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

PRE-DESIGN REPORT

Prepared for:
TOWN OF QUEEN CREEK

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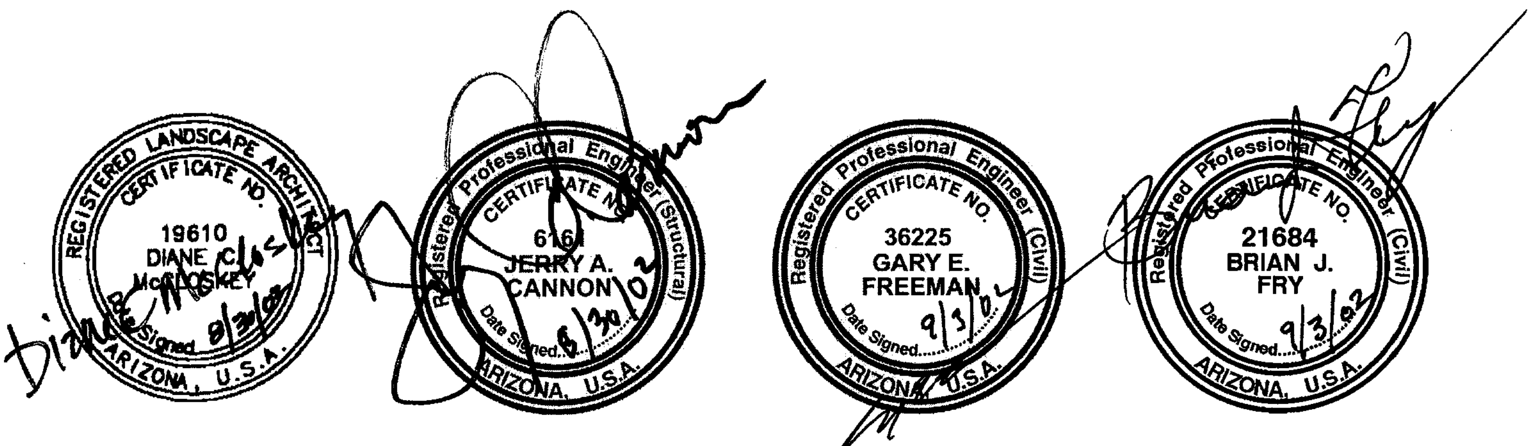

Seal applies to Chapter VII- *Landscape Concept.*

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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

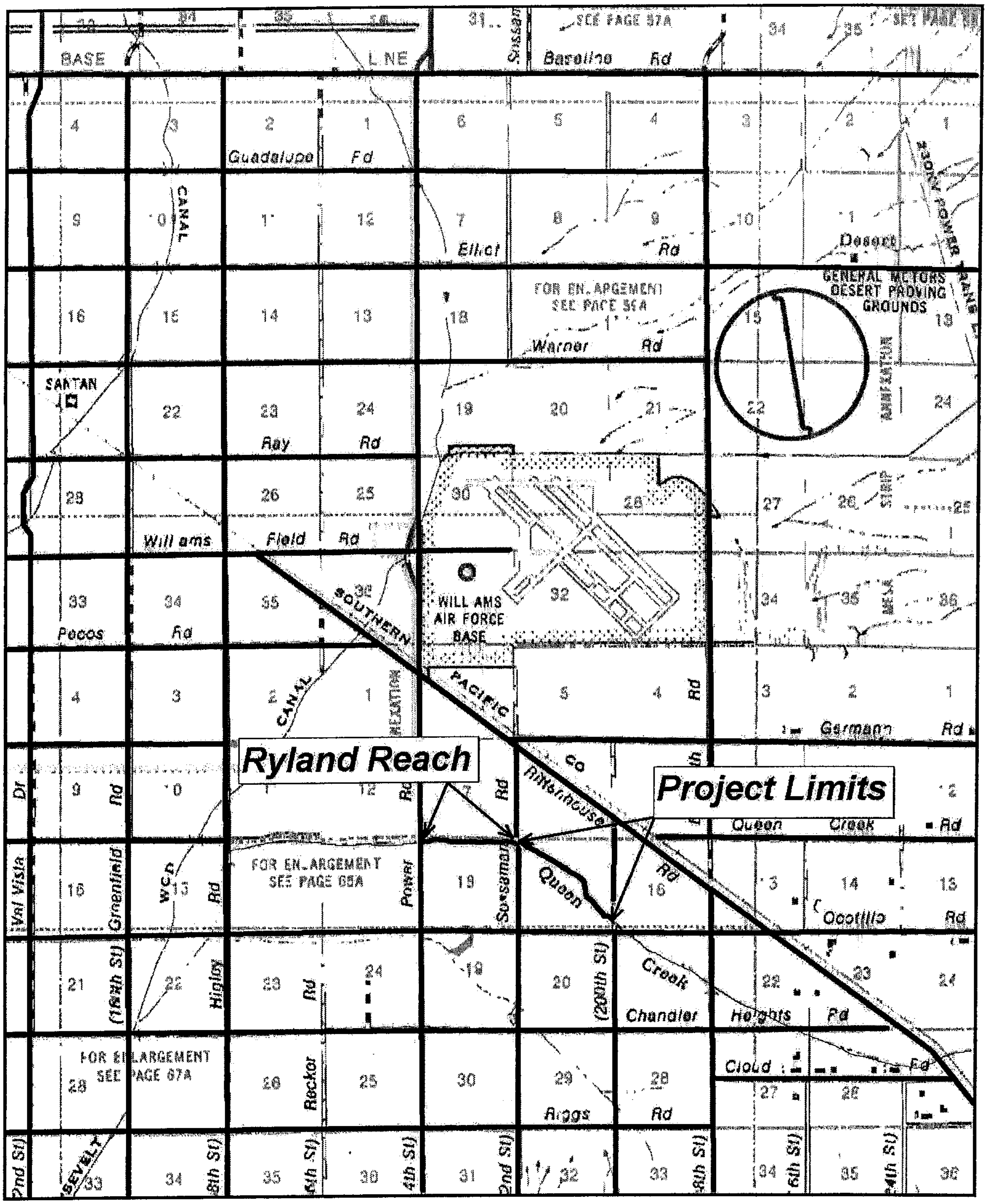


Figure 1- Project Location

"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**.

The project design criteria set forth at project startup dictated that the proposed improved channel be stable with respect to sediment transport, that the design eliminate the existing berms on both sides of the wash, and that the proposed channel have capacity for the 100-year flow rate.

B. Approach

A spreadsheet program was developed, which allowed the wash to be analyzed based on sediment transport characteristics. The spreadsheet allows the geometric and roughness characteristics to be varied by the user, and then uses those values to calculate the sediment transport capacity of the cross section.

The initial design approach incorporated a "9-point" channel cross section. A "pilot channel" was designed at the center of the cross section, which would have capacity for approximately the 2-year storm runoff, with over-bank areas designed to carry the balance of the 100-year storm runoff. When the first design iteration was completed based on sediment transport loads, the geometry of the pilot channel for most of the design reach closely resembled the geometry of the existing wash bottom.

This inspired the second and ultimate design approach- use the existing wash bottom as the pilot channel wherever possible, and design the wash "from the top, down". This will allow the existing sandy bed of the wash to remain in place, and much of the existing vegetation to be salvaged. The wash was redesigned with this approach using the new project aerial mapping and the HEC-RAS computer program. The bottom 2 feet (approximately) of the existing wash was left as-is, and over-bank areas were cut into the side slopes until the cross section had capacity for the 100-year storm. The existing berms were removed as the over-bank areas were cut into the slopes.

C. Proposed Design

Appendix E contains exhibits showing the proposed design over lain onto an aerial photograph of the wash. The pilot channel for the proposed wash will be the existing bed and will have capacity for approximately the 2-year storm runoff. The over-bank areas are level. The slopes connecting the over-bank areas to existing ground are generally 6:1 (h:v).

There are locations along the wash where constraints dictate that no over-bank area be constructed. Attempts were made to keep impacts to these areas to a minimum, however, steep existing side slopes are flattened in the proposed design to be no steeper than 4:1.

The first of these locations occurs along the south side of the wash, from approximately station 65+00 through station 80+00. The design constraint in this instance is the existence of residential properties along the south bank of the wash. These residences are in unincorporated Maricopa County. Some of these properties actually extend out into the wash. In lieu of taking right-of-way in order to construct the southern over-bank through this reach, the proposed design simply flattens the side slopes from 1:1 or steeper in some locations, to a slope no steeper than 4:1, and no flatter than 6:1. The over-bank area along the north side of this reach has been widened to make up for the lost conveyance area.

The second location occurs beginning at approximately station 108+00 through station 117+00, in the Arroyo de la Reina development. The design constraint at this location is the existing development that is occurring along both sides of the wash. A 90' wide drainage easement exists through Arroyo de la Reina for the wash. In addition, a 20' public use easement exists immediately adjacent on the north to the 90' easement, and a 15' "buffer" exists immediately south of the 90' easement. The proposed design attempts to remain completely within the 90' drainage easement and the 20' public use easement. Once again, however, steep existing slopes will be flattened to 6:1, and encroachment into the 15' buffer does occur.

The paved maintenance road is planned run parallel to the wash along the top of the south bank from station 50+00 (Sossaman Road) to station 63+00. As the maintenance road approaches the residences in the unincorporated county island, it will cross over from the south side to the north side. It remains along the top of the north bank until it reaches the Arroyo de la Reina development at station 108+00. Due to limited right of way through this reach, the maintenance road transitions down to the proposed north over bank area, where it remains until it reaches Hawes Road. Access will be provided to the maintenance road both above and below the bridge at Hawes Road and the proposed bridge at Sossaman Road.

V. SEDIMENT TRANSPORT AND SCOUR

An inspection of Queen Creek Wash from Power Road to Hawes Road indicates the creek is relatively stable in its current configuration however the channel is constrained and filled with dense vegetation below Sossaman Road. A site inspection by a team of WEST and Dibble personnel indicated no apparent vertical instabilities in the reach. The team walked the reach from Hawes Road to Power Road inspecting the vegetation, channel and banks. The reach appeared to be stable with the exception of bank erosion along the south bank of the County Island in the western half of section 17 between Hawes and Sossaman Roads.

The existing channel from Sossaman Road to Hawes Road (Dibble Reach) is less constrained than the channel from Power Road to Sossaman Road (Ryland Reach). The existing base of the channel is wider and levee heights are, for the most part, lower. The channel contains a large amount of vegetation but less than the upstream portion of the Ryland section which is currently densely vegetated. The vegetation consists primarily of desert wash vegetation with large areas of bare sand bed. The vegetation has a significant impact on flow in the channel and may direct flows towards the banks and other areas where vegetation is less dense. Currently flow paths exist between the vegetated areas but over time some clearing or adjustment in levee heights may be necessary to insure channel capacity.

Bank protection has been previously installed along portions of the north and south bank of the wash and will likely be necessary in the current project to protect homes built adjacent to the wash and on bends where vegetation is absent or not sufficient for protection.

Sediment samples were obtained for the reach from Power Road to Ellsworth Road to assist in modeling the wash. This sediment data was used in both the WEST and CVL studies as the basis for sedimentation in the wash. Sediment samples obtained by WEST for an earlier study were also used in this study to reduce the number of sediment samples necessary to describe the bed and banks of the wash. The size distribution data for the various samples are shown in **Figure 2**.

The sediment gradations are very similar between the banks and the sub-bed of the wash in areas where the sand bed is relatively shallow. This can be noted by comparing the sub-bed material (1.5-3.0 samples) with that obtained from the banks in the same areas. The bank gradations are shown in **Figure 3**. The bank and sub-bed samples obtained for this study were classed as CL, CL-ML, SC-SM or SC – all indicating the presence of clay in the samples. The banks in this area exhibit erosion features indicating that the sub-bed and banks are erodible regardless of the clay content in the soils.

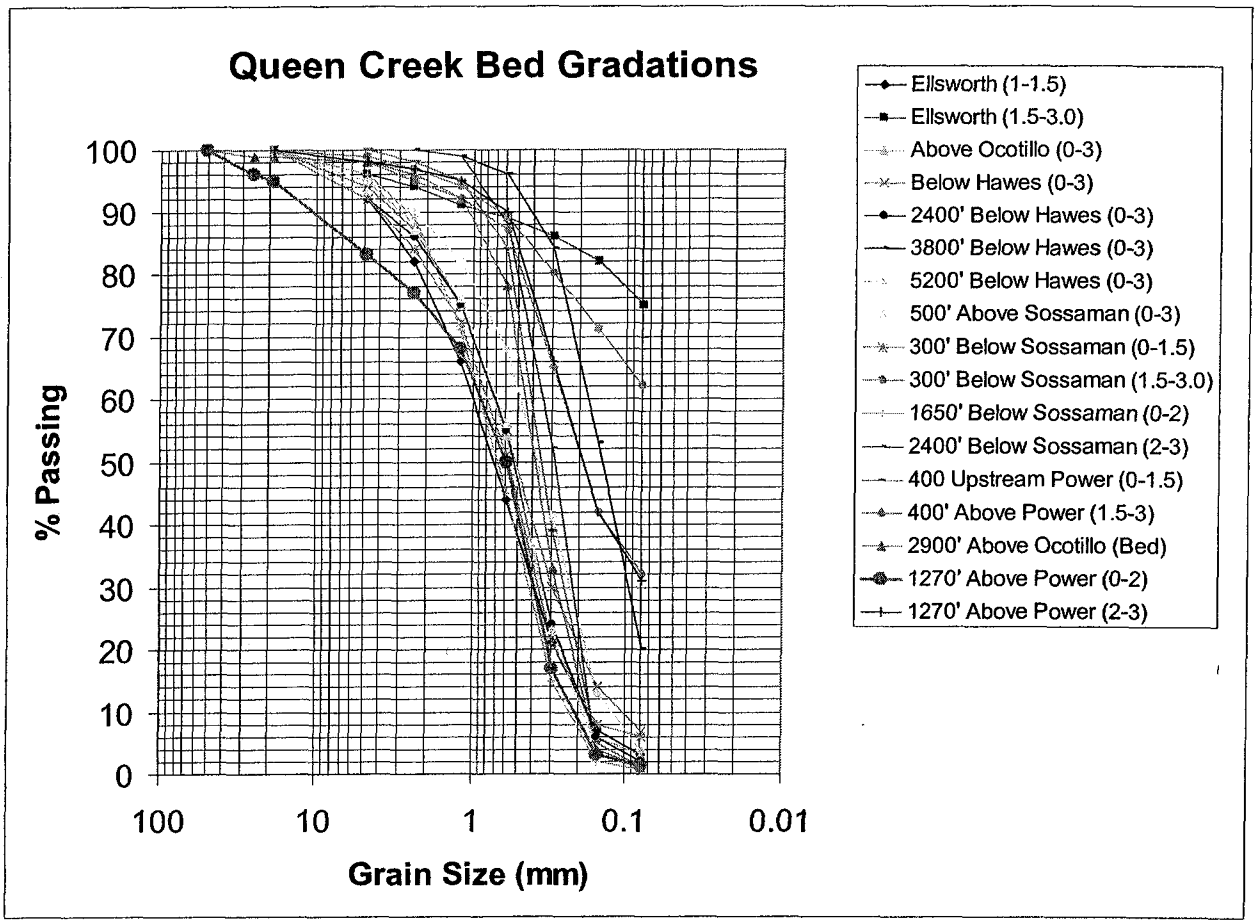


Figure 2 – Bed Gradations for Queen Creek from Ellsworth Road to Power Road. Numbers in parentheses indicate sample depth below bed in feet.

The bank and sub-bed materials are similar within a reach but vary significantly from reach. This can be shown by comparing sub-bed samples taken at Ellsworth Rd (1.5-3.0), 300' below Sossaman Rd (1.5-3.0) and 400' above Power Rd (1.5-3.0), (see **Figure 2**) which represent the parent material under the active bed of the channel. These samples can be compared with the bank gradation plots in **Figure 3**. The similarities between the sub-bed and bank material is obvious when comparing the two plots. Based on the soil samples and field observations, the sub-bed and banks appear to be less erodible than the sand bed of the channel due to the

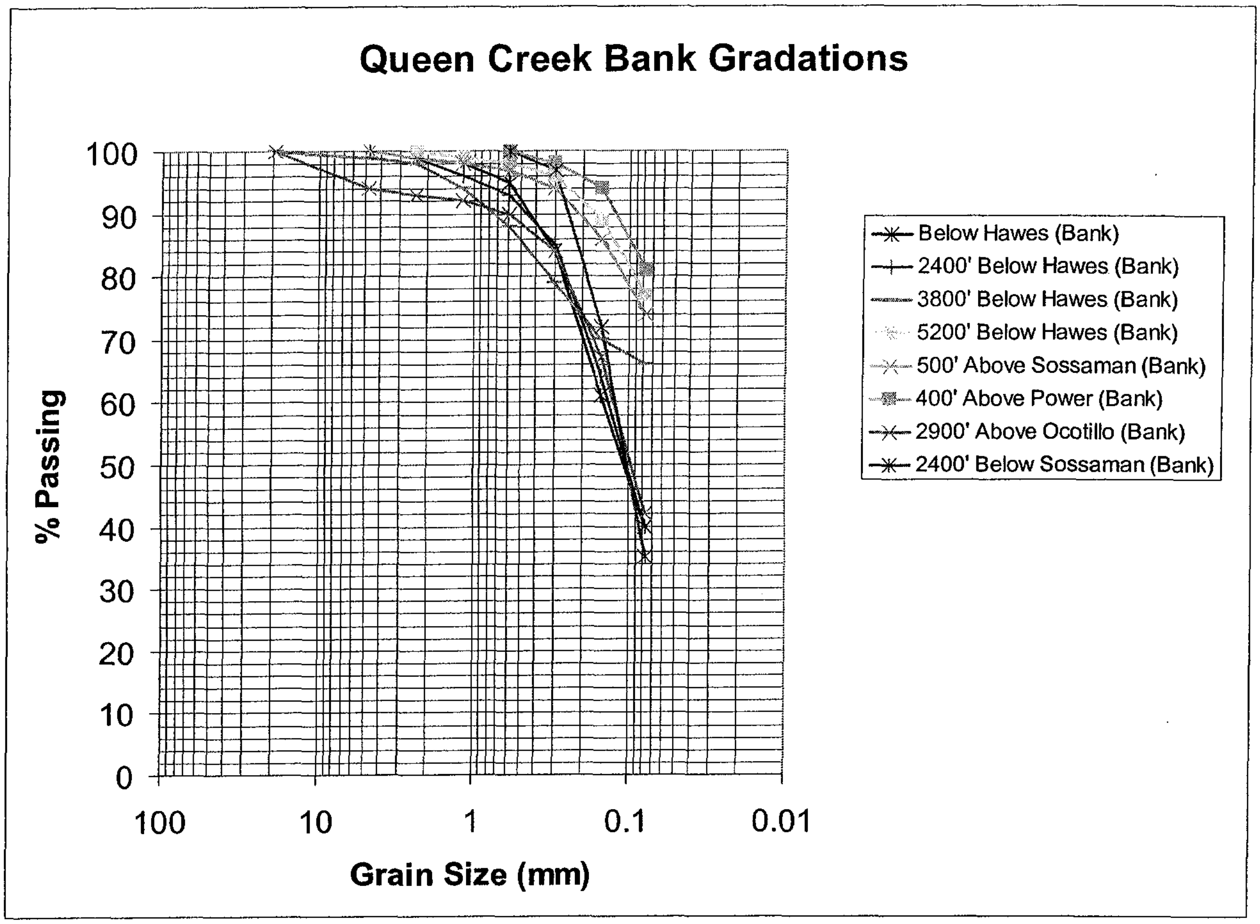


Figure 3 – Bank Gradations for Queen Creek from above Ocotillo Road to Power Road.

influence of the clay soil fractions. Based on the soil samples, erosion should be slower than that of the sand bed. Erosion of the banks during flood events could, however, be rapid and under direct attack the banks could recede at dramatic rates if not protected from erosion. In fact an eye witness account from one of the adjoining landowners indicated that just downstream of Haws road the bank retreated 40 feet or more during a single flood event. This was prior to the installation of the bank protection on the outer bank and illustrates the importance of protection for bends in the wash.

Currently there is sufficient sediment being transported into the design reach from upstream of Ellsworth and Hawes Roads to maintain a stable channel. As development continues in the area upstream from Hawes Road and sediment sources are reduced, the local sediment inflow will be reduced. This will combine with the impacts of the upstream Sanoki Flood Retention Structure (FRS) to cause a major reduction in the inflowing sediment load in the channel. At some future time, the sand in the system will likely be removed resulting in probable impacts to channel vegetation. This will result in the sub-bed being exposed to erosion unless armoring occurs within the active bed. While this condition does not appear to be imminent, it represents the probable future condition of the wash. The sand bed is important ecologically as it helps retain water for vegetation and reduces evapotranspiration below what would occur from the bare native soil, aiding in both the establishment and growth of wash vegetation.

A. Development of the Sediment Transport Model

The HEC6T software version 5.13.15 was used to analyze the sediment transport characteristics of the designed channel for Queen Creek Wash for the 2, 5, 10, 25, 50 and 100 year events. An HEC-6T model was developed based on the HEC-RAS model provided to WEST by Dibble. The cross-section locations and the river-station numbering were converted from the HEC-RAS model and used as the geometry input for the sediment model. Since HEC-6T does not provide a straightforward method of inputting the cross-sections at the bridge and culverts, the cross-sections at these locations were modified so that they approximated the presence of the bridges and culverts. The other related data such as the reach-lengths, bank station locations and expansion/contraction coefficients were also based on the values used in the HEC-RAS model. The Manning's n values were based on those used in the HEC-RAS model. In order to analyze the sensitivity of the model to changes in roughness values the supplied Manning's n values were varied in the reach between Hawes Road and Power Road.

The HEC-6T model was developed using a supply reach rather than a equilibrium inflowing sediment load. This methodology gives an idea of the impact a clear water inflow has on existing bed elevations but features a sufficiently long model segment upstream of the design reach to allow the model to reach equilibrium transport conditions prior to flows reaching the area of interest. The impact of a clear water inflow on the design reach can be approximated by noting the lowering of the thalweg by about 3 feet at the far left side of **Figure 4** for the 100-year flood.

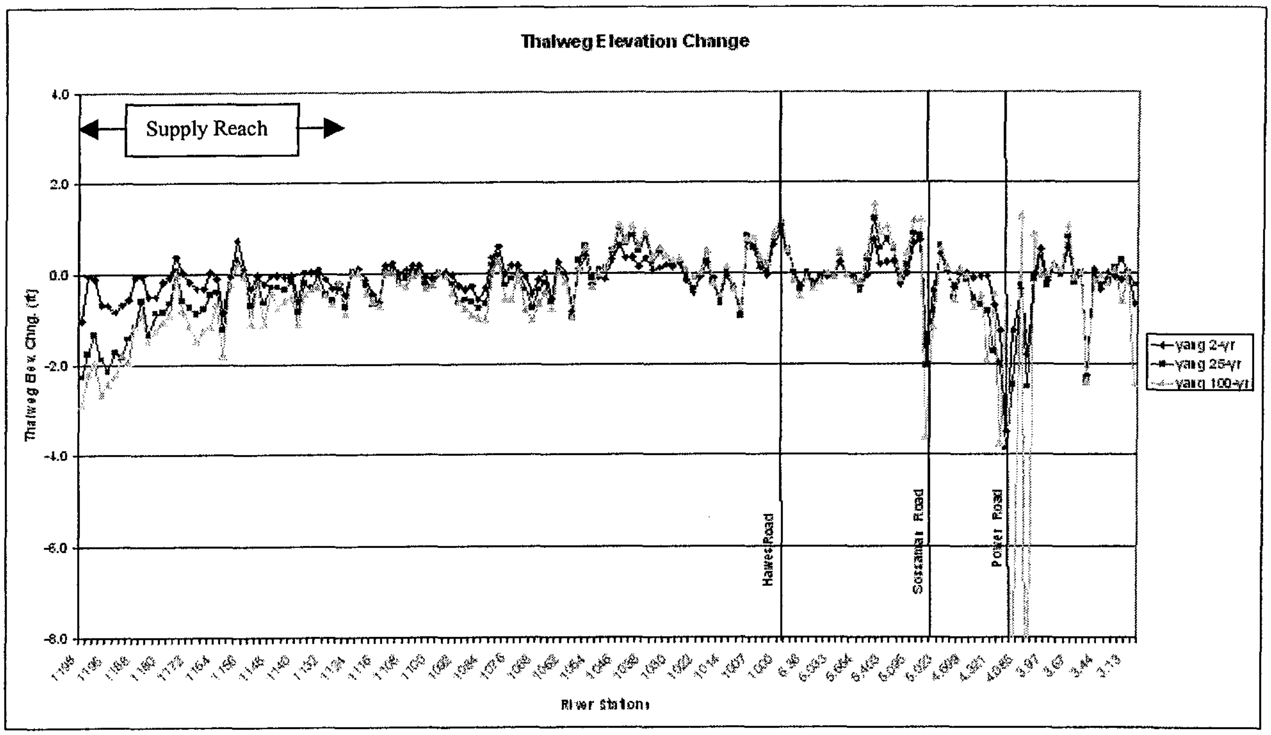


Figure 4- Thalweg Elevation Change for 2, 25 and 100 Year Flood for Existing Conditions.

The Manning's n value for a bare sand bed with gradations typical of those in the Dibble Reach is approximately 0.018. This very low n value yields a higher velocity and a lower slope for channel stability. The vegetation in the wash, however, increases the roughness significantly and it is estimated that the n value in the wash is currently 0.035 or higher. The vegetation is currently estimated to cover more than 50% of the wash in some areas. Since the current design anticipates leaving the current wash bed undisturbed with the existing vegetation, it can be anticipated that the Manning's n value for the wash will not be the 0.018 predicted for the bare sand bed. Only if all of the vegetation were to be removed from the channel would the n value fall to near the 0.018 range. Given the current plans for the wash it is anticipated that vegetation will be preserved in the wash and the Manning's n value kept significantly above the minimum. A minimum n value of 0.020 was used for design evaluations.

HEC-6T has the capability to use a number of different sediment transport equations to perform the modeling. The Corps of Engineers software SAMAID which is a part of the U.S. Army Corps of Engineers SAM software package was used to determine the appropriate equation for the Queen Creek Wash. The results from the SAMAID software indicated that the most appropriate equations were: 1) Van Rijn, 2) Yang and 3) Ackers-White equations. HEC-6T does not have the capability to use Van Rijn Equation and the Yang equation was therefore chosen as the best available equation with which to model sediment transport in this study. The Ackers-White equation was used for comparison.

For the model analysis it was assumed that an unlimited supply of bed sediment exists in the wash and the depth of the sediment available for erosion was set to 10 ft to view how far the bed would scour based on an erodible sand bed. Exceptions to the 10 ft depth would include the cross-sections near culvert locations and grade control structures. In addition, it is also assumed that the entire bed cross-section was erodible from the left bank station to right bank station (left bank toe to right bank toe).

B. Existing Channel Stability

The HEC-6T model for existing conditions showed the reach to be relatively stable in its current configuration. This further substantiated what had been noted in the field by project personnel. The expected thalweg changes due to the 2, 25 and 100 year floods are shown in **Figure 4**. It can be noted that most erosion is less than ± 1 foot with the exception of the very upstream (left) end of the model (the supply reach) and the lower end of the model in the Power Ranch Reach where the channel has been extensively modified.

The large scour values at the right side of **Figure 4** are due to the existing bridge at Power Road which is scheduled for replacement. This area of erosion is due to the constriction at the existing bridge. The replacement of this bridge will reduce scour in this area and when the new bridge geometry was input into the HEC-6T model the erosion at Power Road was reduced to approximately two feet for the 100-year flood.

The scour depths reported above assume a continuing supply of bed material from upstream portions of the wash combined with low Manning's n values of at least 0.020. For higher n values that represent vegetated conditions scour depths are lower. Currently there is sufficient sediment being transported into the design reach from upstream of Ellsworth and Hawes Roads to maintain a stable channel. As development continues in the area upstream from Hawes Road and sediment sources are reduced, the local sediment inflow will be reduced. This will combine with the impacts of the upstream Sanoki Flood Retention Structure (FRS) to cause a major reduction in the inflowing sediment load in the channel. At some future time the sand in the system will likely be removed resulting in probable impacts to channel vegetation. This will result in the sub-bed being exposed to erosion unless armoring occurs within the active bed. While this condition does not appear to be imminent, it represents the probable future condition of the wash.

C. Design Channel Analysis (DIBBLE REACH)

The stability of the channel was evaluated not only by modeling of the 100, 50, 25, 10 and 2 year hydrographs in HEC-6T but also by using empirical relationships to determine stable slopes, armoring potential and long term scour. This process was completed for both the Sossaman to Hawes reach (Dibble Reach) and the Sossaman to Power reach (Ryland Reach).

The influence of sediment transport equations was evaluated for the "original" design conditions (final Dibble Reach plus the Preliminary Ryland Reach). In **Figure 5** a plot of the bed elevation changes computed using the Yang and Ackers-White Equations are presented. This plot provides a way to compare the influence of the two sediment transport equations on the results. The results show that the bed elevations calculated using the two equations are close to each other for most of the study reach. Both equations thus give similar results for this reach of Queen Creek. If the equations gave significantly differing answers further investigation into sediment equations would be warranted.

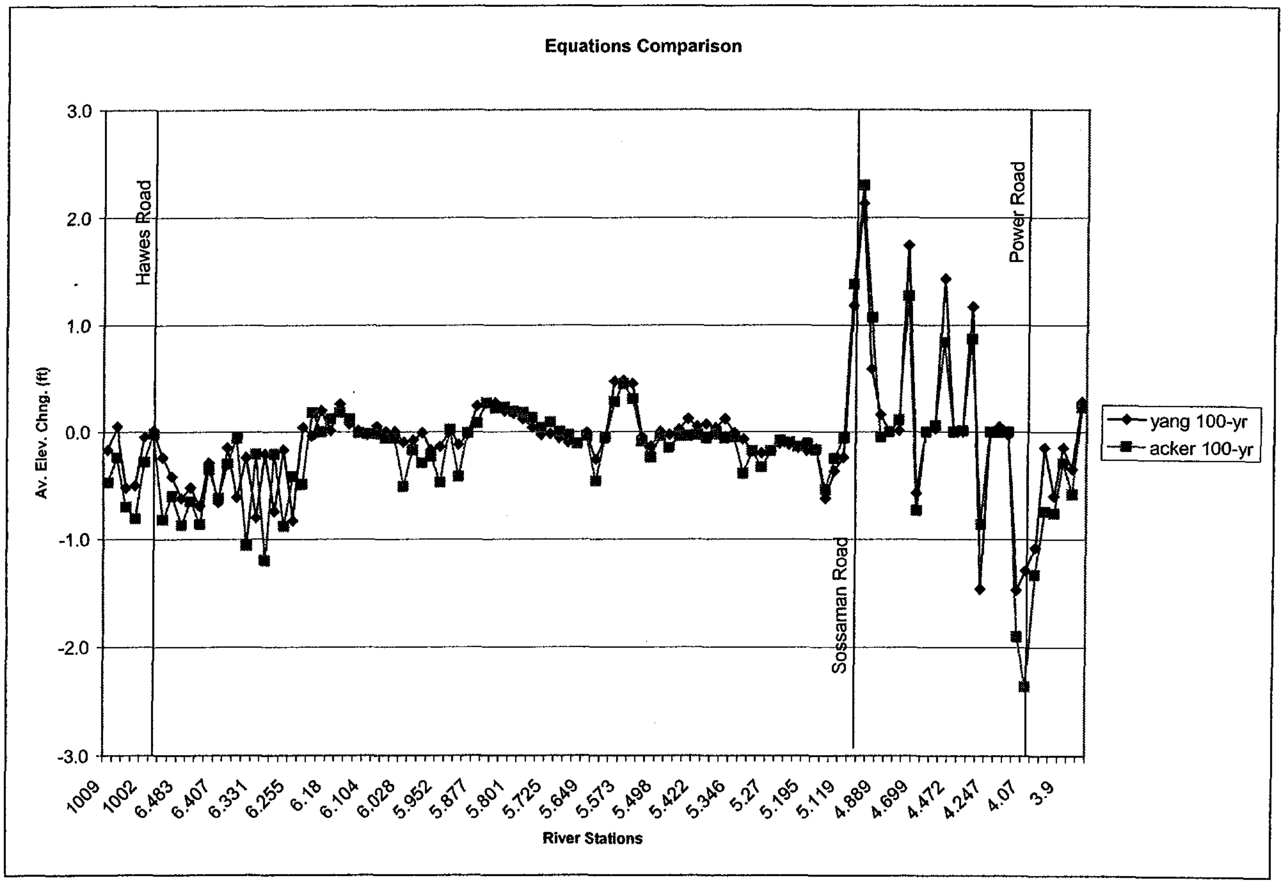


Figure 5. Yang vs. Acker-White Sediment Transport Equations for Dibble Design Reach with the Preliminary Ryland Design Below Sossaman Road.

Armoring calculations were performed using the methodology presented in Arizona Department of Water Resources State Standard 5-96. The details of the calculations are shown in **Table 5**. The calculations estimate Yd which is the scour depth at which armoring occurs. It can be noted that for low n values (0.020) the channel will armor at 4.2 ft of scour depth as shown in **Table 5** for the Dibble Reach. This is below the depth of the sand bed in some areas but not in all areas of the wash. It is expected that an armor layer sufficient to curtail erosion will form for at least the 2-25 year floods if not for all floods. The influence of Manning's n value can be seen in the comparison of the 100 year flood armor depths for varying Manning's n values in **Table 5**. In the higher n value cases the scour is significantly less and armor will develop under vegetated conditions. The maintenance of vegetation in the channel is thus important to wash stability. It should be noted that these calculations are based on channel averages and velocities between the vegetation will be somewhat higher than the average but should not be high enough to cause the system to unravel and fail.

Table 5- Table of Channel Armoring Calculations for Dibble Reach. (Hawes to Sossaman) Depth to Creation of Armor Layer is Yd.

Event	Mannings n	V (fps)	D90 (mm)	R (ft)	Grain n	f	Tau_p (lb/ft^2)	Dc (ft)	Dc (mm)	Ya (ft)	Ratio of sediment > Dc	Yd (ft)
2-yr	0.02	4.8	3	1.4	0.0146	0.022	0.122	0.025	7.7	0.08	0.04	1.8
5-yr	0.02	5.2	3	1.7	0.0146	0.021	0.139	0.029	8.8	0.09	0.035	2.4
10-yr	0.02	5.8	3	1.9	0.0146	0.020	0.164	0.034	10.3	0.10	0.037	2.6
25-yr	0.02	6.1	3	2.1	0.0146	0.019	0.176	0.036	11.1	0.11	0.033	3.2
50-yr	0.02	6.4	3	2.3	0.0146	0.019	0.189	0.039	11.9	0.12	0.03	3.8
100-yr	0.02	6.7	3	2.5	0.0146	0.018	0.197	0.041	12.4	0.12	0.028	4.2
100-yr	0.025	5.5	3	2.4	0.0146	0.019	0.137	0.028	8.7	0.09	0.043	1.9
100-yr	0.0375	4.9	3	3.1	0.0146	0.017	0.099	0.021	6.3	0.06	0.05	1.2

Figure 6 shows the sediment load in the designed channel for the 2- through 100 year flow events for the entire modeled reach. It can be seen that sediment load is near zero at the upstream end of the model. The load is set to zero at the upstream boundary to view the impacts of clear water inflow. Approximately five miles upstream from the inflow boundary of the model is the outlet of the Sonokai Flood Retarding Structure (FRS), which retards the incoming flood flows. Most of the sediment load in the wash from upstream will be deposited in the structure and not travel further down Queen Creek. The impact of the FRS and other upstream impacts are currently far enough from the upstream project limit that they will not impact the project in the immediate future. Any inaccuracy in boundary conditions in the HEC-6T model is also far enough upstream that it will not impact analysis in the Hawes to Sossaman reach of the wash. The use of this analysis does, however, give an indicator of future conditions in the wash. Degradation can be expected ultimately based on the reduction of bed material in the upper wash. For this analysis, the bed material gradations obtained from the Ellsworth Road channel sample were extended upstream to the SPRR bridge. A prior study by WEST indicates that the D84 for the channel upstream from Ellsworth coarsens significantly while the D50 and the D16 coarsen to a lesser extent as one moves up the wash towards the FRS.

The sediment load increases rapidly downstream from the clear water boundary and the curves remain approximately flat for the Dibble Reach as shown in **Figure 6**. The sudden increase and

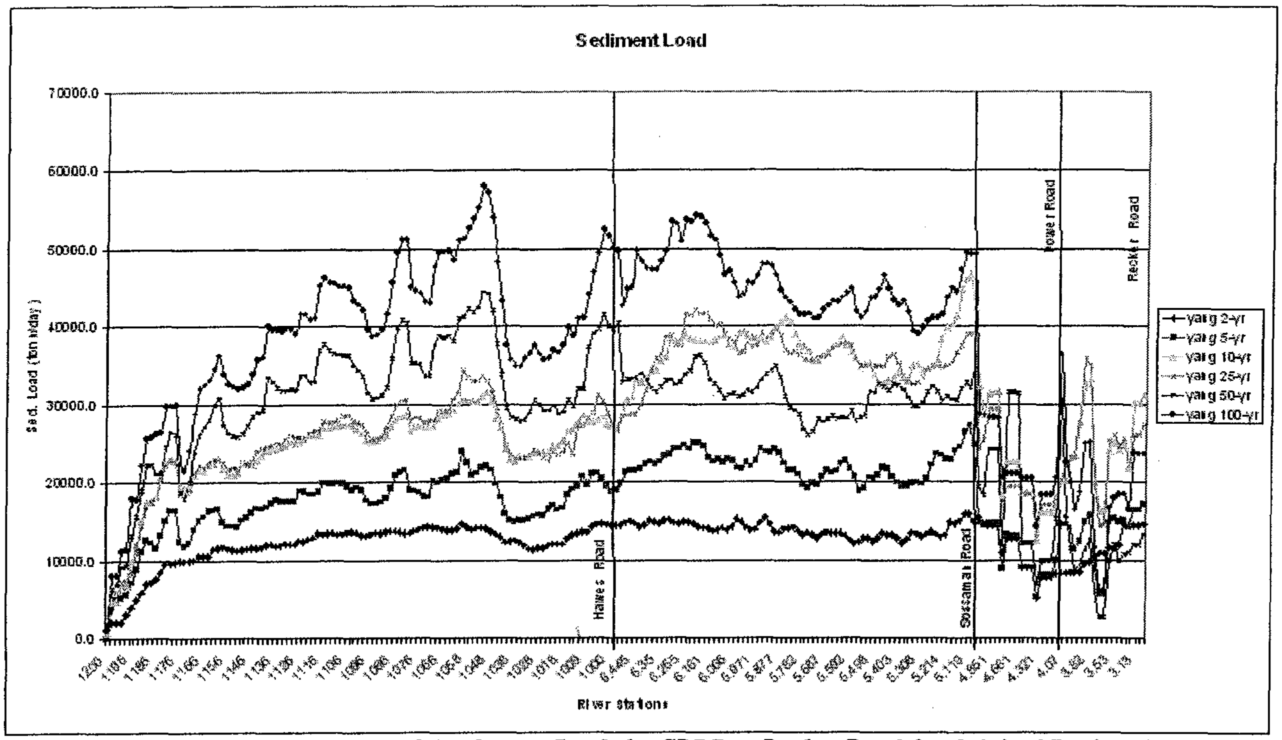


Figure 6. Sediment Load for Queen Creek for SPRR to Recker Road for Original Design Conditions.

subsequent drop in sediment load at about cross section 5.0 (Sossaman Rd.) (Shown more clearly in **Figure 7**) is where the Ryland drop structures began to impact sediment transport under the preliminary Ryland design. This analysis implies that the equilibrium sediment transport capacity can be reached within a relatively short distance from the FRS or other point upstream from Hawes Road. The analysis from this HEC-6T model in the area from the SPRR to Ocotillo Road should not be relied on for design in that reach since the model is not adjusted for the farthest upstream reach as discussed above.

The change in the thalweg (minimum cross-section elevation) and average bed elevations for the design conditions are presented in **Figure 8** and **Figure 9** respectively. These figures show that the changes in the elevations between Hawes Road and Sossaman Road (Dibble Reach) are less than 2 ft for all the flow events for both the thalweg and average bed elevation. This indicates that the stream bed can be expected to be relatively stable during the various flood flows given the current inflowing sediment load.

An additional run was made with two 100 year flood hydrographs placed back to back in the HEC-6T model. This analysis showed little change in final bed elevations as shown in **Figure 10**. The depth of scour at the inflow boundary continues to increase slightly with the twin flood hydrograph but elsewhere the bed remains relatively constant throughout the reach. There are some minor variations but through the design reaches the model predicts the bed reaching an equilibrium condition after the first 100 year flow event. This indicates that after a large flood event the Ryland Reach as originally designed may have returned to a condition near the current equilibrium bed slope. Some additional scour was also noted below Power Road as the creek continues to scour in an attempt to regain equilibrium downstream of the preliminary Ryland drop structures and again below the new Power Road Bridge.

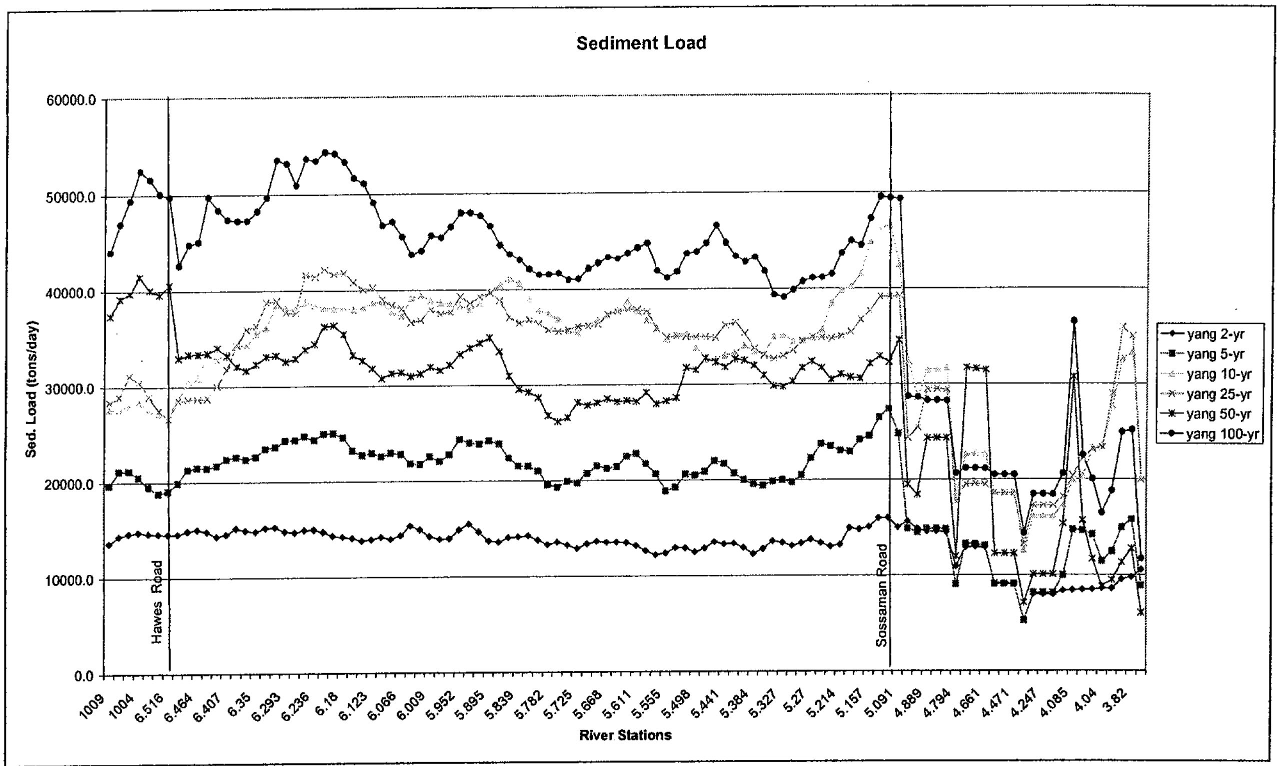


Figure 7. Sediment Load for Design Conditions Hawes Road to Power Road Design Reaches.

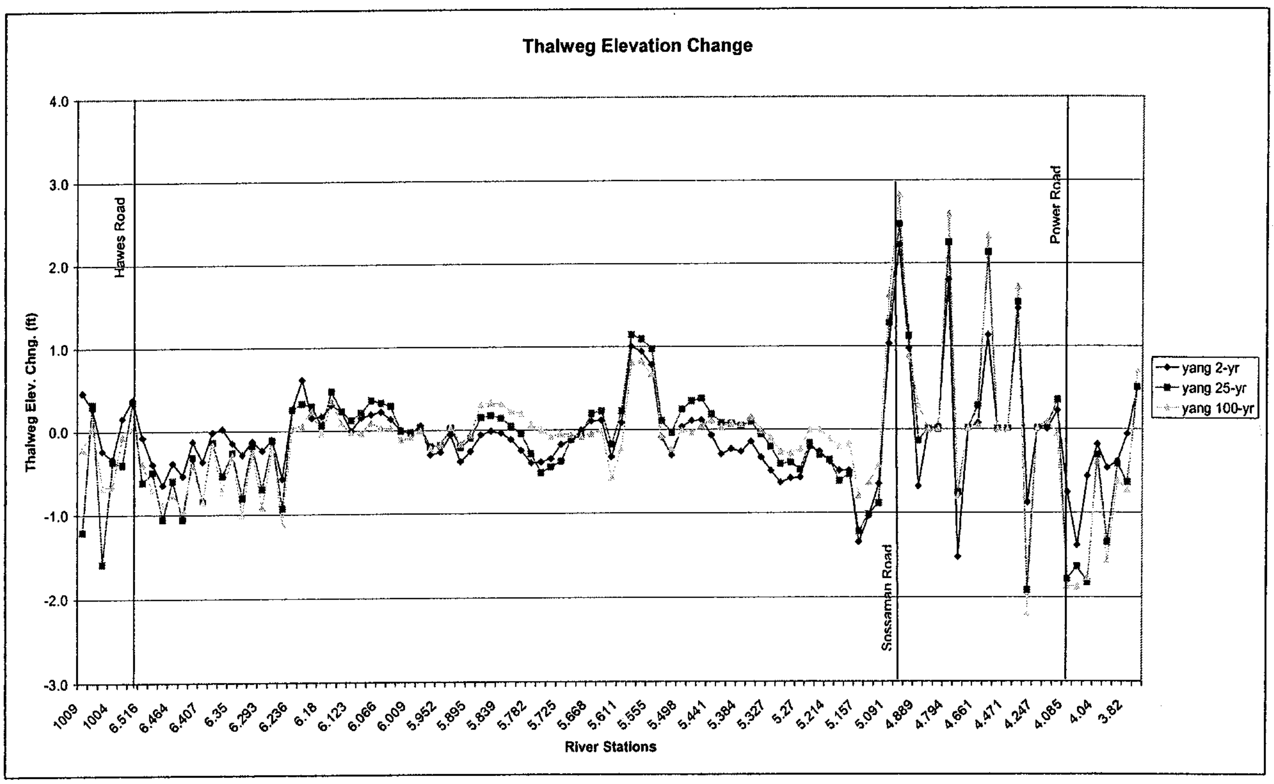


Figure 8. Thalweg Elevation Change for 2, 25, and 100 Year Flood Hydrographs.

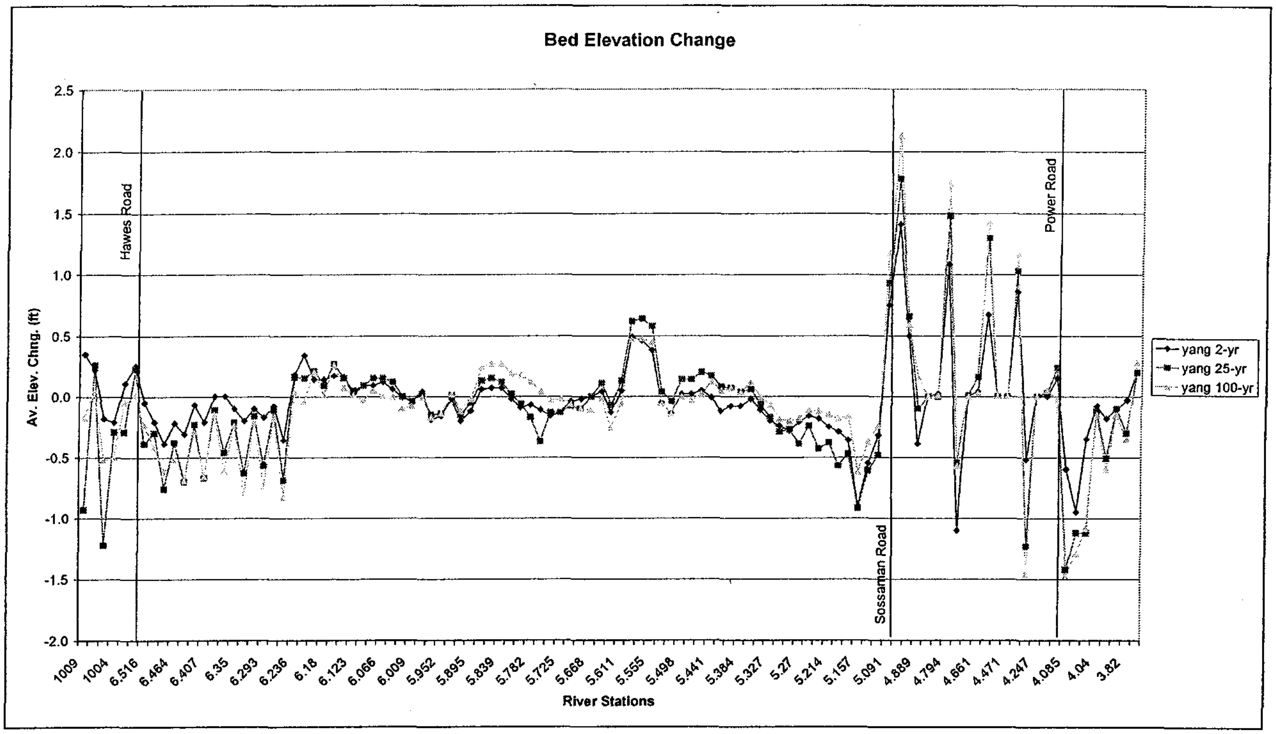


Figure 9. Average Bed Elevation for Yang Equation for 2, 25 and 100 Year Flood Hydrographs.

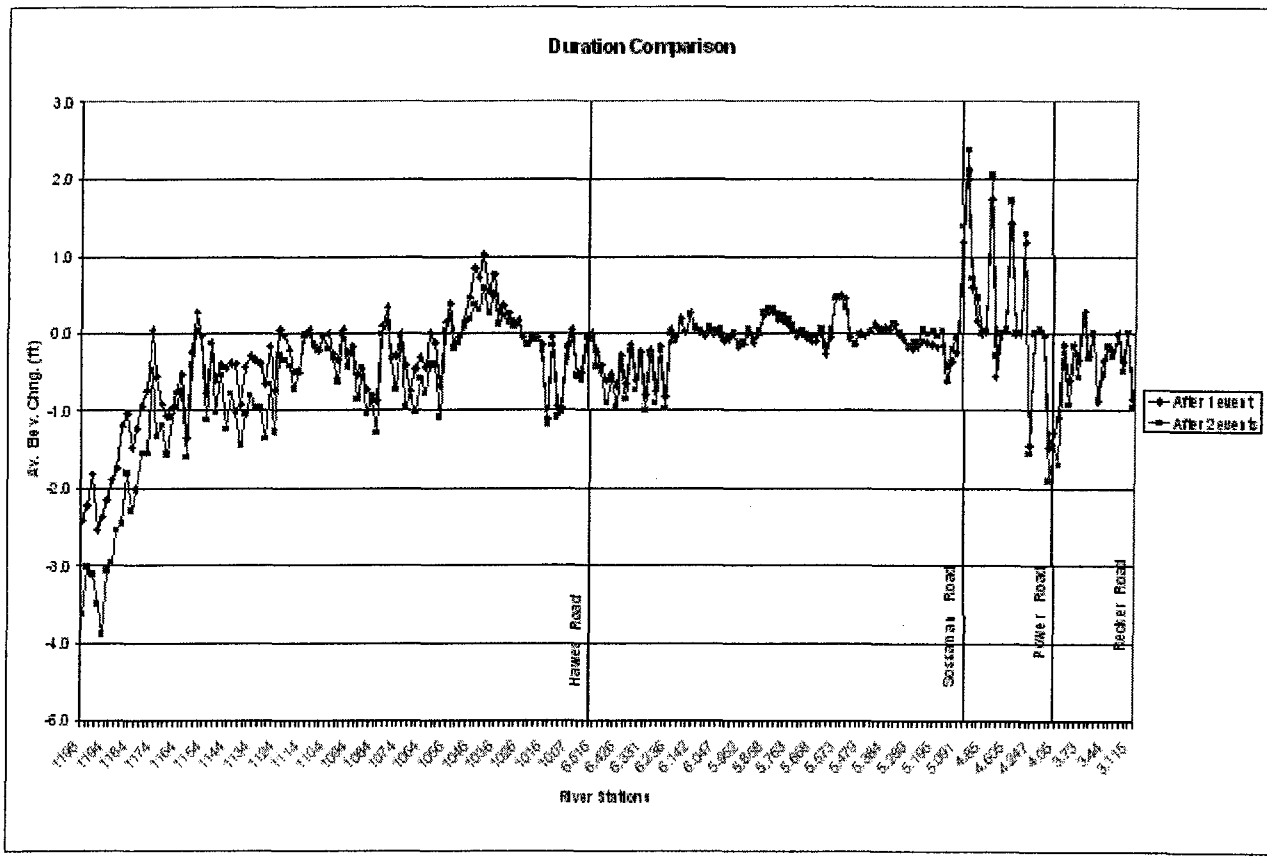


Figure 10. Bed Elevation for One and Two 100 Year Flood Hydrographs for Queen Creek from SPRR to Recker Road. Upper Portion Model Bed Gradation Based on Ellsworth Road Data.

