2003P053

FINAL DRAINAGE REPORT FOR THE PECOS ROAD BRIDGE

May 22, 2003

WOOD/PATEL

FINAL DRAINAGE REPORT
FOR THE
PECOS ROAD BRIDGE

May 22, 2003

WP #021734

DRAFT

Prepared for:

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1.0 EXECUTIVE SUMMARY

The Town of Gilbert proposes to extend Pecos Road as a major arterial roadway along a section line alignment to provide an important east-west transportation link between Higley Road and Power Road. Construction of this extension will require crossings of both the Roosevelt Water Conservation District (RWCD) canal and the East Maricopa Floodway (EMF) and will involve the construction of a post-tensioned box-girder bridge over the EMF and a two-cell box culvert across the RWCD canal. Pecos Road currently terminates east of Recker Road approximately 1/8 mile west of the RWCD and EMF western right-of-way. The project will include the design of Pecos Road from Recker Road to the bridge crossing and will be coordinated with the design and construction of Pecos Road east of the EMF.

The north half of Pecos Road currently terminates east of Recker Road in front of the Higley High School. The south half of Pecos Road has not been constructed and is included in this design. The project will also include the design of the approach roadway to tie in to the existing north half of the roadway west of the bridge crossing and will be coordinated with the design and construction of the Power Ranch portion of Pecos Road east of the EMF.

The 100-year design discharge for the EMF was obtained from the Flood Control District of Maricopa County (District) and will be the original (NRCS) design discharge of 6,900 cfs. Required freeboard will be one (1) foot below the bridge soffit. The RWCD canal currently carries 375 cfs, which is adequate to meet current demand; however, the future water rights needs may necessitate an increase to as much as 500 cfs.

Based on the hydrologic information obtained from the District and the hydraulic analysis performed by Wood/Patel, there should be no adverse impact to the East Maricopa Floodway as a result of the construction or operation of the Pecos Road Bridge crossing. The HEC-RAS model shows an increase, due to the presence of the bridge piers, of only 0.19 feet immediately upstream of the bridge.

The impacts to the EMF from a Water Quality perspective (404) are minimal and the approved 404 permit was obtained from the Corps of Engineers on March 6, 2003.

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2.0 INTRODUCTION

2.1 General Background

The Town of Gilbert proposes to extend Pecos Road as a major arterial roadway along a section line alignment to provide an important east-west transportation link between Higley Road and Power Road. Construction of this extension will require crossings of both the Roosevelt Water Conservation District (RWCD) canal and the East Maricopa Floodway (EMF) and will involve the construction of a post-tensioned box-girder bridge over the EMF and a two-cell box culvert across the RWCD canal. Pecos Road currently terminates east of Recker Road approximately 1/8 mile west of the RWCD and EMF western right-of-way. The project will include the design of Pecos Road from Recker Road to the bridge crossing and will be coordinated with the design and construction of Pecos Road east of the EMF.

2.2 Scope of Work

Wood/Patel will provide all Engineering and project management services, including all utility approvals (including SRP & RWCD), all public and private agency coordination and approvals, and the preparation of construction drawings and final bid documents, including special provisions that are required for the bidding of this project.

The intent of this project is to minimize the involvement of Town of Gilbert staff to plan review only. The Town will authorize Wood/Patel to act as their representative in all elements of this project.

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3.0 DESCRIPTION OF STUDY AREA

3.1 Location

The project is located along the Pecos Road alignment approximately 1/8 mile east of the intersection with Recker Road between Section 1, Township 2 South, Range 6 East and Section 36, Township 1 South, Range 6 East in southeastern Gilbert (the Pecos Road alignment lies along the line separating Township 1 South from Township 2 South).

3.2 Existing Drainage Features

The East Maricopa Floodway, a large flood control facility, and the Roosevelt Water Conservation District (RWCD) canal both cross the proposed alignment and will require structures.

3.3 Existing and Proposed Utilities

There are a number of existing utilities in the project area including water, sewer, gas, electric, and irrigation. The majority of these utilities will be unaffected by the construction of this project, however, some of the RWCD irrigation features may require relocation and the existing 16" waterline will be extended to the east side of the bridge. The existing 15" sewer line will be extended to the west side of the EMF and, in addition, a new 16" reclaimed water line will be installed along the south side of Pecos Road along the length of the project.

3.4 Flood Insurance Rate Map

The Maricopa County, Arizona and Unincorporated Areas Flood Insurance Rate Map (FIRM) Community-Panel Number XXXXXX dated XXXX, indicates the site falls within Zone "XXX".

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4.0 DRAINAGE DESIGN

4.1 404 Permit

Due to the minimal area of impact in the floodway (the area of the drilled shafts), the project was expected to fall under the Nationwide 14 provision of the 404 Permit. Wood/Patel coordinated with the Corps of Engineers, requested a 404 Permit under Nationwide 14, and was granted a Permit on March 10, 2003.

4.2 Offsite Hydrology

The 100-year design discharge for the EMF was obtained from the Flood Control District of Maricopa County (District) and is equal to the original Soil Conservation Service (SCS – now the Natural Resources Conservation Service or NRCS) design discharge of 6,900 cfs. Required freeboard for the design flow will be one (1) foot below the minimum bridge soffit elevation. The existing discharge in the EMF is approximately 12,438 cfs and is not contained within the channel; however, the District has agreed that the 6,900 cfs discharge will be acceptable for design.

The RWCD canal currently carries 375 cfs, which is adequate to meet current demand; however, the future water rights needs may necessitate an increase to as much as 500 cfs. The RWCD has requested that the structure be sized to accommodate this future increase.

4.3 Offsite Hydraulic Analysis

Several criteria were developed at the early stages of this project to guide the development of the bridge crossing design. These include:

- The bridge soffit elevation will provide a minimum of 1-foot of freeboard above the design water surface elevation (WSEL) in the EMF.
- The minimum bridge soffit elevation will be set equal to the existing top of bank. This criterion was included to address the existing discharge in the EMF, which is significantly above its hydraulic capacity. In discussions with the District, it was determined that, by providing for bank-full flow in the EMF, concerns regarding the existing discharge would be alleviated. The District agreed that any discharge which exceeded the capacity of the EMF would likely have overtopped the west bank of the EMF at some point upstream and, therefore, the bank-full discharge is all that would reach the structure.

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A HEC-RAS hydraulic model has been prepared for the EMF which demonstrates that the proposed structures do not adversely impact the water surface elevation. The results of the HEC-RAS hydraulic analyses are summarized in the following table and are further documented in Appendix A.

Cross-Section Location	WSEL in Existing Channel Design Flow (6900 cfs)	WSEL with Bridge Design Flow (6900 cfs)	WSEL Increase (ft)
Channel Upstream of Bridge & Drop	1319.07	1319.26	0.19
Upstream Side of Drop Structure	1319.01	1319.20	0.19
Upstream Side of Bridge Structure	1319.00	1319.19	0.19

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As documented in the above table, the increase in WSEL due to the presence of the bridge piers is negligible and will have no adverse affect on the performance of the EMF channel.

A Level I bridge scour analysis was also performed, based on the data generated in the HEC-RAS hydraulic model, which yielded an anticipated scour depth of approximately 13.6 feet. This scour depth will be accounted for in the design of the bridge foundations. Due to the regular shape of the EMF channel, significant contraction scour is not anticipated.

4.4 RWCD Crossing Structure

The RWCD canal carries a fairly constant flow of approximately 375 cfs. The existing canal is a shotcrete lined, trapezoidal channel with 2:1 side slopes, a six foot average depth and a top width of approximately 30 feet. The RWCD has requested that the Town of Gilbert install an oversized structure at this location to accommodate a possible increase in the capacity of the canal to meet future water rights needs. Based on this request, the proposed crossing structure is a two cell, 18 foot by 8 foot reinforced concrete box culvert (RCBC). Since this is a non-standard RCBC size, a special design will be required, however, the total cost still makes this the most economical option.

4.5 Pavement Drainage

The roadway is designed so that general drainage patterns are maintained wherever possible. Storm water will not create off-site flooding or adverse ponding within the right-of-way. Runoff from intersection streets is designed to maintain existing drainage conditions, as much as possible, and in no case will it adversely impact the improvements of this project. Pavement with curb and gutter (existing and proposed) will be checked to ensure that one lane of traffic remains dry in each direction, during peak flow of a 10-year storm frequency. The roadway may, however, be inundated during the 50 and 100-year storm events. Reduction of gutter flow by some means (adding inlets or adjusting roadway geometry) or an exemption from the Town Engineer must be provided where these criteria cannot be achieved.

Wood/Patel has coordinated the design of drainage facilities with current and on-going drainage studies and roadway design projects that affect the proposed improvements and utilized these facilities wherever possible.

Hydrologic analysis for pavement drainage is limited to Town of Gilbert right-of-way. Since there are no adjacent subdivisions, all of the runoff from the new pavement must be accommodated within Town of Gilbert right-of-way. This will require the construction of a storm drainage system which includes catch basins, storm drain pipe, and retention basins. The curb-opening catch basins were used within Pecos Road to collect the runoff and direct it to the retention basins adjacent to the roadway alignment. These retention basins were sized to contain the 50-year, 24-hour runoff volume according to Town of Gilbert Design Standards. The retention basins are approximately 3 feet in depth and have 4:1 side slopes.

The Rational Method calculations, an exhibit depicting the contributing areas, and the StormCAD hydraulic model of the storm sewer system are included in Appendix B.

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5.0 MAINTENANCE ACCESS ISSUES FOR FCDMC AND RWCD

5.1 Flood Control District of Maricopa County (FCDMC)

The existing EMF crossings north and south of the Pecos Road crossing currently have at-grade maintenance access ramps and this is the general concept that was carried over to the Pecos Road crossing. However, the east end of the Pecos Road bridge has very little right-of-way to accommodate maintenance ramp and additional right-of-way will be required. Since the western maintenance road is shared with the RWCD, please refer to the following section for a description of its configuration and operation.

5.2 Roosevelt Water Conservation District (RWCD)

In discussions with the RWCD, it was clear that, although the majority of their maintenance crossings in the area are at-grade, non-signalized crossings. The RWCD staff feels that there is excessive time spent waiting for traffic to clear during emergencies and they requested that an improved crossing scenario be devised. Further discussions revealed that, since a right turn movement off of the maintenance road is simpler to make in high traffic conditions and there is a nearby left turn bay available, it would be acceptable to the RWCD to make a right turn off of their maintenance road, make a u-turn at the nearby left turn bay, and make another right turn back onto the next segment of maintenance road. A break in the median was also provided to facilitate straight across movements should traffic be clear. The curb & gutter in the vicinity of the maintenance roads was also changed to 4" roll to facilitate an easier traverse. The first 40 feet of the maintenance roads are paved with asphalt to allow rapid entrance and exit from the traveled lanes without excessive tire spin.

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6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the hydrologic information obtained from the District and the hydraulic analysis performed by Wood/Patel, there should be no adverse impact to the East Maricopa Floodway as a result of the construction or operation of the Pecos Road Bridge crossing. The HEC-RAS model shows an increase, due to the presence of the bridge piers, of only 0.19 feet immediately upstream of the bridge.

The impacts to the EMF from a Water Quality perspective (404) are minimal and the approved 404 permit was obtained from the Corps of Engineers on March 6, 2003.

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PLATES

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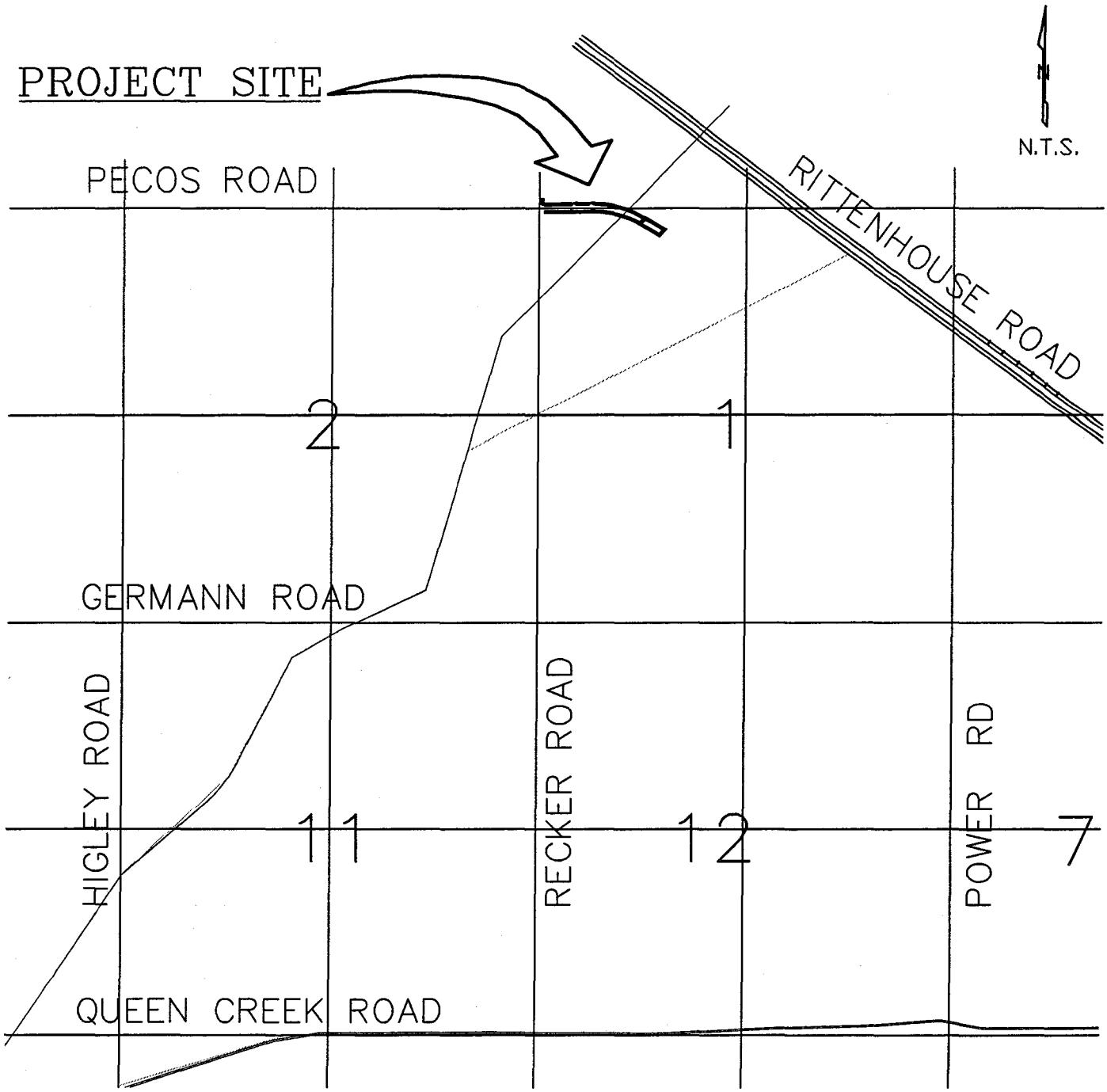
PLATE 1

