANDARD SPECIFICATIONS AND TO THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (1988 AND THEIR LATEST REVISIONS. FOR CONSTRUCTION WITHIN MARICOPA COUNT RIGHT-OF-WAY, THE CONTRACTOR SHALL COMPLY WITH THE PROVISIONS FOR TRAFFIC CONTROL AND BARRICADING AS PER THE MARICOPA COUNTY TRAFFIC BARRICADE MANUAL.

8. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE RELOCATION OF ALL UTILITIES, POWER POLES, IRRIGATION DRY-UPS, REMOVAL BY OTHERS, ETC.

9. THE CONTRACTOR SHALL ADJUST ALL FRAMES, COVERS, VALVE BOXES, MANHOLES, ETC. THAT ARE LOCATED WITHIN THE PROJECT AREA AFTER FINAL GRADING AND INSTALLATION OF LANDSCAPING.

10. ALL SPRINKLER AND LANDSCAPING WORK MUST BE INSTALLED IN ACCORDANCE WITH ARIZONA DEPT. OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION SECTION 807, LANDSCAPING AND IRRIGATION STANDARDS .

11. CLEARING AND GRUBBING SHALL INCLUDE THE REMOVAL OF ALL TRASH AND DEBRIS WITHIN PROJECT WORK AREA. THE REMOVAL OF TREES WILL NOT BE MEASURED OR PAID SEPARATELY, BUT CONSIDERED AS PART OF THE CLEARING AND GRUBBING WORK.

12. ALL CONSTRUCTION WITHIN MARICOPA COUNTY RIGHT-OF-WAY SHALL CONFORM TO MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION STANDARD PROVISIONS FOR CONSTRUCTION OF STREET IMPROVEMENTS.

13. BACKFILL AND COMPACTION WITHIN MARICOPA COUNTY RIGHT-OF-WAY SHALL BE IN ACCORDANCE WITH THE LATEST MARICOPA COUNTY SPECIAL PROVISIONS FOR THE INSTALLATION OF UNDERGROUND FACILITIES.

14. IN THE EVENT A DISCREPANCY IS ENCOUNTERED ON THESE PLANS OR WITHIN THE SPECIAL PROVISIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY FOR ADVISEMENT, PRIOR TO ANY CONSTRUCTION ACTIVITY.

ENGINEERS NOTES

NOTHING CONTAINED IN THE CONTRACT DOCUMENTS SHALL CREATE, NOR SHALL BE CONSTRUED TO CREATE ANY CONTRACTUAL RELATIONSHIP BETWEEN THE ENGINEER AND THE CONTRACTOR OR ANY SUBCONTRACTOR.

THE CONTRACTOR SHALL MAKE NO CLAIM AGAINST THE OWNER AND/OR THE ENGINEER REGARDING ALLEGED INACCURACY OF THE CONSTRUCTION STAKES SET BY THE ENGINEER UNLESS ALL SURVEY STAKES SET BY THE ENGINEER ARE MAINTAINED INTACT AND CAN BE VERIFIED AS TO THEIR ORIGIN. IF, IN THE OPINION OF THE ENGINEER, THE STAKES ARE NOT MAINTAINED INTACT THE SOLE EXPENSE OF THE RESPONSIBLE CONTRACTOR OR SUBCONTRACTOR.

THE ENGINEER IS NOT RESPONSIBLE FOR THE CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, PROCEDURES, OR FOR THE SAFETY PRECAUTIONS, OR PROGRAMS UTILIZED IN CONNECTION WITH THE WORK. THE ENGINEER IS NOT RESPONSIBLE FOR THE CONTRACTOR'S FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS NOR ANY COSTS INCURRED, WHETHER INITIAL OR ADDITIONAL, TO CORRECT, MODIFY, OR ALTER ANY CONSTRUCTION COMPLETED CONTRARY TO THE CONTRACT DOCUMENTS.

THE PLANS ARE NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS THE APPROVAL BLOCK HAS BEEN SIGNED BY THE APPROPRIATE AGENCIES. ALL WORK SHALL CONFORM TO THE CURRENT M.A.G. SPECIFICATIONS AND STANDARD DETAILS TOGETHER WITH THE SUPPLEMENT OF THE APPROPRIATE AGENCY.

ALL QUANTITIES SHOWN ARE ESTIMATES ONLY. THE CONTRACTOR IS RESPONSIBLE TO VERIFY QUANTITIES FOR BIDDING PURPOSES.

A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA. HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN THE AREA.

ALL EARTHWORK CONSTRUCTION SHALL CONFORM TO THE LATEST MARICOPA ASSOCIATION OF GOVERNMENTS STANDARD DETAILS AND/OR SPECIFICATIONS INCLUDING ANY SUPPLEMENTS

ALL COMPACTION TO COMPLY WITH M.A.G. SPECS SECTION 601.

LEGEND

- PROPOSED CHANNEL
- EXISTING IRRIG. PIPE (TO BE RELOCATED)
- PRESERVED WASH AREAS WITH CHAIN-LINK FENCING
- TREES TO BE UNDISTURBED / ALL OTHER TREE SYMBOLS REPRESENT TREES TO BE REMOVED
- CHANNEL ℄
- NEW CHANNEL R.O.W.
- FLOOD CONTROL DISTRICT ACCESS ROAD & TRAILS (NO CLOSER THAN 5 FEET FROM BANK OF CHANNEL FOR SLOPES STEEPER THAN 4:1)

THE QUANTITIES SHOWN ARE AN ESTIMATE ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL QUANTITIES BEFORE BIDDING.

ESTIMATED QUANTITIES

DESCRIPTION		
CUT	CY	180235(CY)
FILL	CY	9876(CY)
AGGREGATE BASE (6" AB)	SY	283 (SY)
MAINT RD PAVING (2" AC)	SY	94 (SY)
CUTOFF WALL (STRUCTURAL CONCRETE)	CY	57 (CY)

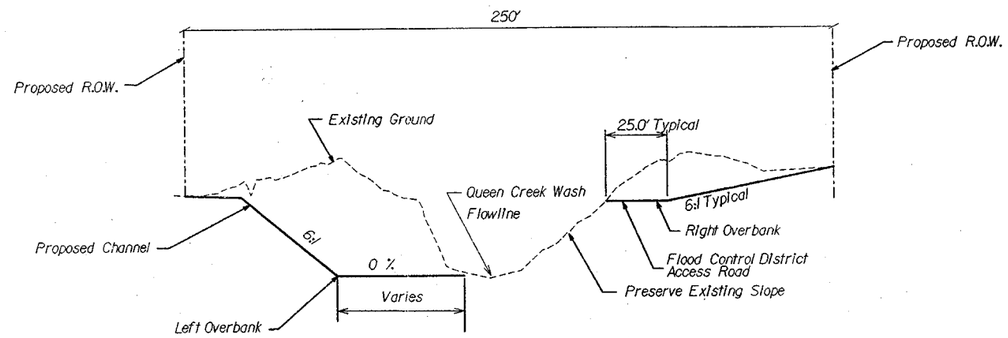
HABITAT PRESERVATION NOTES

NO CLEARING OR GRADING SHALL OCCUR UNTIL THE SALVAGE OPERATION HAS BEEN COMPLETED AND PRESERVATION FENCING HAS BEEN INSTALLED AND INSPECTED BY THE DSD LANDSCAPE ARCHITECT.

THE PRESERVATION FENCING SHALL REMAIN IN PLACE AT ALL TIMES DURING CONSTRUCTION. REMOVAL OF ANY FENCING WILL REQUIRE PRIOR APPROVAL FROM THE DSD LANDSCAPE ARCHITECT. MINIMUM FENCE REQUIREMENTS SHALL BE A CHAIN LINK FENCE 5 FT HIGH AROUND DESIGNATED AREA .

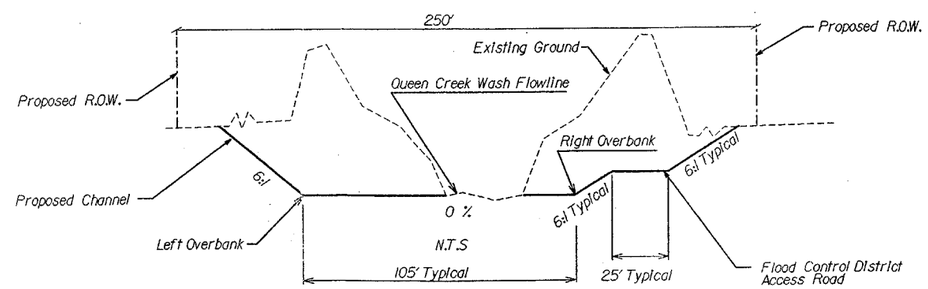
BEFORE GRADING AREAS WHICH CONTAIN NATIVE DESERT VEGETATION, THE CONTRACTOR MUST OBTAIN A PERMIT FROM ARIZONA DEPARTMENT OF AGRICULTURE. FOR INFORMATION, PHONE (602) 255-4933/542-0994.

CONSTRUCTION FENCING LOCATIONS, AND APPROPRIATE AREAS LABELED. PRIOR TO ANY CLEARING, GRUBBING, OR GRADING OPERATIONS, CONSTRUCTION FENCING SHALL BE SHOWN ON APPROVED PLANS, PERMITTED AND INSPECTED AND SALVAGE OPERATIONS PERMITTED, INSPECTED AND COMPLETED.



TYPICAL CHANNEL CROSS SECTION
HABITAT PRESERVATION N.T.S

Note:
1. TYPICAL CHANNEL SECTIONS FOR PROJECT ARE SHOWN FOR GENERAL ILLUSTRATION PURPOSES ONLY.
2. ACTUAL DESIGN CROSS SECTIONS VARY CONSIDERABLY FROM STATION TO STATION, IN ORDER TO MINIMIZE DISTURBANCE TO NATIVE HABITAT AREAS.



TYPICAL CHANNEL CROSS SECTION
N.T.S

Call 602-263-1100 1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

QUEEN CREEK CHANNEL

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

DESIGNED	S. GARCIA	REVISIONS	BY
DRAWN	K. KENNY	12/16/02	
CHECKED	D. BOTH	DATE	
DATE	6/3/02		

GENERAL NOTES & LEGEND

13788 LES F. OLSON, JR. ARIZONA U.S.A.

CVL

SHEET 2 OF 16

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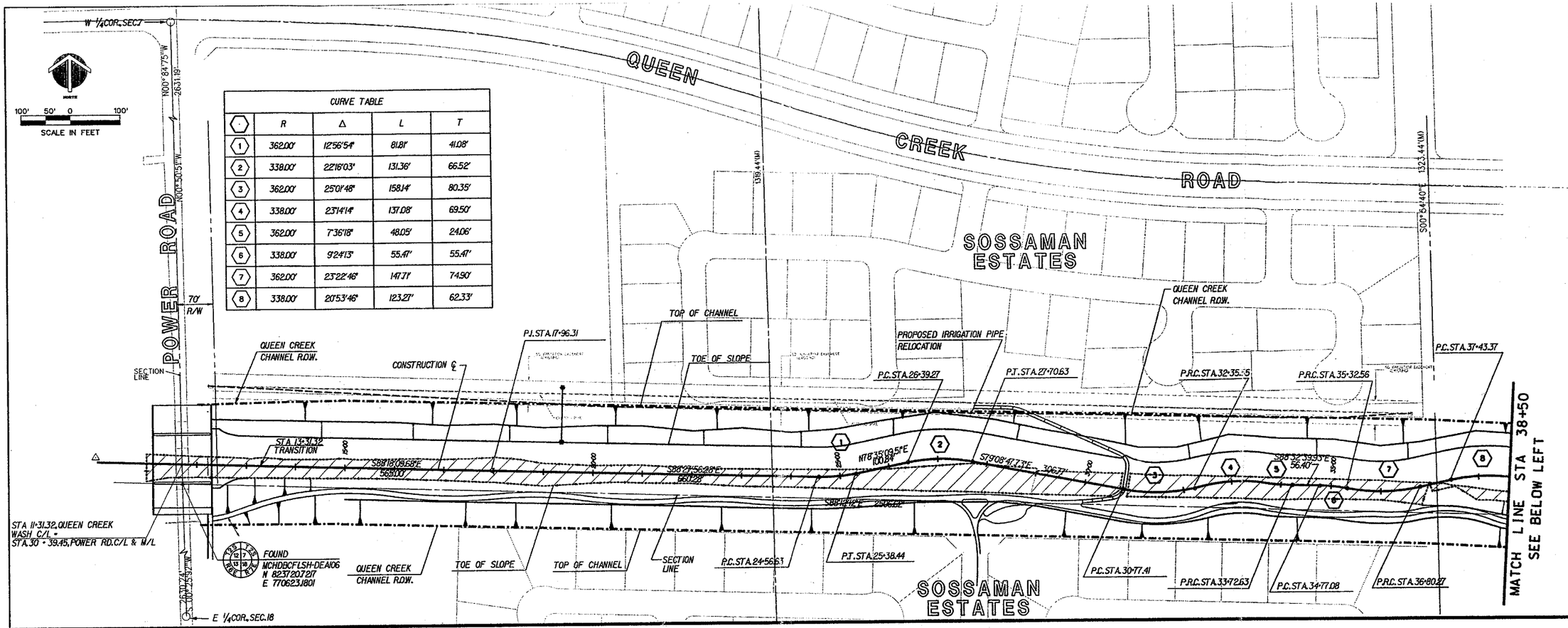
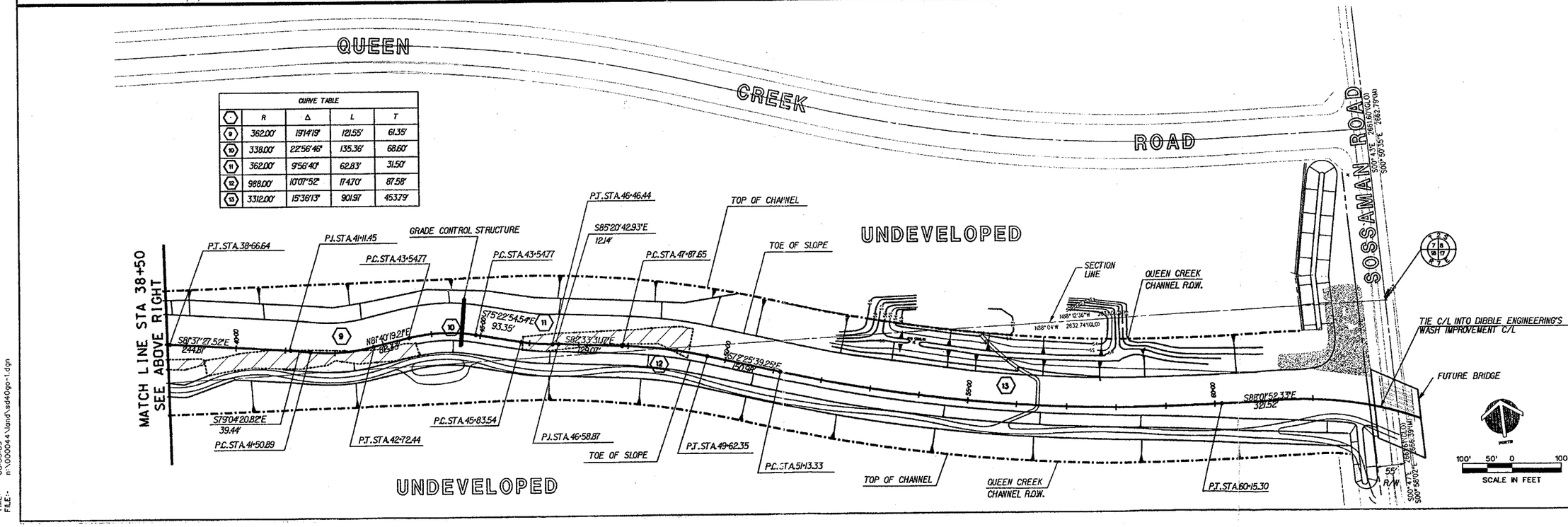


CURVE TABLE				
	R	Δ	L	T
1	362.00'	12°56'54"	81.81'	41.08'
2	338.00'	22°16'03"	131.36'	66.52'
3	362.00'	25°01'48"	158.14'	80.35'
4	338.00'	23°14'14"	137.08'	69.50'
5	362.00'	7°36'18"	48.05'	24.06'
6	338.00'	9°24'13"	55.47'	55.47'
7	362.00'	23°22'46"	147.71'	74.90'
8	338.00'	20°53'46"	123.27'	62.33'



CURVE TABLE				
	R	Δ	L	T
9	362.00'	19°14'19"	121.55'	61.35'
10	338.00'	22°56'46"	135.36'	68.60'
11	362.00'	9°56'40"	62.83'	31.50'
12	988.00'	10°07'52"	174.70'	87.58'
13	3312.00'	15°36'13"	901.97'	453.79'

QUEEN CREEK CHANNEL

HORIZONTAL ALIGNMENT

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

DESIGNED	S. GARCIA		
DRAWN	K. KENNY	12/16/02	
CHECKED	D. BOTH		
DATE	06/03/02		

REVISIONS	DATE	BY

CVL

SHEET 3 OF 16

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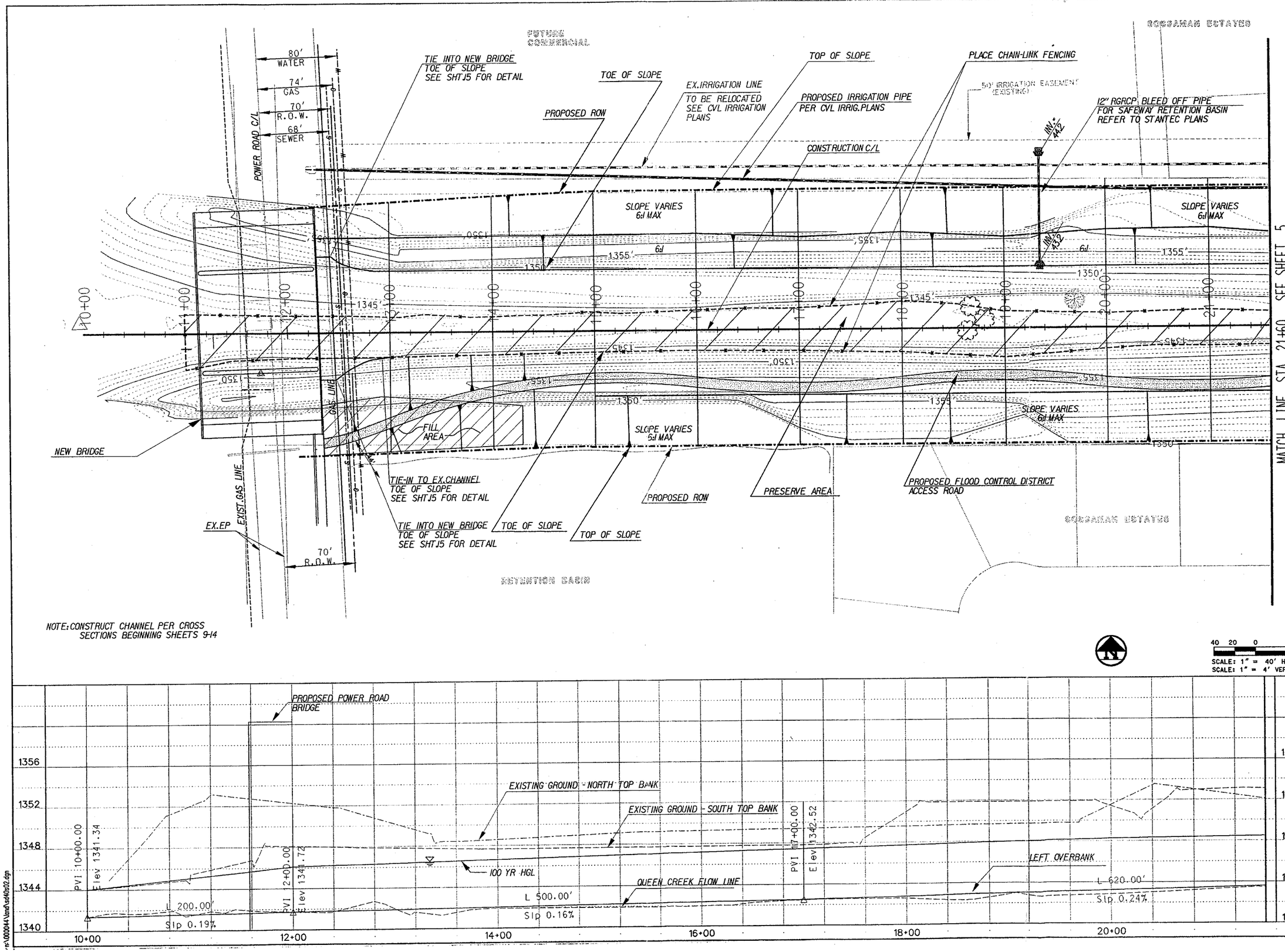
DATE:- Sep. 12, 2000
TIME:- 08:35:59
FILE:- n:\000044\land\sd40go-1.dgn



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PHOENIX, ARIZONA 85014
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QUEEN CREEK CHANNEL

CHANNEL PLAN & PROFILE

REVISIONS	DATE	BY
	12/16/02	

DESIGNED	S. GARCIA	
DRAWN	K. KENNY	
CHECKED	D. BOTH	
DATE	06/03/02	

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 13788 LES F. OLSON, JR. ARIZONA U.S.A.

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SHEET 4 OF 16

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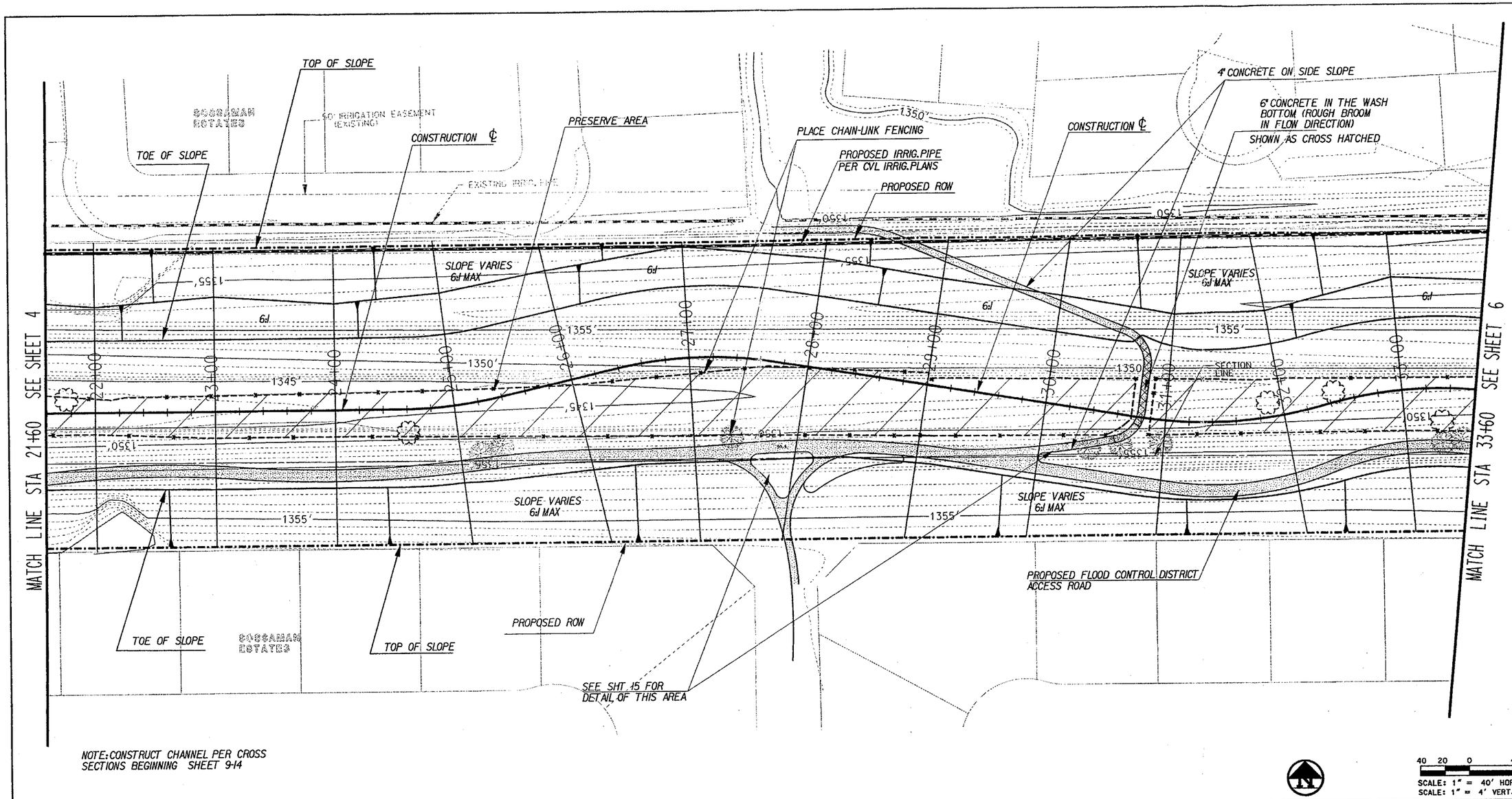

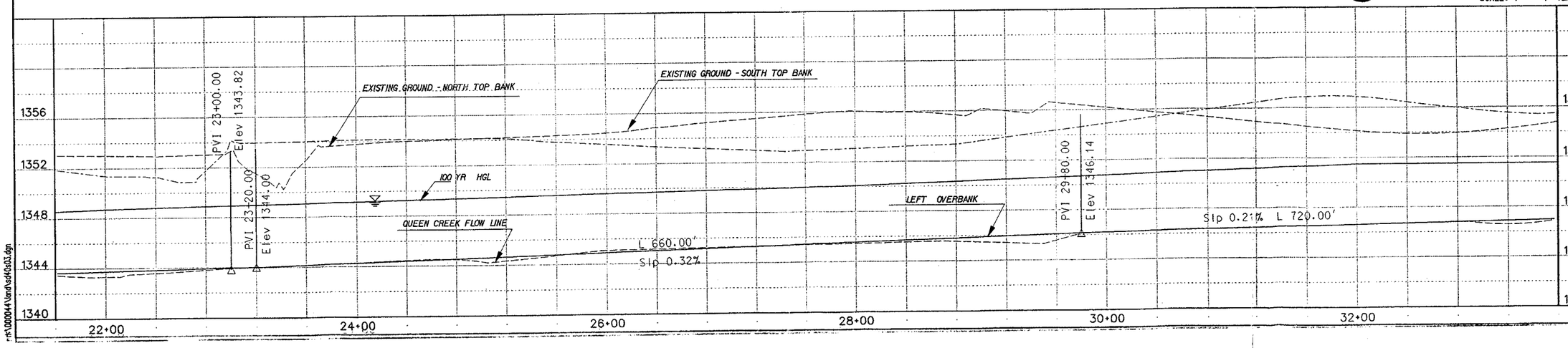

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QUEEN CREEK CHANNEL

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REVISIONS	DATE	BY
	12/16/02	

DESIGNED	S. GARCIA
DRAWN	K. KENNY
CHECKED	D. BOTH
DATE	06/03/02

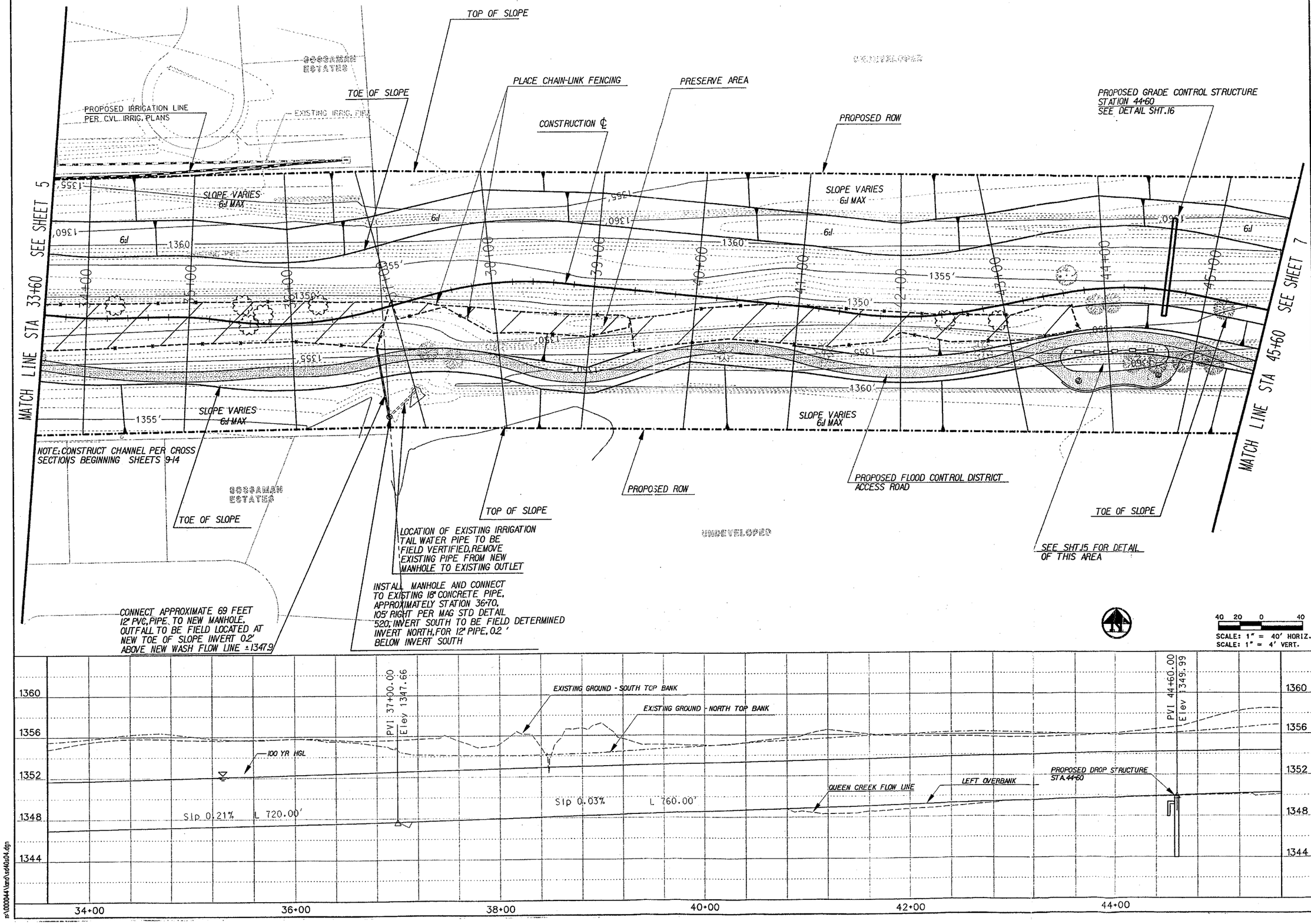
CHANNEL PLAN & PROFILE

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 13788 LES F. OLSON, JR. Date Signed 12-17-02 ARIZONA, U.S.A.