Based on existing vegetation and expected future conditions it is not expected that grade control will be necessary in the short term for the Dibble Reach. If it is assumed that the vegetation is removed and only the sand bed provides roughness for the flow then grade control would be necessary in the long term. Also if the upstream sediment supply is cut off it may be necessary to provide some grade control to slow the flows in this reach. Based on the assumption of a Manning's n value of 0.021 the final slope would be 0.0006 (0.06%). This would require grade control to dissipate 15.2 feet of excess slope. When the armoring is considered, however, the grade control requirement would be reduced to approximately 4.2 ft. Necessary grade control could be accomplished by placing a 2.2 ft grade control structure some distance downstream from the Hawes Road Bridge, and an additional structure above the midpoint between Hawes Road and Sossaman Road.

It is recommendeded that the top of the grade control structures be placed approximately 1.0 ft below the existing grade and the channel slope allowed to adjust naturally to the existing processes in the wash.

Bank protection will be required on the outside of bends in the reach and a minimum of toe protection should be provided for reaches where homes will be built immediately adjacent to the wash and erosion can be reasonably expected. The toe protection can be at the base of the set-back banks and extend only sufficiently up the bank to prevent erosion of the bank toe and failure of the banks. It is recommended that toe protection be placed at the outside edge of the berms and toed down sufficiently to prevent failure due to the erosive actions of the stream. In areas with bends the outer bank should be protected to near the level of the 100 year flood.

D. Final Design Recommendations – Dibble Reach

Based on the revised/final Ryland design, the need for additional grade control was noted near the downstream end of the Dibble Reach to insure long term stability. This was in accordance with discussions that involved Dibble, CVL, Ryland, the Town of Queen Creek, and FCDMC. A drop structure with a height of 2.0 feet is thus recommended just downstream of the Sossaman Road bridge. This will also provide the transition between the Dibble and Ryland channels.

Since grade control of 4.2 ft was determined to be necessary for a no sediment inflow future conditions in the Dibble Reach of the wash, two grade control structures are recommended with a total drop of 4.2 feet. Drop heights should be kept small to allow crossing of the structures by equestrians and others. It is recommended that these structures be covered to the extent possible and lowered to approximately 1.0 ft below the existing grade. Proposed locations of the structures are approximately 1250 ft above Sossaman Rd (station 62+50 or just west of the trail crossing) and approximately 1600 feet below Hawes Road (station 109+00 or where the channel begins to widen from its existing configuration). The two structures should have drops of 2.2 and 2.0 feet respectively. The weirs on both structures should be aligned to be perpendicular to a line drawn from the centerline of the downstream channel for the upstream drop and from the center of the bridge opening on Sossaman Road to the center of the lower drop structure. This alignment will insure that the flow is aligned in the channel to the best possible extent.

Bank and toe protection are also recommended for areas along the wash. Full bank protection (above the 100 year flood level) is recommended for the outside of bends and near the grade control structures. Toe protection is recommended where there is risk of erosion but where full bank protection is not required. The toe protection should be tied back to the top bank at intervals not to exceed every 200 feet.

The current designs should provide for a stable wash for flows up to the 100 year flow. Some minor erosion or sedimentation can be expected within the wash but this is normal for channels that are adjusting to changing conditions. Routine maintenance will be required along the wash to insure that local erosion points that may develop do not endanger property along the banks of the wash.

VI. INITIAL BRIDGE SELECTION REPORT

A. General

The Town of Queen Creek plans to build a new bridge to convey Sossaman Road traffic over Queen Creek Wash. The new bridge will replace existing pipe culverts that now carry the flow under the existing roadway.

B. Bridge Roadway Geometry

The bridge roadway section will accommodate 5 lanes of traffic. It consists of two 12-foot-wide lanes in each direction with 2-foot-wide shoulders and a 12-foot-wide left turn lane/median. The clear roadway width of the bridge will be 68'-0". There will be 5'-0" wide raised sidewalks on each side of the bridge with metal railing which conforms to AASHTO requirements.

The roadway design speed for the bridge is 50 mph. The bridge profile will be on a vertical curve and the bridge roadway will have a 2% cross slope in each direction.

C. Hydraulic Data

The Sossaman Road Bridge will be designed for the following hydraulic requirements:

a) The bridge opening under the bridge will be 130 feet based on the hydraulic analysis performed by Dibble and Associates.

b) The bridge will be designed to pass flow from the 100-year flood event

Q100 =	2831 cfs
Velocity100 =	6.34 feet/second
Water Surface Elevation100 =	1359.31

c) The bridge will be checked for scour to verify that it will be stable when subjected to the 500-year flood event.

Q500 =	4813 cfs
Velocity500 =	7.41 feet/second
Water Surface Elevation500 =	1360.55

d) Bridge piers and abutments shall be designed for scour forces, which are to be determined during final design.

D. Foundations

A preliminary geotechnical letter report has been prepared by Ricker, Atkinson, McBee and Associates, Inc. dated March 21, 2002. The report establishes the foundation type as drilled shafts. The shafts should extend about 60'-0" below scour depth. This letter is included in **Appendix D**.

E. Bridge Type

Possible structure types for this size of bridge include AASHTO precast prestressed concrete I girders, AASHTO precast prestressed concrete box girders, structural steel I girders, cast-in-place prestressed concrete box girders, or cast-in-place reinforced concrete slab.

The bridge deck (superstructure) needs to be as shallow as possible to minimize the amount the roadway needs to be raised. The depth of a bridge supported on girders would be as deep as 5'-0" while a slab bridge would be about 2'-0" deep. A slab bridge will work in this setting and will be the most economical structure type.

The estimated cost for a cast-in-place reinforced concrete slab bridge is approximately $600,000. A more detailed cost estimate will be provided during preliminary design.

F. Architectural Treatment

The architectural treatment for the new bridge is to be determined by the Town of Queen Creek. The underside of the bridge will be visible from the equestrian trail under the new bridge. Because of future residential development in the area, the exterior facade should be simple and clean. It could be similar to the Ocotillo Road Bridge at Queen Creek Wash.

Cannon was requested to consider using a concrete arch-type bridge, such as the ConArch Bridge System that was used on Subdivision Bridge over Queen Creek Wash near Ranch House Road for Trilogy Development. The ConArch facade was covered with a thin rock facade that has partially fallen off the bridge. Cracking of the underside of the bridge soffit was also observed, which may be an indicator of the structural problems with the design. The bridge has four openings, one of which is used for a trail. It would be possible to use this bridge type, and it could be evaluated further, but it would most likely prove more costly and would require a thicker stone veneer.

G. Utilities

We are unaware of any utilities that would have to be carried on the bridge.

H. Recommendations

We recommend that a cast-in-place reinforced concrete slab bridge be used for the Sossaman Road Bridge that spans Queen Creek Wash. The abutments and piers are to be supported on drilled shaft foundations. A slab-type bridge is best for this site, and has been used on adjacent bridges, because of its shallow depth compared to I-girder bridges. The shallowness means that the roadway will not have to be raised as much as if an I-girder bridge was used.

We recommend that the bridge be a three-span bridge and carry 5 lanes of traffic with a 68-foot-wide clear roadway width and 5'-0" wide sidewalks on each side. The exterior barriers can be concrete with tubular steel railing. The exterior facade of the concrete barriers can be enhanced by use of artistic rustication as has been done on recent bridges in the area.

Exhibits showing the preliminary concept may be observed in **Appendix D**.

VII. LANDSCAPE CONCEPT

A. Existing Conditions

(See Aerial Photo Drawing Nos. 9-11 in **Appendix E**).
The existing conditions of Queen Creek Wash between Sossaman Road and Hawes Road reflect a desert wash character. The wash bottom is sandy with scattered trees, shrubs, and grasses. The majority of significant vegetation is concentrated at the wash edge and extends up the wash sideslope. Density of vegetation varies from quite dense towards the western half of this reach to some fairly open areas towards the east. Trees consist primarily of Blue Palo Verde and Desert Willow, along with a few Native Mesquite, Salt Cedar, and one Cottonwood.

Because of the very sandy conditions and positions of existing trees on the wash sideslopes, most of the existing trees would likely not be salvageable. Some specimens on the upper portions of the slopes may be salvageable. Once exact limits of construction disturbance have been established, salvage potential of existing impacted trees can be further evaluated.

Areas adjacent to the wash are primarily agricultural with planned impending residential development. There are some existing horse properties adjacent to the wash which impact the proposed wash improvements – one property at Sossaman (north side), several properties on the south side extending approximately from Station 65+00 to Station 80+00, and developing properties on both the north and south side extending approximately from Station 108+00 to Station 117+00.

B. Preliminary Landscape Concept

(See Landscape Concept Plans Drawing Nos. 9-14 in **Appendix E**).
The Preliminary Landscape Concept consists of several components including:

1. Preservation of the existing wash bottom and existing vegetation
2. 404 Landscape Mitigation
3. Landscaped slope areas
4. Trails including a 10' paved multi-use trail, pedestrian stops and an equestrian trail in the wash bottom
5. Landscape buffer areas

A major objective of the preliminary landscape concept is to preserve the natural character of Queen Creek Wash. The proposed wash improvements will preserve the existing wash bottom along with all the existing native vegetation within the wash bottom and approximately 1-2 feet up the side slope for the entire reach from Sossaman Road to Hawes Road. Preservation of existing vegetation will preserve existing habitat as well as provide a level of maturity to the landscape.

Beyond the existing wash bottom, the wash improvements feature a graded flat bench area. This bench area is designated as the 404 landscape mitigation area. It will be defined on one side by the preserved existing wash area and vegetation and on the other by the graded wash sideslope which varies from 6:1 to a more steep 4:1 in narrow wash areas in the eastern portion of the reach. The plant palette for the 404 landscape mitigation area will consist of native species of trees (15 gallon to 36" box sizes), shrubs (1 gallon and 5 gallon sizes) and native seed mix and will be consistent with that proposed for the Queen Creek Wash improvements 404 mitigation areas between Power Road and Sossaman Road. Plant layout and density will be designed to imitate natural plant patterns and to provide habitat enhancement.

Proposed Plant List:

Trees

Celtis pallida – Desert Hackberry
Celtis reticulata – Netleaf Hackberry
Cercidium floridum – Blue Palo Verde
Chilopsis linearis – Desert Willow
Prosopis velutina – Native Mesquite

Shrubs

Baccharis glutinosa – Seepwillow
Baccharis sarothroides – Desert Broom
Dodonea viscosa - Hopbush
Hyptis emoryii – Desert Lavender
Justicia californica – Chuparosa
Larrea tridentata – Creosote
Lycium sp. – Wolfberry
Trixis californica - Trixis
Vauquelinia californica – Arizona Rosewood
Zizyphus obtusifolia – Graythorn

Groundcovers and Accents

Ambrosia deltoidea - Bursage
Baileya multiradiata – Desert Marigold
Carnegia gigantea - Saguaro
Encelia farinosa – Brittlebush
Fouquieria splendens – Ocotillo
Opuntia phaecantha – Prickly Pear
Penstemon sp. – Penstemon

Native Seed Mixes: Mitigation Seed Mix, Wildflower Seed Mix, Revegetation Seed Mix

At the outer edge of the bench areas, or preserved native wash areas, are graded wash sideslopes which vary from 6:1 to a more steep 4:1 in narrow wash areas in the eastern portion of the reach. The wash sideslopes will be landscaped with a plant palette consistent with the 404 landscape mitigation areas with some aesthetic enhancement. Placement of plants will consider proximity to the proposed maintenance road, required vertical and horizontal clearances, views, security and safety of users, varying degrees of enclosure, climate mitigation, and buffering/screening of adjacent properties.

Trails, including a 10' wide paved maintenance road (with 2'minimum graded shoulders) and an equestrian trail are incorporated into the design. The maintenance road is located at the top of the wash sideslope or within the bench area and the equestrian trail is located in the existing wash bottom. The maintenance road alignment is shown on Landscape Concept Plans Drawings 9-11. At Sossaman Road the maintenance road is located on the south side of the wash. The maintenance road continues both under the bridge from the maintenance road to the west, as well as provides a link to Sossaman Road. At approximately station 63+00, the maintenance road crosses to the north side of the wash to avoid existing properties on the south side. The maintenance road continues on the north side of the wash either on top of the slope or within the bench area until Hawes Road. At Hawes Road the maintenance road will continue both under the bridge, as well as provide a link to Hawes Road. The maintenance road will be graded with a 20:1 maximum slope in accordance with ADA accessibility requirements. The maintenance road also incorporates three pedestrian stops at Stations 64+00, 85+00, and 107+00. The design of the pedestrian stops is illustrated in Drawing 14 in **Appendix E**, and is consistent with similar features designed in the wash section between Power Road and Sossaman Road.

Per the Queen Creek Open Space and Trails Plan, a 20' minimum landscape area should also be included adjacent to the maintenance road as a buffer between the maintenance road and existing or proposed development.

VIII. 404 PERMIT

A Section 404 Clean Water Act permit is required for this flood control project as a result of the proposed unavoidable impacts to jurisdictional waters of the U.S. In this case, the area that falls under the U.S. Army Corps of Engineer's (Corps') jurisdiction is the ordinary high water (OHW) channel of Queen Creek. According to the Corps' delineation, Queen Creek's OHW is approximately 71 feet wide. To complete proposed channel modifications (impacts) to Queen Creek, waters of the United States would be impacted and a U.S. Army Corps of Engineers Section 404 Individual Permit will be required. SWCA Environmental Consultants (SWCA), a third party contractor, is preparing that permit application.

According to a planning study of Queen Creek conducted by the FCDMC, this project area is susceptible to flooding. Under current conditions, larger flood events exceed the existing channel's capacity. Current Federal Emergency Management Agency (FEMA) mapping reveals that the 100-year flood event could yield depths of one to four feet across lands adjacent to this portion of the creek. In addition, the Town of Queen Creek has also indicated that previous damage has occurred in town due to the creek's flooding problems. The FCDMC and the Town of Queen Creek are jointly proposing to design, monitor, and develop controls along Queen Creek in order to ensure the 100-year conveyance capacity of the Creek. The purpose of this flood control project is to protect the property adjacent to Queen Creek from a 100-year flooding event, as well as to provide open space amenities and recreational opportunities along the creek's banks.

Proposed project activities include altering the width and alignment of the current channel of Queen Creek between Power and Hawes Roads. These changes would alter the creek from its current width of approximately 71 feet to approximately 160 to 250 feet. Creek improvements would occur in two segments: 1) the creek located between Power and Sossaman Roads; and 2) the creek located between Sossaman and Hawes Roads. Ryland Homes currently owns the portion of the creek between Power and Sossaman Road, and plans to widen this section to approximately 250 feet.

The two segments are being planned separately and the engineering plans for each vary slightly. Because of these separate engineering efforts, the proposed impacts to Queen Creek are presented separately:

A. Power-Sossaman Road (Ryland Homes)

Plans include:

- Excavate/Modify Channel
- Install one vertical wall and splash pad below grade
- Install preservation fencing in areas to protect some of the existing vegetation
- Reroute section of wash

Proposed activities will avoid a portion of the existing delineated jurisdictional area. Engineers have calculated that approximately 6.6 acres of jurisdictional area would be impacted by these improvements.

B. Sossaman-Hawes Road (Town of Queen Creek)

Current plans show that engineers will be able to avoid the lowest 2 feet of depth of the channel, which equates to between 80 and 120 feet of width, depending on the location. Since the ordinary high water mark delineated for the creek is approximately 71 feet, preliminary analysis indicates that no jurisdictional area would be impacted within this segment of the creek.

C. Full Reach

As part of the Section 404 permitting process, project proponents are required to complete resource studies to determine the presence and extent of cultural and biological resources within the project area. These resources studies were completed by SWCA. In January 2000, SWCA conducted a Biological Evaluation for the project area. The project area and its vicinity were determined not to include potentially suitable habitat for any federally listed species. Consequently, no individuals of such species are known or suspected to occur in the project area on a regular basis.

Also, in January 2000, SWCA conducted an archaeological survey for the project area. No sites were encountered in the project area. Although one isolated occurrence was found, it does not represent a significant resource and no further cultural resource work is recommended for the project area. As a result of these resource studies, no significant impacts to cultural or natural resources resulting from the construction of this project are anticipated.

Because the amount of proposed impact would require an Individual Permit (proposed impacts would impact more than 0.5 acres of jurisdictional area), the U.S. Army Corps of Engineers will require that compensatory mitigation be completed in order to replace the function and value of the habitat that would be lost during the construction of this project. Currently, mitigation activities include sandy bottom replacement and replanting native vegetation along the north bank of Queen Creek. This mitigation effort will include an on-site plan for replacing impacted habitat for the proposed 6.6 acres of impacts at a ratio of 2:1. Ryland Homes is currently preparing a Habitat Mitigation and Monitoring Plan for their anticipated impacts.

SWCA will be working on other portions of the permit application, the alternatives analysis, and the environmental assessment during the 30-day public comment period. The comment period could begin within two weeks after submittal of the application, depending on the Corps' review schedule.

IX. SOSSAMAN ROAD TO POWER ROAD CHANNEL REVIEW (RYLAND REACH)

The reach of the channel from Sossaman Road to Power Road was designed for Ryland Homes by Coe & Van Loo. The preliminary design for this reach (designated the Ryland Reach) included four drop structures in a channel that was widened and the slope reduced as compared with the existing channel. The design preserved large areas of existing vegetation in the existing channel and along the north side of the new channel.

The channel slope as originally designed by Coe & Van Loo was lowered to a slope of 0.0006 ft/ft with four drop structures yielding a combined drop of 9.42 feet. The existing slope in the channel is approximately 0.0026 ft/ft to 0.0028 ft/ft and appears to be stable in the current configuration based on HEC-6T analysis. The reduction in slope appeared to correspond with the value obtained by considering only the stable slope methodology for a Manning's n of approximately 0.021 however justification and methodology was not-provided in the CVL report. While the calculations for stable slope were in the range of 0.0006 when using a Manning's n value of 0.021, the stable slope increased when using a higher n value. Given the desire to have significant vegetation in the wash for a more natural channel it would appear that a higher n value could be used for slope stability calculations. The 0.0006 slope with the n value of 0.021 would be the worst case condition where a bare sand or native material bed exists with no vegetation in the channel. This reach of the wash will not armor based on observed sediment sizes.

Previous studies by WEST, based on less complete data, also indicated significantly less scour than that found by CVL and recommended a drop structure of 3.6 ft in height. These calculations were based on a channel n value of 0.035. Current channel vegetation in the upper portion of this reach probably results in an n value in excess of 0.10 based on research performed by the U.S. Army Corps of Engineers (See Freeman, et. al. 2000).

An additional problem was noted in the CVL reach in regards to sediment continuity. Sediment flow in a wash or channel should be uninterrupted or substantial scour and deposition will result. The preliminary design by CVL interrupted sediment continuity in Queen Creek from Sossaman to Power Road. All bed sediment was removed from Power to Recker Roads and the channel reshaped as a part of the Power Ranch development project. The interception of sediment in the Ryland Reach would increased scour in the Power Ranch Development downstream of Power Road.

The installation of the originally proposed drop structures in conjunction with the lowering of the bed to reduce the slope would have caused a series of problems in the channel. First, the upstream drop structure was set below the existing channel grade and would have caused a headcut to move up the channel into the reach above Sossaman Road unless an additional grade control structure were placed at Sossaman Road. This head cut would have been on the order of three feet and would have caused a large amount of sediment to be transported down the channel and deposited. This could have placed upstream improvements at risk during low to intermediate flows.

Secondly the drop structures and low slope reaches between drop structures would tend to fill with sediment during larger floods until an equilibrium slope is reestablished through the reach possibly impacting water surface elevations in the wash. Until upstream sediment deposits are exhausted the equilibrium slope will be higher than the 0.0006 ft/ft slope. This impact can be seen in **Figures 6** through **9**.

The reaches of very low slope in the Ryland Reach would have intercepted sediment that is needed below Power Road to maintain channel bed elevations between Power and Recker Roads. Queen Creek would attempt to again reach sediment equilibrium and would scour until either a hard bed is reached or the sediment load is in equilibrium. If the sediment transport is not interrupted in the Ryland Reach the incoming sediment will continue down the channel and tend to keep the channel through Power Ranch stable. Some deposition may occur just downstream of the Power Road bridge depending on the relative flow conditions in the two sections of the wash (Ryland and Power Ranch).

A. Preliminary Recommendations

It was recommended that the initial design for the Ryland Reach of Queen Creek not be accepted without modification. While the grade control structures may be needed to insure future stability of the channel, if installed now it was recommended that they be installed as buried drop structures (i.e. with the top of the structure at or below current bed elevation) and the bed of the channel constructed close to the existing slope between the structures. If the bed were to be lowered to accommodate the design flows or if the current elevations of the drop structures were retained an additional drop control structure was recommended immediately downstream from the new Sossaman Road bridge to prevent a headcut from moving upstream into the Dibble Reach and beyond. With vegetation being planned for the channel a higher n value could be used (if allowed by FCD policies) which would result in fewer drop structures.

Bank protection should be planned for the outside of bends and toe protection should be designed for banks that are or will be immediately adjacent to homes along the wash where erosion is likely. This could consist of either riprap or some other type of permanent protection to insure the channel does not move beyond the lateral design limits.

Toe protection as well as full bank protection should be toed down in accordance with Flood Control District Guidelines. Riprap may be an attractive option depending on the distance and cost of transportation to the site. Riprap or other protection sizing should be such as to resist expected velocities in the channel.

In summary, it was recommended that the Ryland Reach be redesigned to keep near current slopes in their reach although the grade control structures could have been retained to protect against future lowered sediment conditions and bed adjustments in the wash.

B. Revised Ryland Design

Based on the above recommendations the Ryland design was modified to be more compatible with the Dibble Reach and less aggressive in terms of slope reduction. The number of drop structures was lowered from four to one and the slope modifications were eliminated to allow the wash to retain its natural character and to retain the sand bed. The need for a drop structure at Sossaman Road was discussed and the responsibility for the design of the structure was incorporated into the Dibble contract. The height of this drop is 2.0 feet (based on the revised Ryland design) and the structure is to be placed immediately downstream of the Sossaman bridge. This drop structure will be necessary to protect the upstream channel from degradation during low flows.

The updated Ryland design appears to be stable for existing conditions on the wash. This assumes vegetation will continue to be found in the wash after construction of homes along the wash and the elimination of irrigated farmland along the wash. Additionally the wash should be stable without extensive vegetation given the existing sediment load flowing into the reach from upstream. The average bed elevations for the various flows are shown in **Figure 11**.

The sediment load is shown in **Figure 12**. No evaluation of bank protection needs or lateral stability was performed for the Ryland Reach but protection is recommended as necessary. Stability, as discussed in this report, unless specified otherwise, refers to the stability of the channel bed elevation and not stability of the banks.

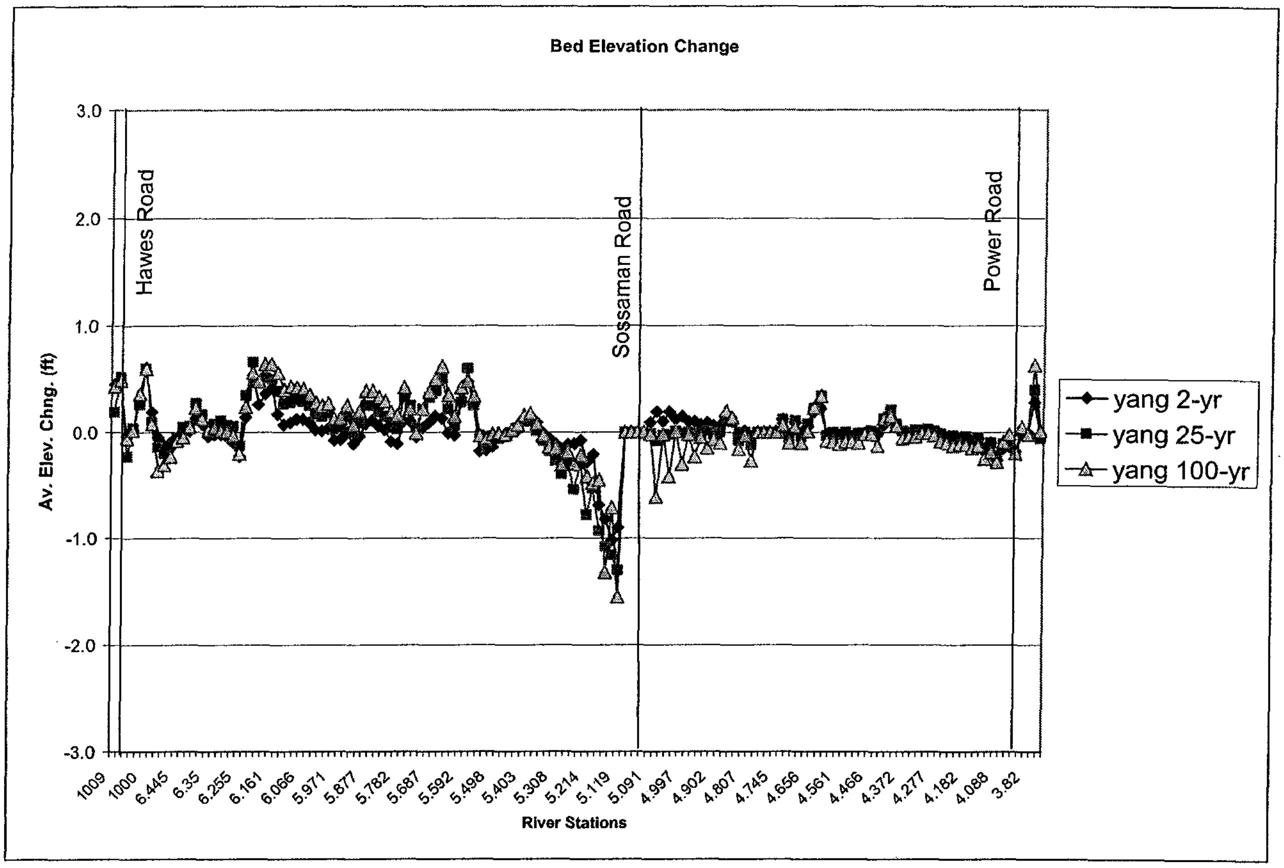


Figure 11. Average Bed Elevations for Study Reach with Redesigned Ryland Reach.

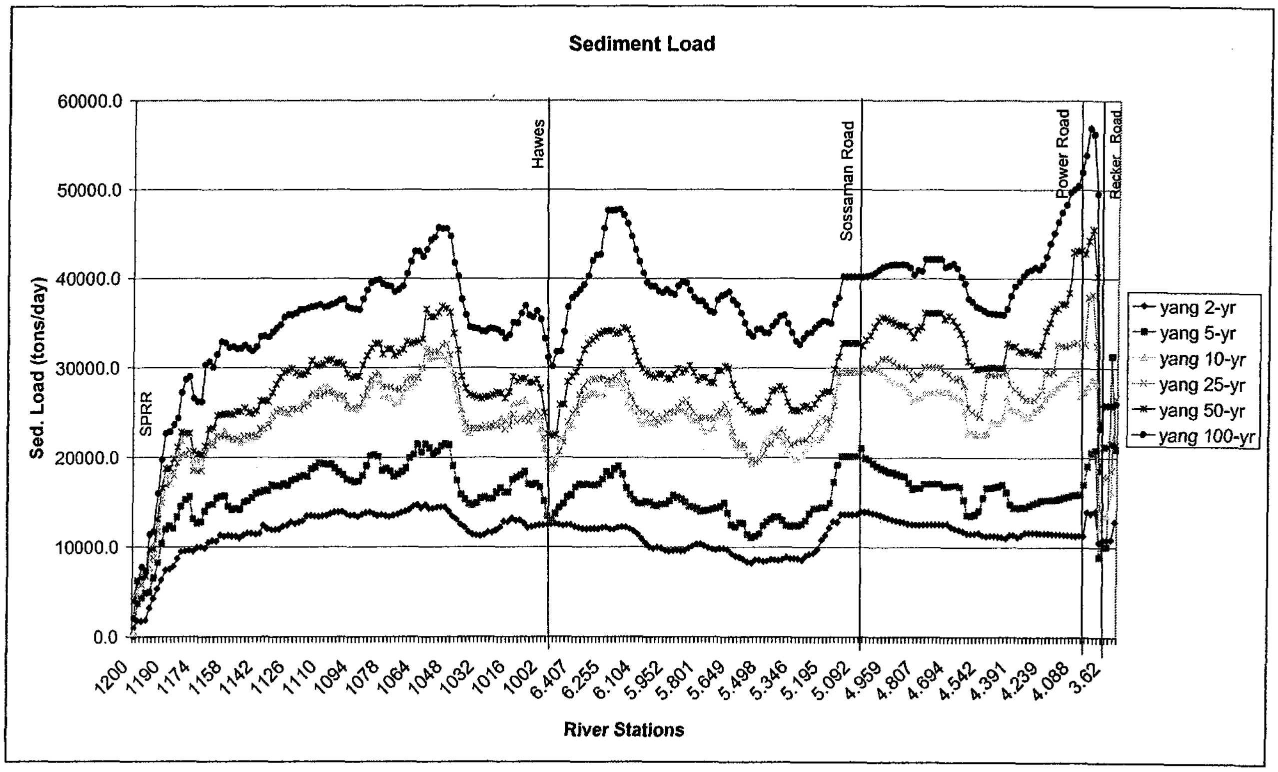


Figure 12. Sediment Load for Study Reach with Revised Ryland Design.

References:

Arizona Department of Water Resources, 1996, "State Standard 5-96, State Standard for Watercourse system Sediment Balance," September 1996.

Dibble & Associates, Consulting Engineers, 2001, "Queen Creek Wash, Hawes to Power Road, Revised Hydrology," Technical Memorandum #1, Prepared for Town of Queen Creek, September, 2001.

Freeman, Gary E., William H. Rahmeyer and Ronald R. Copeland, 2000, "Determination of Resistance Due to Shrubs and Woody Vegetation", ERDC/CHL TR-00-25, Engineering Research and Development Center, U.S. Army Corps of Engineers, Vicksburg, MS.

WEST Consultants, Inc., 2000, "Sediment Transport Analysis – Queen Creek & Sanokai Wash Hydraulic Master Plan East Maricopa Floodway Capacity Mitigation Study," Project No. 05-0949-01, Prepared for Huitt~Zollars, Inc., September, 2000.

X. APPENDICES

A. Project Survey Report
B. Soil Sample Analysis
C. HEC-RAS Output
D. Preliminary Bridge Concept
E. Project Design Exhibits

APPENDIX A

PROJECT SURVEY REPORT

PROJECT REPORT
Queen Creek Wash
26 April 2001

Section 1: Project Overview

Introduction

This is the report for Z&H Engineering of the survey of the Queen Creek Wash between Hawes Road and Sossaman Road. This report contains a project overview and then details the observations, problems encountered, reduction and adjustments performed to provide Horizontal and Vertical control for mapping a 400 foot wide strip along Queen Creek.

Method

The geodetic control survey was completed using ASHTECH- Z12 dual channel GPS receivers and a WILD N-3 Level with a Philly rod. The receivers collected data from the GPS, a constellation of satellites developed for the Department of Defense using RTK methods. The level was used for verification of elevation data from NSRS bench mark stations using 3rd Order procedures.

Control Selection

Horizontal Control

The following National Geodetic Survey (NGS) stations were used as the basis for the horizontal control:

G 68 1980 "B" Order station NGS
T2SR7ES15
T2SR7ES34SW

Vertical Control

The following stations were used as the basis for the vertical control:

R 364	1967	NGS
G 68	1980	NGS
Q 364	1967	NGS
ERM 1416		Maricopa County Brass Cap
ERM 1381		Maricopa County Brass Cap

The two ERM's were used as an effort to stabilize the vertical plane. However, they actually created a tilt.

Sequence of Events

1. After completing the original tasking we tied to the Bench mark on Power Road and the Queen Creek Bridge. The difference in elevation was slightly less than 5 feet. The position was off 125 feet by 115 feet, indicating to me that this coordinate might be a Ground coordinate instead of a Grid coordinate. After applying the Grid/Ground factor for this area the coordinate checked within a few hundredth of a foot horizontally. The vertical was still a problem that could not be explained without further investigation.

2. Next, I was invited to attend a meeting at Dibble to discuss the vertical problem we had found. (Ref Attachment A).

3. I was assigned to survey the additional points provided by Dibble (See Action Items, Attachment A). I was given two additional days of GPS to complete the Action Items. Upon completion of the two days, I found that the data provided was on different datums in the vertical and some of the points were on Grid while others were on Ground. I also found that the points selected were not the points used to create the primary models of the Queen Creek Wash. The points were instead, other projects that had been done near the wash. I discovered that there were two main studies for the Queen Creek Wash. One done in 1995 from the County line to just past Hawes Road and the other in 1997 from Hawes Road to Greenfield Road. In order for me to evaluate the elevation problem, I needed some of both projects points or the stations and data used to establish them.

4. I spoke with Dave Vanderlinden of Z & H Engineering to get approval to go to the Flood Control office and get the data on the points I needed. He spoke with Dibble and got the okay to gather the correct information from Marta Dent at Flood Control.

5. I contacted Marta Dent and arranged for a time to come in to do research on the points I needed. I took my research person, Trent Moody, with me to Flood Control. Marta gave us the folders containing the original survey data for both projects as well as a third one that was in the area. We looked through the folders and found the level and the horizontal survey data collected for each of the points in the two studies. I found an error in the starting elevation for one of the projects level loops. That changed all of the elevations in the East project by about 0.6 feet. I also found several other problems with the data, such as Grid/Ground errors. I was running out of time for the day so we asked Marta if we could copy the pertinent data and take it with us for further investigation. She said that would be fine and to let her know what we found out. This process took one full day of office time for both Trent and myself including the time with Marta.

6. Errors were found in the data which required additional observations to prove the corrections and the GPS data, as well as tie down the apparent differences in datums from the East study to the West study.

7. Our research and additional observations led to another meeting at Queen Creek to discuss the findings and make a Plan of Action to proceed. Approval was given at that meeting for 2 additional GPS observation days and four days of levels to verify the datum differences and the originally assigned GPS data from Hawes Road to Sossaman Road.

8. The levels were run by Z & H Engineering, processed and compared with the GPS solution. This resulted in a correction to the GPS data of about 1.5 feet, reducing the differences in the datums to about 3.5 feet. The GPS files were adjusted to account for the errors found in the ERMs and the adjusted data was then compared to the level loops run by Z & H Engineering resulting in a check on the level loops of less than 0.1 foot. This is within the expected error of GPS Vertical observations. At this point we had two sources that agreed on the vertical datum differences. The average difference in the West study from the corrected Level loop data of the East study is 3.56 feet. It should be noted that the errors in the ERMs caused a tilt in the GPS vertical plane. Which results in the need to readjust the aerial mapping by about 1.5 feet.

9. This information was presented at the last meeting at Dibble where we were assigned to continue to check to the West study to see if the datum differences were still 3.56 feet and to bring together all of Queen Creek Wash in the same Datum.

To be continued after additional data collection.....

Bob Phillips

The remaining observations and levels were obtained in the 29 vertical datum and check sections were run to verify the final solution in the 29 datum. The check sections reveled that the NGS control points did not agree within the allowable tolerances. Additional levels were run to attempt to find two NGS Control points that fall within the tolerance. Stations G 68, and S 364 resulted in the best solution and just within the tolerances of third order leveling. These points and the other points not meeting the allowable error are all part of a NGS First Order level line and should all be within the allowable tolerances. The same level data was processed using the NAVD 88 control values and all control points fell within the allowable tolerances.

I contacted NGS to discuss the history of this particular level line and was sent the complete history of the line and others within the area. I was told that there is documented subsidence issues in the area of the Queen Creek Wash. This explained the problems originally encountered in the earlier observations addressed in this report. It was the recommendation of the NGS that we not use NGVD 29 for our study. This along with the data problems led me to the decision that we should be using NAVD 88 to complete the study.

Project Datum Resolution Meeting
Dibble & Associates
Monday, July 16, 2001

ATTENDEES:

Tom Narva	(Town of Queen Creek)
Paul Stears	(FCDMC)
John Stock	(FCDMC)
Blair Haines	(Z&H Engineering)
Bob Phillips	(GPS Services)
Brian Fry	(Dibble)

PURPOSE OF MEETING:

To identify the course of action to correct the FCDMC mapping for use on the Queen Creek Wash project. The datum issue impacts three sets of mapping. FCDMC mapping from Hawes Road west to the EMF was completed by Kenney Aerial Mapping, Inc. (KAM), FCDMC mapping from Hawes Road east to the Maricopa County line was completed by Lee Harbers of DTM, Inc., and project design mapping was prepared from Hawes Road to Ocotillo Road by Aerial Mapping Company, Inc. (AMCI). All three sets of mapping will be corrected based on the results of the field control surveys.

DECISIONS:

The mapping will be adjusted to NAVD 88 vertical datum. Per John Stock, since all the mapping is being updated it is better to go to the 88 datum instead of NGVD 1929.

Bob Phillips will provide equations for conversion to NGVD 1929 and Town of Gilbert datums.

Bob Phillips will provide results of surveys and the required mapping adjustments for each set of mapping to Dave VanderLinden of Z&H Engineers. Upon review and approval of the data, Dave will forward the mapping adjustments to KAM, DTM, and AMCI.

The GPS data collected for this project was readjusted using NAVD 88 vertical data and the results are found at the end of this report. The level data was adjusted using Starnet and NAVD 88 and the results are found at the end of this report.

Queen Creek Wash Panel Points in East Area From the County Line to Hawes Rd. Study 95-03 DTM Inc.

The data originally provided by Collins Pina for the East portion of the Queen Creek Wash, County line to Hawes Rd., proved to be NAVD 88 values not NGVD 29 as reported. However, DTM Inc. used a modified version of these values as shown on the spreadsheet provided at the end of the report. This results in the need for readjustment of the mapping provided by DTM Inc. The average correction to the data used by DTM is +2.427 feet, the range of the correction is +1.958 to +3.032 feet with most of the corrections around +2.35 feet. The Conversion for the observed points to NGVD 29 are given in the spreadsheet at the end of the report.

Queen Creek Wash Panel Points in West Area From the Hawes Rd. to the EMF. Study 97-11 Kenney Aerial Mapping Inc.

The data provided by Collins Pina for the West portion of the Queen Creek Wash, Hawes Rd. to the EMF, was established using points included in the town of Gilbert. The town of Gilbert apparently has it's own datum and is different than the NGS points used in the East area. The difference appears to be on the magnitude of +2.5 feet. That is to say that Gilbert's data is 2.5 feet lower than NGS at least in the area of Queen Creek Wash. The mapping data done by Kenney Aerial Mapping, Inc. should be corrected using the data provided at the end of the study. The average correction to Kenney mapping is +2.683 feet. The range is from +2.350 to 2.903 feet with most of the corrections around +2.7 feet. The Conversion for the observed points to NGVD 29 are given in the spreadsheet at the end of the report.

Queen Creek Wash Panel Points in the middle Area From the Hawes Rd. to Ocotillo Rd. Aerial Mapping Inc.

The mapping provided by Aerial Mapping Inc. needs to be corrected because of the tilt introduced into the data from the use of bad ERM's . The average correction is –1.000 feet. The range is -.745 to -1.203 feet, with most of the corrections around -1.0 feet. The Conversion for the observed points to NGVD 29 are given in the spreadsheet at the end of the report. In the future, it is not recommended to use NGVD 29 data for survey control.

We are converting and combining all of the Queen Creek Wash studies into one datum. I believe this will result in the least amount of cost and will result in a database of common datum throughout the Queen Creek Wash.

Robert A. Phillips II
Geodesist,
GPS Services L.L.C.

1. Reference Email from Dave VanderLinden, Z& H Engineering, dated 16 May 2001, Subject: Queen Creek Additional GPS & Survey Level Requirements:
2. Reference Email from Brian Fry, Dibble, dated 17 May 2001, Subject: Queen Creek Survey Proposal.
3. Paragraph 2 of Ref 2 above, the additional survey work to the West of Meadowbrook Road to include the EMF and Paragraph 4 of Ref 2 above, culvert crossings at Meadowbrook Road, would require at a minimum the following:
   a. One day of Static GPS Observations to extend control @ $950/ Day (GPS Services)
   b. Three days of Office Research on known Queen Creek Data & Wood data @ $700/Day (GPS Services)
   c. Two days of RTK GPS Observations to find and tag points researched in office @ $950/Day (GPS Services)
   d. Five days of levels to maintain and check existing vertical datum and survey the culvert crossings at Meadowbrook Road @ $950/Day (Z&H)
   e. One day of Office data processing to combine and evaluate all data in the West area @ $700/Day (GPS Services)
4. Paragraph 2 of Ref 2 above, the additional survey work to the East to the County Line and Paragraph 4 of Ref 2 above, the crossing at Will Rogers, would require at a minimum the following:
   a. One day of Office Research to extend to the county line @ $700/Day (GPS Services)
   b. One day of RTK GPS Observations to find and tag researched points @ $950/Day (GPS Services)
   c. Two days of levels to maintain and check existing vertical datum and survey a crossing at Will Rogers @ $950/Day (Z&H)
   d. One day of Office data processing to combine and evaluate all data in the East area @ $700/Day (GPS Services)

Bob Phillips

DTM Mapping Company

Final mapping data for Queen Creek Wash from County Line to Hawes Rd. DTM						
Pt #	Northing	Easting	Elevation	Elevation		
	NAD83(92)	NAD83(92)	Old Coords	NGVD 88		
	GPS	GPS	DTM	GPS		gps-dtm
1000	812656.061	799375.037		1447.825		
1001	811343.494	800028.607	1422.340			
1002	811841.410	798614.897	1439.450	1441.517	1/2"RB E of RR N of Wash	2.067
1003	811365.561	797705.646	1439.480	1441.620		2.140
1004	810908.853	796925.392	1437.560	1439.805		2.245
1005	811432.260	796814.312	1437.760	1439.920		2.160
1006	811523.220	795394.016	1432.960	1434.994	RB 1006 N-side of wash	2.034
1007	812033.484	794185.393	1429.200	1431.380		2.180
1008	811565.270	794286.710	1428.610	1430.775		2.165
1009	812071.076	792869.294	1415.010	1417.270		2.260
1010	812801.314	791534.509	1419.050	1421.008	1010 RB N-side of wash	1.958
1011	812329.747	791584.550	1419.670	1421.940		2.270
1012	813488.917	789770.027	1403.050	1405.270		2.220
1013	814025.073	788990.155	1407.490	1409.820		2.330
1014	813718.877	789006.558	1409.880	1412.190		2.310
1015	814366.805	787648.422	1394.790	1397.170		2.380
1016	815513.336	786266.798	1401.260	1403.655		2.395
1017	814915.643	786270.956	1401.860	1404.394	PK Nail Ellsworth S. of Qwncrk Bridge	2.534
1018	816130.750	785017.190	1384.870	1387.270		2.400
1019	816333.149	783821.997	1387.630	1390.208		2.578
1020	816953.517	783735.732	1387.300	1389.720		2.420
1021	817311.904	782684.779	1377.800	1380.190		2.390
1022	818110.957	781589.730	1386.070	1389.102		3.032
1023	818428.750	780288.056	1376.110	1378.580		2.470
1024	818729.624	780427.755	1381.960	1384.420		2.460
						2.427

Kenney Aerial Mapping

	Final mapping data for Queen Creek Wash from Hawes Rd.to EMF.					
Pt #	Northing	Easting	Elevation	Elevation		
	NAD83(92)	NAD83(92)		NGVD 88		
	GPS	GPS	Collins Pina	GPS		gps-cp
1023a	819250.245	780272.991	1375.020	1377.370		2.350
1024a	818942.882	779836.097	1375.380	1377.730		2.350
1025	819741.053	779672.211	1369.470	1371.816	Rock near old panel 1025	2.346
1026			1370.750	1373.100		2.350
1027	820870.798	779290.274				0.000
1028	821584.961	778591.949	1364.590	1367.245		2.655
1029	821657.249	777893.022	1365.210	1367.810		2.600
1030	822207.799	777867.981	1366.720	1369.320		2.600
1031	822596.133	776927.690	1356.210	1358.762		2.552
1032	822951.573	775649.932	1359.850	1362.308		2.458
1033	823434.178	775640.650	1359.920	1362.430		2.510
1034	823463.446	775649.932	1355.270	1357.780		2.510
1035	823311.066	773033.122	1350.430	1352.940		2.510
1036	823850.522	773000.465	1349.830	1352.340		2.510
1037	823641.753	771685.378	1347.290	1349.846	1/2" RB on North side of Queen Creek	2.556
1038	823397.533	770507.590	1349.020	1351.670		2.650
1039	824053.288	770494.328	1347.030	1349.772	pk nail Power Rd. N of Queen Creek	2.742
1040	823546.188	769210.798	1338.690	1341.400		2.710
1042	823738.274	767872.291	1335.650	1338.380		2.730
1043	823414.078	766545.908	1334.570	1337.300		2.730
1044	823135.749	765178.934	1329.420	1332.150		2.730
1045	823593.212	765201.885	1327.850	1330.570		2.720
1046	823348.593	763985.930	1327.880	1330.600		2.720
1047	823136.292	762599.659	1324.430	1327.150		2.720
1048	823661.919	762527.362	1320.730	1323.440		2.710
1049	822795.678	761320.750	1322.050	1324.755	tbm1049 rebar in old panel	2.705
1050	822243.682	760377.060	1321.450	1324.160		2.710
1051	822644.812	760280.758	1317.020	1319.730		2.710
1052	821592.029	759789.655	1315.430	1318.160		2.730
1053	820203.689	759670.781	1315.620	1318.370		2.750
1054	820236.781	760200.515	1318.310	1321.080		2.770
1055	819133.263	759665.711	1311.450	1314.250		2.800
1056	818238.604	758720.955	1313.440	1316.260		2.820
1057	817892.383	759044.465	1313.580	1316.420		2.840
1058	817091.107	758188.310	1311.510	1314.360		2.850
1059	816117.076	757151.906	1307.660	1310.523	nail West side canal	2.863
1060	815841.662	757429.294	1309.970	1312.820		2.850
1061	815244.485	756794.924	1308.400	1311.254	nail west side canal	2.854
1062	814689.606	755499.731	1307.080	1309.940		2.860
1063	814553.857	756257.103	1308.560	1311.430		2.870
1064	813728.037	755341.759	1296.520	1299.400		2.880
1065	812646.717	754597.779	1307.720	1310.610		2.890
1066	812337.071	755087.546	1304.230	1307.133	tbm1066 nail in old panel	2.903
						2.683

Aerial Mapping Company

Final mapping data for Queen Creek Wash from Hawes Rd.to Ocotillo Rd. AMC						
Pt #	Northing	Easting	Elevation	Elevation		
	NAD83(92)	NAD83(92)	NAVD 29	NGVD 88		
	GPS	GPS	GPS	GPS		88-29
11	823594.378	770504.624	1354.028	1352.825	bc fl Power Rd & Queen Creek	-1.203
20	823425.703	780889.819	1378.358	1377.334	BCHH Hawes & Queen Creek	-1.024
21	820771.116	780934.889	1379.849	1378.919	BCHH	-0.930
23	818117.187	783624.381	1393.899	1393.106	BC FL	-0.793
24	815460.578	780992.652	1385.591	1384.846	BCHH	-0.745
25	818109.586	778355.830	1377.336	1376.455	CPS	-0.881
26	818101.829	775730.982	1371.254	1370.330	PK	-0.924
27	820587.212	775689.146	1366.142	1365.130	CPS	-1.012
28	823433.544	775641.007	1363.232	1362.121	RB Queen Creek & Sossmann	-1.111
30	823986.466	775635.089	1360.965	1359.835	PNL	-1.130
31	823235.611	775645.866	1362.395	1361.291	PNL	-1.104
32	823319.584	775317.167	1366.252	1365.139	PNL	-1.113
33	822258.056	775660.905	1363.336	1362.266	PNL	-1.070
34	822175.175	778340.255	1369.221	1368.198	PNL	-1.023
35	823052.562	776090.265	1365.102	1364.011	PNL	-1.091
36	822576.322	777095.203	1369.312	1368.254	PNL	-1.058
37	821755.557	778301.691	1372.334	1371.326	PNL	-1.008
38	821704.553	777905.384	1368.118	1367.104	PNL	-1.014
39	821418.023	778551.088	1373.624	1372.632	PNL	-0.992
40	820739.858	779262.283	1373.751	1372.794	PNL	-0.957
41	818496.284	780974.011	1385.814	1384.964	PK Nail Hawes Rd. N. Queen Creek	-0.850
42	818524.085	780860.181	1390.448	1389.594	PNL	-0.854
43	817531.288	782254.940	1386.835	1386.040	PNL	-0.795
44	818287.423	782691.525	1389.932	1389.117	PNL	-0.815
45	818117.397	781854.390	1390.044	1389.221	PK Nail Ocotillo E. of Bridge	-0.823
46	819881.462	779572.178	1379.572	1378.650	PNL	-0.922
47	819279.965	779836.789	1378.737	1377.840	PNL	-0.897
48	818903.720	780047.057	1379.871	1378.991	PNL	-0.880
49	818304.576	779735.879	1380.998	1380.134	PNL	-0.864
103	823235.944	775666.393	1362.435	1361.331	ZH3	-1.104
						-1.000

		Final mapping data for Queen Creek Wash Old Panel points in West area from Hawes Rd.to Confluence												
Pt #	Northing	Easting	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation						
	NAD83(92)	NAD83(92)			NAVD 29	NGVD 88	NGVD 88	NGVD 88						
	GPS	GPS	Collins Pina	DTM	GPS	GPS	PUB	Z&H Levels			88-GPS	88-29	gps-cp	
1023a	819250.245	780272.991	1375.020			1377.370							2.350	
1024a	818942.882	779836.097	1375.380			1377.730							2.350	
1025	819741.053	779672.211	1369.470		1372.732	1371.816		1371.710	tbm1025	Rock near old panel 1025	-0.106	-0.916	2.346	
1026			1370.750			1373.100							2.350	
1027	820870.798	779290.274											0.000	
1028	821584.961	778591.949	1364.590		1368.243	1367.245						-0.998	2.655	
1029	821657.249	777893.022	1365.210			1367.810							2.600	
1030	822207.799	777867.981	1366.720			1369.320							2.600	
1031	822596.133	776927.690	1356.210		1359.823	1358.762						-1.061	2.552	
1032	822951.573	775649.932	1359.850		1363.402	1362.308						-1.094	2.458	
1033	823434.178	775640.650	1359.920			1362.430							2.510	
1034	823463.446	775649.932	1355.270			1357.780							2.510	
1035	823311.066	773033.122	1350.430			1352.940							2.510	
1036	823850.522	773000.465	1349.830			1352.340							2.510	
1037	823641.753	771685.378	1347.290		1351.031	1349.846		1349.613	tbm1037	1/2" RB on North side of Queen Creek	-0.233	-1.185	2.556	
1038	823397.533	770507.590	1349.020			1351.670							2.650	
1039	824053.288	770494.328	1347.030		1350.992	1349.772		1349.373	tbm1039	pk nail Power Rd. N of Queen Creek	-0.399	-1.220	2.742	
1040	823546.188	769210.798	1338.690			1341.400							2.710	
1042	823738.274	767872.291	1335.650			1338.380							2.730	
1043	823414.078	766545.908	1334.570			1337.300							2.730	
1044	823135.749	765178.934	1329.420			1332.150							2.730	
1045	823593.212	765201.885	1327.850			1330.570							2.720	
1046	823348.593	763985.930	1327.880			1330.600							2.720	
1047	823136.292	762599.659	1324.430			1327.150							2.720	
1048	823661.919	762527.362	1320.730			1323.440							2.710	
1049	822795.678	761320.750	1322.050		1326.084	1324.755		1324.323	tbm1049	tbm1049 rebar in old panel	-0.432	-1.329	2.705	
1050	822243.682	760377.060	1321.450			1324.160							2.710	
1051	822644.812	760280.758	1317.020			1319.730							2.710	
1052	821592.029	759789.655	1315.430			1318.160							2.730	
1053	820203.689	759670.781	1315.620			1318.370							2.750	
1054	820236.781	760200.515	1318.310			1321.080							2.770	
1055	819133.263	759665.711	1311.450			1314.250							2.800	
1056	818238.604	758720.955	1313.440			1316.260							2.820	
1057	817892.383	759044.465	1313.580			1316.420							2.840	
1058	817091.107	758188.310	1311.510			1314.360							2.850	
1059	816117.076	757151.906	1307.660		1311.689	1310.523		1309.923	tbm1059	nail West side canal	-0.600	-1.166	2.863	
1060	815841.662	757429.294	1309.970			1312.820							2.850	
1061	815244.485	756794.924	1308.400		1312.396	1311.254		1310.683	tbm1061	nail west side canal	-0.571	-1.142	2.854	
1062	814689.606	755499.731	1307.080			1309.940							2.860	

1063	814553.857	756257.103	1308.560			1311.430							2.870	
1064	813728.037	755341.759	1296.520			1299.400							2.880	
1065	812646.717	754597.779	1307.720			1310.610							2.890	
1066	812337.071	755087.546	1304.230		1308.202	1307.133		1306.478	tbm1066	tbm1066 nail in old panel	-0.655	-1.069	2.903	
										Average Correction to Kenney Data			2.683	

Final mapping data for Queen Creek Wash New Panel points in Center area from Hawes Rd.to ~~Power~~ Ocotillo Rd.

