AGUA CALIENTE
BRIDGE DESIGN REPORT

July, 1986
(Revised September, 1986)

Prepared for:
MARICOPA COUNTY HIGHWAY DEPARTMENT
3325 West Durango Street
Phoenix, Arizona 85009

Prepared by:
A-N WEST, INC.
4120 North 20th Street
Phoenix, Arizona 85016

Registered Professional Engineer (Civil)
CERTIFICATE NO.
13925
LAWRENCE
TYSIAC
Date Signed 7/7/86
ARIZONA, U.S.A.

TABLE OF CONTENTS

AGUA CALIENTE
BRIDGE DESIGN REPORT

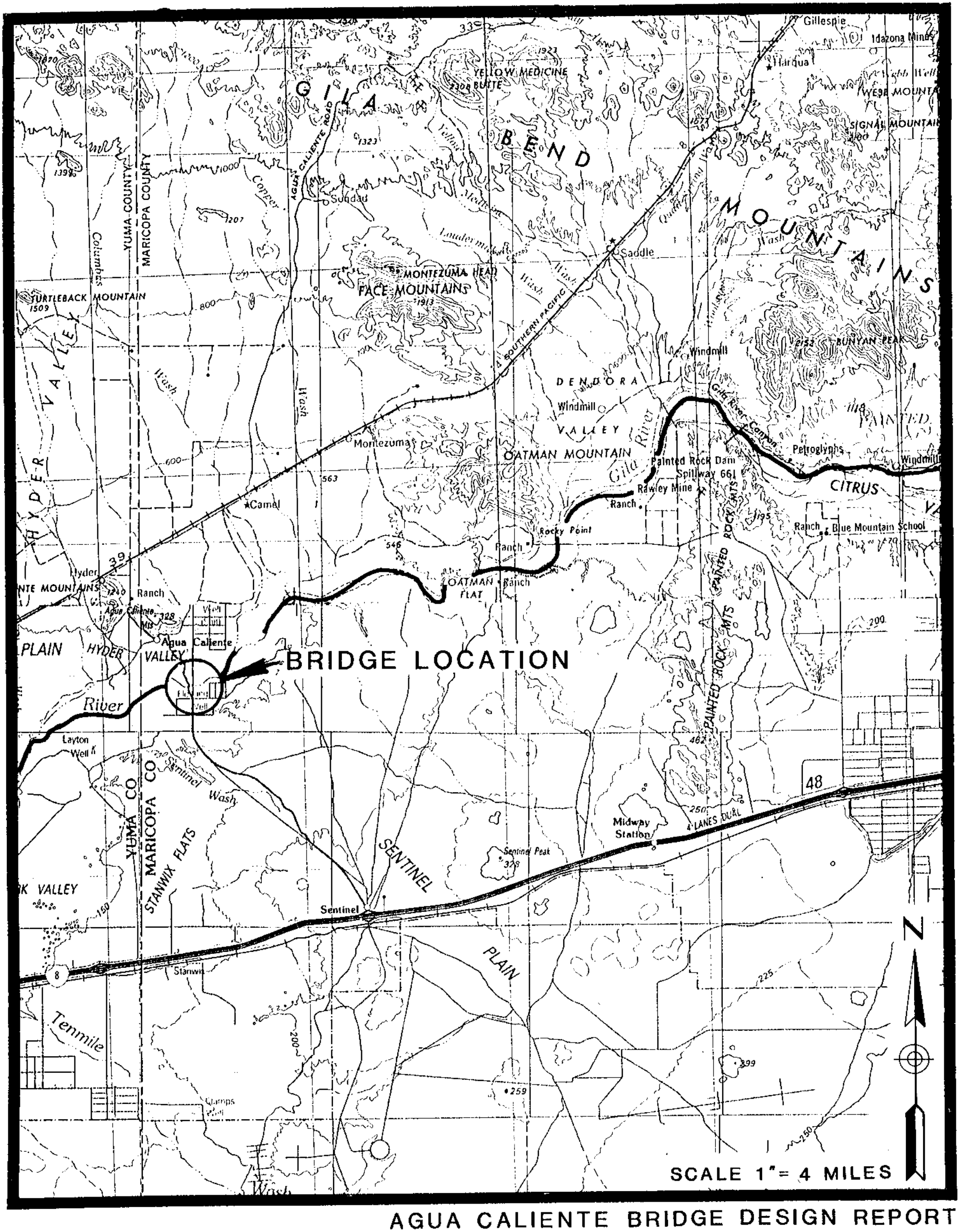
INTRODUCTION

The purpose of this report is to summarize the design information on the Agua Caliente Road Bridge over the Gila River. The structure is designed to provide a dry crossing at the river channel for flows up to 10,000 cfs and to withstand the maximum expected discharge of 22,500 cfs from Painted Rock Dam.

Agua Caliente Road crosses the Gila River approximately two miles from the western boundary of Maricopa County and approximately eighteen miles downstream of Painted Rock Reservoir (Figure 1). The river, with a floodplain width varying from one to two miles, flows in a westerly direction at an average slope of 0.08 percent. The floodplain consists of a meandering main channel with braided secondary channels and a heavy growth of salt cedar brush outside the main channel banks.

Painted Rock Dam and Reservoir was constructed by the Corps of Engineers in 1959 to provide flood control for the lower Gila River. The drainage area above the dam and gauge station (No. 09519800) is 50,910 square miles according to the United States Geological Survey (USGS) Water Resource Publication. The dam was designed to reduce the maximum probable flood, which includes the record flood of 195,000 cfs in 1916, to a maximum outflow of 22,500 cfs. A normal maximum discharge of 10,000 cfs is expected from the operation of the dam. Peak flows from the dam to date have been in the 4,000 to 5,000 cfs range with lesser flows continuing for durations of up to three to six months.

The existing Agua Caliente roadway, as it crosses the Gila River, contains approximately thirty corrugated metal pipe (CMP) culverts generally of 60-inch diameter. The CMP culverts are placed along the roadway embankment in groups with capacity roughly proportionate to the size of braided channels intersecting the road. At the north and south edges of the Gila River floodplain, the existing roadway consists of a dip section road crossing with



AGUA CALIENTE BRIDGE DESIGN REPORT

LOCATION MAP

FIGURE 1

A-N WEST INC.

no drainage structures. Consequently, floodwaters become trapped behind the road, spread out, and flow over the roadway at these locations. Previous peak discharges of approximately 5,000 cfs, 4,500 cfs, and 4,000 cfs in October 1980, June 1983, and early 1984, respectively, from Painted Rock Dam have inundated portions of the roadway, thereby closing the road.

SUMMARY OF DESIGN

The design calculations and other pertinent data presented in this report are in conjunction with the "plans for construction of Agua Caliente Road Bridge over the Gila River", project number 68246. The design involved a total nominal bridge length of 252 feet using multiple span lengths of 84 feet. In conjunction with a 252-foot bridge, only minor river channelization (approximately 300 feet upstream and 200 feet downstream) of the bridge will be performed in the area of the spur dikes, to pass the design discharge of 10,000 cfs. The bridge structure will also pass a flow of 22,500 cfs without damage to the structure.

The bridge is located within the south half of the existing river floodplain with the south abutment of the bridge at the bank of the existing natural channel. The main flow of the Gila River is presently concentrated in the area of the proposed bridge.

To protect the bridge from flood damage, a system of spur dikes was designed extending approximately 200 feet upstream and 150 feet downstream of both bridge abutments.

An unusual situation exists in the south overbank area upstream of the bridge where high river flows have the potential for entering the overbank area and causing flooding of the road crossing to the south of the bridge. Since the existing roadway elevations are below the anticipated highwater elevations for a river flow of 10,000 cfs and it is not practical to raise the roadway, we propose the construction of a low dike to contain river flows. The dike would be located on a ridge of high ground, approximately 1,800 feet south of the proposed bridge. The dike would be approximately three feet in height and would extend to approximately 2,000 feet east of the road centerline. The dike would require an easement or right-of-way dedication. The dike is proposed as a safety measure to insure that river flows pass through the bridge opening and not across the road. There is a possibility that the dike is not necessary if river scour creates a larger more efficient channel. Our computer models of the river hydraulics does not consider scour and, therefore, generates a conservative water surface elevation.

FINAL DESIGN

Hydraulic Analysis:

The hydraulic analysis of the Gila River floodplain was performed using the Corps of Engineers (COE) backwater program, HEC-2 (Reference 1). Aerial photography was flown on May 4, 1984 (Reference 2) to obtain cross-sections and contour mapping of the river floodplain for use in the hydraulic analysis. Floodwater releases from Painted Rock Reservoir had subsided to approximately 50 cfs by this time. The aerial photography covers from approximately one mile downstream to 2.5 miles upstream of the road crossing at a photo scale of 1:12,000. Topographic mapping at a scale of 1" = 200' with 5-foot contour intervals was compiled for the river floodplain. Digitized cross-sections of the floodplain were also obtained for the 3.5 mile reach analyzed in the HEC-2. In addition, an area one mile by 1,600 feet centered on the existing road crossing was flown at 1:3,000 scale to compile 40-scale, 1-foot contour interval mapping for use in investigating road crossing improvement alternatives and in the development of preliminary designs.

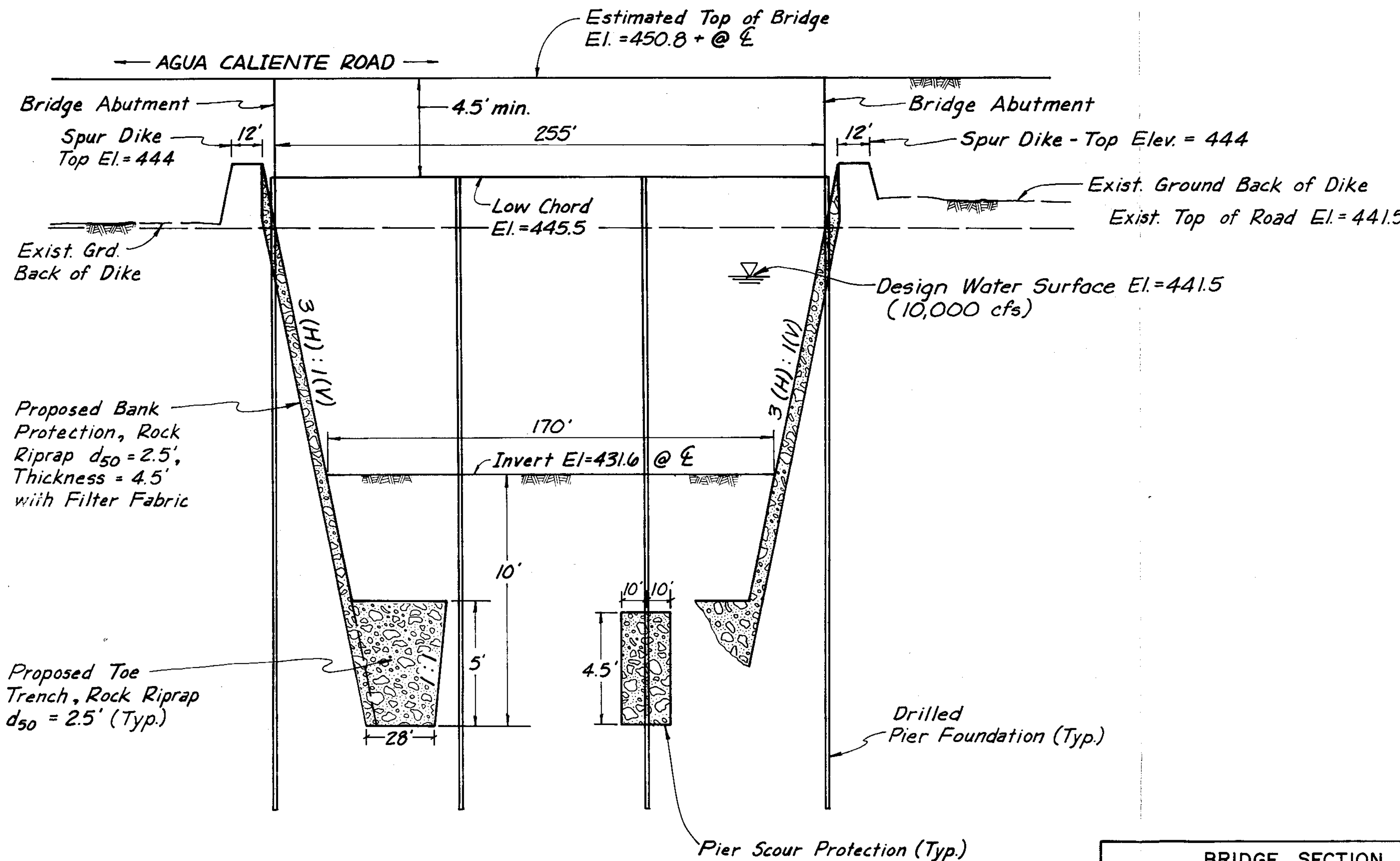
Discharges of 5,000, 10,000, and 22,500 cfs were used in the hydraulic analysis of the Gila River. These flows are based on the operating procedures established for Painted Rock Dam by the Corps of Engineers.