CVL

SHEET 5 OF 16

000044-01



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4550 NORTH 12TH STREET
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TELEPHONE (602) 264-6831

REVISIONS	DATE	BY
	12/16/02	

DESIGNED	S. GARCIA	
DRAWN	K. KENNY	
CHECKED	D. BOTH	
DATE	06/03/02	

CHANNEL
PLAN & PROFILE

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO. 13768
LES F. OLSON, JR.
Date Signed 12-17-02
ARIZONA, U.S.A.

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SHEET
6 OF 16

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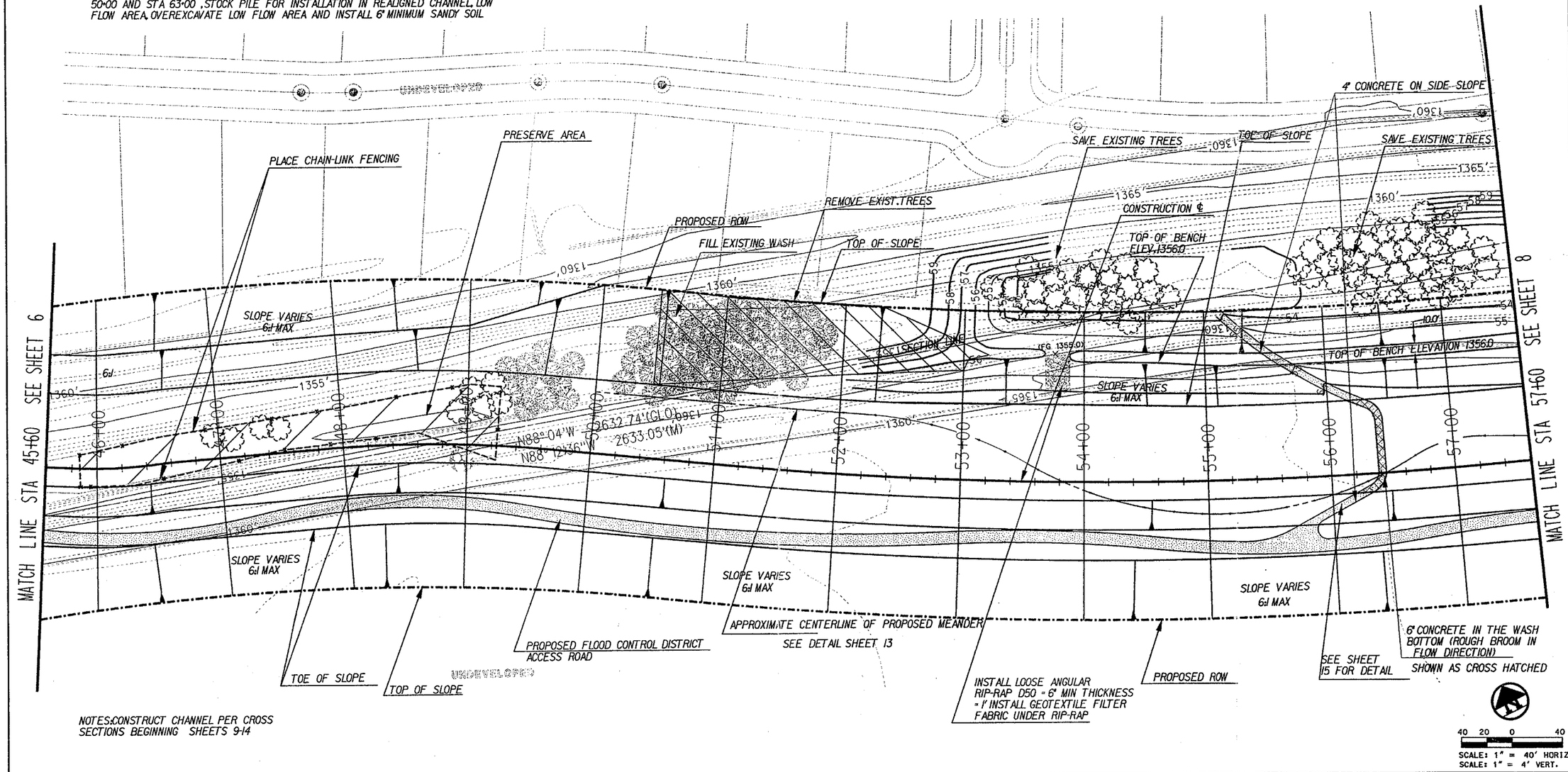
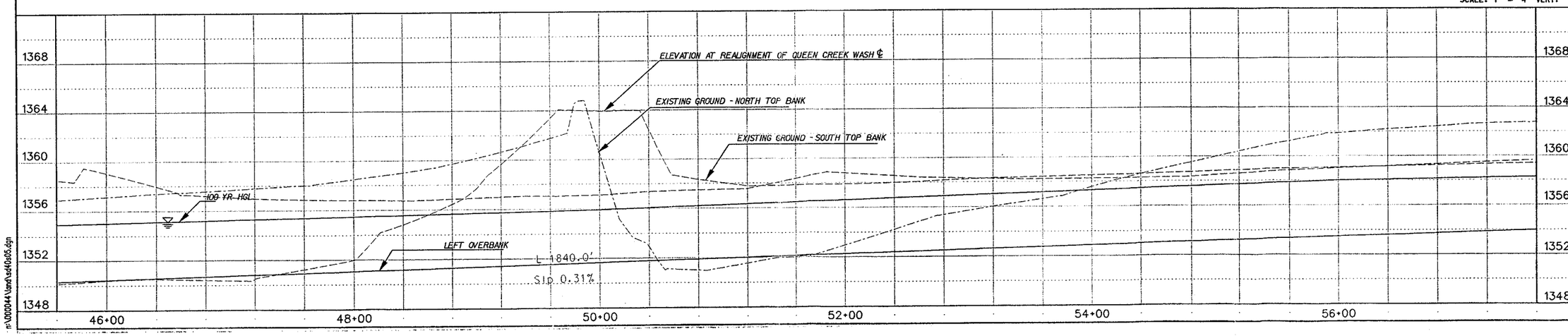
NOTE:
EXCAVATE SANDY SOIL FROM EXISTING WASH BOTTOM TO BE BURIED BETWEEN STA. 50+00 AND STA 63+00 ,STOCK PILE FOR INSTALLATION IN REALIGNED CHANNEL LOW FLOW AREA. OVEREXCAVATE LOW FLOW AREA AND INSTALL 6" MINIMUM SANDY SOIL



NOTES: CONSTRUCT CHANNEL PER CROSS SECTIONS BEGINNING SHEETS 9-14



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TELEPHONE (602) 264-6831

DESIGNED	S. GARCIA	REVISIONS	BY
DRAWN	K. KENNY	12/16/02	
CHECKED	D. BOTH	DATE	
DATE	06/03/02		

CHANNEL PLAN & PROFILE

13788 LES F. OLSON, JR. ARIZONA, U.S.A.

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SHEET 7 OF 16

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NOTE:
EXCAVATE SANDY SOIL FROM EXISTING WASH BOTTOM TO BE BURIED BETWEEN STA. 50+00 AND STA 63+00, STOCK PILE FOR INSTALLATION IN REALIGNED CHANNEL. LOW FLOW AREA. OVEREXCAVATE LOW FLOW AREA AND INSTALL 6" MINIMUM SANDY SOIL

QUEEN CREEK RD R.O.W.

MATCH LINE STA 57+60 SEE SHEET 7

SEE SHT 15 FOR DETAIL OF THIS AREA

DRAINAGE EASEMENT

MATCH EXIST. GRADE

1367.3 TOP OF BERM

INSTALL BERM COMPACTION TO 95% DENSITY

TOE OF SLOPE

TOP OF SLOPE

EXIST. CONC. W/ DITCH

SECTION LINE

N88°04'W 2632.74'(GLO)

N88°12'36"W 2633.05'(M)

FILL AREA

F/G 1360.0

PROPOSED ROW

1361.0 TOP OF BERM

DIVERSION CHANNEL (FG 1360.0)

EX. EDGE OF PAVEMENT

SEE SHT 16 FOR CROSS SECTIONS A-A & B-B

INSTALL LOOSE ANGULAR RIP-RAP D50 = 9", MIN THICKNESS = 9" INSTALL GEOTEXTILE FILTER FABRIC UNDER RIP-RAP

FND PK NAIL (P 1364.44)

PEDESTRIAN TRAIL WILL BE COMPLETED AS PART OF FUTURE PLANS FOR SOSSAMAN RD BRIDGE (BY OTHERS) EAST OF STATION 61+00

STA 63+37.14 TIE-IN TO EX. CULVERTS

EX. 5-72" PIPE CULVERTS

16" U/G IRRIGATION PIPE

PROPOSED/FUTURE BRIDGE OUTLINE

SOSSAMAN ROAD

APPROXIMATE CENTERLINE OF PROPOSED MEANDER SEE DETAIL SHEET 13

SEE ABOVE RIGHT FOR CROSS SECTION A-A & B-B

SLOPE VARIES 6:1 MAX

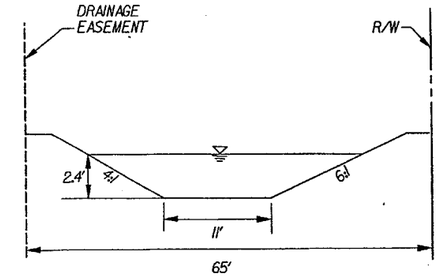
DRAINAGE EASEMENT

CONSTRUCTION ℄

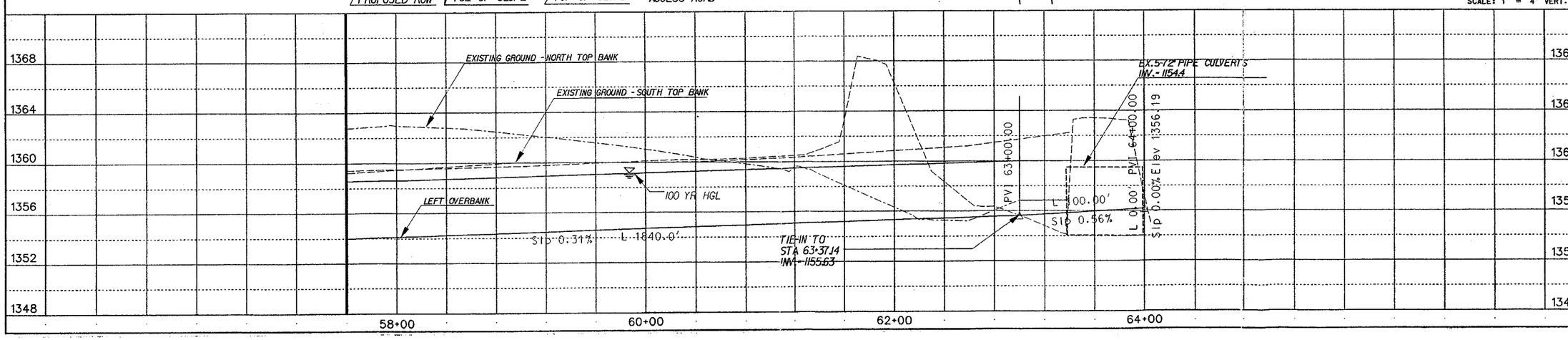
PROPOSED FLOOD CONTROL DISTRICT ACCESS ROAD

NOTE: CONSTRUCT CHANNEL PER CROSS SECTION BEGINNING SHEETS 9-14

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 4' VERT.



SOUTH COLLECTOR CHANNEL SECTION C-C



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QUEEN CREEK CHANNEL

REVISIONS	DATE	BY

DESIGNED	S. GARCIA	
DRAWN	K. KENNY	12/16/02
CHECKED	D. BOTH	
DATE	06/03/02	

CHANNEL PLAN & PROFILE

REGISTERED PROFESSIONAL ENGINEER (CIVIL) 13788 LES F. OLSON, JR. ARIZONA, U.S.A.

CVL

SHEET 8 OF 16

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15+00

18+00

14+00

17+00

13+00

16+00

CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 8 ' VERT.

QUEEN CREEK CHANNEL

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DESIGNED	S. CHRICH	REVISIONS	DATE	BY
DRAWN	K. KENNY	12-16-02		
CHECKED	D. BOTH			
DATE	6-03-02			

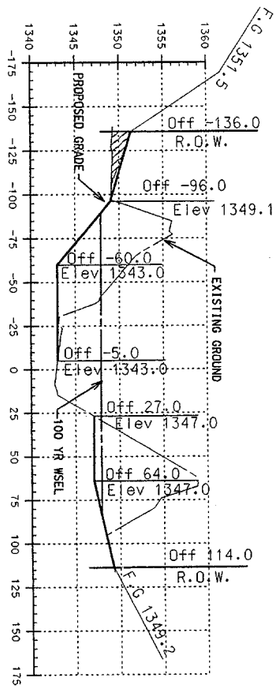
CHANNEL
CROSS SECTIONS

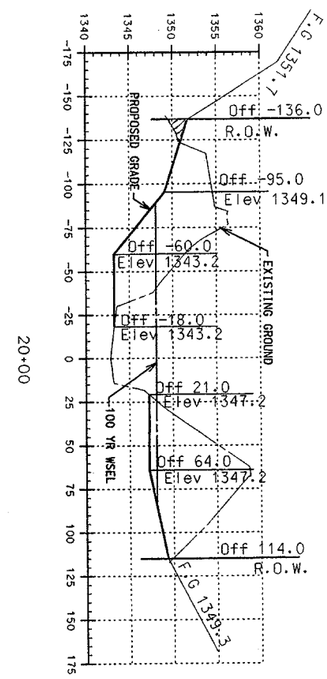
13788
LES F.
OLSON, JR.
ARIZONA, U.S.A.

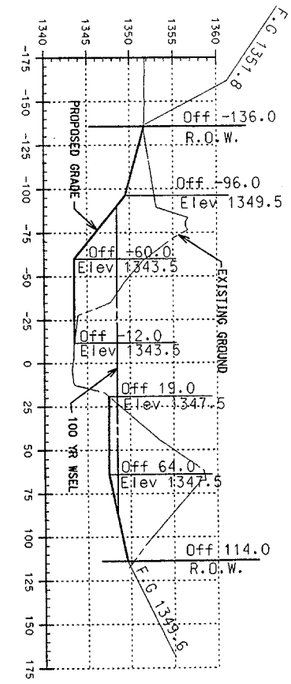
CVL

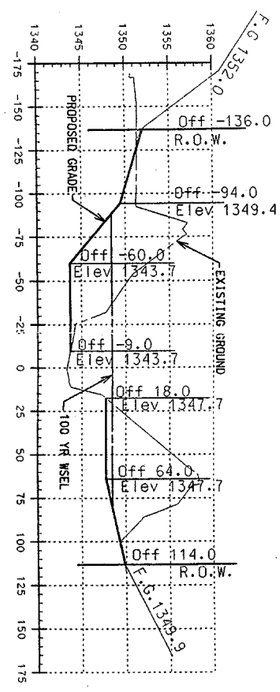
SHEET
9 OF 16

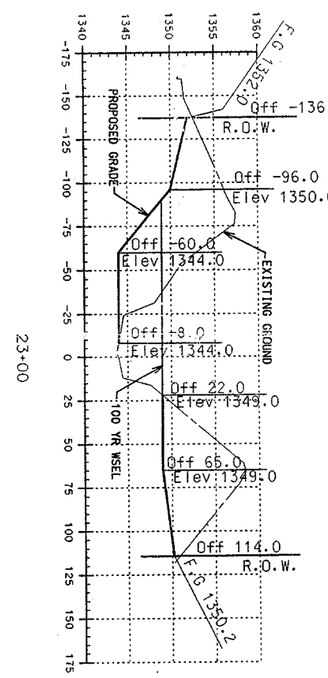
000044-01

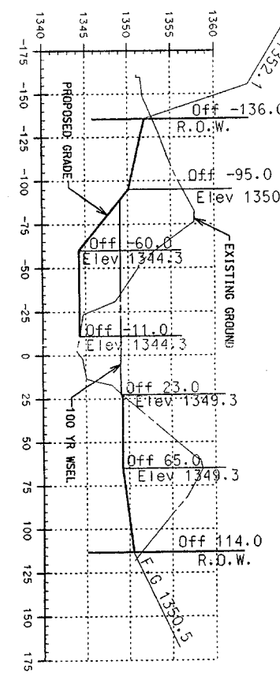


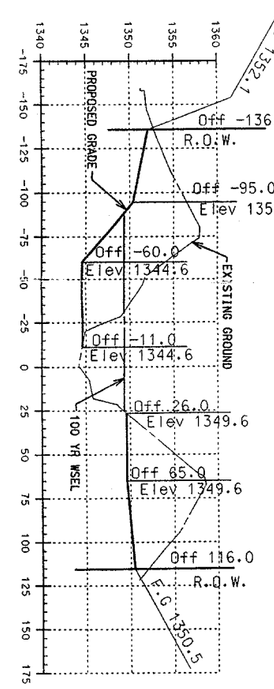


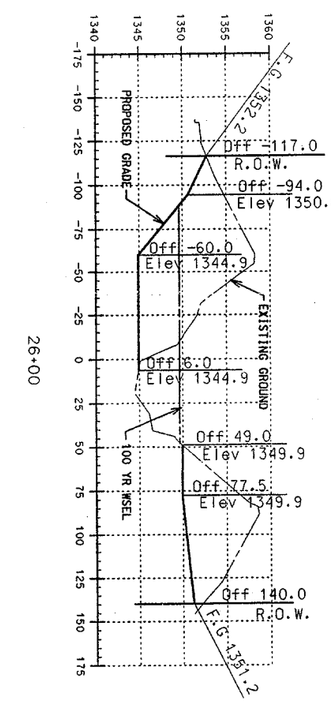


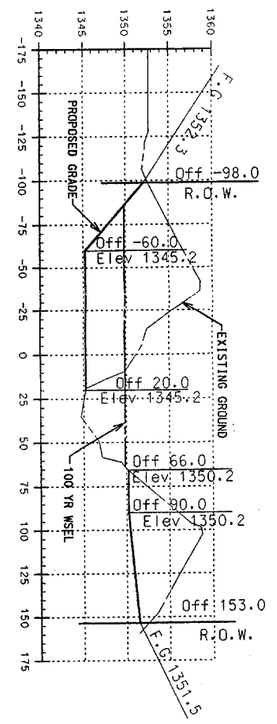












SCALE: 1" = 40' HORIZ.
SCALE: 1" = 8' VERT.

DESIGNED	S. GARCIA	REVISIONS	DATE	BY
DRAWN	K. KENNY	12/16/02		
CHECKED	D. BOTH			
DATE	6/3/02			

CHANNEL CROSS SECTIONS

QUEEN CREEK CHANNEL

COE & VAN LOO
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4550 NORTH 12TH STREET
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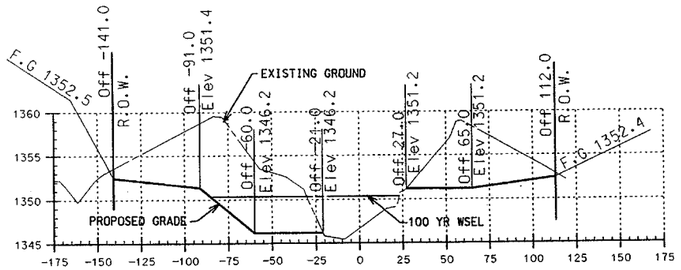
SHEET 10 OF 16
000044-01



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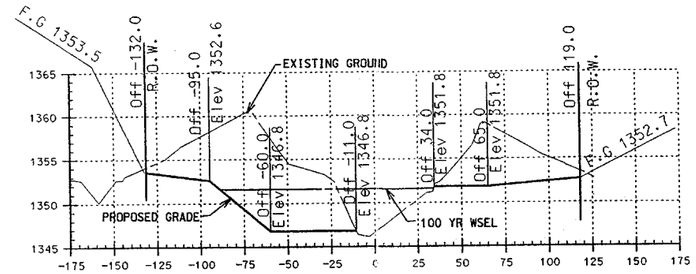

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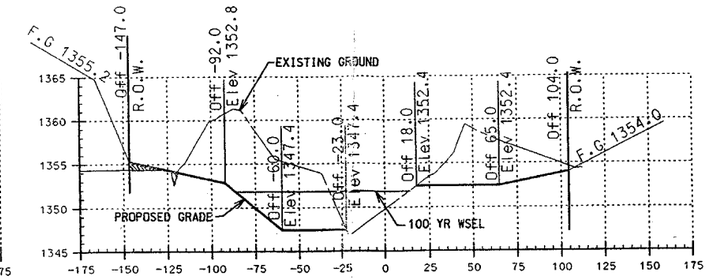

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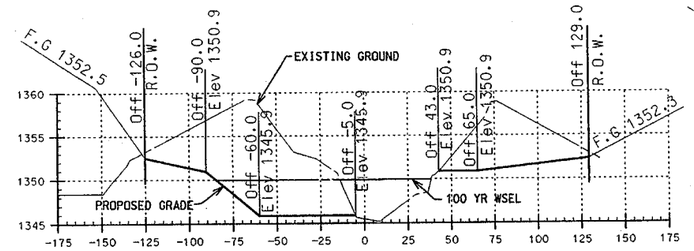

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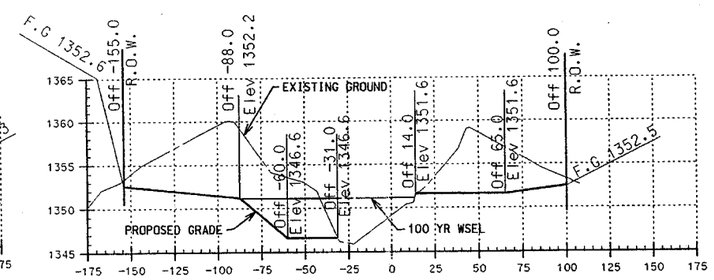

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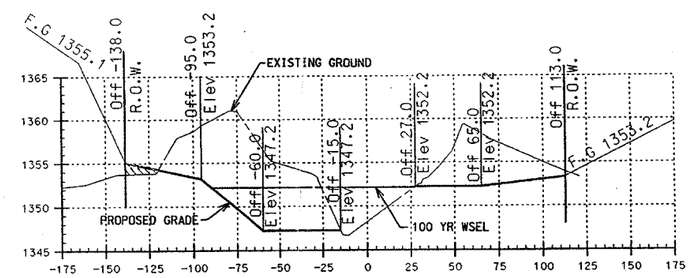

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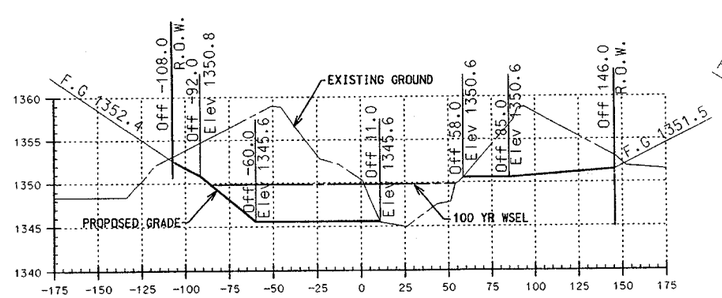

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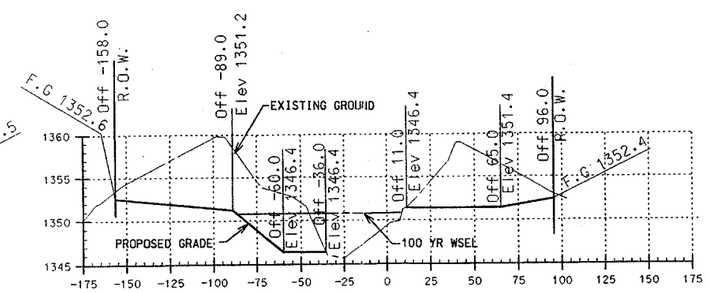

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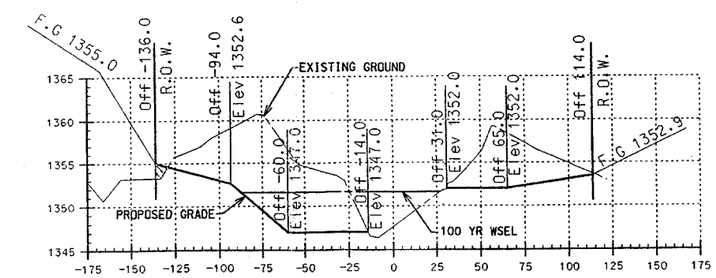

34+00

602-263-1100
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(OUTSIDE MARICOPA COUNTY)

40 20 0 40
SCALE: 1" = 40' HORIZ.
SCALE: 1" = 8' VERT.