Pt #	Northing	Easting	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation				
	NAD83(92)	NAD83(92)			NAVD 29	NGVD 88	NGVD 88	NGVD 88				
	GPS	GPS	Collins Pina	DTM	GPS	GPS	PUB	Z&H Levels			88-GPS	88-29
11	823594.378	770504.624			1354.028	1352.825		1352.633	bm6	bc fl Power Rd & Queen Creek	-0.192	-1.203
20	823425.703	780889.819			1378.358	1377.334		1377.228	tbm7	BCHH Hawes & Queen Creek	-0.106	-1.024
21	820771.116	780934.889			1379.849	1378.919				BCHH		-0.930
23	818117.187	783624.381			1393.899	1393.106				BC FL		-0.793
24	815460.578	780992.652			1385.591	1384.846				BCHH		-0.745
25	818109.586	778355.830			1377.336	1376.455				CPS		-0.881
26	818101.829	775730.982			1371.254	1370.330				PK		-0.924
27	820587.212	775689.146			1366.142	1365.130				CPS		-1.012
28	823433.544	775641.007			1363.232	1362.121		1362.023	tbm8	RB Queen Creek & Sossmann	-0.098	-1.111
30	823986.466	775635.089			1360.965	1359.835				PNL		-1.130
31	823235.611	775645.866			1362.395	1361.291				PNL		-1.104
32	823319.584	775317.167			1366.252	1365.139				PNL		-1.113
33	822258.056	775660.905			1363.336	1362.266				PNL		-1.070
34	822175.175	778340.255			1369.221	1368.198				PNL		-1.023
35	823052.562	776090.265			1365.102	1364.011				PNL		-1.091
36	822576.322	777095.203			1369.312	1368.254				PNL		-1.058
37	821755.557	778301.691			1372.334	1371.326				PNL		-1.008
38	821704.553	777905.384			1368.118	1367.104				PNL		-1.014
39	821418.023	778551.088			1373.624	1372.632				PNL		-0.992
40	820739.858	779262.283			1373.751	1372.794				PNL		-0.957
41	818496.284	780974.011			1385.814	1384.964		1384.836	tbm4	PK Nail Hawes Rd. N. Queen Creek	-0.128	-0.850
42	818524.085	780860.181			1390.448	1389.594				PNL		-0.854
43	817531.288	782254.940			1386.835	1386.040				PNL		-0.795
44	818287.423	782691.525			1389.932	1389.117				PNL		-0.815
45	818117.397	781854.390			1390.044	1389.221		1389.119	tbm2	PK Nail Ocotillo E. of Bridge	-0.102	-0.823
46	819881.462	779572.178			1379.572	1378.650				PNL		-0.922
47	819279.965	779836.789			1378.737	1377.840				PNL		-0.897
48	818903.720	780047.057			1379.871	1378.991				PNL		-0.880
49	818304.576	779735.879			1380.998	1380.134				PNL		-0.864
103	823235.944	775666.393			1362.435	1361.331				ZH3		-1.104
											Average Correction to Aerial Data	-1.000

		Final mapping data for Queen Creek Wash Panel points in East area from County Line to Hawes Rd.												
Pt #	Northing	Easting	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation						
	NAD83(92)	NAD83(92)			NAVD 29	NGVD 88	NGVD 88	NGVD 88						
	GPS	GPS	Collins Pina	DTM	GPS	GPS	PUB	Z&H Levels			lev-gps	88-29	gps-cp	gps-dtm
1	819434.552	780562.032			1381.448	1380.558		1380.558	tbm5	1/2"RB Base1	0.000	-0.890		
6	815117.146	794086.092	1426.920		1427.507	1426.919	1426.919	1426.919	bm1	G 68 BC NGS	0.000	-0.588	-0.001	
7	811778.000	798622.000			1445.906	1445.597	1445.597	1445.597	bm2	Q 364 BC NGS	0.000	-0.309		
4	817323.000	791109.000			1414.524	1413.901	1413.901	1413.901	bm3	R 364 BC NGS	0.000	-0.623		
500	820883.000	786269.000			1400.728	1399.916	1399.813	1399.813	bm5	S 364 BC NGS	-0.103	-0.812		
			1401.415		1402.015	1401.415		1401.386	bm4	BCHH Ocotillo & Ellsworth	-0.029	-0.600	0.000	
1000	812656.061	799375.037	1447.825		1448.395	1447.825						-0.570	0.000	
1001	811343.494	800028.607		1422.340										
1002	811841.410	798614.897	1441.560	1439.450	1442.130	1441.517		1441.497	tbm1002	1/2"RB E of RR N of Wash	-0.020	-0.613	-0.043	2.067
1003	811365.561	797705.646	1441.620	1439.480	1442.190	1441.620						-0.570	0.000	2.140
1004	810908.853	796925.392	1439.805	1437.560	1440.241	1439.805						-0.436	0.000	2.245
1005	811432.260	796814.312	1439.920	1437.760	1440.490	1439.920						-0.570	0.000	2.160
1006	811523.220	795394.016	1435.110	1432.960	1435.680	1434.994		1435.014	tbm1006	RB 1006 N-side of wash	0.020	-0.686	-0.116	2.034
1007	812033.484	794185.393	1431.380	1429.200	1431.950	1431.380						-0.570	0.000	2.180
1008	811565.270	794286.710	1430.775	1428.610	1431.345	1430.775						-0.570	0.000	2.165
1009	812071.076	792869.294	1417.270	1415.010	1417.840	1417.270						-0.570	0.000	2.260
1010	812801.314	791534.509	1421.330	1419.050	1421.900	1421.008		1420.954	tbm1010	1010 RB N-side of wash	-0.054	-0.892	-0.322	1.958
1011	812329.747	791584.550	1421.940	1419.670	1422.510	1421.940						-0.570	0.000	2.270
1012	813488.917	789770.027	1405.270	1403.050	1405.860	1405.270						-0.590	0.000	2.220
1013	814025.073	788990.155	1409.820	1407.490	1410.420	1409.820						-0.600	0.000	2.330
1014	813718.877	789006.558	1412.190	1409.880	1412.760	1412.190						-0.570	0.000	2.310
1015	814366.805	787648.422	1397.170	1394.790	1397.770	1397.170						-0.600	0.000	2.380
1016	815513.336	786266.798	1403.655	1401.260	1404.255	1403.655						-0.600	0.000	2.395
1017	814915.643	786270.956	1404.265	1401.860	1404.865	1404.394		1404.337	tbm1017	PK Nail Ellsworth S. of Qwncrk Bridge	-0.057	-0.471	0.129	2.534
1018	816130.750	785017.190	1387.270	1384.870	1387.870	1387.270						-0.600	0.000	2.400
1019	816333.149	783821.997	1390.060	1387.630	1390.660	1390.208						-0.452	0.148	2.578
1020	816953.517	783735.732	1389.720	1387.300	1390.320	1389.720						-0.600	0.000	2.420
1021	817311.904	782684.779	1380.190	1377.800	1380.790	1380.190						-0.600	0.000	2.390
1022	818110.957	781589.730	1388.510	1386.070	1389.110	1389.102						-0.008	0.592	3.032
1023	818428.750	780288.056	1378.580	1376.110	1379.180	1378.580						-0.600	0.000	2.470
1024	818729.624	780427.755	1384.420	1381.960	1385.020	1384.420						-0.600	0.000	2.460
											Average Correction to DTM Data			2.427

	Final mapping data for Queen Creek Wash points in Culvert Crossing Meadowbrook Rd.& Other areas													
Pt #	Northing	Easting	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation						
	NAD83(92)	NAD83(92)			NAVD 29	NGVD 88	NGVD 88	NGVD 88						
	GPS	GPS	Collins Pina	DTM	GPS	GPS	PUB	Z&H Levels			88-GPS	88-29		
472	818064.412	785600.127				1398.936	1398.881	1398.862	2DN1	GDACS Point 2DN1 Rod Driven Refusal	-0.074			
1381	818117.241	780979.932			1381.080	1383.429		1383.309	tbm3	BC Hole Hawes & Ocotillo	-0.120	2.349		
						1378.923		1378.823	tbm6	BC FL in Culdesac	-0.100			
						1363.123		1363.013	tp111	Pan 32	-0.110			
								1344.333	tp141	E6 SW				
								1332.978	tbm70	nail				
								1331.808	tp148	FL North pipe East End				
								1331.838	tp149	FL Center pipe East end North				
								1331.818	tp150	FL Center pipe East end South				
								1333.438	tp151	FL South pipe East end				
								1332.916	tp153	FL South pipe West end				
								1332.746	tp154	FL Center pipe West end South				
								1331.356	tp155	FL Center pipe West end North				
								1331.404	tp156	FL North pipe West end				
								1340.632	tp157	BSW NW Cor Bridge				
								1342.062	tp158	CLS West side pipe to N on West side				
								1342.722	tp159	CLS West side center pipe West end North				
								1343.252	tp160	CLS West side center pipe West end South				
								1343.612	tp161	CLS West side South end pipe West side				
								1344.162	tp162	CLS East side center pipe West end South				
								1336.888	tp167	NE Cor Bridge nail				
								1340.618	tbm17	NW Cor Bridge BSW				
						1335.030		1334.803	bm7	bchh SW Cor Bridge Recker & Queen Creek Rd	-0.227			
						1334.310		1334.158	bm8	1/2"RB 1/2 mile West Recker & Queen Creek Rc	-0.152			
						1335.540		1335.353	bm9	BCF Top Wall on Bridge Queen Creek & Higley	-0.187			
1326	820669.357	759938.356			1326.010	1328.648		1328.143	bm1326	BCHH Southbound Lane Higley Rd.	-0.505	2.638		
						1325.960		1325.748	bm10	1/2"RB 1/2 mile S on Higley Rd	-0.212			
						1315.310		1315.083	bm11	1/2"RB East side of Canal	-0.227			
						1312.830		1312.568	bm12	rock in cc East side canal	-0.262			
						1331.620		1331.393	bm13	1/2"RB N side of wash 200' E bridge	-0.227			

	Final mapping data for Misc. Points, ERMs													
Pt #	Northing	Easting	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation						
	NAD83(92)	NAD83(92)			NAVD 29	NGVD 88	NGVD 88	NGVD 88						
	GPS	GPS	Collins Pina	DTM	GPS	GPS	PUB	Z&H Levels			88-GPS	88-29		
473	804890.688	786304.644			1419.197	1418.909				erm 1416 mcbchh		-0.288		
474	818117.657	786260.328			1402.166	1401.417				erm 2126 mcbchh		-0.749		
475	826095.760	775601.968			1359.859	1358.655				5007 1 1/2" AC		-1.204		
476	820767.897	775686.133			1365.351	1364.333				5002 1 1/2"AC		-1.018		
477	820868.800	773055.694			1357.066	1356.001				5005 1"IP		-1.065		
478	818333.238	770587.137			1355.694	1354.675				7002 bchh dea108		-1.019		
479	820964.782	770546.089			1349.408	1348.298				7003 bchh dea107		-1.110		
480	824533.981	770490.628			1346.644	1345.409				7050 bchh dea122		-1.235		
481	826224.738	770465.656			1344.293	1342.998				7007 bchh dea107		-1.295		

APPENDIX B

SOIL SAMPLE ANALYSIS

R·A·M

RICKER • ATKINSON • McBEE & ASSOCIATES, INC.

Geotechnical Engineering • Construction Materials Testing

Dibble & Associates
2633 East Indian School Road, Suite 401
Phoenix, Arizona 85016-6763

February 7, 2001

Attention: Brian Fry

Subject: Bank and Bed Sampling and Testing
Queen Creek Improvements
Ellsworth Road to Power Road
Queen Creek, Arizona

R.A.M. Project No. G06046

At your request this firm has sampled from the bank and bed area of Queen Creek between Ellsworth Road and Power Road. The samples were obtained by excavating 15 test pits at the locations selected by West Consultants and as described on the attached sheet. The test pits were 3 feet deep and representative samples were obtained and returned to our laboratory for testing. In Test Pits 1, 7, 9 and 10 two materials were encountered, both were sampled and both materials were tested. Bed samples were obtained from 10 locations (1 to 10) and bank samples were obtained from 5 locations (3B, 4B, 5B, 6B and 10B). The results of the laboratory tests are attached.

If you have any questions or need additional information please do not hesitate to call.

Respectfully submitted,
RICKER, ATKINSON, MCBEE & ASSOCIATES, INC.

2-7-01

Kenneth L. Ricker, P.E.

/ces
Copies to: Addressee (4)
West Consultants, Inc. (1)

2105 South Hardy Drive, Suite 13, Tempe, AZ 85282 • Telephone (480) 921-8100 • Facsimile (480) 921-4081

Sample Locations for Queen Creek Channel Design
<u>Sediment Transport Study</u>

Location	Description	Bed	Bank
Ellsworth to Ocotillo			
	1. 200' downstream from Ellsworth Road	X	
	2. 500' upstream from Ocotillo Road	X	
Hawes to Sossaman			
	3. 500' downstream from Hawes Road	X	X
	4. 2400' downstream from Hawes Road	X	X
	5. 5200' downstream from Hawes Road	X	X
	6. 6900' downstream from Hawes Road (Approximately 500' upstream of Sossaman Road)	X	X
Sossaman to Power			
	7. Approximately 300' below Sossaman Road	X	
	8. 1650' downstream from Sossaman Road	X	
	9. 1270' upstream from Power Road	X	
	10. 400' upstream from Power Road	X	X
	Total Samples	10	5

LABORATORY TEST RESULTS

Date: 6-Feb-01

SAMPLE SOURCE: As noted below

TESTING PERFORMED: Sieve Analysis, Percent Passing No. 200 Sieve, Atterberg Limits (ASTM C136, D1140, D4318)

SAMPLED BY: RAM/Miller

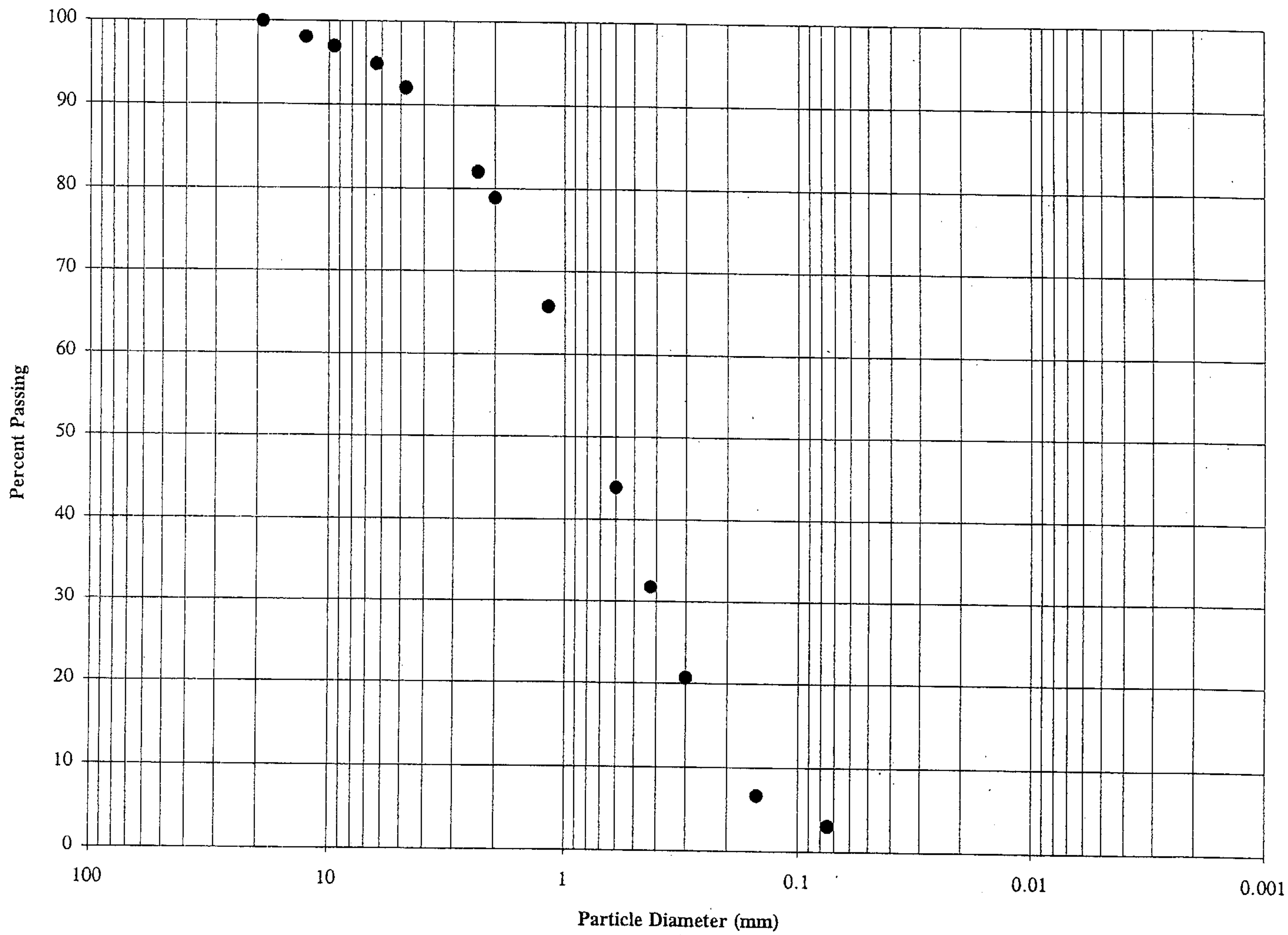
RESULTS:

Sample	Atterberg Limits		Sieve Size - Accumulative Percent Passing											Soil
Source	LL	PI	200	100	50	30	16	8	4	3/4"	1"	2"	3"	Class.*
1 @ 0'-1.5'	N/A	NP	3.1	7	21	44	66	82	92	100				SP
1 @ 1.5'-3'	26	5	75	82	86	89	91	94	96	100				CL-ML
2 @ 0'-3'	N/A	NP	3.0	6	23	54	75	88	95	100				SP
3 @ 0'-3'	N/A	NP	6.9	14	30	55	75	87	94	100				SW-SM
3B @ 0'-3'	N/A	NP	40	61	84	95	98	99	100					SM
4 @ 0'-3'	N/A	NP	2.0	6	24	55	75	86	92	100				SP
4B @ 0'-3'	N/A	NP	40	64	85	93	96	99	100					SM
5 @ 0'-3'	N/A	NP	3.8	13	41	68	82	90	95	100				SP
5B @ 0'-3'	27	9	77	89	96	98	99	100						CL
6 @ 0'-3'	N/A	NP	1.1	4	23	56	76	87	93	100				SP
6B @ 0'-3'	26	10	74	86	94	97	98	99	100					CL
7 @ 0'-1.5'	N/A	NP	5.9	8	21	51	72	84	92	100				SP-SM
7 @ 1.5'-3'	23	8	62	71	80	89	94	97	99	100				CL
8 @ 0'-3'	N/A	NP	0.7	2	15	45	71	89	96	100				SP
9 @ 0'-2'	N/A	NP	1.4	3	17	50	68	77	83	95	96	100		SP
9 @ 2'-3'	26	9	31	42	66	90	95	97	98	100				SC
10 @ 0'-1.5'	N/A	NP	1.2	5	39	84	95	98	100					SP
10 @ 1.5'-3'	22	7	32	42	65	87	92	95	98	100				SC-SM
10B @ 0'-3'	26	7	81	94	98	100								CL-ML

NP = Non-Plastic

* Unified Soil Classification System

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



<u>Sample Source:</u>

1 @ 0'-1.5'

Percent Gravel: 8

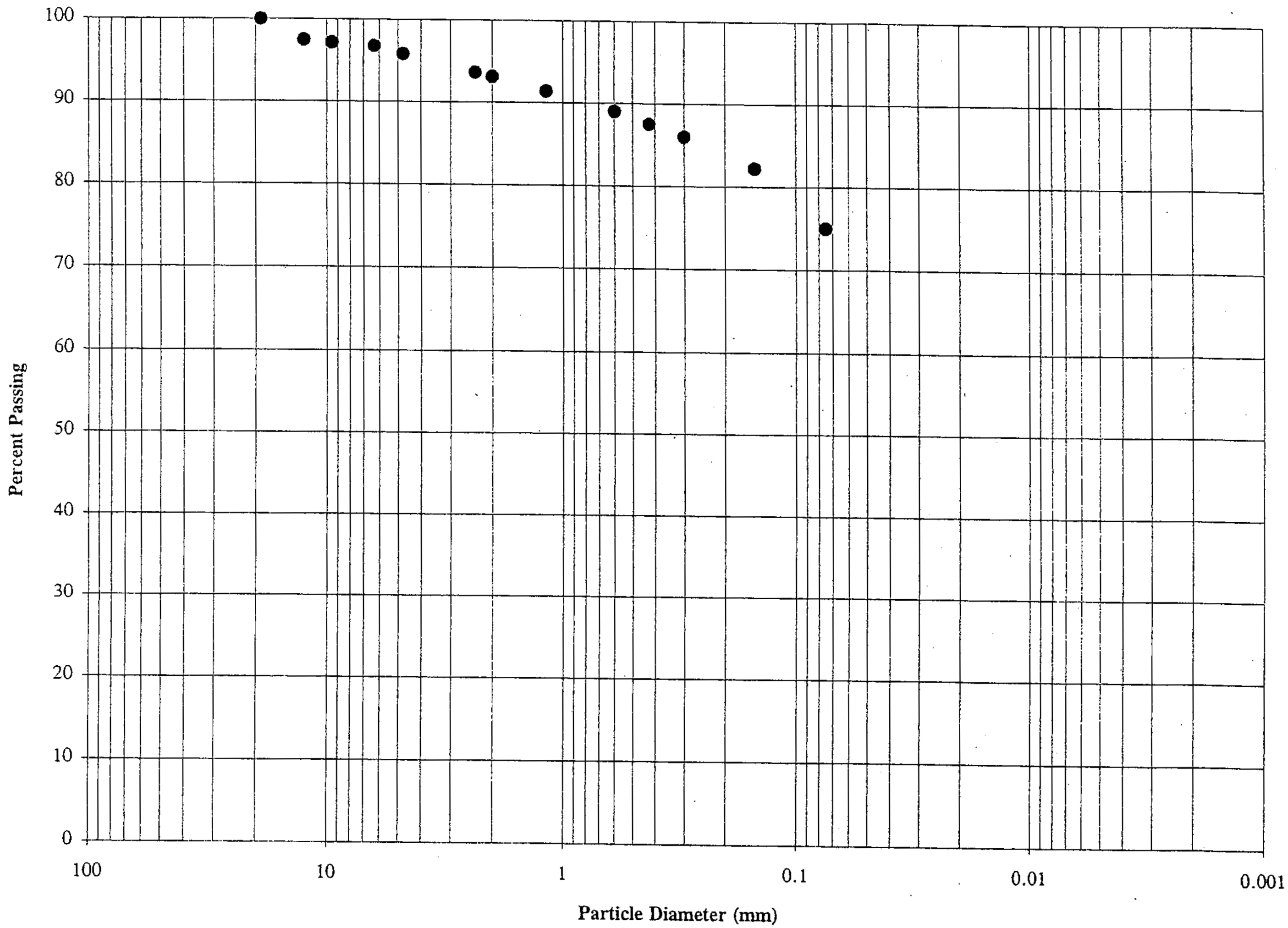
Percent Sand: 89

Percent Silt & Clay: 3

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



<u>Sample Source:</u>

1 @ 1.5'-3'

Percent Gravel: 4

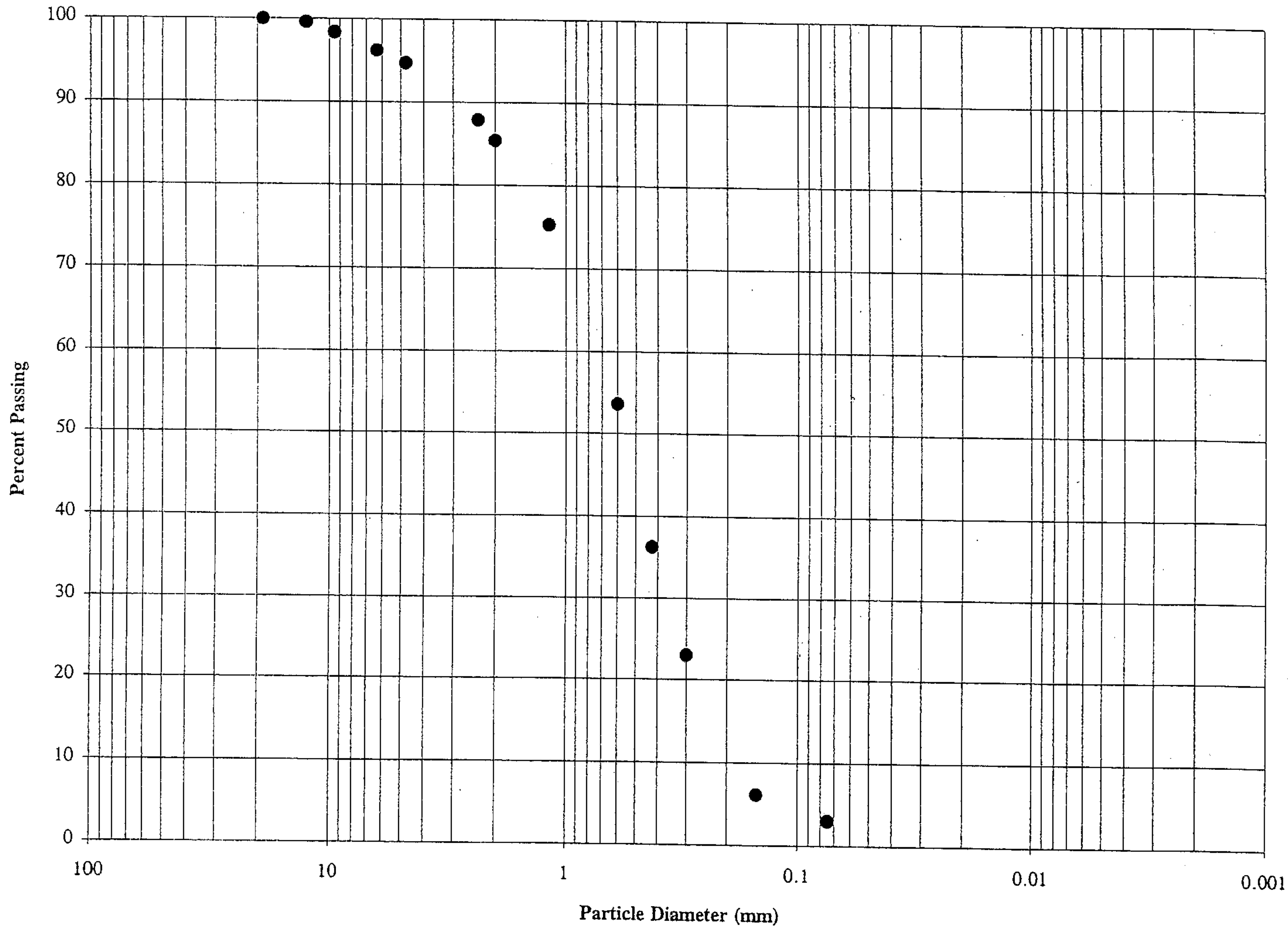
Percent Sand: 21

Percent Silt & Clay: 75

Liquid Limit: 26

Plastic Limit: 5

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

2 @ 0'-3'

Percent Gravel: 5

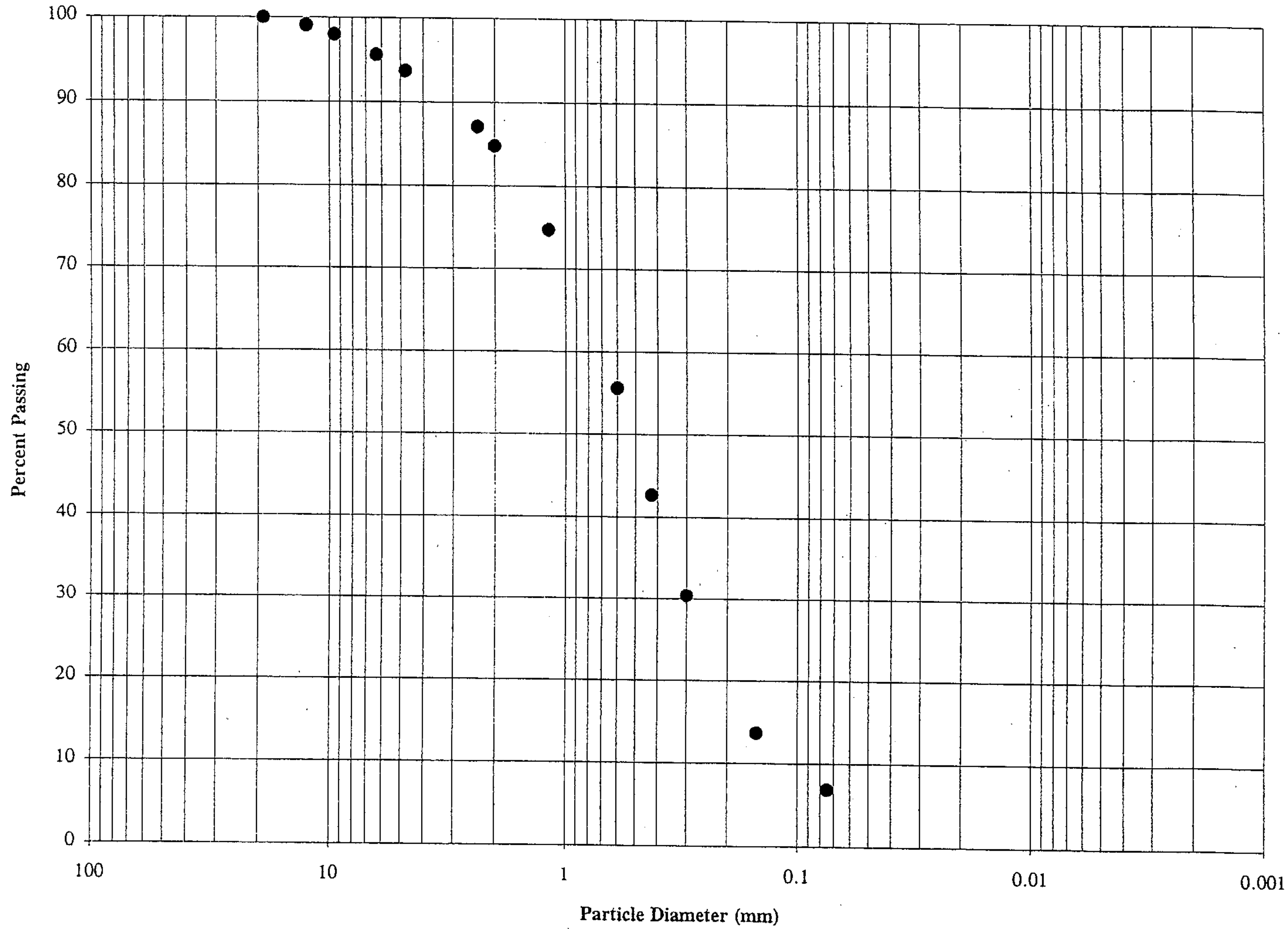
Percent Sand: 92

Percent Silt & Clay: 3

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

3 @ 0'-3'

Percent Gravel: 6

Percent Sand: 87

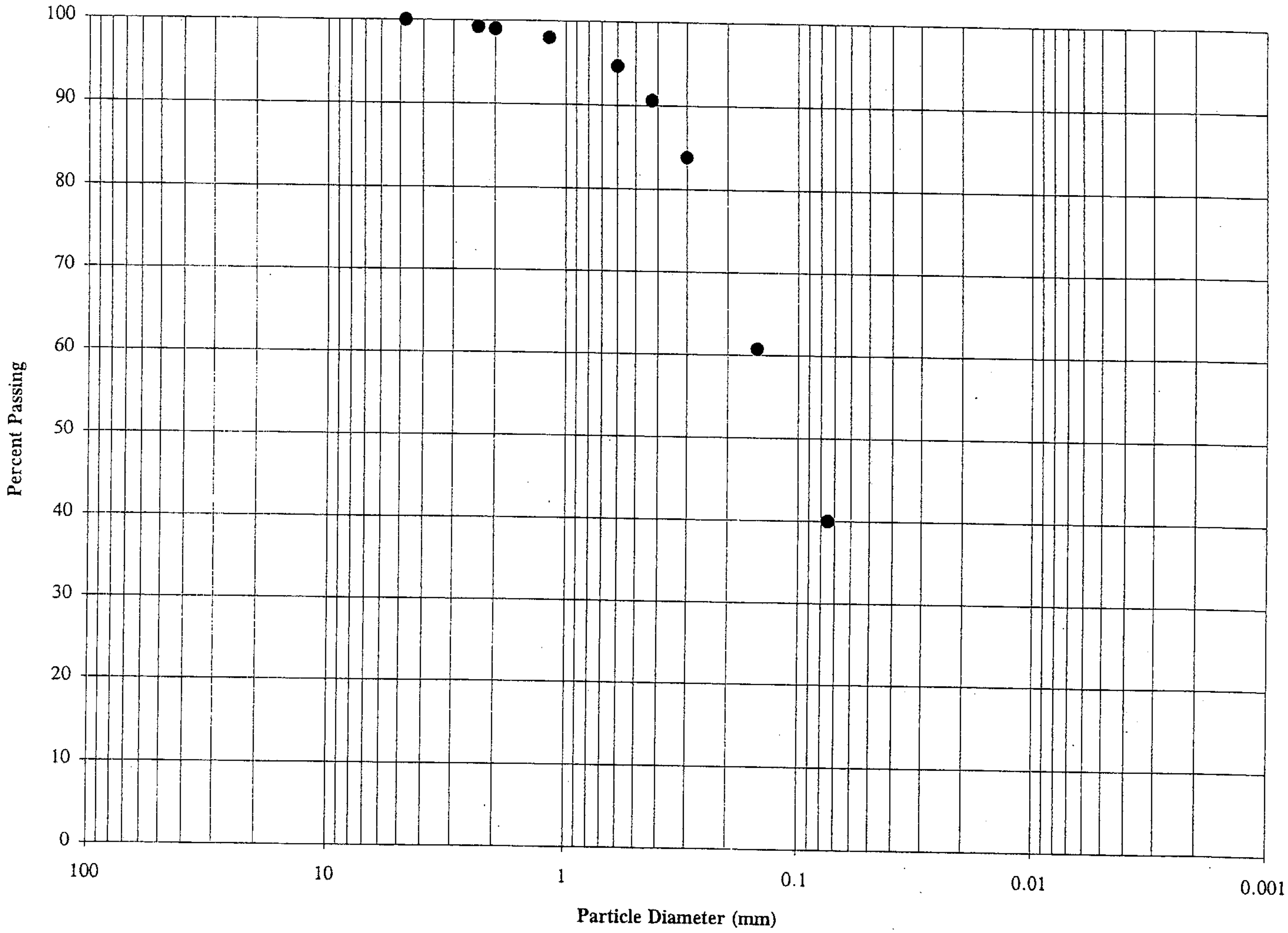
Percent Silt & Clay: 7

Liquid Limit: N/A

Plastic Limit: NP

R.A.M. Project No. G06046

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

3B @ 0'-3'

Percent Gravel: 0

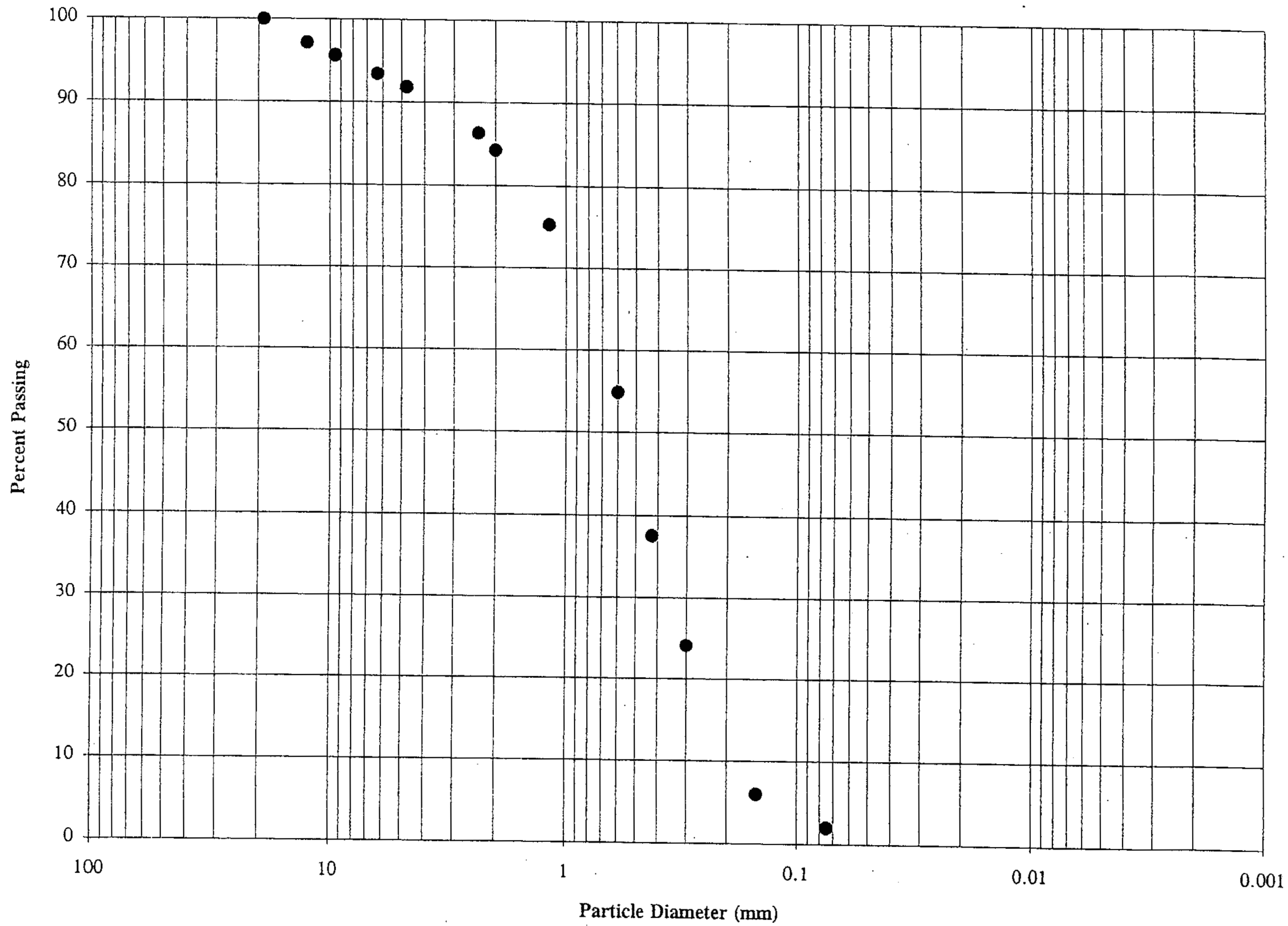
Percent Sand: 60

Percent Silt & Clay: 40

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

4 @ 0'-3'

Percent Gravel: 8

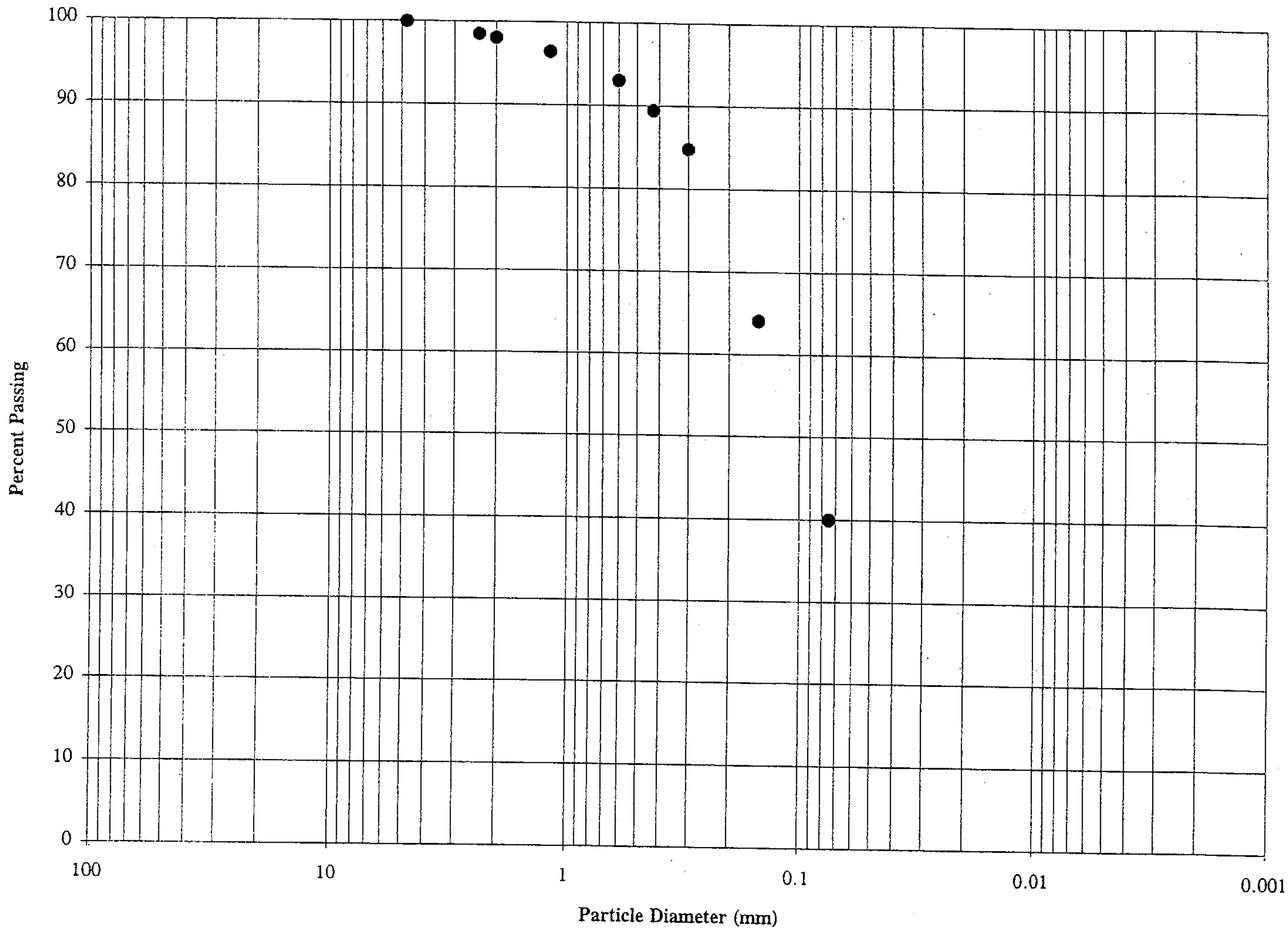
Percent Sand: 90

Percent Silt & Clay: 2

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

4B @ 0'-3'

Percent Gravel: 0

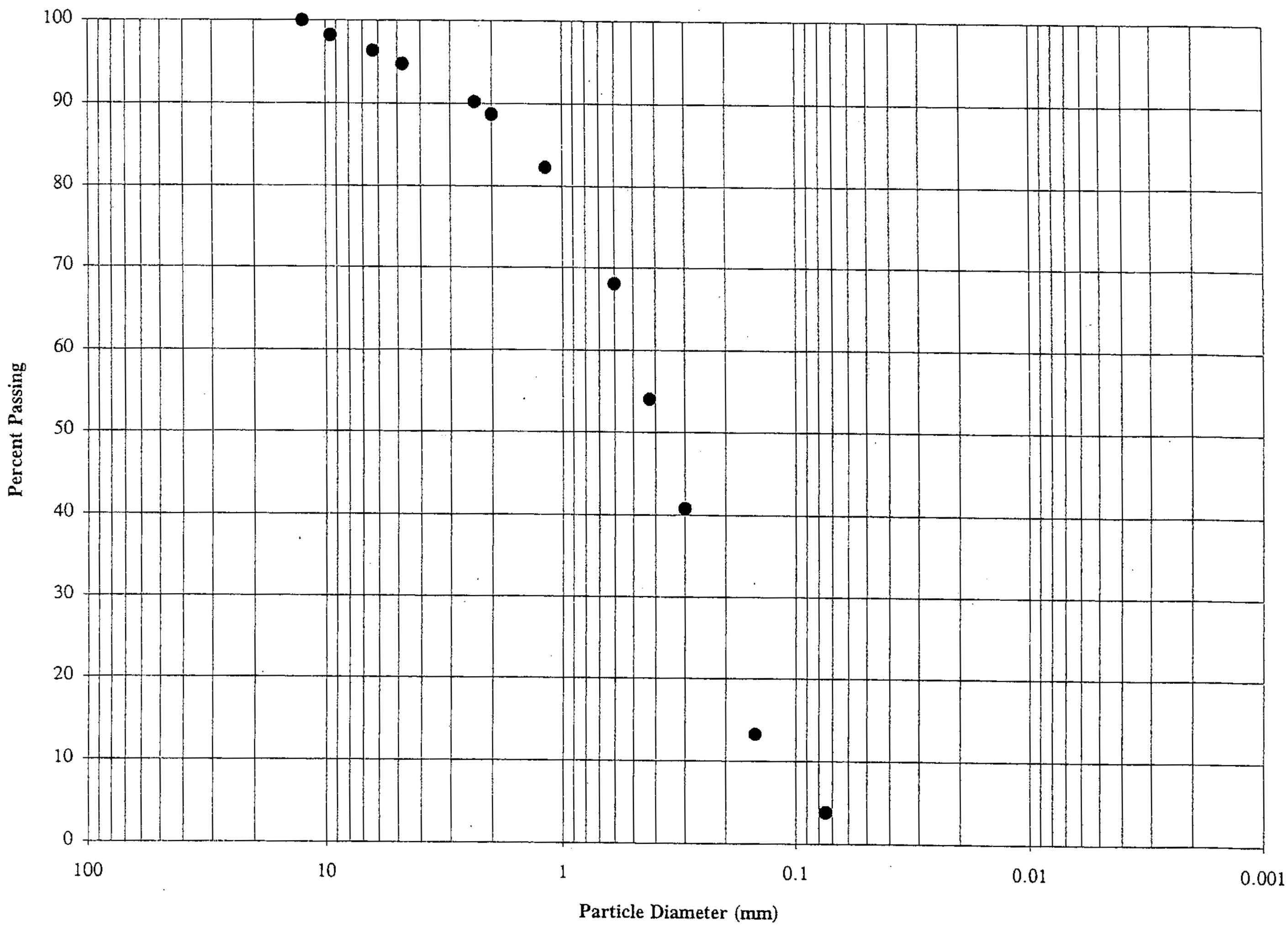
Percent Sand: 60

Percent Silt & Clay: 40

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

5 @ 0'-3'

Percent Gravel: 5

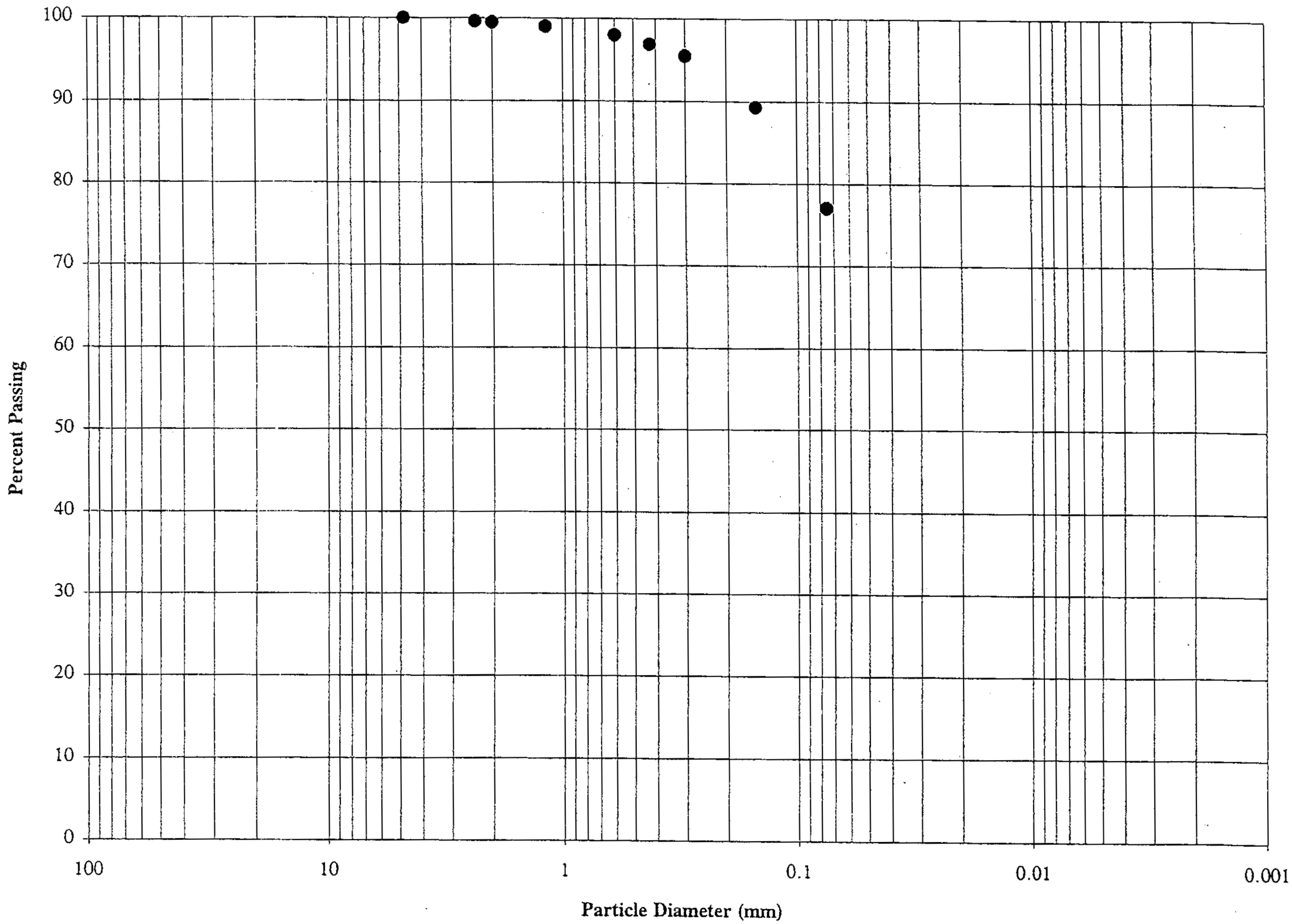
Percent Sand: 91

Percent Silt & Clay: 4

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

5B @ 0'-3'

Percent Gravel: 0

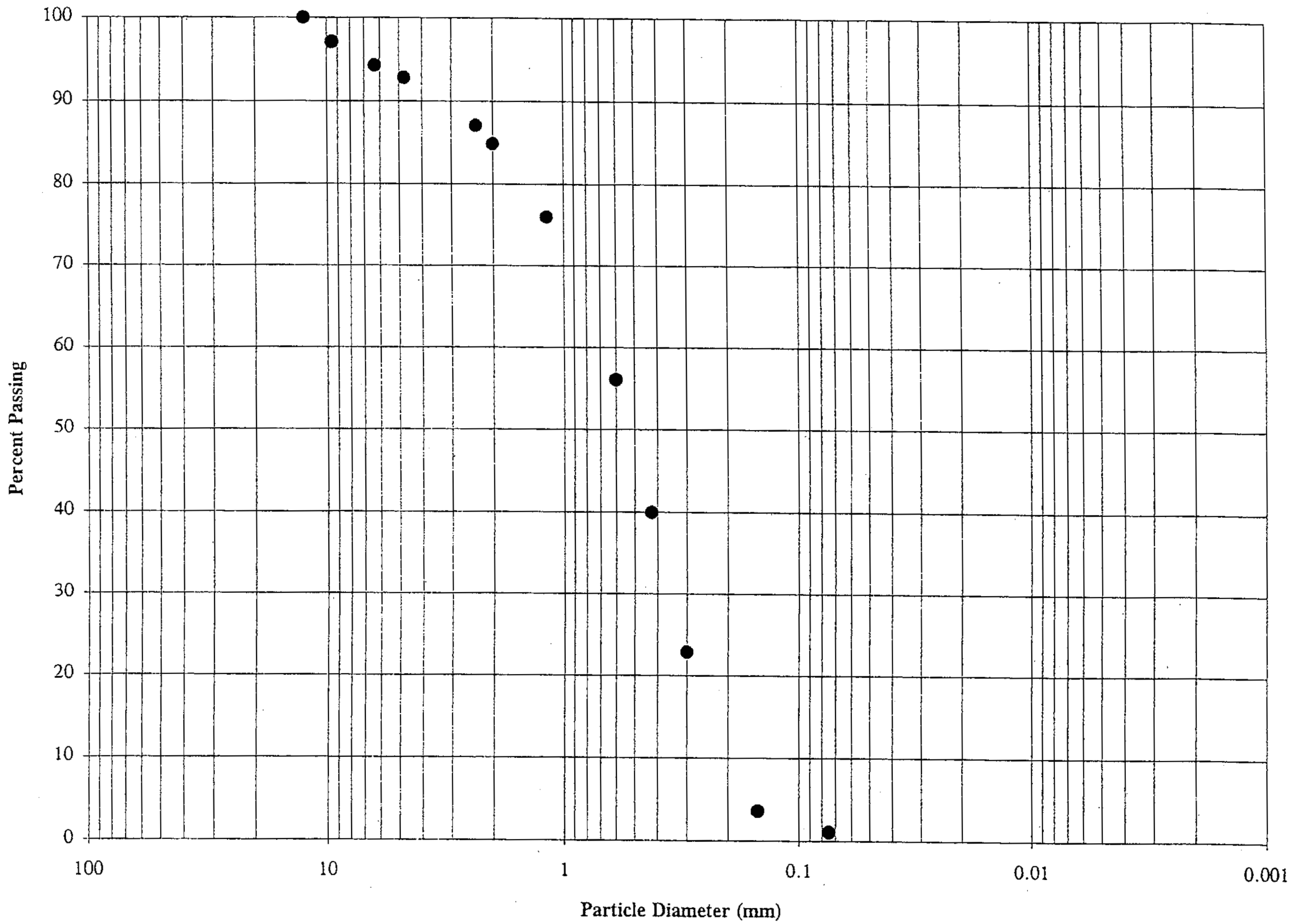
Percent Sand: 23

Percent Silt & Clay: 77

Liquid Limit: 27

Plastic Limit: 9

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

6 @ 0'-3'