Roughness coefficients or Manning's "n" values for use in the hydraulic analysis were determined by a combination of field inspection, inspection of aerial photos, reference to hydraulic handbooks (Reference 4) and engineering judgement. A Manning's "n" value of 0.080 was used for both overbank areas due to the shallower depth of flow and the heavy salt cedar growth. A Manning's "n" value of 0.045 was used for the main channel area.

The starting water surface elevation for the HEC-2 backwater program was determined using the slope area method beginning one mile downstream of the roadway. Information on the existing corrugated metal pipe (CMP) culverts

FLOOD PROFILES-GILA RIVER				
DESIGN G.A.S. / DRAWN K.D.S. / CHECK C.J.L.	SCALE HORZ. 1"=500' VERT. 1"=5'	JOB NO. 4350-02	DATE	FIGURE 2

AN WEST INC.
Consulting Engineers
PHOENIX, ARIZONA



BRIDGE SECTION

DESIGN G.A.S. / DRAWN P.C. / CHECK C.J.L.	SCALE HORZ. N.T.S. / VERT. N.T.S.	JOB NO. 4350	DATE	FIGURE 3

AN WEST INC.
Consulting Engineers
PHOENIX, ARIZONA

was obtained from a field survey for use in the hydraulic analysis. The HEC-2 model of the existing culverts and roadway was calibrated by checking the computed water surface for the 5,000 cfs discharge to determine if inundation of the existing road occurred as reported in past flood events.

The results of the HEC-2 analysis for the floodplain are shown on Figure 2 and in the Appendix. The floodplain delineation for the 10,000 cfs discharge is shown on Exhibit 1.

Hydraulic analysis indicates that the northern edge of the floodplain is not effective for conveying flood flows due to the restriction caused by a slight topographic ridge. Therefore, that portion of the floodplain was blocked out in the HEC-2 analysis (see Exhibit 1 in the Appendix). The 10,000 cfs existing floodplain was delineated beyond the effective area above the road to show the extent of ponded water in this area.

The potential capacity of the various braided channels across the width of the floodplain was evaluated using HEC-2 to aid in the design and location of culvert capacities proportional to the channel capacities. The approximate capacity distribution was used in conjunction with the mapping, HEC-2 analysis, and aerial photos (see Exhibit 1) to identify three general areas of flow.

The existing roadway and culvert configuration has a drainage capacity of only about 4,000 cfs. With the mild slope of the river bed, flow over the existing roadway causes water to pond upstream in the overbank areas to approximately section 10.668 of the HEC-2 analysis. At this location, the flow remains essentially contained in the main channel. Redistribution of the flow in relation to the weir capacity of the road profile focuses a redistribution of the flow within the floodplain due to the backwater or ponding effect of the roadway embankment. This potential for redistribution of flow allows the routing of the majority of flow through a main bridge opening by raising the roadway embankment and forcing more flow through the main channel.

<u>Hydraulic Design:</u>

A bridge opening was designed and analyzed so that computed water surface elevations would not exceed the water surface elevation for a 10,000 cfs discharge under existing conditions. It was recognized that ponding would occur north and south of the bridge as in the existing condition, but that the flow would route through the bridge opening. Some small drainage structures will be required under this alternative to drain local nuisance flows and the ponded water remaining on the upstream side of the road after the flood flows subside.

Due to the heavy vegetation growth and potential for sediment deposition within this broad floodplain, channelization was not considered a feasible element for improving the road crossing. Furthermore, channelization, if used, would be costly because extensive downstream excavation would be reuqired to produce a more effective bridge opening. Extensive upstream excavation would also be required to intercept flows in the broad floodplain. Although not modeled as part of the hydraulic analysis of the bridge alternative, some natural channel modification would be anticipated during flood flows as a result of scour due to confinement of the flow in the main channel.

Some modification of the road is necessary to eliminate the flooding conditions at the existing dip-section crossings. Raising the roadway embankment was considered the most cost-effective method of improving the road crossing since this would also route the flood flows through the bridge opening.

The proposed bridge opening, modeled by the HEC-2 analysis, is shown on Figure 3. The results of the HEC-2 analysis are shown in the Appendix and Figure 2. The proposed bridge opening has a bottom width of 170 feet and top width of 250 feet with sideslopes of 3 horizontal to 1 vertical. Flow through the bridge opening was not reduced for the culverts which are included as part of the roadway design to drain nuisance flows. This conservative assumption was used because the culverts have a relatively small capacity and their locations were not considered effective in conveying the main river discharges.

The HEC-2 hydraulic analysis of the 22,500 cfs flood flow would pass through the bridge opening and showed that the proposed roadway would remain intact although in reality some damage to the roadway embankment would be expected from this flow. It would be difficult to accurately estimate the extent of this damage which is due to the severe constricting effect the raised roadway has on the wide floodplain of the river. The probability and extent of this damage is expected to be reduced in the future as the river becomes more naturally channelized in response to the bridge and road construction.

The existing water surface elevations at the bridge are El. 442.14 for a 10,000 cfs discharge and El. 443.10 for a 22,500 cfs discharge.

The design water surface elevations of the bridge section are El. 441.50 for the 10,000 cfs discharge and El. 443.50 for the 22,500 cfs discharge. The above design values were determined through a conservative interpretation of the results of the computer analysis.

The proposed bridge low chord of El. 445.50 will provide a four-foot freeboard for the 10,000 cfs discharge and a two-foot freeboard above the top of road elevation of 443.50.

Bridge Design:

The bridge structure of the Agua Caliente Road bridge over the Gila River consists of precast, prestressed concrete beams, Type IV, 85 feet in length, founded on four-foot diameter concrete, drilled shafts extending 70 feet below the channel bottom. The bridge consists of three spans.

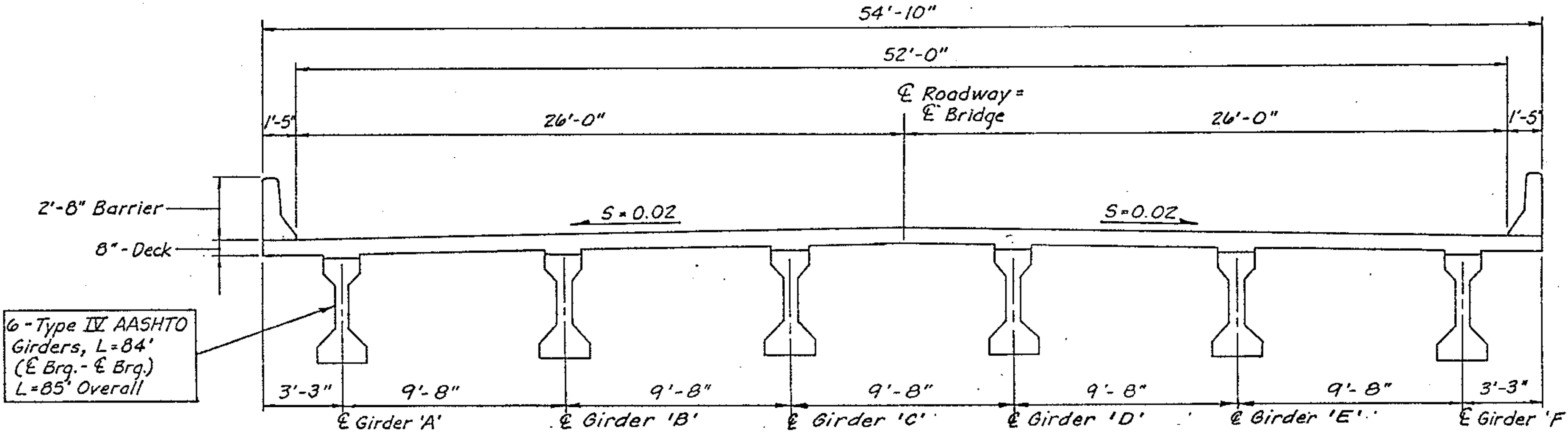
The deck is cast-in-place concrete and acts through composite action with the beams joined into one continuous span unit of 255 feet. The 52-foot wide roadway with concrete barriers results in a 55-foot, 2-inch wide bridge which requires seven strings of beams. Concrete barriers are used on the edge of the roadway, with no fencing provided on the barrier.

The type of foundation system to be used was studied in detail, resulting in the determination that concrete drilled shafts provided the most flood resistant and cost-effective foundation.

A summary of the bridge structural calculations and design is presented under a separate cover.

Road Design:

The results of the hydraulic analysis show a water surface elevation upstream of the bridge of approximately 441 feet for a river flow of 10,000 cfs and 444 feet for a river flow of 22,500 cfs.



TYPICAL BRIDGE SECTION

AGUA CALIENTE

SCALE: 1"=4'

To provide for adequate freeboard and to allow for velocity head in the large overbank areas, a top-of-road elevation of 443.5 is proposed. This proposed roadway elevation, in conjunction with the proposed bridge structure, will provide a dry crossing for river flows in excess of 10,000 cfs.

To provide a top-of-road elevation of 443.5 feet, it will be necessary to reconstruct the existing road for a distance of approximately 2,000 feet south and 6,000 feet north of the bridge centerline. This results in a total roadway length of approximately 8,000 feet. The road section consists of two, 14-foot driving lanes for a total pavement width of 28 feet. The section is to be normally crowned with a two percent cross slope, including 10-foot shoulders. Maximum fill side slopes are 4 to 1. The design speed is 55 MPH.

Due to the high frequency of river flows and the need to provide for traffic during construction, a detour road is planned. The detour road will be located upstream or east of the proposed bridge. This will allow the detour road to function as a river control structure to prevent flooding of the construction site. It is proposed that the plans and specifications call for the contractor to maintain or provide for river flows of up to 3,000 cfs below the detour road and through the bridge construction area for the duration of the construction. It is proposed that the method the contractor chooses to convey this river flow be left to his discretion within the parameters of the specifications.

The detour road is designed for 55 MPH traffic. Minor drainage culverts will be provided as required along the length of the roadway.

SEDIMENT AND SCOUR ANALYSIS

General:

Scour at the proposed road crossing was estimated based upon techniques described by Simon and Senturk (Reference 5) and Simon, Li & Associates (Reference 6). Total scour includes the effects of four components: degradation, general scour, local scour, and antidunes. Degradation refers to the long-term erosion of the stream bed due to the generalized alteration of the sediment transport regime. Dam construction, urban development, and climatic changes are examples of actions that can induce degradation.

General scour represents erosion as a result of the constriction of the flow channel. Turbulent flow (i.e., vortices and eddies) triggers local scour around piers, embankments, and other structures. Finally, total scour includes consideration of the lowering of the river bed due to the formation of antidunes on the channel bottom under high-velocity flow conditions.