QUEEN CREEK CHANNEL

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PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY
12-16-02		

DESIGNED	S. GARCIA
DRAWN	K. KENNY
CHECKED	D. BOTH
DATE	6-03-02

CHANNEL CROSS SECTIONS

13788
LES F. OLSON, JR.
ARIZONA, U.S.A.

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SHEET 11 OF 16

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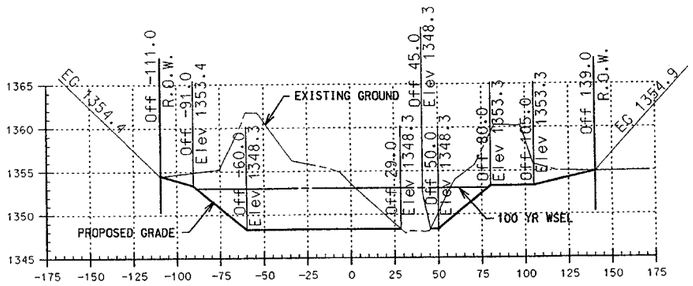

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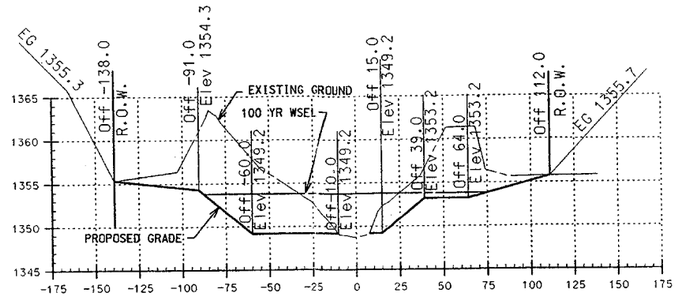

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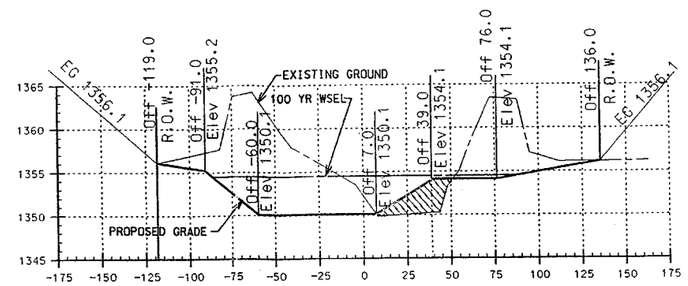

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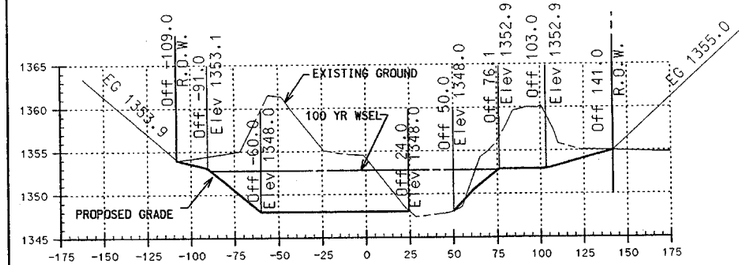

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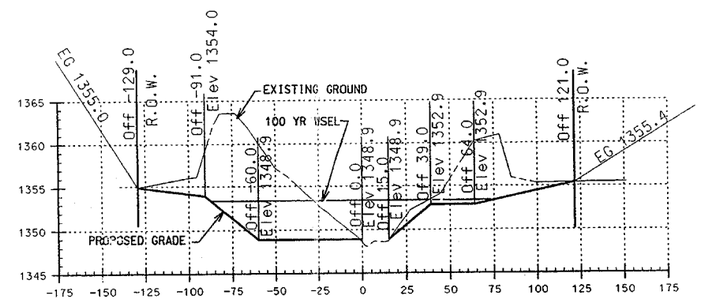

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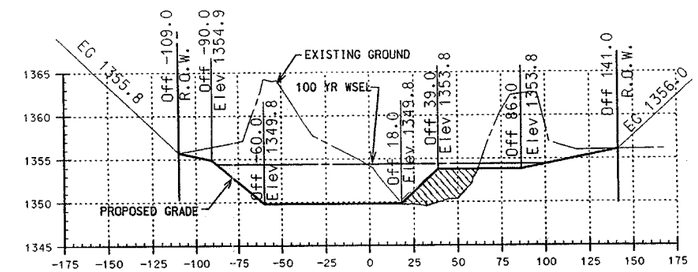

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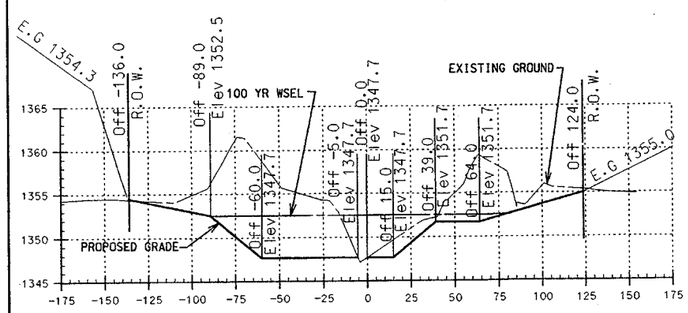

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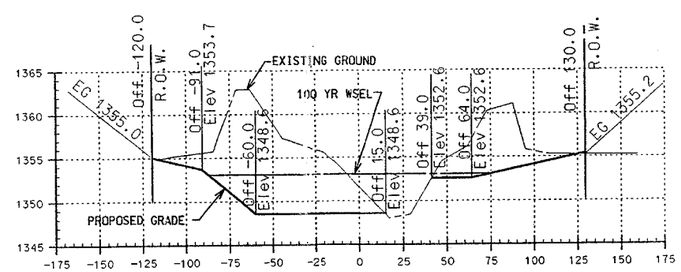

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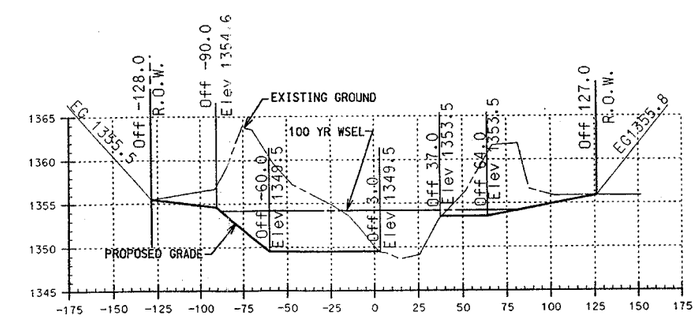

43+00

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TELEPHONE (602) 264-6831

QUEEN CREEK CHANNEL

REVISIONS	DATE	BY

DESIGNED	S. GARCIA	
DRAWN	K. KENNY	12/16/02
CHECKED	D. BOTH	
DATE	06/03/02	

CHANNEL CROSS SECTIONS

Registered Professional Engineer (Civil) 13788 LES F. OLSON, JR. Date Signed 12/16/02 ARIZONA, U.S.A.

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SHEET 12 OF 16

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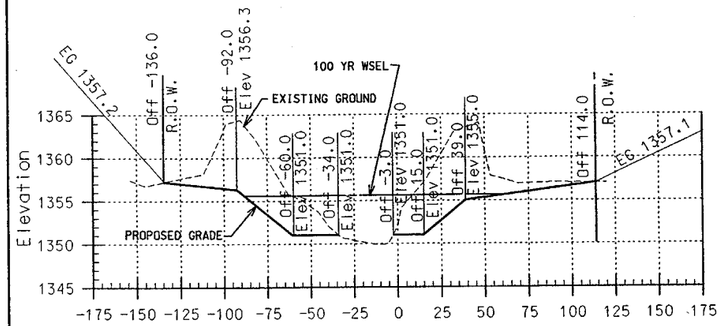

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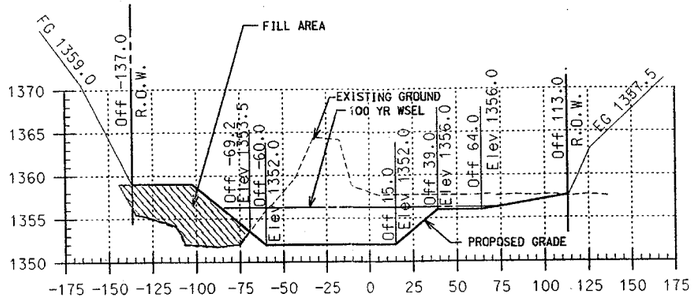

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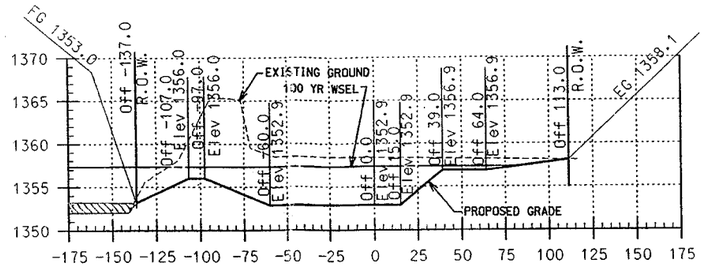

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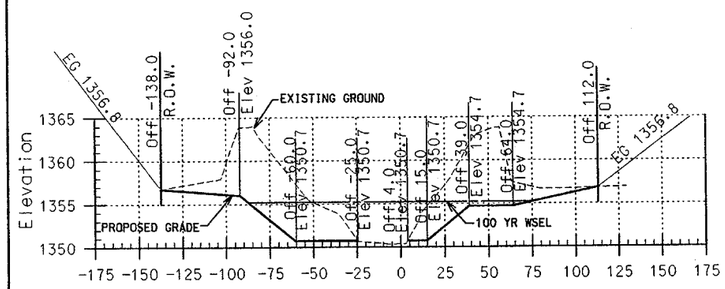

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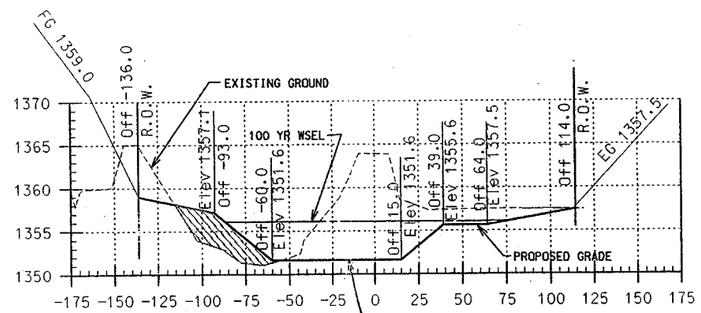
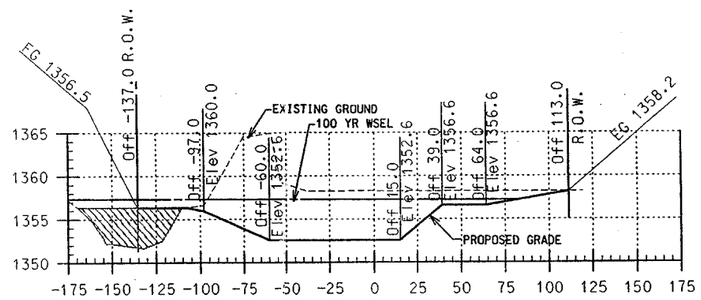


BEGIN MEANDERING LOW FLOW CHANNEL SEE DETAIL BELOW. AND SHEETS 7 & 8 FOR APPROXIMATE LOCATION

5000



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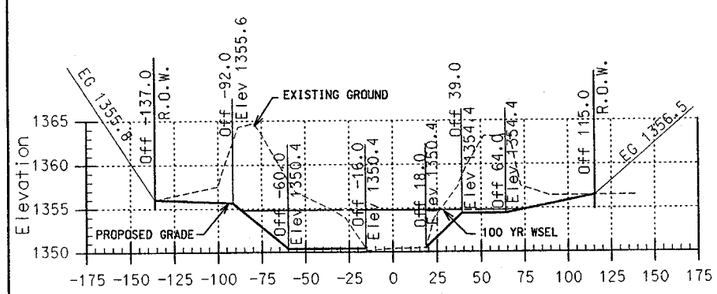

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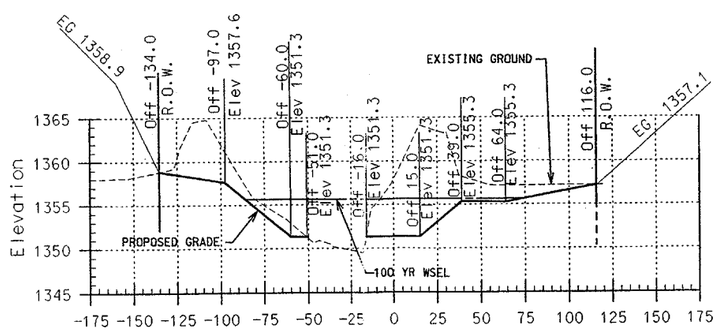

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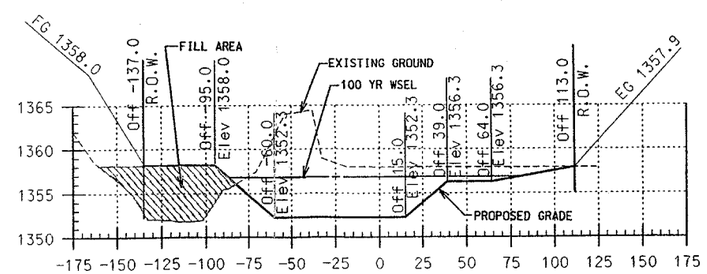

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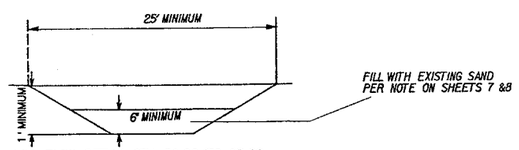


LOW FLOW DETAIL STA 50+00 TO 63+00
NTS

CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 8 ' VERT.

QUEEN CREEK CHANNEL

COE & VAN LOO
PLANNING•ENGINEERING•LANDSCAPE ARCHITECTURE
4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED	S. GARCIA
DRAWN	K. KENNY
CHECKED	D. BOTH
DATE	05/03/02

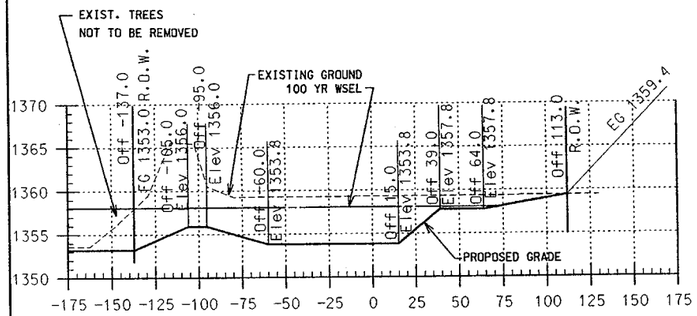
CHANNEL CROSS SECTIONS

LES F. OLSON, JR.
13788
ARIZONA, U.S.A.

CVL

SHEET 13 OF 16

000044-01



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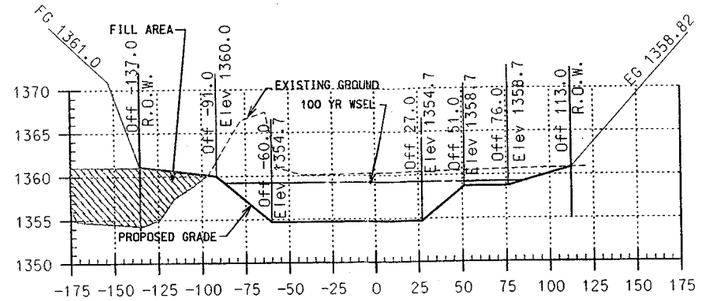

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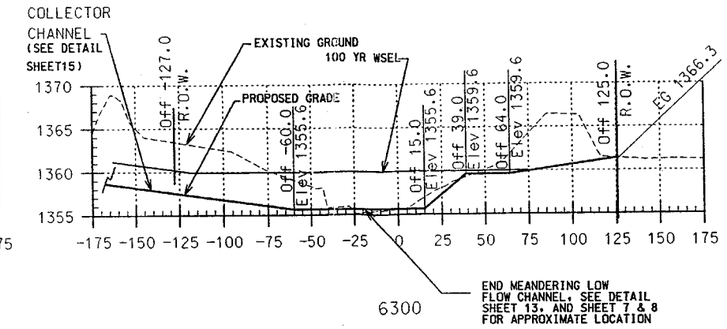

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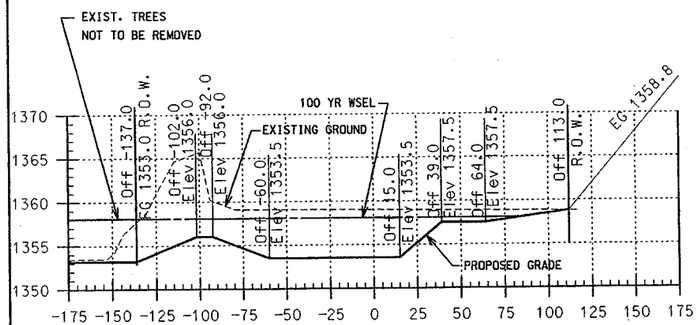

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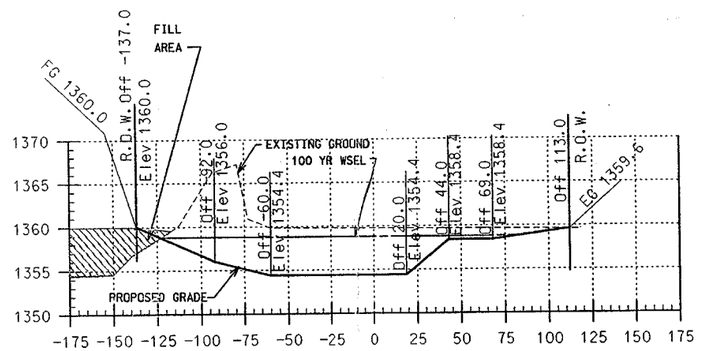

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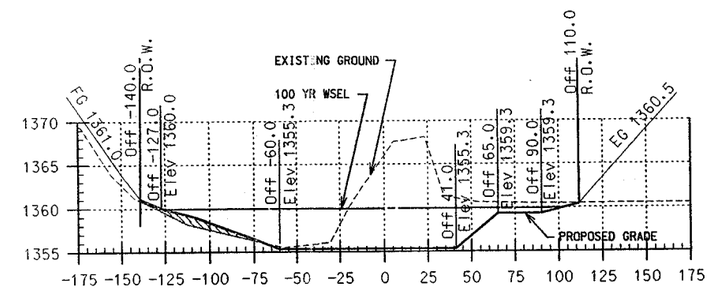

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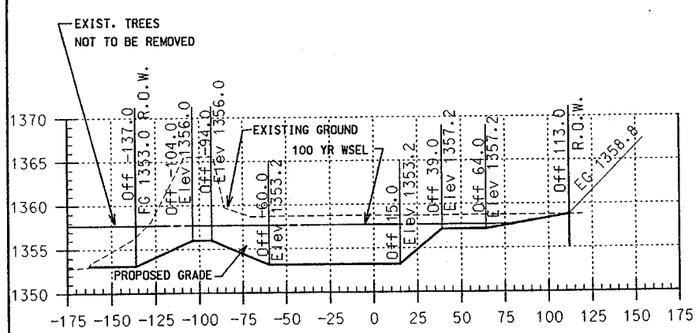

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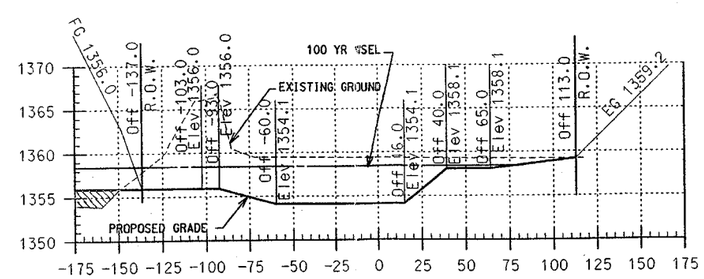

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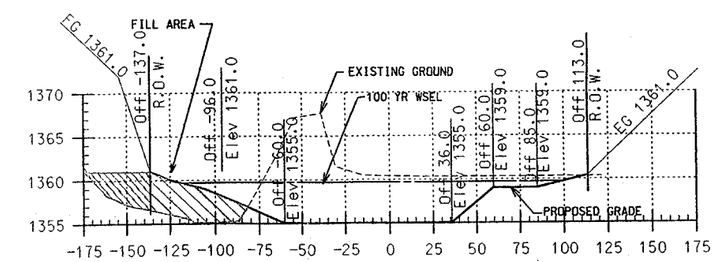


6100

The working days before you dig CALL FOR THE BLUE STAKES 602-263-1100 1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

SCALE: 1" = 40' HORIZ.
SCALE: 1" = 8 ' VERT.

QUEEN CREEK CHANNEL

COE & VAN LOO
PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY

DESIGNED S. GARCIA
DRAWN K. KENNY
CHECKED D.BOHR
DATE 6-03-02

CHANNEL
CROSS SECTIONS

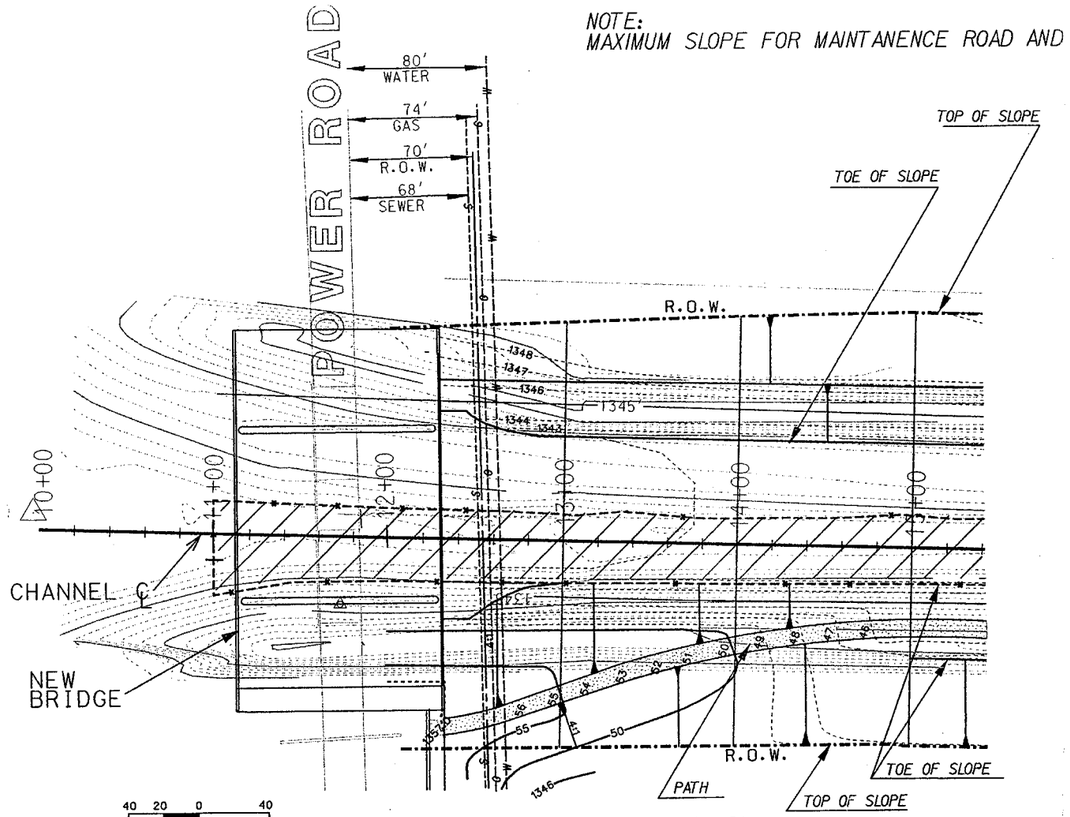
Registered Professional Engineer (Civil) CERTIFICATE NO. 13788 LES F. OLSON, JR. ARIZONA U.S.A.

CVL

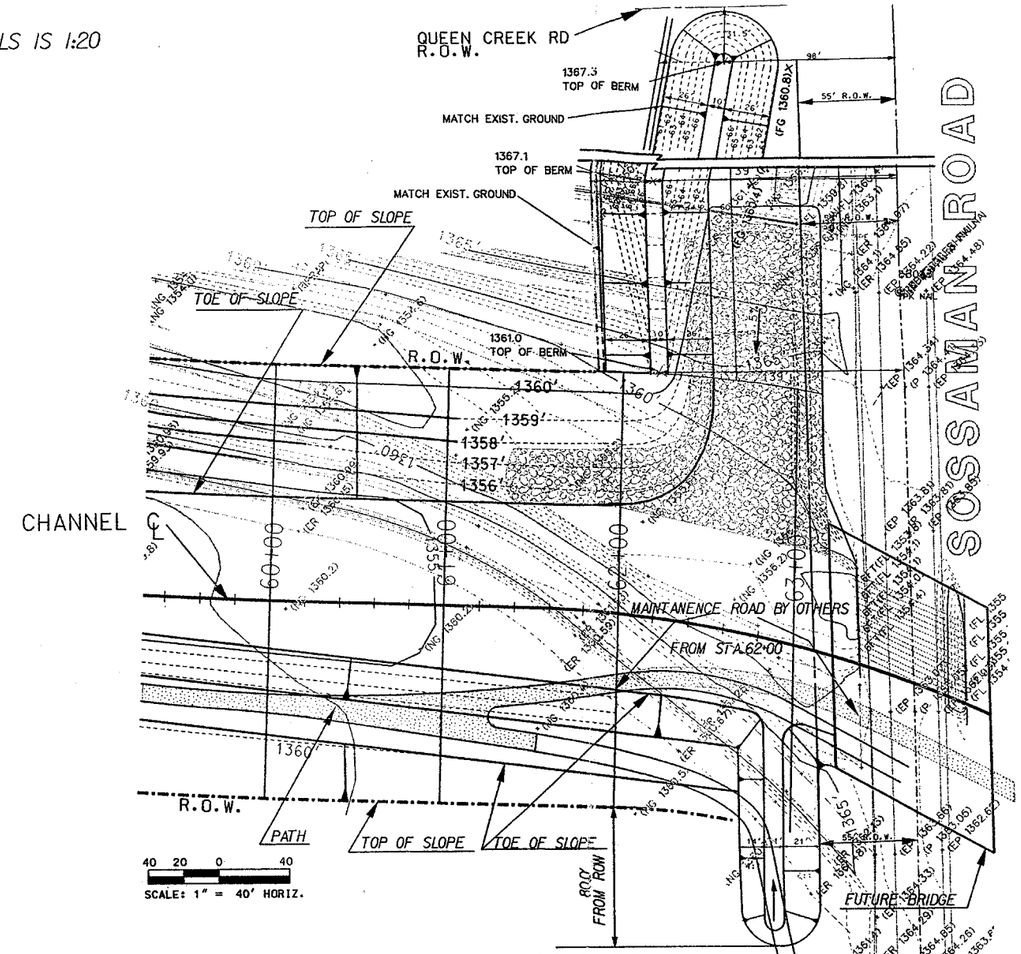
SHEET
14 OF 16

000044-01

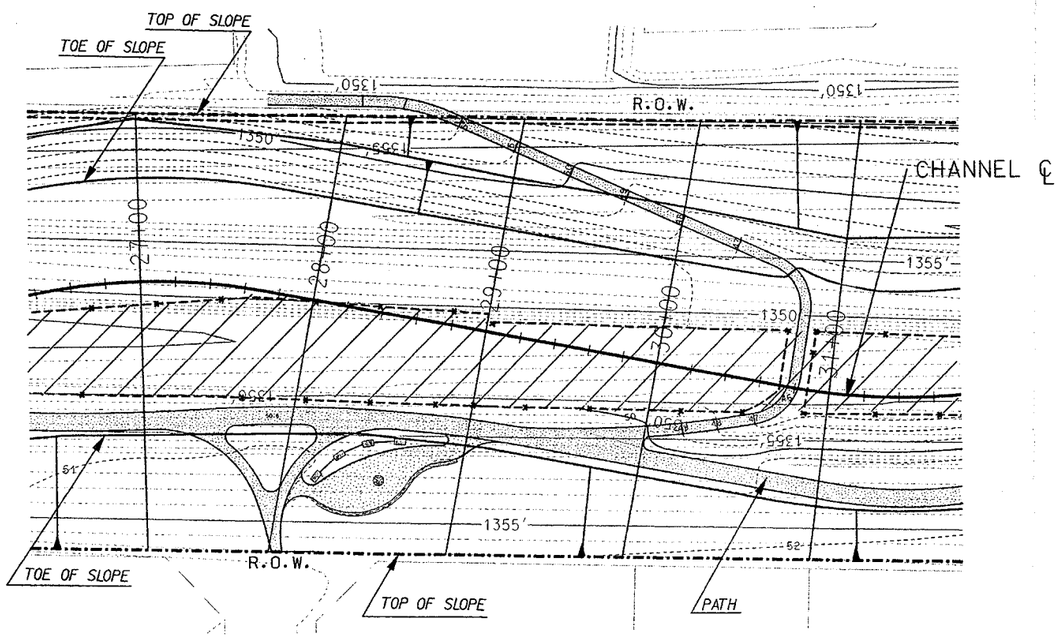
NOTE:
MAXIMUM SLOPE FOR MAINTANENCE ROAD AND TRAILS IS 1:20



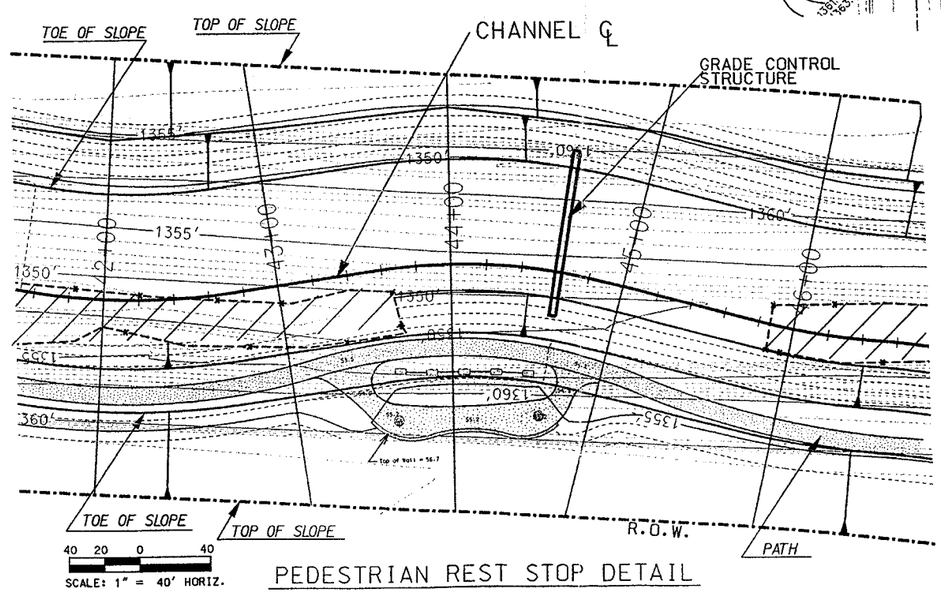
TIE-IN AT POWER ROAD DETAIL



TIE-IN AT SOSSAMAN ROAD DETAIL



ACCESS RAMP DETAIL



PEDESTRIAN REST STOP DETAIL

QUEEN CREEK CHANNEL

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4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

DESIGNED	S. GARCIA
DRAWN	K.KENNY
CHECKED	D. BOTH
DATE	6-03-02

REVISIONS	DATE	BY
	12-16-02	

CHANNEL GRADING DETAIL

13788 LEIF F. OLSON, JR.

CVL

SHEET 15 OF 16

000044-01

CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

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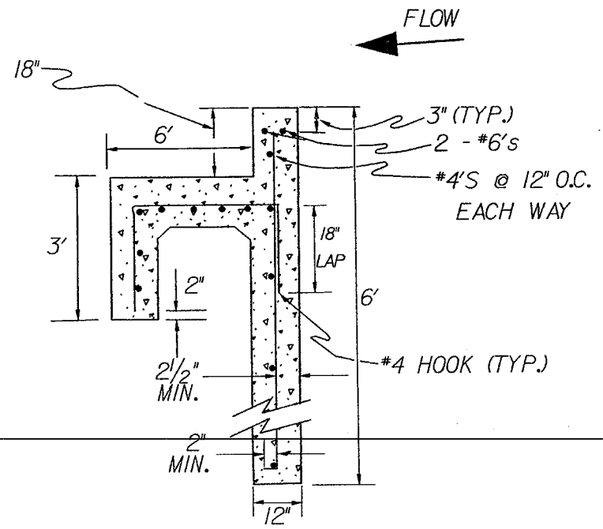
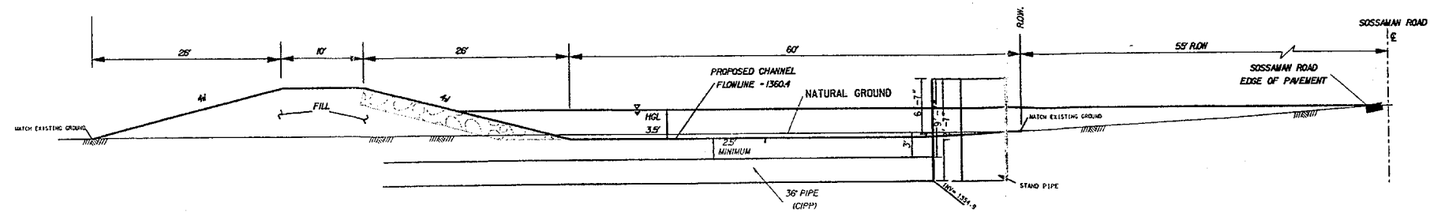


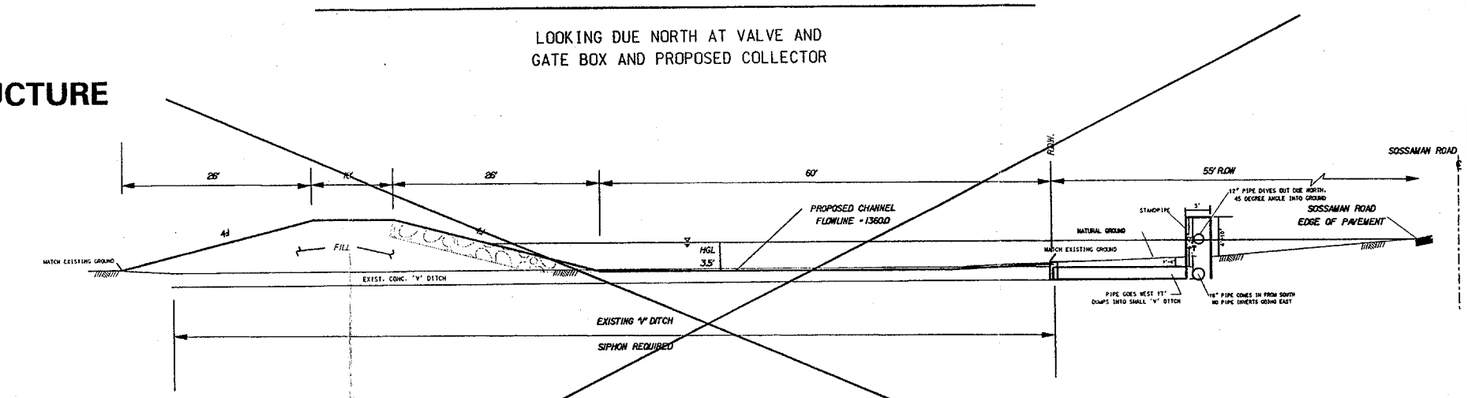
CROSS-SECTION OF GRADE CONTROL STRUCTURE

N.T.S.