Percent Gravel: 7

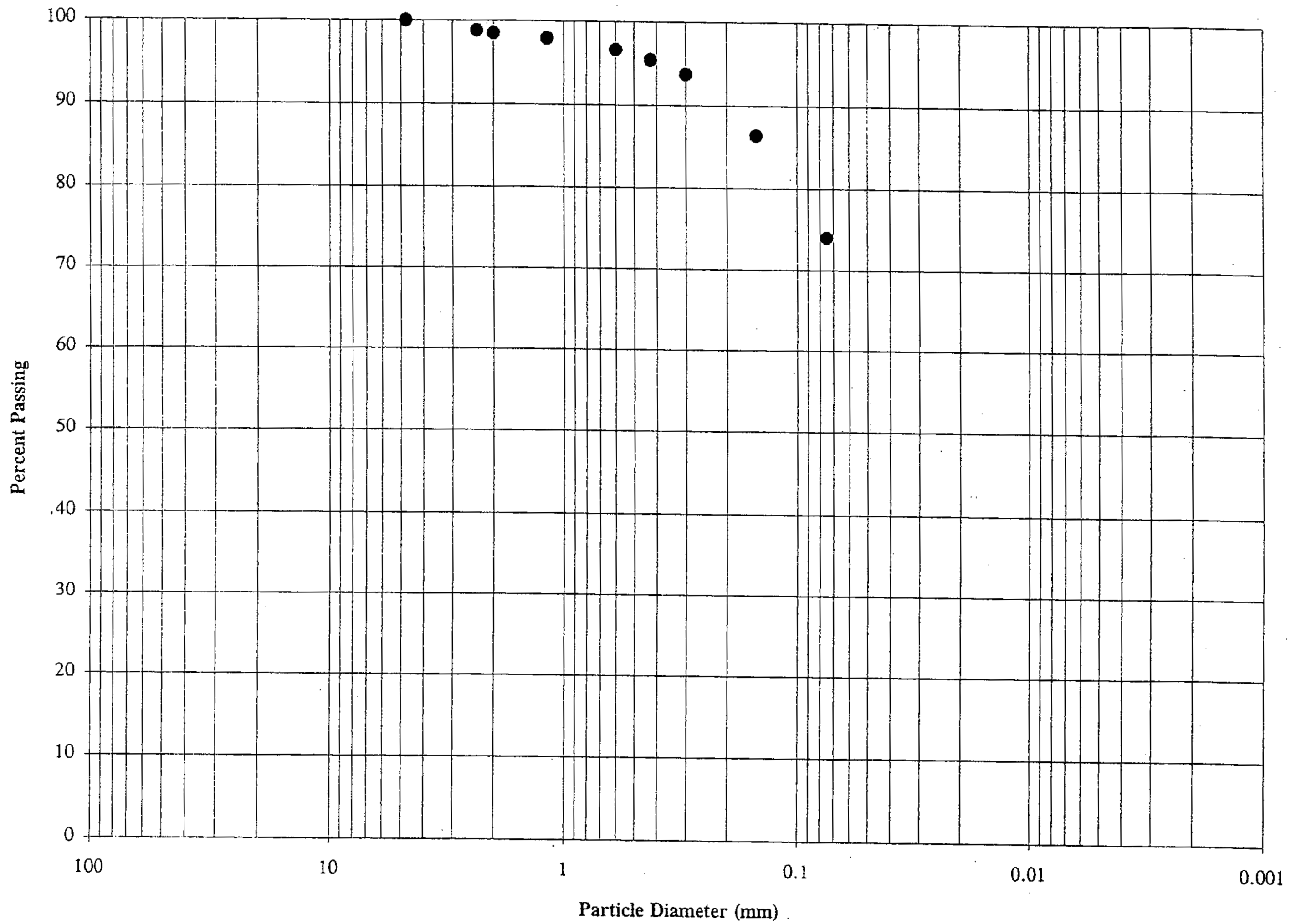
Percent Sand: 92

Percent Silt & Clay: 1

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

6B @ 0'-3'

Percent Gravel: 0

Percent Sand: 26

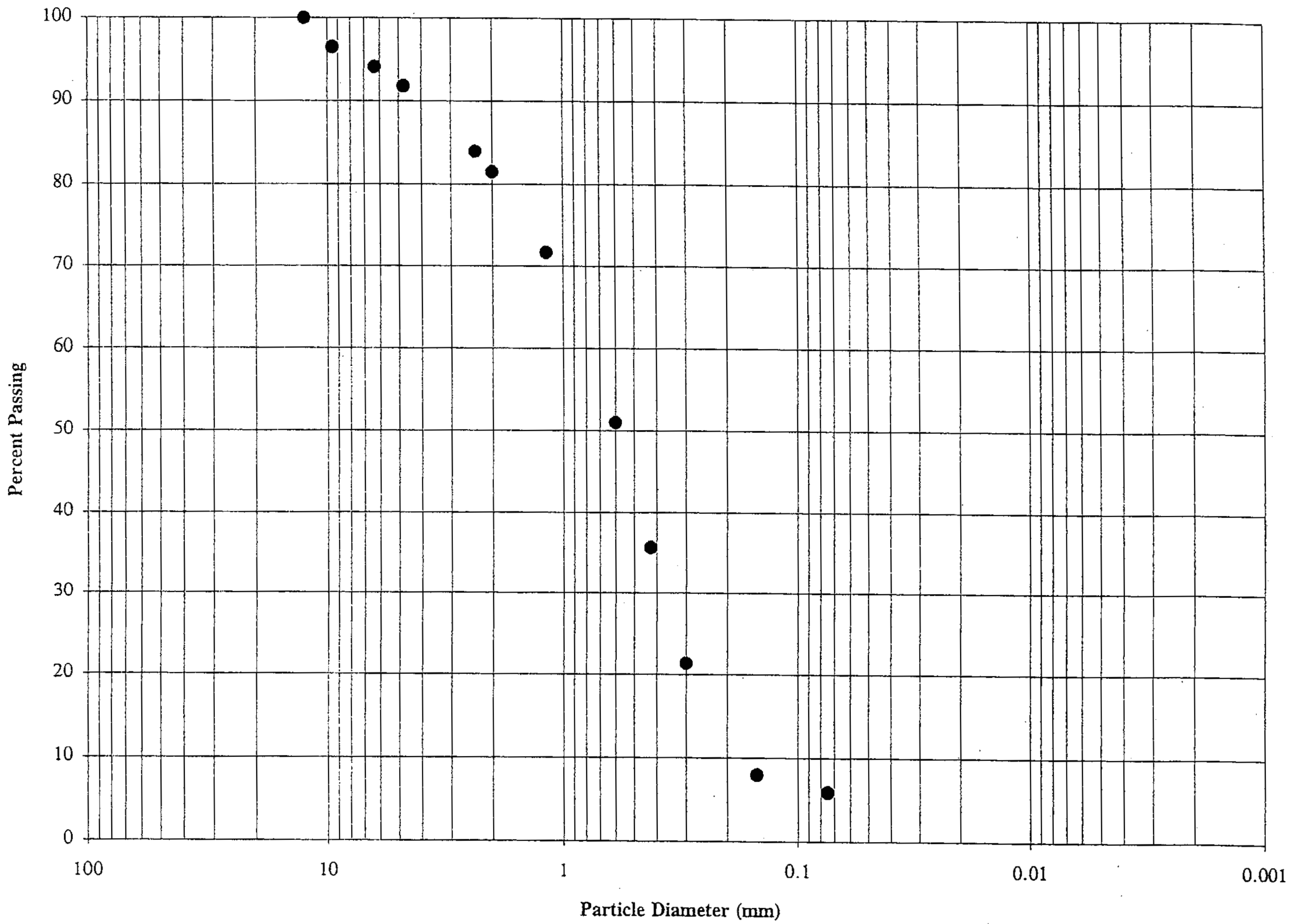
Percent Silt & Clay: 74

Liquid Limit: 26

Plastic Limit: 10

R.A.M. Project No. G06046

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

7 @ 0'-1.5'

Percent Gravel: 8

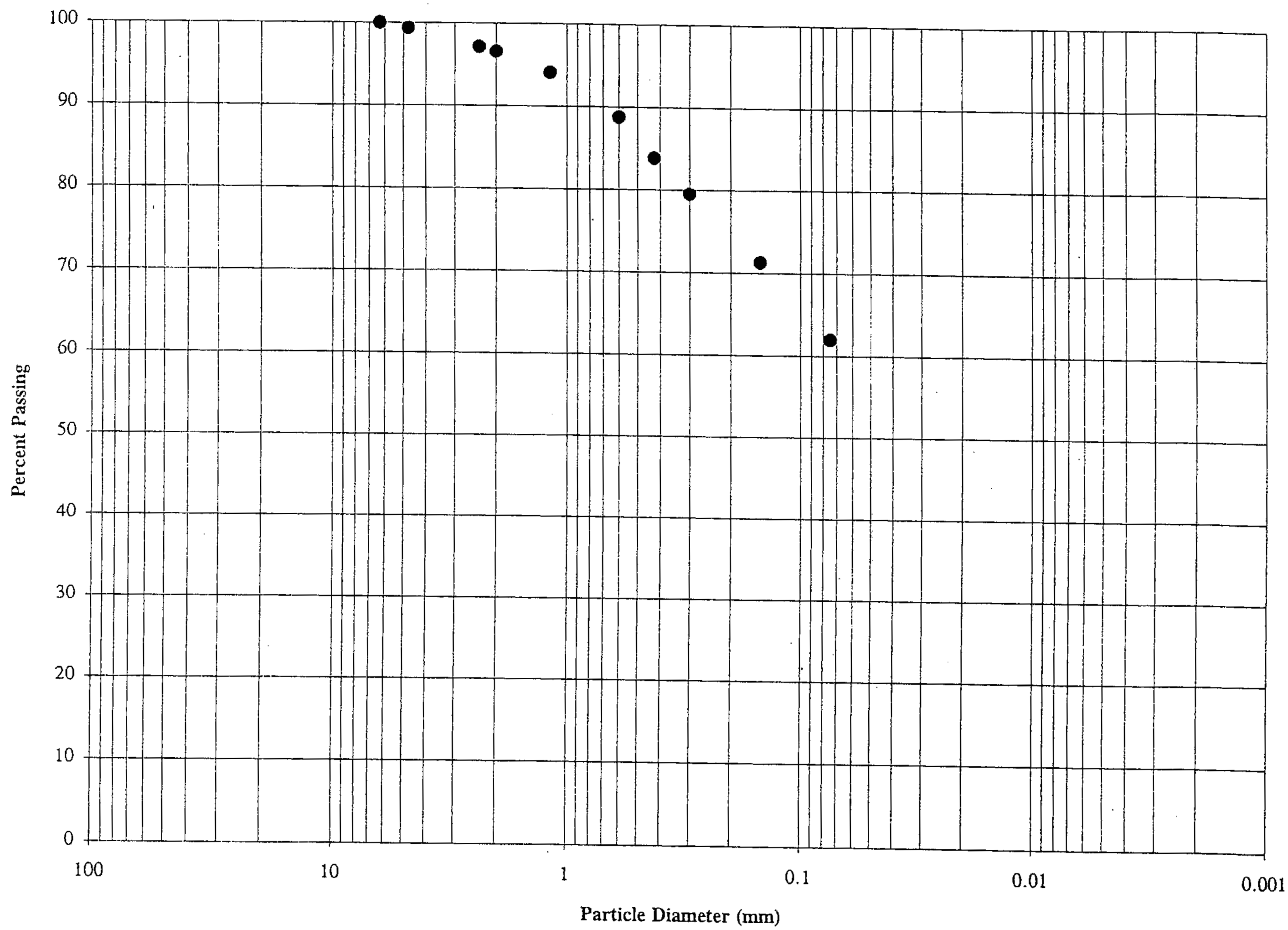
Percent Sand: 86

Percent Silt & Clay: 6

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

7 @ 1.5'-3'

Percent Gravel: 1

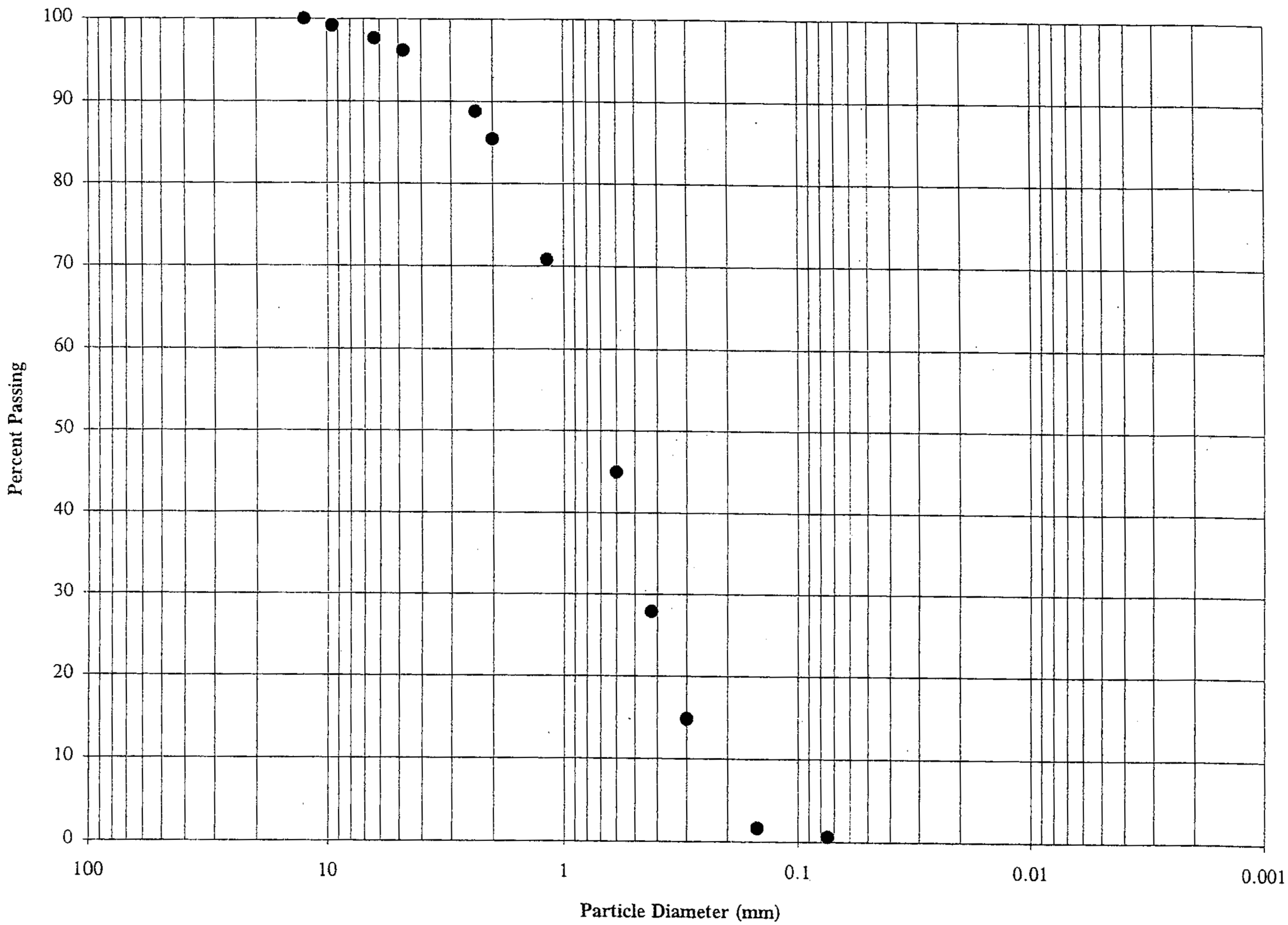
Percent Sand: 37

Percent Silt & Clay: 62

Liquid Limit: 23

Plastic Limit: 8

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

8 @ 0'-3'

Percent Gravel: 4

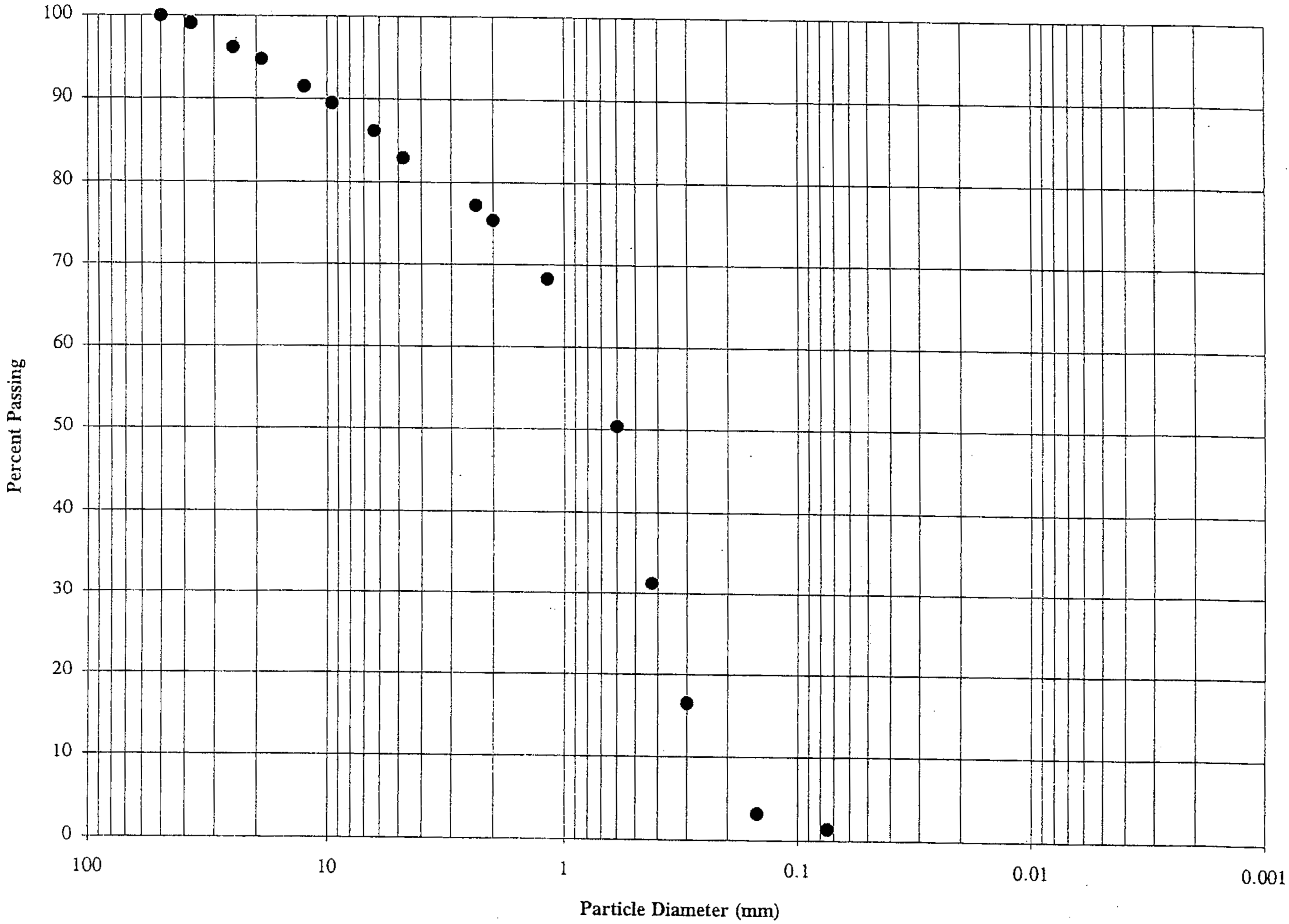
Percent Sand: 95

Percent Silt & Clay: 1

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

9 @ 0'-2'

Percent Gravel: 17

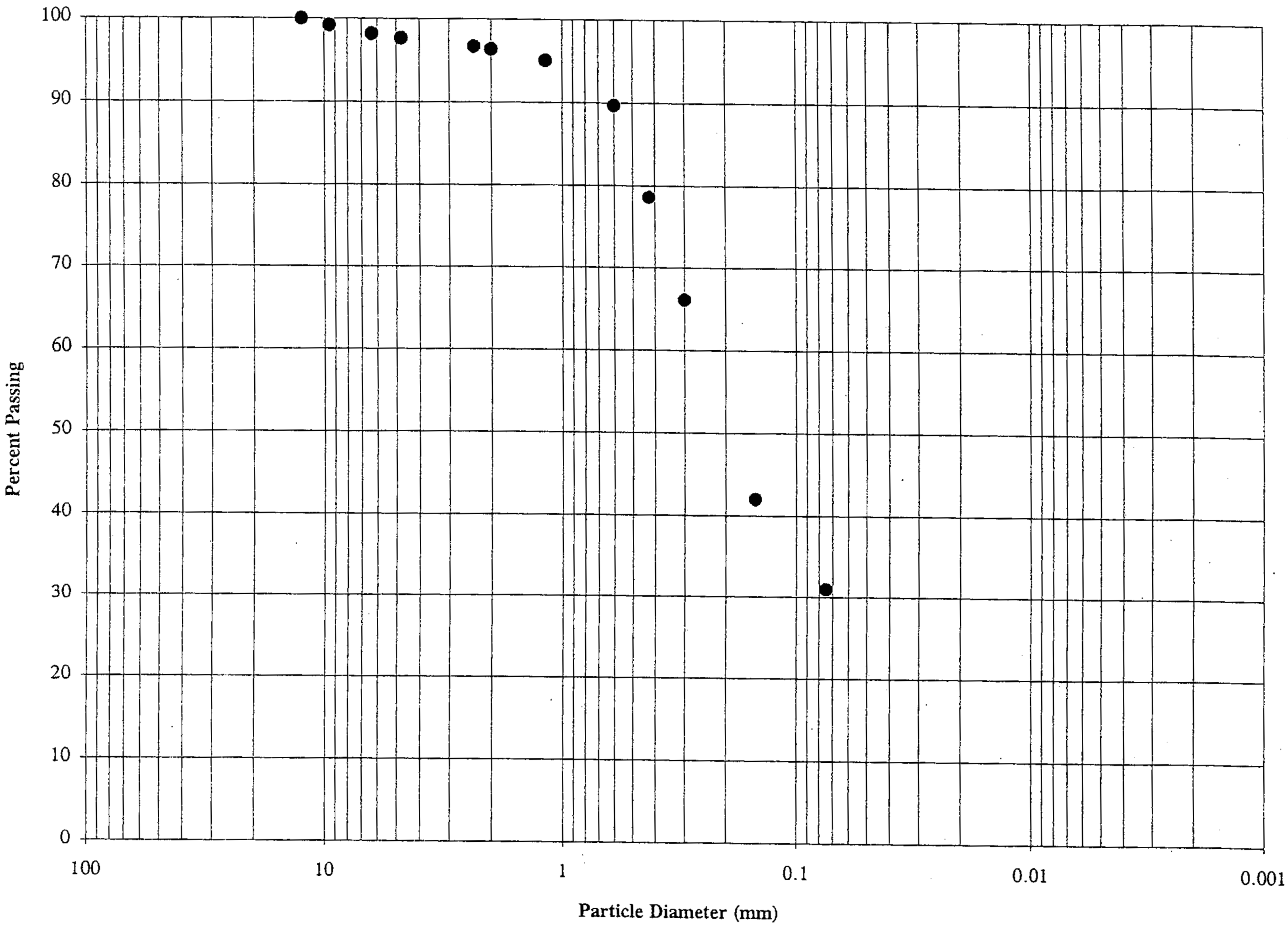
Percent Sand: 82

Percent Silt & Clay: 1

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

9 @ 2'-3'

Percent Gravel: 2

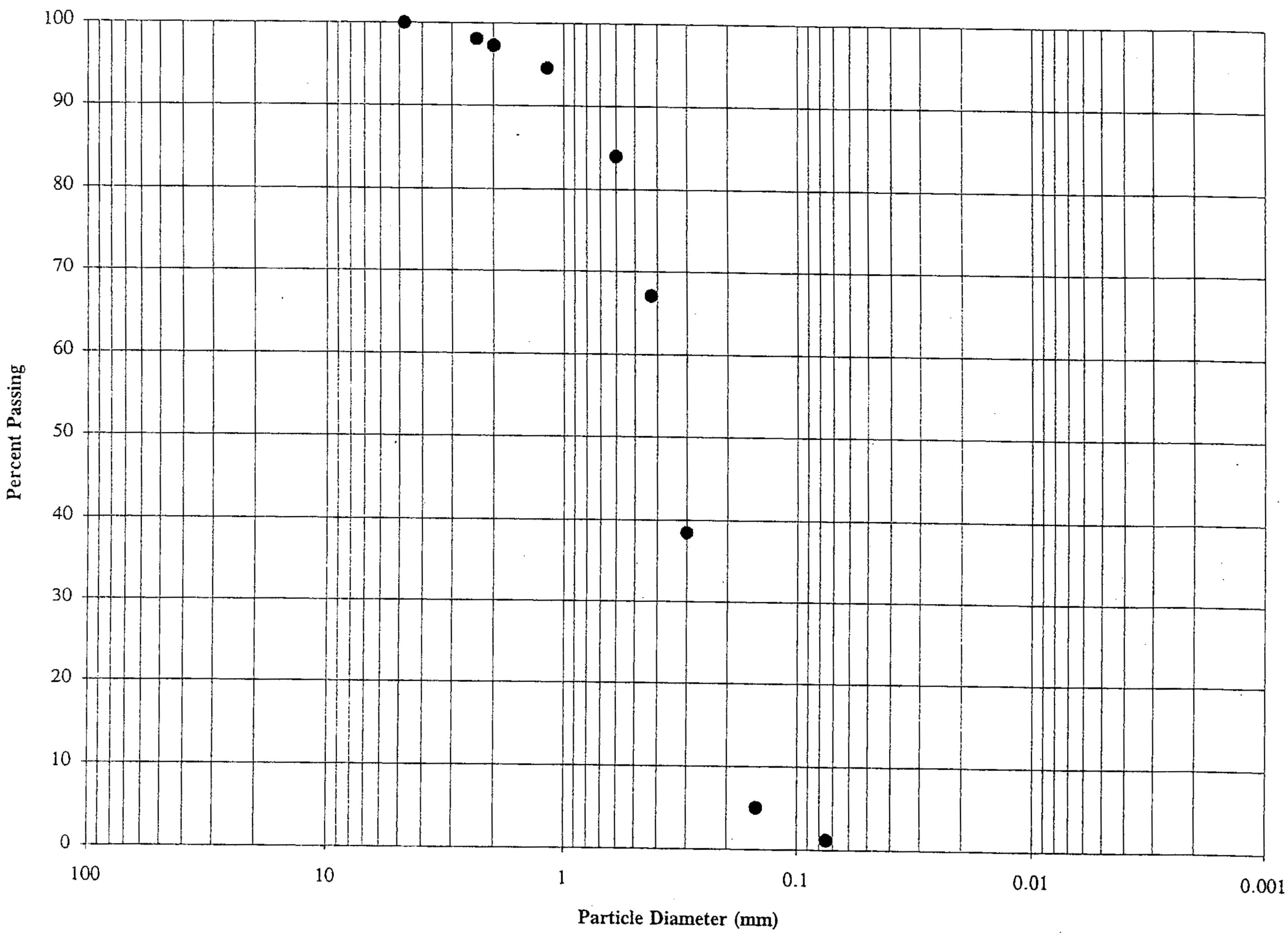
Percent Sand: 67

Percent Silt & Clay: 31

Liquid Limit: 26

Plastic Limit: 9

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

10 @ 0'-1.5'

Percent Gravel: 0

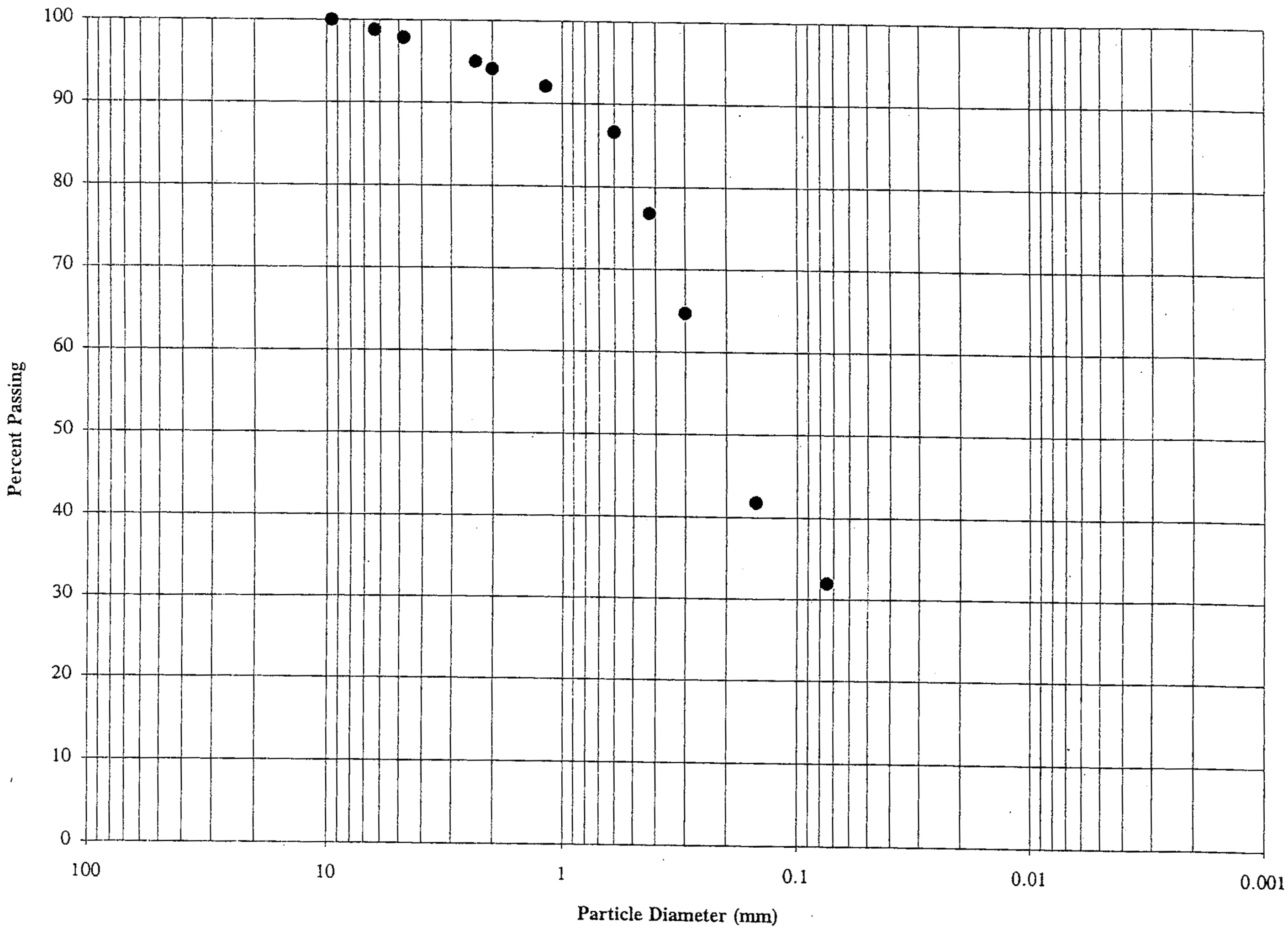
Percent Sand: 99

Percent Silt & Clay: 1

Liquid Limit: N/A

Plastic Limit: NP

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

10 @ 1.5'-3'

Percent Gravel: 2

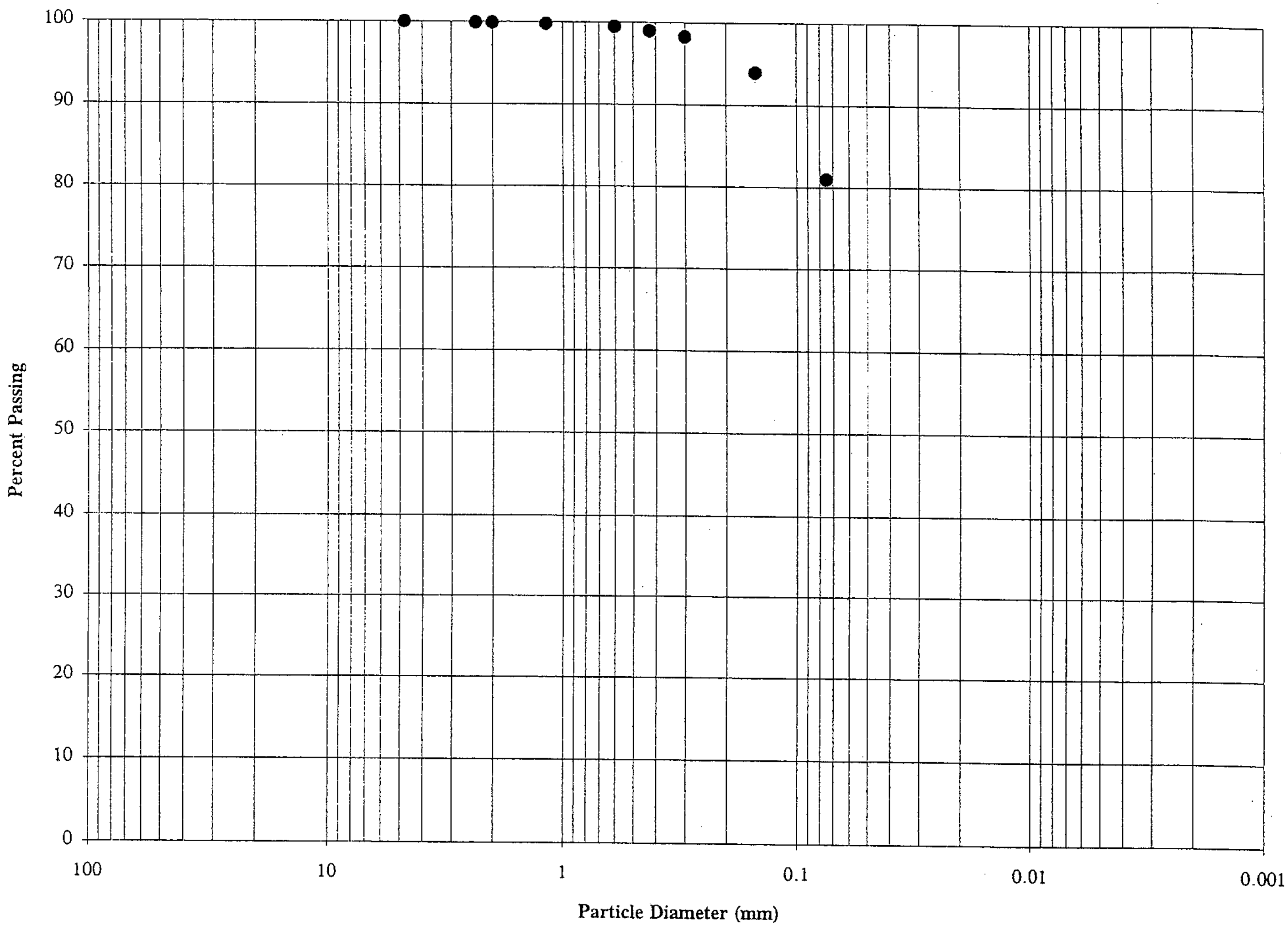
Percent Sand: 66

Percent Silt & Clay: 32

Liquid Limit: 22

Plastic Limit: 7

PARTICLE-SIZE ANALYSIS TEST RESULTS
(ASTM D422)



Sample Source:

10B @ 0'-3'

Percent Gravel: 0

Percent Sand: 19

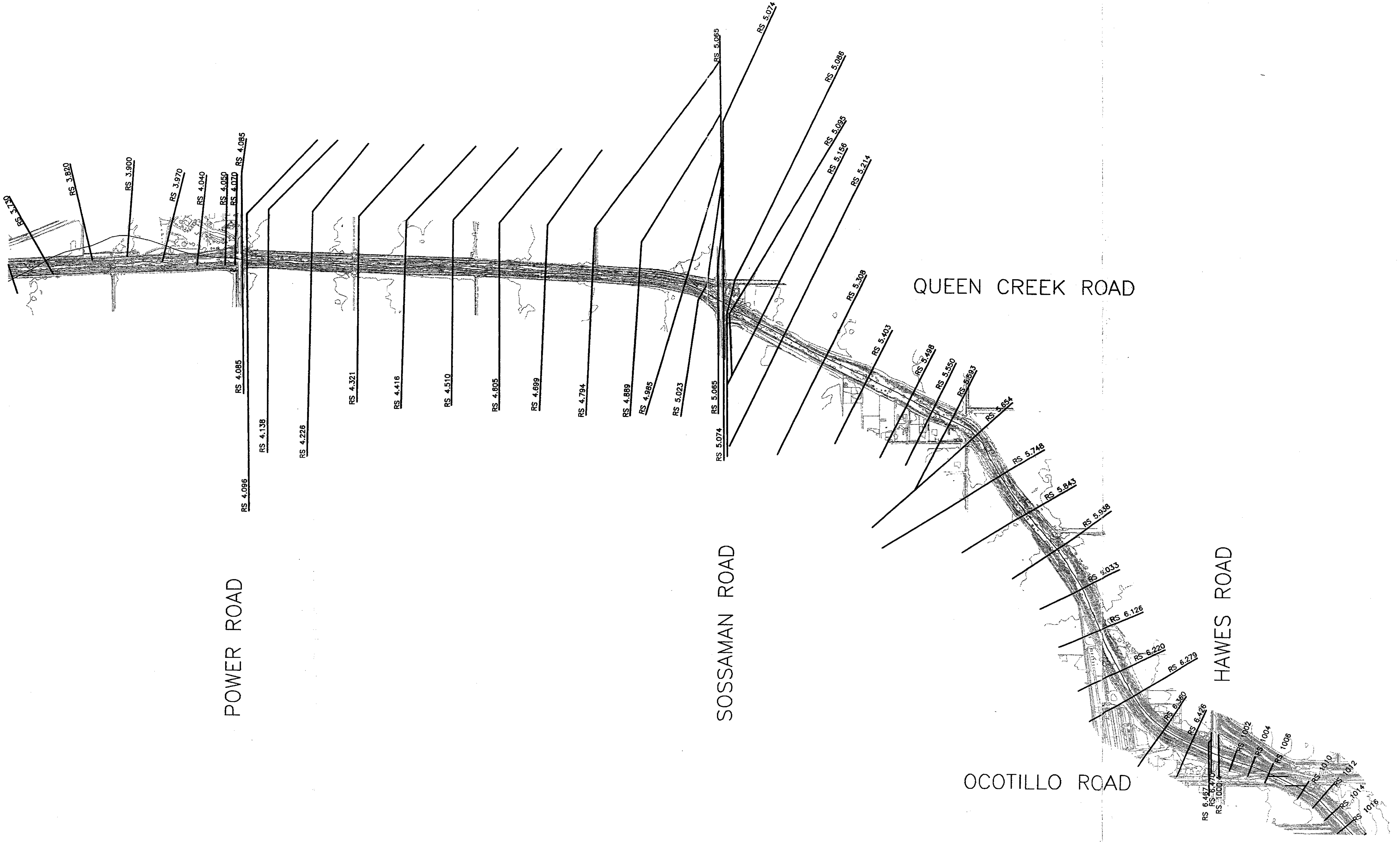
Percent Silt & Clay: 81

Liquid Limit: 26

Plastic Limit: 7

APPENDIX C

HEC-RAS MODEL OUTPUT



COUNTY PROJECT NO.	2000D03	QUEEN CREEK WASH IMPROVEMENTS		
PROJECT DESCRIPTION	EXISTING CONDITIONS HEC-RAS CROSS SECTION LAYOUT			
PRIME CONSULTANT: DIBBLE & ASSOCIATES CONSULTING ENGINEERS	DRN. PAF DATE: 12/10/01	SCALE		SHEETS
	DES. SHD DATE: 12/10/01	1"=1000' HORIZONTAL		
	CKD. KWR DATE: 12/10/01	n/a VERTICAL		NO. 1 OF 1

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1200	1038	1439.93	1442.51	1441.86	1442.69	0.002906	3.43	302.46	193.47	0.48
Reach-1	1200	2655	1439.93	1443.86	1442.73	1444.21	0.002548	4.72	561.98	209.57	0.49
Reach-1	1198	1038	1439.43	1441.5		1441.87	0.005905	4.86	213.64	147.57	0.71
Reach-1	1198	2655	1439.43	1443.08		1443.6	0.003443	5.77	461.52	167.98	0.61
Reach-1	1197.5	1038	1439.23	1441.55	1440.27	1441.65	0.000803	2.58	401.99	177.19	0.3
Reach-1	1197.5	2655	1439.23	1443.15	1441.18	1443.38	0.000907	3.85	689.98	182.17	0.35
Reach-1	1197.3 Bridge										
Reach-1	1197.1	1038	1439.23	1441.54	1440.27	1441.64	0.000811	2.59	400.76	177.17	0.3
Reach-1	1197.1	2655	1439.23	1443.13	1441.18	1443.36	0.00092	3.87	686.76	182.12	0.35
Reach-1	1196.2	1038	1439.23	1441.26	1440.48	1441.49	0.002458	3.85	269.51	135.92	0.48
Reach-1	1196.2	2655	1439.23	1442.61	1441.55	1443.14	0.002905	5.81	456.61	139.88	0.57
Reach-1	1195.8 Bridge										
Reach-1	1195.4	1038	1439.23	1441.24	1440.48	1441.47	0.002535	3.89	267	135.86	0.49
Reach-1	1195.4	2655	1439.23	1442.56	1441.55	1443.1	0.003065	5.91	449.08	139.72	0.58
Reach-1	1194	1038	1438.43	1440.89		1441.09	0.002675	3.56	291.65	177.98	0.49
Reach-1	1194	2655	1438.43	1442.27		1442.64	0.002398	4.85	546.94	192.78	0.51
Reach-1	1192	1038	1437.63	1440.21		1440.46	0.003497	4.05	256.47	157.69	0.56
Reach-1	1192	2655	1437.63	1441.62		1442.07	0.003023	5.4	491.22	175.22	0.57
Reach-1	1190	1038	1436.73	1439.5		1439.76	0.00353	4.11	252.25	138.29	0.54
Reach-1	1190	2655	1436.73	1440.81		1441.37	0.004013	5.98	443.75	152.54	0.62
Reach-1	1188	1038	1436.43	1438.64		1438.9	0.005308	4.08	254.23	167.5	0.58
Reach-1	1188	2655	1436.43	1440.16		1440.56	0.003615	5.08	522.24	185.42	0.53

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1186	1038	1435.43	1438.28		1438.39	0.001301	2.75	377.22	156.11	0.31
Reach-1	1186	2655	1435.43	1439.73		1440.03	0.001851	4.33	612.97	167.01	0.4
Reach-1	1184	1038	1435.23	1437.62		1437.9	0.005698	4.21	246.4	163.06	0.6
Reach-1	1184	2655	1435.23	1438.96		1439.44	0.004759	5.6	474.42	178.9	0.61
Reach-1	1182	1038	1434.43	1436.74		1436.96	0.003828	3.81	272.4	155.4	0.51
Reach-1	1182	2655	1434.43	1438.18		1438.6	0.003604	5.18	512.16	175.75	0.54
Reach-1	1180	1038	1433.43	1435.94		1436.18	0.003954	3.99	260.13	142.01	0.52
Reach-1	1180	2655	1433.43	1437.29		1437.8	0.004378	5.73	463.45	158.59	0.59
Reach-1	1178	1038	1432.43	1434.64		1435.04	0.008602	5.08	204.38	138.98	0.74
Reach-1	1178	2655	1432.43	1436.47		1436.95	0.00404	5.58	475.94	159.12	0.57
Reach-1	1176	1038	1431.43	1434.39		1434.48	0.001091	2.44	425.42	185.04	0.28
Reach-1	1176	2655	1431.43	1436.34		1436.51	0.000956	3.32	799.85	197.92	0.29
Reach-1	1174	1038	1431.13	1433.97		1434.16	0.002411	3.46	300.1	140	0.42
Reach-1	1174	2655	1431.13	1435.94		1436.23	0.001941	4.36	608.54	170.03	0.41
Reach-1	1172	1038	1430.43	1433.45		1433.67	0.002438	3.77	275.38	113.54	0.43
Reach-1	1172	2655	1430.43	1435.35		1435.78	0.002469	5.27	503.85	126.33	0.46
Reach-1	1170	1038	1429.73	1432.77		1433.08	0.003546	4.44	233.9	100.07	0.51
Reach-1	1170	2655	1429.73	1434.56		1435.16	0.003807	6.21	427.44	116.18	0.57
Reach-1	1168	1038	1429.23	1431.9		1432.26	0.004741	4.77	217.58	103.8	0.58
Reach-1	1168	2655	1429.23	1433.8		1434.38	0.003923	6.16	431.14	121.29	0.58
Reach-1	1166	1038	1428.23	1431.36		1431.59	0.002243	3.86	269.06	100.4	0.42
Reach-1	1166	2655	1428.23	1433.2		1433.7	0.002776	5.71	464.94	112.59	0.5
Reach-1	1164	1038	1427.43	1430.92		1431.14	0.002242	3.69	281.2	112.51	0.41

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1164	2655	1427.43	1432.7		1433.14	0.002685	5.36	495.73	129.54	0.48
Reach-1	1162	1038	1426.93	1429.98		1430.4	0.006529	5.23	198.4	104.75	0.67
Reach-1	1162	2655	1426.93	1431.46		1432.3	0.00654	7.38	359.57	112.89	0.73
Reach-1	1160	1038	1424.53	1428.46		1428.96	0.007954	5.66	183.39	99.77	0.74
Reach-1	1160	2655	1424.53	1430.46		1431.14	0.004789	6.64	399.93	116.76	0.63
Reach-1	1158	1038	1423.43	1428.23		1428.37	0.00114	3	345.67	113.03	0.3
Reach-1	1158	2655	1423.43	1430.23		1430.55	0.001441	4.57	584.74	125.62	0.37
Reach-1	1156	1038	1424.43	1427.85		1428.06	0.002113	3.67	282.6	108.98	0.4
Reach-1	1156	2655	1424.43	1429.74		1430.18	0.002416	5.26	504.43	124.99	0.46
Reach-1	1154	1038	1423.53	1427.12		1427.45	0.004417	4.62	224.67	106.58	0.56
Reach-1	1154	2655	1423.53	1428.98		1429.57	0.003714	6.16	431.27	116.17	0.56
Reach-1	1152	1038	1422.93	1426.64		1426.85	0.00199	3.65	284.05	105.27	0.39
Reach-1	1152	2655	1422.93	1428.46		1428.92	0.002508	5.46	486.62	117.11	0.47
Reach-1	1150	1038	1422.03	1425.87		1426.24	0.004823	4.86	213.5	100.37	0.59
Reach-1	1150	2655	1422.03	1427.74		1428.29	0.004024	5.96	445.43	134.39	0.58
Reach-1	1148	1038	1420.93	1425.1		1425.39	0.003598	4.36	238.29	105.99	0.51
Reach-1	1148	2655	1420.93	1427.09		1427.59	0.002913	5.7	469.4	123.63	0.51
Reach-1	1146	1038	1420.43	1424.5		1424.75	0.00275	4.08	254.31	101.99	0.46
Reach-1	1146	2655	1420.43	1426.57		1427.03	0.002615	5.47	485.71	121.15	0.48
Reach-1	1144	1038	1420.43	1423.85		1424.15	0.003221	4.44	233.9	94.07	0.49
Reach-1	1144	2655	1420.43	1425.9		1426.46	0.002965	6.07	442.74	108.18	0.52
Reach-1	1142	1038	1419.33	1423.44		1423.65	0.001812	3.64	285.34	99.24	0.38
Reach-1	1142	2655	1419.33	1425.49		1425.92	0.002177	5.26	504.53	115.33	0.44

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1140	1038	1419.13	1422.27		1422.91	0.009189	6.43	161.51	81.02	0.8
Reach-1	1140	2655	1419.13	1424.13		1425.13	0.007333	8.04	330.07	99.54	0.78
Reach-1	1138	1038	1418.43	1421.63		1421.89	0.002707	4.12	252.02	97.11	0.45
Reach-1	1138	2655	1418.43	1423.57		1424.11	0.002916	5.89	450.72	105.87	0.5
Reach-1	1136	1038	1417.43	1420.91		1421.24	0.003929	4.57	227.04	100.39	0.54
Reach-1	1136	2655	1417.43	1422.96		1423.5	0.003187	5.91	449.05	114.85	0.53
Reach-1	1134	1038	1417.03	1420.41		1420.65	0.002128	3.85	269.29	96.79	0.41
Reach-1	1134	2655	1417.03	1422.46		1422.93	0.002425	5.51	481.66	111.19	0.47
Reach-1	1132	1038	1416.43	1419.81		1420.12	0.003212	4.43	234.1	92.74	0.49
Reach-1	1132	2655	1416.43	1421.73		1422.34	0.003461	6.28	422.73	104.56	0.55
Reach-1	1130	1038	1416.43	1419.05		1419.39	0.004146	4.65	223.34	100.12	0.55
Reach-1	1130	2655	1416.43	1421.07		1421.64	0.003381	6.06	438.22	112.7	0.54
Reach-1	1128	1038	1415.33	1418.51		1418.75	0.002329	3.94	263.67	98.34	0.42
Reach-1	1128	2655	1415.33	1420.56		1421.04	0.002487	5.53	479.73	112.27	0.47
Reach-1	1126	1038	1414.83	1417.38		1417.94	0.007753	6.01	172.69	84.12	0.74
Reach-1	1126	2655	1414.83	1419.48		1420.31	0.005234	7.3	363.93	98.22	0.67
Reach-1	1124	1038	1413.03	1416.73		1417.02	0.002634	4.38	237.24	81.86	0.45
Reach-1	1124	2655	1413.03	1418.83		1419.45	0.003101	6.3	421.34	94.37	0.53
Reach-1	1122	1038	1412.43	1416.27		1416.49	0.002463	3.8	273.45	112.51	0.43
Reach-1	1122	2655	1412.43	1418.54		1418.89	0.00194	4.76	557.27	136	0.41
Reach-1	1120	1038	1411.43	1415.67		1415.97	0.002662	4.43	234.08	80.5	0.46
Reach-1	1120	2655	1411.43	1417.76		1418.37	0.003274	6.25	424.51	101.44	0.54

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1118	1038	1411.03	1414.96		1415.32	0.004048	4.8	216.38	90.41	0.55
Reach-1	1118	2655	1411.03	1417.1		1417.69	0.003467	6.12	434.07	111.39	0.55
Reach-1	1116	1038	1410.43	1413.84		1414.35	0.005669	5.75	180.62	74.29	0.65
Reach-1	1116	2655	1410.43	1415.96		1416.83	0.005074	7.45	356.35	90.94	0.66
Reach-1	1114	1038	1408.93	1413.03		1413.41	0.003658	4.95	209.64	77.67	0.53
Reach-1	1114	2655	1408.93	1415.27		1415.96	0.003328	6.68	400.26	91.3	0.55
Reach-1	1112	1038	1408.43	1412.55		1412.82	0.002185	4.21	246.69	78.87	0.42
Reach-1	1112	2655	1408.43	1414.79		1415.35	0.002495	6.01	443.93	95.46	0.48
Reach-1	1110	1038	1408.43	1411.81		1412.22	0.004218	5.09	203.77	80.44	0.56
Reach-1	1110	2655	1408.43	1414.11		1414.76	0.00347	6.44	411.97	98.22	0.55
Reach-1	1108	1038	1406.43	1411.12		1411.49	0.00308	4.88	212.5	70.3	0.5
Reach-1	1108	2655	1406.43	1413.26		1414.01	0.003857	6.98	380.38	86.83	0.59
Reach-1	1106	1038	1406.53	1410.45		1410.81	0.003726	4.84	214.27	83.21	0.53
Reach-1	1106	2655	1406.53	1412.64		1413.26	0.003279	6.36	419.07	100.74	0.54
Reach-1	1104	1038	1405.83	1409.97		1410.22	0.002173	4.05	256.07	86.61	0.42
Reach-1	1104	2655	1405.83	1412.16		1412.67	0.002385	5.73	464.09	101.74	0.47
Reach-1	1102	1038	1405.93	1409.26		1409.63	0.00403	4.91	211.51	85.4	0.55
Reach-1	1102	2655	1405.93	1411.45		1412.09	0.003456	6.45	411.74	97.59	0.55
Reach-1	1100	1038	1405.43	1408.5		1408.85	0.003678	4.76	218.03	86	0.53
Reach-1	1100	2655	1405.43	1410.86		1411.44	0.002896	6.1	435.1	98.08	0.51
Reach-1	1098	1038	1404.43	1407.96		1408.22	0.002545	4.1	253.27	95.05	0.44
Reach-1	1098	2655	1404.43	1410.51		1410.92	0.00193	5.13	517.2	111.81	0.42
Reach-1	1096	1038	1403.43	1407.43		1407.72	0.002389	4.36	237.92	77.13	0.44