Vicinity Map



PECOS ROAD
VICINITY MAP

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DRAWN BY: P. LOPEZ

JOB NO: 021734

DATE: 5/22/2003

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APPENDICES

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APPENDIX A

East Maricopa Floodway (EMF) Hydraulics

Existing Conditions HEC-RAS Model
Design Conditions HEC-RAS Model
Level 1 Bridge Scour Calculations

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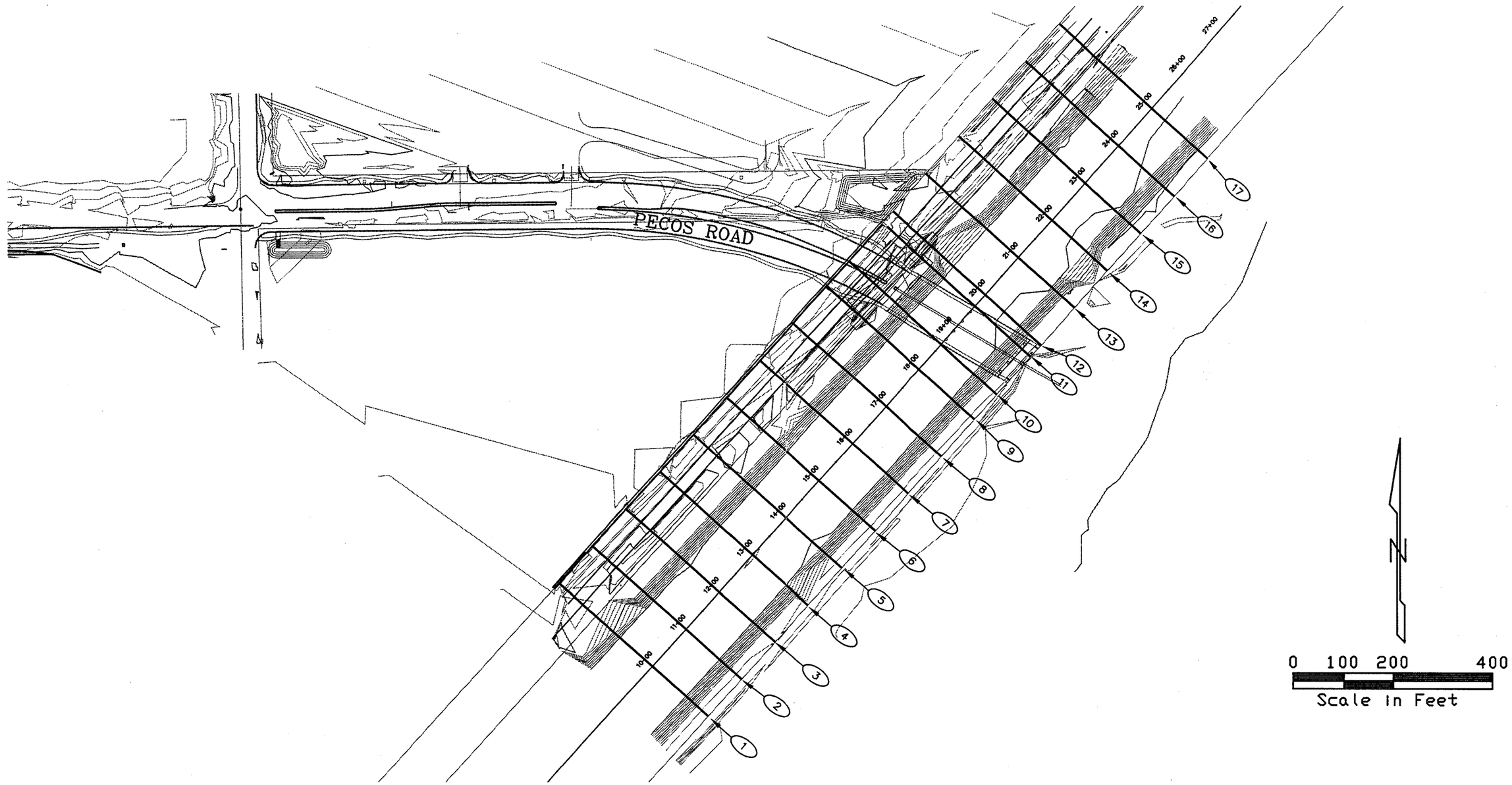
Existing Conditions HEC-RAS Model



LEGEND

(1) RIVER STATION

HEC RAS CROSS SECTION

PECOS ROAD EMF
HEC-RAS
EXHIBIT

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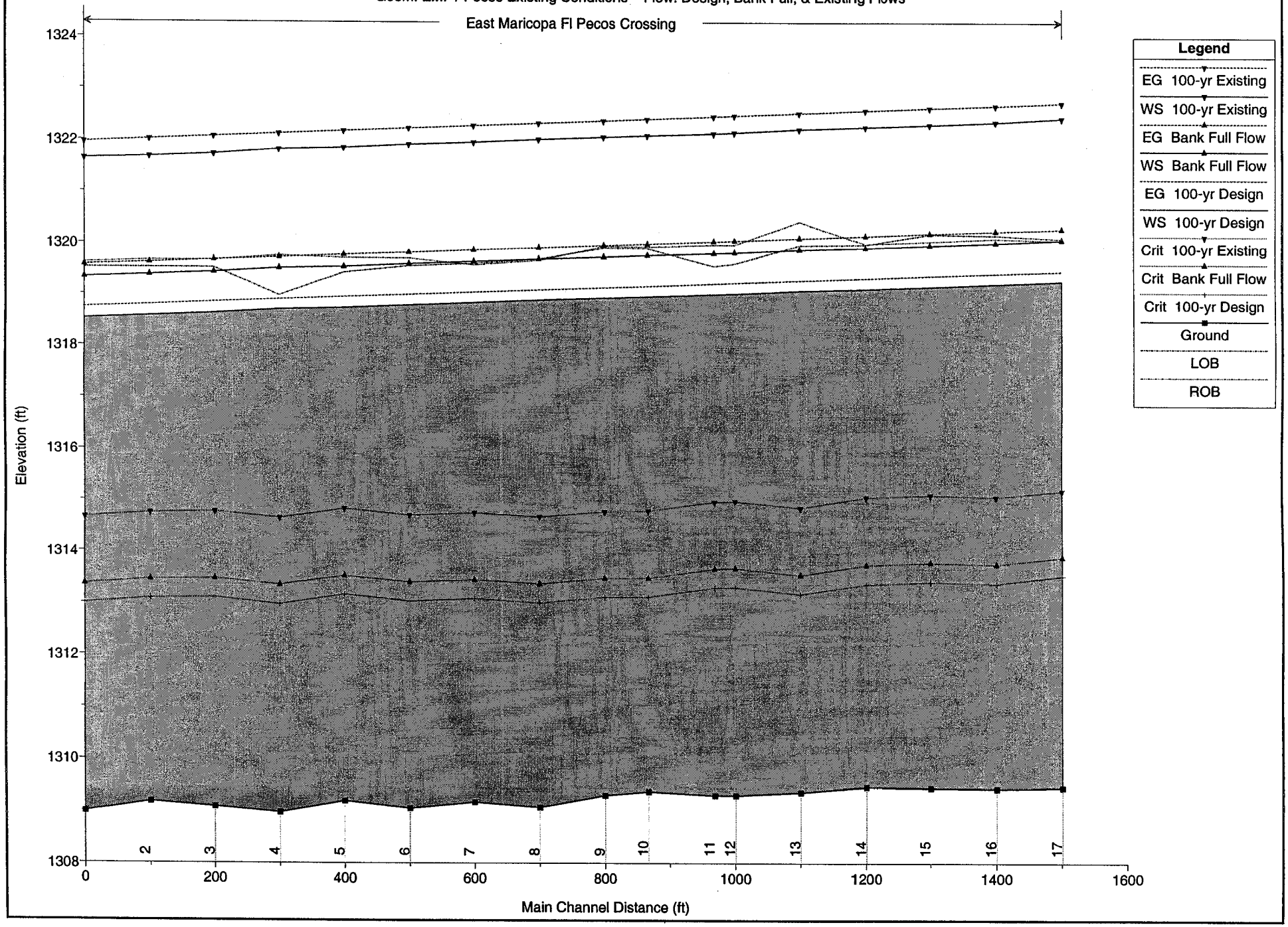
DRAWN BY: P. LOPEZ	PLATE #
JOB NO: 021734	DATE: 5/22/2003

HEC-RAS Plan: EMFPecos River: East Maricopa Fl Reach: Pecos Crossing

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Max Chl Dpth	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Pecos Crossing	17	100-yr Design	6900.00	1309.45	1319.26	9.81	1313.52	1319.46	0.000456	3.54	1950.53	251.12	0.22
Pecos Crossing	17	Bank Full Flow	8000.00	1309.45	1320.07	10.62	1313.88	1320.29	0.000468	3.70	2173.34	300.73	0.23
Pecos Crossing	17	100-yr Existing	12438.00	1309.45	1322.43	12.98	1315.18	1322.73	0.000472	4.40	2904.08	319.80	0.24
Pecos Crossing	16	100-yr Design	6900.00	1309.43	1319.21	9.78	1313.37	1319.41	0.000450	3.62	1904.76	233.74	0.22
Pecos Crossing	16	Bank Full Flow	8000.00	1309.43	1320.01	10.58	1313.74	1320.24	0.000454	3.82	2106.18	287.54	0.23
Pecos Crossing	16	100-yr Existing	12438.00	1309.43	1322.36	12.93	1315.06	1322.68	0.000478	4.58	2830.13	315.44	0.24
Pecos Crossing	15	100-yr Design	6900.00	1309.44	1319.15	9.71	1313.40	1319.36	0.000469	3.67	1879.36	232.86	0.23
Pecos Crossing	15	Bank Full Flow	8000.00	1309.44	1319.96	10.52	1313.77	1320.19	0.000471	3.86	2087.81	289.64	0.23
Pecos Crossing	15	100-yr Existing	12438.00	1309.44	1322.31	12.87	1315.10	1322.63	0.000491	4.61	2811.49	315.27	0.25
Pecos Crossing	14	100-yr Design	6900.00	1309.46	1319.11	9.65	1313.36	1319.32	0.000466	3.66	1885.26	233.68	0.23
Pecos Crossing	14	Bank Full Flow	8000.00	1309.46	1319.91	10.45	1313.73	1320.14	0.000468	3.85	2095.11	294.12	0.23
Pecos Crossing	14	100-yr Existing	12438.00	1309.46	1322.26	12.80	1315.05	1322.58	0.000488	4.61	2814.15	313.47	0.24
Pecos Crossing	13	100-yr Design	6900.00	1309.36	1319.07	9.71	1313.17	1319.27	0.000437	3.59	1923.33	233.91	0.22
Pecos Crossing	13	Bank Full Flow	8000.00	1309.36	1319.87	10.51	1313.53	1320.10	0.000442	3.78	2121.29	259.19	0.22
Pecos Crossing	13	100-yr Existing	12438.00	1309.36	1322.22	12.86	1314.84	1322.53	0.000485	4.54	2832.08	314.25	0.24
Pecos Crossing	12	100-yr Design	6900.00	1309.30	1319.01	9.71	1313.30	1319.22	0.000467	3.66	1884.52	233.62	0.23
Pecos Crossing	12	Bank Full Flow	8000.00	1309.30	1319.82	10.52	1313.67	1320.05	0.000467	3.85	2083.10	268.99	0.23
Pecos Crossing	12	100-yr Existing	12438.00	1309.30	1322.15	12.85	1314.97	1322.48	0.000499	4.66	2759.35	318.03	0.25
Pecos Crossing	11	100-yr Design	6900.00	1309.30	1319.00	9.70	1313.30	1319.21	0.000468	3.67	1882.08	237.24	0.23
Pecos Crossing	11	Bank Full Flow	8000.00	1309.30	1319.81	10.50	1313.66	1320.04	0.000467	3.86	2089.90	269.03	0.23
Pecos Crossing	11	100-yr Existing	12438.00	1309.30	1322.13	12.83	1314.96	1322.47	0.000498	4.65	2788.04	388.54	0.25
Pecos Crossing	10	100-yr Design	6900.00	1309.37	1318.96	9.59	1313.11	1319.16	0.000446	3.61	1909.42	239.71	0.22
Pecos Crossing	10	Bank Full Flow	8000.00	1309.37	1319.76	10.39	1313.47	1319.99	0.000450	3.81	2118.51	289.80	0.23
Pecos Crossing	10	100-yr Existing	12438.00	1309.37	1322.09	12.72	1314.79	1322.41	0.000476	4.57	2839.47	316.18	0.24
Pecos Crossing	9	100-yr Design	6900.00	1309.30	1318.93	9.63	1313.11	1319.13	0.000447	3.62	1909.88	242.56	0.22
Pecos Crossing	9	Bank Full Flow	8000.00	1309.30	1319.73	10.43	1313.47	1319.96	0.000450	3.81	2119.60	289.29	0.23
Pecos Crossing	9	100-yr Existing	12438.00	1309.30	1322.06	12.76	1314.77	1322.38	0.000477	4.57	2841.75	317.20	0.24
Pecos Crossing	8	100-yr Design	6900.00	1309.07	1318.88	9.81	1313.00	1319.08	0.000440	3.60	1919.75	243.74	0.22
Pecos Crossing	8	Bank Full Flow	8000.00	1309.07	1319.69	10.62	1313.36	1319.91	0.000443	3.79	2134.72	302.74	0.22
Pecos Crossing	8	100-yr Existing	12438.00	1309.07	1322.02	12.95	1314.67	1322.33	0.000469	4.55	2855.31	316.50	0.24
Pecos Crossing	7	100-yr Design	6900.00	1309.17	1318.83	9.66	1313.08	1319.04	0.000457	3.64	1897.47	246.99	0.23
Pecos Crossing	7	Bank Full Flow	8000.00	1309.17	1319.64	10.47	1313.44	1319.87	0.000462	3.82	2118.35	299.81	0.23
Pecos Crossing	7	100-yr Existing	12438.00	1309.17	1321.96	12.79	1314.74	1322.28	0.000487	4.60	2862.49	400.00	0.24
Pecos Crossing	6	100-yr Design	6900.00	1309.05	1318.79	9.74	1313.03	1318.99	0.000460	3.65	1893.24	240.81	0.23
Pecos Crossing	6	Bank Full Flow	8000.00	1309.05	1319.59	10.54	1313.39	1319.82	0.000462	3.84	2105.02	296.47	0.23
Pecos Crossing	6	100-yr Existing	12438.00	1309.05	1321.92	12.87	1314.70	1322.23	0.000477	4.56	2933.16	400.00	0.24
Pecos Crossing	5	100-yr Design	6900.00	1309.19	1318.73	9.54	1313.16	1318.94	0.000490	3.72	1857.32	240.27	0.23
Pecos Crossing	5	Bank Full Flow	8000.00	1309.19	1319.53	10.34	1313.52	1319.77	0.000490	3.90	2063.34	268.54	0.24
Pecos Crossing	5	100-yr Existing	12438.00	1309.19	1321.85	12.66	1314.82	1322.18	0.000508	4.66	2845.84	400.00	0.25
Pecos Crossing	4	100-yr Design	6900.00	1308.97	1318.70	9.73	1312.97	1318.89	0.000456	3.54	1951.40	256.89	0.22
Pecos Crossing	4	Bank Full Flow	8000.00	1308.97	1319.50	10.53	1313.34	1319.72	0.000449	3.71	2165.98	269.29	0.22
Pecos Crossing	4	100-yr Existing	12438.00	1308.97	1321.82	12.85	1314.64	1322.12	0.000472	4.45	2883.52	325.12	0.24
Pecos Crossing	3	100-yr Design	6900.00	1309.08	1318.62	9.54	1313.10	1318.84	0.000499	3.74	1843.01	232.51	0.23
Pecos Crossing	3	Bank Full Flow	8000.00	1309.08	1319.43	10.35	1313.46	1319.67	0.000500	3.94	2039.35	281.03	0.24
Pecos Crossing	3	100-yr Existing	12438.00	1309.08	1321.73	12.65	1314.77	1322.07	0.000528	4.73	2770.32	400.00	0.25
Pecos Crossing	2	100-yr Design	6900.00	1309.18	1318.57	9.39	1313.09	1318.79	0.000503	3.75	1840.34	233.03	0.24
Pecos Crossing	2	Bank Full Flow	8000.00	1309.18	1319.38	10.20	1313.45	1319.62	0.000503	3.94	2044.15	283.51	0.24
Pecos Crossing	2	100-yr Existing	12438.00	1309.18	1321.68	12.50	1314.75	1322.02	0.000525	4.71	2761.41	323.87	0.25
Pecos Crossing	1	100-yr Design	6900.00	1308.99	1318.52	9.53	1313.00	1318.74	0.000500	3.74	1842.78	237.65	0.23
Pecos Crossing	1	Bank Full Flow	8000.00	1308.99	1319.33	10.34	1313.36	1319.57	0.000500	3.93	2044.39	263.00	0.24
Pecos Crossing	1	100-yr Existing	12438.00	1308.99	1321.64	12.65	1314.66	1321.96	0.000500	4.60	2934.62	400.00	0.25

EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows



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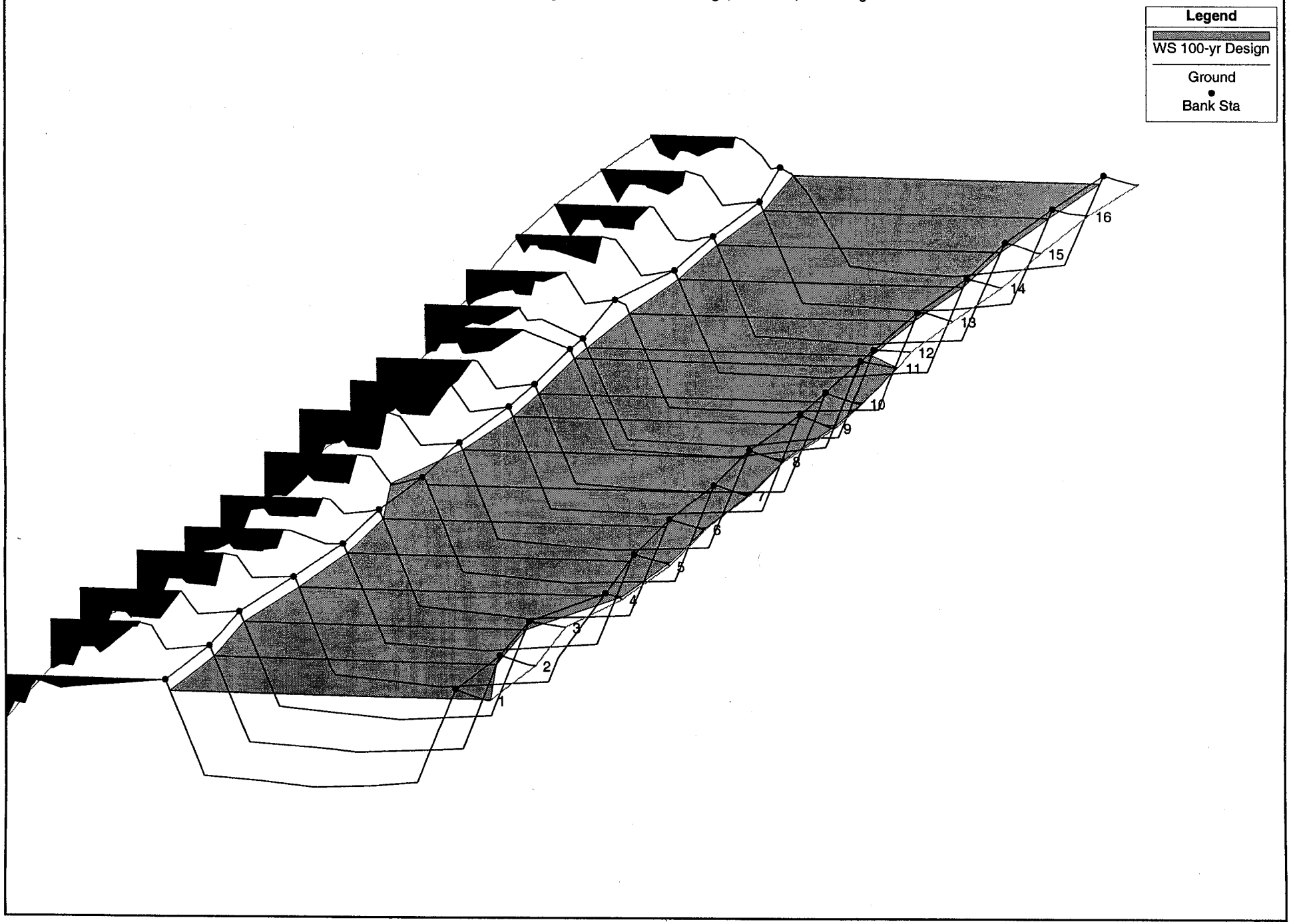

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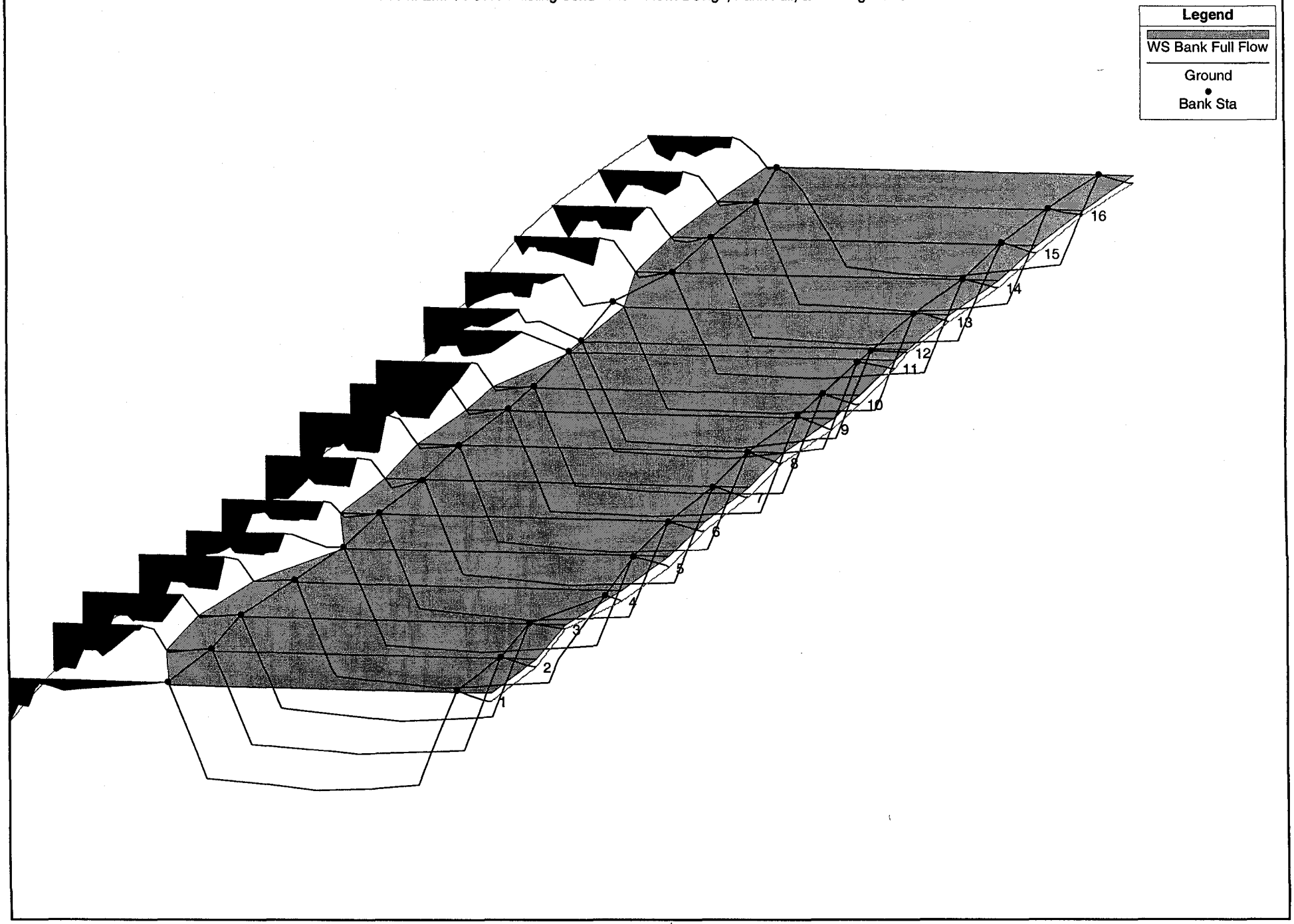
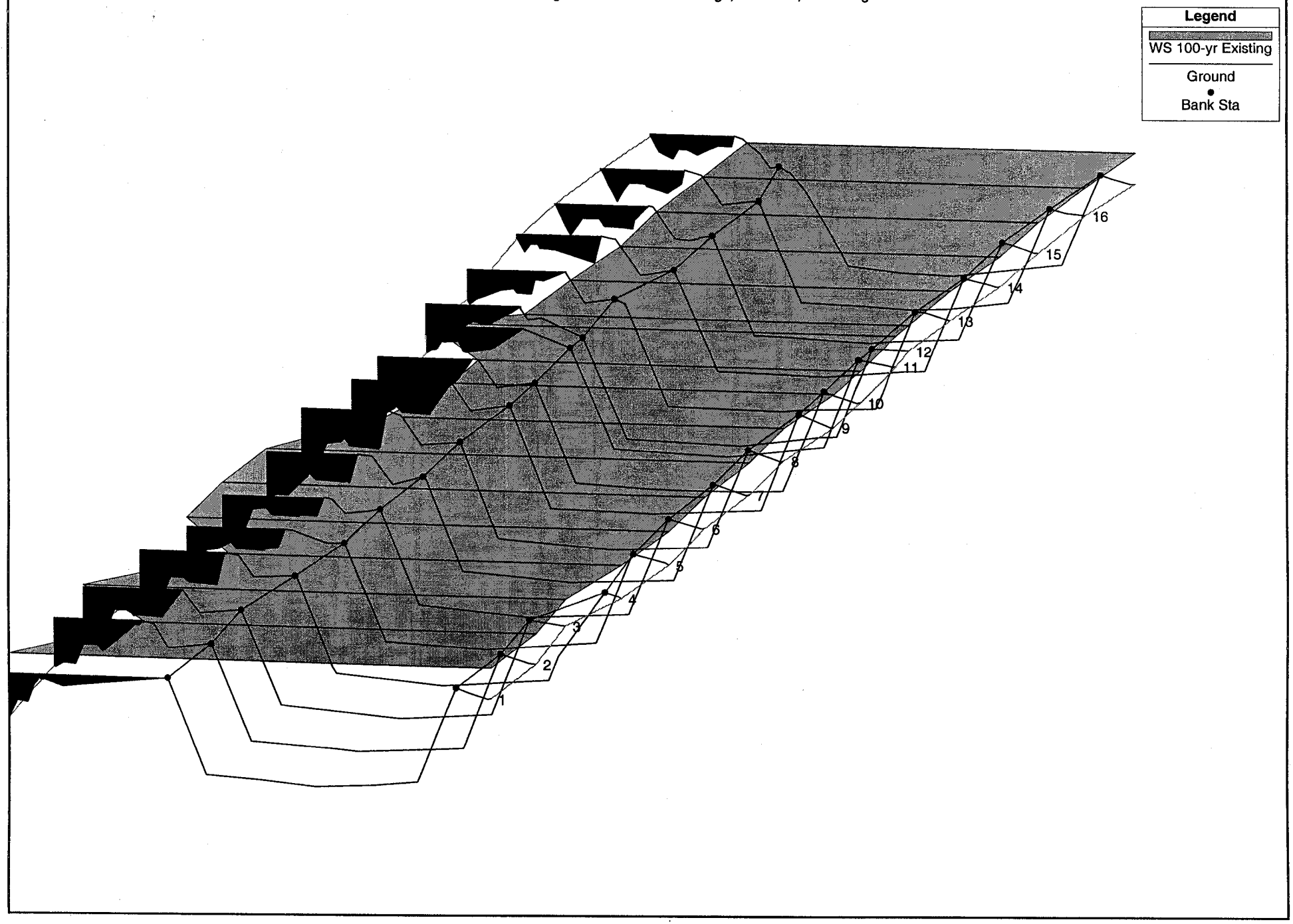
Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