The scour calculations were performed at the main flow channel only and considered both the 10,000 and 22,500 cfs flood events. All hydraulic parameters used in the analysis were taken from the HEC-2 model runs. The flow velocities through the bridge opening used in the scour analysis were 6 fps and 15 fps for the 10,000 and 22,500 cfs flows, respectively. As indicated in the hydraulic analysis, the flow velocities for the 22,500 cfs flood event are higher than would be realistically expected. Therefore, the scour analysis is conservative due to the analysis assumption that the proposed roadway would remain intact.

The Gila River bed material was characterized as follows:

DIAMETER PERCENT PASSING	SIEVE	DIAMETER (mm)
D_5	#200	0.075
D_{50}	#10	2.0
D_{95}	#4	4.8

These values were based upon data gathered in the preliminary soils investigation for this project (Reference 7).

Components of Scour Analysis

Degradation: The proposed design is not expected to alter the long-term sediment transport character of the areas enough to disrupt the current sedimentation characteristics of the river. The elevated nature of the existing Agua Caliente Road in relation to the surrounding floodplain does significantly affect the transport of water and sediment on the river. However, since both the present and proposed crossings are elevated, little change in the overall sediment transport system is anticipated. Based upon this qualitative evaluation, the potential for degradation as a result of the implementation of the proposed design is assumed to be negligible.

General Scour:

The estimated depths of general scour due to the contraction of flow at the road crossing were determined by applying Neil's procedure, as described in Simons and Senturk (Reference 5). Neil's technique allows for a trial-and-error estimation of scour depths by relating flow velocity and the erodibility of the bed material.

Local Scour:

Equations to estimate local scour at piers and embankments have been developed by several investigators using both flume and field data. The local scour calculations for the bridge piers were based on an average value from three separate fomulae (Simons and Senturk, Reference 5). Scour at an embankment is caused by the eddies that result when the water turns into the bridge opening after moving parallel to the upstream face of the road embankment. A formulation for long embankments (Simons and Senturk, 1977) was deemed most appropriate and used for this analysis.

Antidunes:

The movable bed of the Gila River will be subject to antidune formation as a consequence of the high flow velocities that will exist at the crossing. Since the troughs of the antidunes can be significantly below the mean bed level, their effect has been calculated (Simons, Li & Associates, Reference 6 and included in the scour evaluation.

Scour and Embankment Protection Design:

The results of the scour analysis for the bridge design are presented in Table 1. Total scour at the abutment is 29 feet for the design flow of 10,000 cfs and consists of the sum of general scour, embankment scour, and antidunes. At the bridge piers, total scour is 6 feet which is the sum of general scour, pier scour, and antidunes. Values are only given to the nearest foot, due to the uncertainty of scour estimation procedures.

TABLE 1
SCOUR ANALYSIS
BRIDGE DESIGN

COMPONENT	SCOUR IN FEET 10,000 CFS EVENT	2,2500 CFS EVENT
General Scour	3	13
Embankment Scour	25	32
Pier Scour	2	4
Antidunes	0.5	3
Total Abutment Scour	29	48
Total Pier Scour	6	20

The design of spur dikes and bank protection at the bridge is shown on Exhibit 2 and Figure 3. Loose rock riprap is proposed as bank protection. Exposed rock outcroppings exist within several miles of the project and it is anticipated thay would provide an economical rock source, although no investigation was made of specific sources and costs.

Total scour depths at the proposed bridge abutments of 29 and 48 feet have been calculated for the 10,000 cfs and 22,500 cfs flood flows, respectively. According to Simons and Senturk (Reference 5) and Simons, Li & Associates (Reference 6) it is recommended that bank and scour protection be designed and constructed to the full depth of scour calculated. Full-depth scour protection is preferred to the alternative of providing a sufficient quantity of loose rock in a toe trench which would fill in and protect the embankment as scour occurs.

However, due to the construction difficulties and additional cost involved in constructing scour protection to the calculated scour depths, an alternative design is used. It is proposed that bank protection with a toe trench be used in conjunction with spur dikes on the upstream side of the bridge opening. Embankment scour, the most significant component of scour, occurs at the constriction of flow where transitions cause eddy currents. The purpose of the spur dike is to move the constriction and, therefore, the embankment scour upstream and away from the bridge structure. In addition, the spur dike streamlines flow as it passes through the structure, thereby reducing turbulent eddy currents and scour at the structure.

Spur dikes are proposed for a distance of 200 feet upstream of the north abutment and 150 feet upstream of the south abutment of the bridge. The lengths of the spur dikes downstream of the north and south abutments of the bridge are approximately 100 feet each. The shape of the spur dikes conform to the equation of a quarter ellipse with a 2.5:1 ratio of the major axis to the minor axis.

The spur dikes and bank protection with toe trenches as proposed would provide scour protection to a depth of approximately 29 feet if the toe trench protection functions as expected. If the toe trench does not fill in scour holes as they occur, some damage would be anticipated at the upstream end of the spur dike for the design flood of 10,000 cfs. It is expected that the spur dike would still function adequately to streamline flow and thereby minimize scour and damage at the bridge for flows of 10,000 cfs. The resultant cost of damage to the spur dike is expected to be relatively small when compared to the cost of damage to the structure or to the cost of providing full-depth scour protection.

The total scour depths for the flow of 22,500 cfs were calculated assuming the proposed roadway would remain intact and the majority of the flow would pass through the bridge opening. If a breaching of the adjacent roadway occurs as anticpated for flows in excess of 10,000 cfs, scour at the bridge opening would not be as severe as calculated. However, damage to the roadway embankment at the bridge could still occur with the bank and scour protection proposed for flood flows over 10,000 cfs. The bridge structure, supported by pile foundation, would be expected to survive. Therefore, additional scour protection for the 22,500 cfs discharge was not considered cost-effective and was not included for this design.

REFERENCES

1. "HEC-2, Water Surface Profiles" Generalized Computer Program, Hydraulic Engineering Center, U.S. Army Corps of Engineers, September 1982.

2. "Topographic Mapping" 200-scale, 5 foot contour, interval mapping compiled from aerial photography scale 1:12,000. 40-scale, 1 foot contour interval mapping compiled from aerial photography at scale 1:3000. Date flown, May 4, 1984. Aerial Mapping Company, Phoenix, Arizona.

3. "Hydraulic Charts for the Selection of Highway Culverts", Hydraulic Engineering Circular No. 5, Bridge Division, Office of Engineering, Federal Highway Adminsitration, Washington, D.C.

4. "Open-Channel Hydraulics", Ven Te Chow, McGraw-Hill Book Company, New York, 1959.

5. "Sediment Transport Technology", Daryl B. Simons and Fuat Senturk, Water Resources Publications, Fort Collins, Colorado 80522, 1977.

6. "Engineering Analysis of Fluvial Systems", Simons, Li & Associates, Fort Collins, Colorado, 1982.

7. "Preliminary Investigation, Multi-Span Bridge, Agua Caliente Road over the Gila River, Maricopa County, Arizona" Western Technologies, Inc., Phoenix, Arizona, June 19, 1984.

APPENDIX

HEC-2 INPUT AND OUTPUT

A - EXISTING CONDITION

B - BRIDGE DESIGN

```
*************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
  ERROR CORR -  01,02,03,04,05
  MODIFICATION -  50,51,52,53,54,55
*************************************************
```

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SUMMARY PRINTOUT TABLE-1

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q(cfs)	CWSEL+	CRIWS	EG	.01K	STCHL	STCHR	VCH
	8.915	0.00	0.00	0.00	426.10	5000.00	432.38	0.00	432.42	1892.80	9714.00	10416.60	1.89
	8.915	0.00	0.00	0.00	426.10	10000.00	433.66	0.00	433.70	3770.06	9714.00	10416.60	2.13
	8.915	0.00	0.00	0.00	426.10	22500.00	435.30	0.00	435.36	8476.77	9714.00	10416.60	2.70
	9.186	1431.00	0.00	0.00	427.10	5000.00	433.37	0.00	433.42	1903.91	9909.60	10240.20	2.18
	9.186	1431.00	0.00	0.00	427.10	10000.00	434.76	0.00	434.83	3379.22	9909.60	10240.20	2.76
	9.186	1431.00	0.00	0.00	427.10	22500.00	436.51	0.00	436.62	6785.69	9909.60	10240.20	3.81
	9.436	1320.00	0.00	0.00	427.00	5000.00	434.34	0.00	434.42	1738.93	9767.10	10293.00	2.55
	9.436	1320.00	0.00	0.00	427.00	10000.00	435.96	0.00	436.06	3202.81	9767.10	10293.00	3.05
	9.436	1320.00	0.00	0.00	427.00	22500.00	437.94	0.00	438.06	6849.18	9767.10	10293.00	3.62
	9.666	1214.00	0.00	0.00	430.50	5000.00	435.67	0.00	435.74	1304.09	9905.10	10242.50	2.69
	9.666	1214.00	0.00	0.00	430.50	10000.00	437.09	0.00	437.14	3525.93	9905.10	10242.50	2.56
	9.666	1214.00	0.00	0.00	430.50	22500.00	439.03	0.00	439.08	8687.80	9905.10	10242.50	2.96
	9.884	1151.00	0.00	0.00	430.90	5000.00	437.21	0.00	437.31	1408.09	9819.30	10020.40	3.33
	9.884	1151.00	0.00	0.00	430.90	10000.00	438.31	0.00	438.46	2437.86	9819.30	10020.40	4.33
	9.884	1151.00	0.00	0.00	430.90	22500.00	440.11	0.00	440.26	5551.14	9819.30	10020.40	4.98
	9.980	507.00	0.00	0.00	431.30	5000.00	437.77	0.00	437.83	1751.08	9948.90	10108.50	2.82
	9.980	507.00	0.00	0.00	431.30	10000.00	439.03	0.00	439.12	3187.22	9948.90	10108.50	3.58
	9.980	507.00	0.00	0.00	431.30	22500.00	440.84	0.00	440.95	6818.25	9948.90	10108.50	4.44
*	9.995	79.00	0.00	0.00	431.60	5000.00	437.18	437.18	439.29	366.34	9973.00	10082.00	11.67
*	9.995	79.00	0.00	0.00	431.60	10000.00	440.66	440.66	441.48	1439.73	9973.00	10082.00	8.63
*	9.995	79.00	0.00	0.00	431.60	22500.00	441.94	441.94	442.81	2882.68	9973.00	10082.00	10.78
	9.996	1.00	439.20	442.30	431.60	5000.00	438.04	0.00	439.50	541.00	9973.00	10082.00	9.70
*	9.996	1.00	439.20	442.30	431.60	10000.00	441.66	441.66	441.98	1162.27	9973.00	10082.00	6.96
*	9.996	1.00	439.20	442.30	431.60	22500.00	442.81	442.21	443.01	3100.65	9973.00	10082.00	6.78

+ CWSEL= Water Surface Elevation (ft.)