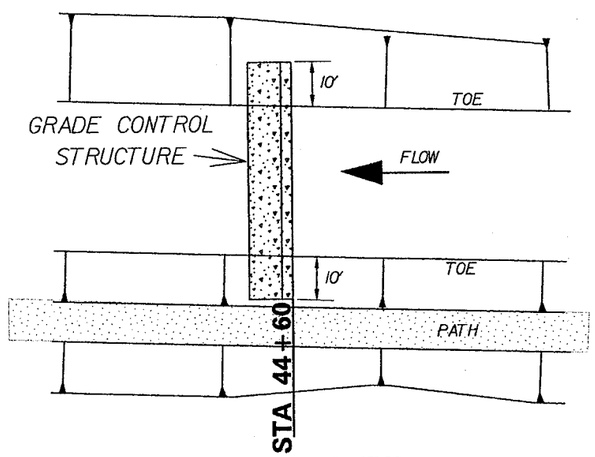
CROSS-SECTION A-A—BERMED COLLECTOR

LOOKING DUE NORTH AT VALVE AND
GATE BOX AND PROPOSED COLLECTOR



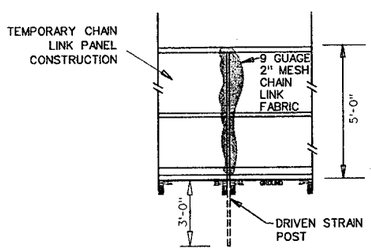
CROSS-SECTION B-B—BERMED COLLECTOR CHANNEL OVER 18" SIPHON N.T.S.

LOOKING DUE NORTH AT STANDPIPE
AND PROPOSED COLLECTOR CHANNEL

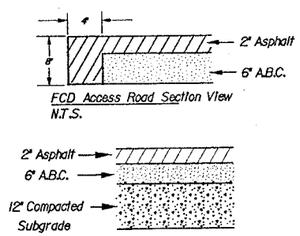


PLAN VIEW

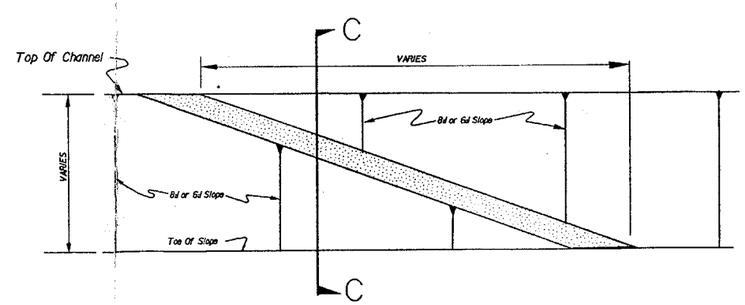
N.T.S..



5' TEMPORARY CONSTRUCTION CHAIN LINK FENCE - N.T.S.

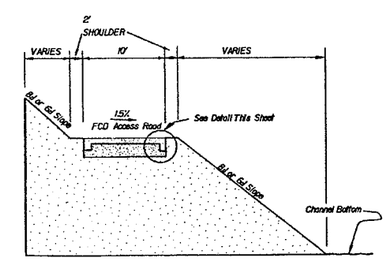


FCD ACCESS ROAD PAVEMENT SECTION N.T.S.



PLAN VIEW — FCD ACCESS DESCENDING TO CHANNEL BOTTOM

N.T.S.



SECTION C-C

N.T.S.

QUEEN CREEK CHANNEL

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4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

REVISIONS	DATE	BY
	12/16/02	

DESIGNED	S. GARCIA
DRAWN	K. KENNY
CHECKED	D. BOTH
DATE	06/3/02

DROP STRUCTURE
DETAILS, PAVEMENT & FENCING

13788
LES F.
OLSON, JR.
ARIZONA, U.S.A.

CVL

SHEET
16 OF 16

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The central time before you dig.
CALL FOR THE BLUE STAKES.
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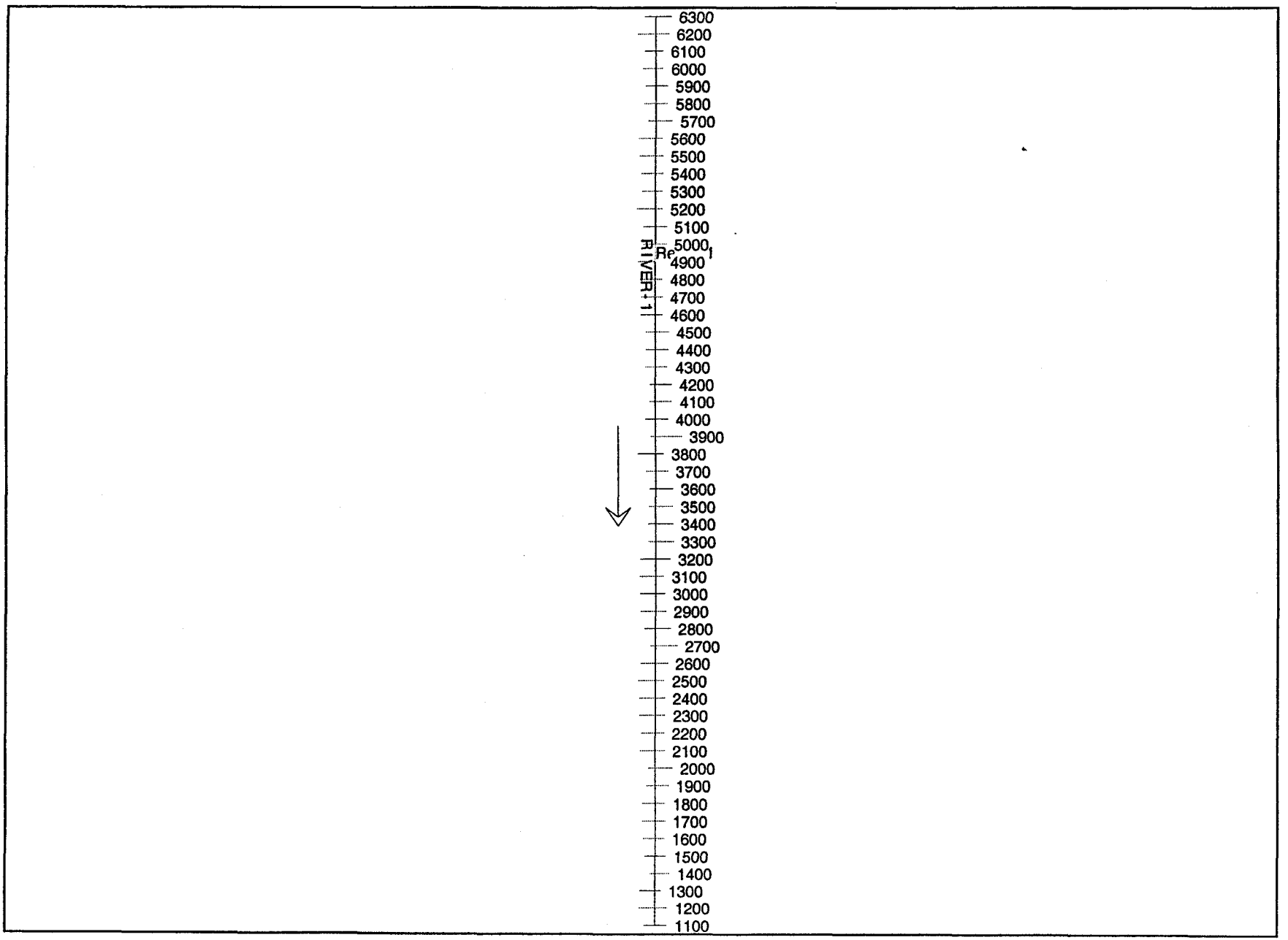
1-800-STAKE-IT
OUTSIDE MARICOPA COUNTY

n:\000044\tmd\sd20gd53.dgn

APPENDIX C

Proposed Condition Hydraulic Model


6300
6200
6100
6000
5900
5800
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5600
5500
5400
5300
5200
5100
5000
Re
4900
RIVER 1
4800
4700
4600
4500
4400
4300
4200
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4000
3900
3800
3700
3600
3500
3400
3300
3200
3100
3000
2900
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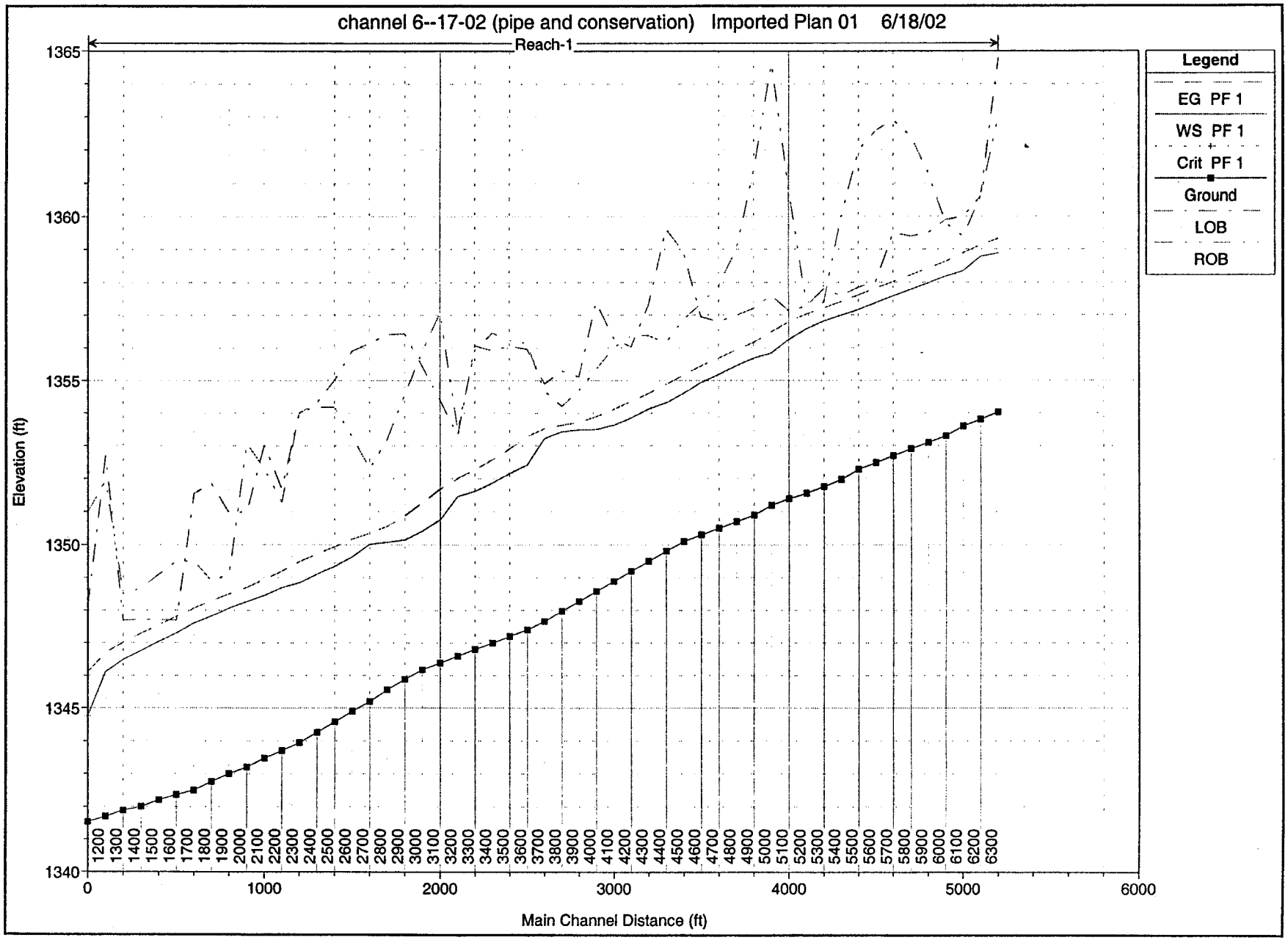
1600
1500
1400
1300
1200
1100

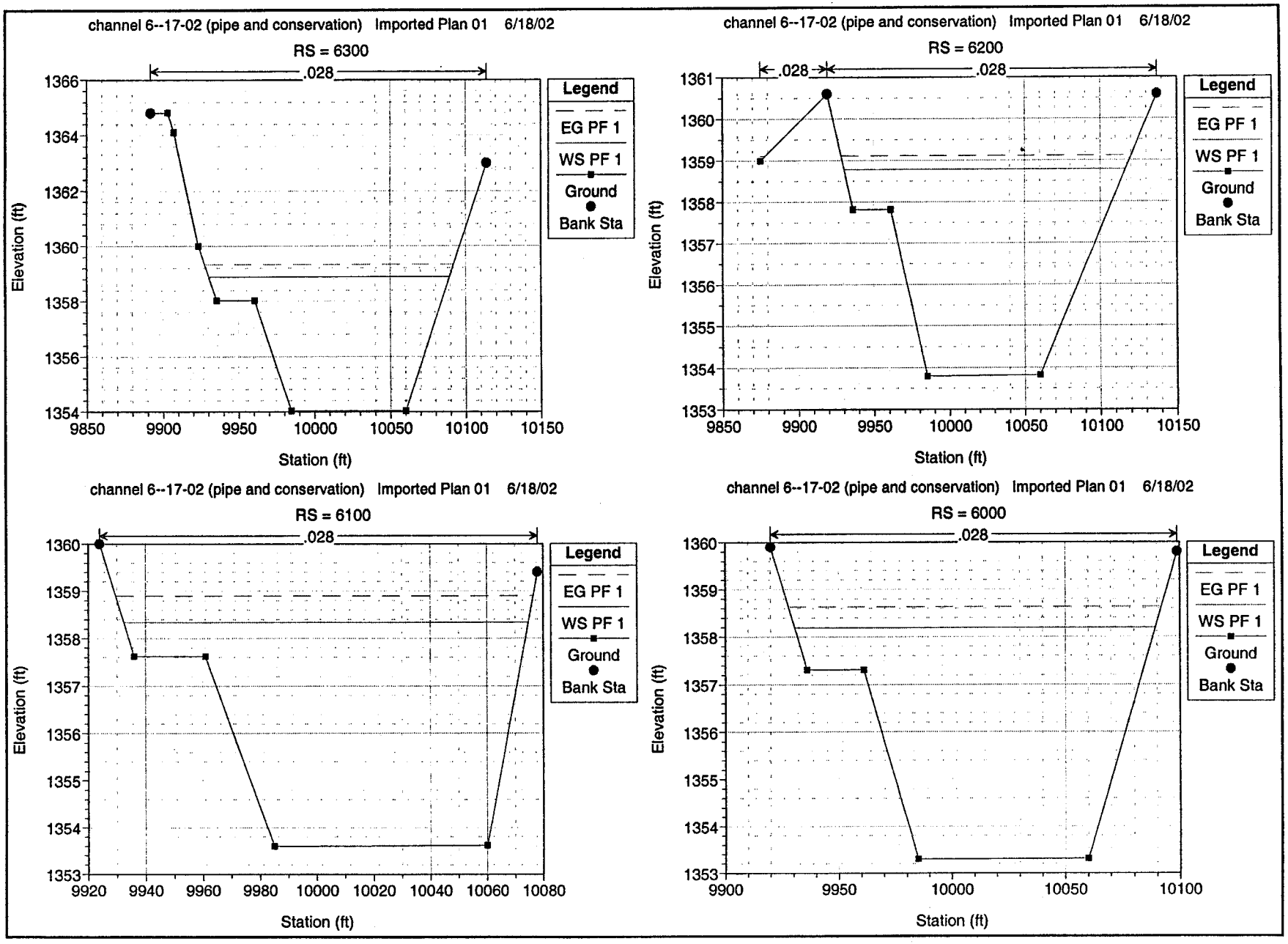

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
Reach-1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
LOB
ROB
Elevation (ft)
1365
1360
1355
1350
1345
1340
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)
1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000 3100 3200 3300 3400 3500 3600 3700 3800 3900 4000 4100 4200 4300 4400 4500 4600 4700 4800 4900 5000 5100 5200 5300 5400 5500 5600 5700 5800 5900 6000 6100 6200 6300

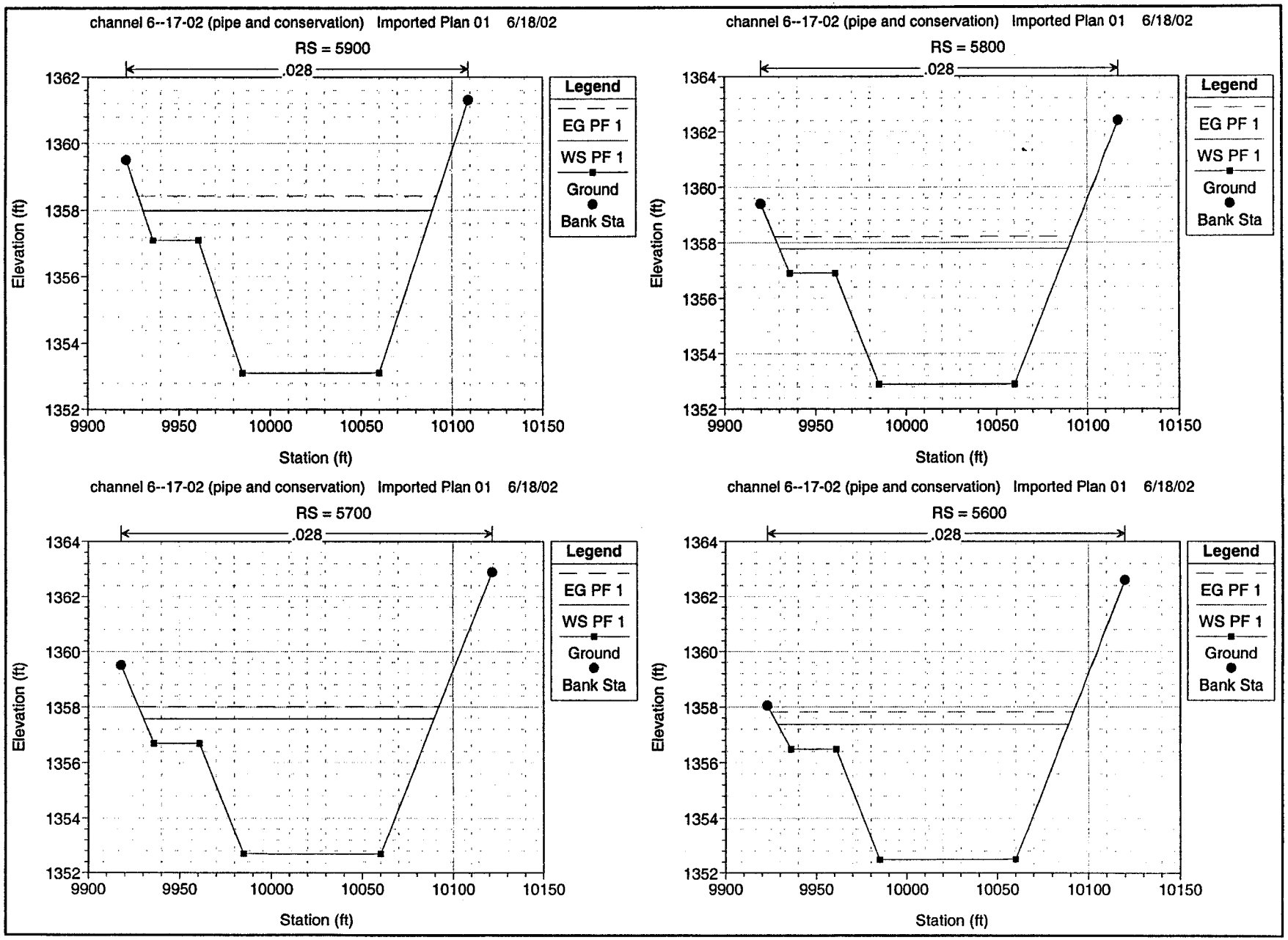
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

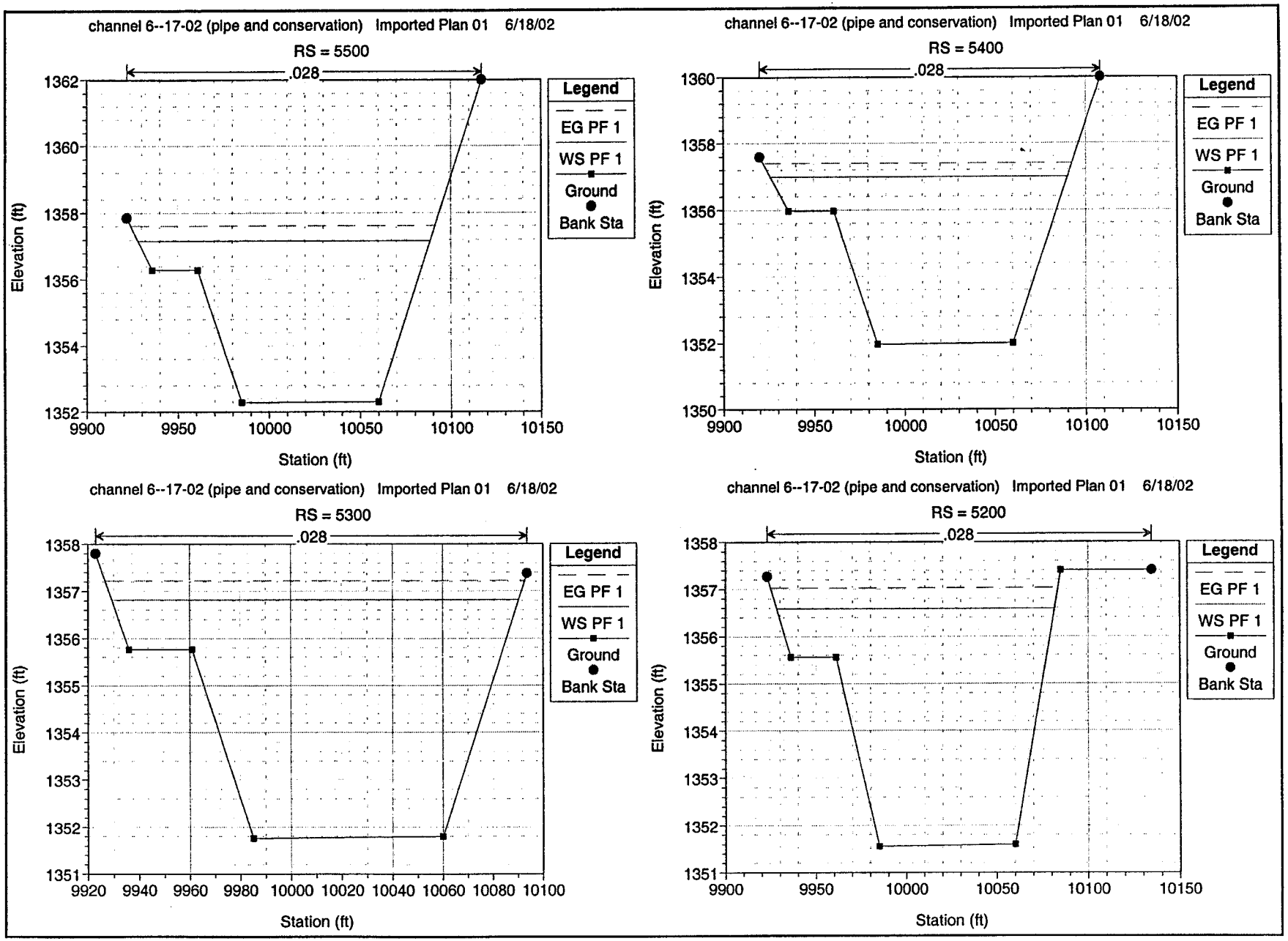
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	6300	2839.00	1354.03	1358.88		1359.33	0.002073	5.37	528.73	158.79	0.52
Reach-1	6200	2839.00	1353.80	1358.78		1359.12	0.001580	4.65	610.76	186.12	0.45
Reach-1	6100	2839.00	1353.60	1358.34		1358.90	0.002588	5.99	474.04	142.32	0.58
Reach-1	6000	2839.00	1353.30	1358.19		1358.63	0.002038	5.34	531.41	158.75	0.51
Reach-1	5900	2839.00	1353.10	1357.99		1358.43	0.002034	5.34	531.66	158.74	0.51
Reach-1	5800	2839.00	1352.90	1357.78		1358.23	0.002041	5.34	531.43	158.94	0.51
Reach-1	5700	2839.00	1352.69	1357.58		1358.02	0.002031	5.33	532.58	159.25	0.51
Reach-1	5600	2839.00	1352.48	1357.37		1357.82	0.002060	5.34	531.81	160.39	0.52
Reach-1	5500	2839.00	1352.28	1357.16		1357.61	0.002088	5.36	529.79	160.46	0.52
Reach-1	5400	2839.00	1351.97	1356.99		1357.40	0.001856	5.13	553.74	164.07	0.49
Reach-1	5300	2839.00	1351.76	1356.81		1357.22	0.001778	5.10	556.67	160.97	0.48
Reach-1	5200	2839.00	1351.56	1356.58		1357.03	0.001952	5.35	531.08	153.27	0.51
Reach-1	5100	2839.00	1351.40	1356.26		1356.79	0.002615	5.89	482.34	150.23	0.58
Reach-1	5000	2839.00	1351.20	1355.85		1356.49	0.003304	6.44	440.92	142.96	0.65
Reach-1	4900	2839.00	1350.90	1355.69		1356.17	0.002264	5.54	512.25	156.72	0.54
Reach-1	4800	2839.00	1350.70	1355.45		1355.94	0.002337	5.61	506.31	155.88	0.55
Reach-1	4700	2839.00	1350.50	1355.18		1355.69	0.002494	5.73	495.40	155.00	0.56
Reach-1	4600	2839.00	1350.30	1354.94		1355.44	0.002483	5.72	496.61	155.42	0.56
Reach-1	4500	2839.00	1350.11	1354.61		1355.17	0.002922	6.03	471.05	153.94	0.61
Reach-1	4400	2839.00	1349.81	1354.32		1354.88	0.002870	6.00	473.05	153.48	0.60
Reach-1	4300	2839.00	1349.50	1354.13		1354.60	0.002221	5.50	516.39	157.38	0.53
Reach-1	4200	2839.00	1349.19	1353.85		1354.36	0.002489	5.71	497.31	156.30	0.56
Reach-1	4100	2839.00	1348.89	1353.63		1354.11	0.002327	5.58	508.33	156.95	0.55
Reach-1	4000	2839.00	1348.58	1353.50		1353.89	0.001652	5.01	567.04	159.04	0.47
Reach-1	3900	2839.00	1348.27	1353.49		1353.72	0.000927	3.82	742.38	203.11	0.35
Reach-1	3800	2839.00	1347.97	1353.42		1353.63	0.000771	3.64	780.75	200.48	0.32
Reach-1	3700	2839.00	1347.66	1353.22		1353.53	0.001161	4.42	642.21	167.08	0.40
Reach-1	3600	2839.00	1347.40	1352.42		1353.28	0.003688	7.45	381.18	107.70	0.70
Reach-1	3500	2839.00	1347.20	1352.16		1352.90	0.003202	6.93	409.48	115.97	0.65
Reach-1	3400	2839.00	1347.00	1351.88		1352.58	0.002961	6.70	423.71	119.14	0.63
Reach-1	3300	2839.00	1346.80	1351.63		1352.28	0.002736	6.49	437.42	121.61	0.60
Reach-1	3200	2839.00	1346.60	1351.47		1352.01	0.002111	5.87	483.38	128.47	0.53
Reach-1	3100	2839.00	1346.39	1350.76		1351.69	0.003852	7.74	366.95	97.20	0.70
Reach-1	3000	2839.00	1346.18	1350.42		1351.29	0.003822	7.47	380.28	109.82	0.71
Reach-1	2900	2839.00	1345.88	1350.15		1350.89	0.003388	6.87	413.09	123.80	0.66
Reach-1	2800	2839.00	1345.56	1350.08		1350.55	0.001981	5.54	512.23	141.78	0.51