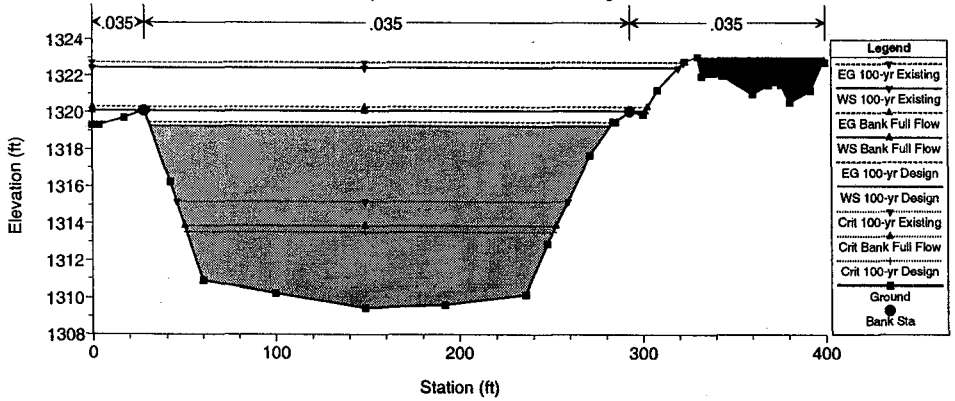
Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

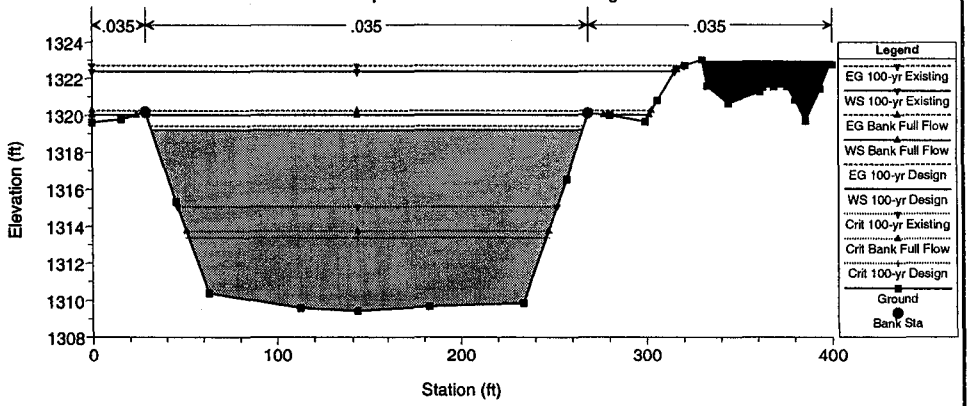
River = East Maricopa Fl Reach = Pecos Crossing RS = 17



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

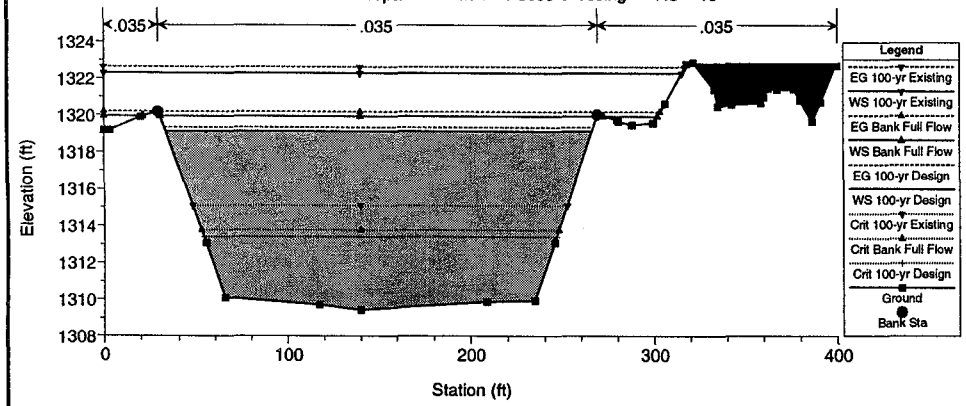
River = East Maricopa Fl Reach = Pecos Crossing RS = 16



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

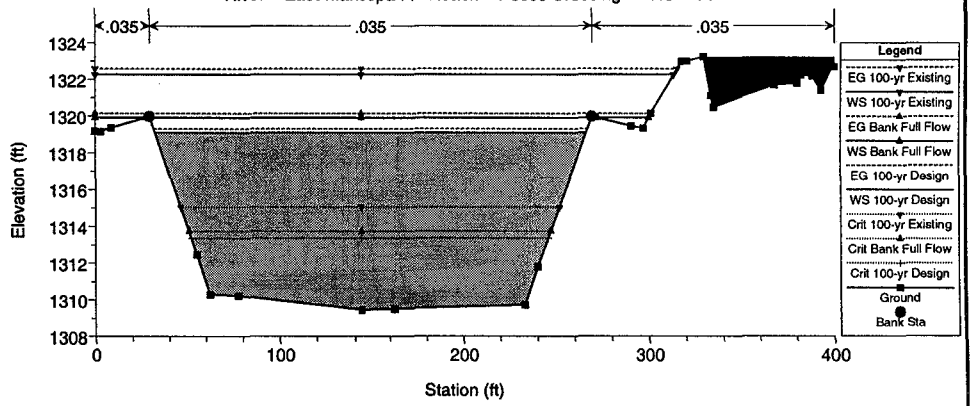
River = East Maricopa Fl Reach = Pecos Crossing RS = 15



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

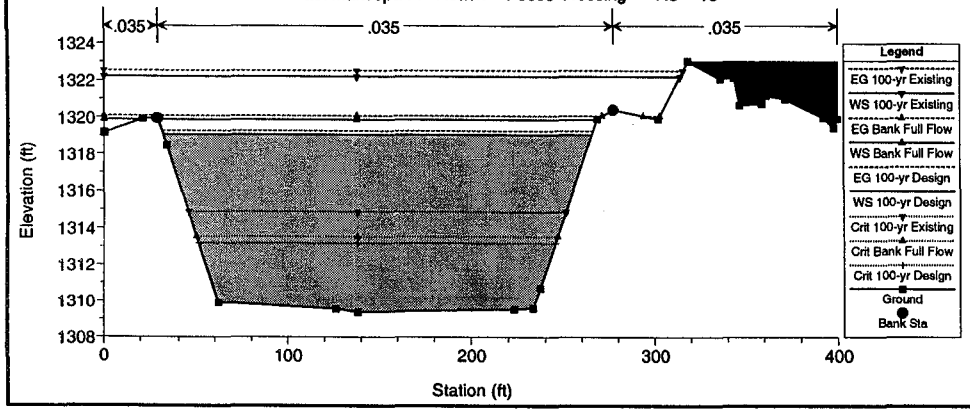
River = East Maricopa Fl Reach = Pecos Crossing RS = 14



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

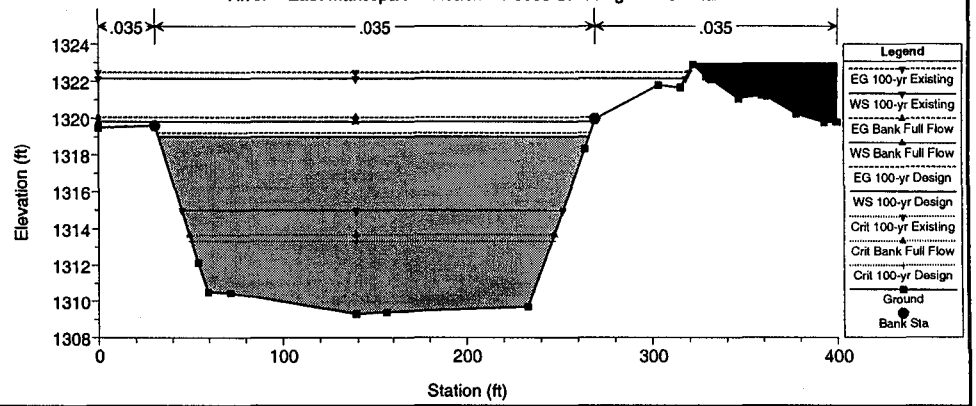
River = East Maricopa Fl Reach = Pecos Crossing RS = 13



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

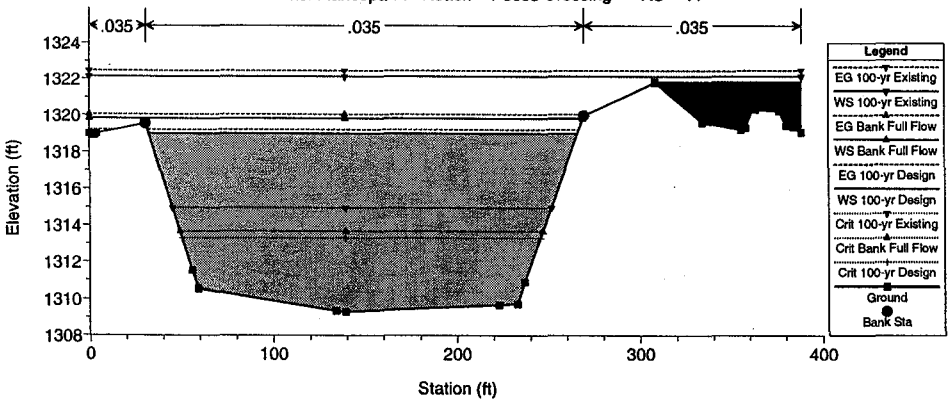
River = East Maricopa Fl Reach = Pecos Crossing RS = 12



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

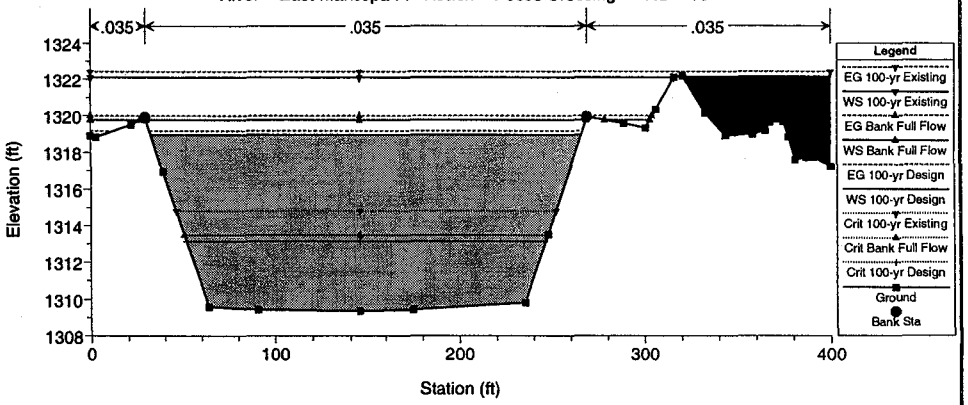
River = East Maricopa Fl Reach = Pecos Crossing RS = 11



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

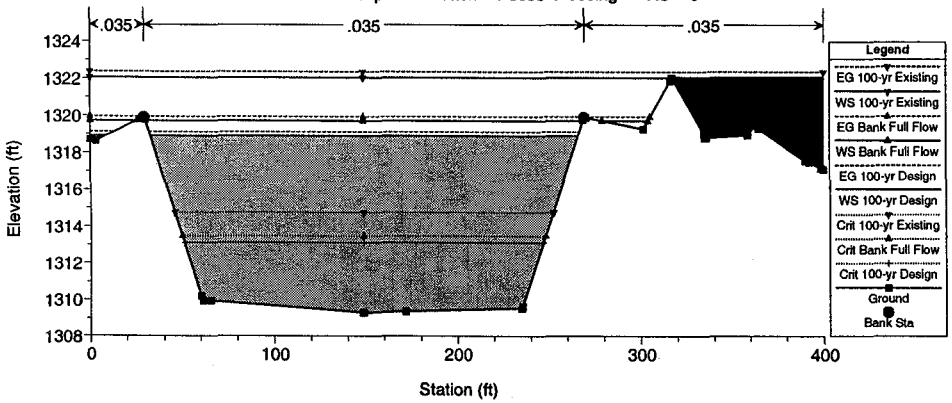
River = East Maricopa Fl Reach = Pecos Crossing RS = 10



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

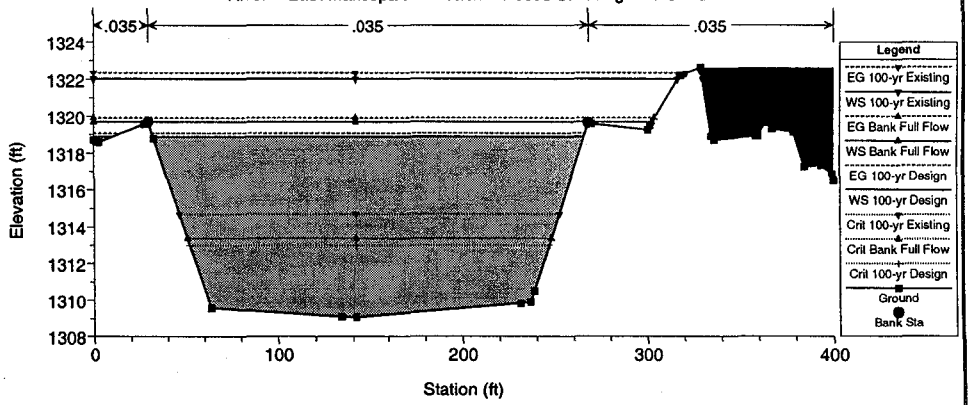
River = East Maricopa Fl Reach = Pecos Crossing RS = 9



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

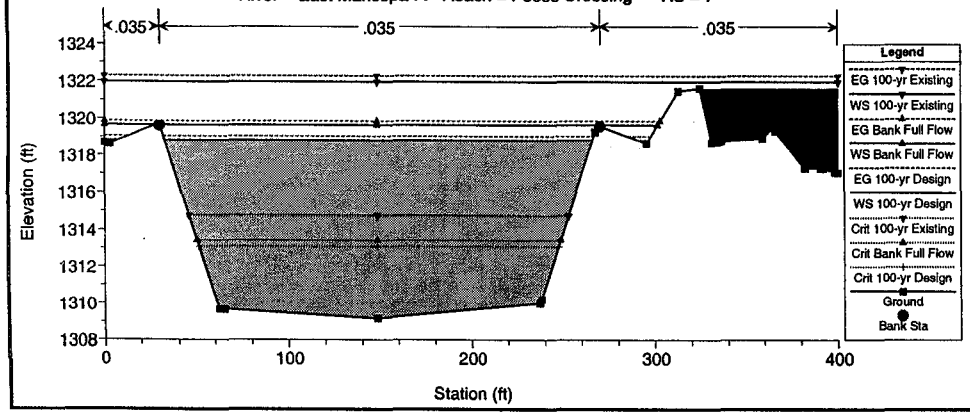
River = East Maricopa Fl Reach = Pecos Crossing RS = 8