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	.01K	STCHL	STCHR	VCH
*	10.004	49.00	439.20	442.30	431.60	5000.00	440.43	440.43	441.25	658.55	9973.00	10082.00	7.97
	10.004	49.00	439.20	442.30	431.60	10000.00	442.14	0.00	442.26	1796.50	9973.00	10082.00	4.80
	10.004	49.00	439.20	442.30	431.60	22500.00	443.10	0.00	443.24	3767.97	9973.00	10082.00	5.75
	10.005	1.00	0.00	0.00	431.60	5000.00	441.26	0.00	441.44	2885.17	9973.00	10082.00	4.08
	10.005	1.00	0.00	0.00	431.60	10000.00	442.03	0.00	442.37	4096.95	9973.00	10082.00	6.11
	10.005	1.00	0.00	0.00	431.60	22500.00	442.80	0.00	443.55	5902.83	9973.00	10082.00	10.09
	10.020	84.00	0.00	0.00	431.80	5000.00	441.50	0.00	441.50	8139.71	9849.50	10087.40	.80
	10.020	84.00	0.00	0.00	431.80	10000.00	442.47	0.00	442.48	11479.55	9849.50	10087.40	1.23
	10.020	84.00	0.00	0.00	431.80	22500.00	443.78	0.00	443.80	17048.16	9849.50	10087.40	2.04
	10.174	813.00	0.00	0.00	431.50	5000.00	441.52	0.00	441.53	9101.79	9717.10	10515.60	.60
	10.174	813.00	0.00	0.00	431.50	10000.00	442.53	0.00	442.54	12687.31	9717.10	10515.60	.95
	10.174	813.00	0.00	0.00	431.50	22500.00	443.91	0.00	443.93	18478.71	9717.10	10515.60	1.66
	10.330	824.00	0.00	0.00	431.50	5000.00	441.55	0.00	441.56	6273.71	9873.30	10122.00	1.07
	10.330	824.00	0.00	0.00	431.50	10000.00	442.59	0.00	442.61	8798.78	9873.30	10122.00	1.65
	10.330	824.00	0.00	0.00	431.50	22500.00	444.06	0.00	444.10	13258.40	9873.30	10122.00	2.71
	10.470	739.00	0.00	0.00	431.80	5000.00	441.61	0.00	441.63	4472.68	9911.40	10196.40	1.39
	10.470	739.00	0.00	0.00	431.80	10000.00	442.71	0.00	442.75	6462.86	9911.40	10196.40	2.10
	10.470	739.00	0.00	0.00	431.80	22500.00	444.30	0.00	444.39	10163.84	9911.40	10196.40	3.38
	10.668	1045.00	0.00	0.00	431.70	5000.00	441.72	0.00	441.73	5739.11	9770.30	10448.40	.96
	10.668	1045.00	0.00	0.00	431.70	10000.00	442.91	0.00	442.94	8371.76	9770.30	10448.40	1.48
	10.668	1045.00	0.00	0.00	431.70	22500.00	444.71	0.00	444.78	13305.08	9770.30	10448.40	2.43
	10.976	1626.00	0.00	0.00	433.00	5000.00	441.92	0.00	441.95	3007.88	9905.80	10033.00	1.99
	10.976	1626.00	0.00	0.00	433.00	10000.00	443.26	0.00	443.31	4935.37	9905.80	10033.00	2.73
	10.976	1626.00	0.00	0.00	433.00	22500.00	445.34	0.00	445.42	9378.32	9905.80	10033.00	3.75
	11.251	1452.00	0.00	0.00	434.00	5000.00	442.46	0.00	442.49	2191.36	9223.90	10344.90	1.43
	11.251	1452.00	0.00	0.00	434.00	10000.00	443.92	0.00	443.96	4491.52	9223.90	10344.90	1.81
	11.251	1452.00	0.00	0.00	434.00	22500.00	446.14	0.00	446.22	9858.95	9223.90	10344.90	2.51
	11.526	1452.00	0.00	0.00	437.00	5000.00	443.55	0.00	443.60	1435.37	9740.40	10249.80	2.01
	11.526	1452.00	0.00	0.00	437.00	10000.00	444.93	0.00	444.98	3069.73	9740.40	10249.80	2.43
	11.526	1452.00	0.00	0.00	437.00	22500.00	447.08	0.00	447.15	7928.90	9740.40	10249.80	2.93
	11.758	1225.00	0.00	0.00	438.90	5000.00	445.18	0.00	445.25	1295.24	9706.30	10306.00	2.53
	11.758	1225.00	0.00	0.00	438.90	10000.00	446.35	0.00	446.42	2779.97	9706.30	10306.00	2.74
	11.758	1225.00	0.00	0.00	438.90	22500.00	448.20	0.00	448.27	6895.23	9706.30	10306.00	2.97
	12.011	1336.00	0.00	0.00	439.80	5000.00	446.47	0.00	446.53	1937.19	9643.90	10395.20	2.00
	12.011	1336.00	0.00	0.00	439.80	10000.00	447.73	0.00	447.82	3415.94	9643.90	10395.20	2.55
	12.011	1336.00	0.00	0.00	439.80	22500.00	449.53	0.00	449.64	7261.33	9643.90	10395.20	3.25
	12.277	1404.00	0.00	0.00	439.20	5000.00	447.23	0.00	447.27	2414.55	9550.20	10170.30	1.75
	12.277	1404.00	0.00	0.00	439.20	10000.00	448.67	0.00	448.73	4438.88	9550.20	10170.30	2.25
	12.277	1404.00	0.00	0.00	439.20	22500.00	450.62	0.00	450.70	9140.47	9550.20	10170.30	2.83

APPENDIX A
EXISTING CONDITIONS (cont'd)

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	.01K	STCHL	STCHR	VCH
12.523	1299.00	0.00	0.00	442.60	5000.00	447.99	0.00	448.03	1719.75	9500.20	10399.80	1.86
12.523	1299.00	0.00	0.00	442.60	10000.00	449.43	0.00	449.47	3925.51	9500.20	10399.80	1.95
12.523	1299.00	0.00	0.00	442.60	22500.00	451.39	0.00	451.44	9718.05	9500.20	10399.80	2.35
12.777	1341.00	0.00	0.00	443.40	5000.00	449.60	0.00	449.67	1145.32	9479.20	10086.30	2.37
12.777	1341.00	0.00	0.00	443.40	10000.00	450.82	0.00	450.91	2211.13	9479.20	10086.30	2.91
12.777	1341.00	0.00	0.00	443.40	22500.00	452.53	0.00	452.65	5406.52	9479.20	10086.30	3.64
13.053	1457.00	0.00	0.00	445.00	5000.00	451.60	0.00	451.65	1568.91	9071.50	10122.60	2.04
13.053	1457.00	0.00	0.00	445.00	10000.00	452.92	0.00	452.99	3088.84	9071.50	10122.60	2.53
13.053	1457.00	0.00	0.00	445.00	22500.00	454.62	0.00	454.70	6603.68	9071.50	10122.60	2.67

SUMMARY PRINTOUT TABLE-2

	SECNO	CWSEL	DIFWSP	DIFEG	DIFWSX	SSTA	STENCL	TOPWID	STENCR	ENDST	QLOB	QCH	QROB
	8.915	432.38	0.00	0.00	0.00	7110.81	0.00	2374.05	0.00	12018.62	110.79	3494.23	1394.98
	8.915	433.66	1.28	1.28	0.00	7072.84	0.00	3894.23	0.00	12032.92	1318.95	5658.44	3022.61
	8.915	435.30	1.64	2.93	0.00	7013.56	0.00	4876.53	0.00	12051.29	5742.73	10307.84	6449.43
	9.186	433.37	0.00	0.00	.99	9636.50	0.00	1227.92	0.00	11651.96	528.24	2474.60	1997.16
	9.186	434.76	1.39	1.41	1.11	7877.82	0.00	2464.91	0.00	11672.77	1476.30	4359.95	4163.74
	9.186	436.51	1.74	3.20	1.21	6907.56	0.00	4057.34	0.00	12061.80	4753.66	8211.16	9535.17
	9.436	434.34	0.00	0.00	.97	9486.73	0.00	1105.05	0.00	12089.77	377.79	4079.95	542.26
	9.436	435.96	1.62	1.64	1.19	7225.63	0.00	2082.64	0.00	12104.70	814.65	6787.37	2397.98
	9.436	437.94	1.98	3.63	1.43	7214.34	0.00	4538.60	0.00	12622.29	3361.56	11641.44	7497.00
	9.666	435.67	0.00	0.00	1.33	9309.36	0.00	2822.49	0.00	12804.49	1094.99	2811.13	1093.88
	9.666	437.09	1.42	1.40	1.13	7996.26	0.00	3342.22	0.00	12870.62	.2108.04	3897.03	3994.93
	9.666	439.03	1.94	3.34	1.09	7479.80	0.00	5442.55	0.00	13504.30	5097.56	6454.57	10947.86
	9.884	437.21	0.00	0.00	1.54	8208.56	8188.70	1420.20	13000.00	12246.19	6.07	2877.01	2116.92
	9.884	438.31	1.10	1.15	1.22	8199.76	8188.70	2331.57	13000.00	12708.98	117.15	4616.08	5266.77
	9.884	440.11	1.80	2.95	1.08	8188.70	8188.70	4612.40	13000.00	13000.00	1643.28	7014.37	13842.36
	9.980	437.77	0.00	0.00	.56	9881.75	8100.00	1573.08	13000.00	12380.82	98.57	2339.63	2561.79
	9.980	439.03	1.27	1.29	.72	8480.38	8100.00	2571.92	13000.00	12412.53	401.66	3697.79	5900.54
	9.980	440.84	1.80	3.11	.73	8384.53	8100.00	4221.80	13000.00	12909.78	2682.44	5861.23	13956.33
*	9.995	437.18	0.00	0.00	-.59	9976.47	8067.00	101.68	13000.00	10078.14	0.00	5000.00	0.00
*	9.995	440.66	3.49	2.19	1.63	8464.82	8067.00	1900.12	13000.00	12749.37	2892.35	6950.10	157.55
*	9.995	441.94	1.28	3.52	1.10	8067.00	8067.00	4362.58	13000.00	13000.00	10440.19	10182.78	1877.03
	9.996	438.04	0.00	0.00	.86	9965.07	8067.00	117.33	13000.00	10082.40	0.00	5000.00	0.00
*	9.996	441.66	3.62	2.48	1.00	8097.28	8067.00	3772.48	13000.00	13000.00	5423.71	3632.09	944.19
*	9.996	442.81	1.15	3.51	.87	8067.00	8067.00	4933.00	13000.00	13000.00	11842.84	4389.32	6267.84
*	10.004	440.43	0.00	0.00	2.40	8488.87	8067.00	1807.91	13000.00	12716.38	855.08	4107.52	37.40
	10.004	442.14	1.70	1.01	.48	8067.00	8067.00	4522.36	13000.00	13000.00	5513.55	2753.55	1732.90
	10.004	443.10	.97	1.99	.29	8067.00	8067.00	4933.00	13000.00	13000.00	11579.35	3900.32	7020.33
	10.005	441.26	0.00	0.00	.82	8403.40	8067.00	2173.72	13000.00	12833.60	1341.50	3543.90	114.60
	10.005	442.03	.77	.93	-.11	8067.00	8067.00	4430.99	13000.00	13000.00	3473.11	5830.66	696.23
	10.005	442.80	.77	2.11	-.30	8067.00	8067.00	4933.00	13000.00	13000.00	8613.43	10477.71	3408.86
	10.020	441.50	0.00	0.00	.24	8484.90	8031.40	4444.91	13000.00	13000.00	457.14	1514.64	3028.22
	10.020	442.47	.98	.98	.45	8031.40	8031.40	4843.89	13000.00	13000.00	1284.09	2605.15	6110.76
	10.020	443.78	1.30	2.30	.98	8031.40	8031.40	4968.60	13000.00	13000.00	3819.29	4959.03	13721.68
	10.174	441.52	0.00	0.00	.03	8800.00	8800.00	3708.04	12520.00	12508.04	286.28	2861.94	1851.78
	10.174	442.53	1.01	1.01	.06	8800.00	8800.00	3720.00	12520.00	12520.00	808.65	5318.68	3872.66
	10.174	443.91	1.38	2.40	.13	8800.00	8800.00	3720.00	12520.00	12520.00	2354.78	11081.11	9064.11