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1096	2655	1403.43	1409.94		1410.48	0.002379	5.9	449.9	91.72	0.47
Reach-1	1094	1038	1402.43	1406.96		1407.26	0.002286	4.4	235.87	72.87	0.43
Reach-1	1094	2655	1402.43	1409.4		1409.98	0.002584	6.13	432.77	88.53	0.49
Reach-1	1092	1038	1402.43	1406.36		1406.71	0.003185	4.77	217.59	76.71	0.5
Reach-1	1092	2655	1402.43	1408.87		1409.44	0.002745	6.05	438.71	95.79	0.5
Reach-1	1090	1038	1401.43	1405.76		1406.11	0.002853	4.73	219.28	71.76	0.48
Reach-1	1090	2655	1401.43	1408.25		1408.87	0.002882	6.35	418.37	88.38	0.51
Reach-1	1088	1038	1400.53	1405.07		1405.49	0.003319	5.16	201	63.91	0.51
Reach-1	1088	2655	1400.53	1407.4		1408.18	0.003999	7.08	374.8	85.27	0.6
Reach-1	1086	1038	1399.83	1404.19		1404.71	0.004562	5.74	180.82	62.43	0.59
Reach-1	1086	2655	1399.83	1406.27		1407.26	0.005198	7.95	335.5	82.9	0.68
Reach-1	1084	1038	1399.43	1403.04		1403.63	0.006359	6.14	169.1	68.51	0.69
Reach-1	1084	2655	1399.43	1405.35		1406.26	0.004566	7.66	351.59	86.81	0.64
Reach-1	1082	1038	1398.43	1402.21		1402.65	0.003613	5.31	195.31	63.6	0.53
Reach-1	1082	2655	1398.43	1404.6		1405.34	0.004172	6.91	384.46	95.03	0.6
Reach-1	1080	1038	1397.43	1402.02		1402.17	0.001203	3.08	336.94	110.67	0.31
Reach-1	1080	2655	1397.43	1404.56		1404.83	0.001023	4.15	649.07	131.06	0.32
Reach-1	1078	1038	1396.93	1401.23		1401.72	0.00438	5.62	184.75	64.39	0.58
Reach-1	1078	2655	1396.93	1403.52		1404.4	0.00434	7.51	355.41	83.4	0.63
Reach-1	1076	1038	1395.93	1400.71		1401.02	0.002486	4.43	234.49	76.51	0.45
Reach-1	1076	2655	1395.93	1403.11		1403.68	0.002371	6.08	441.72	93.31	0.47
Reach-1	1074	1038	1395.63	1400.27		1400.54	0.002196	4.14	250.49	82.29	0.42
Reach-1	1074	2655	1395.63	1402.7		1403.21	0.002101	5.75	467.19	95.65	0.45

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1072	1038	1395.23	1399.81		1400.09	0.002293	4.28	242.32	78.29	0.43
Reach-1	1072	2655	1395.23	1402.24		1402.77	0.002309	5.84	458.14	97.45	0.46
Reach-1	1070	1038	1394.83	1398.79		1399.37	0.005789	6.13	169.2	63.71	0.66
Reach-1	1070	2655	1394.83	1401.04		1402.05	0.005462	8.03	330.45	79.06	0.69
Reach-1	1068	1038	1393.93	1398.12		1398.53	0.002857	5.11	203.17	67.77	0.52
Reach-1	1068	2655	1393.93	1400.35		1401.15	0.00328	7.18	369.62	81.52	0.59
Reach-1	1066	1038	1393.43	1397.6		1398	0.002459	5.08	204.34	67.65	0.52
Reach-1	1066	2655	1393.43	1399.63		1400.49	0.003257	7.44	356.74	81.83	0.63
Reach-1	1064	1038	1393.34	1396.78		1397.34	0.0043	6.01	172.66	75.47	0.7
Reach-1	1064	2655	1393.34	1399		1399.83	0.003277	7.35	361.42	95.05	0.66
Reach-1	1063.7	1038	1392.63	1396.88	1395.18	1397.12	0.00121	3.98	260.64	81.21	0.39
Reach-1	1063.7	2655	1392.63	1399.08	1396.87	1399.62	0.001512	5.88	451.87	92.14	0.47
Reach-1	1062.95	Bridge									
Reach-1	1062.2	1038	1392.63	1396.81	1395.17	1397.07	0.001289	4.07	255.3	80.88	0.4
Reach-1	1062.2	2655	1392.63	1398.92	1396.86	1399.49	0.001674	6.08	436.6	91.31	0.49
Reach-1	1060	1038	1392.33	1395.38	1395.29	1396.27	0.009429	7.56	137.25	68.96	0.94
Reach-1	1060	2655	1392.33	1397.34		1398.62	0.006841	9.07	292.7	87.72	0.88
Reach-1	1058	1038	1391.43	1394.56		1394.99	0.003358	5.24	199.47	80.74	0.58
Reach-1	1058	2655	1391.43	1396.77		1397.5	0.002859	6.87	392.23	93.57	0.59
Reach-1	1056	1038	1390.33	1394.32		1394.53	0.001274	3.67	283.02	82.54	0.35
Reach-1	1056	2655	1390.33	1396.49		1396.98	0.00178	5.62	472.27	91.77	0.44
Reach-1	1054	1038	1390.43	1393.55		1394.06	0.004714	5.73	181.13	74.33	0.65

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1054	2655	1390.43	1395.31		1396.35	0.005612	8.17	324.96	89	0.75
Reach-1	1052	1038	1389.43	1392.96	1391.65	1393.25	0.002999	4.37	237.34	90.52	0.48
Reach-1	1052	2655	1389.43	1394.57	1393.38	1395.24	0.004462	6.59	403.08	112.13	0.61
Reach-1	1050	1038	1388.73	1391.87		1392.33	0.007681	5.45	190.55	106.98	0.72
Reach-1	1050	2655	1388.73	1393.42		1394.17	0.006447	6.92	383.41	131.47	0.71
Reach-1	1048	1038	1387.43	1390.9		1391.19	0.004074	4.32	240.17	118.61	0.54
Reach-1	1048	2655	1387.43	1392.65		1393.17	0.003502	5.79	458.64	129.96	0.54
Reach-1	1046	1038	1387.43	1390.32		1390.54	0.002478	3.72	279.06	118.71	0.43
Reach-1	1046	2655	1387.43	1392.11		1392.55	0.002598	5.28	502.85	130.6	0.47
Reach-1	1044	1038	1386.93	1389.76		1390	0.00293	3.9	266.24	120.03	0.46
Reach-1	1044	2655	1386.93	1391.58		1392.02	0.002689	5.32	500.61	136.08	0.48
Reach-1	1042	1038	1386.23	1389.33		1389.49	0.00205	3.19	324.93	151.24	0.38
Reach-1	1042	2655	1386.23	1391.3		1391.57	0.00153	4.19	636.8	162.82	0.37
Reach-1	1040	1038	1385.43	1388.76		1389	0.00286	3.92	264.9	115.78	0.46
Reach-1	1040	2655	1385.43	1390.75		1391.17	0.00244	5.21	509.75	129.45	0.46
Reach-1	1038	1038	1385.13	1388.38	1386.86	1388.55	0.001658	3.31	313.4	117.31	0.36
Reach-1	1038	2655	1385.13	1390.39	1388.19	1390.73	0.001803	4.7	565.01	132.71	0.4
Reach-1	1036	1038	1384.43	1387.84	1386.77	1388.1	0.003164	4.09	254.07	112.91	0.48
Reach-1	1036	2655	1384.43	1389.85	1388.16	1390.29	0.002637	5.36	495.26	138.47	0.48
Reach-1	1034	1038	1384.03	1387.38		1387.59	0.001963	3.66	283.25	103.43	0.39
Reach-1	1034	2655	1384.03	1389.37		1389.8	0.002265	5.28	502.84	117.74	0.45
Reach-1	1032	1038	1383.33	1386.92	1385.56	1387.16	0.002355	3.89	266.54	101.95	0.42
Reach-1	1032	2655	1383.33	1388.81	1387.08	1389.3	0.002758	5.6	473.89	204.9	0.49

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1030	1038	1382.43	1386.48	1385	1386.69	0.002258	3.68	282.27	114.05	0.41
Reach-1	1030	2655	1382.43	1388.35	1386.56	1388.77	0.002305	5.19	511.43	132.1	0.45
Reach-1	1028	1038	1382.43	1386.04	1384.58	1386.24	0.00221	3.57	290.59	133.7	0.41
Reach-1	1028	2655	1382.43	1387.94	1386.1	1388.3	0.002254	4.82	551.2	212.73	0.44
Reach-1	1026	1038	1382.33	1385.63		1385.81	0.002055	3.39	306.64	130.58	0.39
Reach-1	1026	2655	1382.33	1387.53		1387.87	0.001969	4.68	567.88	143.86	0.41
Reach-1	1024	1038	1382.43	1384.93	1384.28	1385.21	0.004447	4.28	242.24	174.05	0.55
Reach-1	1024	2655	1382.43	1387.04	1385.41	1387.43	0.002453	5.01	530.23	273.03	0.46
Reach-1	1022	1038	1380.63	1384.33	1383.1	1384.57	0.002341	3.89	267.06	125.38	0.42
Reach-1	1022	2655	1380.63	1386.52	1384.46	1386.96	0.002184	5.32	498.81	180.55	0.44
Reach-1	1020	1038	1380.43	1384.02		1384.18	0.001438	3.23	321.38	111.79	0.34
Reach-1	1020	2655	1380.43	1386.24		1386.57	0.001478	4.59	578.57	119.86	0.37
Reach-1	1018	1038	1379.73	1383.64		1383.86	0.001825	3.76	276.03	91.56	0.38
Reach-1	1018	2655	1379.73	1385.71		1386.19	0.002318	5.53	479.96	106.25	0.46
Reach-1	1016	1038	1380.43	1382.89		1383.27	0.004967	4.99	207.95	95.96	0.6
Reach-1	1016	2655	1380.43	1384.99		1385.6	0.003612	6.3	421.2	107.08	0.56
Reach-1	1014	1038	1379.23	1382.62		1382.78	0.001172	3.25	319.07	107.91	0.33
Reach-1	1014	2655	1379.23	1384.76		1385.11	0.001329	4.72	562.93	119.18	0.38
Reach-1	1012	1038	1378.43	1382.24		1382.5	0.001603	4.06	255.5	86.33	0.42
Reach-1	1012	2655	1378.43	1384.23		1384.75	0.002318	5.79	458.28	119.87	0.52
Reach-1	1010	1038	1378.43	1380.92	1380.92	1381.79	0.009955	7.47	138.9	82.14	1.01
Reach-1	1010	2655	1378.43	1382.83		1383.99	0.005655	8.67	306.07	94.18	0.85

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1009	1038	1376.93	1380.19	1378.71	1380.43	0.001295	3.96	261.99	85.86	0.4
Reach-1	1009	2655	1376.93	1383	1380.23	1383.41	0.001031	5.14	516.71	95.24	0.39
Reach-1	1007.9	Bridge									
Reach-1	1006.8	1038	1376.93	1380.11	1378.71	1380.37	0.001407	4.07	255.23	85.6	0.42
Reach-1	1006.8	2655	1376.93	1382.88	1380.23	1383.31	0.001103	5.25	505.39	94.84	0.4
Reach-1	1006	1038	1376.93	1380.01		1380.24	0.001354	3.83	271.24	97.97	0.41
Reach-1	1006	2655	1376.93	1382.85		1383.18	0.000916	4.62	575.25	116.34	0.37
Reach-1	1004	1038	1376.43	1379.29		1379.76	0.003545	5.45	190.33	83.37	0.64
Reach-1	1004	2655	1376.43	1382.45		1382.92	0.001381	5.49	483.73	102.62	0.45
Reach-1	1002	1038	1375.43	1379.23		1379.38	0.000743	3.12	332.34	103.83	0.31
Reach-1	1002	2655	1375.43	1382.46		1382.68	0.000526	3.72	713.09	131.75	0.28
Reach-1	1000.4	1038	1374.93	1379.16	1376.75	1379.27	0.000522	2.78	373.73	106.91	0.26
Reach-1	1000.4	2655	1374.93	1382.41	1378.22	1382.6	0.000426	3.46	767.93	135.35	0.26
Reach-1	1000	Bridge									
Reach-1	6.47	1039	1375.18	1379.13		1379.27	0.000663	3.01	345.02	104.54	0.29
Reach-1	6.47	2831	1375.18	1381.94		1382.21	0.000708	4.21	672.31	129.03	0.33
Reach-1	6.467	1039	1374.48	1379.08		1379.24	0.001791	3.2	324.65	92.59	0.3
Reach-1	6.467	2831	1374.48	1381.83		1382.16	0.002209	4.6	616.03	119.22	0.36
Reach-1	6.426	1039	1374.13	1378.38		1378.72	0.003656	4.64	224.09	74.63	0.47
Reach-1	6.426	2831	1374.13	1380.88		1381.54	0.004008	6.5	472.49	320.53	0.53
Reach-1	6.36	1039	1373.23	1377.6		1377.81	0.001894	3.62	286.93	84.46	0.35
Reach-1	6.36	2831	1373.23	1380.17		1380.49	0.002026	4.83	896.76	609.71	0.38

HEC-RAS	Plan: normal ineff	River: RIVER-1	Reach: Reach-1								
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	6.279	1039	1372.68	1376.14		1376.49	0.003984	4.77	217.6	73.75	0.49
Reach-1	6.279	2831	1372.68	1378.56		1379.09	0.004056	6.15	680.95	588.24	0.52
Reach-1	6.22	1039	1371.68	1375.3		1375.52	0.002415	3.73	278.84	94.74	0.38
Reach-1	6.22	2831	1371.68	1377.81		1378.16	0.002165	4.9	754.01	555.26	0.39
Reach-1	6.126	1039	1370.68	1373.96		1374.2	0.002866	3.98	261.08	91.23	0.41
Reach-1	6.126	2831	1370.68	1376.39		1376.88	0.00298	5.6	505.27	108.28	0.46
Reach-1	6.033	1039	1368.68	1372.26		1372.58	0.003887	4.53	229.44	82.81	0.48
Reach-1	6.033	2831	1368.68	1374.58		1375.18	0.004045	6.31	470.69	131.19	0.53
Reach-1	5.938	1039	1367.68	1371.14		1371.29	0.001707	3.16	328.69	110.2	0.32
Reach-1	5.938	2831	1367.68	1373.55		1373.83	0.001707	4.33	829.68	552.44	0.35
Reach-1	5.843	1039	1366.68	1370.07		1370.26	0.002595	3.48	298.44	98.96	0.35
Reach-1	5.843	2831	1366.68	1372.45		1372.78	0.002637	4.81	829.66	984.36	0.38
Reach-1	5.748	1039	1364.68	1368.47		1368.73	0.003761	4.14	250.68	84.71	0.42
Reach-1	5.748	2831	1364.68	1370.84		1371.26	0.003665	5.42	748.2	759.98	0.45
Reach-1	5.654	1039	1362.68	1366.85		1367.06	0.002833	3.65	284.63	94.04	0.37
Reach-1	5.654	2831	1362.68	1369.08		1369.48	0.003375	5.24	731.02	808.81	0.43
Reach-1	5.593	1039	1362.68	1365.06		1365.52	0.010344	5.43	191.41	92.68	0.67
Reach-1	5.593	2831	1362.68	1367.16		1367.93	0.007986	7.06	404.41	142.68	0.64
Reach-1	5.55	1039	1360.68	1364.74		1364.82	0.001152	2.38	435.66	139.28	0.24
Reach-1	5.55	2831	1360.68	1366.85		1367.07	0.001598	3.79	801.77	526.41	0.3
Reach-1	5.498	1039	1361.68	1364.07		1364.27	0.004183	3.63	286.04	128.34	0.43
Reach-1	5.498	2831	1361.68	1366.06		1366.43	0.003689	4.95	678.8	593.6	0.44
Reach-1	5.403	1039	1359.68	1363.13		1363.22	0.00121	2.39	434.6	143.95	0.24

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	5.403	2831	1359.68	1365.02		1365.2	0.00163	3.57	1024.3	684.56	0.3
Reach-1	5.308	1039	1357.68	1362.31		1362.48	0.001815	3.28	316.38	87.15	0.3
Reach-1	5.308	2831	1357.68	1364.19		1364.36	0.001711	3.95	1381.14	1190.32	0.31
Reach-1	5.214	1039	1357.68	1361.13		1361.34	0.002884	3.65	284.36	95.17	0.37
Reach-1	5.214	2831	1357.68	1363.21		1363.41	0.00212	4.17	1530.61	2385.43	0.34
Reach-1	5.156	1039	1356.68	1360.34		1360.52	0.002477	3.46	300.35	97.27	0.35
Reach-1	5.156	2831	1356.68	1361.73		1362.37	0.005724	6.4	445.32	210.1	0.55
Reach-1	5.095	1039	1354.68	1360.06		1360.13	0.000635	2.15	493.7	222.85	0.18
Reach-1	5.095	2831	1354.68	1361.22		1361.4	0.001507	3.77	1252.07	1107.82	0.29
Reach-1	5.086	1039	1354.68	1359.99		1360.08	0.001859	2.38	460.72	255.75	0.22
Reach-1	5.086	2831	1354.68	1361.11		1361.19	0.002615	2.84	1703.77	1826.52	0.26
Reach-1	5.074	1039	1354.68	1359.8	1357.17	1359.82	0.000929	1.75	1032.13	1247.18	0.15
Reach-1	5.074	2831	1354.68	1360.6	1359.51	1360.63	0.001171	2.12	2512.98	2398.5	0.17
Reach-1	5.0695 Bridge										
Reach-1	5.065	1039	1354.68	1359.34		1359.58	0.004785	4.29	438.6	734.24	0.39
Reach-1	5.065	2831	1354.68	1360.24		1360.41	0.005186	4.89	1482.13	1630.65	0.42
Reach-1	5.023	1039	1353.68	1359.14		1359.19	0.0008	1.99	961.76	1617.54	0.17
Reach-1	5.023	2831	1353.68	1359.97		1360.03	0.001183	2.67	2977.6	3167.49	0.21
Reach-1	4.985	1039	1353.68	1358.82		1358.94	0.002004	2.92	603.76	1304.83	0.26
Reach-1	4.985	2831	1353.68	1359.7		1359.77	0.001746	3	2916.76	3429.33	0.25
Reach-1	4.889	1039	1352.68	1357.38		1357.58	0.003943	3.61	300.97	305.35	0.34
Reach-1	4.889	2831	1352.68	1358.34		1358.5	0.004318	4.23	1667.62	2248.36	0.36

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	4.794	1039	1350.68	1355.89		1356.04	0.002467	3.08	398.78	666.64	0.27
Reach-1	4.794	2831	1350.68	1356.74		1356.84	0.00265	3.49	2197	3399.76	0.29
Reach-1	4.699	1039	1348.68	1354.71		1354.82	0.002332	2.77	543.62	1212.13	0.24
Reach-1	4.699	2831	1348.68	1355.74		1355.78	0.001622	2.4	2388.71	2196.87	0.2
Reach-1	4.605	1039	1346.68	1352.88		1353.14	0.005421	4.06	255.8	66.62	0.37
Reach-1	4.605	2831	1346.68	1354.16		1354.34	0.006444	4.36	1333.8	1770.45	0.4
Reach-1	4.51	1039	1344.68	1351.63		1351.68	0.001708	2.16	880.61	1231.64	0.19
Reach-1	4.51	2831	1344.68	1352.41		1352.45	0.002381	2.4	2120.86	1911.04	0.22
Reach-1	4.416	1039	1343.68	1350.48		1350.6	0.002765	2.96	531.34	1056.93	0.26
Reach-1	4.416	2831	1343.68	1351.66		1351.68	0.001062	2	2648.56	2277.08	0.17
Reach-1	4.321	1039	1342.68	1348.94		1349.13	0.003128	3.47	299.32	86.66	0.3
Reach-1	4.321	2831	1342.68	1350.22		1350.6	0.00624	5.56	1291.85	1606.46	0.44
Reach-1	4.226	1039	1342.68	1347.83		1347.94	0.001824	2.84	624.41	1402.96	0.25
Reach-1	4.226	2831	1342.68	1350.39		1350.39	0.000055	0.59	7916.09	3452.21	0.05
Reach-1	4.138	1039	1340.68	1347.28		1347.34	0.000922	2.26	925.08	1640.5	0.2
Reach-1	4.138	2831	1340.68	1350.37		1350.38	0.00002	0.42	10893.21	3537.64	0.03
Reach-1	4.096	1039	1339.68	1347.23		1347.24	0.000202	1.1	1991.35	1989.12	0.09
Reach-1	4.096	2831	1339.68	1350.37		1350.37	0.000016	0.41	10845.15	3091.9	0.03
Reach-1	4.085	1039	1340.38	1347.08	1343.29	1347.19	0.000275	2.65	391.61	1300.63	0.22
Reach-1	4.085	2856	1340.38	1350.01	1345.53	1350.29	0.000453	4.19	681.57	1854.14	0.3
Reach-1	4.0775 Bridge										
Reach-1	4.07	1039	1340.38	1343.31	1343.31	1344.42	0.00701	8.45	122.99	54.89	0.99
Reach-1	4.07	2856	1340.38	1345.54	1345.54	1347.31	0.006043	10.7	266.98	74.54	1

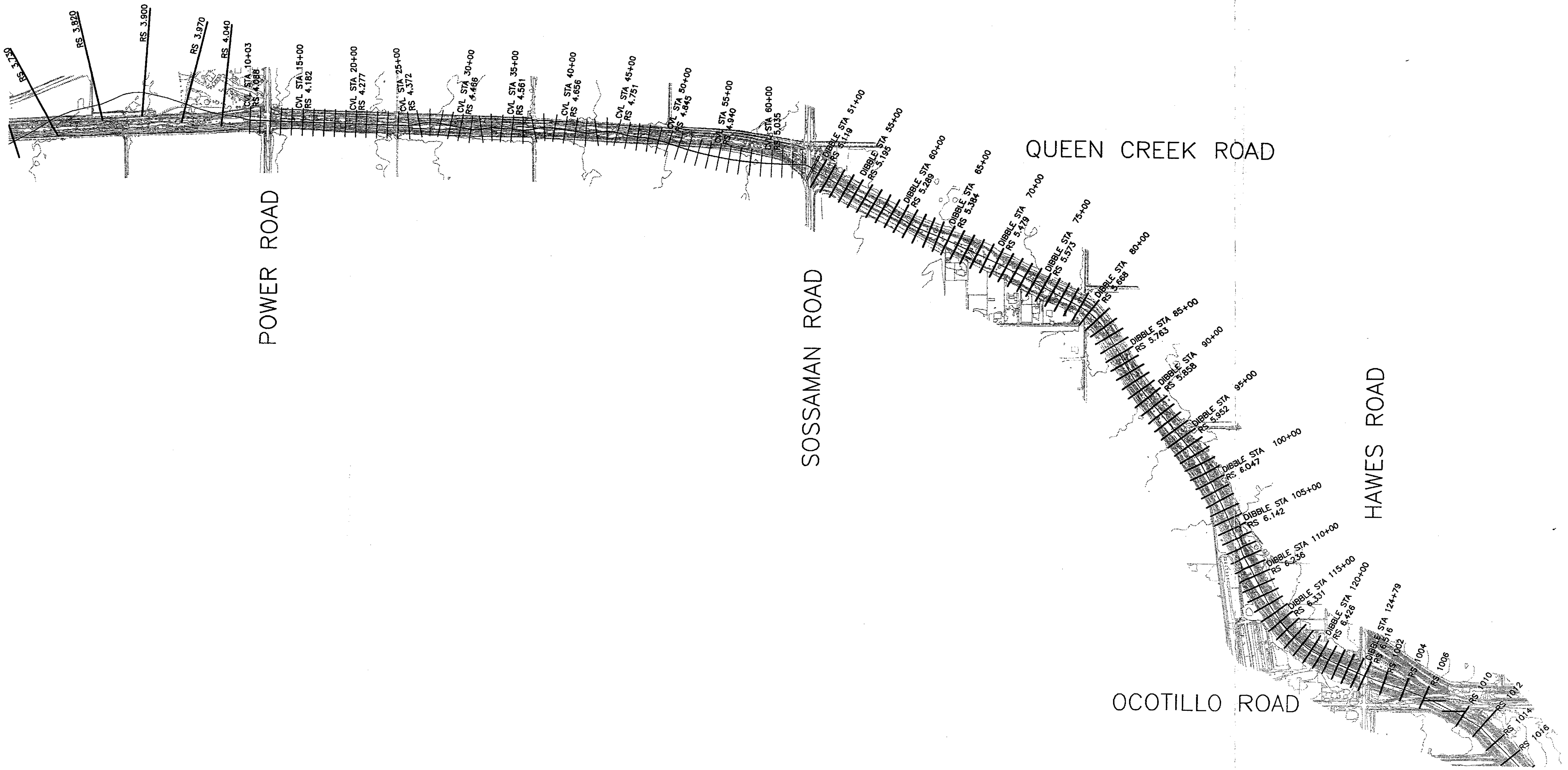
HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	4.05	1039	1339.18	1340.02	1340.72	1342.66	0.06242	13.2	80.62	102.3	2.54
Reach-1	4.05	2856	1339.18	1340.8	1342.12	1345.63	0.048345	18.06	165.6	114.41	2.5
Reach-1	4.04	1039	1338.48	1340.97	1340.13	1341.25	0.001661	4.45	282.47	159.01	0.5
Reach-1	4.04	2856	1338.48	1342.9	1341.59	1343.37	0.001424	6.04	629.44	193.7	0.51
Reach-1	3.97	1039	1337.78	1339.93		1340.41	0.003274	5.66	194.06	102.82	0.68
Reach-1	3.97	2856	1337.78	1341.36		1342.48	0.004059	8.86	361.72	131.97	0.83
Reach-1	3.9	1039	1336.68	1339.05		1339.33	0.001861	4.55	276.5	171.06	0.52
Reach-1	3.9	2856	1336.68	1340.5		1341.09	0.002228	6.85	571.56	235	0.62
Reach-1	3.82	1039	1335.48	1337.11	1337.11	1337.87	0.00755	7.14	152.98	104.68	0.99
Reach-1	3.82	2856	1335.48	1338.99		1339.88	0.003499	8.12	443.97	192.59	0.76
Reach-1	3.73	1039	1334.38	1336.44	1335.46	1336.57	0.000988	3.02	381.87	221.76	0.37
Reach-1	3.73	2856	1334.38	1339.04		1339.19	0.000407	3.34	1063.36	321.91	0.27
Reach-1	3.67	1039	1333.38	1336.08		1336.23	0.000832	3.32	376.07	178.09	0.36
Reach-1	3.67	2856	1333.38	1338.83		1339.02	0.000462	3.96	979.88	252.02	0.3
Reach-1	3.62	1039	1332.88	1335.77	1334.42	1335.96	0.000874	3.43	302.66	150.17	0.36
Reach-1	3.62	2856	1332.88	1338.48	1335.77	1338.83	0.000672	4.75	600.68	283.28	0.36
Reach-1	3.615 Culvert										
Reach-1	3.61	1039	1332.68	1334.88	1334.2	1335.2	0.002229	4.55	228.39	137.75	0.56
Reach-1	3.61	2856	1332.68	1336.36	1335.55	1337.19	0.002796	7.3	391.4	162.03	0.68
Reach-1	3.53	1039	1331.68	1333.71		1334.17	0.003668	5.77	206.89	141.2	0.71
Reach-1	3.53	2856	1331.68	1335.63		1336.22	0.002217	6.99	544.76	207.59	0.62
Reach-1	3.44	1039	1330.28	1332.24		1332.57	0.002606	4.74	235.52	133.89	0.6

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	3.44	2856	1330.28	1335.2		1335.52	0.000775	4.79	740.39	212.44	0.38
Reach-1	3.34	1039	1328.58	1331.48		1331.7	0.001034	3.88	297.56	117.4	0.4
Reach-1	3.34	2856	1328.58	1335.09		1335.22	0.000285	3.5	1328.59	403.57	0.24
Reach-1	3.24	1039	1327.18	1331.35		1331.42	0.000234	2.35	590.48	270.91	0.2
Reach-1	3.24	2856	1327.18	1335.06		1335.11	0.000103	2.39	1992.24	460.54	0.15
Reach-1	3.15	1039	1325.78	1331.33		1331.36	0.000059	1.43	857.65	222.82	0.11
Reach-1	3.15	2856	1325.78	1335.01		1335.07	0.000072	2.22	1750.25	420	0.13
Reach-1	3.13	1039	1325.38	1331.3	1326.87	1331.35	0.000185	1.76	591.77	100	0.13
Reach-1	3.13	2856	1325.38	1334.91	1328.31	1335.05	0.000311	3	953.09	100	0.17
Reach-1	3.1225	Culvert									
Reach-1	3.115	1039	1324.88	1331.18		1331.23	0.000199	1.73	600.06	120.42	0.14
Reach-1	3.115	2856	1324.88	1334.27		1334.39	0.000341	2.83	1009.57	145.1	0.19
Reach-1	3.04	1039	1325.9	1330.83	1328.94	1331.08	0.001959	4.03	257.9	3105.28	0.4
Reach-1	3.04	2856	1325.9	1333.74	1331.06	1334.17	0.001958	5.25	544.45	3152.12	0.43
Reach-1	2.945	1039	1324.6	1329.86	1327.96	1330.11	0.001895	4.03	257.78	3506.51	0.39
Reach-1	2.945	2856	1324.6	1332.69	1330.06	1333.15	0.002053	5.46	523.14	3547.21	0.44
Reach-1	2.85	1039	1324	1328.79	1327.24	1329.07	0.002321	4.25	244.46	3498.56	0.43
Reach-1	2.85	2856	1324	1331.61	1329.19	1332.1	0.002218	5.61	509.1	3540	0.45
Reach-1	2.755	1039	1323.2	1327.89	1325.88	1328.1	0.001525	3.66	283.71	3448.39	0.35
Reach-1	2.755	2856	1323.2	1330.67	1327.81	1331.08	0.001733	5.13	556.44	3492.61	0.4
Reach-1	2.66	1039	1322.1	1326.57	1325.43	1326.97	0.003599	5.06	205.38	3494.88	0.53
Reach-1	2.66	2856	1322.1	1329.12	1327.46	1329.84	0.003629	6.81	419.1	3530.11	0.57

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	2.565	1039	1320.7	1325.38	1323.68	1325.62	0.001977	3.93	264.63	1888.56	0.4
Reach-1	2.565	2856	1320.7	1327.84	1325.59	1328.32	0.002373	5.57	512.72	1935.73	0.46
Reach-1	2.47	1039	1320.2	1324.63	1322.84	1324.79	0.001385	3.21	323.7	1850.37	0.33
Reach-1	2.47	2856	1320.2	1326.99	1324.44	1327.32	0.001628	4.61	619.25	1916.14	0.39
Reach-1	2.375	1039	1319	1322.18	1322.18	1323.1	0.014588	7.72	134.64	1043.06	1
Reach-1	2.375	2856	1319	1324.03	1324.03	1325.45	0.012537	9.54	299.29	1920.27	0.99
Reach-1	2.28	1039	1318	1319.01	1318.05	1319.04	0.000733	0.73	823.22	598.93	0.18
Reach-1	2.28	2856	1318	1321.27	1318.51	1321.3	0.000216	1	2252.9	652.05	0.12
Reach-1	2.185	1039	1317.3	1319.02		1319.02	0.000005	0.11	7006.95	2950.17	0.02
Reach-1	2.185	2856	1317.3	1321.28		1321.28	0.000004	0.16	14412.64	3871.58	0.02
Reach-1	2.109	1039	1316.5	1318.52	1318.07	1318.97	0.003472	5.35	194.14	102.13	0.68
Reach-1	2.109	2856	1316.5	1320.38	1319.53	1321.19	0.002864	7.25	393.96	113.26	0.68
Reach-1	2.0995	Bridge									
Reach-1	2.09	1039	1316.1	1316.62		1316.62	0.000068	0.14	2283.55	1274.7	0.05
Reach-1	2.09	2856	1316.1	1317.57		1317.58	0.000135	0.4	3580.18	1457.3	0.08
Reach-1	1.995	1039	1315.7	1316.53		1316.54	0.000322	0.57	1492.54	1464.46	0.12
Reach-1	1.995	2856	1315.7	1317.43		1317.44	0.000331	0.99	3090.95	1948.25	0.14
Reach-1	1.9	1039	1314.2	1316.23		1316.26	0.001184	1.57	866.43	991.86	0.26
Reach-1	1.9	2856	1314.2	1317.14		1317.18	0.000959	2.03	2021.16	1547.28	0.26
Reach-1	1.805	1039	1313.3	1315.83		1315.85	0.000613	1.67	1031.6	1060.76	0.21
Reach-1	1.805	2856	1313.3	1316.77		1316.8	0.000609	2.08	2233.63	1488.54	0.22
Reach-1	1.71	1039	1312.4	1315.18		1315.27	0.002781	3.25	519.63	604.58	0.43
Reach-1	1.71	2856	1312.4	1316.18		1316.28	0.002118	3.57	1304.85	996.77	0.4

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	1.615	1039	1311.7	1315		1315.01	0.000188	1.06	1693.07	1389.97	0.12
Reach-1	1.615	2856	1311.7	1315.97		1315.98	0.000249	1.41	3273.68	1889.33	0.14
Reach-1	1.52	1039	1310.3	1314.63		1314.78	0.001922	3.69	477.8	594.6	0.39
Reach-1	1.52	2856	1310.3	1315.55		1315.7	0.002214	4.5	1480.09	1858.53	0.43
Reach-1	1.425	1039	1309.5	1313.34		1313.65	0.002761	4.44	235.14	139.95	0.46
Reach-1	1.425	2856	1309.5	1314.4		1314.59	0.002323	4.7	1363.85	1822.12	0.44
Reach-1	1.33	1039	1308.8	1312.86		1312.91	0.000768	2.22	880.07	1001.79	0.24
Reach-1	1.33	2856	1308.8	1314.04		1314.07	0.000498	2.1	2322.6	1432.09	0.2
Reach-1	1.235	1039	1307.8	1311.78		1312.17	0.003479	4.99	208.34	73.38	0.52
Reach-1	1.235	2856	1307.8	1312.92		1313.45	0.004833	6.77	674.4	566.7	0.64
Reach-1	1.14	1039	1307.3	1311.36	1310.5	1311.41	0.000685	2.27	799.94	682.2	0.23
Reach-1	1.14	2856	1307.3	1312.15	1311.21	1312.24	0.001222	3.37	1406.18	829.09	0.32
Reach-1	1.045	1039	1308	1310.19	1310.19	1310.39	0.026072	6.79	311.38	774.4	1.14
Reach-1	1.045	2856	1308	1311.09		1311.2	0.004168	3.42	1073.18	919.82	0.48
Reach-1	0.95	1039	1306.5	1309.67	1308.55	1309.69	0.000377	1.34	1226.25	1021.55	0.16
Reach-1	0.95	2856	1306.5	1310.69		1310.71	0.000395	1.67	2382.35	1184.37	0.18
Reach-1	0.855	1039	1305.8	1309.5		1309.51	0.000319	1.42	1261.89	988.63	0.15
Reach-1	0.855	2856	1305.8	1310.49		1310.52	0.000393	1.8	2348.62	1146.44	0.18
Reach-1	0.76	1039	1305.4	1309.29		1309.31	0.000546	1.68	1009.47	860.7	0.2
Reach-1	0.76	2856	1305.4	1310.23		1310.27	0.000665	2.16	1912.96	1029.27	0.23
Reach-1	0.665	1039	1304.8	1308.9	1308.39	1308.95	0.000969	2.55	754.5	724.78	0.27
Reach-1	0.665	2856	1304.8	1309.73	1308.86	1309.81	0.001324	3.34	1423.75	976.62	0.33

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1											
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	0.57	1039	1304.8	1307.62	1307.62	1307.87	0.007646	5.33	364.56	744.74	0.71
Reach-1	0.57	2856	1304.8	1308.08	1308.08	1308.38	0.009765	6.66	845.22	1266.68	0.83
Reach-1	0.475	1039	1302.9	1307.3	1304.53	1307.31	0.000069	0.78	1842.84	1302.28	0.08
Reach-1	0.475	2856	1302.9	1307.55	1305.47	1307.58	0.00037	1.86	2174.67	1366.71	0.18
Reach-1	0.445	1039	1303	1307.26		1307.28	0.000346	1.63	1278.49	1205.97	0.17
Reach-1	0.445	2856	1303	1307.28		1307.4	0.002516	4.4	1297.39	1213.08	0.45
Reach-1	0.38	1039	1302	1307.27		1307.27	0.000003	0.22	5231.28	1712.94	0.02
Reach-1	0.38	2856	1302	1307.34		1307.34	0.000022	0.59	5346.9	1737.75	0.05
Reach-1	0.357	1039	1301	1307.26	1303.38	1307.27	0.000058	1.03	2198.21	1405.68	0.08
Reach-1	0.357	2856	1301	1307.26	1305.04	1307.32	0.000435	2.84	2198.21	1405.68	0.21



TOWN OF QUEEN CREEK ARIZONA

COUNTY PROJECT NO. 2000D03

QUEEN CREEK WASH IMPROVEMENTS

PROJECT DESCRIPTION

PROPOSED CONDITIONS HEC-RAS
CROSS SECTION LAYOUT

PRIME CONSULTANT

DIBBLE & ASSOCIATES
CONSULTING ENGINEERS

DRN. PAF DATE: 12/10/01	SCALE	SHEETS
DES. SHD DATE: 12/10/01	1"=1000' HORIZONTAL	
CKD. KWR DATE: 12/10/01	n/a VERTICAL	NO. 1 OF 1

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	1200	1038	1439.93	1442.51	1441.86	1442.69	0.00292	3.44	302.01	187.96	0.48	2-year
100-year	Reach-1	1200	2655	1439.93	1444.03	1442.72	1444.34	0.00211	4.46	595.95	196.45	0.45	100-year
2-year	Reach-1	1198	1039	1439.43	1441.51	1441.18	1441.87	0.005853	4.85	214.37	147.62	0.71	2-year
100-year	Reach-1	1198	2856	1439.43	1443.26	1442.33	1443.79	0.003303	5.84	488.98	165.34	0.6	100-year
2-year	Reach-1	1197.5	1039	1439.23	1441.54	1440.28	1441.65	0.000807	2.59	401.6	177.19	0.3	2-year
100-year	Reach-1	1197.5	2856	1439.23	1443.32	1441.27	1443.56	0.000911	3.96	720.8	182.7	0.35	100-year
	Reach-1	1197.3 Bridge											
2-year	Reach-1	1197.1	1039	1439.23	1441.54	1440.28	1441.64	0.000815	2.6	400.37	177.16	0.3	2-year
100-year	Reach-1	1197.1	2856	1439.23	1443.3	1441.27	1443.55	0.000925	3.98	717.35	182.64	0.35	100-year
2-year	Reach-1	1196.2	1039	1439.23	1441.25	1440.48	1441.48	0.002482	3.86	268.87	135.9	0.48	2-year
100-year	Reach-1	1196.2	2856	1439.23	1442.76	1441.67	1443.31	0.002931	5.99	476.48	140.29	0.57	100-year
	Reach-1	1195.8 Bridge											
2-year	Reach-1	1195.4	1039	1439.23	1441.23	1440.48	1441.47	0.00256	3.9	266.34	135.85	0.49	2-year
100-year	Reach-1	1195.4	2856	1439.23	1442.7	1441.67	1443.28	0.003098	6.1	468.31	140.12	0.59	100-year
2-year	Reach-1	1194	1039	1438.43	1440.9		1441.09	0.002663	3.56	292.24	178.01	0.49	2-year
100-year	Reach-1	1194	2856	1438.43	1442.42		1442.8	0.002373	4.97	575.1	194.35	0.51	100-year
2-year	Reach-1	1192	1039	1437.63	1440.21		1440.46	0.003498	4.05	256.61	157.7	0.56	2-year
100-year	Reach-1	1192	2856	1437.63	1441.77		1442.24	0.00299	5.52	517.04	177.04	0.57	100-year
2-year	Reach-1	1190	1039	1436.73	1439.5		1439.76	0.003539	4.12	252.2	138.29	0.54	2-year
100-year	Reach-1	1190	2856	1436.73	1440.95		1441.54	0.00403	6.14	464.86	154.03	0.62	100-year
2-year	Reach-1	1188	1039	1436.43	1438.64		1438.9	0.005293	4.08	254.6	167.53	0.58	2-year
100-year	Reach-1	1188	2856	1436.43	1440.31		1440.73	0.003556	5.19	550.47	187.21	0.53	100-year

	HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1													
	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	1186	1039	1435.43	1438.28		1438.39	0.001303	2.75	377.26	156.11	0.31	2-year
100-year	Reach-1	1186	2856	1435.43	1439.88		1440.19	0.001901	4.48	636.96	168.08	0.41	100-year
2-year	Reach-1	1184	1039	1435.23	1437.63		1437.9	0.005699	4.21	246.54	163.07	0.6	2-year
100-year	Reach-1	1184	2856	1435.23	1439.1		1439.61	0.004682	5.71	500	180.59	0.6	100-year
2-year	Reach-1	1182	1039	1434.43	1436.74		1436.97	0.003776	3.8	273.75	155.52	0.5	2-year
100-year	Reach-1	1182	2856	1434.43	1438.34		1438.77	0.003571	5.3	539.23	177.91	0.54	100-year
2-year	Reach-1	1180	1039	1433.43	1435.94	1435.21	1436.19	0.003944	3.99	260.5	142.04	0.52	2-year
100-year	Reach-1	1180	2856	1433.43	1437.45		1437.98	0.004291	5.83	489.6	160.6	0.59	100-year
2-year	Reach-1	1178	1039	1432.43	1434.65		1435.05	0.008553	5.07	204.88	139.02	0.74	2-year
100-year	Reach-1	1178	2856	1432.43	1436.66		1437.15	0.003855	5.63	507.01	161.27	0.56	100-year
2-year	Reach-1	1176	1039	1431.43	1434.39		1434.48	0.001091	2.44	425.72	185.06	0.28	2-year
100-year	Reach-1	1176	2856	1431.43	1436.54		1436.72	0.00095	3.4	839.46	199.19	0.29	100-year
2-year	Reach-1	1174	1039	1431.13	1433.97		1434.16	0.002411	3.46	300.31	140.03	0.42	2-year
100-year	Reach-1	1174	2856	1431.13	1436.14		1436.44	0.001896	4.44	642.74	171.67	0.4	100-year
2-year	Reach-1	1172	1039	1430.43	1433.45		1433.67	0.002438	3.77	275.55	113.55	0.43	2-year
100-year	Reach-1	1172	2856	1430.43	1435.54		1436	0.002475	5.41	528.21	127.62	0.47	100-year
2-year	Reach-1	1170	1039	1429.73	1432.77		1433.08	0.003553	4.44	233.9	100.07	0.51	2-year
100-year	Reach-1	1170	2856	1429.73	1434.74		1435.37	0.003817	6.36	448.79	117.82	0.57	100-year
2-year	Reach-1	1168	1039	1429.23	1431.9		1432.26	0.004759	4.78	217.44	103.79	0.58	2-year
100-year	Reach-1	1168	2856	1429.23	1433.99		1434.6	0.003878	6.29	454.21	122.73	0.58	100-year
2-year	Reach-1	1166	1039	1428.23	1431.35		1431.59	0.002265	3.87	268.39	100.36	0.42	2-year
100-year	Reach-1	1166	2856	1428.23	1433.38		1433.92	0.002818	5.88	485.68	113.8	0.5	100-year
2-year	Reach-1	1164	1039	1427.43	1430.92		1431.14	0.002246	3.69	281.21	112.51	0.41	2-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
100-year	Reach-1	1164	2856	1427.43	1432.88		1433.35	0.002707	5.5	519.29	131.18	0.49	100-year
2-year	Reach-1	1162	1039	1426.93	1429.98	1429.51	1430.4	0.006542	5.24	198.4	104.75	0.67	2-year
100-year	Reach-1	1162	2856	1426.93	1431.62	1430.95	1432.51	0.006485	7.56	377.86	113.78	0.73	100-year
2-year	Reach-1	1160	1039	1424.53	1428.46		1428.96	0.007922	5.65	183.74	99.8	0.73	2-year
100-year	Reach-1	1160	2856	1424.53	1430.66		1431.36	0.004621	6.75	423.36	117.94	0.63	100-year
2-year	Reach-1	1158	1039	1423.43	1428.23		1428.37	0.00114	3	345.83	113.04	0.3	2-year
100-year	Reach-1	1158	2856	1423.43	1430.43		1430.77	0.001464	4.71	609.98	126.85	0.37	100-year
2-year	Reach-1	1156	1039	1424.43	1427.85		1428.06	0.002114	3.67	282.73	108.99	0.4	2-year
100-year	Reach-1	1156	2856	1424.43	1429.94		1430.39	0.002433	5.4	528.68	126.62	0.47	100-year
2-year	Reach-1	1154	1039	1423.53	1427.13		1427.46	0.004407	4.62	224.96	106.6	0.56	2-year
100-year	Reach-1	1154	2856	1423.53	1429.16		1429.78	0.003699	6.31	452.67	117.12	0.57	100-year
2-year	Reach-1	1152	1039	1422.93	1426.64		1426.85	0.001986	3.65	284.41	105.29	0.39	2-year
100-year	Reach-1	1152	2856	1422.93	1428.64		1429.13	0.002556	5.63	507.58	118.27	0.48	100-year
2-year	Reach-1	1150	1039	1422.03	1425.88		1426.25	0.004815	4.86	213.87	100.53	0.59	2-year
100-year	Reach-1	1150	2856	1422.03	1427.93		1428.5	0.003916	6.06	471.19	135.8	0.57	100-year
2-year	Reach-1	1148	1039	1420.93	1425.1		1425.4	0.003567	4.34	239.16	106.12	0.51	2-year
100-year	Reach-1	1148	2856	1420.93	1427.29		1427.82	0.002878	5.83	494.33	125.15	0.51	100-year
2-year	Reach-1	1146	1039	1420.43	1424.5		1424.75	0.002755	4.09	254.32	101.99	0.46	2-year
100-year	Reach-1	1146	2856	1420.43	1426.78		1427.26	0.002577	5.59	511.2	122.7	0.48	100-year
2-year	Reach-1	1144	1039	1420.43	1423.85		1424.16	0.003218	4.44	234.13	94.09	0.49	2-year
100-year	Reach-1	1144	2856	1420.43	1426.1		1426.7	0.002956	6.22	464.91	109.35	0.52	100-year
2-year	Reach-1	1142	1039	1419.33	1423.45		1423.66	0.001805	3.63	285.86	99.28	0.38	2-year
100-year	Reach-1	1142	2856	1419.33	1425.69		1426.15	0.002204	5.41	528.15	116.93	0.45	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	1140	1039	1419.13	1422.28		1422.92	0.009184	6.43	161.66	81.05	0.8	2-year
100-year	Reach-1	1140	2856	1419.13	1424.32		1425.36	0.007189	8.17	349.39	101.31	0.78	100-year
2-year	Reach-1	1138	1039	1418.43	1421.63		1421.89	0.002709	4.12	252.14	97.12	0.45	2-year
100-year	Reach-1	1138	2856	1418.43	1423.77		1424.34	0.002927	6.05	471.84	106.56	0.51	100-year
2-year	Reach-1	1136	1039	1417.43	1420.92		1421.24	0.003932	4.57	227.14	100.4	0.54	2-year
100-year	Reach-1	1136	2856	1417.43	1423.17		1423.73	0.003147	6.04	473.06	116.09	0.53	100-year
2-year	Reach-1	1134	1039	1417.03	1420.42		1420.65	0.002132	3.86	269.31	96.79	0.41	2-year
100-year	Reach-1	1134	2856	1417.03	1422.66		1423.16	0.002442	5.66	504.86	112.65	0.47	100-year
2-year	Reach-1	1132	1039	1416.43	1419.81		1420.12	0.003224	4.44	233.96	92.73	0.49	2-year
100-year	Reach-1	1132	2856	1416.43	1421.92		1422.57	0.003468	6.44	443.48	105.78	0.55	100-year
2-year	Reach-1	1130	1039	1416.43	1419.05		1419.39	0.004161	4.65	223.21	100.11	0.55	2-year
100-year	Reach-1	1130	2856	1416.43	1421.28		1421.87	0.003347	6.19	461.35	113.98	0.54	100-year
2-year	Reach-1	1128	1039	1415.33	1418.51		1418.75	0.002327	3.94	263.91	98.36	0.42	2-year
100-year	Reach-1	1128	2856	1415.33	1420.78		1421.28	0.002485	5.67	504.05	113.74	0.47	100-year
2-year	Reach-1	1126	1039	1414.83	1417.39		1417.95	0.007728	6.01	172.98	84.14	0.74	2-year
100-year	Reach-1	1126	2856	1414.83	1419.7		1420.55	0.005097	7.41	385.61	99.69	0.66	100-year
2-year	Reach-1	1124	1039	1413.03	1416.73		1417.03	0.002635	4.38	237.35	81.87	0.45	2-year
100-year	Reach-1	1124	2856	1413.03	1419.05		1419.7	0.00313	6.46	441.8	95.9	0.53	100-year
2-year	Reach-1	1122	1039	1412.43	1416.27		1416.49	0.002465	3.8	273.57	112.53	0.43	2-year
100-year	Reach-1	1122	2856	1412.43	1418.76		1419.13	0.001913	4.85	588.47	138.16	0.41	100-year
2-year	Reach-1	1120	1039	1411.43	1415.67		1415.97	0.002667	4.44	234.06	80.5	0.46	2-year
100-year	Reach-1	1120	2856	1411.43	1417.97		1418.61	0.003296	6.4	446.39	103.57	0.54	100-year

	HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1													
	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	1118	1039	1411.03	1414.96		1415.32	0.004049	4.8	216.49	90.42	0.55	2-year
100-year	Reach-1	1118	2856	1411.03	1417.33		1417.93	0.003403	6.22	459.06	113.17	0.54	100-year
2-year	Reach-1	1116	1039	1410.43	1413.84		1414.35	0.005669	5.75	180.74	74.31	0.65	2-year
100-year	Reach-1	1116	2856	1410.43	1416.18		1417.08	0.00502	7.59	376.34	92.64	0.66	100-year
2-year	Reach-1	1114	1039	1408.93	1413.03		1413.41	0.003659	4.95	209.77	77.68	0.53	2-year
100-year	Reach-1	1114	2856	1408.93	1415.49		1416.22	0.003321	6.85	420.43	92.51	0.55	100-year
2-year	Reach-1	1112	1039	1408.43	1412.55		1412.82	0.002189	4.21	246.7	78.87	0.42	2-year
100-year	Reach-1	1112	2856	1408.43	1415.01		1415.6	0.002509	6.18	465.12	96.83	0.49	100-year
2-year	Reach-1	1110	1039	1408.43	1411.81		1412.22	0.004237	5.1	203.59	80.41	0.57	2-year
100-year	Reach-1	1110	2856	1408.43	1414.34		1415.01	0.00343	6.57	434.49	99.63	0.55	100-year
2-year	Reach-1	1108	1039	1406.43	1411.12		1411.49	0.00308	4.89	212.63	70.31	0.5	2-year
100-year	Reach-1	1108	2856	1406.43	1413.47		1414.26	0.003909	7.16	398.83	88.46	0.59	100-year
2-year	Reach-1	1106	1039	1406.53	1410.45		1410.82	0.003726	4.85	214.41	83.23	0.53	2-year
100-year	Reach-1	1106	2856	1406.53	1412.86		1413.51	0.003237	6.5	441.18	101.91	0.54	100-year
2-year	Reach-1	1104	1039	1405.83	1409.97		1410.22	0.002176	4.06	256.11	86.61	0.42	2-year
100-year	Reach-1	1104	2856	1405.83	1412.39		1412.92	0.002377	5.88	486.95	102.99	0.47	100-year
2-year	Reach-1	1102	1039	1405.93	1409.26		1409.63	0.004034	4.91	211.58	85.41	0.55	2-year
100-year	Reach-1	1102	2856	1405.93	1411.67		1412.35	0.003415	6.58	434.05	98.85	0.55	100-year
2-year	Reach-1	1100	1039	1405.43	1408.5		1408.86	0.003688	4.77	217.97	85.99	0.53	2-year
100-year	Reach-1	1100	2856	1405.43	1411.1		1411.7	0.002869	6.23	458.22	99.28	0.51	100-year
2-year	Reach-1	1098	1039	1404.43	1407.96		1408.22	0.002544	4.1	253.47	95.06	0.44	2-year
100-year	Reach-1	1098	2856	1404.43	1410.75		1411.18	0.001918	5.25	544.48	113.4	0.42	100-year
2-year	Reach-1	1096	1039	1403.43	1407.43		1407.73	0.002388	4.36	238.09	77.14	0.44	2-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
100-year	Reach-1	1096	2856	1403.43	1410.18		1410.75	0.002392	6.05	472.3	93.13	0.47	100-year
2-year	Reach-1	1094	1039	1402.43	1406.96		1407.26	0.002286	4.4	236.02	72.88	0.43	2-year
100-year	Reach-1	1094	2856	1402.43	1409.63		1410.24	0.002616	6.3	453.64	90.03	0.49	100-year
2-year	Reach-1	1092	1039	1402.43	1406.36		1406.72	0.003191	4.78	217.59	76.71	0.5	2-year
100-year	Reach-1	1092	2856	1402.43	1409.11		1409.7	0.002735	6.19	461.49	97.01	0.5	100-year
2-year	Reach-1	1090	1039	1401.43	1405.76		1406.11	0.002852	4.73	219.44	71.78	0.48	2-year
100-year	Reach-1	1090	2856	1401.43	1408.47		1409.13	0.00292	6.51	438.4	89.88	0.52	100-year
2-year	Reach-1	1088	1039	1400.53	1405.08		1405.49	0.003321	5.17	201.1	63.93	0.51	2-year
100-year	Reach-1	1088	2856	1400.53	1407.62		1408.44	0.004003	7.27	392.98	86.71	0.6	100-year
2-year	Reach-1	1086	1039	1399.83	1404.19		1404.71	0.004575	5.75	180.75	62.41	0.6	2-year
100-year	Reach-1	1086	2856	1399.83	1406.47		1407.51	0.00518	8.18	351.72	84.03	0.68	100-year
2-year	Reach-1	1084	1039	1399.43	1403.05	1402.36	1403.63	0.006352	6.14	169.29	68.54	0.69	2-year
100-year	Reach-1	1084	2856	1399.43	1405.56		1406.51	0.004527	7.86	369.55	88.07	0.64	100-year
2-year	Reach-1	1082	1039	1398.43	1402.21		1402.65	0.0036	5.31	195.7	63.65	0.53	2-year
100-year	Reach-1	1082	2856	1398.43	1404.83		1405.6	0.004067	7.02	407.19	97.2	0.6	100-year
2-year	Reach-1	1080	1039	1397.43	1402.03		1402.17	0.001201	3.08	337.33	110.73	0.31	2-year
100-year	Reach-1	1080	2856	1397.43	1404.81		1405.09	0.001015	4.27	681.77	132.58	0.32	100-year
2-year	Reach-1	1078	1039	1396.93	1401.24		1401.73	0.004362	5.61	185.14	64.44	0.58	2-year
100-year	Reach-1	1078	2856	1396.93	1403.74		1404.66	0.00432	7.7	373.89	84.98	0.63	100-year
2-year	Reach-1	1076	1039	1395.93	1400.72		1401.03	0.002471	4.42	235.19	76.62	0.44	2-year
100-year	Reach-1	1076	2856	1395.93	1403.34		1403.95	0.002355	6.25	463.9	94.48	0.48	100-year
2-year	Reach-1	1074	1039	1395.63	1400.28		1400.54	0.002197	4.15	250.62	82.31	0.42	2-year
100-year	Reach-1	1074	2856	1395.63	1402.94		1403.48	0.002103	5.9	490.3	96.92	0.45	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	1072	1039	1395.23	1399.81		1400.09	0.002295	4.29	242.41	78.3	0.43	2-year
100-year	Reach-1	1072	2856	1395.23	1402.49		1403.04	0.002305	5.98	481.92	99.19	0.47	100-year
2-year	Reach-1	1070	1039	1394.83	1398.79		1399.37	0.005796	6.14	169.24	63.71	0.66	2-year
100-year	Reach-1	1070	2856	1394.83	1401.27		1402.31	0.005447	8.2	348.23	80.57	0.7	100-year
2-year	Reach-1	1068	1039	1393.93	1398.12		1398.53	0.00287	5.12	202.99	67.75	0.52	2-year
100-year	Reach-1	1068	2856	1393.93	1400.57		1401.42	0.003311	7.37	387.69	82.87	0.6	100-year
2-year	Reach-1	1066	1039	1393.43	1397.59		1397.99	0.002479	5.1	203.92	67.61	0.52	2-year
100-year	Reach-1	1066	2856	1393.43	1399.84		1400.75	0.00331	7.65	373.51	83.24	0.64	100-year
2-year	Reach-1	1064	1039	1393.34	1396.78		1397.34	0.004322	6.02	172.48	75.45	0.7	2-year
100-year	Reach-1	1064	2856	1393.34	1399.21		1400.08	0.003236	7.47	382.14	96.97	0.66	100-year
2-year	Reach-1	1063.7	1039	1392.63	1396.87	1395.18	1397.12	0.001215	3.99	260.41	81.2	0.39	2-year
100-year	Reach-1	1063.7	2856	1392.63	1399.3	1397.04	1399.87	0.001541	6.06	471.62	93.19	0.47	100-year
	Reach-1	1062.95 Bridge											
2-year	Reach-1	1062.2	1039	1392.63	1396.81	1395.17	1397.07	0.001295	4.07	255.04	80.87	0.4	2-year
100-year	Reach-1	1062.2	2856	1392.63	1399.12	1397.03	1399.73	0.001714	6.28	454.95	92.3	0.5	100-year
2-year	Reach-1	1060	1039	1392.33	1395.39	1395.29	1396.27	0.009387	7.55	137.55	69.01	0.94	2-year
100-year	Reach-1	1060	2856	1392.33	1397.56		1398.86	0.006542	9.15	312.28	89.35	0.86	100-year
2-year	Reach-1	1058	1039	1391.43	1394.57	1393.69	1394.99	0.003354	5.24	198.11	79.07	0.58	2-year
100-year	Reach-1	1058	2856	1391.43	1396.99	1395.53	1397.76	0.002876	7.06	404.37	91.18	0.59	100-year
2-year	Reach-1	1056	1039	1390.33	1394.32		1394.53	0.001275	3.67	283.13	82.55	0.35	2-year
100-year	Reach-1	1056	2856	1390.33	1396.7		1397.23	0.001829	5.81	491.57	92.66	0.44	100-year
2-year	Reach-1	1054	1039	1390.43	1393.55		1394.06	0.004709	5.73	181.32	74.35	0.65	2-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
100-year	Reach-1	1054	2856	1390.43	1395.47		1396.57	0.005738	8.42	339.29	90.33	0.77	100-year
2-year	Reach-1	1052	1039	1389.43	1392.96	1391.65	1393.26	0.003001	4.38	237.45	90.54	0.48	2-year
100-year	Reach-1	1052	2856	1389.43	1394.71	1393.55	1395.43	0.004624	6.82	418.83	113.61	0.63	100-year
2-year	Reach-1	1050	1039	1388.73	1391.87		1392.33	0.007643	5.44	191.05	107.13	0.72	2-year
100-year	Reach-1	1050	2856	1388.73	1393.59		1394.36	0.006294	7.06	404.81	132.52	0.71	100-year
2-year	Reach-1	1048	1039	1387.43	1390.9		1391.19	0.004084	4.33	240.13	118.6	0.54	2-year
100-year	Reach-1	1048	2856	1387.43	1392.82		1393.37	0.0035	5.94	480.92	131.06	0.55	100-year
2-year	Reach-1	1046	1039	1387.43	1390.32		1390.54	0.00248	3.72	279.17	118.72	0.43	2-year
100-year	Reach-1	1046	2856	1387.43	1392.3		1392.75	0.00261	5.42	526.6	131.76	0.48	100-year
2-year	Reach-1	1044	1039	1386.93	1389.76		1390	0.00293	3.9	266.38	120.05	0.46	2-year
100-year	Reach-1	1044	2856	1386.93	1391.77		1392.23	0.002644	5.45	526.33	137.17	0.48	100-year
2-year	Reach-1	1042	1039	1386.23	1389.33		1389.49	0.002051	3.2	325.07	151.26	0.38	2-year
100-year	Reach-1	1042	2856	1386.23	1391.5		1391.78	0.001505	4.29	669.39	163.56	0.37	100-year
2-year	Reach-1	1040	1039	1385.43	1388.76		1389	0.002866	3.92	264.9	115.78	0.46	2-year
100-year	Reach-1	1040	2856	1385.43	1390.95		1391.39	0.002415	5.34	535.25	130.45	0.46	100-year
2-year	Reach-1	1038	1039	1385.13	1388.38	1386.86	1388.55	0.001663	3.32	313.29	117.3	0.36	2-year
100-year	Reach-1	1038	2856	1385.13	1390.59	1388.34	1390.95	0.001802	4.83	591.58	133.86	0.4	100-year
2-year	Reach-1	1036	1039	1384.43	1387.83	1386.77	1388.09	0.003189	4.1	253.57	112.88	0.48	2-year
100-year	Reach-1	1036	2856	1384.43	1390.04	1388.32	1390.51	0.002622	5.48	520.72	145.27	0.48	100-year
2-year	Reach-1	1034	1039	1384.03	1387.37		1387.58	0.001981	3.68	282.59	103.39	0.39	2-year
100-year	Reach-1	1034	2856	1384.03	1389.56		1390.02	0.00229	5.43	526.16	119.16	0.46	100-year
2-year	Reach-1	1032	1039	1383.33	1386.92	1385.56	1387.15	0.002375	3.91	265.98	101.91	0.43	2-year
100-year	Reach-1	1032	2856	1383.33	1389	1387.22	1389.51	0.002786	5.75	496.35	214.6	0.5	100-year

	HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1													
	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	1030	1039	1382.43	1386.47	1385	1386.68	0.002278	3.69	281.61	113.98	0.41	2-year
100-year	Reach-1	1030	2856	1382.43	1388.54	1386.7	1388.99	0.002292	5.34	535.23	204.27	0.45	100-year
2-year	Reach-1	1028	1039	1382.43	1386.04	1384.59	1386.24	0.002218	3.58	290.42	133.64	0.41	2-year
100-year	Reach-1	1028	2856	1382.43	1388.15	1386.25	1388.52	0.002201	4.9	582.27	223.3	0.44	100-year
2-year	Reach-1	1026	1039	1382.33	1385.63		1385.81	0.002056	3.39	306.75	130.58	0.39	2-year
100-year	Reach-1	1026	2856	1382.33	1387.75		1388.1	0.001932	4.77	599.32	145.38	0.41	100-year
2-year	Reach-1	1024	1039	1382.43	1384.93	1384.28	1385.21	0.004443	4.29	242.47	174.09	0.55	2-year
100-year	Reach-1	1024	2856	1382.43	1387.28	1385.54	1387.67	0.002341	5.06	564.29	276.73	0.45	100-year
2-year	Reach-1	1022	1039	1380.63	1384.33	1383.11	1384.57	0.002343	3.89	267.16	125.46	0.42	2-year
100-year	Reach-1	1022	2856	1380.63	1386.76	1384.6	1387.22	0.002157	5.44	525.26	184.51	0.44	100-year
2-year	Reach-1	1020	1039	1380.43	1384.02		1384.19	0.00144	3.23	321.43	111.79	0.34	2-year
100-year	Reach-1	1020	2856	1380.43	1386.48		1386.83	0.001474	4.7	607.64	121.07	0.37	100-year
2-year	Reach-1	1018	1039	1379.73	1383.64		1383.86	0.001829	3.76	276.01	91.56	0.38	2-year
100-year	Reach-1	1018	2856	1379.73	1385.95		1386.45	0.002345	5.65	505.23	109.2	0.46	100-year
2-year	Reach-1	1016	1039	1380.43	1382.89		1383.27	0.004973	5	208	95.96	0.6	2-year
100-year	Reach-1	1016	2856	1380.43	1385.23		1385.86	0.003483	6.39	447.13	108.36	0.55	100-year
2-year	Reach-1	1014	1039	1379.23	1382.62		1382.78	0.001174	3.26	319.01	107.91	0.33	2-year
100-year	Reach-1	1014	2856	1379.23	1385.01		1385.37	0.001315	4.82	592.69	120.48	0.38	100-year
2-year	Reach-1	1012	1039	1378.43	1382.24		1382.5	0.001609	4.07	255.33	86.31	0.42	2-year
100-year	Reach-1	1012	2856	1378.43	1384.5	1382.56	1385.02	0.002226	5.82	491.01	123.78	0.51	100-year
2-year	Reach-1	1010	1039	1378.43	1380.93	1380.93	1381.79	0.009848	7.45	139.46	82.18	1.01	2-year
100-year	Reach-1	1010	2856	1378.43	1382.6	1382.6	1384.16	0.008097	10.04	284.56	92.13	1.01	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	1009	1039	1376.93	1380.16	1378.71	1380.41	0.001332	4	259.84	85.77	0.4	2-year
100-year	Reach-1	1009	2856	1376.93	1382.63	1380.38	1383.18	0.001479	5.93	481.55	94	0.46	100-year
	Reach-1	1007.9	Bridge										
2-year	Reach-1	1006.8	1039	1376.93	1380.08	1378.71	1380.34	0.001452	4.11	252.81	85.5	0.42	2-year
100-year	Reach-1	1006.8	2856	1376.93	1382.41	1380.39	1383.01	0.001687	6.19	461.31	93.28	0.49	100-year
2-year	Reach-1	1006	1039	1376.93	1379.98		1380.21	0.001407	3.88	268.06	97.76	0.41	2-year
100-year	Reach-1	1006	2856	1376.93	1382.35		1382.82	0.001448	5.52	517.82	113.1	0.45	100-year
2-year	Reach-1	1004	1039	1376.43	1378.93		1379.58	0.006044	6.48	160.44	81.16	0.81	2-year
100-year	Reach-1	1004	2856	1376.43	1381.41		1382.28	0.003268	7.51	380.04	96.26	0.67	100-year
2-year	Reach-1	1002	1039	1375.43	1378.81		1379.01	0.001126	3.59	289.29	100.19	0.37	2-year
100-year	Reach-1	1002	2856	1375.43	1381.4		1381.78	0.001115	4.94	577.61	122.55	0.4	100-year
2-year	Reach-1	1000.4	1039	1374.93	1378.69	1376.75	1378.85	0.000793	3.2	324.81	102.84	0.32	2-year
100-year	Reach-1	1000.4	2856	1374.93	1381.27	1378.37	1381.6	0.00091	4.61	619.68	125.41	0.37	100-year
	Reach-1	1000	Bridge										
2-year	Reach-1	6.516	1039	1374.66	1378.65		1378.84	0.002472	3.51	295.97	93.8	0.35	2-year
100-year	Reach-1	6.516	2856	1374.66	1381.19		1381.6	0.002879	5.13	556.92	111.52	0.4	100-year
2-year	Reach-1	6.502	1039	1374.49	1378.37	1376.82	1378.61	0.00341	3.97	261.54	87.55	0.41	2-year
100-year	Reach-1	6.502	2856	1374.49	1380.83	1378.59	1381.33	0.003982	5.65	505.26	111.64	0.47	100-year
2-year	Reach-1	6.483	1039	1374.13	1378.04	1376.65	1378.28	0.003189	3.98	260.82	93.01	0.42	2-year
100-year	Reach-1	6.483	2856	1374.13	1380.47	1378.32	1380.95	0.003494	5.58	512.07	118.5	0.47	100-year
2-year	Reach-1	6.464	1039	1373.95	1377.66	1376.5	1377.95	0.003261	4.33	239.68	91.02	0.47	2-year
100-year	Reach-1	6.464	2856	1373.95	1380.05	1378.18	1380.6	0.003356	5.94	480.57	114.92	0.51	100-year

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
	HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1												
2-year	Reach-1	6.445	1039	1373.74	1377.35		1377.64	0.003193	4.27	243.13	91.19	0.46	2-year
100-year	Reach-1	6.445	2856	1373.74	1379.73		1380.28	0.003143	5.94	480.55	108.31	0.5	100-year
2-year	Reach-1	6.426	1039	1373.26	1377.07	1375.77	1377.34	0.002916	4.16	249.63	90.81	0.44	2-year
100-year	Reach-1	6.426	2856	1373.26	1379.43	1377.46	1379.97	0.0031	5.86	487.01	110.49	0.49	100-year
2-year	Reach-1	6.407	1039	1373.2	1376.81	1375.54	1377.05	0.002747	3.93	264.55	99.71	0.42	2-year
100-year	Reach-1	6.407	2856	1373.2	1379.2	1377.1	1379.66	0.00264	5.44	524.8	117.54	0.45	100-year
2-year	Reach-1	6.388	1039	1372.68	1376.59	1375.1	1376.8	0.002173	3.65	284.62	100.83	0.38	2-year
100-year	Reach-1	6.388	2856	1372.68	1378.98	1376.69	1379.4	0.002315	5.22	547.45	118.8	0.43	100-year
2-year	Reach-1	6.369	1039	1372.21	1376.37	1374.67	1376.58	0.002128	3.68	282.05	97.06	0.38	2-year
100-year	Reach-1	6.369	2856	1372.21	1378.72	1376.47	1379.16	0.002467	5.37	531.82	115.84	0.44	100-year
2-year	Reach-1	6.35	1039	1372.35	1376.1	1374.81	1376.35	0.002558	3.99	260.2	96.75	0.43	2-year
100-year	Reach-1	6.35	2856	1372.35	1378.41	1376.44	1378.91	0.002662	5.66	504.84	115.21	0.48	100-year
2-year	Reach-1	6.331	1039	1371.88	1375.85		1376.1	0.002609	3.99	260.45	95.3	0.43	2-year
100-year	Reach-1	6.331	2856	1371.88	1378.12		1378.63	0.002847	5.75	496.41	112.98	0.48	100-year
2-year	Reach-1	6.312	1039	1371.54	1375.6	1374.21	1375.84	0.002499	3.95	262.92	94.56	0.42	2-year
100-year	Reach-1	6.312	2856	1371.54	1377.82	1375.87	1378.34	0.002891	5.79	493.26	112.65	0.49	100-year
2-year	Reach-1	6.293	1039	1371.56	1375.31		1375.57	0.002808	4.1	253.38	94.07	0.44	2-year
100-year	Reach-1	6.293	2856	1371.56	1377.46		1378.02	0.003244	6.02	474.39	111.34	0.51	100-year
2-year	Reach-1	6.274	1039	1371.03	1375	1373.8	1375.28	0.002972	4.2	247.6	93.61	0.45	2-year
100-year	Reach-1	6.274	2856	1371.03	1377.08	1375.45	1377.68	0.003538	6.21	460.04	111.05	0.54	100-year
2-year	Reach-1	6.255	1039	1371.44	1374.41	1373.78	1374.85	0.006224	5.29	196.36	90.19	0.63	2-year
100-year	Reach-1	6.255	2856	1371.44	1376.34	1375.41	1377.2	0.006052	7.41	385.28	105.4	0.68	100-year
2-year	Reach-1	6.236	1039	1370.14	1374.04	1372.8	1374.34	0.003568	4.45	233.23	91.33	0.49	2-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
100-year	Reach-1	6.236	2856	1370.14	1375.9	1374.62	1376.63	0.004685	6.85	416.82	105.8	0.61	100-year
2-year	Reach-1	6.217	1039	1369.33	1373.83	1372	1374.05	0.002132	3.78	274.86	93.55	0.39	2-year
100-year	Reach-1	6.217	2856	1369.33	1375.55	1373.97	1376.18	0.003751	6.38	447.69	106.98	0.55	100-year
2-year	Reach-1	6.199	1039	1370.16	1373.57	1372.4	1373.79	0.003049	3.82	272.11	120.21	0.45	2-year
100-year	Reach-1	6.199	2856	1370.16	1375.23	1373.9	1375.77	0.003904	5.9	484.46	135.18	0.55	100-year
2-year	Reach-1	6.18	1039	1369.49	1373.35	1371.98	1373.51	0.002382	3.18	326.86	146.59	0.38	2-year
100-year	Reach-1	6.18	2856	1369.49	1375.02	1373.4	1375.39	0.002869	4.87	585.9	163.74	0.45	100-year
2-year	Reach-1	6.161	1039	1368.9	1373.14		1373.27	0.002214	2.91	357.3	172.44	0.36	2-year
100-year	Reach-1	6.161	2856	1368.9	1374.82		1375.11	0.00235	4.3	664.65	192.64	0.41	100-year
2-year	Reach-1	6.142	1039	1369.26	1372.91		1373.04	0.002272	2.93	354.45	172.73	0.36	2-year
100-year	Reach-1	6.142	2856	1369.26	1374.58		1374.87	0.002414	4.33	659.04	192.73	0.41	100-year
2-year	Reach-1	6.123	1039	1368.96	1372.63		1372.78	0.003016	3.19	325.84	172.33	0.41	2-year
100-year	Reach-1	6.123	2856	1368.96	1374.28		1374.6	0.002852	4.55	627.43	192.18	0.44	100-year
2-year	Reach-1	6.104	1039	1368.76	1372.36		1372.5	0.002684	3.08	336.84	172.09	0.39	2-year
100-year	Reach-1	6.104	2856	1368.76	1374.02		1374.33	0.002659	4.47	639.59	192.03	0.43	100-year
2-year	Reach-1	6.085	1039	1368.52	1372.11		1372.25	0.0025	3.02	344.12	172.07	0.38	2-year
100-year	Reach-1	6.085	2856	1368.52	1373.77		1374.07	0.002567	4.42	646.36	192.01	0.42	100-year
2-year	Reach-1	6.066	1039	1368.21	1371.87	1370.42	1372	0.002305	2.94	352.86	172.8	0.36	2-year
100-year	Reach-1	6.066	2856	1368.21	1373.51	1371.86	1373.81	0.00248	4.37	653.39	192.55	0.42	100-year
2-year	Reach-1	6.047	1039	1368.09	1371.62	1370.6	1371.76	0.002441	2.99	347.4	173.43	0.37	2-year
100-year	Reach-1	6.047	2856	1368.09	1373.25	1371.66	1373.55	0.002597	4.43	645.4	192.95	0.43	100-year
2-year	Reach-1	6.028	1039	1367.84	1371.36	1370.38	1371.5	0.002621	3.05	340.35	173.9	0.38	2-year
100-year	Reach-1	6.028	2856	1367.84	1372.97	1371.42	1373.29	0.002724	4.49	636.77	193.27	0.44	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	6.009	1039	1367.66	1371.1		1371.25	0.00273	3.09	336.6	174.37	0.39	2-year
100-year	Reach-1	6.009	2856	1367.66	1372.7		1373.02	0.00281	4.52	631.43	193.59	0.44	100-year
2-year	Reach-1	5.99	1039	1367.8	1370.86		1370.99	0.002235	2.9	357.78	175.15	0.36	2-year
100-year	Reach-1	5.99	2856	1367.8	1372.44		1372.74	0.002559	4.4	649.81	194.13	0.42	100-year
2-year	Reach-1	5.971	1039	1367.85	1370.56		1370.72	0.003206	3.23	321.42	175.13	0.42	2-year
100-year	Reach-1	5.971	2856	1367.85	1372.12		1372.46	0.003175	4.68	609.61	193.87	0.47	100-year
2-year	Reach-1	5.952	1039	1367.61	1370.25	1369.39	1370.41	0.003201	3.23	321.42	175	0.42	2-year
100-year	Reach-1	5.952	2856	1367.61	1371.81	1370.43	1372.15	0.003166	4.68	609.91	193.77	0.47	100-year
2-year	Reach-1	5.933	1039	1366.83	1369.97	1368.98	1370.12	0.002617	3.04	341.71	175.28	0.38	2-year
100-year	Reach-1	5.933	2856	1366.83	1371.53	1370.05	1371.85	0.002872	4.55	628.26	193.91	0.45	100-year
2-year	Reach-1	5.914	1039	1366.87	1369.62	1368.85	1369.8	0.003816	3.41	305.03	174.65	0.45	2-year
100-year	Reach-1	5.914	2856	1366.87	1371.16	1369.9	1371.53	0.00357	4.85	588.31	193.13	0.49	100-year
2-year	Reach-1	5.896	1039	1366.4	1369.21	1368.49	1369.4	0.004185	3.51	295.8	173.3	0.47	2-year
100-year	Reach-1	5.896	2856	1366.4	1370.8	1369.54	1371.17	0.003572	4.86	587.05	192.42	0.49	100-year
2-year	Reach-1	5.877	1039	1366.17	1368.93	1367.98	1369.06	0.002695	2.87	361.91	195.94	0.37	2-year
100-year	Reach-1	5.877	2856	1366.17	1370.57	1368.95	1370.83	0.002605	4.08	699.6	215.63	0.4	100-year
2-year	Reach-1	5.858	1039	1365.61	1368.68	1367.7	1368.8	0.002526	2.82	368.99	196.52	0.36	2-year
100-year	Reach-1	5.858	2856	1365.61	1370.33	1368.67	1370.58	0.002474	4.02	710.61	216.37	0.39	100-year
2-year	Reach-1	5.839	1039	1365.11	1368.43	1367.44	1368.55	0.002347	2.78	373.54	197.13	0.36	2-year
100-year	Reach-1	5.839	2856	1365.11	1370.09	1368.4	1370.33	0.002349	3.98	717.43	217.06	0.39	100-year
2-year	Reach-1	5.82	1039	1364.81	1368.16	1367.25	1368.29	0.002625	2.88	360.39	196.97	0.38	2-year
100-year	Reach-1	5.82	2856	1364.81	1369.84	1368.2	1370.09	0.002449	4.04	707.23	217.07	0.39	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	5.801	1039	1364.45	1367.88	1367.01	1368.02	0.002826	2.96	350.46	196.61	0.39	2-year
100-year	Reach-1	5.801	2856	1364.45	1369.59	1367.97	1369.85	0.002474	4.06	703.51	217.09	0.4	100-year
2-year	Reach-1	5.782	1039	1364.42	1367.51	1366.84	1367.68	0.004096	3.35	310.32	194.1	0.47	2-year
100-year	Reach-1	5.782	2856	1364.42	1369.31	1367.8	1369.58	0.002752	4.2	680.22	215.75	0.42	100-year
2-year	Reach-1	5.763	1039	1364.27	1367.28		1367.39	0.001896	2.68	388.08	176.45	0.32	2-year
100-year	Reach-1	5.763	2856	1364.27	1369.1		1369.34	0.001957	3.91	729.98	198.37	0.36	100-year
2-year	Reach-1	5.744	1039	1363.7	1367.01		1367.16	0.00267	3.15	329.4	150.27	0.38	2-year
100-year	Reach-1	5.744	2856	1363.7	1368.75		1369.09	0.002966	4.69	609.56	171.19	0.44	100-year
2-year	Reach-1	5.725	1039	1363.37	1366.64		1366.84	0.003875	3.64	285.73	139.15	0.45	2-year
100-year	Reach-1	5.725	2856	1363.37	1368.28		1368.73	0.004327	5.39	529.8	158.94	0.52	100-year
2-year	Reach-1	5.706	1039	1362.95	1366.28	1365.38	1366.46	0.003611	3.46	300.3	152.38	0.43	2-year
100-year	Reach-1	5.706	2856	1362.95	1367.9	1366.54	1368.3	0.003866	5.06	564	171.9	0.49	100-year
2-year	Reach-1	5.687	1039	1362.74	1365.98	1365.03	1366.13	0.00292	3.14	330.55	171.59	0.4	2-year
100-year	Reach-1	5.687	2856	1362.74	1367.62	1366.1	1367.94	0.003058	4.55	627.79	191.25	0.44	100-year
2-year	Reach-1	5.668	1039	1362.49	1365.77	1364.7	1365.88	0.002114	2.64	393.47	204.76	0.34	2-year
100-year	Reach-1	5.668	2856	1362.49	1367.43	1365.66	1367.65	0.002132	3.78	756.13	232.42	0.37	100-year
2-year	Reach-1	5.649	1039	1362.3	1365.58	1364.44	1365.68	0.001816	2.45	423.27	213.17	0.31	2-year
100-year	Reach-1	5.649	2856	1362.3	1367.24	1365.36	1367.44	0.001894	3.6	793.17	233.08	0.34	100-year
2-year	Reach-1	5.63	1039	1362.36	1365.35		1365.47	0.002431	2.71	382.73	203.54	0.35	2-year
100-year	Reach-1	5.63	2856	1362.36	1367		1367.23	0.002332	3.9	733.2	223.26	0.38	100-year
2-year	Reach-1	5.611	1039	1362	1364.96	1363.93	1365.15	0.004081	3.5	296.5	205.38	0.51	2-year
100-year	Reach-1	5.611	2856	1362	1366.67	1365.34	1366.96	0.00313	4.29	665.78	226.16	0.44	100-year
2-year	Reach-1	5.592	1039	1360.27	1364.79		1364.89	0.001469	2.52	412.93	206.93	0.31	2-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
100-year	Reach-1	5.592	2856	1360.27	1366.5		1366.71	0.001826	3.65	783.2	227.44	0.35	100-year
2-year	Reach-1	5.574	1039	1359.97	1364.66		1364.75	0.001348	2.4	433.31	206.38	0.29	2-year
100-year	Reach-1	5.574	2856	1359.97	1366.33		1366.53	0.001776	3.6	793.27	226.35	0.34	100-year
2-year	Reach-1	5.555	1039	1359.3	1364.54		1364.63	0.001173	2.3	450.81	205.67	0.27	2-year
100-year	Reach-1	5.555	2856	1359.3	1366.16		1366.36	0.001706	3.58	798.1	225.01	0.33	100-year
2-year	Reach-1	5.536	1039	1360.91	1364.32	1363.25	1364.45	0.002918	2.9	358.73	214.16	0.39	2-year
100-year	Reach-1	5.536	2856	1360.91	1365.87	1364.41	1366.13	0.002801	4.04	707.21	232.87	0.41	100-year
2-year	Reach-1	5.517	1039	1360.75	1364		1364.14	0.003311	3.02	344	211.61	0.42	2-year
100-year	Reach-1	5.517	2856	1360.75	1365.58		1365.84	0.002988	4.12	692.76	230.53	0.42	100-year
2-year	Reach-1	5.498	1039	1360.38	1363.71	1362.56	1363.84	0.002777	2.89	359.38	208.86	0.39	2-year
100-year	Reach-1	5.498	2856	1360.38	1365.29	1363.78	1365.54	0.002761	4.05	704.59	227.83	0.41	100-year
2-year	Reach-1	5.479	1039	1359.79	1363.43	1362.2	1363.56	0.002674	2.94	353.4	202.15	0.39	2-year
100-year	Reach-1	5.479	2856	1359.79	1364.98	1363.52	1365.26	0.002878	4.18	682.73	220.82	0.42	100-year
2-year	Reach-1	5.46	1039	1360.21	1363.13		1363.27	0.002974	2.98	348.36	197.85	0.4	2-year
100-year	Reach-1	5.46	2856	1360.21	1364.68		1364.96	0.00312	4.27	668.66	216.35	0.43	100-year
2-year	Reach-1	5.441	1039	1360.11	1362.83	1361.89	1362.96	0.002899	2.87	361.85	196.76	0.37	2-year
100-year	Reach-1	5.441	2856	1360.11	1364.38	1362.87	1364.66	0.002979	4.19	680.94	215.29	0.42	100-year
2-year	Reach-1	5.422	1039	1359.44	1362.54	1361.67	1362.67	0.003029	2.86	363.27	206	0.38	2-year
100-year	Reach-1	5.422	2856	1359.44	1364.1	1362.59	1364.36	0.002878	4.08	699.59	224.73	0.41	100-year
2-year	Reach-1	5.403	1039	1359.54	1362.31	1361.31	1362.41	0.002258	2.54	409.81	225.42	0.33	2-year
100-year	Reach-1	5.403	2856	1359.54	1363.89	1362.18	1364.1	0.002206	3.65	781.86	244.42	0.36	100-year
2-year	Reach-1	5.384	1039	1359.18	1362.11	1361.09	1362.2	0.00197	2.41	431.82	239.69	0.32	2-year
100-year	Reach-1	5.384	2856	1359.18	1363.7	1361.94	1363.88	0.001929	3.45	827.62	258.76	0.34	100-year

	HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1												
	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	5.365	1039	1358.77	1361.91		1362	0.001868	2.41	430.59	234.59	0.31	2-year
100-year	Reach-1	5.365	2856	1358.77	1363.49		1363.68	0.001924	3.5	816.29	253.54	0.34	100-year
2-year	Reach-1	5.346	1039	1358.52	1361.69		1361.79	0.002192	2.56	406.31	229.24	0.34	2-year
100-year	Reach-1	5.346	2856	1358.52	1363.26		1363.47	0.002142	3.65	781.49	248.09	0.36	100-year
2-year	Reach-1	5.327	1039	1358.48	1361.45		1361.56	0.002372	2.65	392.23	223.74	0.35	2-year
100-year	Reach-1	5.327	2856	1358.48	1363.02		1363.24	0.002295	3.77	757.27	242.52	0.38	100-year
2-year	Reach-1	5.308	1039	1357.82	1361.17		1361.3	0.002811	2.84	366	215.87	0.38	2-year
100-year	Reach-1	5.308	2856	1357.82	1362.76		1363	0.002525	3.94	724.34	234.94	0.4	100-year
2-year	Reach-1	5.289	1039	1357.6	1360.88		1361.01	0.002853	2.87	362.44	215.38	0.39	2-year
100-year	Reach-1	5.289	2856	1357.6	1362.52		1362.76	0.002429	3.9	732.24	235.08	0.39	100-year
2-year	Reach-1	5.271	1039	1356.88	1360.58		1360.71	0.003096	2.94	352.87	214.73	0.4	2-year
100-year	Reach-1	5.271	2856	1356.88	1362.29		1362.52	0.002384	3.87	737.11	235.23	0.39	100-year
2-year	Reach-1	5.252	1039	1356.58	1360.34	1359.39	1360.45	0.00226	2.68	387.48	214.88	0.35	2-year
100-year	Reach-1	5.252	2856	1356.58	1362.09	1360.29	1362.3	0.00197	3.65	782.62	235.92	0.35	100-year
2-year	Reach-1	5.233	1039	1356.42	1360.13	1359.15	1360.24	0.002082	2.62	396.14	215.4	0.34	2-year
100-year	Reach-1	5.233	2856	1356.42	1361.92	1360.05	1362.11	0.001835	3.57	799.03	236.78	0.34	100-year
2-year	Reach-1	5.214	1039	1356.65	1359.95	1358.9	1360.05	0.001916	2.54	409.57	216.14	0.32	2-year
100-year	Reach-1	5.214	2856	1356.65	1361.75	1359.8	1361.94	0.001709	3.49	819.47	237.81	0.33	100-year
2-year	Reach-1	5.195	1039	1356.09	1359.78	1358.65	1359.87	0.001748	2.43	426.81	217.72	0.31	2-year
100-year	Reach-1	5.195	2856	1356.09	1361.6	1359.55	1361.78	0.001582	3.38	844.09	239.61	0.32	100-year
2-year	Reach-1	5.176	1039	1355.92	1359.63	1358.36	1359.71	0.001376	2.26	459.39	219.58	0.28	2-year
100-year	Reach-1	5.176	2856	1355.92	1361.47	1359.25	1361.63	0.001359	3.24	883.57	254.93	0.3	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	5.157	1039	1356.57	1359.28	1358.47	1359.48	0.004277	3.53	294.41	159.46	0.46	2-year
100-year	Reach-1	5.157	2856	1356.57	1361.04	1359.6	1361.4	0.003538	4.81	593.95	180.6	0.47	100-year
2-year	Reach-1	5.138	1039	1355.81	1358.82		1359.02	0.00497	3.6	288.54	155.92	0.47	2-year
100-year	Reach-1	5.138	2856	1355.81	1360.68		1361.03	0.003813	4.78	597.49	175.51	0.46	100-year
2-year	Reach-1	5.119	1039	1354.63	1357.88	1357.42	1358.28	0.01076	5.13	202.4	108.99	0.66	2-year
100-year	Reach-1	5.119	2856	1354.63	1359.63	1358.79	1360.42	0.009332	7.15	399.57	115.84	0.68	100-year
	Reach-1	5.102	Bridge										
2-year	Reach-1	5.091	1039	1353.63	1356.06	1355.35	1356.43	0.003085	4.94	210.14	94.93	0.59	2-year
100-year	Reach-1	5.091	2856	1353.63	1358.1	1356.9	1358.79	0.003355	6.66	428.7	130	0.65	100-year
2-year	Reach-1	5.073	1039	1353.3	1355.86		1356.1	0.002297	3.94	263.63	136.39	0.5	2-year
100-year	Reach-1	5.073	2856	1353.3	1358.06		1358.38	0.001609	4.56	625.67	198.65	0.45	100-year
2-year	Reach-1	5.054	1039	1353	1355.43		1355.81	0.00324	5	207.84	97.06	0.6	2-year
100-year	Reach-1	5.054	2856	1353	1357.43		1358.11	0.00354	6.63	430.54	140.33	0.67	100-year
2-year	Reach-1	5.035	1039	1352.7	1355.12		1355.48	0.00309	4.8	216.6	104.06	0.59	2-year
100-year	Reach-1	5.035	2856	1352.7	1357.17		1357.75	0.003062	6.13	465.74	153.61	0.62	100-year
2-year	Reach-1	5.016	1039	1352.4	1354.82		1355.18	0.003074	4.79	216.94	104.07	0.58	2-year
100-year	Reach-1	5.016	2856	1352.4	1356.87		1357.45	0.003051	6.13	466.23	153.58	0.62	100-year
2-year	Reach-1	4.997	1039	1352.1	1354.52		1354.88	0.00308	4.79	216.82	104.06	0.59	2-year
100-year	Reach-1	4.997	2856	1352.1	1356.56		1357.15	0.003056	6.13	465.97	153.57	0.62	100-year
2-year	Reach-1	4.978	1039	1351.79	1354.22		1354.58	0.003063	4.78	217.24	104.14	0.58	2-year
100-year	Reach-1	4.978	2856	1351.79	1356.27		1356.85	0.00302	6.1	467.86	153.75	0.62	100-year
2-year	Reach-1	4.959	1039	1351.48	1353.92		1354.27	0.003046	4.77	217.63	104.17	0.58	2-year
100-year	Reach-1	4.959	2856	1351.48	1355.99		1356.56	0.002971	6.06	471.49	154.87	0.61	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	4.94	1039	1351.18	1353.62		1353.97	0.003052	4.78	217.51	104.17	0.58	2-year
100-year	Reach-1	4.94	2856	1351.18	1355.7		1356.27	0.002923	6.02	474.1	155.1	0.61	100-year
2-year	Reach-1	4.921	1039	1350.87	1353.33		1353.68	0.002997	4.75	218.82	104.33	0.58	2-year
100-year	Reach-1	4.921	2856	1350.87	1355.43		1355.98	0.002824	5.96	479.48	155.45	0.6	100-year
2-year	Reach-1	4.902	1039	1350.56	1353.03		1353.38	0.002943	4.72	220.18	104.52	0.57	2-year
100-year	Reach-1	4.902	2856	1350.56	1355.17		1355.71	0.002692	5.86	487.12	156.04	0.58	100-year
2-year	Reach-1	4.883	1039	1350.26	1352.68		1353.06	0.003265	4.97	208.99	99.07	0.6	2-year
100-year	Reach-1	4.883	2856	1350.26	1354.79		1355.41	0.003111	6.29	454.21	145.79	0.63	100-year
2-year	Reach-1	4.864	1039	1349.95	1352.21		1352.69	0.004298	5.55	187.29	92.2	0.69	2-year
100-year	Reach-1	4.864	2856	1349.95	1354.18		1355.02	0.004633	7.35	388.57	132.36	0.76	100-year
2-year	Reach-1	4.845	1039	1349.13	1352.16		1352.35	0.001605	3.56	291.53	133.88	0.43	2-year
100-year	Reach-1	4.845	2856	1349.13	1354.28		1354.62	0.0015	4.67	611.83	177.82	0.44	100-year
2-year	Reach-1	4.826	1039	1349.34	1351.77		1352.12	0.003041	4.77	217.82	104.27	0.58	2-year
100-year	Reach-1	4.826	2856	1349.34	1353.81		1354.39	0.003019	6.11	467.69	153.57	0.62	100-year
2-year	Reach-1	4.807	1039	1349	1351.47		1351.81	0.00296	4.73	219.59	104.27	0.57	2-year
100-year	Reach-1	4.807	2856	1349	1353.5		1354.08	0.002996	6.09	468.9	153.66	0.61	100-year
2-year	Reach-1	4.788	1039	1348.7	1351.16		1351.51	0.002982	4.74	219.1	104.26	0.58	2-year
100-year	Reach-1	4.788	2856	1348.7	1353.2		1353.78	0.003011	6.1	468.2	153.69	0.62	100-year
2-year	Reach-1	4.77	1039	1348.4	1350.85		1351.2	0.002983	4.74	219.08	104.27	0.58	2-year
100-year	Reach-1	4.77	2856	1348.4	1352.89		1353.47	0.003011	6.1	468.19	153.69	0.62	100-year
2-year	Reach-1	4.751	1039	1348.11	1350.55		1350.9	0.003004	4.75	218.68	104.33	0.58	2-year
100-year	Reach-1	4.751	2856	1348.11	1352.58		1353.16	0.003035	6.11	467.06	153.68	0.62	100-year

	HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1												
	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	4.732	1039	1347.81	1350.24		1350.59	0.003061	4.78	217.32	104.19	0.58	2-year
100-year	Reach-1	4.732	2856	1347.81	1352.27		1352.85	0.003074	6.14	465.12	153.56	0.62	100-year
2-year	Reach-1	4.713	1039	1347.5	1349.91		1350.27	0.003116	4.81	215.99	103.99	0.59	2-year
100-year	Reach-1	4.713	2856	1347.5	1351.95		1352.54	0.003089	6.15	464.34	153.48	0.62	100-year
2-year	Reach-1	4.694	1039	1347.19	1349.59		1349.96	0.003195	4.85	214.23	103.79	0.59	2-year
100-year	Reach-1	4.694	2856	1347.19	1351.64		1352.23	0.003111	6.16	463.31	153.41	0.63	100-year
2-year	Reach-1	4.675	1039	1346.89	1349.24		1349.62	0.003462	4.98	208.6	103.17	0.62	2-year
100-year	Reach-1	4.675	2856	1346.89	1351.3		1351.9	0.003255	6.25	456.82	153.23	0.64	100-year
2-year	Reach-1	4.656	1039	1346.58	1348.84		1349.26	0.003919	5.19	200.14	102.08	0.65	2-year
100-year	Reach-1	4.656	2856	1346.58	1350.94		1351.57	0.003393	6.34	450.19	152.4	0.65	100-year
2-year	Reach-1	4.637	1039	1346.27	1348.8		1348.97	0.001315	3.3	315.32	140.34	0.39	2-year
100-year	Reach-1	4.637	2856	1346.27	1350.99		1351.29	0.001119	4.39	650.83	166.66	0.39	100-year
2-year	Reach-1	4.618	1039	1345.97	1348.7	1347.35	1348.85	0.00103	3.07	338.33	139.27	0.35	2-year
100-year	Reach-1	4.618	2856	1345.97	1350.9	1348.62	1351.18	0.001	4.24	673.55	166.89	0.37	100-year
2-year	Reach-1	4.599	1039	1345.66	1348.45		1348.7	0.001882	4.07	255.58	108.47	0.47	2-year
100-year	Reach-1	4.599	2856	1345.66	1350.59		1351.03	0.001981	5.31	538.29	159.06	0.51	100-year
2-year	Reach-1	4.58	1039	1345.4	1348.22		1348.51	0.002099	4.28	242.78	103.49	0.49	2-year
100-year	Reach-1	4.58	2856	1345.4	1350.25		1350.81	0.002219	5.99	476.74	127.71	0.55	100-year
2-year	Reach-1	4.561	1039	1345.2	1348		1348.29	0.002145	4.31	241.04	103.32	0.5	2-year
100-year	Reach-1	4.561	2856	1345.2	1350		1350.57	0.00229	6.06	471.58	127.27	0.55	100-year
2-year	Reach-1	4.542	1039	1345	1347.77		1348.07	0.00222	4.36	238.28	103.02	0.51	2-year
100-year	Reach-1	4.542	2856	1345	1349.76		1350.34	0.002365	6.12	466.42	126.82	0.56	100-year
2-year	Reach-1	4.523	1039	1344.8	1347.53		1347.83	0.002334	4.43	234.34	102.59	0.52	2-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

Profile	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Profile
100-year	Reach-1	4.523	2856	1344.8	1349.48		1350.08	0.002497	6.24	457.69	126.03	0.58	100-year
2-year	Reach-1	4.504	1039	1344.6	1347.27		1347.59	0.002468	4.52	229.98	102.09	0.53	2-year
100-year	Reach-1	4.504	2856	1344.6	1349.19		1349.82	0.002652	6.37	448.21	125.15	0.59	100-year
2-year	Reach-1	4.485	1039	1344.39	1346.99		1347.33	0.002759	4.69	221.58	101.12	0.56	2-year
100-year	Reach-1	4.485	2856	1344.39	1348.86		1349.54	0.002933	6.6	432.87	123.71	0.62	100-year
2-year	Reach-1	4.466	1039	1344.18	1346.61		1347.01	0.003506	5.08	204.51	99.09	0.62	2-year
100-year	Reach-1	4.466	2856	1344.18	1348.45		1349.21	0.003509	7.02	406.8	121.17	0.68	100-year
2-year	Reach-1	4.448	1039	1343.88	1346.11		1346.6	0.004772	5.63	184.57	96.64	0.72	2-year
100-year	Reach-1	4.448	2856	1343.88	1347.98		1348.83	0.004052	7.38	387.03	119.19	0.72	100-year
2-year	Reach-1	4.429	1039	1343.56	1345.88		1346.18	0.00277	4.42	234.91	117.54	0.55	2-year
100-year	Reach-1	4.429	2856	1343.56	1347.93		1348.44	0.002138	5.73	498.23	138.8	0.53	100-year
2-year	Reach-1	4.41	1039	1343.2	1345.72		1345.94	0.001771	3.77	275.37	124.96	0.45	2-year
100-year	Reach-1	4.41	2856	1343.2	1347.83		1348.22	0.001558	5.05	565.41	150.2	0.46	100-year
2-year	Reach-1	4.391	1039	1342.9	1345.48		1345.74	0.002087	4.12	252.17	113.39	0.49	2-year
100-year	Reach-1	4.391	2856	1342.9	1347.56		1348.04	0.001913	5.55	514.55	138.39	0.51	100-year
2-year	Reach-1	4.372	1039	1342.58	1345.13		1345.49	0.002954	4.8	216.57	100.53	0.58	2-year
100-year	Reach-1	4.372	2856	1342.58	1347.16		1347.8	0.002697	6.41	445.68	124.96	0.6	100-year
2-year	Reach-1	4.353	1039	1342.26	1344.85		1345.2	0.002819	4.72	220.02	100.98	0.56	2-year
100-year	Reach-1	4.353	2856	1342.26	1346.92		1347.54	0.002548	6.28	454.68	125.88	0.58	100-year
2-year	Reach-1	4.334	1039	1341.95	1344.59		1344.92	0.002673	4.64	223.98	101.45	0.55	2-year
100-year	Reach-1	4.334	2856	1341.95	1346.69		1347.28	0.002402	6.15	464.14	126.78	0.57	100-year
2-year	Reach-1	4.315	1039	1341.7	1344.38		1344.66	0.002184	4.27	243.11	107.03	0.5	2-year
100-year	Reach-1	4.315	2856	1341.7	1346.56		1347.02	0.002117	5.42	526.49	158.19	0.52	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	4.296	1039	1341.47	1344.16		1344.45	0.00216	4.26	244.1	107.22	0.5	2-year
100-year	Reach-1	4.296	2856	1341.47	1346.36		1346.81	0.002068	5.38	530.79	158.62	0.52	100-year
2-year	Reach-1	4.277	1039	1341.2	1343.96		1344.23	0.001995	4.15	250.55	107.83	0.48	2-year
100-year	Reach-1	4.277	2856	1341.2	1346.17		1346.6	0.001945	5.27	541.58	159.31	0.5	100-year
2-year	Reach-1	4.258	1039	1341	1343.75		1344.03	0.002041	4.24	244.77	103.34	0.49	2-year
100-year	Reach-1	4.258	2856	1341	1345.93		1346.4	0.002105	5.52	517.75	150.87	0.52	100-year
2-year	Reach-1	4.239	1039	1340.76	1343.56		1343.83	0.001945	4.17	249.26	104.35	0.48	2-year
100-year	Reach-1	4.239	2856	1340.76	1345.74		1346.2	0.002025	5.43	525.9	152.39	0.52	100-year
2-year	Reach-1	4.22	1039	1340.5	1343.39		1343.64	0.001708	3.98	261.01	106.19	0.45	2-year
100-year	Reach-1	4.22	2856	1340.5	1345.56		1345.99	0.001851	5.26	543.33	154.58	0.49	100-year
2-year	Reach-1	4.201	1039	1340.36	1343.21		1343.47	0.001769	4.03	257.59	105.52	0.45	2-year
100-year	Reach-1	4.201	2856	1340.36	1345.36		1345.8	0.001956	5.36	532.9	153.5	0.51	100-year
2-year	Reach-1	4.182	1039	1340.2	1343.04		1343.28	0.001766	3.98	261.09	109.07	0.45	2-year
100-year	Reach-1	4.182	2856	1340.2	1345.18		1345.6	0.001894	5.23	546.5	159.7	0.5	100-year
2-year	Reach-1	4.163	1039	1340	1342.85		1343.1	0.001784	3.99	260.09	108.86	0.46	2-year
100-year	Reach-1	4.163	2856	1340	1344.97		1345.4	0.001951	5.28	540.71	159.01	0.5	100-year
2-year	Reach-1	4.145	1039	1339.88	1342.65		1342.91	0.001953	4.12	252.48	108.16	0.47	2-year
100-year	Reach-1	4.145	2856	1339.88	1344.75		1345.2	0.002119	5.41	528.23	159.63	0.52	100-year
2-year	Reach-1	4.126	1039	1339.7	1342.45	1341.43	1342.71	0.002011	4.16	249.87	107.74	0.48	2-year
100-year	Reach-1	4.126	2856	1339.7	1344.53	1342.95	1344.98	0.00229	5.36	532.99	173.12	0.54	100-year
	Reach-1	4.12	Bridge										
2-year	Reach-1	4.107	1039	1339.53	1342.12		1342.43	0.002427	4.42	234.82	106.22	0.52	2-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

Profile	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Profile
100-year	Reach-1	4.107	2856	1339.53	1344.1		1344.64	0.002744	5.91	482.86	154.83	0.59	100-year
2-year	Reach-1	4.088	1039	1339.34	1341.85	1341.04	1342.18	0.002585	4.58	226.79	101.91	0.54	2-year
100-year	Reach-1	4.088	2856	1339.34	1343.63	1342.55	1344.32	0.003598	6.66	428.51	139.7	0.67	100-year
2-year	Reach-1	4.05	1039	1339.18	1341.49		1341.78	0.001866	4.48	248.1	127.59	0.52	2-year
100-year	Reach-1	4.05	2856	1339.18	1343.31		1343.85	0.001673	6.26	498.47	145.55	0.54	100-year
2-year	Reach-1	4.04	1039	1338.48	1340.97		1341.25	0.001661	4.45	282.53	159.02	0.5	2-year
100-year	Reach-1	4.04	2856	1338.48	1342.9		1343.37	0.00142	6.03	630.11	193.75	0.51	100-year
2-year	Reach-1	3.97	1039	1337.78	1339.93		1340.41	0.003271	5.66	194.11	102.83	0.68	2-year
100-year	Reach-1	3.97	2856	1337.78	1341.38		1342.49	0.003983	8.81	364.19	132.37	0.82	100-year
2-year	Reach-1	3.9	1039	1336.68	1339.04	1338.33	1339.33	0.001874	4.56	275.73	170.86	0.52	2-year
100-year	Reach-1	3.9	2856	1336.68	1340.73	1339.71	1341.23	0.001776	6.36	625.89	245.63	0.56	100-year
2-year	Reach-1	3.82	1039	1335.48	1337.12	1337.12	1337.87	0.007391	7.1	154.04	104.84	0.98	2-year
100-year	Reach-1	3.82	2856	1335.48	1338.81	1338.59	1339.99	0.00469	9.08	354.64	131.47	0.88	100-year
2-year	Reach-1	3.73	1039	1334.38	1336.43		1336.56	0.001001	3.03	380.17	221.43	0.37	2-year
100-year	Reach-1	3.73	2856	1334.38	1339.03		1339.19	0.000408	3.35	1062.1	321.64	0.27	100-year
2-year	Reach-1	3.67	1039	1333.38	1336.06		1336.22	0.000848	3.34	373.63	177.72	0.36	2-year
100-year	Reach-1	3.67	2856	1333.38	1338.83		1339.02	0.000463	3.96	978.75	251.98	0.3	100-year
2-year	Reach-1	3.62	1039	1332.79	1335.79	1334.31	1335.96	0.000784	3.32	312.68	150.57	0.35	2-year
100-year	Reach-1	3.62	2856	1332.79	1338.5	1335.69	1338.84	0.000637	4.68	610.59	284.1	0.35	100-year
	Reach-1	3.615 Culvert											
2-year	Reach-1	3.61	1039	1332.68	1334.9	1334.2	1335.22	0.00216	4.51	230.56	138.07	0.55	2-year
100-year	Reach-1	3.61	2856	1332.68	1336.42	1335.55	1337.22	0.002663	7.19	397.19	162.89	0.67	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	3.53	1039	1331.68	1333.71	1333.39	1334.17	0.003678	5.78	206.69	141.14	0.71	2-year
100-year	Reach-1	3.53	2856	1331.68	1335.67		1336.25	0.002127	6.9	553.55	208.89	0.61	100-year
2-year	Reach-1	3.44	1039	1330.28	1332.24	1331.69	1332.58	0.00257	4.72	236.57	134	0.59	2-year
100-year	Reach-1	3.44	2856	1330.28	1335.26		1335.57	0.000742	4.72	752.76	214.1	0.37	100-year
2-year	Reach-1	3.34	1039	1328.58	1331.51	1330.2	1331.73	0.000991	3.83	301.78	117.75	0.39	2-year
100-year	Reach-1	3.34	2856	1328.58	1335.15	1331.66	1335.28	0.000276	3.46	1334.35	393.21	0.24	100-year
2-year	Reach-1	3.24	1039	1327.18	1331.39		1331.46	0.000224	2.32	602.1	274.82	0.2	2-year
100-year	Reach-1	3.24	2856	1327.18	1335.12		1335.17	0.0001	2.36	2019.88	461.74	0.15	100-year
2-year	Reach-1	3.15	1039	1325.78	1331.37		1331.4	0.000057	1.41	866.52	223.07	0.11	2-year
100-year	Reach-1	3.15	2856	1325.78	1335.07		1335.13	0.000069	2.18	1776.14	420	0.13	100-year
2-year	Reach-1	3.13	1039	1325.12	1331.34	1326.62	1331.39	0.000158	1.67	621.92	100	0.12	2-year
100-year	Reach-1	3.13	2856	1325.12	1334.98	1328.05	1335.11	0.00028	2.9	985.75	100	0.16	100-year
	Reach-1	3.1225	Culvert										
2-year	Reach-1	3.115	1039	1324.88	1331.23		1331.27	0.000194	1.72	605.17	120.76	0.14	2-year
100-year	Reach-1	3.115	2856	1324.88	1334.33		1334.45	0.000333	2.8	1018.35	145.58	0.19	100-year
2-year	Reach-1	3.04	1039	1325.9	1330.83	1328.94	1331.08	0.001952	4.02	258.24	81.36	0.4	2-year
100-year	Reach-1	3.04	2856	1325.9	1333.74	1331.06	1334.17	0.001958	5.25	544.43	115.3	0.43	100-year
2-year	Reach-1	2.945	1039	1324.6	1329.86	1327.96	1330.11	0.001896	4.03	257.73	79.17	0.39	2-year
100-year	Reach-1	2.945	2856	1324.6	1332.69	1330.06	1333.16	0.002053	5.46	523.12	107.97	0.44	100-year
2-year	Reach-1	2.85	1039	1324	1328.79	1327.24	1329.07	0.002321	4.25	244.46	80.85	0.43	2-year
100-year	Reach-1	2.85	2856	1324	1331.61	1329.19	1332.1	0.002216	5.61	509.28	106.99	0.45	100-year
2-year	Reach-1	2.755	1039	1323.2	1327.89	1325.88	1328.1	0.001525	3.66	283.71	85.56	0.35	2-year
100-year	Reach-1	2.755	2856	1323.2	1330.67	1327.81	1331.08	0.001729	5.13	556.81	110.96	0.4	100-year

	HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1													
	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	2.66	1039	1322.1	1326.57	1325.43	1326.97	0.003604	5.06	205.28	72.63	0.53	2-year
100-year	Reach-1	2.66	2856	1322.1	1329.14	1327.46	1329.86	0.003595	6.79	420.52	95.18	0.57	100-year
2-year	Reach-1	2.565	1039	1320.7	1325.37	1323.68	1325.61	0.001996	3.94	263.75	87.2	0.4	2-year
100-year	Reach-1	2.565	2856	1320.7	1327.89	1325.59	1328.36	0.002306	5.51	518.07	114.97	0.46	100-year
2-year	Reach-1	2.47	1039	1320.2	1324.61	1322.84	1324.77	0.001421	3.24	320.85	110.95	0.34	2-year
100-year	Reach-1	2.47	2856	1320.2	1327.08	1324.44	1327.4	0.00154	4.52	631.67	140.33	0.38	100-year
2-year	Reach-1	2.375	1039	1319	1323.52	1322.17	1323.8	0.00276	4.19	248.01	95.87	0.46	2-year
100-year	Reach-1	2.375	2856	1319	1325.93	1324	1326.39	0.002697	5.4	529.35	137.52	0.48	100-year
2-year	Reach-1	2.28	1039	1318	1322.09	1320.91	1322.39	0.00296	4.43	234.53	87.62	0.48	2-year
100-year	Reach-1	2.28	2856	1318	1324.18	1322.66	1324.85	0.003624	6.54	436.42	105.29	0.57	100-year
2-year	Reach-1	2.185	1039	1317.3	1320.63	1319.55	1320.89	0.003054	4.06	255.8	111.99	0.47	2-year
100-year	Reach-1	2.185	2856	1317.3	1322.56	1321.12	1323.06	0.003425	5.66	504.77	146.37	0.54	100-year
2-year	Reach-1	2.109	1039	1316.5	1318.53	1318.07	1318.97	0.003441	5.34	194.69	102.16	0.68	2-year
100-year	Reach-1	2.109	2856	1316.5	1320.41	1319.53	1321.21	0.002793	7.19	397.22	113.43	0.68	100-year
	Reach-1	2.0995	Bridge										
2-year	Reach-1	2.09	1039	1316.1	1316.62		1316.63	0.000067	0.14	2287.91	1275.35	0.05	2-year
100-year	Reach-1	2.09	2856	1316.1	1317.58		1317.59	0.000134	0.4	3587.83	1458.31	0.08	100-year
2-year	Reach-1	1.995	1039	1315.7	1316.53		1316.54	0.000319	0.57	1498.09	1467.78	0.12	2-year
100-year	Reach-1	1.995	2856	1315.7	1317.44		1317.45	0.000326	0.98	3104.26	1948.34	0.14	100-year
2-year	Reach-1	1.9	1039	1314.2	1316.23		1316.26	0.001178	1.57	868.25	992.97	0.26	2-year
100-year	Reach-1	1.9	2856	1314.2	1317.14		1317.18	0.000957	2.03	2022.67	1547.87	0.26	100-year
2-year	Reach-1	1.805	1039	1313.3	1315.83		1315.85	0.000611	1.67	1033.03	1061.29	0.21	2-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
100-year	Reach-1	1.805	2856	1313.3	1316.78		1316.81	0.000604	2.07	2241.45	1490.98	0.22	100-year
2-year	Reach-1	1.71	1039	1312.4	1315.18		1315.27	0.002757	3.24	521.4	605.6	0.43	2-year
100-year	Reach-1	1.71	2856	1312.4	1316.18		1316.28	0.002117	3.57	1305.21	996.99	0.4	100-year
2-year	Reach-1	1.615	1039	1311.7	1315		1315.01	0.000187	1.06	1695.79	1390.98	0.12	2-year
100-year	Reach-1	1.615	2856	1311.7	1315.97		1315.98	0.000249	1.41	3271.83	1888.82	0.14	100-year
2-year	Reach-1	1.52	1039	1310.3	1314.63		1314.79	0.001915	3.68	478.67	595	0.39	2-year
100-year	Reach-1	1.52	2856	1310.3	1315.54		1315.7	0.002256	4.54	1468.53	1856.32	0.43	100-year
2-year	Reach-1	1.425	1039	1309.5	1313.34		1313.65	0.002763	4.44	235.04	138.87	0.47	2-year
100-year	Reach-1	1.425	2856	1309.5	1314.41		1314.59	0.002259	4.64	1380.98	1822.66	0.44	100-year
2-year	Reach-1	1.33	1039	1308.8	1312.87	1311.69	1312.91	0.000759	2.21	884.23	1003.36	0.24	2-year
100-year	Reach-1	1.33	2856	1308.8	1314.04		1314.07	0.000498	2.1	2323.13	1432.1	0.2	100-year
2-year	Reach-1	1.235	1039	1307.8	1311.78		1312.17	0.003478	4.99	208.35	73.38	0.52	2-year
100-year	Reach-1	1.235	2856	1307.8	1312.92		1313.45	0.00486	6.79	672.46	566.1	0.64	100-year
2-year	Reach-1	1.14	1039	1307.3	1311.37		1311.41	0.00068	2.26	802.69	683.1	0.23	2-year
100-year	Reach-1	1.14	2856	1307.3	1312.15		1312.24	0.001231	3.38	1402.74	828.96	0.32	100-year
2-year	Reach-1	1.045	1039	1308	1310.19	1310.19	1310.39	0.026322	6.82	310.43	774.2	1.15	2-year
100-year	Reach-1	1.045	2856	1308	1311.09		1311.2	0.004141	3.41	1075.42	920.21	0.48	100-year
2-year	Reach-1	0.95	1039	1306.5	1309.68		1309.7	0.000371	1.33	1234.36	1024.59	0.16	2-year
100-year	Reach-1	0.95	2856	1306.5	1310.69		1310.72	0.000393	1.66	2385.82	1184.53	0.18	100-year
2-year	Reach-1	0.855	1039	1305.8	1309.5		1309.52	0.000317	1.41	1264.07	989.25	0.15	2-year
100-year	Reach-1	0.855	2856	1305.8	1310.5		1310.52	0.000391	1.79	2353.8	1146.61	0.18	100-year
2-year	Reach-1	0.76	1039	1305.4	1309.3		1309.32	0.00054	1.67	1013.57	861.85	0.2	2-year
100-year	Reach-1	0.76	2856	1305.4	1310.24		1310.27	0.000656	2.15	1921.26	1029.42	0.23	100-year

HEC-RAS Plan: normal ineff River: RIVER-1 Reach: Reach-1

	Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	
2-year	Reach-1	0.665	1039	1304.8	1308.9	1308.36	1308.95	0.00098	2.56	751.41	724.17	0.27	2-year
100-year	Reach-1	0.665	2856	1304.8	1309.74	1308.86	1309.82	0.001303	3.32	1432.36	981.39	0.32	100-year
2-year	Reach-1	0.57	1039	1304.8	1307.62	1307.62	1307.87	0.007623	5.32	365.1	745.71	0.71	2-year
100-year	Reach-1	0.57	2856	1304.8	1308.07	1308.07	1308.38	0.010333	6.84	826.99	1263.78	0.85	100-year
2-year	Reach-1	0.475	1039	1302.9	1307.31		1307.31	0.000069	0.78	1844.91	1302.69	0.08	2-year
100-year	Reach-1	0.475	2856	1302.9	1307.55		1307.58	0.00037	1.86	2175.01	1366.77	0.18	100-year
2-year	Reach-1	0.445	1039	1303	1307.26		1307.28	0.000344	1.63	1280.55	1206.75	0.17	2-year
100-year	Reach-1	0.445	2856	1303	1307.28		1307.4	0.002508	4.4	1299.02	1213.69	0.45	100-year
2-year	Reach-1	0.38	1039	1302	1307.27		1307.27	0.000003	0.22	5226.05	1711.8	0.02	2-year
100-year	Reach-1	0.38	2856	1302	1307.34		1307.34	0.000022	0.59	5346.69	1737.71	0.05	100-year
2-year	Reach-1	0.357	1039	1301	1307.26	1303.38	1307.27	0.000058	1.03	2198.21	1405.68	0.08	2-year
100-year	Reach-1	0.357	2856	1301	1307.26	1305.04	1307.32	0.000435	2.84	2198.21	1405.68	0.21	100-year

APPENDIX D

PRELIMINARY BRIDGE CONCEPT

R·A·M

RICKER • ATKINSON • McBEE & ASSOCIATES, INC.

Geotechnical Engineering • Construction Materials Testing

Dibble & Associates
2633 East Indian School Road, Suite 401
Phoenix, Arizona 85016-6763

March 21, 2002

Attention: Brian Fry

Subject: Preliminary Drilled Shaft Capacities
Sossaman Road Bridge over Queen Creek Wash
Queen Creek, Arizona

R.A.M. Project No. G06046

Attached to this letter is a design chart providing preliminary capacities for straight, cast-in-place drilled shaft foundations for the above-referenced project. These capacities are for shafts with diameters of 3, 4 and 5 feet, extending to a depth of 60 feet below the scour depth. We anticipate that the site soils to depths of at least 60 feet will consist of stratified layers of sands, silts and clays, containing varying amounts of gravel and variably cemented. The site soils were generalized using an average unit weight of 120 pcf and an average blow count of 30 to determine these capacities, using the AASHTO method to determine the axial capacities of the drilled shafts in cohesionless soil. These capacities are net in that the weight of the concrete in the foundations do not need to be included in the overall weight of the structure when determining size and depth of the shafts. This chart will be revised as necessary once we have completed the field investigation for the new bridge, which will include test borings advanced to a depth of at least 80 feet below the anticipated depth of scour.

Please call if you have any questions or require any additional information.

Respectfully submitted,
RICKER, ATKINSON, MCBEE & ASSOCIATES, INC.

Registered Professional Engineer (Civil) Certificate No. 28182 DAVID A. THOMAS Date Signed 3-21-02 ARIZONA U.S.A.

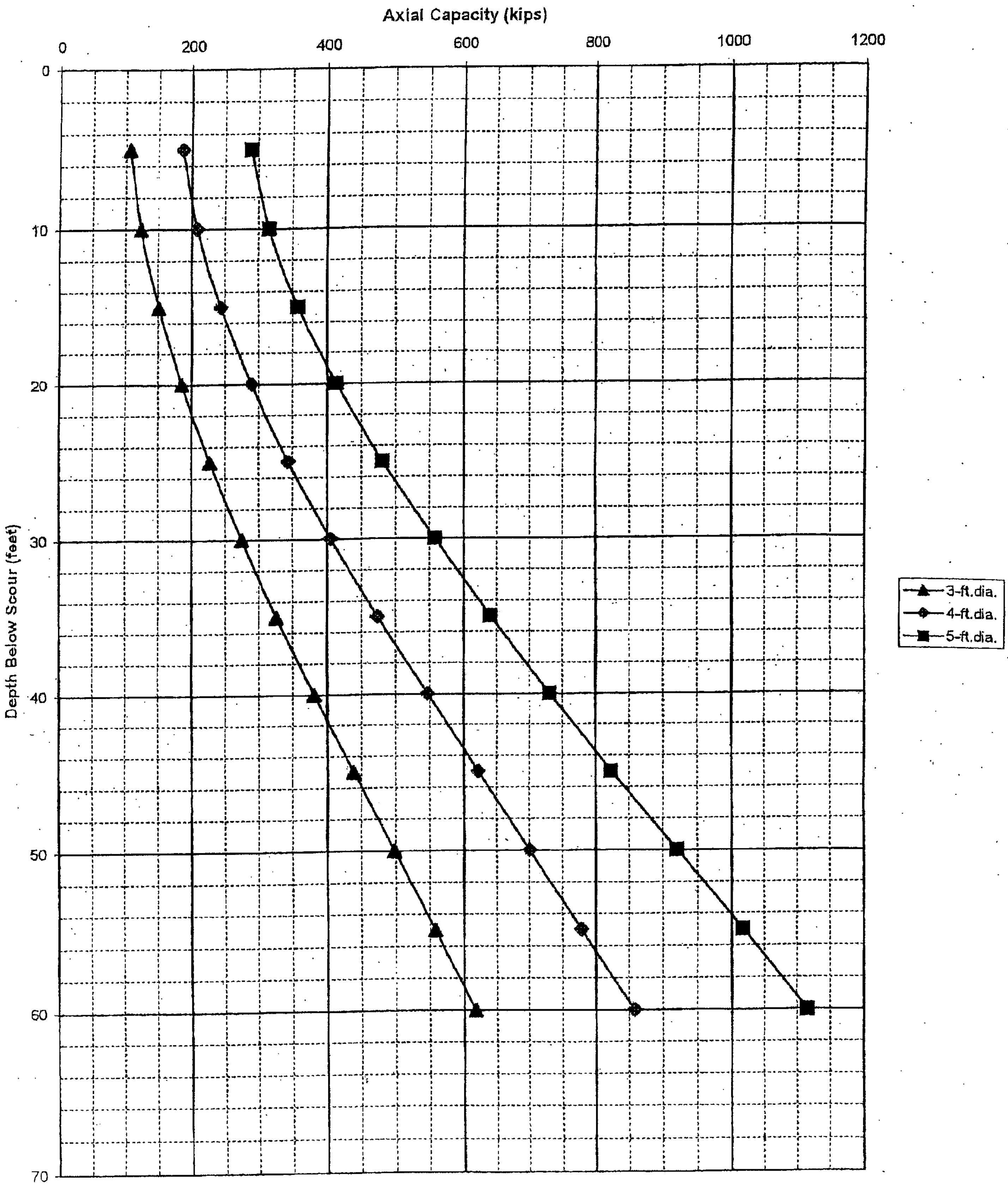
Registered Professional Engineer (Civil) Certificate No. 10971 KENNETH L. RICKER Date Signed 3-21-02 ARIZONA U.S.A.

By: David A. Thomas, P.E.

Reviewed by: Kenneth L. Ricker, P.E.

/dat
Copies to: Addressee (3)
Cannon & Associates; Attn: Jerry A. Cannon, P.E. (1)

Preliminary Axial Capacity of Drilled Shafts for G06046



GENERAL NOTES:

Design Specifications
American Association of State Highway and Transportation Officials (AASHTO)Standard Specifications for Highway Bridges,16th Edition with 1997,1998,1999,2000 & 2002 Interim Revisions.

Construction Specifications
ADOT Standard Specifications for Road and Bridge Construction, 2000 edition.

Design Loadings
Dead Load:
Dead Load includes allowance of 25 psf for future wearing surface.
Live Load:
AASHTO HS20-44.

Seismic Performance Category A.

Hydraulic Design Criteria
Drainage Report provided by Dibble & Associates.

Q_{100} = 2831 cfs downstream of bridge.Q_{500}= 4813 cfs downstream of bridge.The flow that occurs through the bridge opening is as follows:

Q_{100} = 2831 cfs, H.W. Elevation = 1359.31 feet, Velocity = 6.34 ft/sec
Q_{500} = 4813 cfs, H.W. Elevation = 1360.55 feet, Velocity = 7.41 ft/sec

Maximum Q_{500} Abutment Scour = feet. Maximum Q_{500} Pier Scour = feet. The scour depth for the piers and abutments is to be determined.

Concrete and Reinforcement Stresses
f'c = 4500 psi-Superstructure except Barriers (Deck fc = 1400 psi)
f'c = 4000 psi-Abutments,Columns,Wingwalls and Drilled Shafts
f'c = 3000 psi-Approach Slabs and Barriers
fs = 24,000 psi-Grade 60 Reinforcing Steel

All concrete shall be Class 'S' unless noted otherwise.

Reinforcing steel shall conform to ASTM A615. All reinforcing shall be furnished as Grade 60.

Reinforcing steel to be welded, where approved by the Engineer, shall conform to ASTM A706.

All Mechanical splices of reinforcing steel shall develop 125% of the yield strength of the reinforcing bar and shall conform to the requirements for mechanical connections in Section 605-3.02 of the Standard Specifications.

All dimensions for reinforcing steel shall be to center of bars,unless noted otherwise.

Adjacent lap splices shall be staggered a minimum of 40 bar diameters.

All reinforcing shall have a 2" cover unless noted otherwise.

For concrete finish, see the Standard Specifications and Special Provisions.

Concrete Barriers
Concrete barriers shall be constructed after deck slab falsework has been removed. Barriers shall not be slip formed.

Dimensions
Dimensions shall not be scaled from drawings.

Forms
Forms for new construction shall be cambered for dead load deflection,vertical curvature and falsework settlement.

Foundations
Geotechnical Engineering Letter Report by Ricker, Atkinson,McBee & Associates dated March 21, 2002..Abutments and piers to be supported on drilled shaft foundations.

Construction Joints
Sandblast all construction joints in concrete prior to placement of concrete. See Standard Specifications.

Coordination
Contractor shall coordinate all existing conditions during construction of project.

Chamfer
All exposed corners shall be chamfered 3/4 " unless noted otherwise in accordance with Section 601-3.02 (C)1 of the Standard Specifications. This note applies to all bridge drawings.

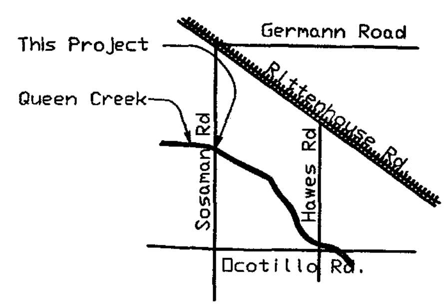
Standard ADOT Drawing List

Inventory & Operating Rating
Ratings are in accordance with the AASHTO Manual for Condition Evaluation of Bridges, 1994,Second Edition,Load Factor Method.
Inventory Rating:
Operating Rating:

Construction of New Bridge
The road will be closed during construction of the new bridge.

The Contractor shall provide an opening between the falsework supports for the new bridge that is of adequate size to pass the flow of water.

Legend
(3/5) — Detail Number / Sheet Number



Vicinity Map

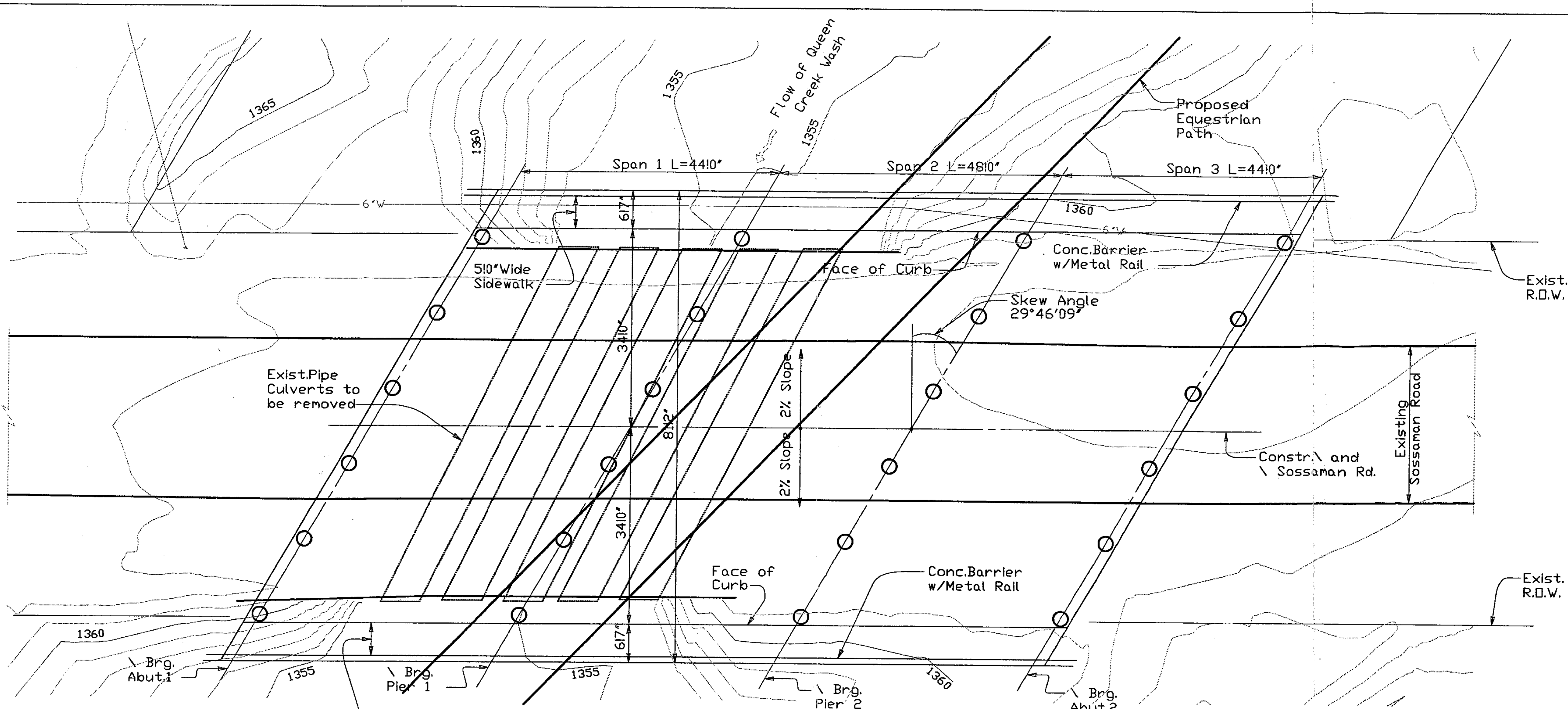
Abbreviations

Abut.	Abutment	Eq.	Equal	psi	Pounds per Square Inch
b/b	Back-to-Back	Exist.	Existing	R.	Radius
Bm.	Beam	Ext.	Exterior	R/W	Right of Way
Bott.	Bottom	F	Fixed	Rdwy.	Roadway
Brg.	Bearing	Fin.	Finish	Reinf.	Reinforcement
C.I.P.	Cast-in-Place	Ftg.	Footing	Sched.	Schedule
C.G.	Center of Gravity	Ga.	Gauge	Sec.	Second
C.S.P.	Corrugated Steel Pipe	H.W.	High Water	Sect.	Section
\	Centerline	Hk.	Hook	Sht.	Sheet
Clr.	Clear	Horiz.	Horizontal	Sim.	Similar
Col.	Column	I.D.	Inner Diameter	Sp.	Space
Conc.	Concrete	Int.	Interior	Sta.	Station
Constr.	Construction	Longit.	Longitudinal	Std.	Standard
Diam.	Diameter	Max.	Maximum	Stl.	Steel
Diaph.	Diaphragm	Min.	Minimum	Sym.	Symmetrical
Dtl.	Detail	Misc.	Miscellaneous	Trans.	Transverse
Dwgs.	Drawings	No.,#	Number	Typ.	Typical
Ea.	Each	o.c.	On Center	u.n.o.	Unless Noted Otherwise
Elev.	Elevation	PCDOT	Pima County Dept.of Transportation	w/	With
Embed.	Embedment			WP	Working Point

SOSSAMAN ROAD BRIDGE AT QUEEN CREEK WASH

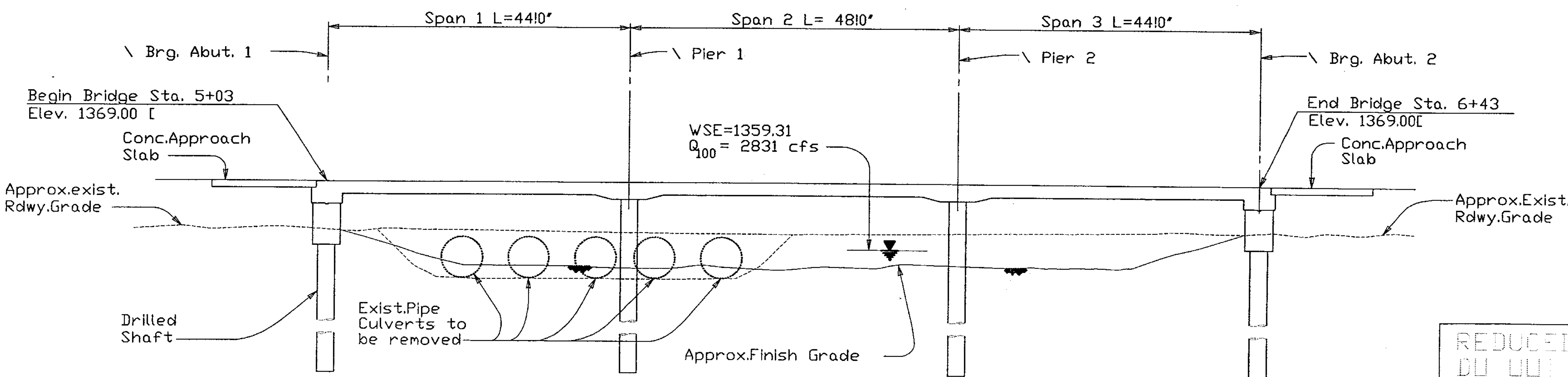
DESIGNED	JAC	5/02
DRAWN	AL	5/02
CHECKED	JAC/AL	5/02
PROJ. ENG.	JAC	

NO. | REVISION DESCRIPTION | DIV/SECT. ENGR. | DATE



LOCATION PLAN

1"=10!0"
New Three Span Cast-in-Place Reinforced Concrete Slab Bridge
Skew 29°46'09"
Contour Interval = 1!0"



SECTION @ CONSTRUCTION \

1"=10!0"

REDUCED SIZE
DO NOT SCALE

DESIGNED	JAC	5/02
DRAWN	AL	5/02
CHECKED	JAC/AL	5/02
PROJ.ENG	JAC	

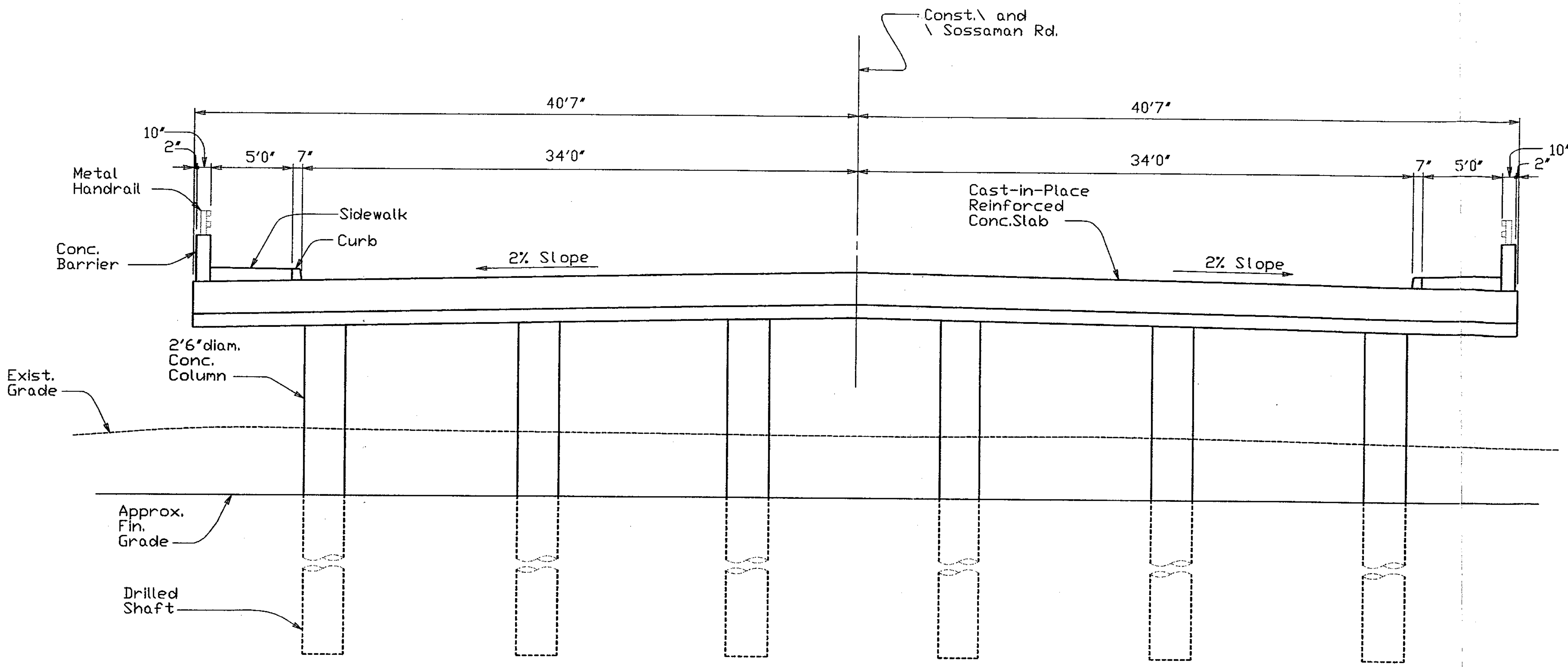
SOSSAMAN ROAD BRIDGE AT QUEEN CREEK WASH

NO. | REVISION DESCRIPTION | DIV/SECT. ENGR. | DATE

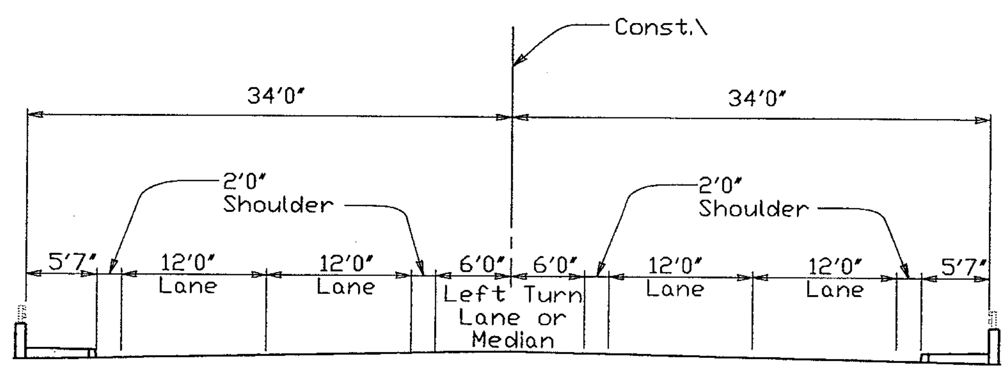
Consulting Engineers

LOCATION PLAN & SECTION

SHEET 2 OF 3



TYPICAL BRIDGE SECTION
1/4 "=1'0"
(1)



PROPOSED BRIDGE LANES
No Scale

REDUCED SIZE
DO NOT SCALE

DESIGNED	JAC	5/02
DRAWN	AL	5/02
CHECKED	JAC/AL	5/02
PROJ. ENG	JAC	

SOSSAMAN ROAD
BRIDGE AT
QUEEN CREEK
WASH

NO.	REVISION DESCRIPTION	DIV/SECT. ENGR.	DATE

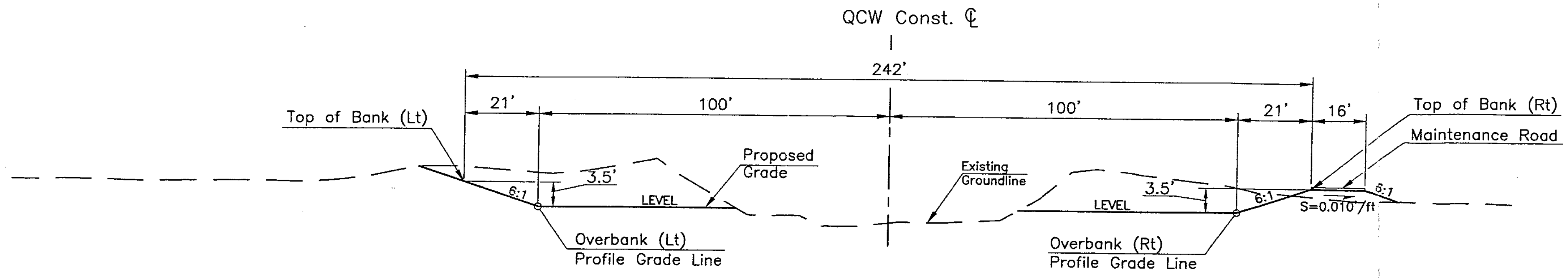
Consulting Engineers

TYP. SECTION

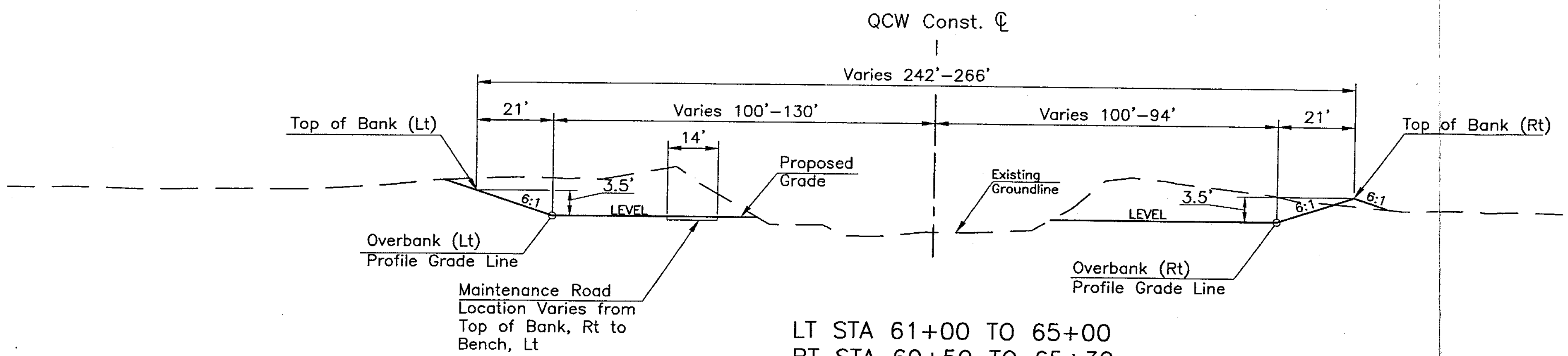
SHEET 3 OF 3

APPENDIX E

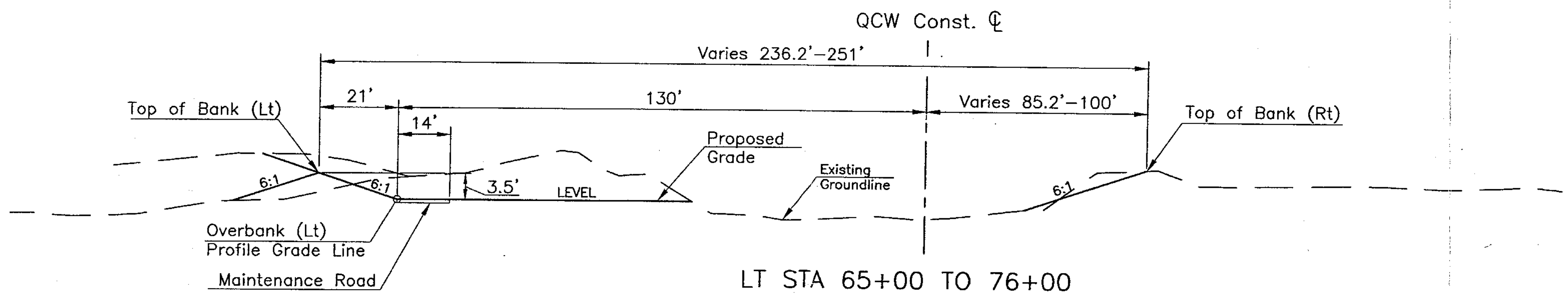
PROJECT DESIGN EXHIBITS



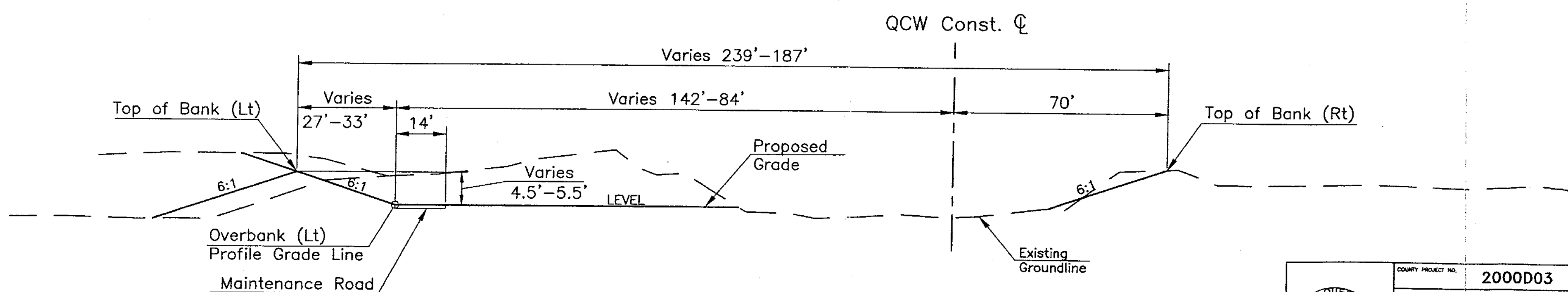
LT STA 56+00 TO 61+00
RT STA 52+00 TO 60+50



LT STA 61+00 TO 65+00
RT STA 60+50 TO 65+32



LT STA 65+00 TO 76+00
RT STA 67+50 TO 76+00



LT STA 77+00 TO 85+50
RT STA 77+00 TO 83+00

COUNTY PROJECT NO. 2000D03 — QUEEN CREEK WASH IMPROVEMENTS

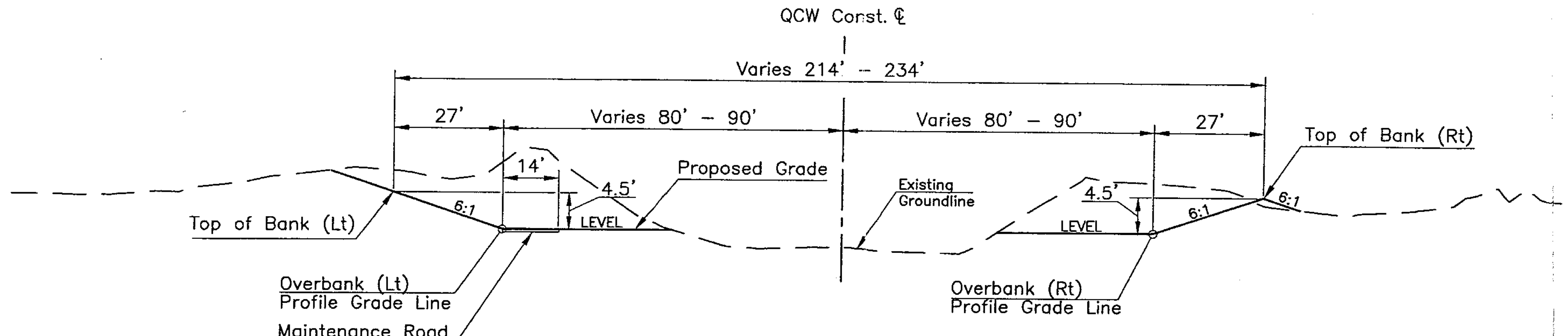
PROJECT DESCRIPTION

TYPICAL SECTIONS

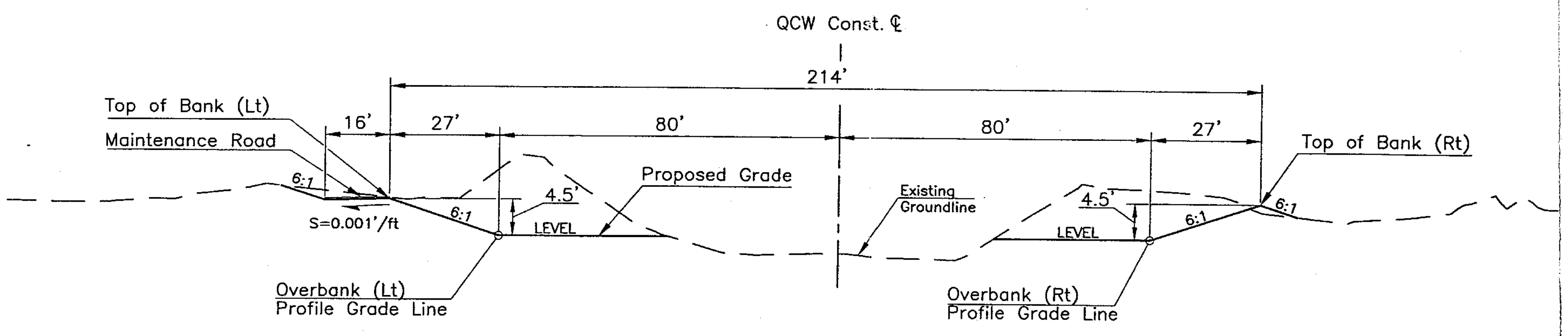
TOWN OF QUEEN CREEK ARIZONA

PRIME CONSULTANT: DIBBLE & ASSOCIATES CONSULTING ENGINEERS Since 1962

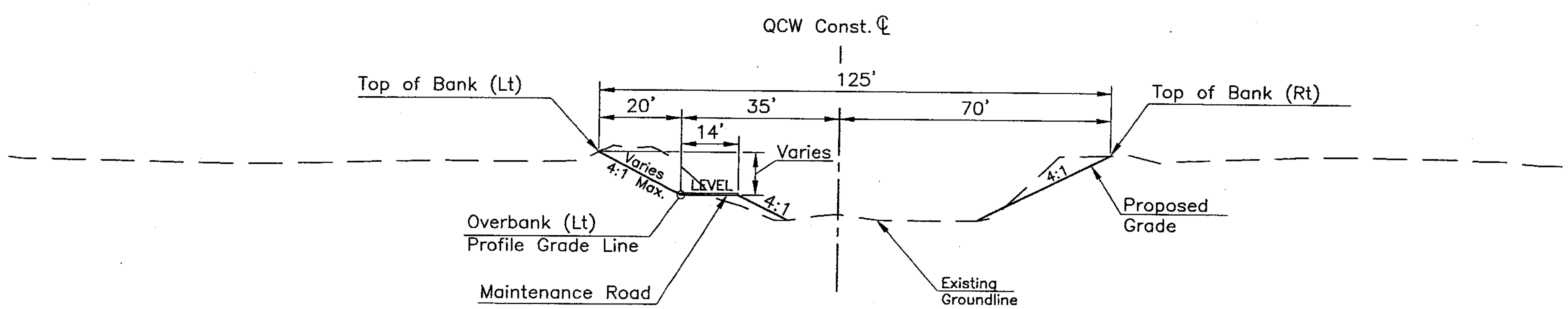
DRN. PAF DATE: 12/10/01	SCALE	SHEETS
DES. SHD DATE: 12/10/01	1"=30' HORIZONTAL	
CKD. KWR DATE: 12/10/01	1"=15' VERTICAL	NO. 1 OF 14



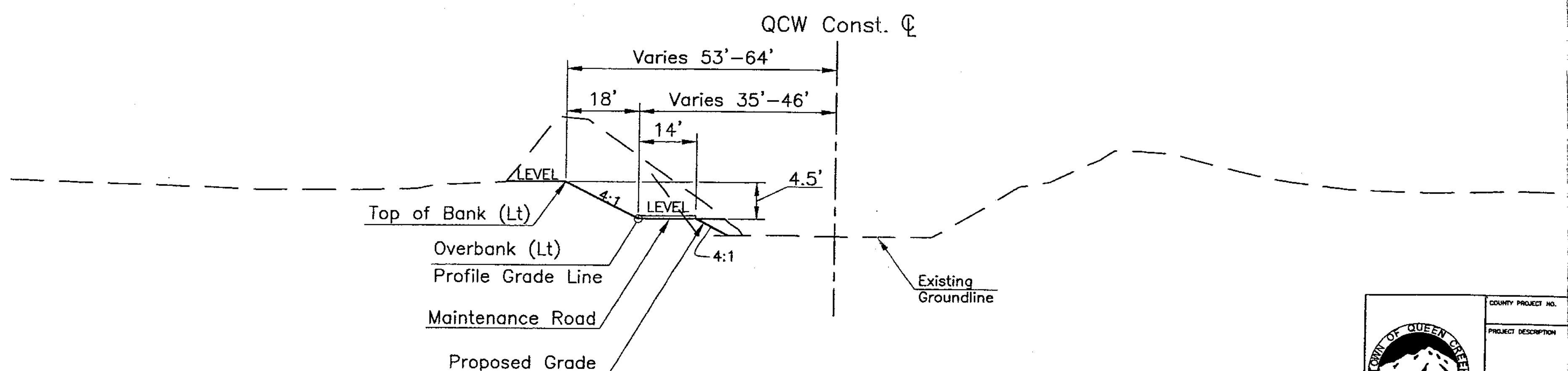
STA 86+00 TO 95+00



STA 96+00 TO 106+00

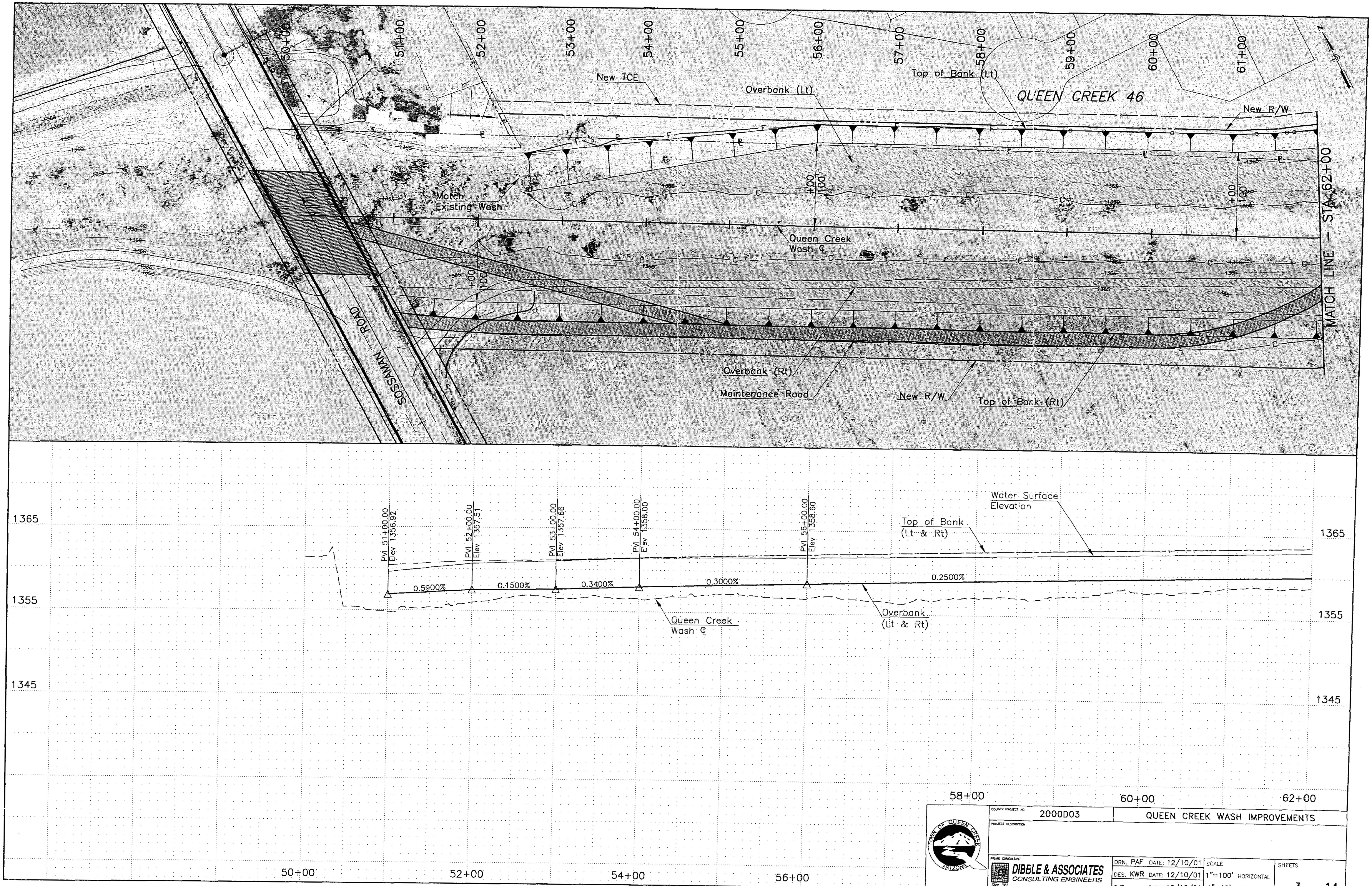


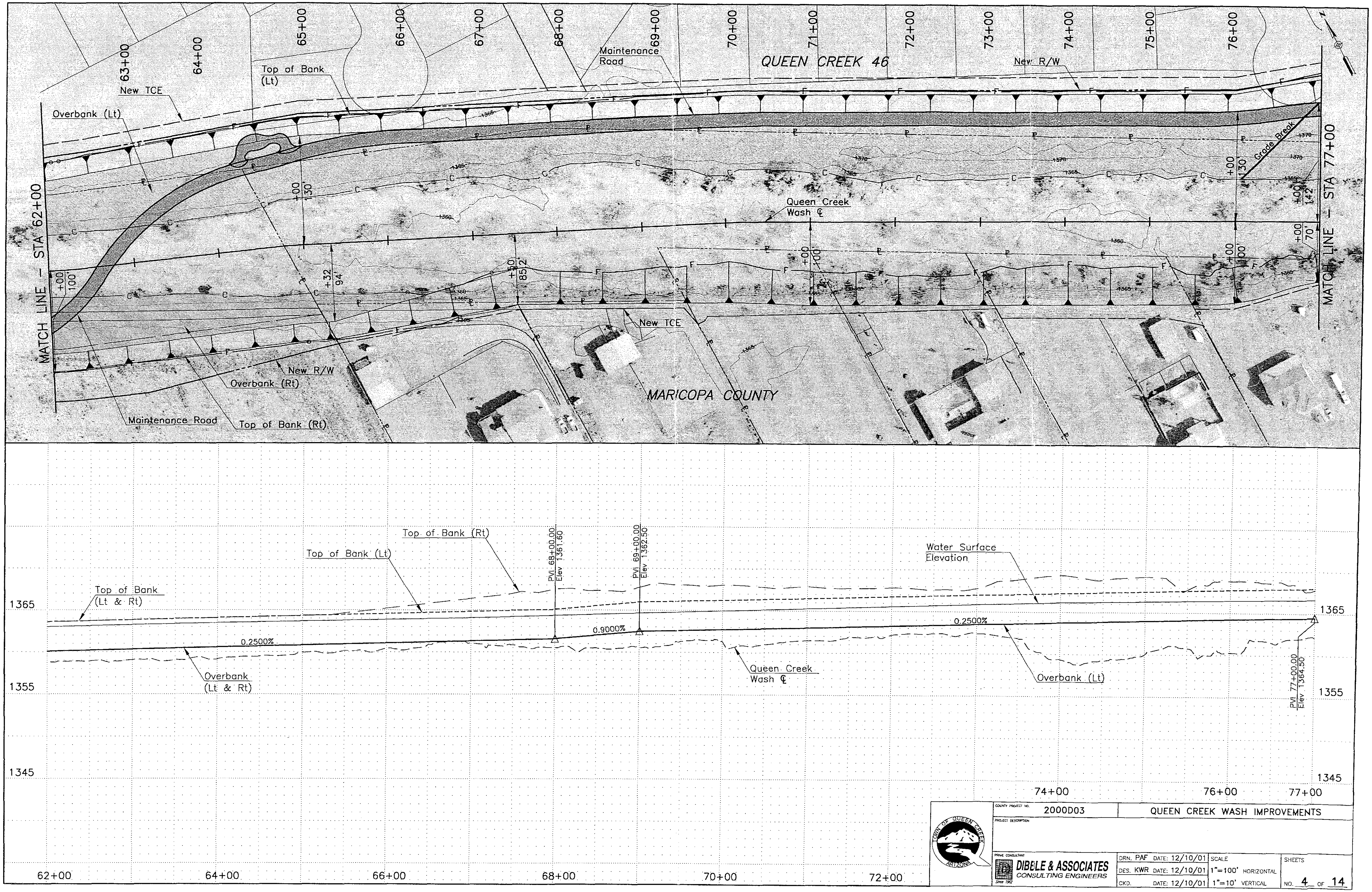
STA 109+00 TO 117+00

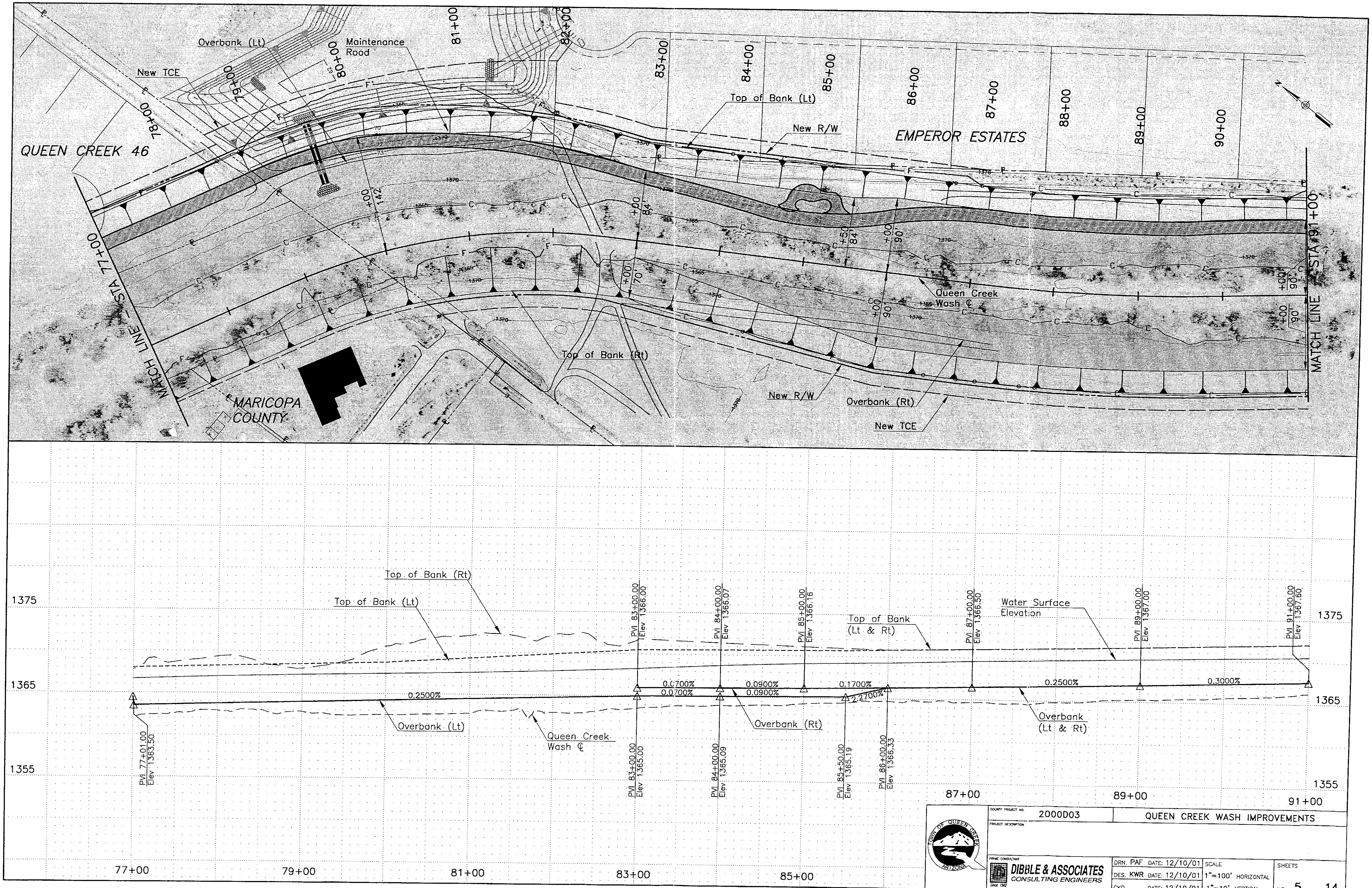


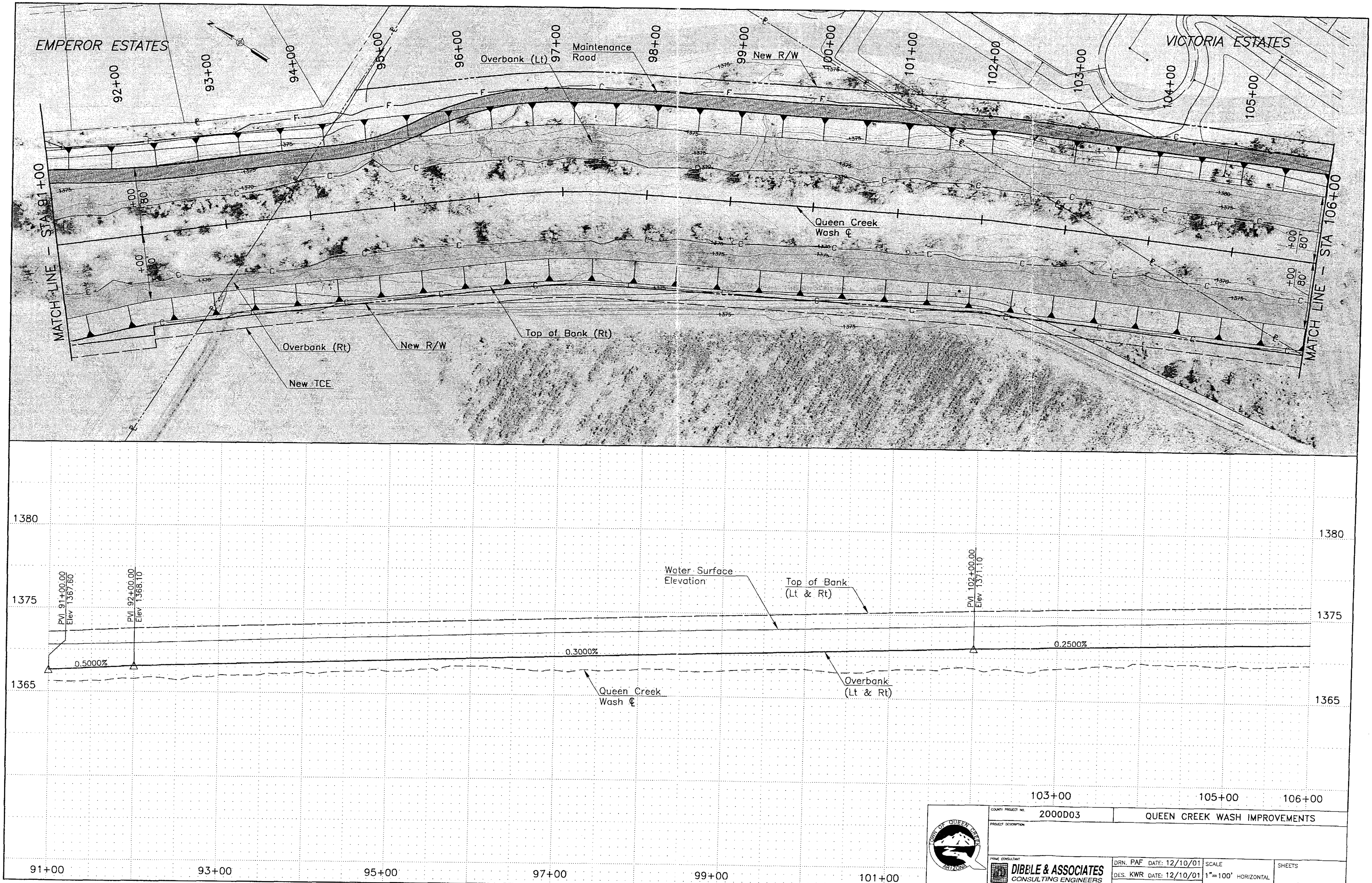
STA 118+00 TO 124+00

COUNTY PROJECT NO. 2000D03	QUEEN CREEK WASH IMPROVEMENTS			
PROJECT DESCRIPTION	TYPICAL SECTIONS			
PRIME CONSULTANT DIBBLE & ASSOCIATES CONSULTING ENGINEERS Since 1962	DRN. PAF DATE: 12/10/01	SCALE		SHEETS
	DES. SHD DATE: 12/10/01	1"=30' HORIZONTAL		
	CKD. KWR DATE: 12/10/01	1"=15' VERTICAL		NO. 2 OF 14