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

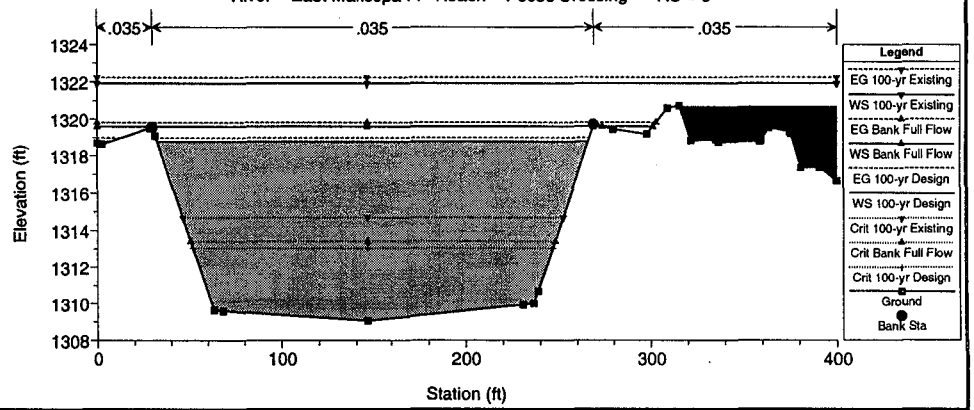
River = East Maricopa Fl Reach = Pecos Crossing RS = 7



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

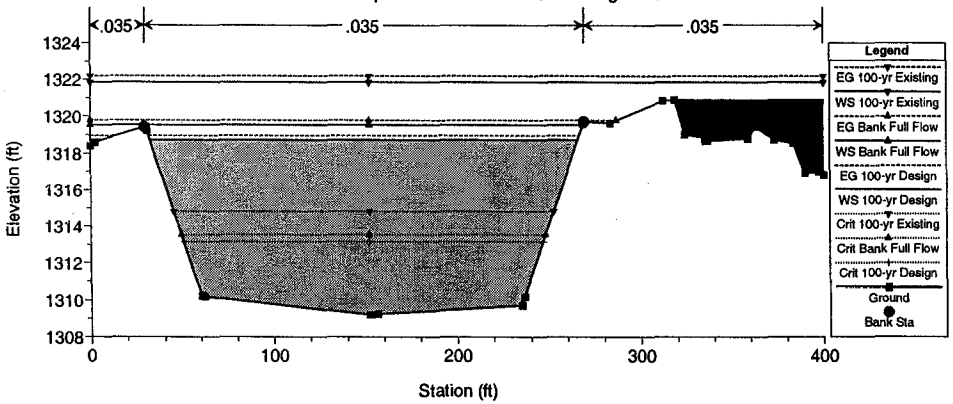
River = East Maricopa Fl Reach = Pecos Crossing RS = 6



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

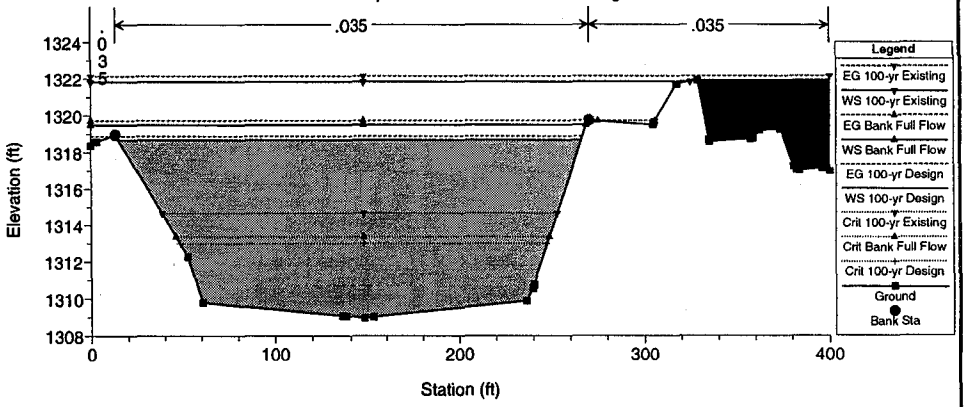
River = East Maricopa Fl Reach = Pecos Crossing RS = 5



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

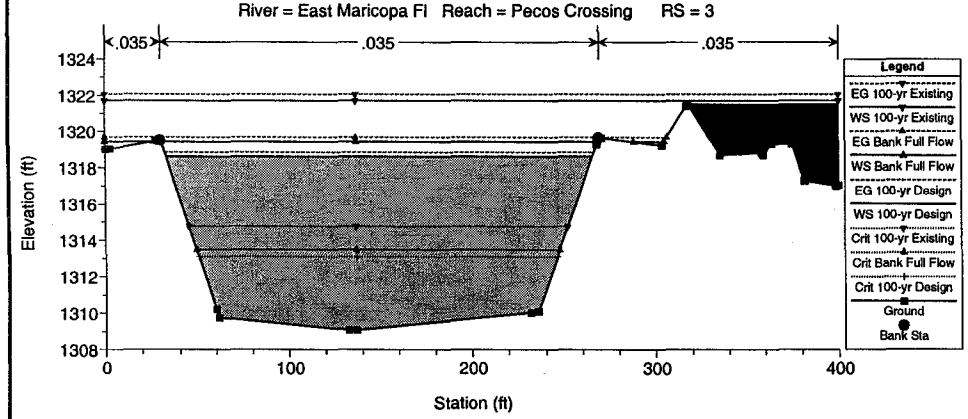
River = East Maricopa Fl Reach = Pecos Crossing RS = 4



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

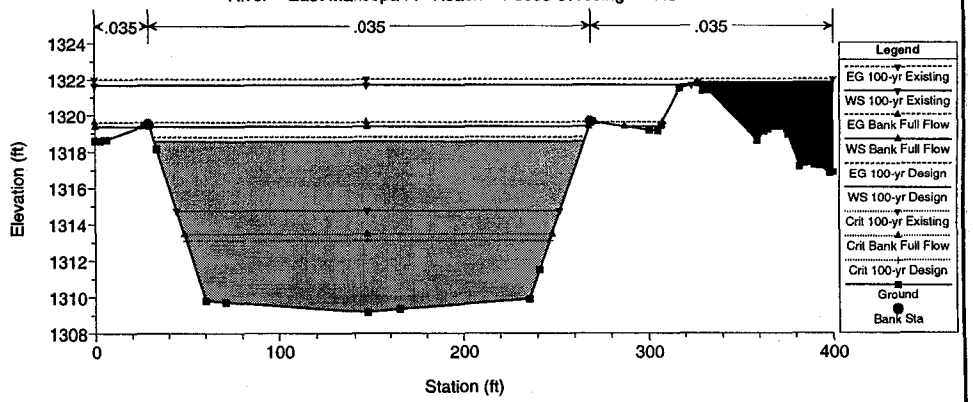
River = East Maricopa Fl Reach = Pecos Crossing RS = 3



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

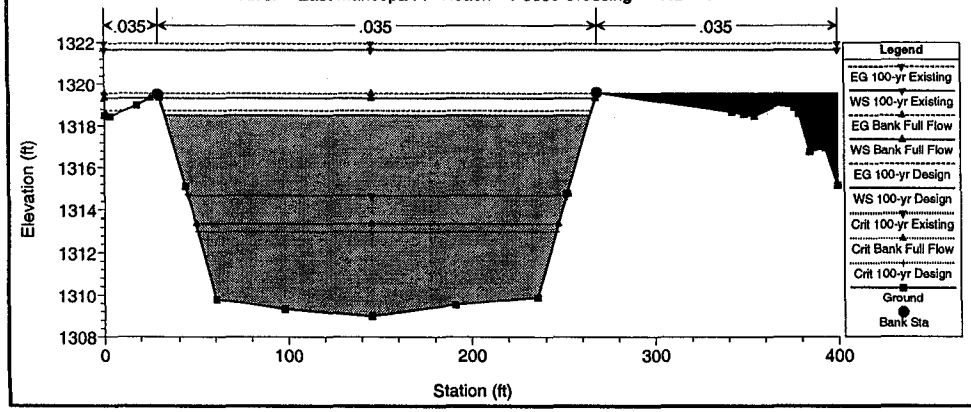
River = East Maricopa Fl Reach = Pecos Crossing RS = 2



EMF / Pecos Existing Conditions Plan: EMF / Pecos Road Existing Conditions 5/21/2003 4:07:45 PM

Geom: EMF / Pecos Existing Conditions Flow: Design, Bank Full, & Existing Flows

River = East Maricopa Fl Reach = Pecos Crossing RS = 1



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                    HEC-RAS Version 3.1.1 May 2003
                     U.S. Army Corp of Engineers
                    Hydrologic Engineering Center
                      609 Second Street, Suite D
                     Davis, California 95616-4687
                            (916) 756-1104


          X     X  XXXXXX    XXXX        XXXX       XX      XXXX
          X     X  X        X    X       X   X     X  X    X
          X     X  X        X            X   X    X    X   X
          XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
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PROJECT DATA
Project Title: EMF / Pecos Existing Conditions
Project File : Pecosnopiers.prj
Run Date and Time: 5/21/2003 4:07:45 PM

Project in English units

Project Description:
******* Autodesk, Inc. HEC-2 Input Data file ********
      ************
Minimum Data Input     *************

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PLAN DATA

Plan Title: EMF / Pecos Road Existing Conditions
Plan File : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\Pecosnopiers.p01

           Geometry Title: EMF / Pecos Existing Conditions
           Geometry File : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\Pecosnopiers.g01

           Flow Title    : Design, Bank Full, & Existing Flows
           Flow File     : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\Pecosnopiers.f01

Plan Summary Information:
Number of:  Cross Sections =   17    Mulitple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance =  0.003
    Critical depth calculaton tolerance =  0.003
    Maximum number of interations       =  20
    Maximum difference tolerance        =  0.1
    Flow tolerance factor               =  0.001

Computation Options
    Critical depth computed at all cross sections
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Mixed Flow
```

FLOW DATA

Flow Title: Design, Bank Full, & Existing Flows
Flow File : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\Pecosnopiers.f01

Flow Data (cfs)

River	Reach	RS	100-yr Design	Bank Full Flow	100-yr Existing
East Maricopa Fl	Pecos Crossing	17	6900	8000	12438
East Maricopa Fl	Pecos Crossing	1	6900	8000	12438

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
East Maricopa Fl	Pecos Crossing	100-yr Design	Normal S = 0.0005	Normal S = 0.0005

GEOMETRY DATA

Geometry Title: EMF / Pecos Existing Conditions
Geometry File : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\Pecosnopiers.g01

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 17

INPUT
Description:
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319.3	3.76	1319.3	17.63	1319.7	28.35	1320.1	42.21	1316.23
60.23	1310.9	99.98	1310.24	148.96	1309.45	192.41	1309.61	236	1310.18
247.87	1312.9	271.32	1317.67	284.08	1319.49	285.29	1319.49	293.17	1320.06
300.54	1319.9	308.27	1321.23	323.41	1322.81	330.43	1323.06	332.5	1321.96
343.87	1322	360.54	1321.01	369.17	1321.49	376.01	1321.51	380.81	1320.55
392.18	1321.2	398.71	1322.76	398.72	1322.76	400	1322.74		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	28.35	.035	293.17	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
28.35	293.17	100	100	100	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
329.98	400	1323.06

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 16

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319.6	15.86	1319.77	29.08	1320.16	45.36	1315.34	63.27	1310.4
112.94	1309.6	143.28	1309.43	182.86	1309.68	233.91	1309.86	257.08	1316.53
269.05	1320.1	280.46	1319.98	299.58	1319.63	306.04	1320.79	316.39	1322.52
320.99	1322.7	330.25	1323.02	332.98	1321.58	344.46	1320.61	361.38	1321.24
363.1	1321.5	368.93	1321.53	376.08	1321.54	380.46	1320.8	386.05	1319.68
393.69	1321.4	398.79	1322.76	400	1322.74				

```
Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   29.08    .035  269.05    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         29.08  269.05              100     100     100              .1       .3
Blocked Obstructions      num=       1
   Sta L   Sta R    Elev
  329.98     400 1322.94

CROSS SECTION


RIVER: East Maricopa Fl
REACH: Pecos Crossing     RS: 15

INPUT
Description:
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1319.2    3.28 1319.19   20.22 1319.92   29.45 1320.18   55.18 1313.09
   65.46  1310.1  117.22 1309.71  140.15 1309.44  208.97 1309.87  234.67 1309.95
  245.65  1313.1  269.02 1320.04  279.59 1319.79  280.73 1319.68  288.11 1319.49
  299.73  1319.6  306.04 1320.65  318.01  1322.8  321.68 1322.89  333.32 1321.41
  334.97  1320.5  342.43 1320.58  358.51 1320.67  360.04 1320.99  362.72 1321.46
  367.45  1321.4  376.42 1321.43   379.8 1320.82  386.46 1319.69  391.04 1320.71
  398.87  1322.7     400 1322.71

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   29.45    .035  269.02    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         29.45  269.02              100     100     100              .1       .3
Blocked Obstructions      num=       1
   Sta L   Sta R    Elev
  323.29     400 1322.86

CROSS SECTION


RIVER: East Maricopa Fl
REACH: Pecos Crossing     RS: 14

INPUT
Description:
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1319.2    3.02 1319.17    8.74 1319.37   29.66 1319.98   55.08 1312.47
   62.21  1310.3   77.56 1310.23  143.89 1309.46  162.36  1309.5  233.35 1309.71
  240.33  1311.8  269.43 1319.99  290.48 1319.47  297.05 1319.36  301.22 1320.16
  317.79    1323  320.48 1323.01   329.6 1323.24  333.67 1321.12  334.95 1320.49
   367.9  1321.7  380.24 1321.81  382.29 1322.23  388.45  1322.2  392.97 1321.41
  398.96  1322.7     400  1322.7

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   29.66    .035  269.43    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         29.66  269.43              100     100     100              .1       .3
Blocked Obstructions      num=       1
   Sta L   Sta R    Elev
  328.77     400 1323.23

CROSS SECTION


RIVER: East Maricopa Fl
REACH: Pecos Crossing     RS: 13
```

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319.2	.58	1319.17	21.6	1319.93	29.16	1319.96	33.72	1318.49
62.03	1309.9	126.45	1309.55	138.25	1309.36	223.23	1309.53	233.37	1309.57
237.47	1310.7	268.79	1319.94	277.63	1320.42	302.3	1319.94	318.68	1323.06
336.4	1322.1	343.78	1322.16	346.86	1320.68	358.85	1320.76	361.21	1321.17
371.57	1321	392.18	1320.01	397.93	1319.46	400	1319.95		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.16	.035	277.63	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.16	277.63	100	100	100	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
317.81	400	1323.06

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 12

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319.5	30.82	1319.6	54.06	1312.14	59.42	1310.52	71.63	1310.45
139	1309.3	156.51	1309.38	232.97	1309.69	263.92	1318.32	269.5	1319.97
303.51	1321.8	315.27	1321.65	315.36	1321.67	322.18	1322.89	329.24	1322.25
330.77	1322.2	330.79	1322.15	332.11	1322.08	346.95	1321.06	359	1321.23
360.12	1321.3	361.8	1321.18	378.01	1320.23	393.1	1319.76	399.43	1319.82
400	1319.8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	30.82	.035	269.5	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
30.82	269.5	30.95	31.53	33.12	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
320.85	400	1322.98

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 11

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319	2.41	1318.95	2.61	1318.9	2.81	1318.95	3.21	1318.95
4.02	1319	31.09	1319.55	56.11	1311.52	59.45	1310.54	134.37	1309.35
139.59	1309.3	223.2	1309.68	233.23	1309.74	237.13	1310.9	269.62	1319.97
308.36	1321.8	308.41	1321.84	308.44	1321.84	308.46	1321.84	308.51	1321.83
334.5	1319.6	355.65	1319.22	358.24	1319.32	362.43	1320.4	362.71	1320.38
363.64	1320.3	376.37	1320.21	380.45	1319.42	384.31	1319.37	388.54	1319.07

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	31.09	.035	269.62	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.