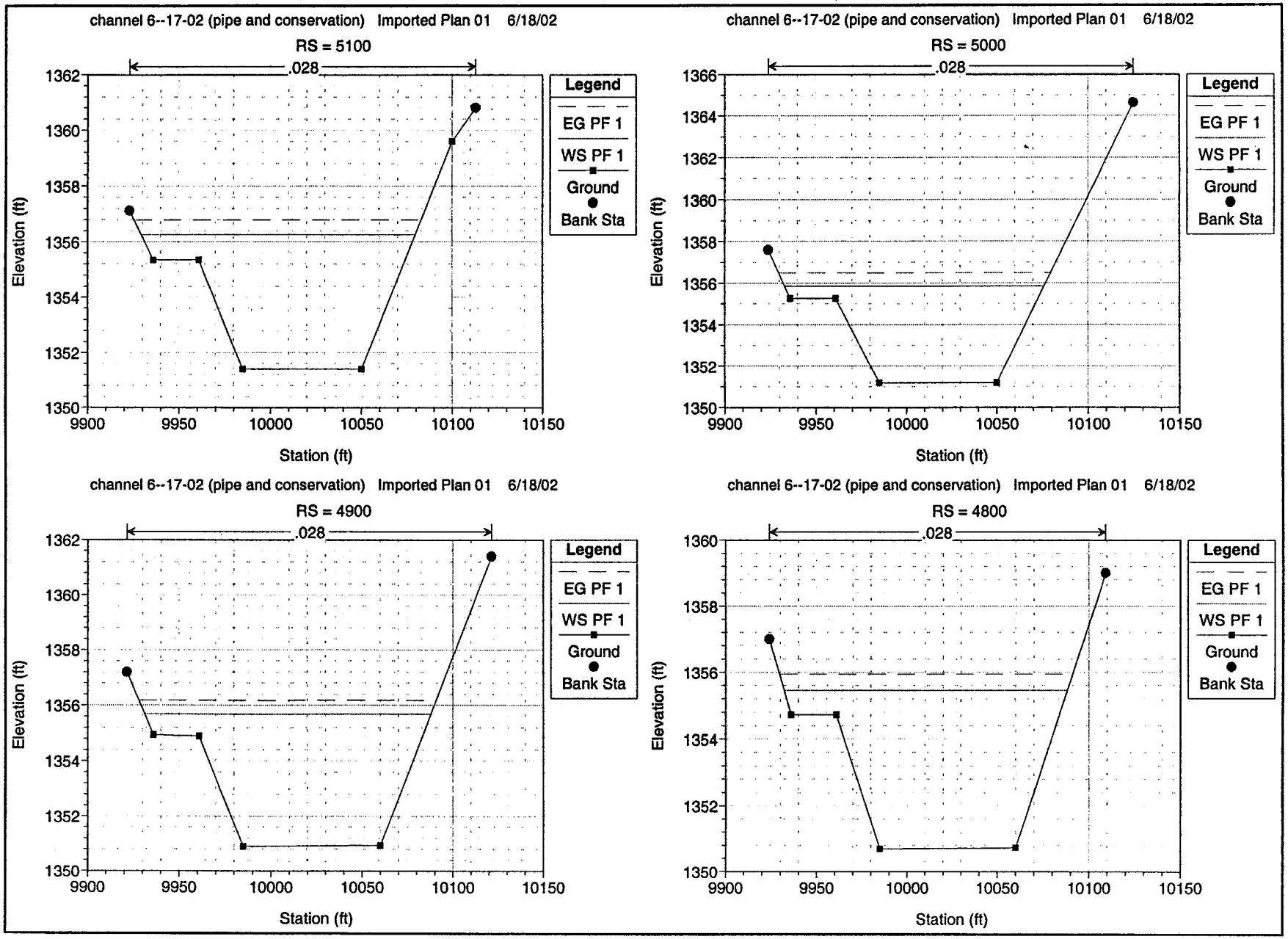
HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 (Continued)

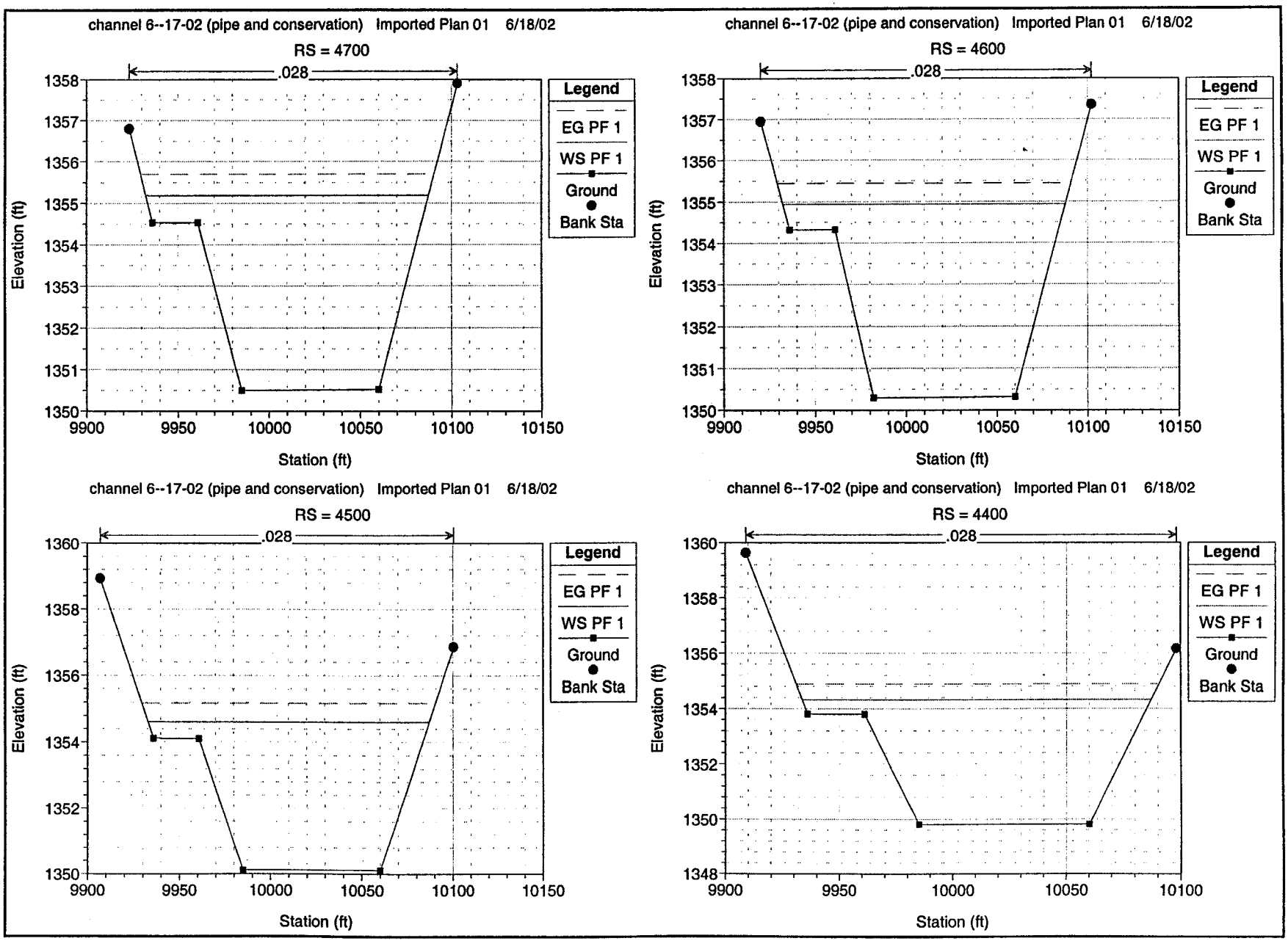
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2700	2839.00	1345.20	1350.02		1350.36	0.001235	4.66	609.72	153.71	0.41
Reach-1	2600	2839.00	1344.90	1349.64		1350.17	0.002279	5.89	482.07	135.31	0.55
Reach-1	2500	2839.00	1344.58	1349.35		1349.95	0.002171	6.21	457.43	112.36	0.54
Reach-1	2400	2839.00	1344.26	1349.10		1349.72	0.002248	6.31	450.22	111.71	0.55
Reach-1	2300	2839.00	1343.95	1348.84		1349.49	0.002392	6.45	440.12	110.96	0.57
Reach-1	2200	2839.00	1343.70	1348.70		1349.20	0.002531	5.67	500.40	159.84	0.57
Reach-1	2100	2839.00	1343.47	1348.46		1348.95	0.002445	5.61	506.49	160.07	0.56
Reach-1	2000	2839.00	1343.20	1348.27		1348.71	0.002057	5.32	533.20	160.89	0.52
Reach-1	1900	2839.00	1343.00	1348.07		1348.50	0.002023	5.30	535.86	160.93	0.51
Reach-1	1800	2839.00	1342.76	1347.83		1348.29	0.002221	5.45	521.11	161.00	0.53
Reach-1	1700	2839.00	1342.50	1347.61		1348.07	0.002212	5.43	523.12	161.88	0.53
Reach-1	1600	2839.00	1342.36	1347.30		1347.82	0.002684	5.79	490.37	159.24	0.58
Reach-1	1500	2839.00	1342.20	1347.05		1347.55	0.002555	5.69	498.84	157.84	0.56
Reach-1	1400	2839.00	1342.00	1346.76		1347.29	0.002648	5.83	486.85	151.78	0.57
Reach-1	1300	2839.00	1341.88	1346.49		1347.02	0.002740	5.80	489.87	159.03	0.58
Reach-1	1200	2839.00	1341.70	1346.11		1346.70	0.003519	6.15	461.30	168.05	0.65
Reach-1	1100	2839.00	1341.53	1344.75	1344.75	1346.10	0.008388	9.33	304.23	113.82	1.01

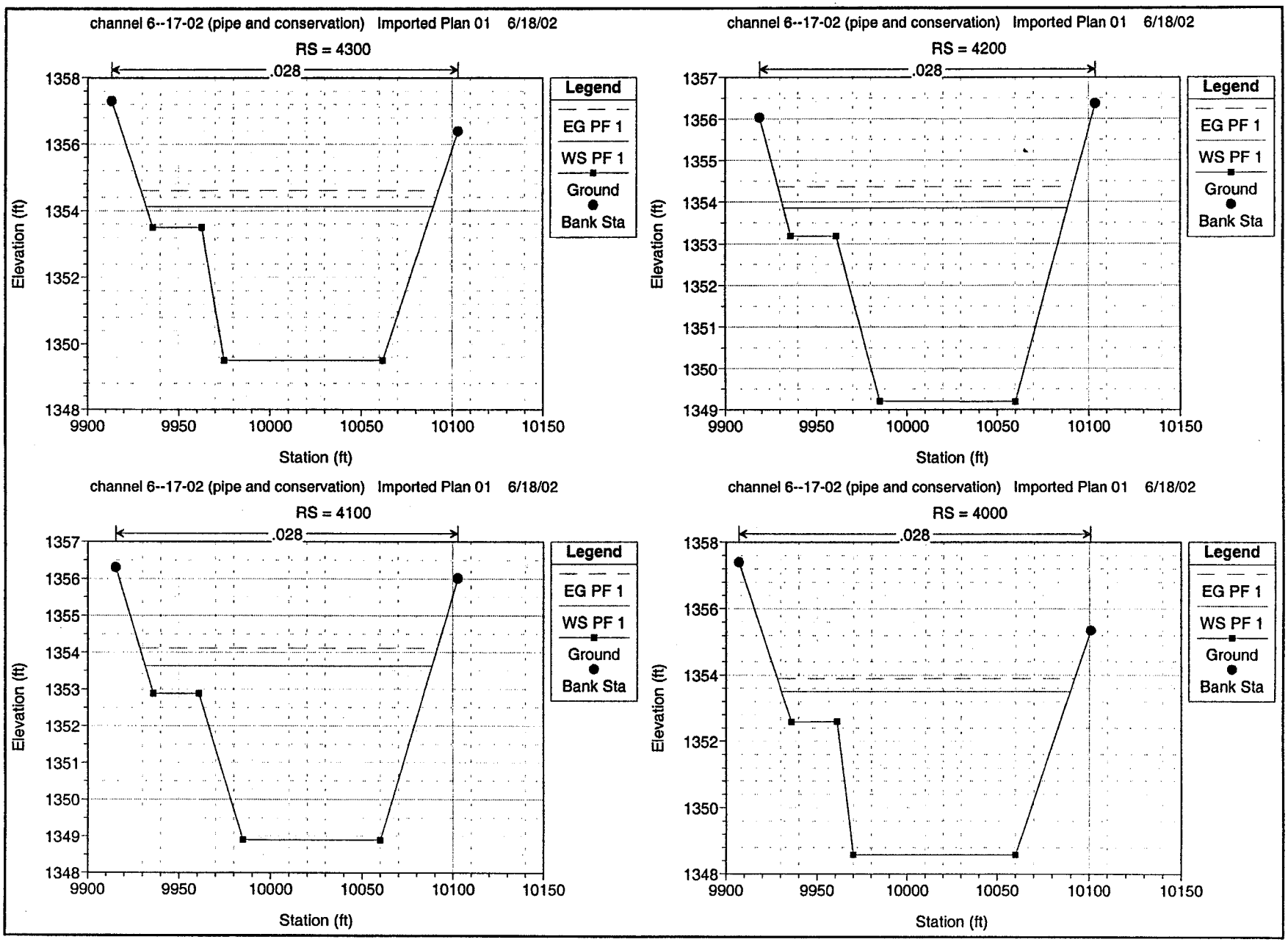

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 6300
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 6200
.028
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 6100
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 6000
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

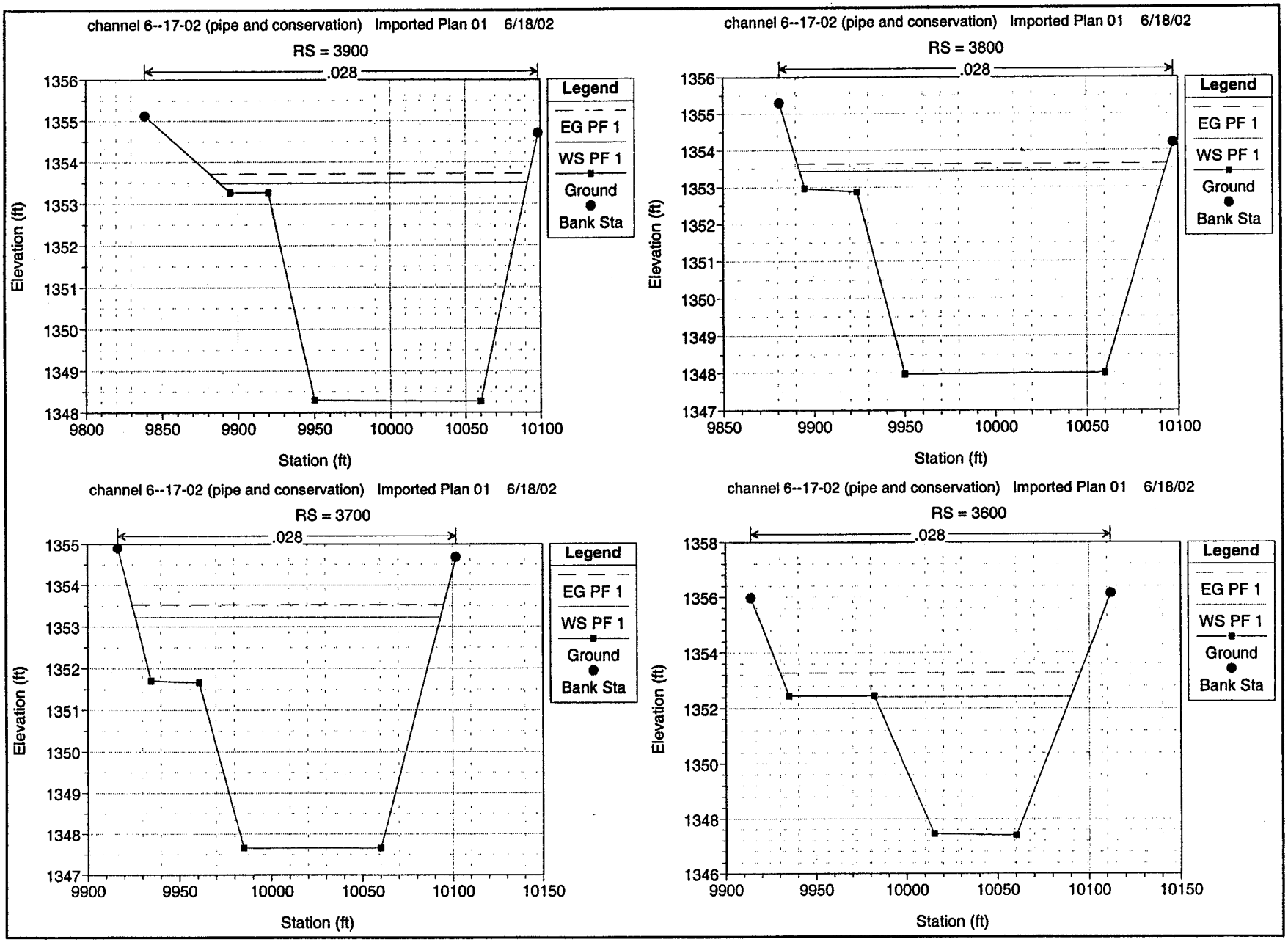

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5900
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5800
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5700
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5600
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

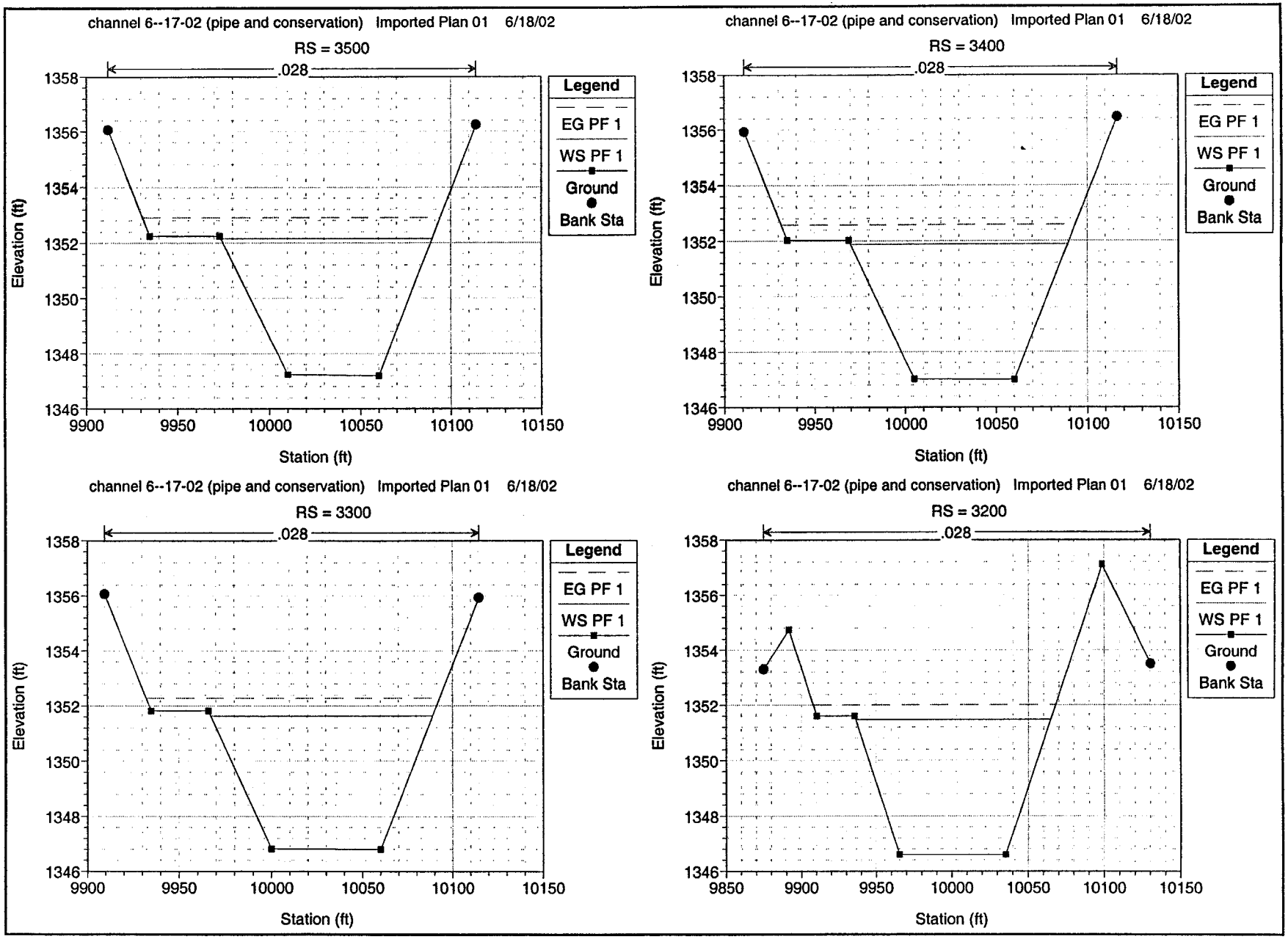

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5500
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5400
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5300
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5200
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

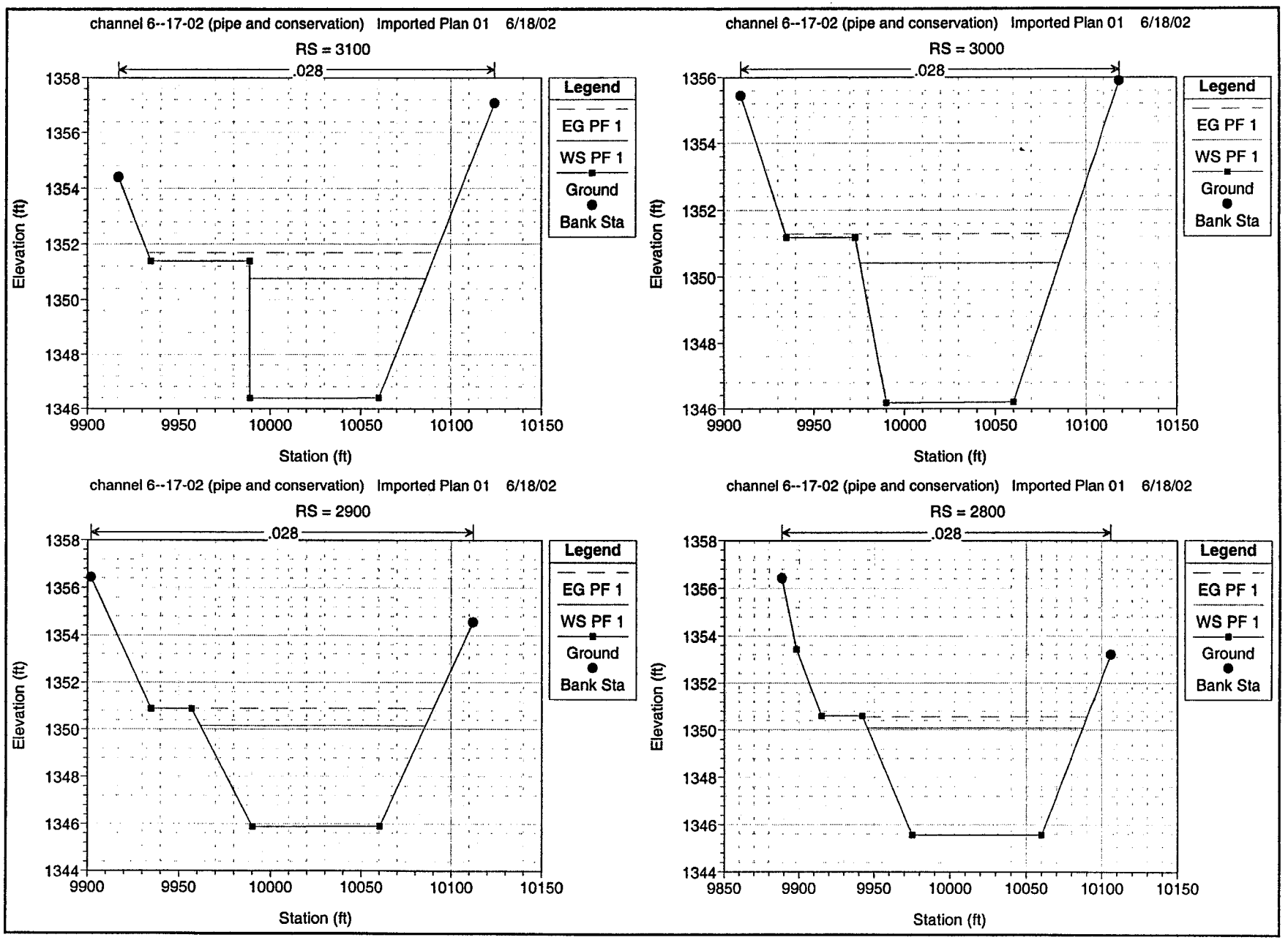

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5100
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 5000
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4900
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4800
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

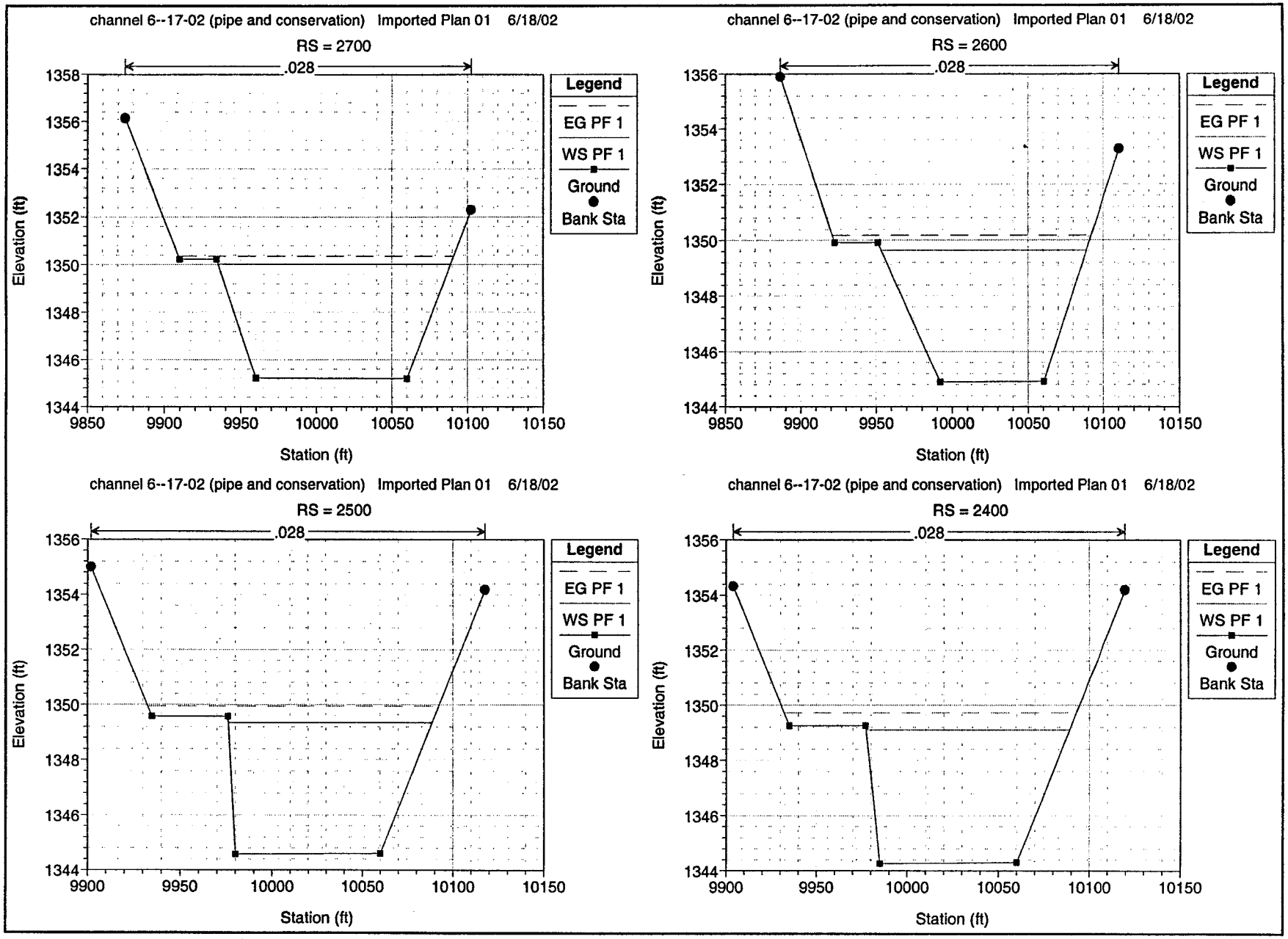

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4700
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4600
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4500
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4400
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