50+00
51+00
52+00
53+00
54+00
55+00
56+00
57+00
58+00
59+00
60+00
61+00
New TCE
Overbank (Lt)
Top of Bank (Lt)
QUEEN CREEK 46
New R/W
Match Existing Wash
Queen Creek Wash ℄
MATCH LINE – STA. 62+00
SOSSAMAN ROAD
Overbank (Rt)
Maintenance Road
New R/W
Top of Bank (Rt)
Water Surface Elevation
Top of Bank (Lt & Rt)
PVI 51+00.00 Elev 1356.92
PVI 52+00.00 Elev 1357.51
PVI 53+00.00 Elev 1357.66
PVI 54+00.00 Elev 1358.00
PVI 56+00.00 Elev 1358.60
0.5900%
0.1500%
0.3400%
0.3000%
0.2500%
Queen Creek Wash ℄
Overbank (Lt & Rt)
1365
1355
1345
50+00
52+00
54+00
56+00
58+00
60+00
62+00
COUNTY PROJECT NO. 2000D03
QUEEN CREEK WASH IMPROVEMENTS
PROJECT DESCRIPTION
TOWN OF QUEEN CREEK ARIZONA
PRIME CONSULTANT
DIBBLE & ASSOCIATES CONSULTING ENGINEERS
DRN. PAF DATE: 12/10/01
DES. KWR DATE: 12/10/01
CKD. DATE: 12/10/01
SCALE 1"=100' HORIZONTAL 1"=10' VERTICAL
SHEETS NO. 3 OF 14


QUEEN CREEK 46
MARICOPA COUNTY
MATCH LINE – STA 62+00
MATCH LINE – STA 77+00
63+00
64+00
65+00
66+00
67+00
68+00
69+00
70+00
71+00
72+00
73+00
74+00
75+00
76+00
New TCE
Overbank (Lt)
Top of Bank (Lt)
Maintenance Road
New R/W
Grade Break
Queen Creek Wash ℄
Overbank (Rt)
Maintenance Road
Top of Bank (Rt)
Top of Bank (Rt)
Top of Bank (Lt)
Top of Bank (Lt & Rt)
PVI 68+00.00 Elev 1361.60
PVI 69+00.00 Elev 1362.50
PVI 77+00.00 Elev 1364.50
Water Surface Elevation
0.2500%
0.9000%
0.2500%
Overbank (Lt & Rt)
Queen Creek Wash ℄
Overbank (Lt)
1365
1355
1345
62+00
64+00
66+00
68+00
70+00
72+00
74+00
76+00
77+00
TOWN OF QUEEN CREEK ARIZONA
COUNTY PROJECT NO. 2000D03
QUEEN CREEK WASH IMPROVEMENTS
PROJECT DESCRIPTION
PRIME CONSULTANT
DIBBLE & ASSOCIATES CONSULTING ENGINEERS
Since 1962
DRN. PAF DATE: 12/10/01
DES. KWR DATE: 12/10/01
CKD. DATE: 12/10/01
SCALE
1"=100' HORIZONTAL
1"=10' VERTICAL
SHEETS
NO. 4 OF 14


Overbank (Lt)
Maintenance Road
New TCE
QUEEN CREEK 46
78+00
79+00
80+00
81+00
82+00
83+00
84+00
85+00
86+00
87+00
88+00
89+00
90+00
Top of Bank (Lt)
New R/W
EMPEROR ESTATES
MATCH LINE STA 77+00
MATCH LINE STA 91+00
Queen Creek Wash ℄
Top of Bank (Rt)
New R/W
Overbank (Rt)
New TCE
MARICOPA COUNTY
Top of Bank (Rt)
Top of Bank (Lt)
Top of Bank (Lt & Rt)
Water Surface Elevation
PVI 83+00.00 Elev 1366.00
PVI 84+00.00 Elev 1366.07
PVI 85+00.00 Elev 1366.16
PVI 87+00.00 Elev 1366.50
PVI 89+00.00 Elev 1367.00
PVI 91+00.00 Elev 1367.60
0.0700%
0.0900%
0.1700%
0.2500%
0.3000%
0.2500%
0.0700%
0.0900%
2.2700%
Overbank (Lt)
Queen Creek Wash ℄
Overbank (Rt)
Overbank (Lt & Rt)
PVI 77+01.00 Elev 1363.50
PVI 83+00.00 Elev 1365.00
PVI 84+00.00 Elev 1365.09
PVI 85+50.00 Elev 1365.19
PVI 86+00.00 Elev 1366.33
1375
1365
1355
77+00
79+00
81+00
83+00
85+00
87+00
89+00
91+00
TOWN OF QUEEN CREEK ARIZONA
COUNTY PROJECT NO. 2000D03
QUEEN CREEK WASH IMPROVEMENTS
DIBBLE & ASSOCIATES CONSULTING ENGINEERS
DRN. PAF DATE: 12/10/01
DES. KWR DATE: 12/10/01
CKD. DATE: 12/10/01
SCALE 1"=100' HORIZONTAL 1"=10' VERTICAL
SHEETS NO. 5 OF 14



COUNTY PROJECT NO. 2000D03

QUEEN CREEK WASH IMPROVEMENTS

PROJECT DESCRIPTION

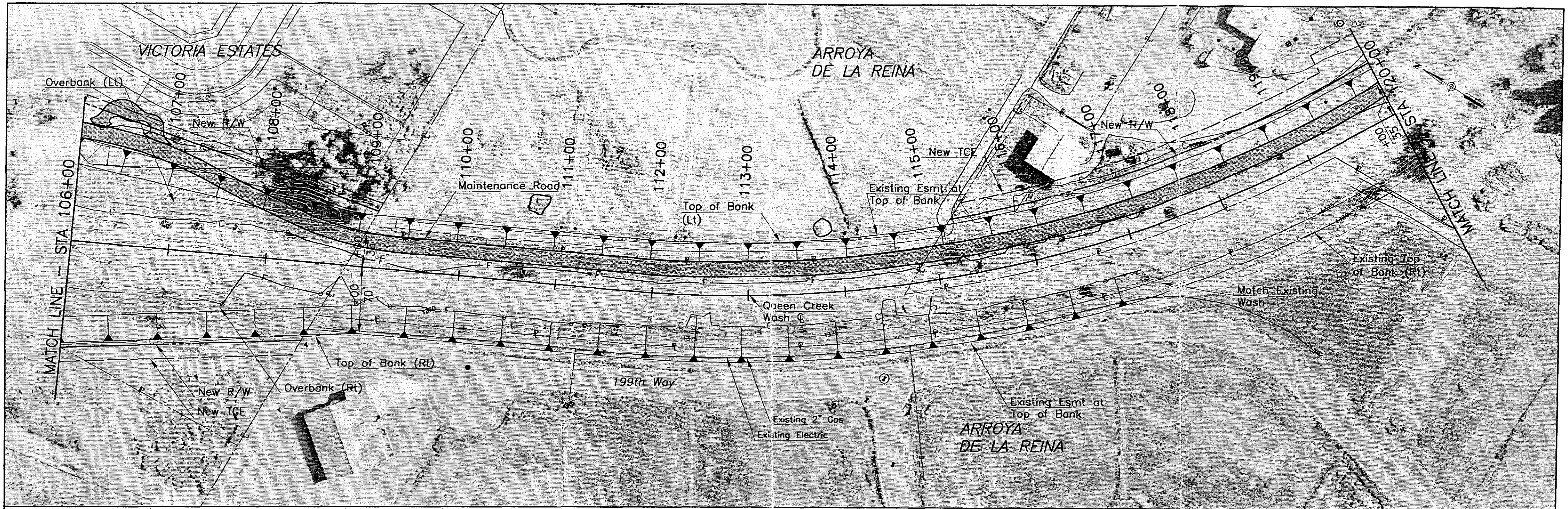
TOWN OF QUEEN CREEK ARIZONA

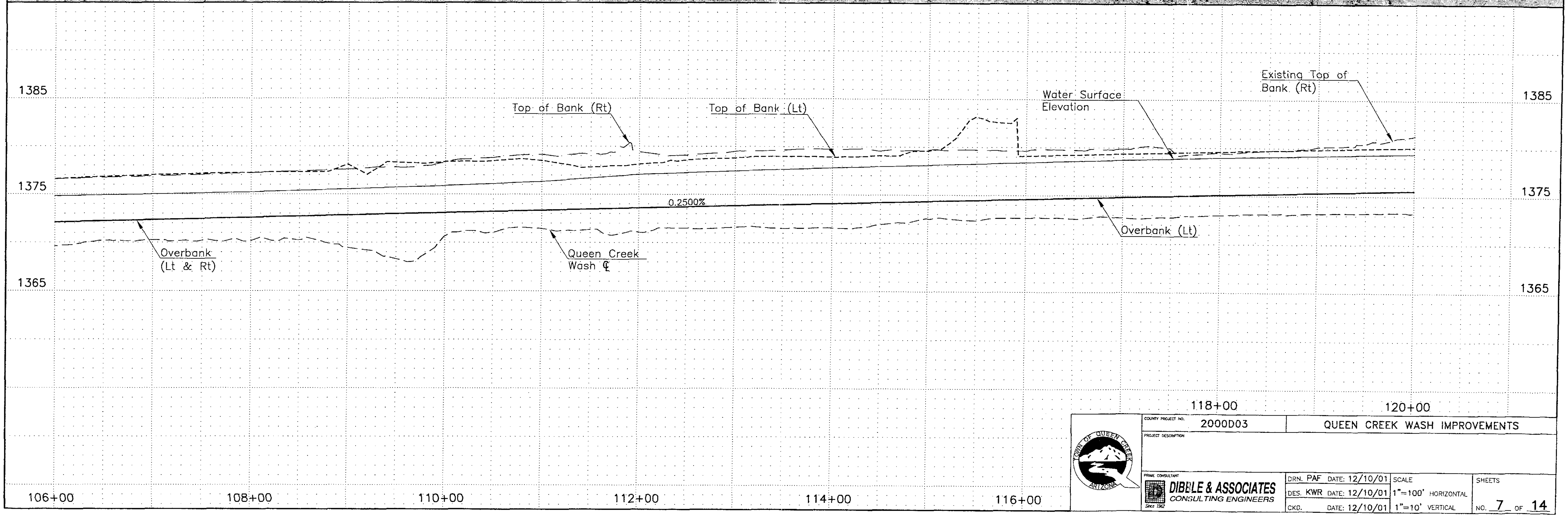
PRIME CONSULTANT

DIBBLE & ASSOCIATES CONSULTING ENGINEERS

Since 1962

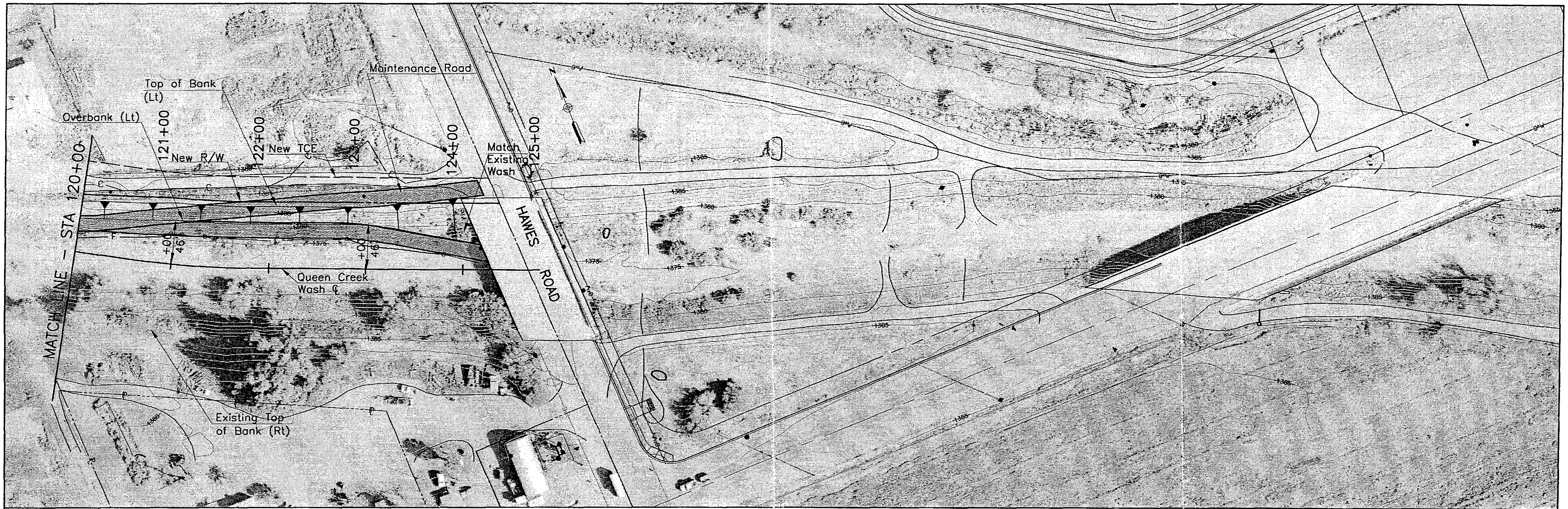
DRN. PAF DATE: 12/10/01	SCALE	SHEETS
DES. KWR DATE: 12/10/01	1"=100' HORIZONTAL	
CKD. DATE: 12/10/01	1"=10' VERTICAL	NO. 6 OF 14

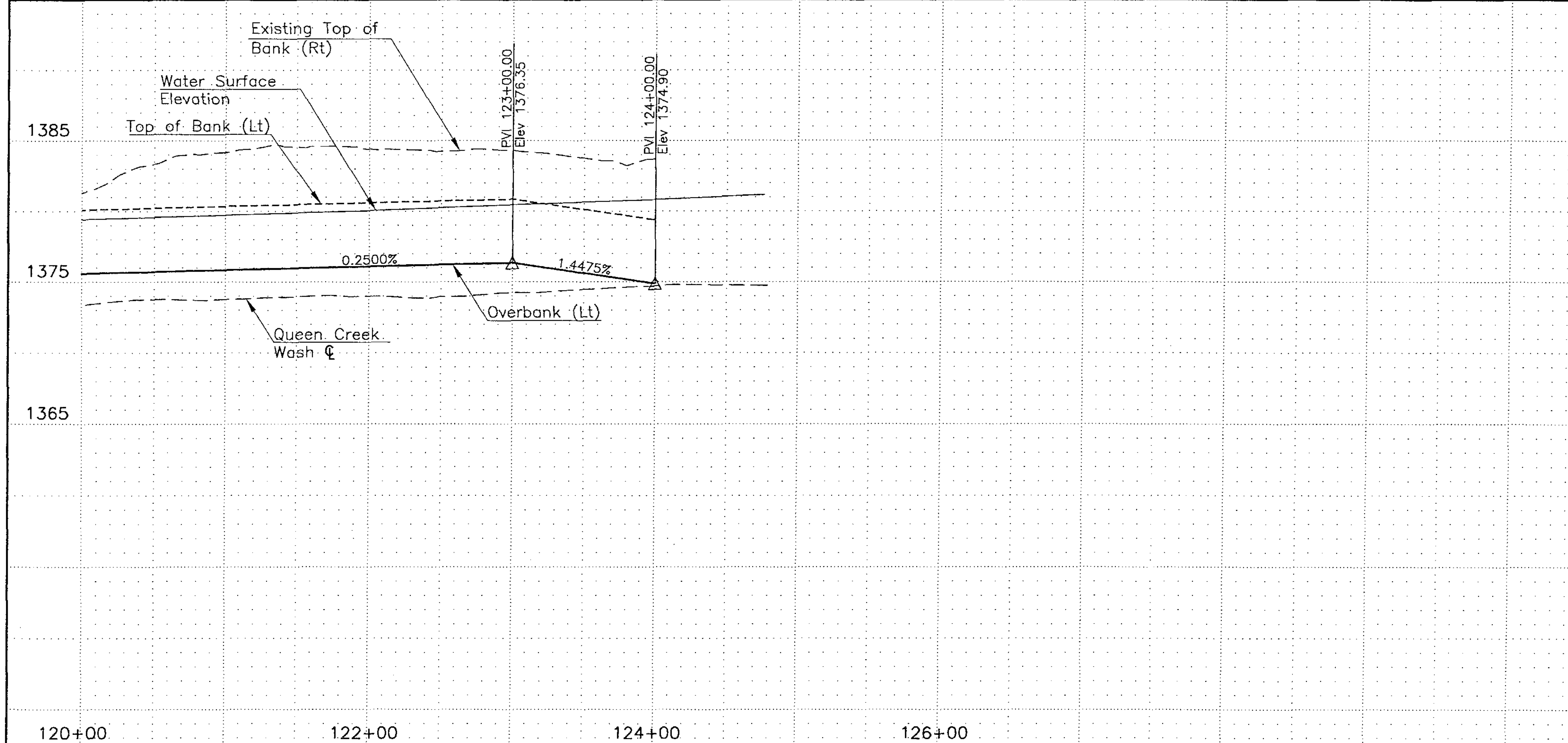




COUNTY PROJECT NO. 2000D03	QUEEN CREEK WASH IMPROVEMENTS		
PROJECT DESCRIPTION			
PRIME CONSULTANT: DIBBLE & ASSOCIATES CONSULTING ENGINEERS Since 1962	DRN. PAF DATE: 12/10/01 DES. KWR DATE: 12/10/01 CKD. DATE: 12/10/01	SCALE 1"=100' HORIZONTAL 1"=10' VERTICAL	SHEETS NO. 7 OF 14

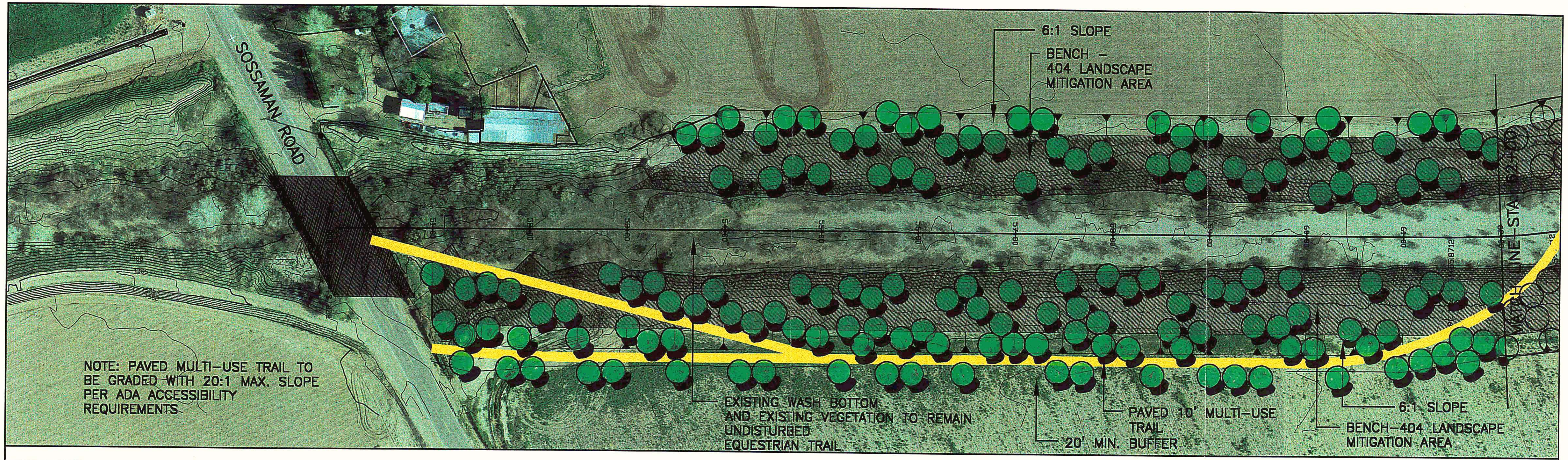
TOWN OF QUEEN CREEK ARIZONA

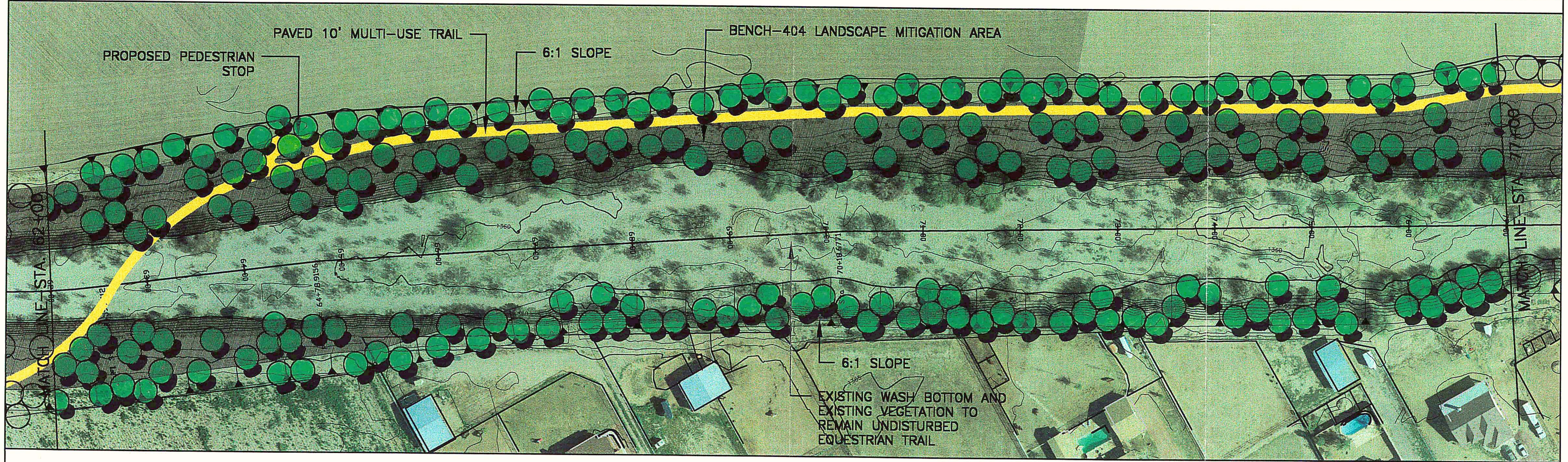


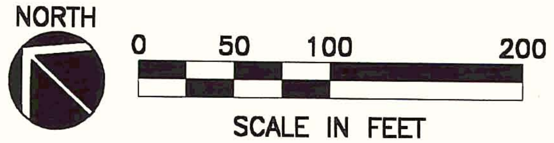


COUNTY PROJECT NO. 2000D03	QUEEN CREEK WASH IMPROVEMENTS		
PROJECT DESCRIPTION			
PRIME CONSULTANT DIBBLE & ASSOCIATES CONSULTING ENGINEERS Since 1962	DRN. PAF DATE: 12/10/01	SCALE	SHEETS
	DES. KWR DATE: 12/10/01	1"=100' HORIZONTAL	
	CKD. DATE: 12/10/01	1"=10' VERTICAL	NO. 8 OF 14

TOWN OF QUEEN CREEK ARIZONA







TOWN OF QUEEN CREEK ARIZONA

COUNTY PROJECT NO. 2000D03

QUEEN CREEK WASH IMPROVEMENTS

PROJECT DESCRIPTION

PRELIMINARY LANDSCAPE CONCEPT PLAN

PRIME CONSULTANT
McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS

DRN. MPI DATE: 5/02	SCALE		SHEETS
DES. MPI DATE: 5/02		HORIZONTAL	
CKD. DCM DATE: 5/02		VERTICAL	NO. 9 OF 14

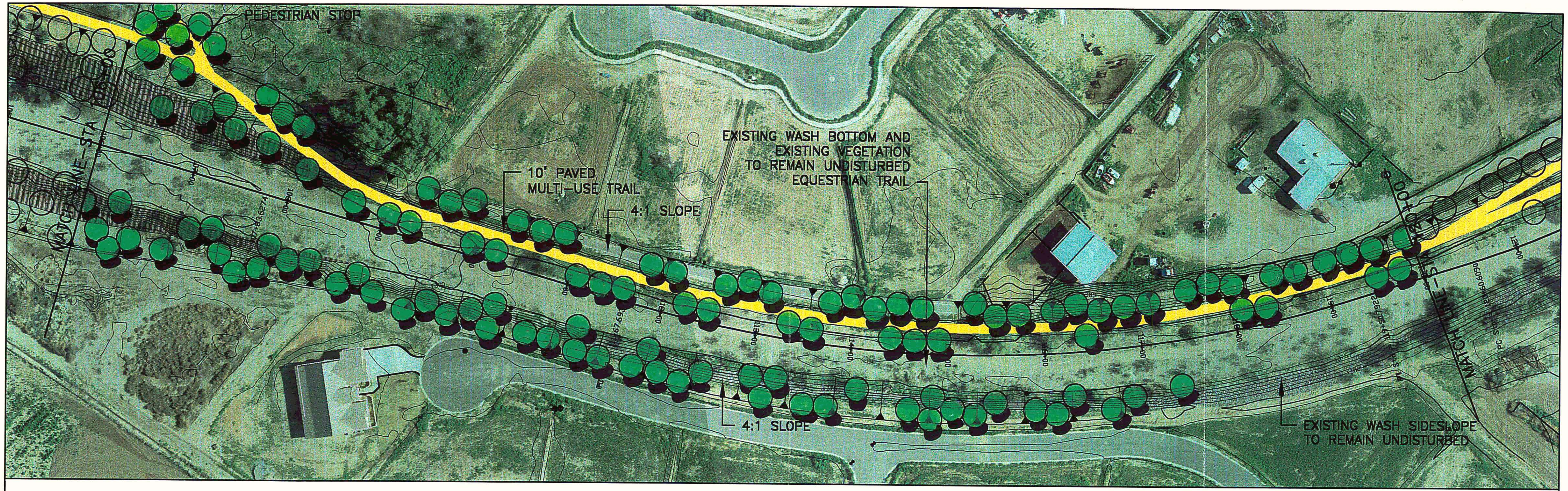
NORTH

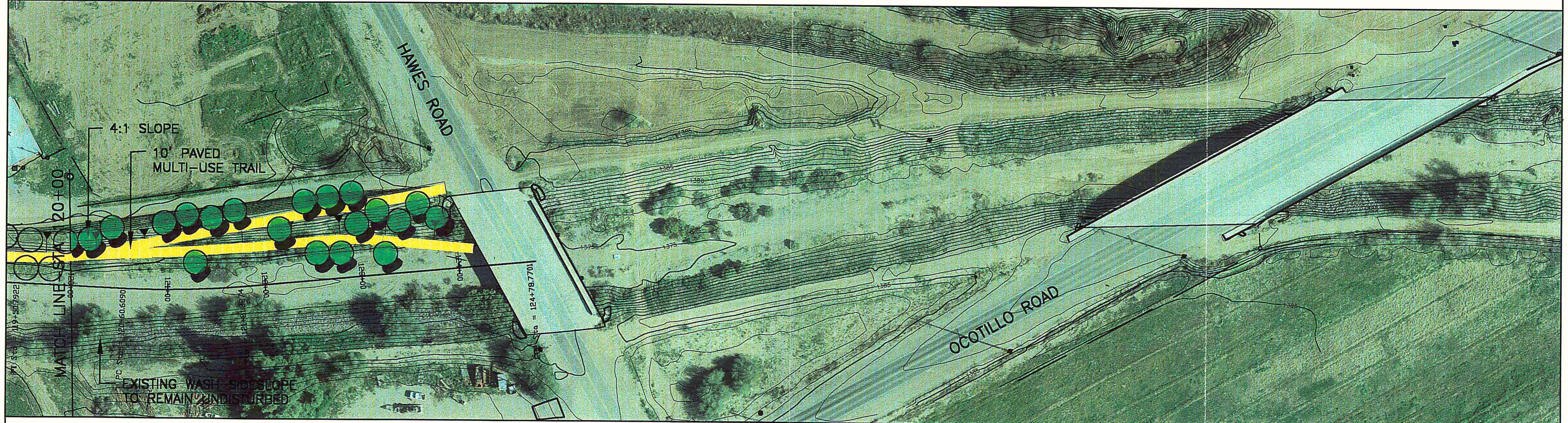
0 50 100 200

SCALE IN FEET

COUNTY PROJECT NO. 2000D03	QUEEN CREEK WASH IMPROVEMENTS
PROJECT DESCRIPTION	PRELIMINARY LANDSCAPE CONCEPT PLAN
PRIME CONSULTANT McCloskey + Peltz, Inc. LANDSCAPE ARCHITECTS	DRN. MPI DATE: 5/02; DES. MPI DATE: 5/02; CKD. DCM DATE: 5/02
SCALE HORIZONTAL VERTICAL	SHEETS NO. 10 OF 14

TOWN OF QUEEN CREEK ARIZONA



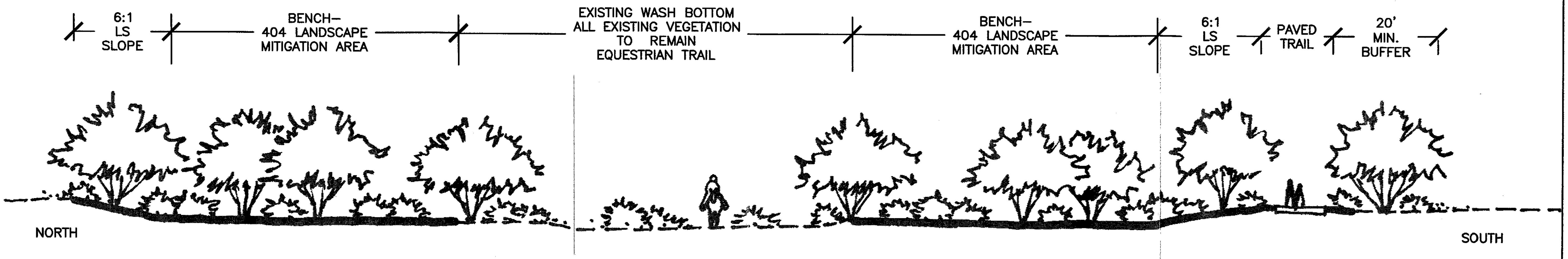


NORTH

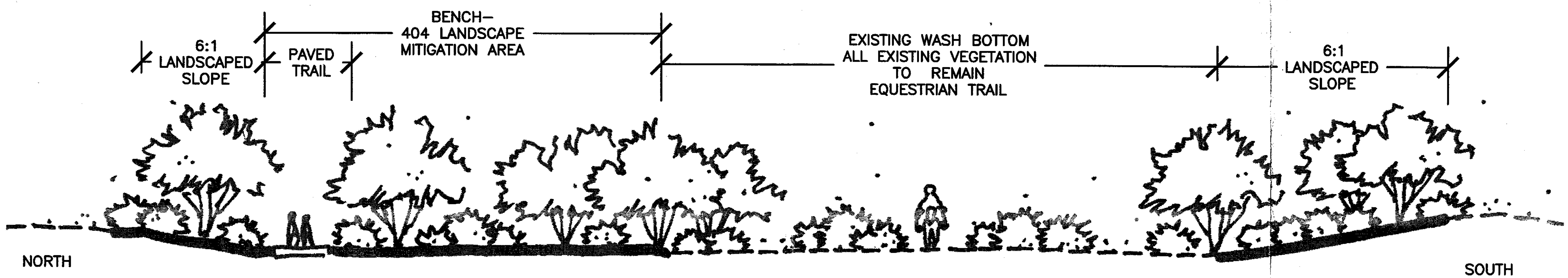
0 50 100 200

SCALE IN FEET

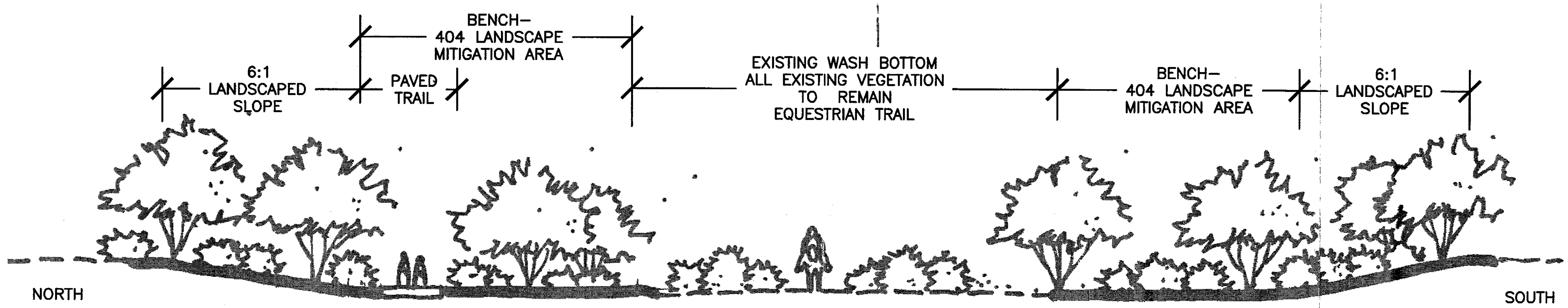
COUNTY PROJECT NO. 2000D03	QUEEN CREEK WASH IMPROVEMENTS		
PROJECT DESCRIPTION **PRELIMINARY LANDSCAPE CONCEPT PLAN**			
PRIME CONSULTANT McCloskey • Peltz, Inc. LANDSCAPE ARCHITECTS	DRN. MPI DATE: 5/02 DES. MPI DATE: 5/02 CKD. DCM DATE: 5/02	SCALE HORIZONTAL VERTICAL	SHEETS NO. 11 OF 14



TYPICAL SECTION – SOSSAMAN ROAD TO STA. 63



TYPICAL SECTION – STA. 63 TO STA. 83

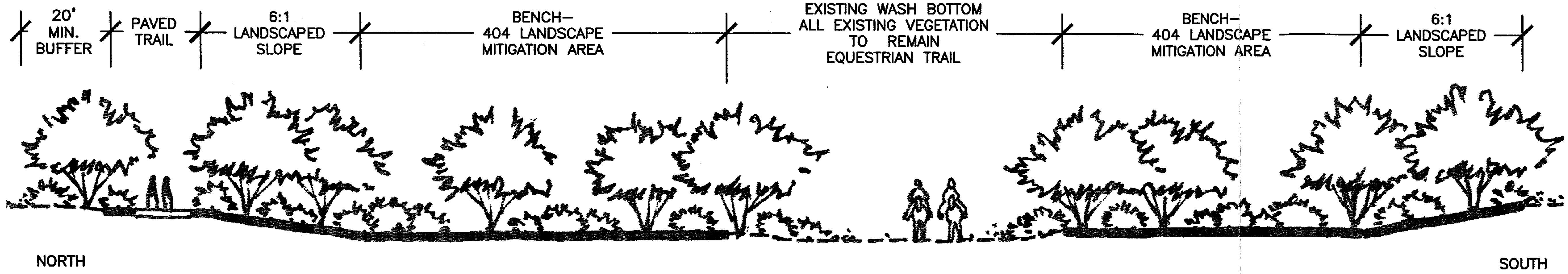


TYPICAL SECTION – STA. 83 TO STA. 88

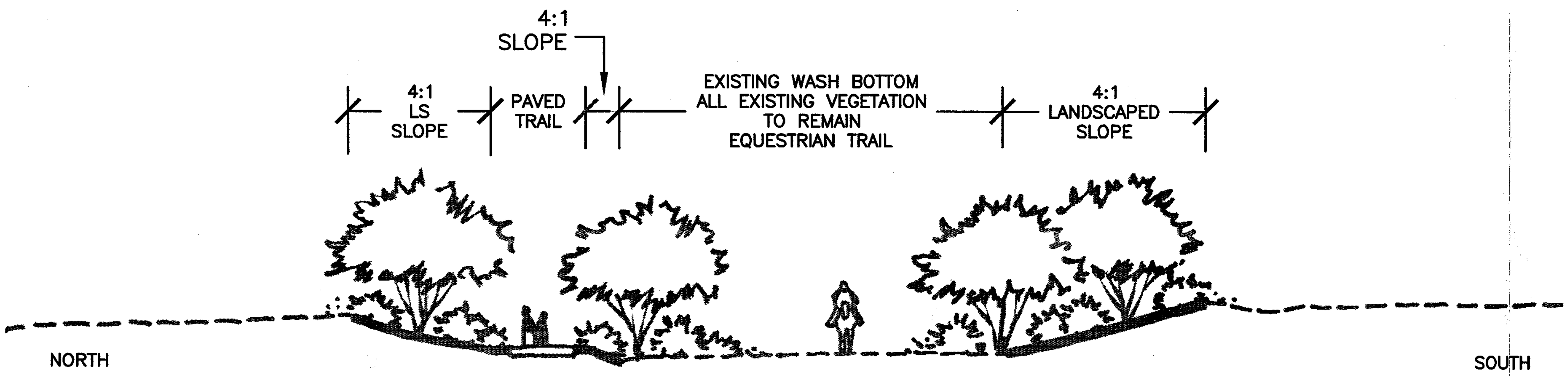
0 10 20 40

SCALE IN FEET

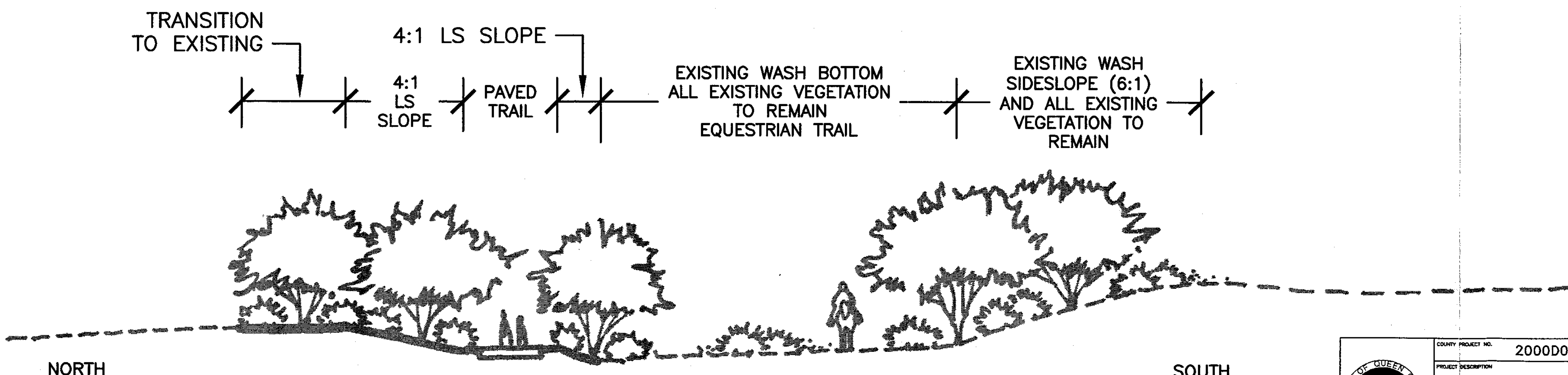
COUNTY PROJECT NO. 2000D03	QUEEN CREEK WASH IMPROVEMENTS		
PROJECT DESCRIPTION	LANDSCAPE CONCEPT TYPICAL SECTIONS		
PRIME CONSULTANT McCloskey • Peltz, Inc. LANDSCAPE ARCHITECTS	DRN. MPI DATE: 5/02	SCALE	SHEETS
	DES. MPI DATE: 5/02	HORIZONTAL	
	CKD. DCM DATE: 5/02	VERTICAL	NO. 12 OF 14



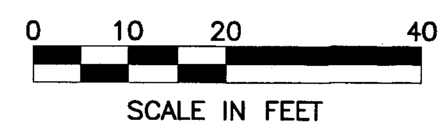
TYPICAL SECTION – STA. 88 TO STA. 108



TYPICAL SECTION – STA. 108 TO STA. 117

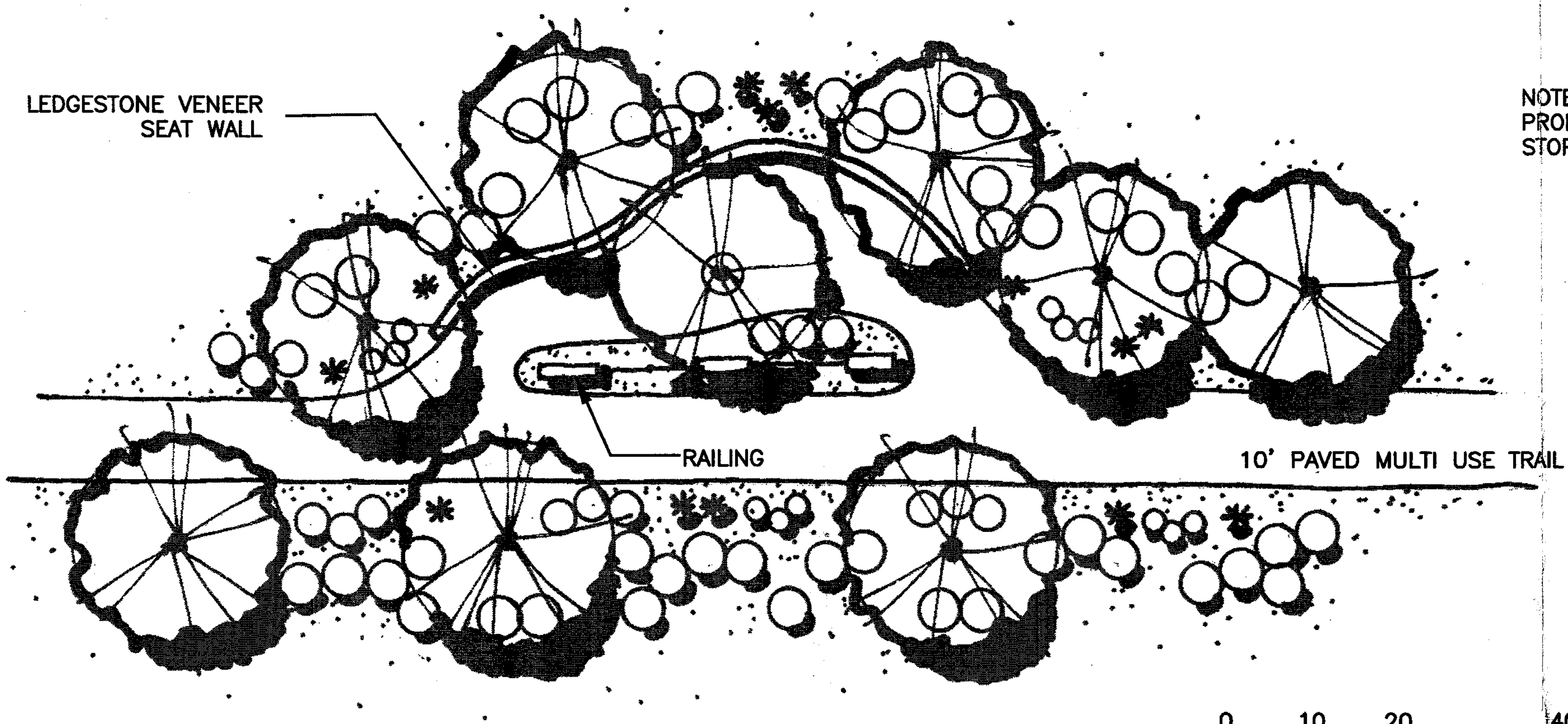


TYPICAL SECTION – STA. 117 TO HAWES ROAD



COUNTY PROJECT NO. 2000D03	QUEEN CREEK WASH IMPROVEMENTS		
PROJECT DESCRIPTION	LANDSCAPE CONCEPT TYPICAL SECTIONS		
PRIME CONSULTANT McCloskey • Peltz, Inc. LANDSCAPE ARCHITECTS	DRN. MPI DATE: 5/02 DES. MPI DATE: 5/02 CKD. DCM DATE: 5/02	SCALE HORIZONTAL VERTICAL	SHEETS NO. 13 OF 14

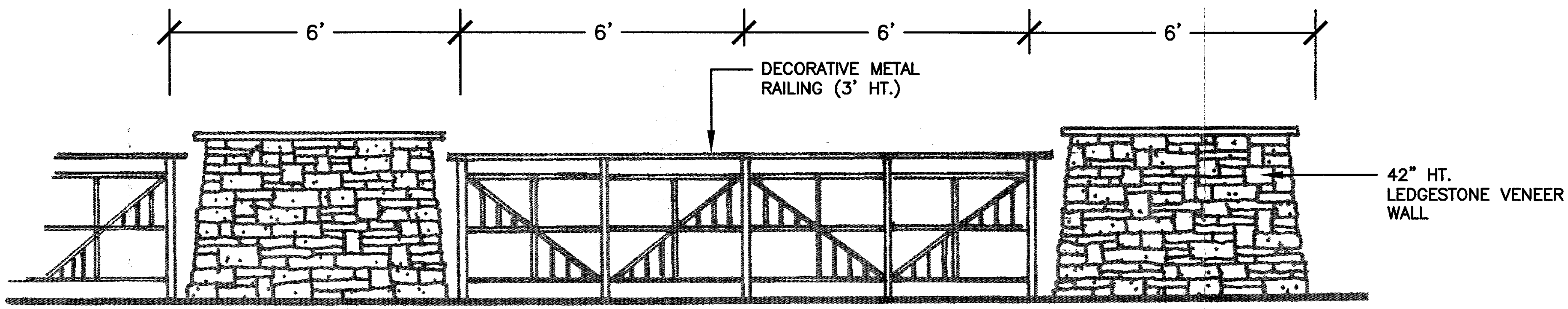
NOTE: SEE OVERALL PLANS FOR PROPOSED LOCATIONS FOR PEDESTRIAN STOPS



0 10 20 40

SCALE IN FEET

TYPICAL PLAN – PEDESTRIAN STOP



TYPICAL ELEVATION – PEDESTRIAN STOP RAILING

0 1 2 4

SCALE IN FEET

COUNTY PROJECT NO. 2000D03	QUEEN CREEK WASH IMPROVEMENTS		
PROJECT DESCRIPTION LANDSCAPE CONCEPT TYPICAL PEDESTRIAN STOP			
PRIME CONSULTANT McCloskey • Peltz, Inc. LANDSCAPE ARCHITECTS	DRN. MPI DATE: 5/02	SCALE	SHEETS
	DES. MPI DATE: 5/02	HORIZONTAL	
	CKD. DCM DATE: 5/02	VERTICAL	NO. 14 OF 14

TOWN OF QUEEN CREEK ARIZONA