```
        31.09  269.62            102.04   102.2  102.69              .1        .3
 Blocked Obstructions      num=        1
    Sta L   Sta R    Elev
  308.07  388.54 1321.86

 CROSS SECTION


 RIVER: East Maricopa Fl
 REACH: Pecos Crossing      RS: 10

 INPUT
 Description:
 Station Elevation Data     num=       28
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
        0  1318.9    2.93 1318.83   21.97 1319.52   29.81  1319.9   39.15 1316.94
    64.12  1309.6   91.11 1309.44  146.13 1309.37  175.24 1309.44   235.7 1309.82
   247.88  1313.5  269.36 1319.93  289.18 1319.58  300.79 1319.34  306.38 1320.33
   316.22  1322.1  320.92 1322.18  332.88 1320.14  343.93 1318.92   358.4 1318.99
   365.09  1319.2  367.67 1319.64  374.81 1319.67  377.57 1318.83  381.32 1317.59
   387.29  1317.7  391.18 1317.73     400 1317.23

 Manning's n Values         num=        3
      Sta   n Val     Sta   n Val     Sta   n Val
        0    .035   29.81    .035  269.36    .035

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          29.81  269.36             67.01   66.95   66.89              .1        .3
 Blocked Obstructions      num=        1
    Sta L   Sta R    Elev
  320.24     400 1322.17

 CROSS SECTION


 RIVER: East Maricopa Fl
 REACH: Pecos Crossing      RS: 9

 INPUT
 Description:
 Station Elevation Data     num=       33
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
        0  1318.7     .56  1318.7     3.2 1318.63    3.24 1318.63   29.65 1319.91
    60.31  1310.2   61.11 1309.95   61.13 1309.95   65.28 1309.92  148.26 1309.31
   148.57  1309.3  171.68 1309.37  235.24 1309.54  235.59 1309.65  269.31 1319.94
   270.33  1319.9  301.57  1319.3  316.19  1321.9  316.97 1322.03  317.48 1322.05
   334.92    1319  335.15 1318.82  336.08 1318.82  358.48 1318.94  358.83    1319
   363.02  1319.5     364 1319.46  364.54  1319.3  389.92 1317.56  390.97 1317.57
   392.22  1317.5  398.69 1317.17     400 1317.11

 Manning's n Values         num=        3
      Sta   n Val     Sta   n Val     Sta   n Val
        0    .035   29.65    .035  269.31    .035

 Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          29.65  269.31              100     100     100              .1        .3
 Blocked Obstructions      num=        1
    Sta L   Sta R    Elev
   317.2     400 1322.13

 CROSS SECTION


 RIVER: East Maricopa Fl
 REACH: Pecos Crossing      RS: 8

 INPUT
 Description:
 Station Elevation Data     num=       31
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

0	1318.7	1.44	1318.62	2.79	1318.58	27.32	1319.58	29.63	1319.69
32.55	1318.8	63.53	1309.58	134.04	1309.11	141.86	1309.07	231.2	1309.83
236.72	1309.9	238.77	1310.51	268.31	1319.66	270.04	1319.6	300.44	1319.26
301.66	1319.5	317.66	1322.22	318.42	1322.23	328.99	1322.63	334.74	1318.91
336.29	1318.7	358.59	1318.91	358.96	1318.95	359.72	1318.94	363.83	1319.65
367.48	1319.3	378.73	1319.12	384.92	1317.25	393.75	1317.32	399.45	1316.87
400	1316.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.63	.035	268.31	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.63	268.31	100	100	100	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
329.98	400	1322.62

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 7

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.7	2.5	1318.63	2.69	1318.62	3.06	1318.63	29.55	1319.69
29.96	1319.6	62.43	1309.68	65.08	1309.66	148.21	1309.17	148.37	1309.17
237.14	1310	238.13	1310.2	267.46	1319.26	270.24	1319.57	295.47	1318.68
312.68	1321.5	324.32	1321.66	330.94	1318.71	334.83	1318.89	335.12	1318.75
336.15	1318.8	336.36	1318.78	358.9	1318.91	364.27	1319.5	365.2	1319.48
365.69	1319.3	382.02	1317.3	390.45	1317.31	391.41	1317.31	392.04	1317.28
398.24	1317.1	400	1317.08						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.96	.035	270.24	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.96	270.24	100	100	100	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
325.11	400	1321.64

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 6

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.7	2.2	1318.66	2.83	1318.64	28.57	1319.51	30.01	1319.55
31.55	1319.1	63.19	1309.64	68.18	1309.59	146.85	1309.05	230.71	1309.93
236.56	1310	239.03	1310.69	269.34	1319.7	279.74	1319.45	298.13	1319.18
309.3	1320.6	315.55	1320.72	321.77	1318.83	335.12	1318.87	336.61	1318.72
358.65	1318.8	358.85	1318.84	359.4	1318.83	363.85	1319.51	374.82	1319.31
375.28	1319.2	380.87	1317.36	390.72	1317.35	391.29	1317.36	400	1316.66

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	30.01	.035	269.34	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
30.01	269.34	100	100	100	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
314.76	400	1320.68

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 5

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.4	2.13	1318.57	2.59	1318.6	29.47	1319.42	30.72	1319.23
60.18	1310.2	61.79	1310.18	152.1	1309.19	152.57	1309.19	156.31	1309.23
234.99	1309.7	236.44	1310.18	269.14	1319.71	283.46	1319.64	312.13	1320.84
318.4	1320.9	324.11	1319	335.29	1318.84	335.58	1318.68	336.7	1318.68
358.64	1318.8	358.94	1318.8	363.12	1319.44	373.18	1318.73	383.7	1318.53
389.68	1316.9	397.08	1316.98	400	1316.81				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.47	.035	269.14	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.47	269.14	100	100	100	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
317.2	400	1320.93

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 4

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.4	2.52	1318.59	3.24	1318.6	13.63	1318.97	52.73	1312.25
60.67	1309.8	135.97	1309.07	137.45	1309.06	148.13	1308.97	153.01	1309.01
236.24	1309.9	239.7	1310.55	240.4	1310.75	269.63	1319.77	270.61	1319.75
304.9	1319.5	305.59	1319.65	317.31	1321.68	317.98	1321.69	328.92	1321.89
335	1318.7	335.3	1318.59	357.43	1318.75	358.7	1318.76	358.94	1318.79
362.48	1319.2	373.48	1319.24	374.12	1319.24	380.67	1317.26	382.24	1317.03
383.91	1317	396.04	1317.13	400	1316.97				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	13.63	.035	270.61	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
13.63	270.61	100	100	100	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
327.55	400	1321.93

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 3

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319	1.87	1319.03	2.49	1319.02	28.67	1319.46	29.99	1319.51
59.92	1310.2	61.27	1309.75	132.53	1309.11	136.99	1309.08	231.96	1310.04

235.84	1310.1	267.55	1319.26	268.92	1319.66	270.48	1319.64	303.39	1319.24
316.89	1321.4	317.41	1321.5	317.92	1321.51	335.15	1318.69	357.76	1318.82
358.77	1318.7	358.93	1318.73	363.26	1319.28	374.29	1319.29	374.64	1319.29
381.03	1317.3	381.24	1317.29	381.51	1317.29	398.33	1317.04	398.49	1317.02
398.6	1317	400	1317.06						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.99	.035	268.92	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.99	268.92	100	100	100	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
318.42	400	1321.54

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 2

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.6	2.83	1318.6	6.31	1318.66	29.4	1319.51	33.71	1318.17
60.24	1309.8	70.82	1309.72	147.7	1309.18	165.09	1309.35	235.9	1309.9
241.41	1311.5	269.14	1319.66	300.6	1319.17	305.16	1319.12	307.04	1319.42
317.21	1321.5	327.22	1321.77	329.77	1321.35	333.11	1321.37	358.93	1318.61
362.86	1319.1	363.49	1319.2	365.08	1319.2	375.09	1319.21	376	1318.93
381.98	1317.2	390.17	1317.3	392.44	1317.27	398.49	1316.84	400	1316.88

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.4	.035	269.14	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.4	269.14	100	100	100	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
326.33	400	1321.86

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 1

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.5	2.79	1318.44	17.63	1318.99	28.84	1319.51	43.8	1315.12
60.79	1309.8	97.99	1309.32	145.66	1308.99	191.18	1309.53	235.94	1309.88
252.08	1314.8	268.55	1319.61	342.32	1318.68	348.94	1318.56	354.6	1318.47
370.31	1319.1	373.41	1319.06	374	1319.14	375.47	1319.14	376.34	1318.89
378.81	1318.6	384.59	1316.75	393.03	1316.93	400	1315.16		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	28.84	.035	268.55	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
28.84	268.55	0	0	0	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
267.88	400	1319.6

SUMMARY OF MANNING'S N VALUES

River:East Maricopa Fl

Reach	River Sta.	n1	n2	n3
Pecos Crossing	17	.035	.035	.035
Pecos Crossing	16	.035	.035	.035
Pecos Crossing	15	.035	.035	.035
Pecos Crossing	14	.035	.035	.035
Pecos Crossing	13	.035	.035	.035
Pecos Crossing	12	.035	.035	.035
Pecos Crossing	11	.035	.035	.035
Pecos Crossing	10	.035	.035	.035
Pecos Crossing	9	.035	.035	.035
Pecos Crossing	8	.035	.035	.035
Pecos Crossing	7	.035	.035	.035
Pecos Crossing	6	.035	.035	.035
Pecos Crossing	5	.035	.035	.035
Pecos Crossing	4	.035	.035	.035
Pecos Crossing	3	.035	.035	.035
Pecos Crossing	2	.035	.035	.035
Pecos Crossing	1	.035	.035	.035

SUMMARY OF REACH LENGTHS

River: East Maricopa Fl

Reach	River Sta.	Left	Channel	Right
Pecos Crossing	17	100	100	100
Pecos Crossing	16	100	100	100
Pecos Crossing	15	100	100	100
Pecos Crossing	14	100	100	100
Pecos Crossing	13	100	100	100
Pecos Crossing	12	30.95	31.53	33.12
Pecos Crossing	11	102.04	102.2	102.69
Pecos Crossing	10	67.01	66.95	66.89
Pecos Crossing	9	100	100	100
Pecos Crossing	8	100	100	100
Pecos Crossing	7	100	100	100
Pecos Crossing	6	100	100	100
Pecos Crossing	5	100	100	100
Pecos Crossing	4	100	100	100
Pecos Crossing	3	100	100	100
Pecos Crossing	2	100	100	100
Pecos Crossing	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: East Maricopa Fl

Reach	River Sta.	Contr.	Expan.
Pecos Crossing	17	.1	.3
Pecos Crossing	16	.1	.3
Pecos Crossing	15	.1	.3
Pecos Crossing	14	.1	.3
Pecos Crossing	13	.1	.3
Pecos Crossing	12	.1	.3
Pecos Crossing	11	.1	.3
Pecos Crossing	10	.1	.3
Pecos Crossing	9	.1	.3