SECNO	CWSEL	DIFWSP	DIFEG	DIFWSX	SSTA	STENCL	TOPWID	STENCR	ENDST	QLOB	QCH	QROB
10.330	441.55	0.00	0.00	.03	9022.18	8900.00	2879.84	12200.00	12024.63	696.14	2164.44	2139.42
10.330	442.59	1.04	1.05	.06	8954.55	8900.00	3245.45	12200.00	12200.00	1581.54	3766.27	4652.19
10.330	444.06	1.46	2.54	.15	8900.00	8900.00	3300.00	12200.00	12200.00	4054.94	7190.41	11254.64
10.470	441.61	0.00	0.00	.06	9488.43	9151.00	2346.30	11860.00	11860.00	63.57	2898.32	2038.12
10.470	442.71	1.10	1.12	.11	9427.61	9151.00	2432.39	11860.00	11860.00	350.61	5058.45	4590.94
10.470	444.30	1.59	2.76	.24	9378.87	9151.00	2481.13	11860.00	11860.00	1474.58	9655.28	11370.15
10.668	441.72	0.00	0.00	.11	9580.64	8585.30	2069.35	11650.00	11650.00	210.21	3973.59	816.19
10.668	442.91	1.19	1.21	.20	8585.30	8585.30	2239.46	11650.00	11650.00	489.64	7338.59	2171.77
10.668	444.71	1.80	3.05	.41	8585.30	8585.30	2317.03	11650.00	11650.00	1437.16	15000.35	6062.49
10.976	441.92	0.00	0.00	.20	8604.73	8051.90	1753.89	10950.00	10838.89	3120.40	1786.10	93.50
10.976	443.26	1.34	1.36	.35	8360.00	8051.90	2492.00	10950.00	10950.00	6360.43	2912.80	726.77
10.976	445.34	2.08	3.47	.63	8216.65	8051.90	2733.34	10950.00	10950.00	14069.52	4987.44	3443.04
11.251	442.46	0.00	0.00	.54	8047.18	7490.80	1516.05	10440.00	10281.53	1090.43	3909.57	0.00
11.251	443.92	1.46	1.48	.66	8036.02	7490.80	1932.49	10440.00	10421.67	2141.09	7846.92	11.99
11.251	446.14	2.21	3.73	.79	8005.75	7490.80	2434.25	10440.00	10440.00	5197.31	17108.62	194.07
11.526	443.55	0.00	0.00	1.09	7821.00	7821.00	1519.73	11344.00	10794.91	656.37	2132.28	2211.35
11.526	444.93	1.38	1.39	1.01	7821.00	7821.00	2918.74	11344.00	10915.76	2067.98	4227.90	3704.12
11.526	447.08	2.15	3.55	.94	7821.00	7821.00	3382.07	11344.00	11344.00	7593.67	8304.91	6601.42
11.758	445.18	0.00	0.00	1.63	7754.49	7670.00	2087.49	11445.00	11335.79	339.89	2975.67	1684.44
11.758	446.35	1.17	1.17	1.42	7706.20	7670.00	3265.27	11445.00	11368.46	1861.09	4759.89	3379.02
11.758	448.20	1.85	3.03	1.13	7670.00	7670.00	3687.16	11445.00	11421.98	7296.70	8060.67	7142.63
12.011	446.47	0.00	0.00	1.29	7386.61	7305.00	1407.33	11852.00	11134.26	18.63	4351.25	630.13
12.011	447.73	1.27	1.29	1.38	7342.34	7305.00	2418.94	11852.00	11147.77	516.73	7616.15	1867.12
12.011	449.53	1.79	3.11	1.32	7305.00	7305.00	4147.90	11852.00	11624.58	3834.34	13885.03	4780.63
12.277	447.23	0.00	0.00	.76	7936.26	7390.00	1603.95	11902.00	11528.44	47.46	3742.20	1210.34
12.277	448.67	1.44	1.46	.94	7662.85	7390.00	2853.44	11902.00	11819.18	368.58	6509.29	3122.13
12.277	450.62	1.95	3.43	1.10	7390.00	7390.00	4369.69	11902.00	11870.30	2813.02	11467.94	8219.04
12.523	447.99	0.00	0.00	.76	7839.43	0.00	2018.25	0.00	11656.71	2.54	3557.65	1439.81
12.523	449.43	1.44	1.44	.76	7595.15	0.00	3269.83	0.00	11938.96	321.14	6090.22	3588.64
12.523	451.39	1.95	3.41	.76	7121.13	0.00	4800.37	0.00	11977.45	2974.60	11475.42	8049.98
12.777	449.60	0.00	0.00	1.62	9545.57	0.00	1117.81	0.00	12015.63	0.00	2279.00	2721.00
12.777	450.82	1.22	1.24	1.39	7859.29	0.00	2425.09	0.00	12086.99	68.93	4635.07	5296.00
12.777	452.53	1.71	2.97	1.14	7790.78	0.00	3956.91	0.00	12128.16	1542.02	9539.22	11418.75
13.053	451.60	0.00	0.00	2.00	7744.44	0.00	1454.86	0.00	11454.39	44.95	2929.27	2025.78
13.053	452.92	1.32	1.34	2.10	7732.83	0.00	2745.51	0.00	11596.53	652.81	5459.17	3888.02
13.053	454.62	1.70	3.04	2.10	7671.76	0.00	4008.80	0.00	11727.46	3760.17	10291.52	8448.31

****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

APPENDIX B
BRIDGE DESIGN

SUMMARY PRINTOUT TABLE-1

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q(cfs)	CWSEL+	CRIWS	EG	.01K	STCHL	STCHR	VCH
8.915	0.00	0.00	0.00	426.10	5000.00	432.38	0.00	432.42	1892.80	9714.00	10416.60	1.89
8.915	0.00	0.00	0.00	426.10	10000.00	433.66	0.00	433.70	3770.06	9714.00	10416.60	2.13
8.915	0.00	0.00	0.00	426.10	22500.00	435.30	0.00	435.36	8476.77	9714.00	10416.60	2.70
9.186	1431.00	0.00	0.00	427.10	5000.00	433.37	0.00	433.42	1903.91	9909.60	10240.20	2.18
9.186	1431.00	0.00	0.00	427.10	10000.00	434.76	0.00	434.83	3379.22	9909.60	10240.20	2.76
9.186	1431.00	0.00	0.00	427.10	22500.00	436.51	0.00	436.62	6785.69	9909.60	10240.20	3.81
9.436	1320.00	0.00	0.00	427.00	5000.00	434.38	0.00	434.48	1642.19	9767.10	10293.00	2.72
9.436	1320.00	0.00	0.00	427.00	10000.00	436.08	0.00	436.24	2793.63	9767.10	10293.00	3.50
9.436	1320.00	0.00	0.00	427.00	22500.00	437.94	0.00	438.06	6849.18	9767.10	10293.00	3.62
9.666	1214.00	0.00	0.00	430.50	5000.00	435.86	0.00	435.96	1230.32	9905.10	10242.50	2.96
9.666	1214.00	0.00	0.00	430.50	10000.00	437.64	0.00	437.76	2869.85	9905.10	10242.50	3.39
9.666	1214.00	0.00	0.00	430.50	22500.00	439.03	0.00	439.08	8687.80	9905.10	10242.50	2.96
9.884	1151.00	0.00	0.00	430.90	5000.00	437.66	0.00	437.85	1252.52	9819.30	10020.40	3.94
9.884	1151.00	0.00	0.00	430.90	10000.00	439.33	0.00	439.67	2130.90	9819.30	10020.40	5.43
9.884	1151.00	0.00	0.00	430.90	22500.00	440.11	0.00	440.26	5551.14	9819.30	10020.40	4.98
9.980	507.00	0.00	0.00	431.30	5000.00	438.46	0.00	438.73	1206.69	9948.90	10108.50	4.45
9.980	507.00	0.00	0.00	431.30	10000.00	440.40	0.00	440.92	2050.52	9948.90	10108.50	6.33
9.980	507.00	0.00	0.00	431.30	22500.00	440.84	0.00	440.95	6818.25	9948.90	10108.50	4.44
9.995	79.00	0.00	0.00	431.60	5000.00	438.63	0.00	438.85	1552.02	9890.00	10110.00	3.71
9.995	79.00	0.00	0.00	431.60	10000.00	440.58	0.00	441.08	2342.42	9890.00	10110.00	5.71
9.995	79.00	0.00	0.00	431.60	22500.00	439.35	439.24	442.86	1826.52	9890.00	10110.00	15.04
10.004	50.00	442.50	443.50	431.60	5000.00	438.68	0.00	438.89	2015.92	9890.00	10110.00	3.68
10.004	50.00	442.50	443.50	431.60	10000.00	440.66	0.00	441.15	3054.17	9890.00	10110.00	5.66
10.004	50.00	442.50	443.50	431.60	22500.00	441.64	439.26	443.65	3635.68	9890.00	10110.00	11.38

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	.01K	STCHL	STCHR	VCH
10.020	84.00	0.00	0.00	431.80	5000.00	438.77	0.00	438.96	1394.70	9849.50	10087.40	3.65
10.020	84.00	0.00	0.00	431.80	10000.00	440.98	0.00	441.31	2554.83	9849.50	10087.40	4.90
10.020	84.00	0.00	0.00	431.80	22500.00	444.27	0.00	444.28	19410.42	9849.50	10087.40	1.85
10.174	813.00	0.00	0.00	431.50	5000.00	439.44	0.00	439.48	2653.02	9717.10	10515.60	1.57
10.174	813.00	0.00	0.00	431.50	10000.00	441.70	0.00	441.74	6443.41	9717.10	10515.60	1.72
10.174	813.00	0.00	0.00	431.50	22500.00	444.37	0.00	444.39	20608.04	9717.10	10515.60	1.54
10.330	824.00	0.00	0.00	431.50	5000.00	439.70	0.00	439.73	3056.38	9873.30	10122.00	1.84

+ CWSEL= Water Surface Elevation (ft.)

10.330	824.00	0.00	0.00	431.50	10000.00	441.90	0.00	441.93	6964.74	9873.30	10122.00	1.97
10.330	824.00	0.00	0.00	431.50	22500.00	444.49	0.00	444.53	14747.57	9873.30	10122.00	2.50
10.470	739.00	0.00	0.00	431.80	5000.00	439.93	0.00	439.99	2365.83	9911.40	10196.40	2.21
10.470	739.00	0.00	0.00	431.80	10000.00	442.08	0.00	442.13	5240.25	9911.40	10196.40	2.46
10.470	739.00	0.00	0.00	431.80	22500.00	444.68	0.00	444.76	11182.46	9911.40	10196.40	3.15
10.668	1045.00	0.00	0.00	431.70	5000.00	440.29	0.00	440.31	3322.55	9770.30	10448.40	1.39
10.668	1045.00	0.00	0.00	431.70	10000.00	442.37	0.00	442.41	7134.23	9770.30	10448.40	1.65
10.668	1045.00	0.00	0.00	431.70	22500.00	445.03	0.00	445.09	14282.66	9770.30	10448.40	2.32
10.976	1626.00	0.00	0.00	433.00	5000.00	440.85	0.00	440.91	1940.51	9905.80	10033.00	2.77
10.976	1626.00	0.00	0.00	433.00	10000.00	442.86	0.00	442.92	4264.16	9905.80	10033.00	3.06
10.976	1626.00	0.00	0.00	433.00	22500.00	445.58	0.00	445.65	9997.07	9905.80	10033.00	3.57
11.251	1452.00	0.00	0.00	434.00	5000.00	441.99	0.00	442.03	1656.36	9223.90	10344.90	1.71
11.251	1452.00	0.00	0.00	434.00	10000.00	443.70	0.00	443.75	4078.91	9223.90	10344.90	1.92
11.251	1452.00	0.00	0.00	434.00	22500.00	446.29	0.00	446.36	10310.96	9223.90	10344.90	2.44
11.526	1452.00	0.00	0.00	437.00	5000.00	443.53	0.00	443.57	1417.01	9740.40	10249.80	2.03
11.526	1452.00	0.00	0.00	437.00	10000.00	444.86	0.00	444.92	2966.99	9740.40	10249.80	2.48
11.526	1452.00	0.00	0.00	437.00	22500.00	447.16	0.00	447.23	8167.16	9740.40	10249.80	2.87
11.758	1225.00	0.00	0.00	438.90	5000.00	445.18	0.00	445.25	1295.33	9706.30	10306.00	2.53
11.758	1225.00	0.00	0.00	438.90	10000.00	446.35	0.00	446.41	2771.91	9706.30	10306.00	2.75
11.758	1225.00	0.00	0.00	438.90	22500.00	448.24	0.00	448.31	6986.89	9706.30	10306.00	2.93
12.011	1336.00	0.00	0.00	439.80	5000.00	446.47	0.00	446.53	1937.38	9643.90	10395.20	2.00
12.011	1336.00	0.00	0.00	439.80	10000.00	447.73	0.00	447.82	3413.64	9643.90	10395.20	2.56
12.011	1336.00	0.00	0.00	439.80	22500.00	449.54	0.00	449.65	7290.07	9643.90	10395.20	3.24
12.277	1404.00	0.00	0.00	439.20	5000.00	447.23	0.00	447.27	2414.69	9550.20	10170.30	1.75
12.277	1404.00	0.00	0.00	439.20	10000.00	448.67	0.00	448.73	4438.65	9550.20	10170.30	2.25
12.277	1404.00	0.00	0.00	439.20	22500.00	450.63	0.00	450.70	9155.01	9550.20	10170.30	2.83
12.523	1299.00	0.00	0.00	442.60	5000.00	447.99	0.00	448.03	1719.73	9500.20	10399.80	1.86
12.523	1299.00	0.00	0.00	442.60	10000.00	449.43	0.00	449.47	3925.46	9500.20	10399.80	1.95
12.523	1299.00	0.00	0.00	442.60	22500.00	451.39	0.00	451.44	9726.20	9500.20	10399.80	2.35
12.777	1341.00	0.00	0.00	443.40	5000.00	449.60	0.00	449.67	1145.34	9479.20	10086.30	2.37
12.777	1341.00	0.00	0.00	443.40	10000.00	450.82	0.00	450.91	2211.13	9479.20	10086.30	2.91
12.777	1341.00	0.00	0.00	443.40	22500.00	452.53	0.00	452.65	5408.16	9479.20	10086.30	3.64