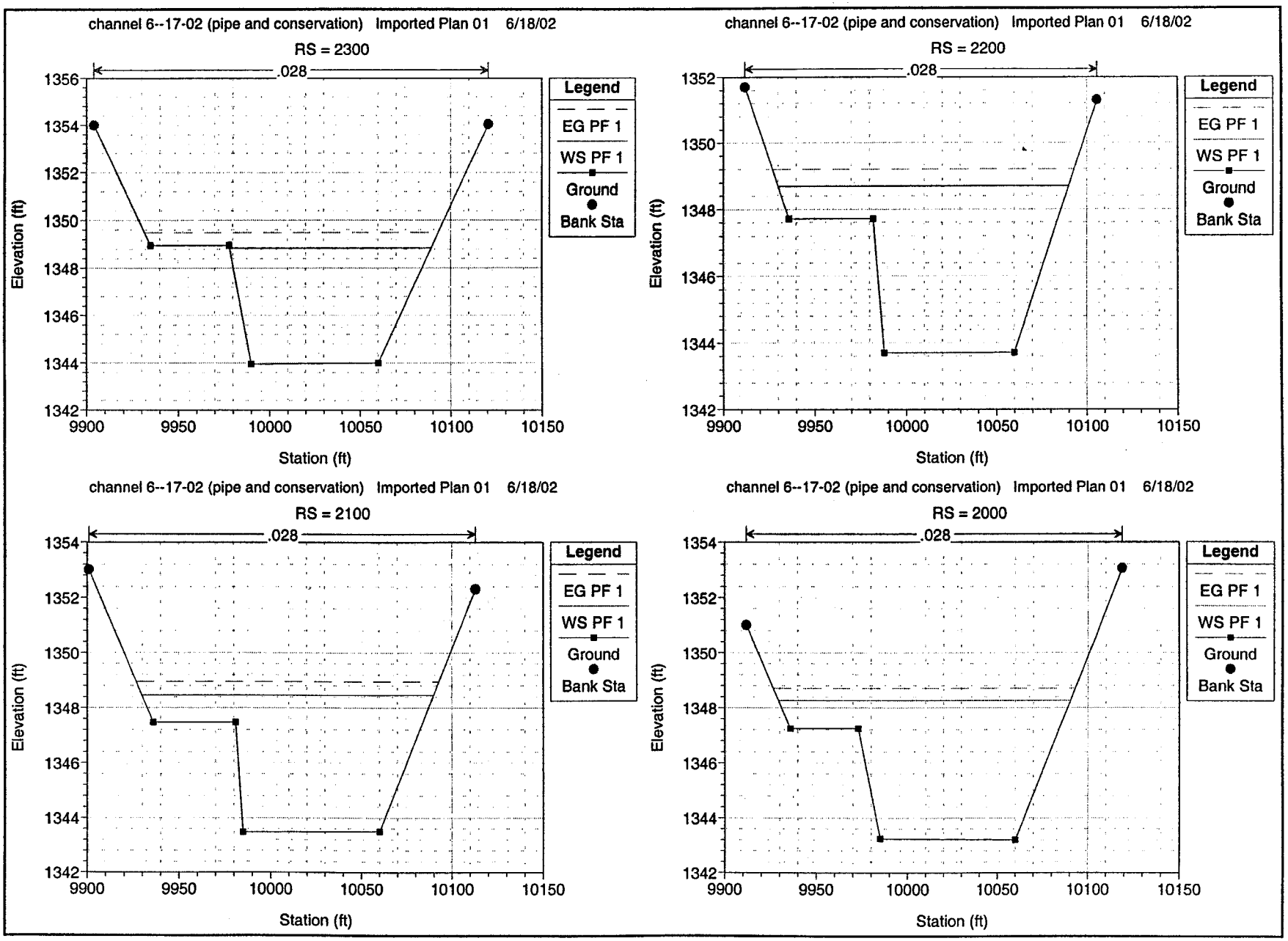

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4300
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4200
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4100
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 4000
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

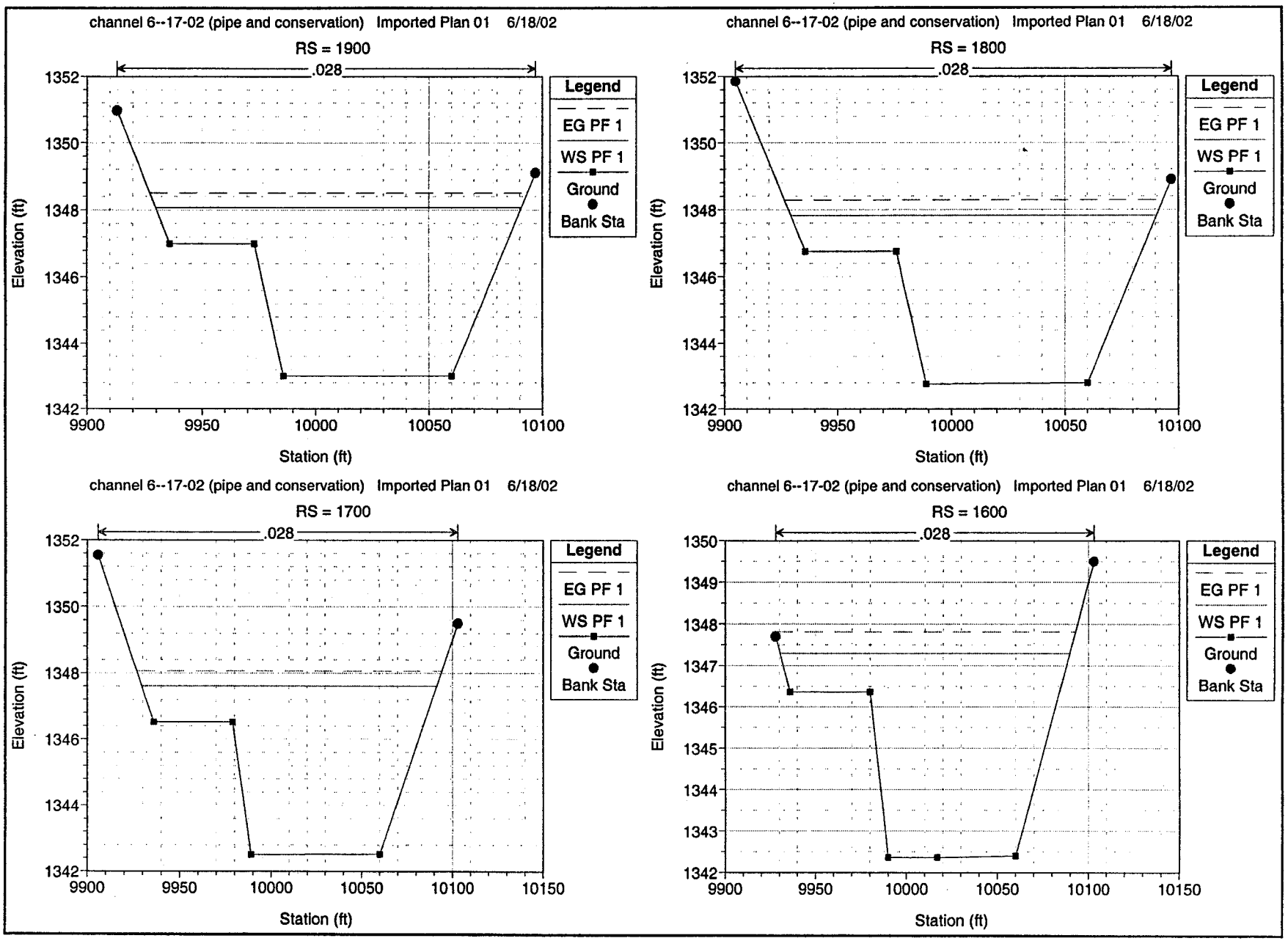

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3900
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3800
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3700
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3600
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

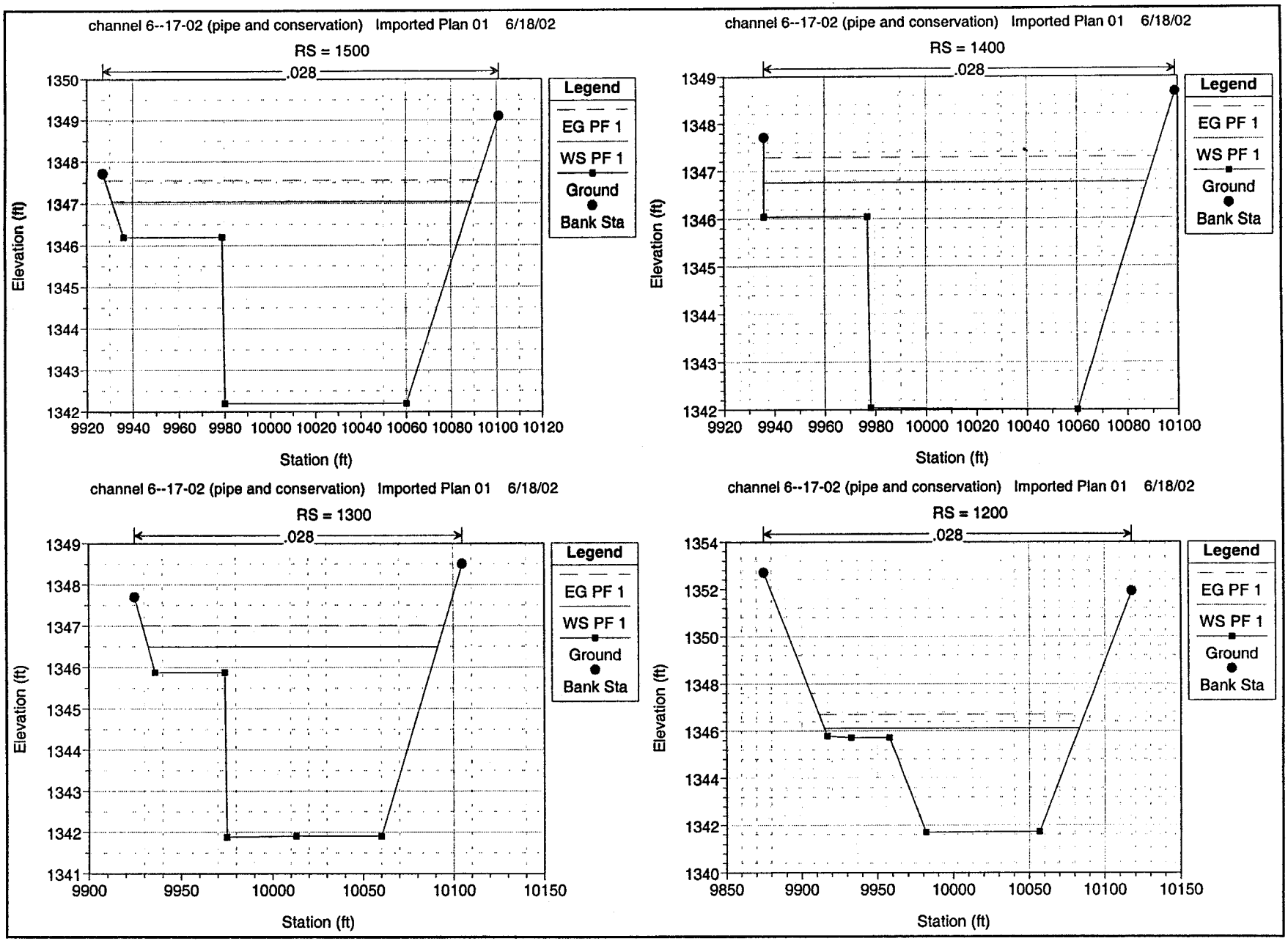

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3500
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3400
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3300
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3200
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

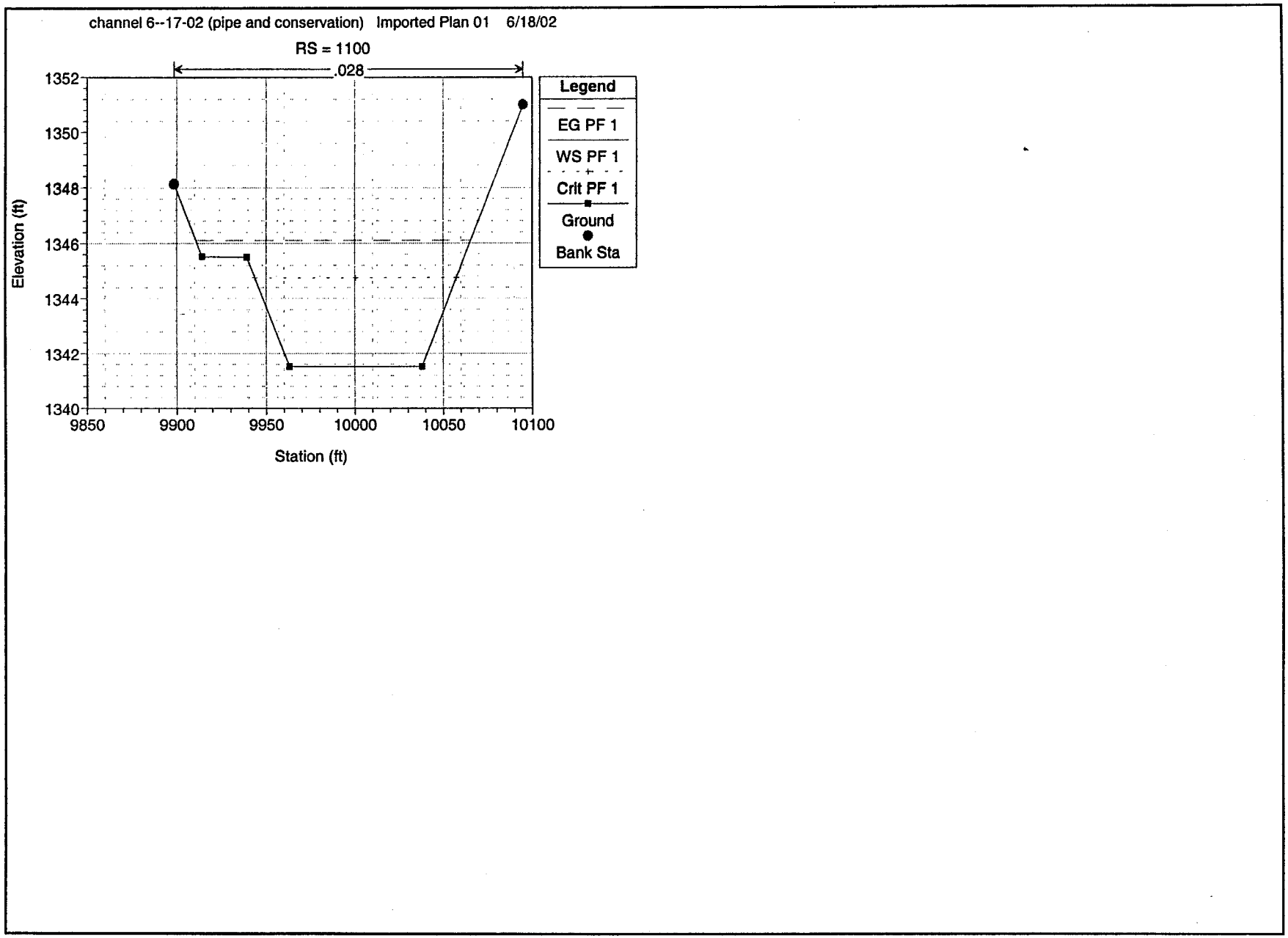

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3100
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 3000
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2900
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2800
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2700
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2600
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2500
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2400
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2300
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2200
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2100
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 2000
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

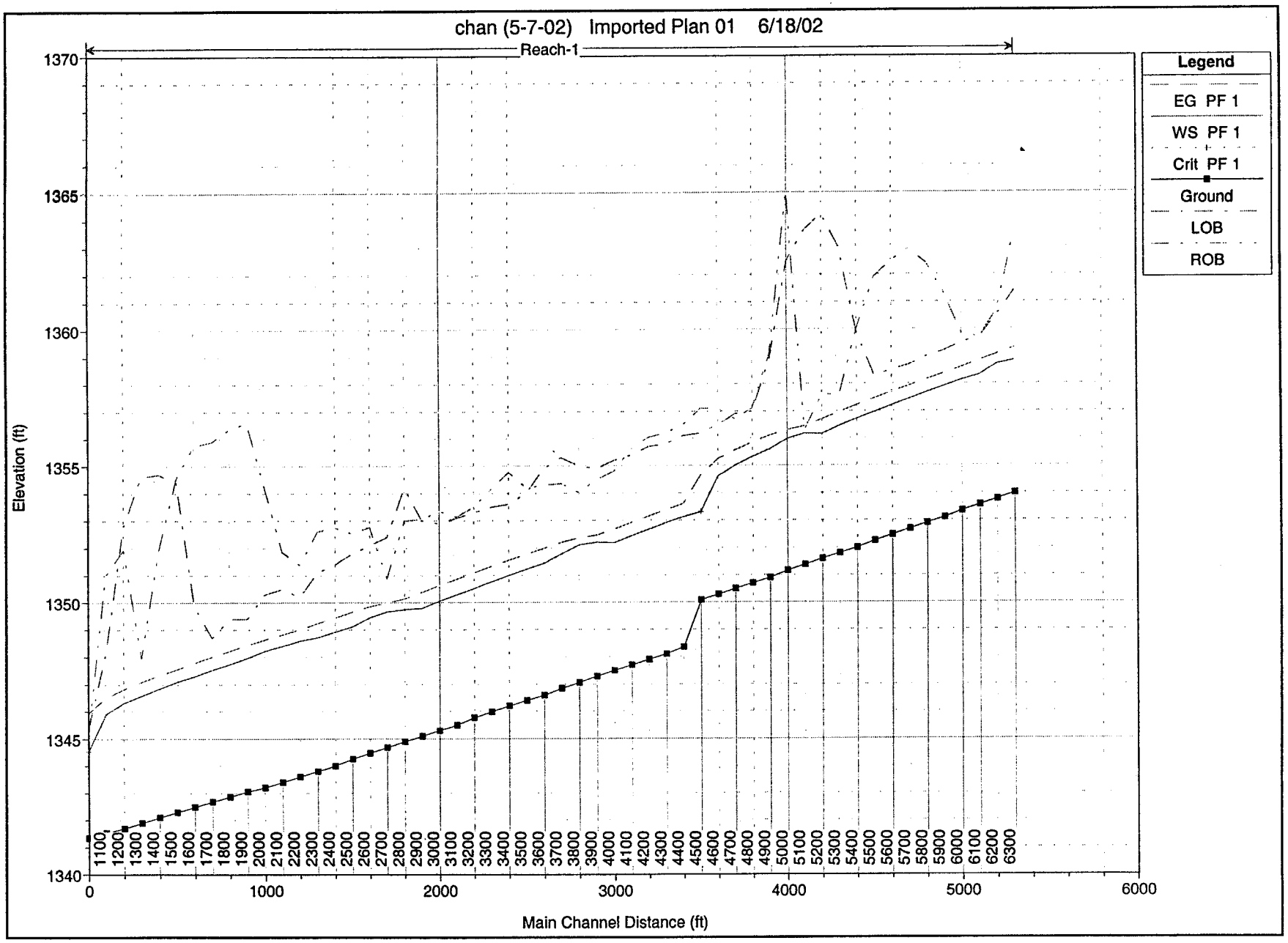

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 1900
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 1800
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 1700
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 1600
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

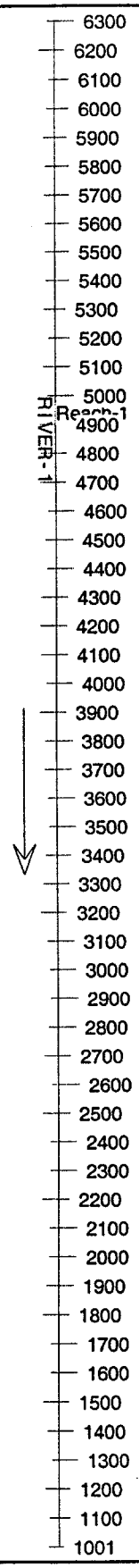

channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 1500
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 1400
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 1300
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 1200
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


channel 6--17-02 (pipe and conservation) Imported Plan 01 6/18/02
RS = 1100
.028
Elevation (ft)
1352
1350
1348
1346
1344
1342
1340
9850
9900
9950
10000
10050
10100
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

APPENDIX D

Future Condition Hydraulic Model

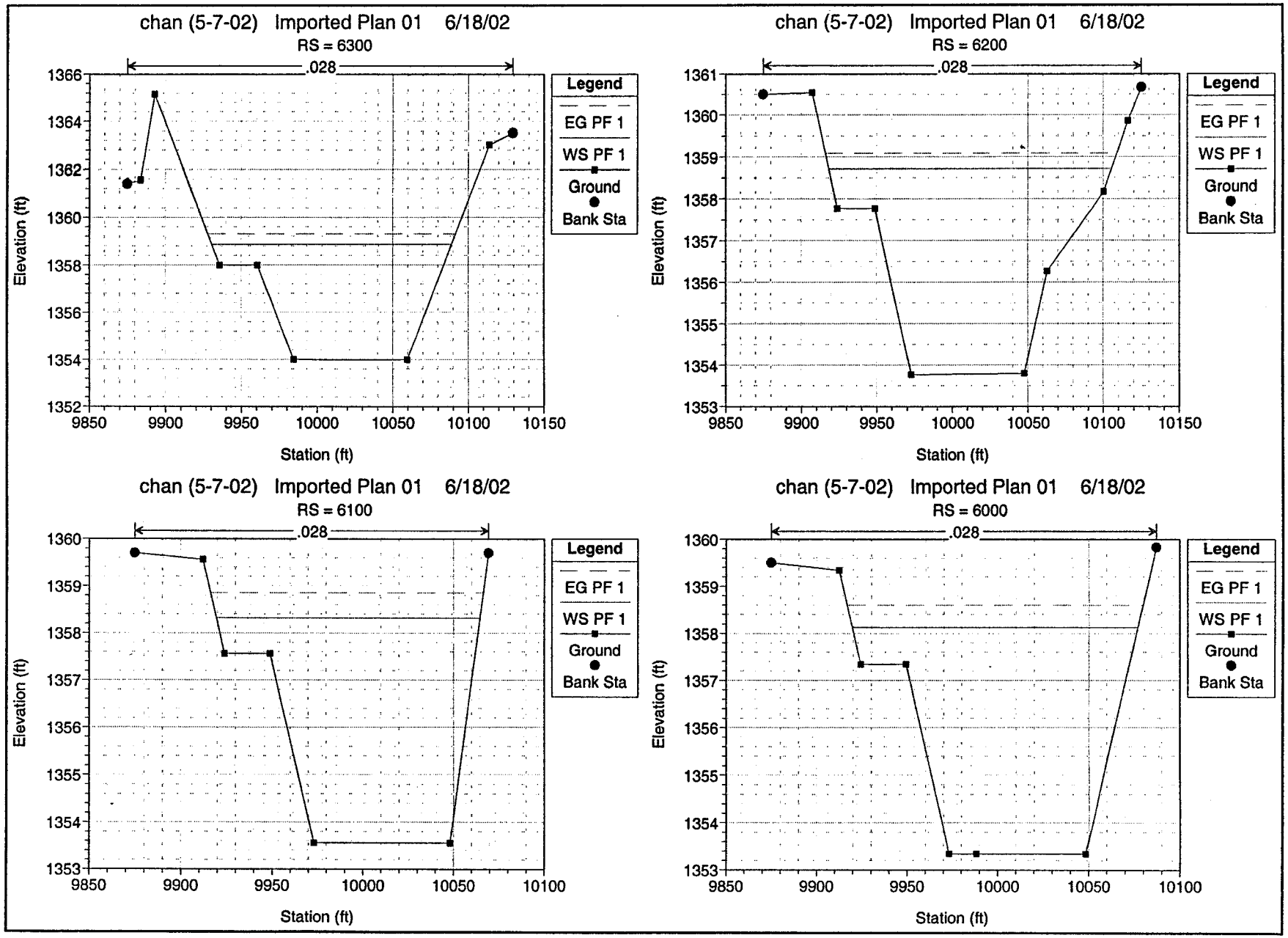

chan (5-7-02) Imported Plan 01 6/18/02
Reach-1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
LOB
ROB
Elevation (ft)
1370
1365
1360
1355
1350
1345
1340
0
1000
2000
3000
4000
5000
6000
Main Channel Distance (ft)
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
4000
4100
4200
4300
4400
4500
4600
4700
4800
4900
5000
5100
5200
5300
5400
5500
5600
5700
5800
5900
6000
6100
6200
6300


6300
6200
6100
6000
5900
5800
5700
5600
5500
5400
5300
5200
5100
5000
4900
4800
4700
4600
4500
4400
4300
4200
4100
4000
3900
3800
3700
3600
3500
3400
3300
3200
3100
3000
2900
2800
2700
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1001
RIVER-1
Reach-1

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

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	6300	2839.00	1353.99	1358.86		1359.31	0.002068	5.37	528.65	158.44	0.52
Reach-1	6200	2839.00	1353.77	1358.71		1359.09	0.001904	4.90	579.12	187.30	0.49
Reach-1	6100	2839.00	1353.56	1358.31		1358.85	0.002501	5.88	482.43	145.02	0.57
Reach-1	6000	2839.00	1353.34	1358.13		1358.60	0.002219	5.50	516.34	157.53	0.54
Reach-1	5900	2839.00	1353.10	1357.90		1358.37	0.002217	5.50	516.28	157.37	0.54
Reach-1	5800	2839.00	1352.90	1357.68		1358.15	0.002235	5.51	515.04	157.34	0.54
Reach-1	5700	2839.00	1352.69	1357.45		1357.93	0.002285	5.55	511.32	157.11	0.54
Reach-1	5600	2839.00	1352.47	1357.21		1357.70	0.002328	5.58	508.36	157.01	0.55
Reach-1	5500	2839.00	1352.25	1356.96		1357.46	0.002404	5.65	502.88	156.54	0.56
Reach-1	5400	2839.00	1352.00	1356.72		1357.22	0.002387	5.64	503.69	156.38	0.55
Reach-1	5300	2839.00	1351.80	1356.46		1356.97	0.002541	5.75	493.86	156.00	0.57
Reach-1	5200	2839.00	1351.60	1356.16		1356.70	0.002710	5.90	481.44	153.57	0.59
Reach-1	5100	2839.00	1351.38	1356.18		1356.45	0.001209	4.20	675.61	195.23	0.40
Reach-1	5000	2839.00	1351.16	1355.98		1356.31	0.001451	4.61	615.94	177.98	0.44
Reach-1	4900	2839.00	1350.90	1355.60		1356.11	0.002472	5.70	497.78	155.86	0.56
Reach-1	4800	2839.00	1350.70	1355.33		1355.85	0.002629	5.82	487.78	155.16	0.58
Reach-1	4700	2839.00	1350.50	1355.01		1355.57	0.002900	6.01	472.24	154.04	0.61
Reach-1	4600	2839.00	1350.29	1354.61		1355.25	0.003506	6.40	443.54	151.86	0.66
Reach-1	4500	2839.00	1350.08	1353.30	1353.30	1354.66	0.008377	9.33	304.15	113.63	1.01
Reach-1	4400	2839.00	1348.36	1353.13		1353.61	0.002273	5.55	511.82	156.87	0.54
Reach-1	4300	2839.00	1348.10	1352.91		1353.38	0.002222	5.50	515.86	157.28	0.54
Reach-1	4200	2839.00	1347.90	1352.68		1353.16	0.002276	5.55	511.80	157.03	0.54
Reach-1	4100	2839.00	1347.70	1352.44		1352.93	0.002329	5.59	507.99	156.81	0.55
Reach-1	4000	2839.00	1347.50	1352.19		1352.69	0.002433	5.67	500.73	156.32	0.56
Reach-1	3900	2839.00	1347.28	1352.21		1352.47	0.000945	4.14	686.28	169.14	0.36
Reach-1	3800	2839.00	1347.06	1352.11		1352.37	0.001079	4.06	698.97	195.62	0.38
Reach-1	3700	2839.00	1346.85	1351.78		1352.21	0.001953	5.27	539.02	159.31	0.50
Reach-1	3600	2839.00	1346.60	1351.44		1351.99	0.002184	5.95	477.48	127.82	0.54
Reach-1	3500	2839.00	1346.40	1351.22		1351.77	0.002201	5.96	476.26	127.75	0.54
Reach-1	3400	2839.00	1346.20	1350.99		1351.55	0.002241	6.00	473.37	127.55	0.55
Reach-1	3300	2839.00	1345.98	1350.76		1351.33	0.002275	6.03	471.03	127.39	0.55
Reach-1	3200	2839.00	1345.77	1350.52		1351.09	0.002345	6.09	466.02	126.91	0.56
Reach-1	3100	2839.00	1345.50	1350.29		1350.86	0.002284	6.04	470.11	127.15	0.55
Reach-1	3000	2839.00	1345.30	1350.05		1350.63	0.002340	6.09	466.17	126.80	0.56
Reach-1	2900	2839.00	1345.10	1349.80		1350.39	0.002436	6.18	459.75	126.22	0.57
Reach-1	2800	2839.00	1344.90	1349.75		1350.14	0.001445	5.02	565.80	143.36	0.45