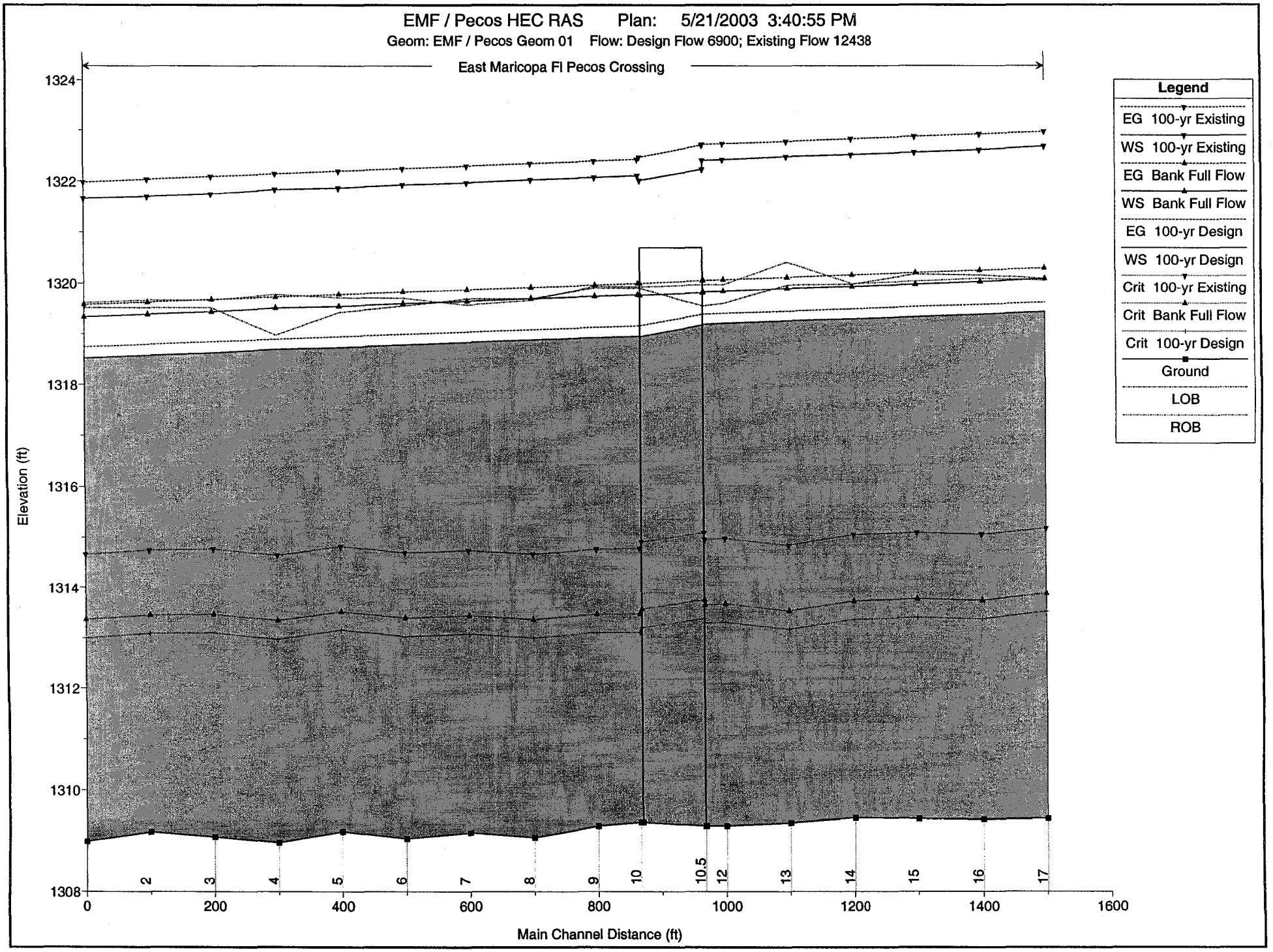
Pecos Crossing	8	.1	.3
Pecos Crossing	7	.1	.3
Pecos Crossing	6	.1	.3
Pecos Crossing	5	.1	.3
Pecos Crossing	4	.1	.3
Pecos Crossing	3	.1	.3
Pecos Crossing	2	.1	.3
Pecos Crossing	1	.1	.3

DRAFT

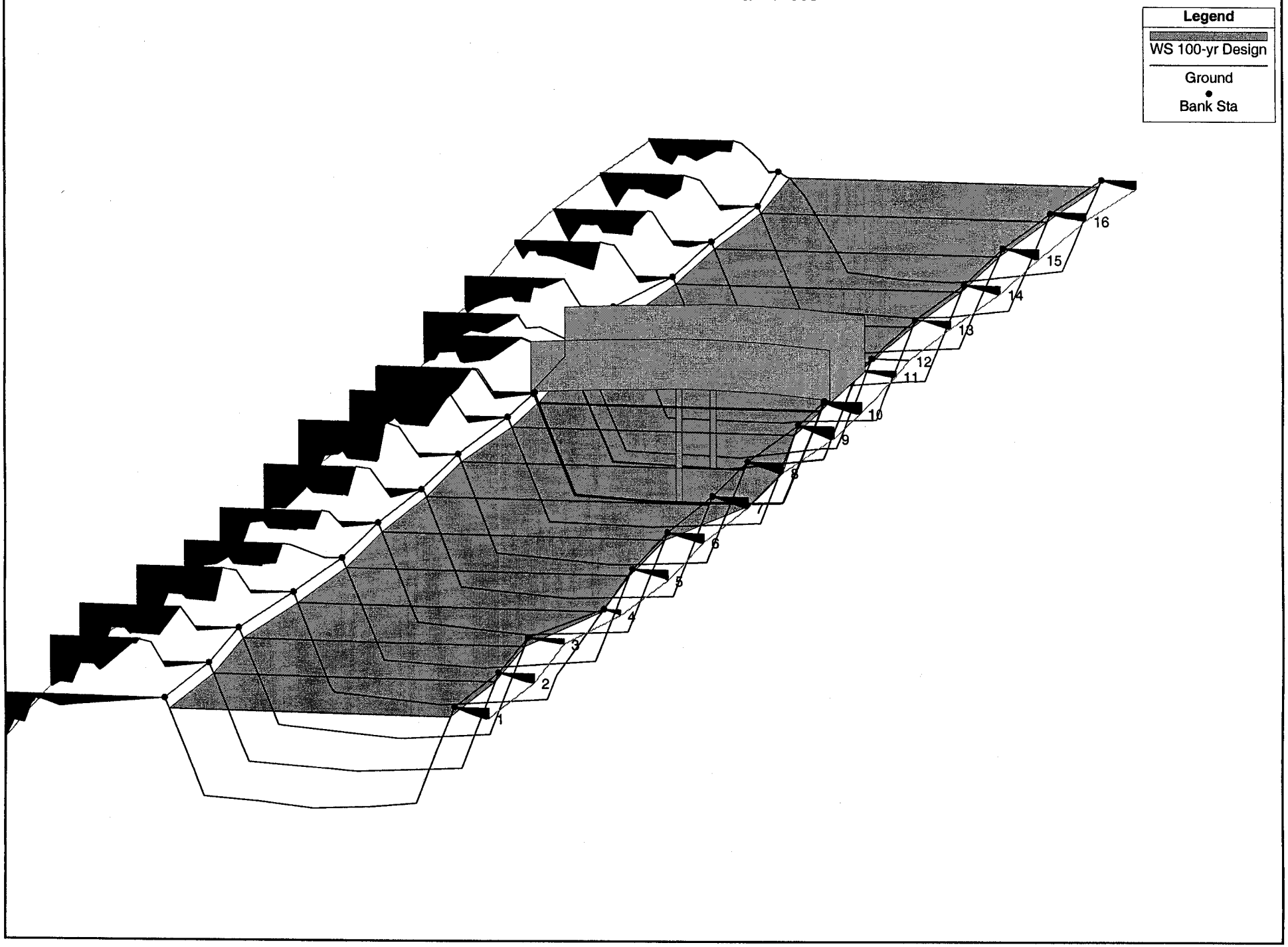
Design Conditions HEC-RAS Model

HEC-RAS Plan: 100-year River: East Maricopa Fl Reach: Pecos Crossing

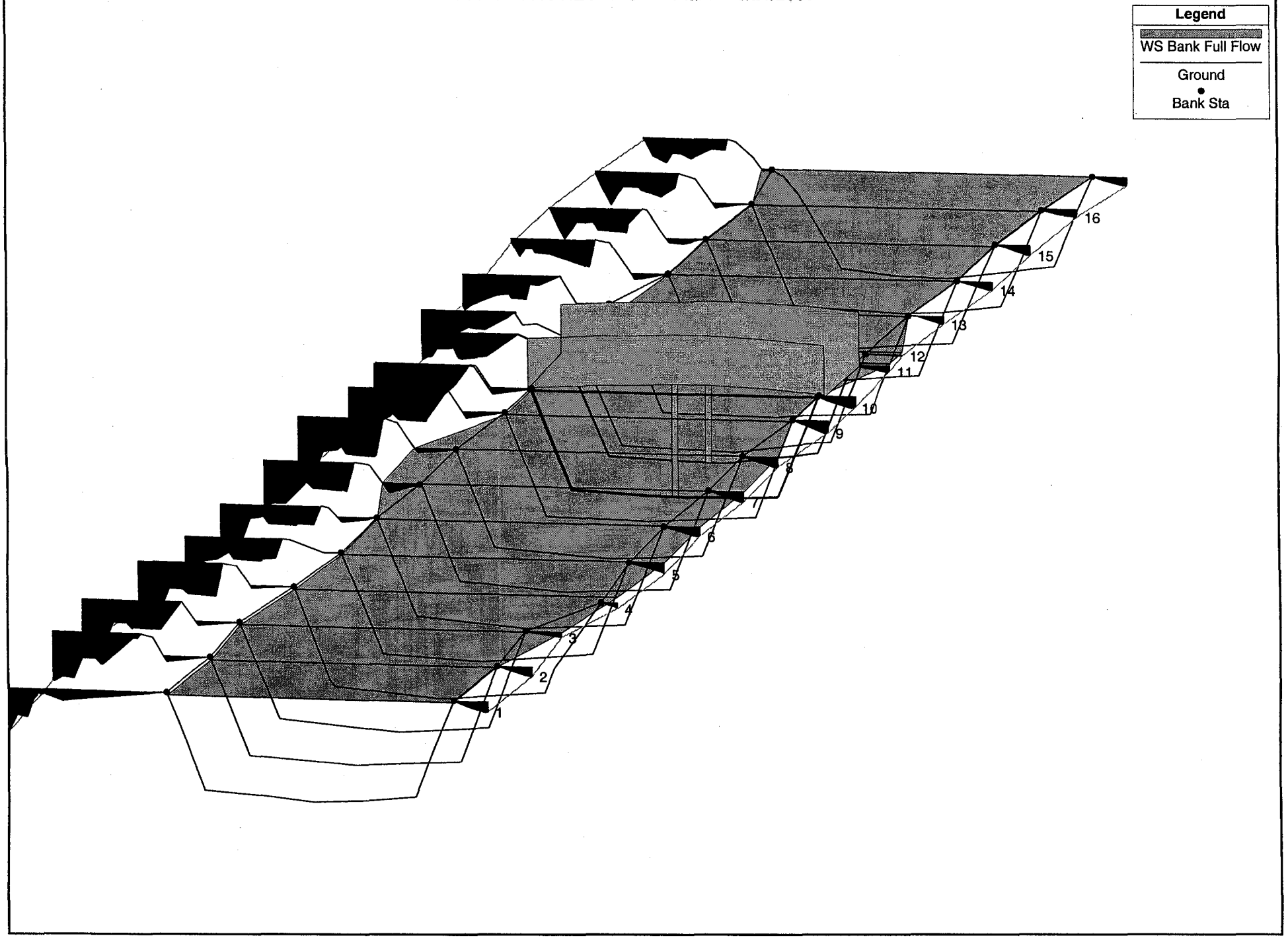
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Max Chl Dpth	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Pecos Crossing	17	100-yr Design	6900.00	1309.45	1319.44	9.99	1313.52	1319.62	0.000428	3.46	1994.62	252.97	0.22
Pecos Crossing	17	Bank Full Flow	8000.00	1309.45	1320.09	10.64	1313.88	1320.30	0.000465	3.70	2165.08	273.28	0.23
Pecos Crossing	17	100-yr Existing	12438.00	1309.45	1322.69	13.24	1315.18	1322.97	0.000436	4.30	2970.83	322.25	0.23
Pecos Crossing	16	100-yr Design	6900.00	1309.43	1319.38	9.95	1313.37	1319.58	0.000422	3.54	1946.44	234.94	0.22
Pecos Crossing	16	Bank Full Flow	8000.00	1309.43	1320.03	10.60	1313.74	1320.26	0.000452	3.81	2100.29	239.31	0.23
Pecos Crossing	16	100-yr Existing	12438.00	1309.43	1322.62	13.19	1315.06	1322.93	0.000445	4.48	2888.80	318.96	0.23
Pecos Crossing	15	100-yr Design	6900.00	1309.44	1319.33	9.89	1313.40	1319.54	0.000438	3.59	1921.72	234.13	0.22
Pecos Crossing	15	Bank Full Flow	8000.00	1309.44	1319.98	10.54	1313.77	1320.21	0.000469	3.86	2074.19	238.64	0.23
Pecos Crossing	15	100-yr Existing	12438.00	1309.44	1322.57	13.13	1315.10	1322.88	0.000457	4.52	2867.75	316.73	0.24
Pecos Crossing	14	100-yr Design	6900.00	1309.46	1319.29	9.83	1313.36	1319.49	0.000435	3.58	1928.48	234.96	0.22
Pecos Crossing	14	Bank Full Flow	8000.00	1309.46	1319.93	10.47	1313.73	1320.16	0.000466	3.84	2080.75	239.41	0.23
Pecos Crossing	14	100-yr Existing	12438.00	1309.46	1322.53	13.07	1315.05	1322.84	0.000453	4.50	2875.07	315.03	0.24
Pecos Crossing	13	100-yr Design	6900.00	1309.36	1319.26	9.90	1313.17	1319.45	0.000408	3.51	1967.21	235.12	0.21
Pecos Crossing	13	Bank Full Flow	8000.00	1309.36	1319.89	10.53	1313.54	1320.12	0.000439	3.78	2118.82	239.27	0.22
Pecos Crossing	13	100-yr Existing	12438.00	1309.36	1322.49	13.13	1314.84	1322.79	0.000447	4.43	2901.43	315.67	0.23
Pecos Crossing	12	100-yr Design	6900.00	1309.30	1319.20	9.90	1313.31	1319.40	0.000435	3.58	1929.21	234.86	0.22
Pecos Crossing	12	Bank Full Flow	8000.00	1309.30	1319.84	10.54	1313.67	1320.07	0.000464	3.85	2086.80	269.06	0.23
Pecos Crossing	12	100-yr Existing	12438.00	1309.30	1322.43	13.13	1314.98	1322.74	0.000457	4.53	2846.43	319.59	0.24
Pecos Crossing	11	100-yr Design	6900.00	1309.30	1319.19	9.89	1313.30	1319.39	0.000436	3.58	1926.80	234.61	0.22
Pecos Crossing	11	Bank Full Flow	8000.00	1309.30	1319.83	10.52	1313.66	1320.06	0.000465	3.85	2085.50	269.10	0.23
Pecos Crossing	11	100-yr Existing	12438.00	1309.30	1322.41	13.11	1314.96	1322.73	0.000456	4.53	2867.10	368.54	0.24
Pecos Crossing	10.5 BR U	100-yr Design	6900.00	1309.30	1319.17	9.87	1313.38	1319.38	0.000518	3.68	1873.62	229.50	0.23
Pecos Crossing	10.5 BR U	Bank Full Flow	8000.00	1309.30	1319.81	10.51	1313.76	1320.05	0.000554	3.96	2029.28	264.05	0.24
Pecos Crossing	10.5 BR U	100-yr Existing	12438.00	1309.30	1322.24	12.94	1315.09	1322.71	0.002391	5.57	2314.47	141.74	0.29
Pecos Crossing	10.5 BR D	100-yr Design	6900.00	1309.37	1318.95	9.58	1313.21	1319.16	0.000527	3.71	1859.11	228.26	0.23
Pecos Crossing	10.5 BR D	Bank Full Flow	8000.00	1309.37	1319.76	10.39	1313.57	1320.00	0.000533	3.91	2047.06	233.55	0.23
Pecos Crossing	10.5 BR D	100-yr Existing	12438.00	1309.37	1322.02	12.65	1314.91	1322.48	0.002261	5.47	2337.48	68.99	0.29
Pecos Crossing	10	100-yr Design	6900.00	1309.37	1318.96	9.59	1313.11	1319.16	0.000446	3.61	1909.00	233.32	0.22
Pecos Crossing	10	Bank Full Flow	8000.00	1309.37	1319.77	10.40	1313.47	1319.99	0.000450	3.81	2100.56	238.59	0.23
Pecos Crossing	10	100-yr Existing	12438.00	1309.37	1322.11	12.74	1314.79	1322.43	0.000479	4.59	2816.88	316.94	0.24
Pecos Crossing	9	100-yr Design	6900.00	1309.30	1318.93	9.63	1313.11	1319.13	0.000447	3.62	1908.18	233.23	0.22
Pecos Crossing	9	Bank Full Flow	8000.00	1309.30	1319.74	10.44	1313.47	1319.96	0.000451	3.81	2099.60	238.45	0.23
Pecos Crossing	9	100-yr Existing	12438.00	1309.30	1322.08	12.78	1314.77	1322.40	0.000480	4.59	2814.78	317.20	0.24
Pecos Crossing	8	100-yr Design	6900.00	1309.07	1318.88	9.81	1313.00	1319.08	0.000440	3.60	1917.97	233.63	0.22
Pecos Crossing	8	Bank Full Flow	8000.00	1309.07	1319.69	10.62	1313.36	1319.92	0.000444	3.79	2110.83	273.28	0.22
Pecos Crossing	8	100-yr Existing	12438.00	1309.07	1322.04	12.96	1314.67	1322.35	0.000471	4.57	2835.47	316.64	0.24
Pecos Crossing	7	100-yr Design	6900.00	1309.17	1318.83	9.66	1313.08	1319.04	0.000457	3.64	1896.08	233.79	0.23
Pecos Crossing	7	Bank Full Flow	8000.00	1309.17	1319.64	10.47	1313.44	1319.87	0.000464	3.83	2090.14	271.77	0.23
Pecos Crossing	7	100-yr Existing	12438.00	1309.17	1321.98	12.81	1314.74	1322.30	0.000490	4.61	2838.50	400.00	0.25
Pecos Crossing	6	100-yr Design	6900.00	1309.05	1318.79	9.74	1313.03	1318.99	0.000460	3.65	1892.63	233.67	0.23
Pecos Crossing	6	Bank Full Flow	8000.00	1309.05	1319.60	10.55	1313.39	1319.83	0.000463	3.84	2085.27	268.99	0.23
Pecos Crossing	6	100-yr Existing	12438.00	1309.05	1321.94	12.89	1314.70	1322.25	0.000478	4.57	2915.79	400.00	0.24
Pecos Crossing	5	100-yr Design	6900.00	1309.19	1318.73	9.54	1313.16	1318.94	0.000490	3.72	1856.49	233.43	0.23
Pecos Crossing	5	Bank Full Flow	8000.00	1309.19	1319.54	10.35	1313.52	1319.78	0.000491	3.91	2051.12	268.56	0.24
Pecos Crossing	5	100-yr Existing	12438.00	1309.19	1321.87	12.68	1314.82	1322.20	0.000507	4.66	2839.79	400.00	0.25
Pecos Crossing	4	100-yr Design	6900.00	1308.97	1318.70	9.73	1312.97	1318.89	0.000456	3.54	1950.72	250.93	0.22
Pecos Crossing	4	Bank Full Flow	8000.00	1308.97	1319.51	10.54	1313.34	1319.72	0.000448	3.71	2164.03	268.79	0.22
Pecos Crossing	4	100-yr Existing	12438.00	1308.97	1321.84	12.87	1314.64	1322.15	0.000469	4.45	2881.42	326.28	0.24
Pecos Crossing	3	100-yr Design	6900.00	1309.08	1318.62	9.54	1313.10	1318.84	0.000499	3.74	1843.04	232.51	0.23
Pecos Crossing	3	Bank Full Flow	8000.00	1309.08	1319.43	10.35	1313.46	1319.67	0.000499	3.93	2033.35	237.94	0.24
Pecos Crossing	3	100-yr Existing	12438.00	1309.08	1321.75	12.67	1314.77	1322.09	0.000527	4.73	2762.10	400.00	0.25
Pecos Crossing	2	100-yr Design	6900.00	1309.18	1318.57	9.39	1313.09	1318.79	0.000503	3.75	1840.37	233.03	0.24
Pecos Crossing	2	Bank Full Flow	8000.00	1309.18	1319.38	10.20	1313.45	1319.62	0.000502	3.94	2031.10	238.38	0.24
Pecos Crossing	2	100-yr Existing	12438.00	1309.18	1321.70	12.52	1314.75	1322.04	0.000528	4.72	2741.08	324.56	0.25
Pecos Crossing	1	100-yr Design	6900.00	1308.99	1318.52	9.53	1313.00	1318.74	0.000500	3.74	1842.57	232.62	0.23
Pecos Crossing	1	Bank Full Flow	8000.00	1308.99	1319.33	10.34	1313.36	1319.57	0.000500	3.93	2033.04	238.15	0.24
Pecos Crossing	1	100-yr Existing	12438.00	1308.99	1321.66	12.67	1314.66	1321.98	0.000500	4.60	2925.06	400.00	0.25