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	.01K	STCHL	STCHR	VCH
13.053	1457.00	0.00	0.00	445.00	5000.00	451.60	0.00	451.65	1568.94	9071.50	10122.60	2.04
13.053	1457.00	0.00	0.00	445.00	10000.00	452.92	0.00	452.99	3088.84	9071.50	10122.60	2.53
13.053	1457.00	0.00	0.00	445.00	22500.00	454.62	0.00	454.70	6603.68	9071.50	10122.60	2.67

SUMMARY PRINTOUT TABLE-2

SECNO	CWSEL	DIFWSP	DIFEG	DIFWSX	SSTA	STENCL	TOPWID	STENCR	ENDST	QLOB	QCH	QROB
8.915	432.38	0.00	0.00	0.00	7110.81	0.00	2374.05	0.00	12018.62	110.79	3494.23	1394.98
8.915	433.66	1.28	1.28	0.00	7072.84	0.00	3894.23	0.00	12032.92	1318.95	5658.44	3022.61
8.915	435.30	1.64	2.93	0.00	7013.56	0.00	4876.53	0.00	12051.29	5742.73	10307.84	6449.43
9.186	433.37	0.00	0.00	.99	9636.50	0.00	1227.92	0.00	11651.96	528.24	2474.60	1997.16
9.186	434.76	1.39	1.41	1.11	7877.82	0.00	2464.91	0.00	11672.77	1476.30	4359.95	4163.74
9.186	436.51	1.74	3.20	1.21	6907.56	0.00	4057.34	0.00	12061.80	4753.66	8211.16	9535.17
9.436	434.38	0.00	0.00	1.01	9486.30	7209.00	682.68	10775.00	10532.15	406.60	4386.60	206.80
9.436	436.08	1.70	1.76	1.32	7224.89	7209.00	1335.35	10775.00	10611.95	1007.84	7994.51	997.66
9.436	437.94	1.85	3.57	1.43	7214.34	0.00	4538.60	0.00	12622.29	3361.56	11641.44	7497.00
9.666	435.86	0.00	0.00	1.48	9307.53	8250.00	1059.10	10500.00	10366.63	1357.80	3284.39	357.80
9.666	437.64	1.78	1.80	1.56	8986.29	8250.00	1155.74	10500.00	10393.01	3384.22	5805.20	810.59
9.666	439.03	1.39	3.12	1.09	7479.80	0.00	5442.55	0.00	13504.30	5097.56	6454.57	10947.86
9.884	437.66	0.00	0.00	1.80	9838.29	9685.00	482.14	10565.00	10320.42	0.00	3730.37	1269.63
9.884	439.33	1.67	1.82	1.69	9829.59	9685.00	519.26	10565.00	10488.75	0.00	6822.80	3177.20
9.884	440.11	.78	2.41	1.08	8188.70	8188.70	4612.40	13000.00	13000.00	1643.28	7014.37	13842.36
9.980	438.46	0.00	0.00	.80	9895.00	9895.00	315.00	10210.00	10210.00	229.82	4185.90	584.28
9.980	440.40	1.94	2.19	1.07	9895.00	9895.00	315.00	10210.00	10210.00	632.30	7912.18	1455.52
9.980	440.84	.44	2.22	.73	8384.53	8100.00	4221.80	13000.00	12909.78	2682.44	5861.23	13956.33
9.995	438.63	0.00	0.00	.17	9898.18	9890.00	203.64	10110.00	10101.82	0.00	5000.00	0.00
9.995	440.58	1.94	2.24	.18	9894.91	9890.00	210.19	10110.00	10105.09	0.00	10000.00	0.00
9.995	439.35	-1.23	4.02	-1.49	9896.98	8067.00	206.04	13000.00	10103.02	0.00	22500.00	0.00
10.004	438.68	0.00	0.00	.04	9898.11	9890.00	203.78	10110.00	10101.89	0.00	5000.00	0.00
10.004	440.66	1.98	2.27	.08	9894.78	9890.00	210.44	10110.00	10105.22	0.00	10000.00	0.00
10.004	441.64	.98	4.77	2.29	9893.13	8067.00	213.75	13000.00	10106.88	0.00	22500.00	0.00
10.020	438.77	0.00	0.00	.10	9859.23	9815.00	365.77	10225.00	10225.00	0.00	4531.63	468.37
10.020	440.98	2.21	2.35	.32	9815.00	9815.00	410.00	10225.00	10225.00	23.86	8615.38	1360.75
10.020	444.27	3.28	5.32	2.62	8031.40	8031.40	4968.60	13000.00	13000.00	4104.39	4706.69	13688.92
10.174	439.44	0.00	0.00	.66	9008.65	8800.00	1329.92	10930.00	10930.00	31.74	4914.99	53.27
10.174	441.70	2.26	2.26	.72	8800.00	8800.00	2130.00	10930.00	10930.00	928.69	8483.60	587.70
10.174	444.37	2.66	4.91	.10	8800.00	8800.00	3720.00	12520.00	12520.00	2494.56	10853.91	9151.54
10.330	439.70	0.00	0.00	.26	9266.59	8900.00	1962.28	11685.00	11685.00	621.40	2890.34	1488.26
10.330	441.90	2.20	2.20	.19	9016.14	8900.00	2668.85	11685.00	11685.00	1475.99	4176.53	4347.48
10.330	444.49	2.59	4.80	.12	8900.00	8900.00	3300.00	12200.00	12200.00	4177.21	6904.22	11418.57
10.470	439.93	0.00	0.00	.24	9735.13	9151.00	1517.23	11860.00	11561.97	.69	3563.68	1435.62
10.470	442.08	2.14	2.14	.18	9463.10	9151.00	2396.00	11860.00	11860.00	217.05	5470.59	4312.36
10.470	444.68	2.61	4.77	.20	9151.00	9151.00	2553.09	11860.00	11860.00	1615.58	9341.33	11543.09

SECNO	CWSEL	DIFWSP	DIFEG	DIFWSX	SSTA	STENCL	TOPWID	STENCR	ENDST	QLOB	QCH	QROB
10.668	440.29	0.00	0.00	.36	9598.78	8585.30	1793.88	11650.00	11650.00	163.87	4423.46	412.68
10.668	442.37	2.09	2.09	.30	9429.57	8585.30	2156.33	11650.00	11650.00	455.59	7590.28	1954.13

10.668	445.03	2.65	4.77	.35	8585.30	8585.30	2348.29	11650.00	11650.00	1495.24	14791.22	6213.54
10.976	440.85	0.00	0.00	.56	8613.99	8051.90	1292.77	10950.00	10758.89	2886.96	2099.00	14.04
10.976	442.86	2.00	2.00	.48	8363.48	8051.90	2372.82	10950.00	10915.53	6365.90	3101.44	532.66
10.976	445.58	2.73	4.74	.55	8203.44	8051.90	2746.56	10950.00	10950.00	14047.71	4858.93	3593.36
11.251	441.99	0.00	0.00	1.14	8049.96	7490.80	1408.36	10440.00	10251.06	1133.49	3866.51	0.00
11.251	443.70	1.71	1.72	.85	8039.03	7490.80	1902.90	10440.00	10418.09	2134.67	7838.76	6.57
11.251	446.29	2.59	4.33	.71	8003.66	7490.80	2436.34	10440.00	10440.00	5244.76	17051.02	204.23
11.526	443.53	0.00	0.00	1.53	7821.00	7821.00	1479.29	11344.00	10793.99	654.05	2131.25	2214.70
11.526	444.86	1.34	1.35	1.16	7821.00	7821.00	2893.09	11344.00	10911.29	2020.04	4240.08	3739.88
11.526	447.16	2.29	3.65	.87	7821.00	7821.00	3401.02	11344.00	11344.00	7667.71	8264.36	6567.93
11.758	445.18	0.00	0.00	1.65	7754.47	7670.00	2087.58	11445.00	11335.79	339.94	2975.61	1684.45
11.758	446.35	1.17	1.17	1.48	7706.31	7670.00	3263.17	11445.00	11368.32	1856.34	4763.68	3379.97
11.758	448.24	1.89	3.06	1.08	7670.00	7670.00	3699.53	11445.00	11422.96	7334.33	8027.91	7137.77
12.011	446.47	0.00	0.00	1.29	7386.60	7305.00	1407.48	11852.00	11134.26	18.64	4351.19	630.18
12.011	447.73	1.26	1.29	1.39	7342.39	7305.00	2417.91	11852.00	11147.75	515.91	7617.37	1866.72
12.011	449.54	1.80	3.12	1.30	7305.00	7305.00	4155.98	11852.00	11626.40	3849.88	13867.49	4782.63
12.277	447.23	0.00	0.00	.76	7936.25	7390.00	1604.11	11902.00	11528.44	47.47	3742.16	1210.37
12.277	448.67	1.44	1.46	.94	7662.85	7390.00	2853.27	11902.00	11819.18	368.54	6509.40	3122.06
12.277	450.63	1.95	3.43	1.09	7390.00	7390.00	4371.18	11902.00	11870.37	2817.92	11462.54	8219.53
12.523	447.99	0.00	0.00	.76	7839.43	0.00	2018.24	0.00	11656.71	2.54	3557.66	1439.80
12.523	449.43	1.44	1.44	.76	7595.16	0.00	3269.81	0.00	11938.96	321.14	6090.23	3588.64
12.523	451.39	1.96	3.41	.76	7121.07	0.00	4801.11	0.00	11977.58	2977.18	11473.31	8049.50
12.777	449.60	0.00	0.00	1.62	9545.57	0.00	1117.83	0.00	12015.63	0.00	2279.01	2720.99
12.777	450.82	1.22	1.24	1.39	7859.29	0.00	2425.09	0.00	12086.99	68.93	4635.07	5296.00
12.777	452.53	1.71	2.98	1.14	7790.77	0.00	3957.17	0.00	12128.18	1542.72	9538.71	11418.56
13.053	451.60	0.00	0.00	2.00	7744.44	0.00	1454.87	0.00	11454.39	44.95	2929.27	2025.77
13.053	452.92	1.32	1.34	2.10	7732.83	0.00	2745.44	0.00	11596.53	652.78	5459.25	3887.96
13.053	454.62	1.70	3.05	2.10	7671.76	0.00	4008.80	0.00	11727.46	3760.17	10291.52	8448.31