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2700	2839.00	1344.68	1349.67		1349.99	0.001166	4.56	622.17	154.85	0.40
Reach-1	2600	2839.00	1344.47	1349.45		1349.86	0.001492	5.08	558.79	142.38	0.45
Reach-1	2500	2839.00	1344.25	1349.12		1349.66	0.002145	5.90	480.90	128.40	0.54
Reach-1	2400	2839.00	1344.00	1348.92		1349.45	0.002063	5.83	487.15	128.75	0.53
Reach-1	2300	2839.00	1343.80	1348.72		1349.24	0.002052	5.82	488.12	128.89	0.53
Reach-1	2200	2839.00	1343.60	1348.60		1349.02	0.001873	5.20	546.15	159.58	0.50
Reach-1	2100	2839.00	1343.40	1348.41		1348.83	0.001857	5.18	547.86	159.79	0.49
Reach-1	2000	2839.00	1343.20	1348.23		1348.64	0.001841	5.17	549.43	159.88	0.49
Reach-1	1900	2839.00	1343.06	1347.97		1348.44	0.002117	5.52	514.72	150.66	0.53
Reach-1	1800	2839.00	1342.87	1347.75		1348.23	0.002170	5.54	512.23	151.68	0.53
Reach-1	1700	2839.00	1342.68	1347.54		1348.01	0.002172	5.52	514.04	153.18	0.53
Reach-1	1600	2839.00	1342.48	1347.30		1347.79	0.002266	5.61	506.03	152.01	0.54
Reach-1	1500	2839.00	1342.29	1347.09		1347.56	0.002203	5.48	517.69	157.70	0.53
Reach-1	1400	2839.00	1342.10	1346.85		1347.33	0.002299	5.57	510.15	156.96	0.54
Reach-1	1300	2839.00	1341.90	1346.59		1347.09	0.002455	5.67	500.62	157.29	0.56
Reach-1	1200	2839.00	1341.70	1346.32		1346.83	0.002802	5.71	496.90	170.54	0.59
Reach-1	1100	2839.00	1341.53	1345.90		1346.51	0.003287	6.27	452.96	152.49	0.64
Reach-1	1001	2839.00	1341.34	1344.54	1344.54	1345.94	0.008307	9.52	298.36	107.37	1.01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EG PF 1
WS PF 1
Ground
Bank Sta
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Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
RS = 6200
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
RS = 6100
.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
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WS PF 1
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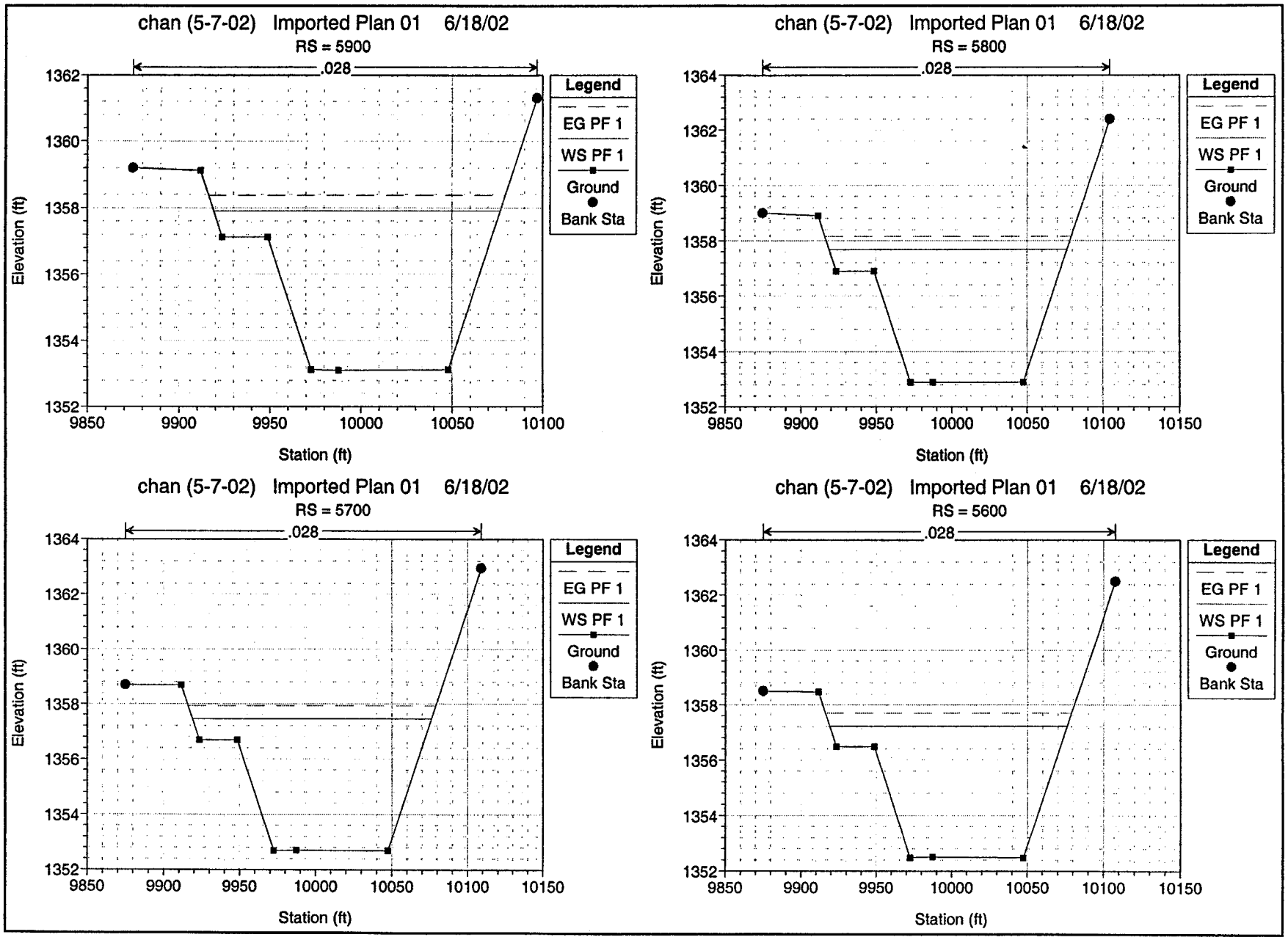
Bank Sta
Elevation (ft)
Station (ft)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Ground
Bank Sta
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Station (ft)
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
RS = 5700
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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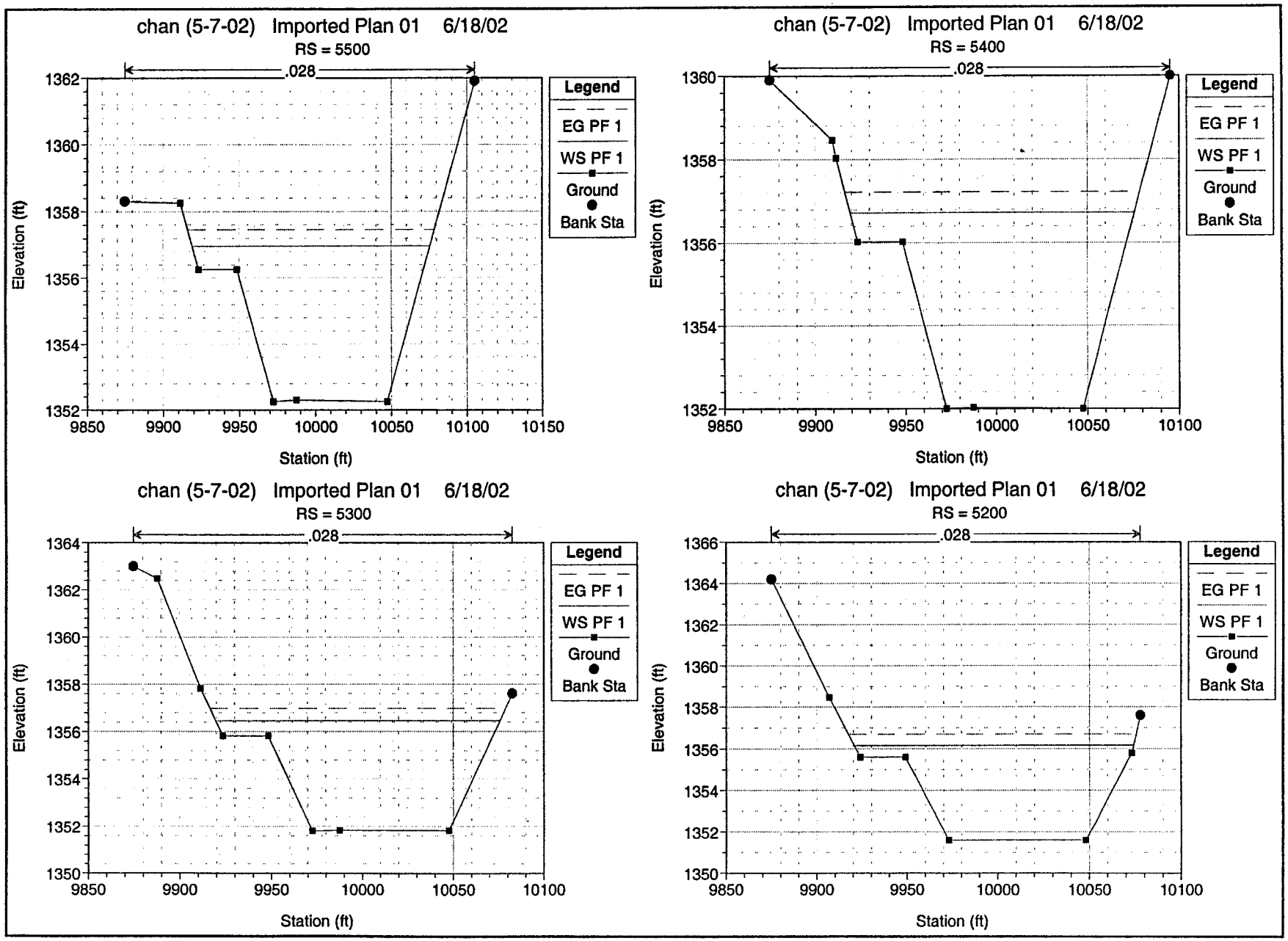
Ground
Bank Sta
Elevation (ft)
Station (ft)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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Ground
Bank Sta
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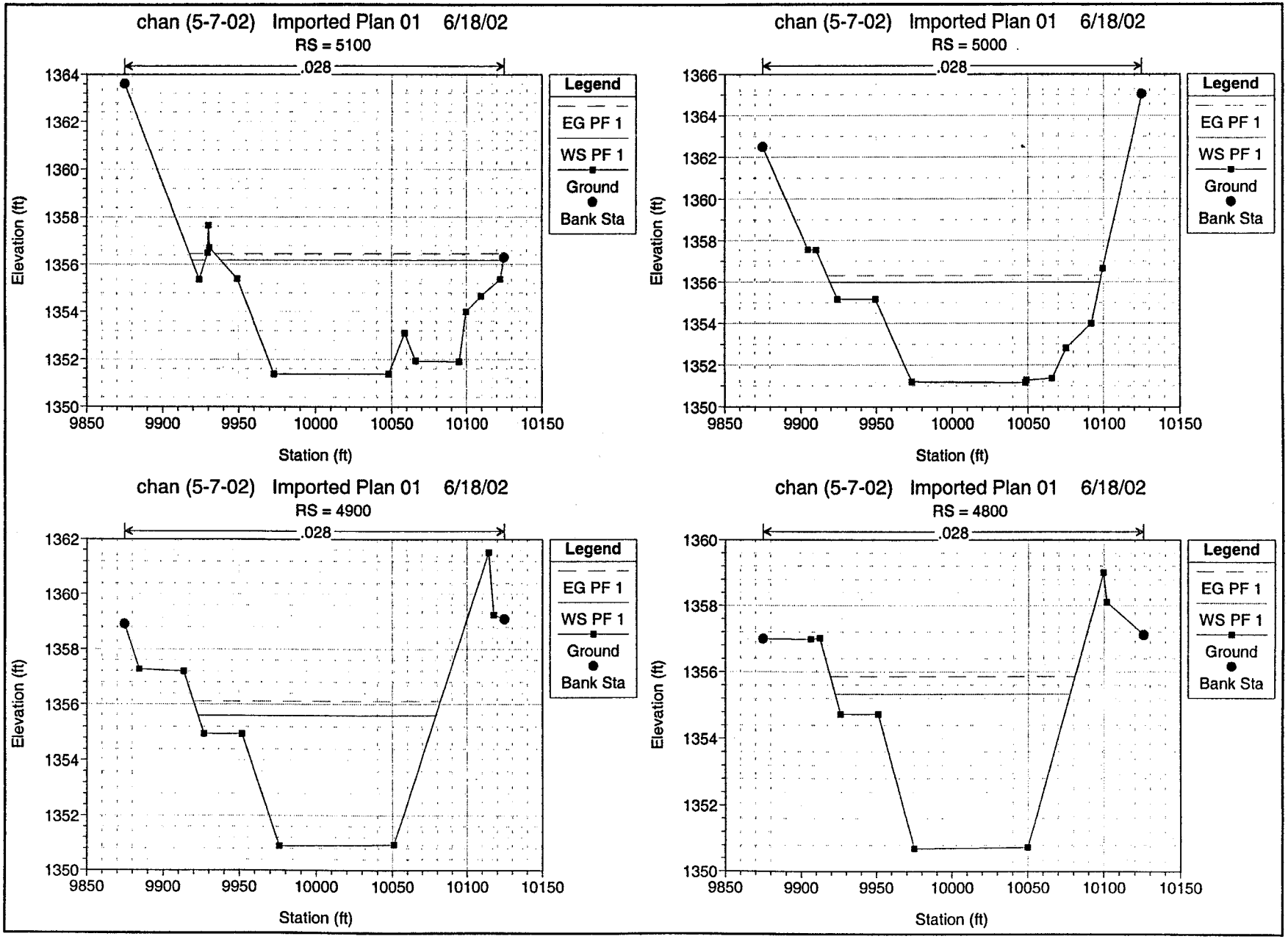
Station (ft)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Ground
Bank Sta
Elevation (ft)
Station (ft)
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Elevation (ft)
Station (ft)
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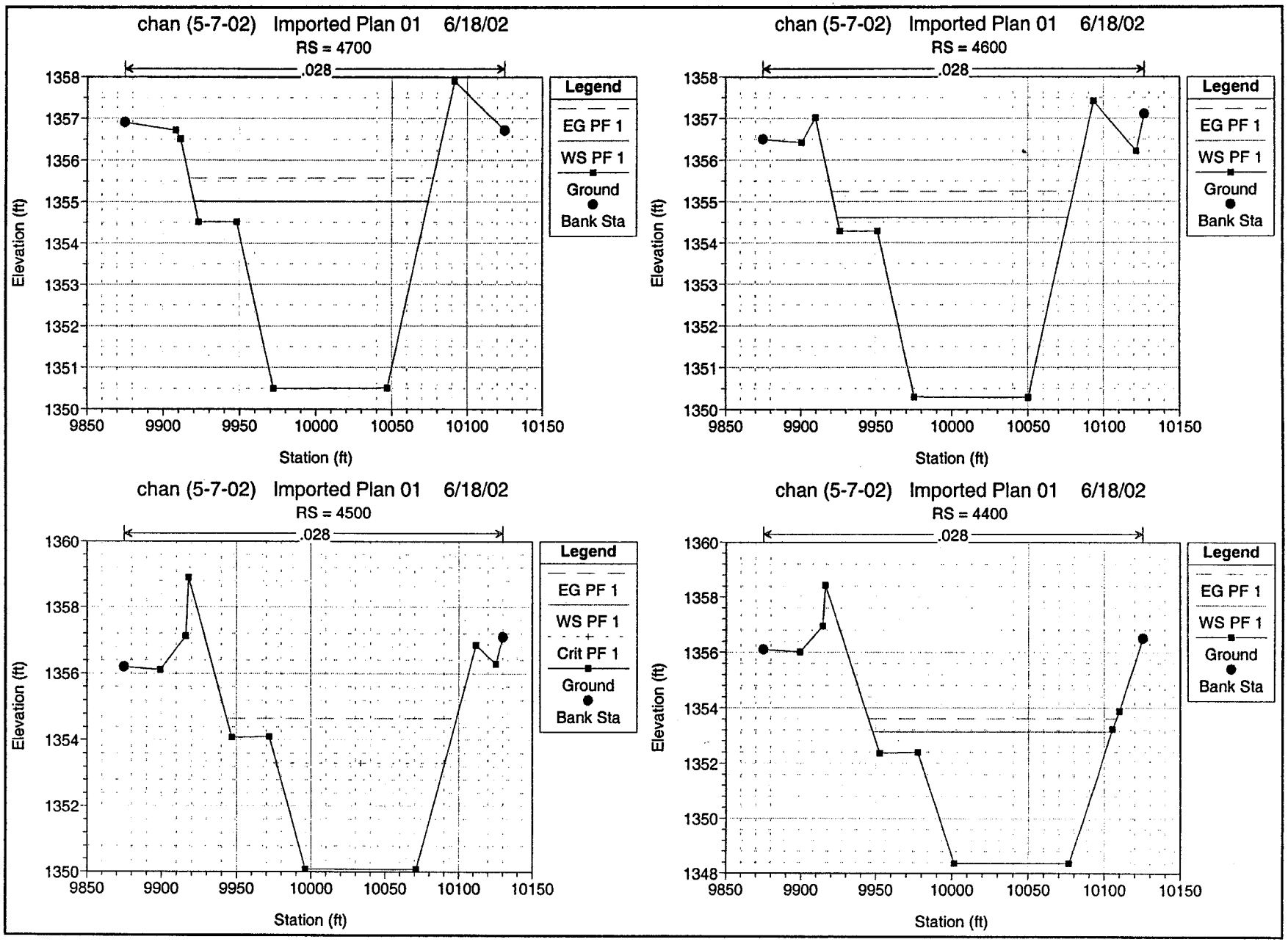
Bank Sta
Elevation (ft)
Station (ft)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.028
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
RS = 4500
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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WS PF 1
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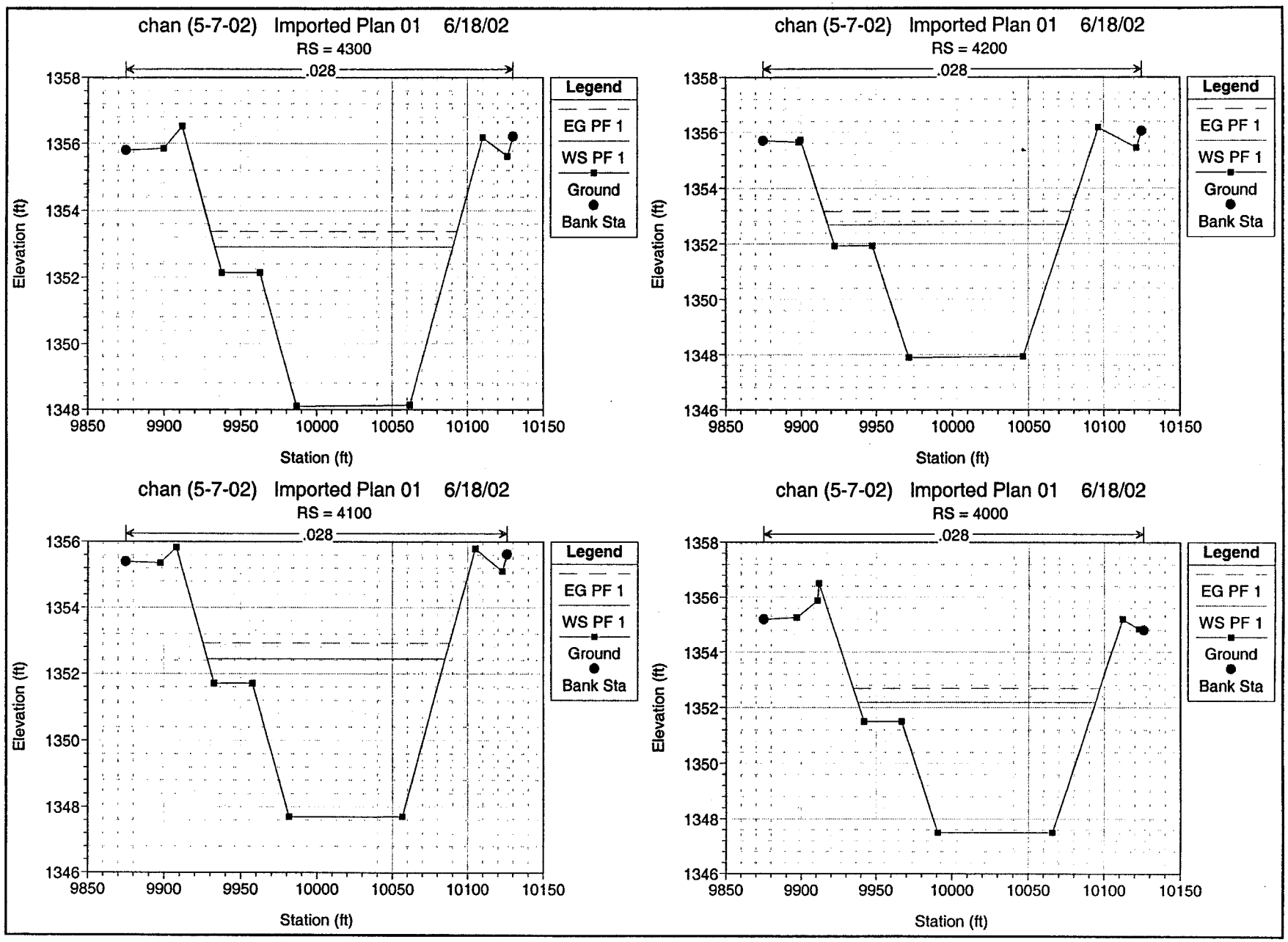
Bank Sta
Elevation (ft)
Station (ft)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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
RS = 4100
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WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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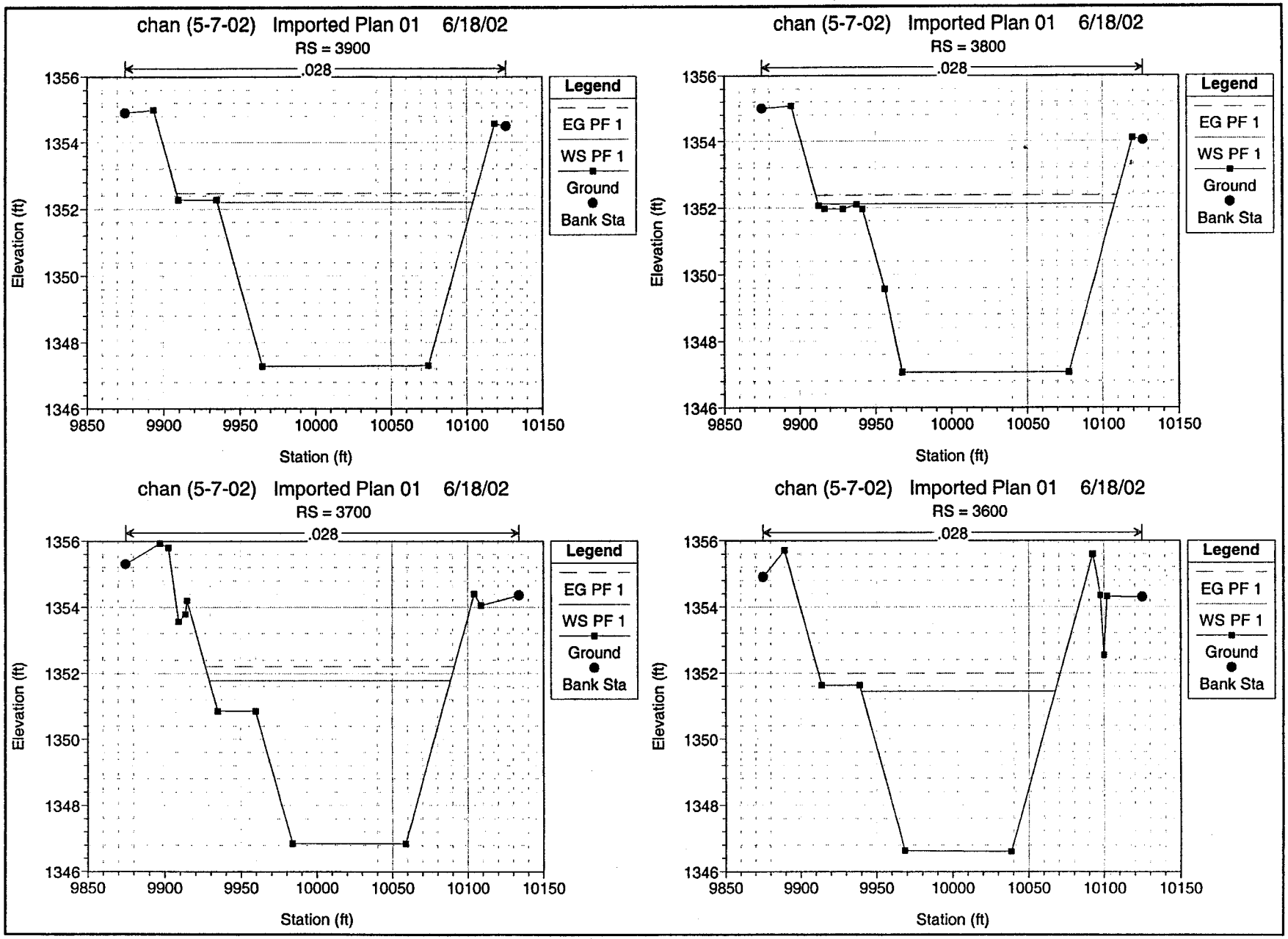
Station (ft)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EG PF 1