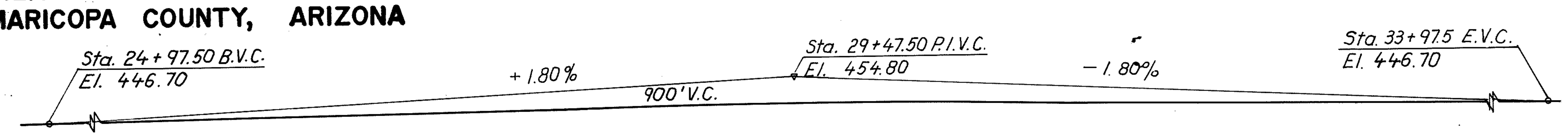
SUMMARY OF ERRORS AND SPECIAL NOTES


```
*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
  ERROR CORR -  01,02,03,04,05
  MODIFICATION -  50,51,52,53,54,55
*****************************************************
```

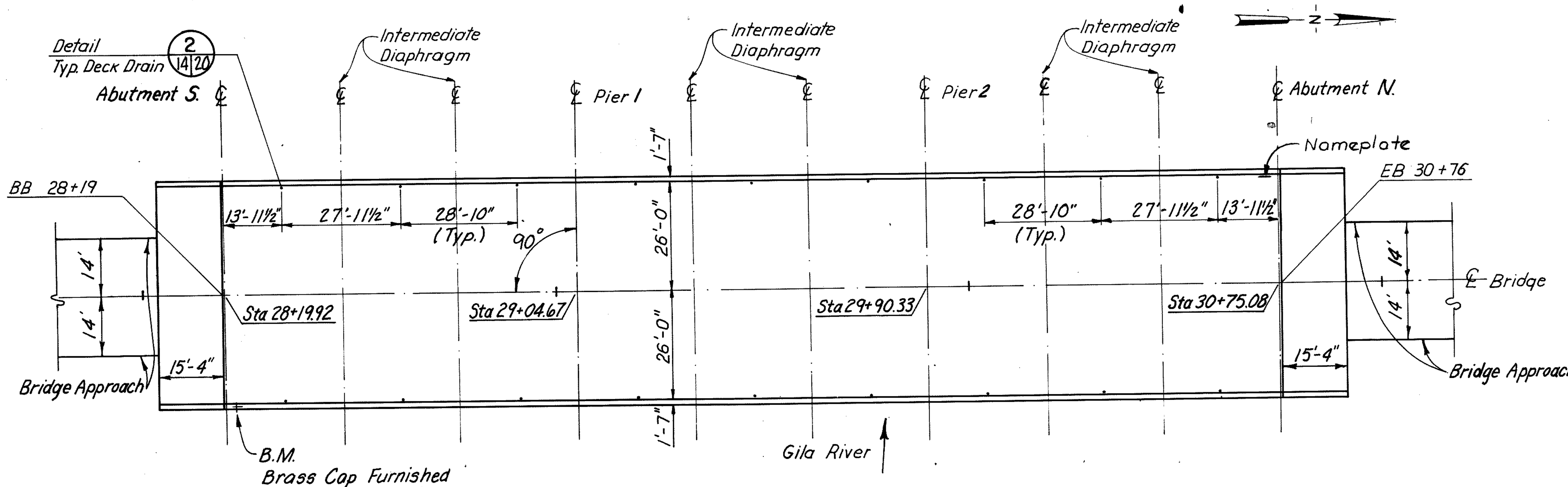
AGUA CALIENTE ROAD BRIDGE
GILA RIVER
MARICOPA COUNTY, ARIZONA

F.H.W.A REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	68246	14	34	

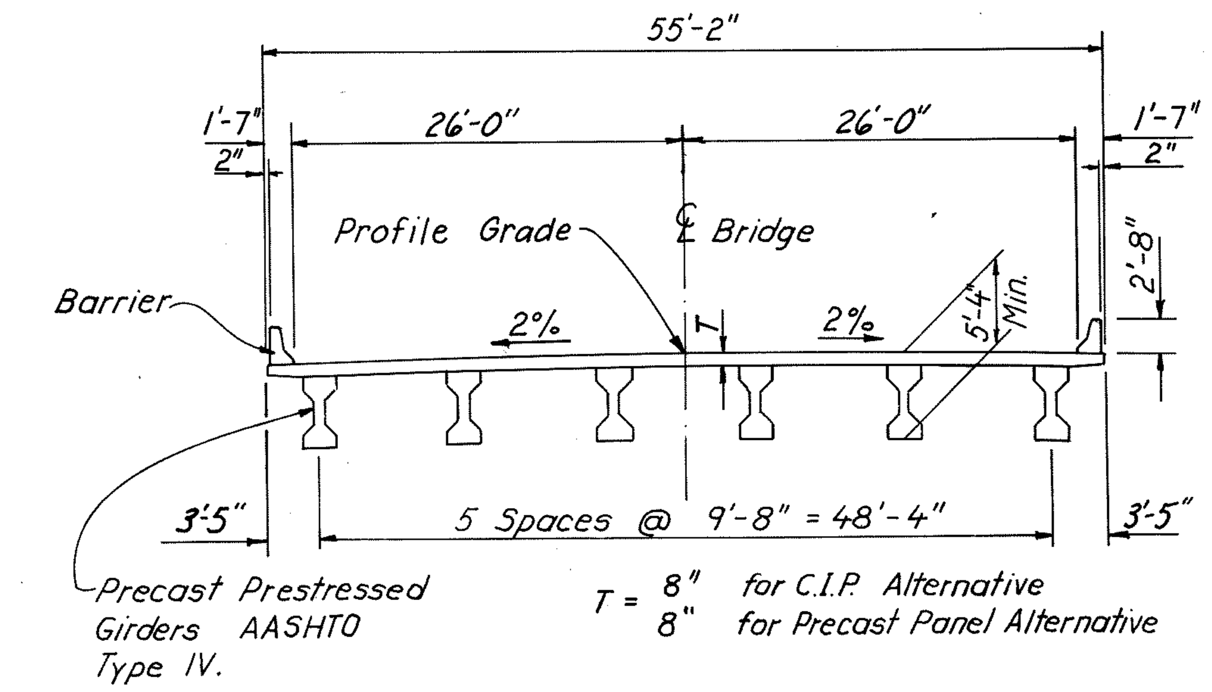
A-N WEST, INC.
2/24/87 — Lawrence L Tysiac
DATE — FOR THE CONSULTING ENGINEER
DESIGN: T.M.P. DRAWN: K.T.M. CHECKED: L.L.T.



PROFILE GRADE AT ℄ BRIDGE
N.T.S.



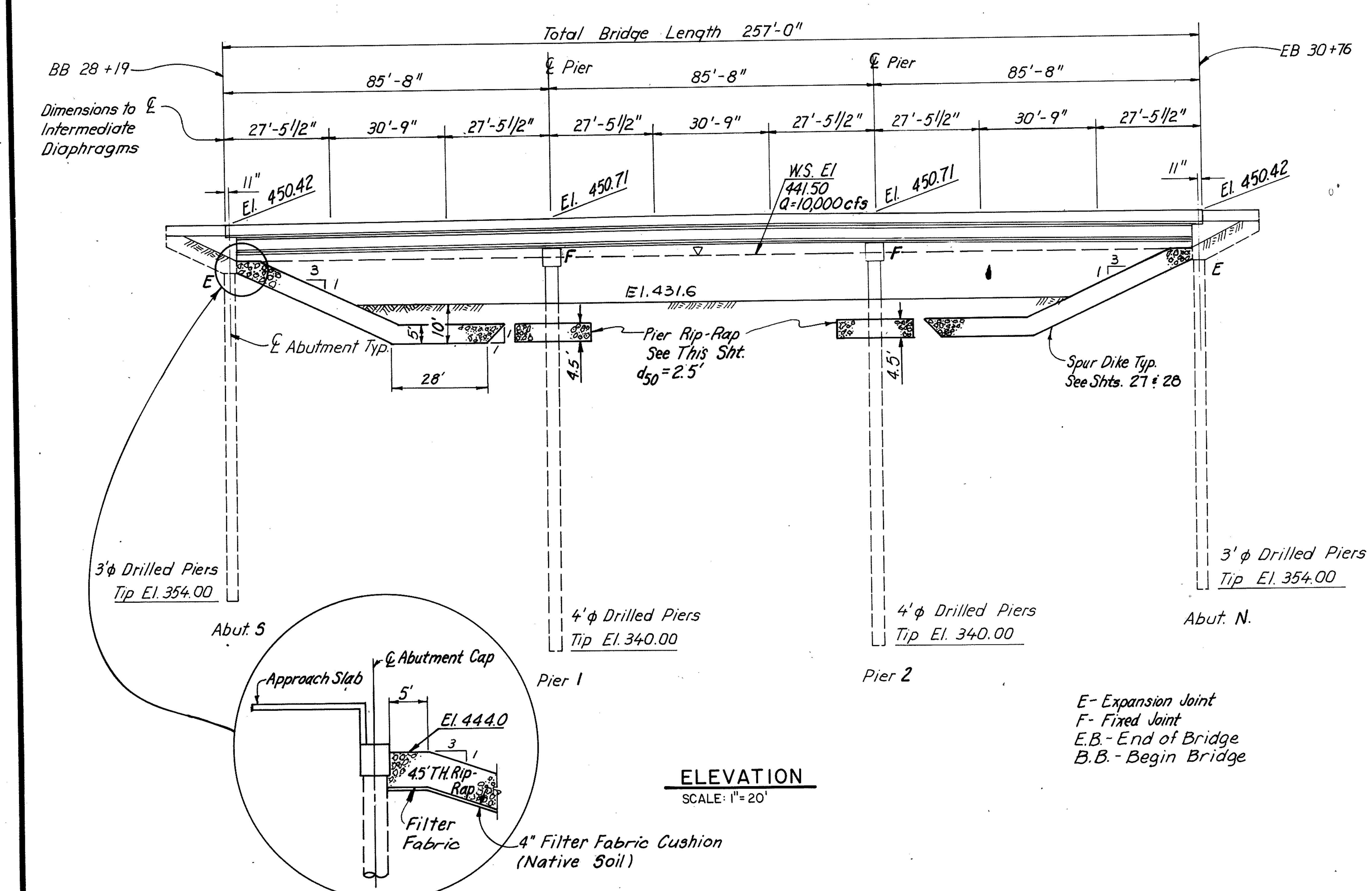
PLAN
SCALE: 1"=20'



TYPICAL SECTION
SCALE: 1"=10'

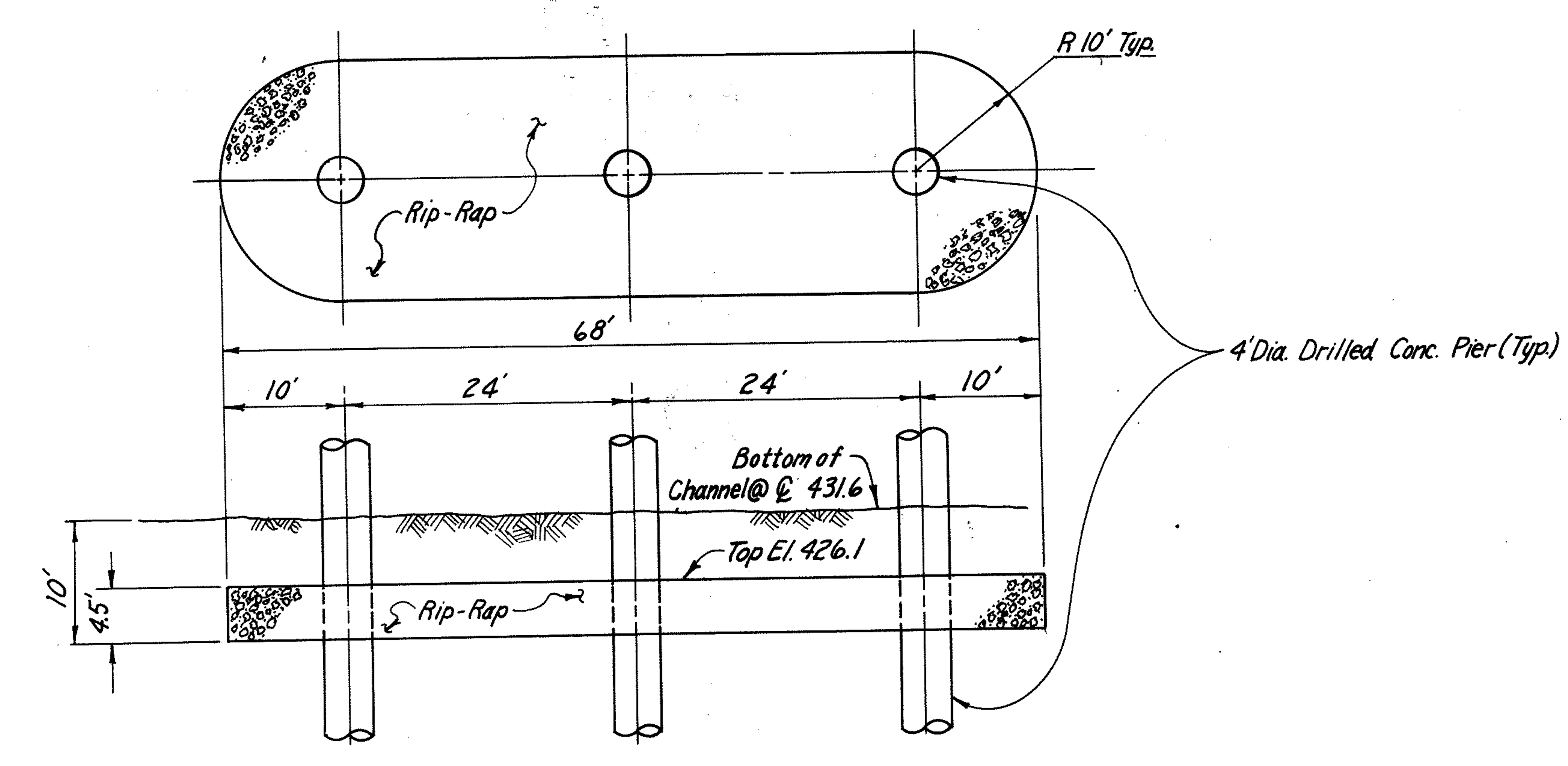
GENERAL NOTES

1. CONSTRUCTION SHALL BE IN ACCORDANCE WITH MAG UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORK CONSTRUCTION, 1979 EDITION, REVISED TO DATE.
2. DESIGN CONFORMS TO AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 1983 EDITION, REVISED TO DATE.
3. SOILS REPORT: "GEOTECHNICAL INVESTIGATION REPORT, AGUA CALIENTE ROAD BRIDGE OVER GILA RIVER, AGUA CALIENTS, ARIZONA," BY SERGENT, HAUSKINS, AND BECKWITH CONSULTING GEOTECHNICAL ENGINEERS; JOB NO. E85-128, DATED JANUARY 29, 1986.
4. HIGHWAY LOADING CLASS = HS 20-44 + ALLOWANCE FOR FUTURE WS.
5. CONCRETE: CLASS AA, f'c = 4,000 PSI; CLASS A, f'c = 3,000 PSI.
6. REINFORCING STEEL: A615, GRADE 60, f_s = 24,000 PSI.
7. LAP SPLICE LENGTHS FOR REINFORCING STEEL NOT DIMENSIONED SHALL BE 45 DIAMETERS OF SMALL BAR LAPPED.
8. ALL HOOKS FOR REINFORCING STEEL SHALL BE ACI STANDARD HOOKS UNLESS OTHERWISE NOTED.
9. DIMENSIONS SHALL NOT BE SCALED FROM DRAWINGS.
10. ALL EXPOSED CORNERS SHALL BE CHAMFERED 3/4" UNLESS OTHERWISE NOTED.
11. THE DESIGN DOWNWARD LOAD FOR THE DRILLED PIER SHAFTS IS 700 KIPS/SHAFT. FOR THE ABUTMENT SHAFTS THE DESIGN DOWNWARD LOAD IS 440 KIPS/SHAFT.



ELEVATION
SCALE: 1"=20'

E - Expansion Joint
F - Fixed Joint
E.B. - End of Bridge
B.B. - Begin Bridge



TYPICAL PIER RIP-RAP
SCALE: 1"=10'

AGUA CALIENTE ROAD BRIDGE
GENERAL BRIDGE PLAN

DESIGN T.M.P.	SCALE	JOB NO.	DATE	SHEET
DRAWN K.T.M.	HORZ. As Shown	4350-02	2/20/87	14 OF 34
CHECK L.L.T.	VERT.			

AN WEST INC.
Consulting Engineers
PHOENIX, ARIZONA

1. REMOVE 2 - 48" X 40' CMP AT STA. 28+00.
2. FROM STA. 28+84 TO STA. 29+46.5 REMOVE 10 - 54" DIAMETER CMP. TOTAL LINEAR FOOTAGE = 370'.
3. REMOVE 2 - 72" DIAMETER CMP AT STA. 29+60 AND STA. 29+85. TOTAL LINEAR FOOTAGE = 90'.
4. REMOVE 3 - 54" DIAMETER CMP AT STA 29+72, STA 29+96, AND STA. 30+07. TOTAL LINEAR FOOTAGE = 116'.
5. REMOVE 1 - 60" X 38' CMP AT STA. 30+18.
6. FROM STA. 31+49 TO STA. 32+00, REMOVE 4 - 48" DIAMETER CMP TOTAL LINEAR FOOTAGE = 168'.

DITCH LOCATION DATA

STATION	OFFSET
24+00	40.9' Rt.
25+00	42.2' Rt.
26+00	49.8' Rt.
27+00	56.2' Rt.

EARTHWORK (THIS SHEET)

EXC.	17 cy
EMB.	21,865 cy
GR. COMP.	741 cy
SHR.	5,650 cy

AGUA CALIENTE ROAD BRIDGE
ROADWAY PLANS

DESIGN	SCALE	JOB NO.	DATE	SHEET
DESIGN R.G.M.	HORZ. 1" = 40'	4350-02	9-23-86	6 OF 34
DRAWN K.T.M.	VERT. 1" = 4'			
CHECK L.L.T.				

AN WEST INC. Consulting Engineers
PHOENIX, ARIZONA

SPUR DIKE LAYOUT DATA

NORTHWEST & SOUTHWEST

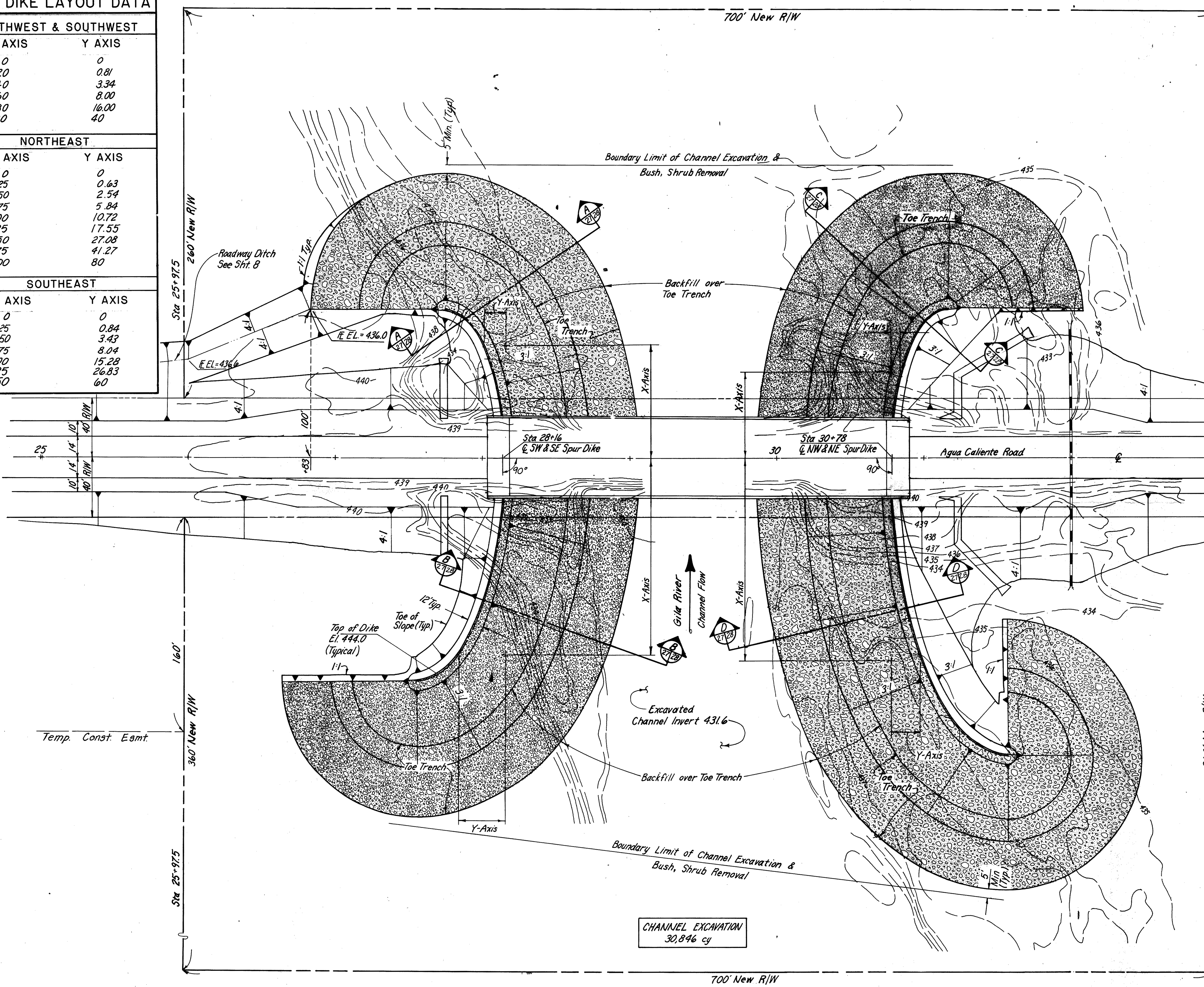
X AXIS	Y AXIS
0	0
20	0.81
40	3.34
60	8.00
80	16.00
100	40

NORTHEAST

X AXIS	Y AXIS
0	0
25	0.63
50	2.54
75	5.84
100	10.72
125	17.55
150	27.08
175	41.27
200	80

SOUTHEAST

X AXIS	Y AXIS
0	0
25	0.84
50	3.43
75	8.04
100	15.28
125	26.83
150	60



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	68246	27	34	

A-N WEST INC.
2/24/87 — Lawrence L. Lysiac
DATE — FOR THE CONSULTING ENGINEER
DESIGN: T.M.P. DRAWN: K.T.M. CHECKED: L.L.T.

Registered Professional Engineer — Certificate No. 13925 — Lawrence L. Lysiac — 2/24/87 — Arizona, U.S.A.

Two working days before you dig CALL FOR THE BLUE STAKES 263-1100 Blue Stake Center CALL COLLECT

AGUA CALIENTE ROAD BRIDGE
SPUR DIKE LAYOUT

DESIGN T.M.P. / DRAWN K.T.M. / CHECK L.L.T.	SCALE HORZ. 1"=30' VERT.	JOB NO. 4350-02	DATE 2/20/87	SHEET 27 OF 34

AN WEST INC. Consulting Engineers — PHOENIX, ARIZONA

AGUA CALIENTE BRIDGE HYDRAULIC ANALYSIS
EXISTING CONDITION FLOODPLAIN MAP

DESIGN GAS	SCALE	JOB NO	DATE	
DRAWN PSC	HORZ 400	4350-02		EXHIBIT I
CHECK CJL	VERT —			

AN WEST INC.
Consulting Engineers
PHOENIX, ARIZONA