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Bank Sta
Elevation (ft)
Station (ft)
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EG PF 1
WS PF 1
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Bank Sta
Elevation (ft)
Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
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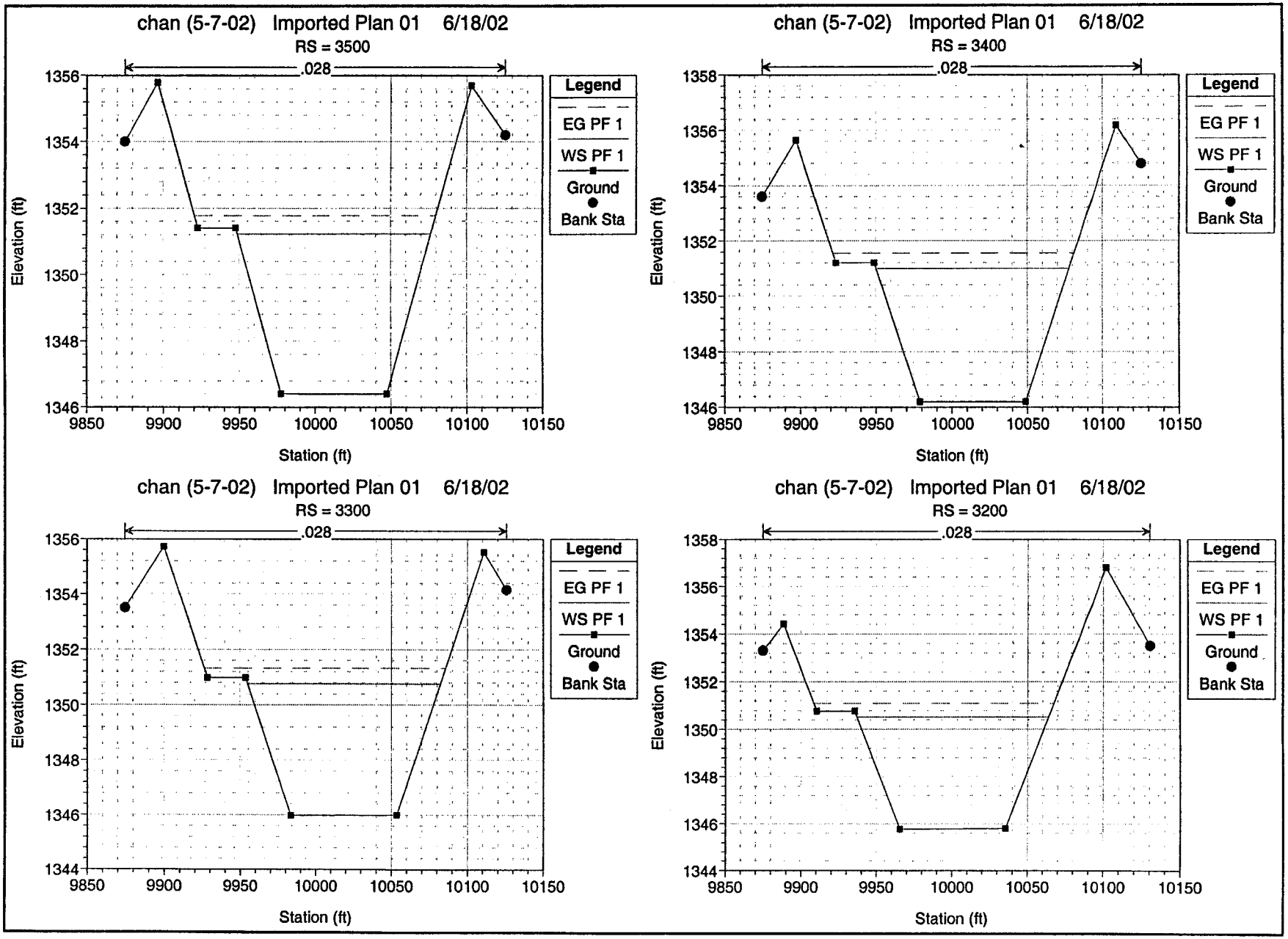
Elevation (ft)
Station (ft)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EG PF 1
WS PF 1
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Elevation (ft)
Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
RS = 3300
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Ground
Bank Sta
Elevation (ft)
Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
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Bank Sta
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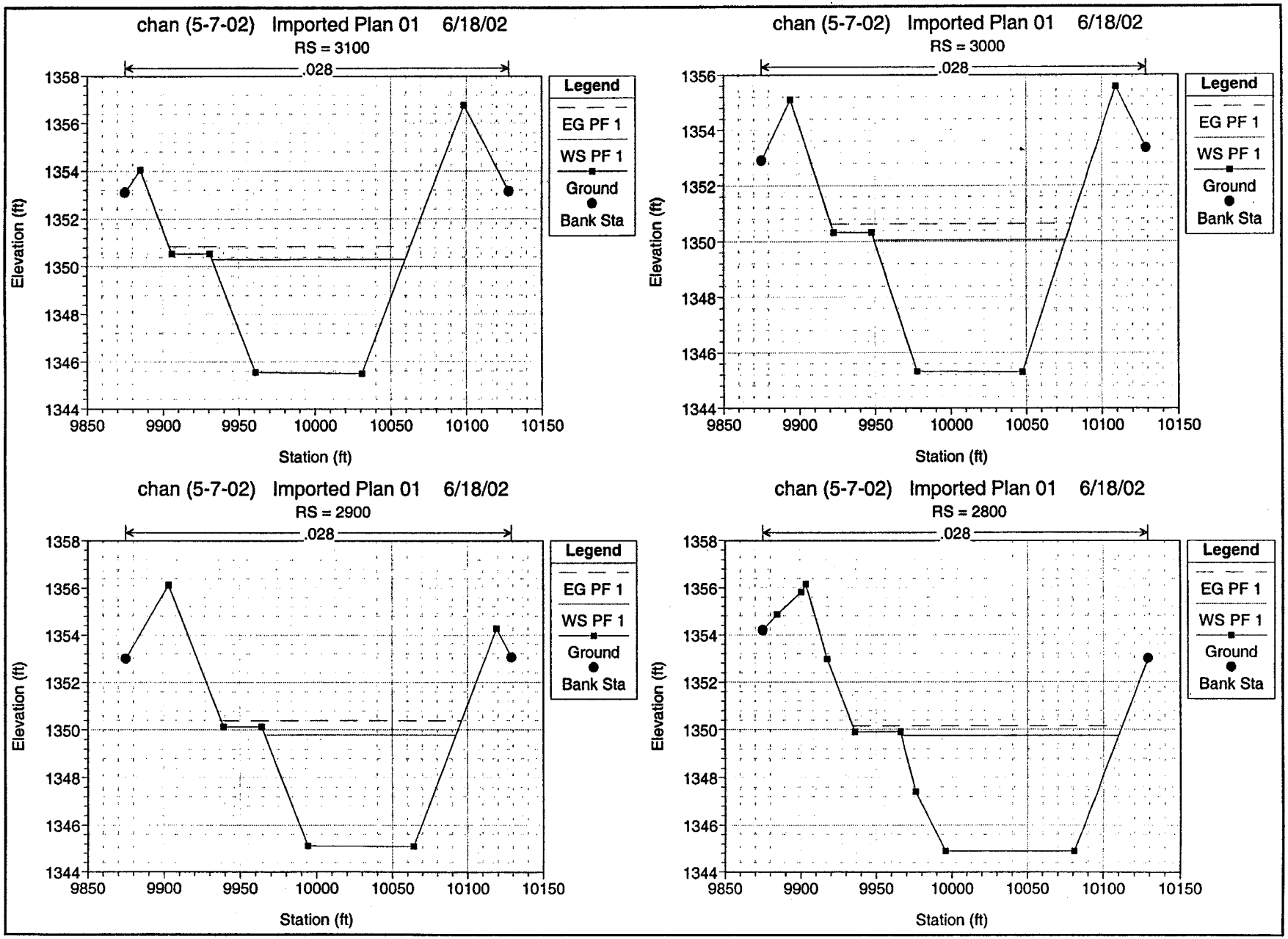
Station (ft)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Station (ft)
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Legend
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WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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RS = 2900
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Legend
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WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
chan (5-7-02) Imported Plan 01 6/18/02
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Bank Sta
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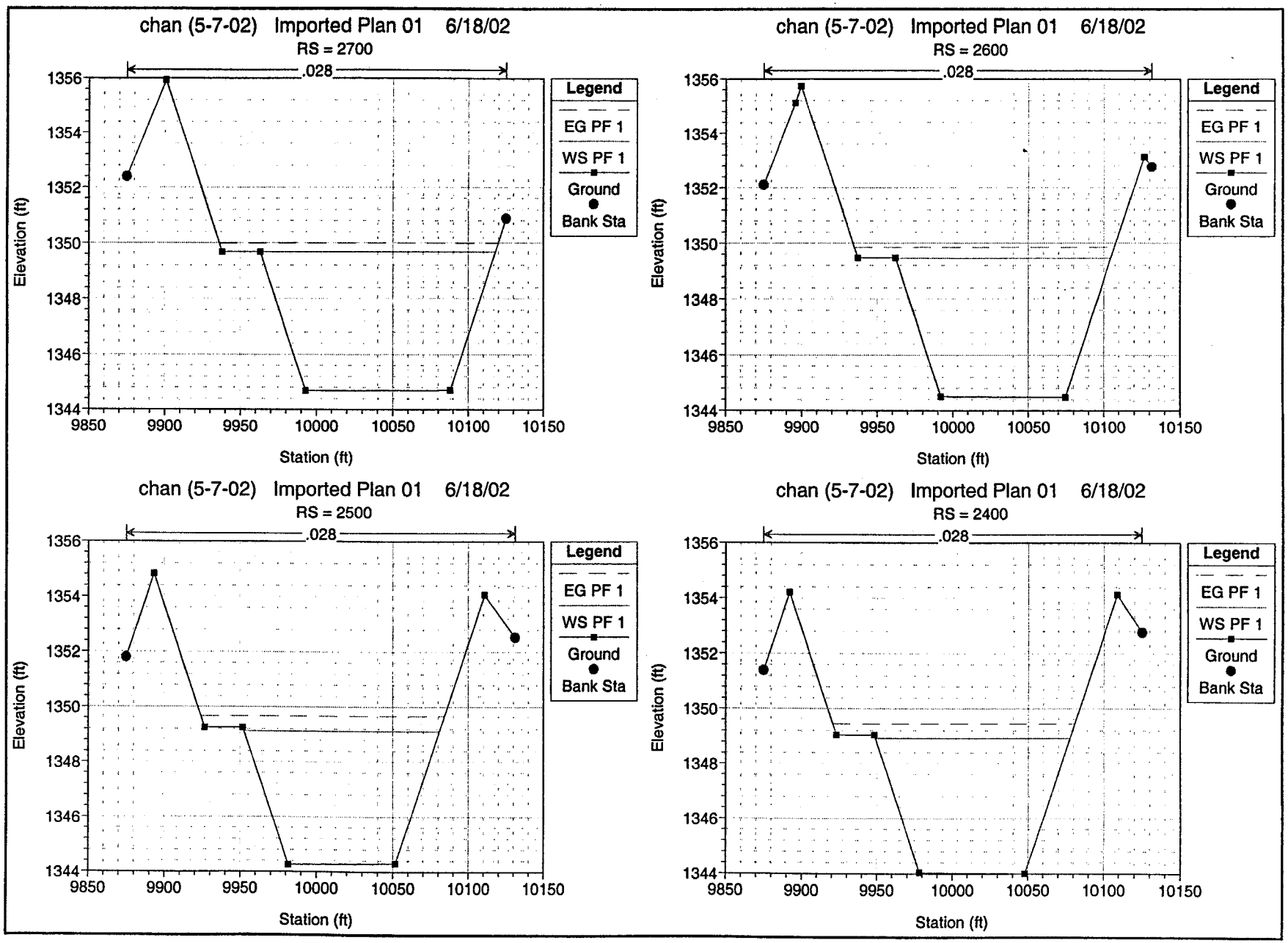
Station (ft)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Elevation (ft)
Station (ft)
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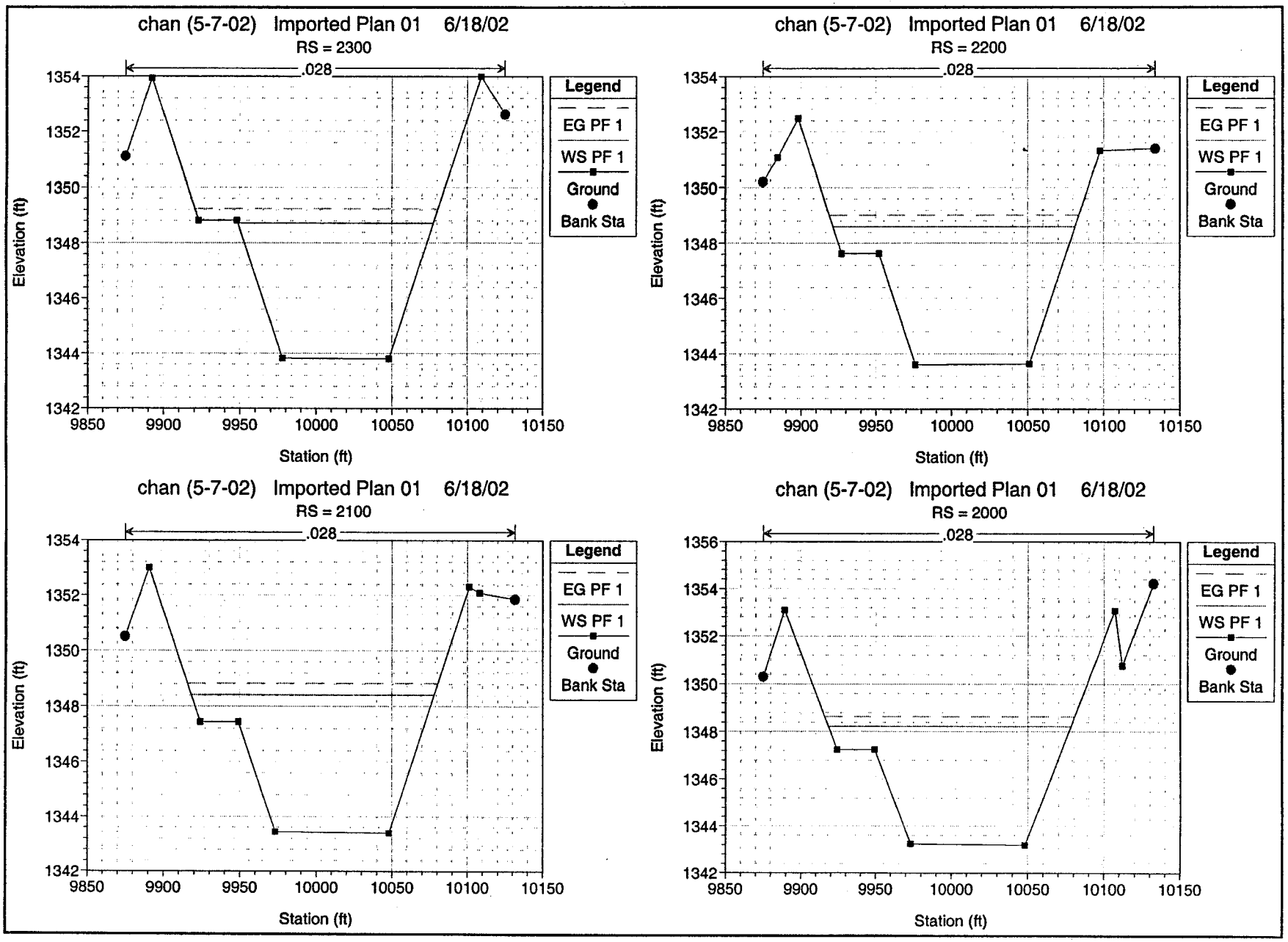
Station (ft)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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
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chan (5-7-02) Imported Plan 01 6/18/02
RS = 2100
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Bank Sta
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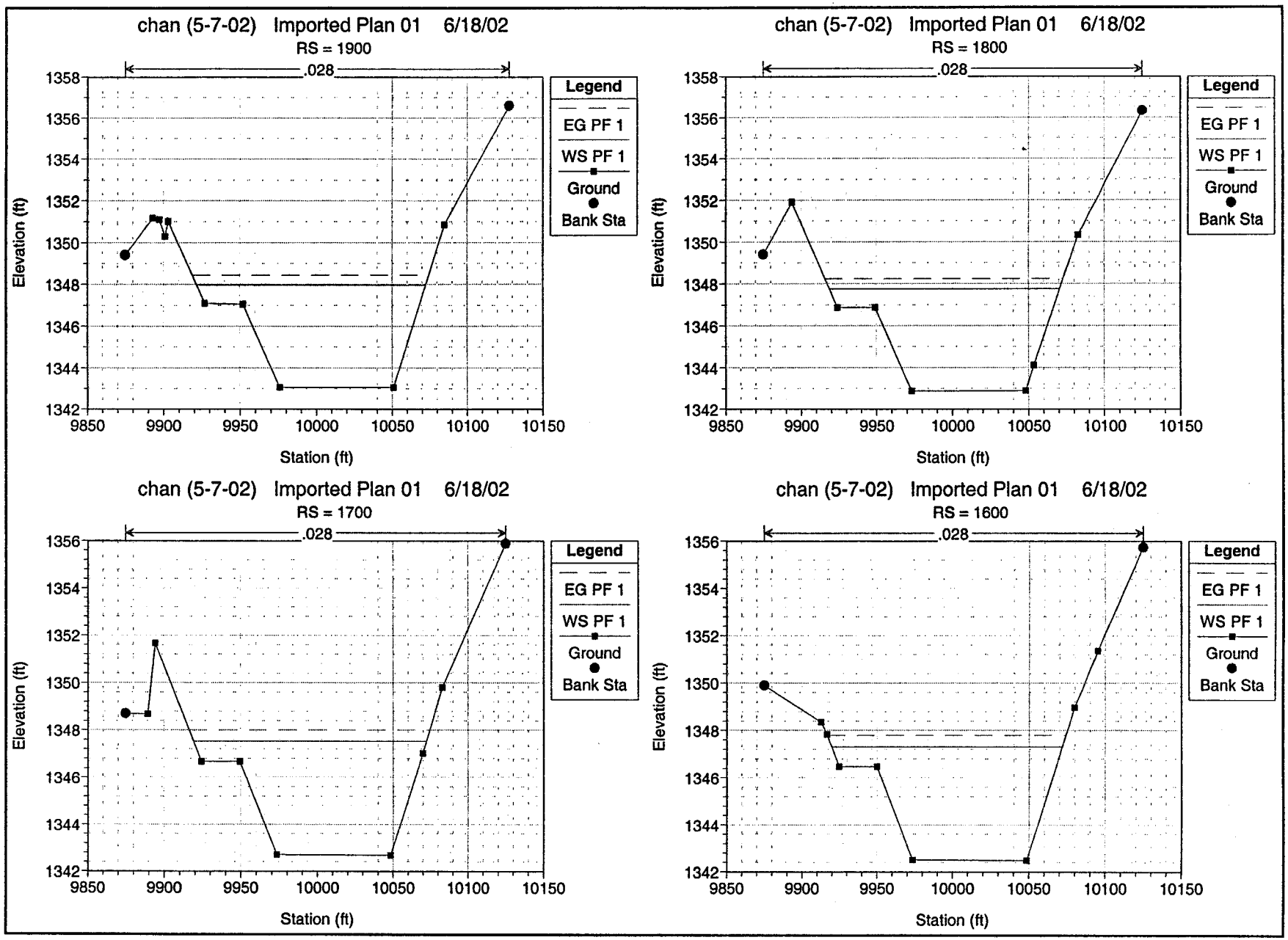
Station (ft)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Ground
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Station (ft)
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Legend
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WS PF 1
Ground
Bank Sta
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Station (ft)
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Legend
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WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Ground
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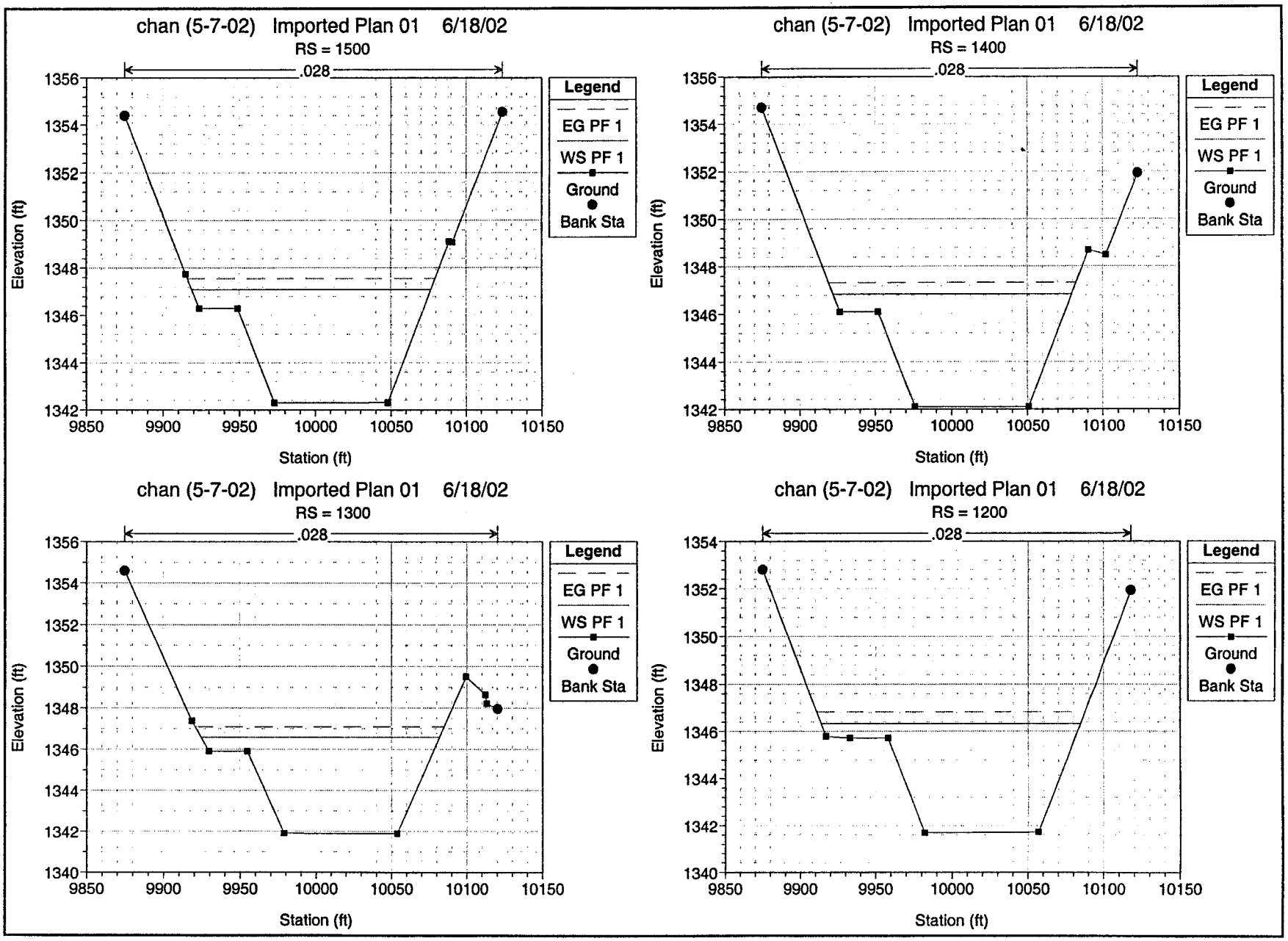
Station (ft)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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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Legend
EG PF 1
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Elevation (ft)
Station (ft)
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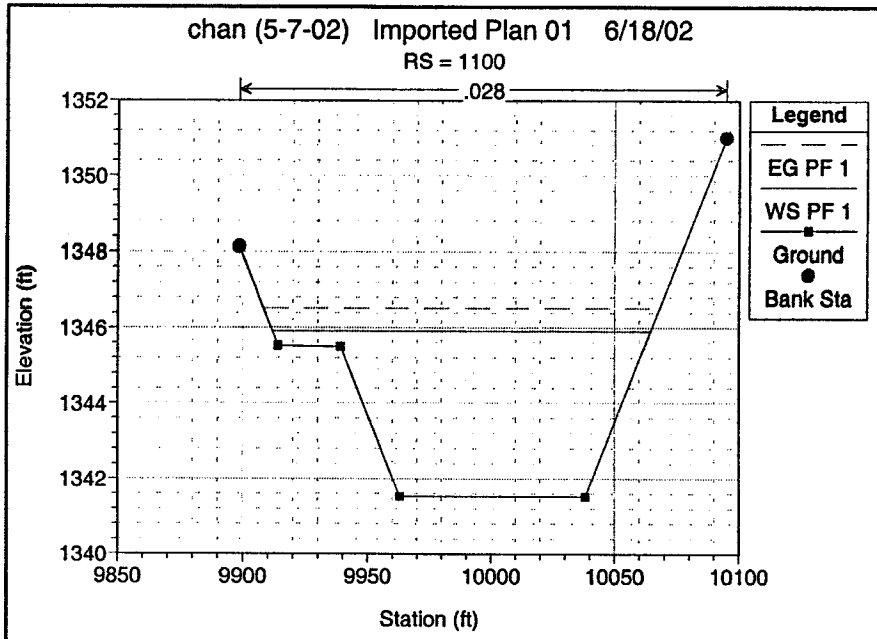
Station (ft)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10050
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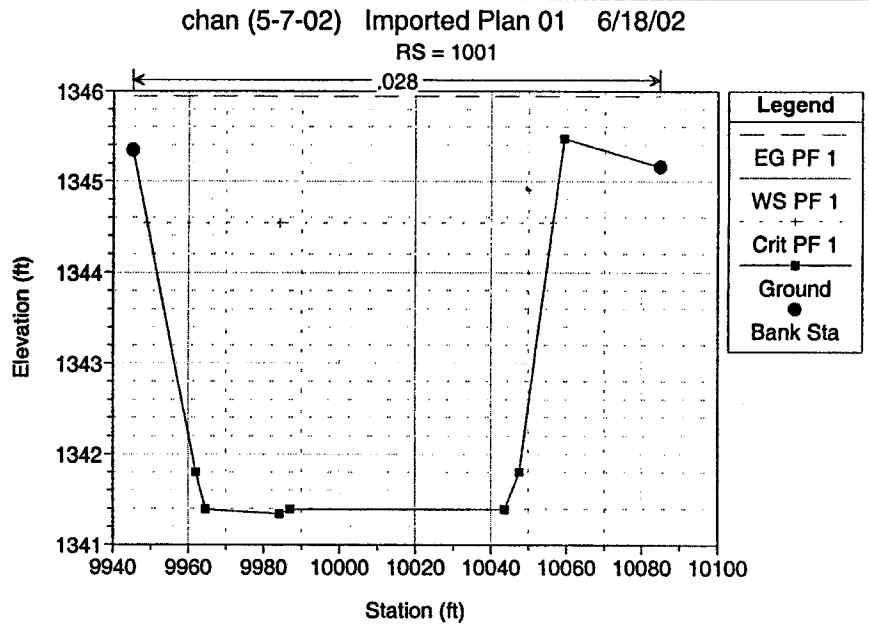
Station (ft)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta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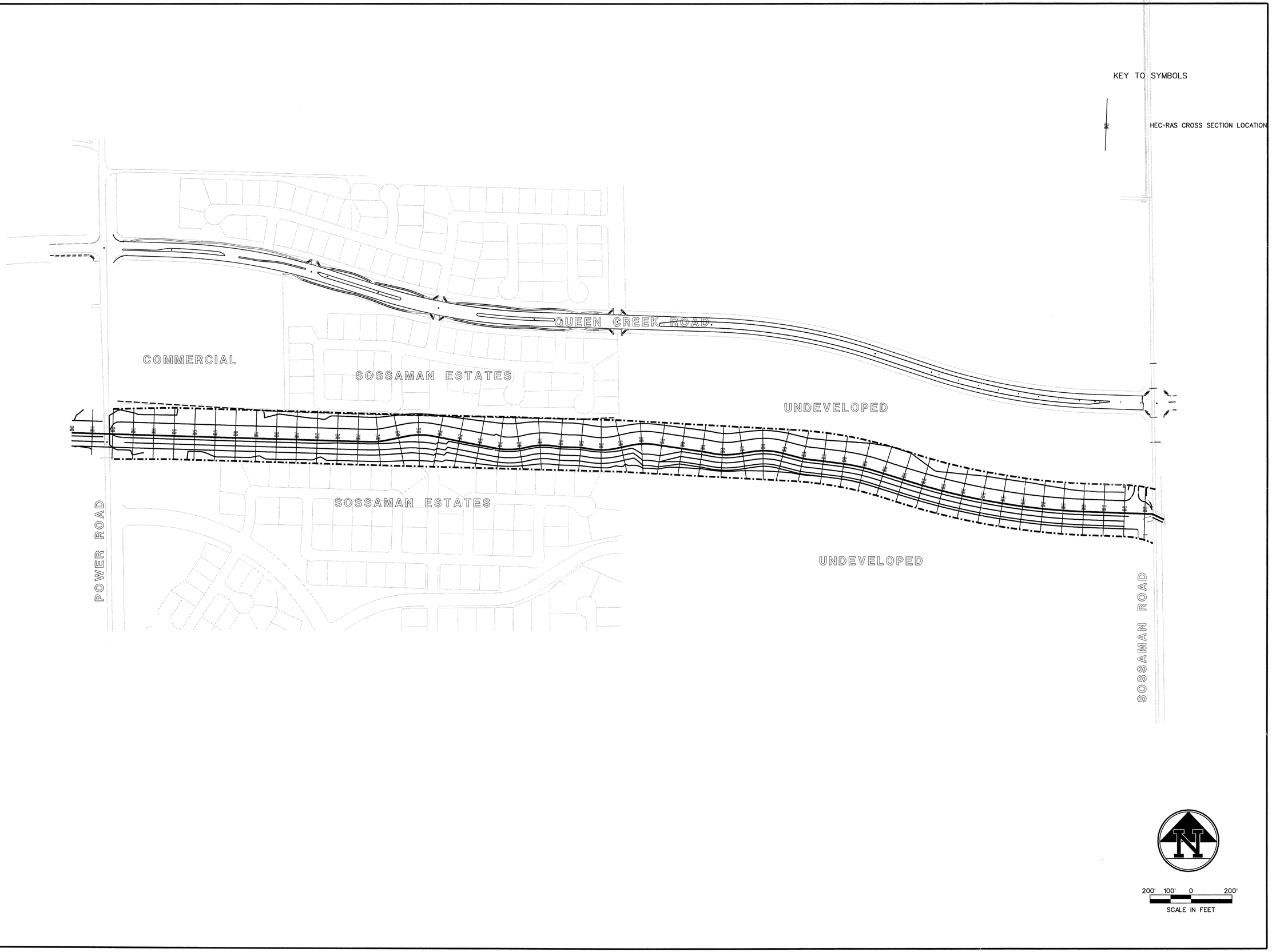
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

PLATES



QUEEN CREEK CHANNEL

COE & VAN LOO
PLANNING•ENGINEERING•LANDSCAPE ARCHITECTURE

HEC-RAS LOCATION MAP

4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

JOB NO.
000044-03

PLATE
1