EMF / Pecos HEC RAS Plan: 5/21/2003 3:40:55 PM
Geom: EMF / Pecos Geom 01 Flow: Design Flow 6900; Existing Flow 12438
East Maricopa Fl Pecos Crossing
Legend
EG 100-yr Existing
WS 100-yr Existing
EG Bank Full Flow
WS Bank Full Flow
EG 100-yr Design
WS 100-yr Design
Crit 100-yr Existing
Crit Bank Full Flow
Crit 100-yr Design
Ground
LOB
ROB
Elevation (ft)
1324
1322
1320
1318
1316
1314
1312
1310
1308
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)
2
3
4
5
6
7
8
9
10
10.5
12
13
14
15
16
17

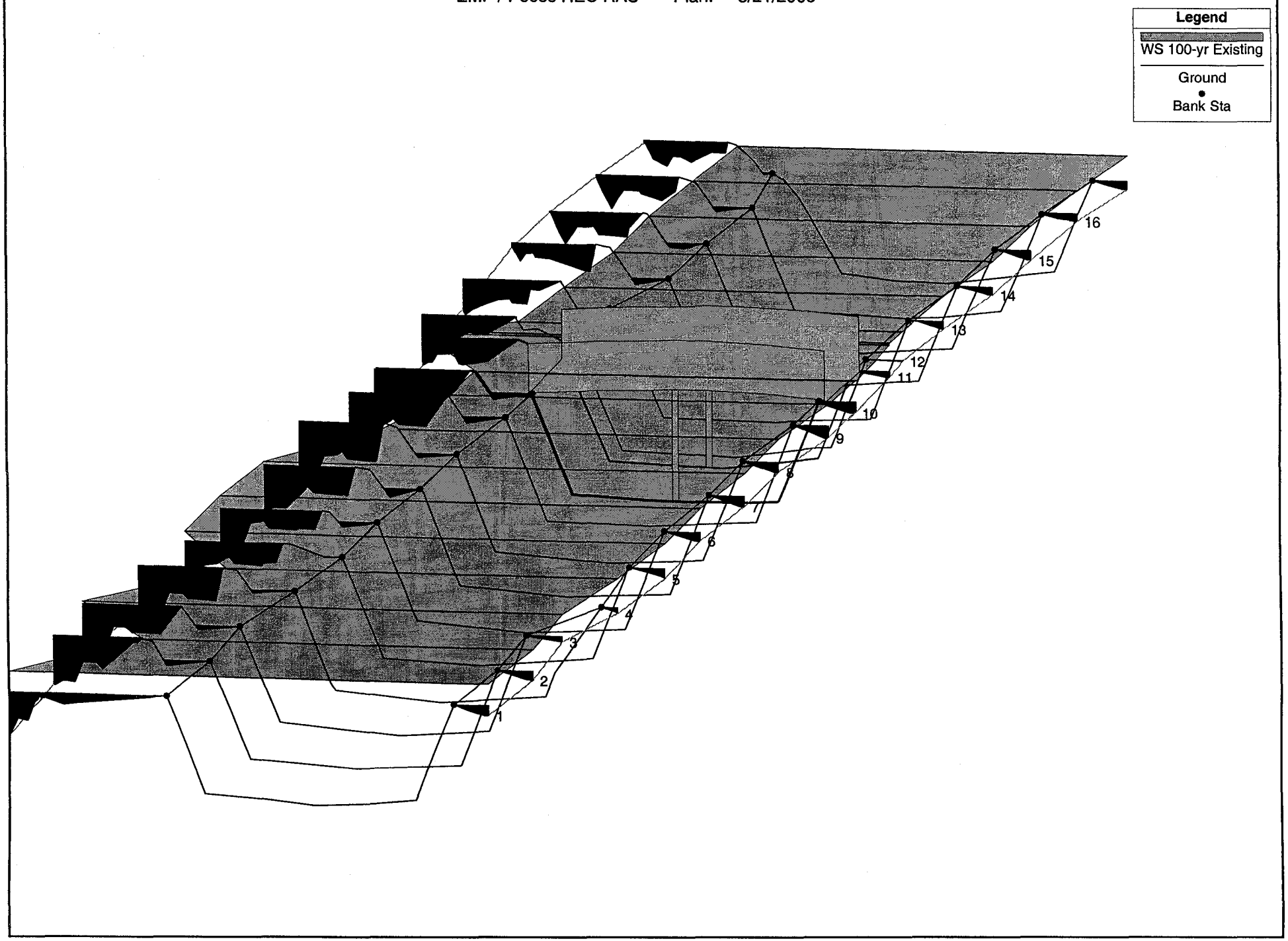
EMF / Pecos HEC RAS Plan: 5/21/2003



EMF / Pecos HEC RAS Plan: 5/21/2003



EMF / Pecos HEC RAS Plan: 5/21/2003



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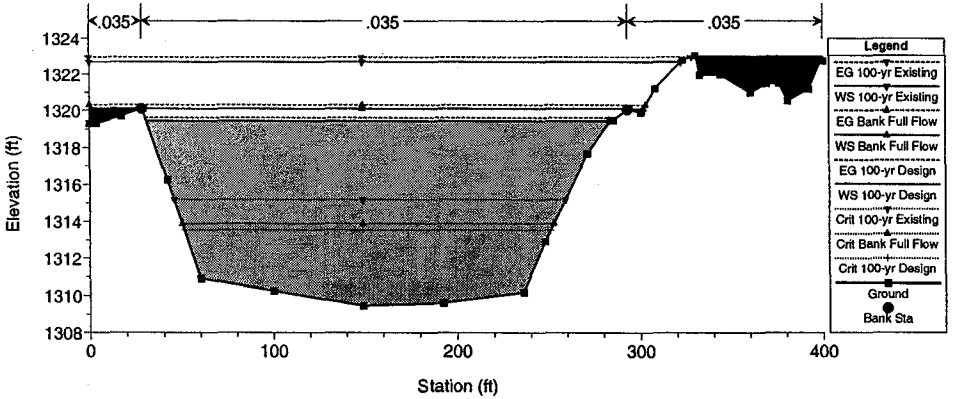
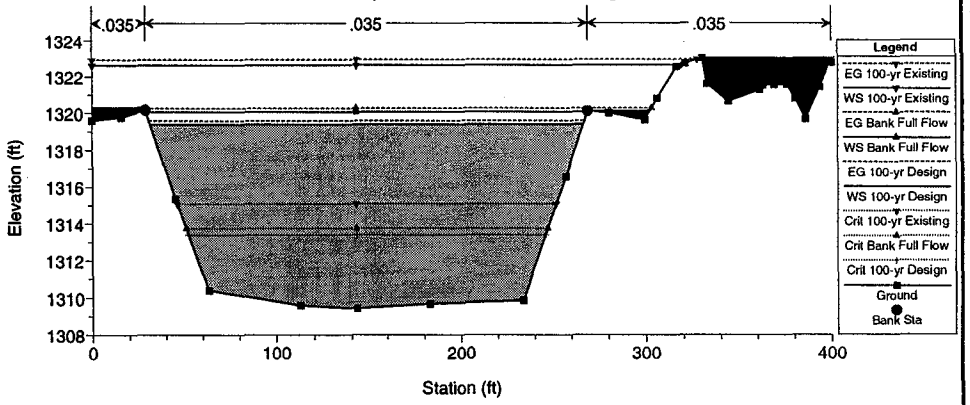
River = East Maricopa Fl Reach = Pecos Crossing RS = 17



EMF / Pecos HEC RAS Plan: 5/21/2003 3:40:55 PM
Geom: EMF / Pecos Geom 01 Flow: Design Flow 6900; Existing Flow 12438
River = East Maricopa Fl Reach = Pecos Crossing RS = 16



EMF / Pecos HEC RAS Plan: 5/21/2003 3:40:55 PM
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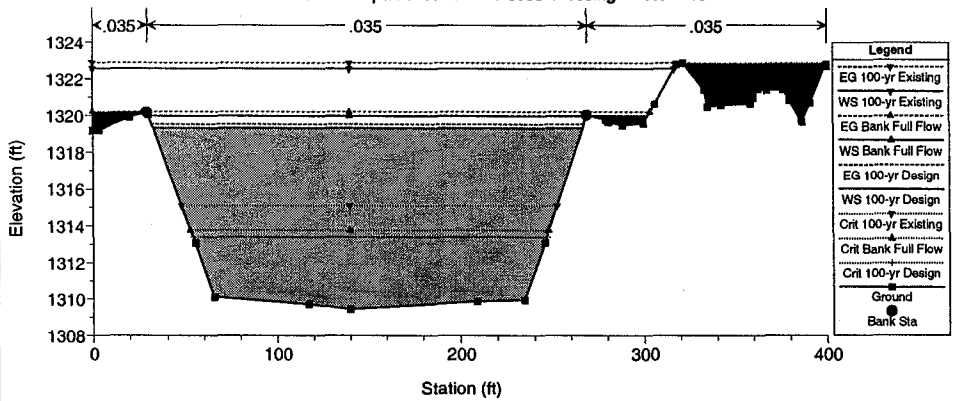
River = East Maricopa Fl Reach = Pecos Crossing RS = 15



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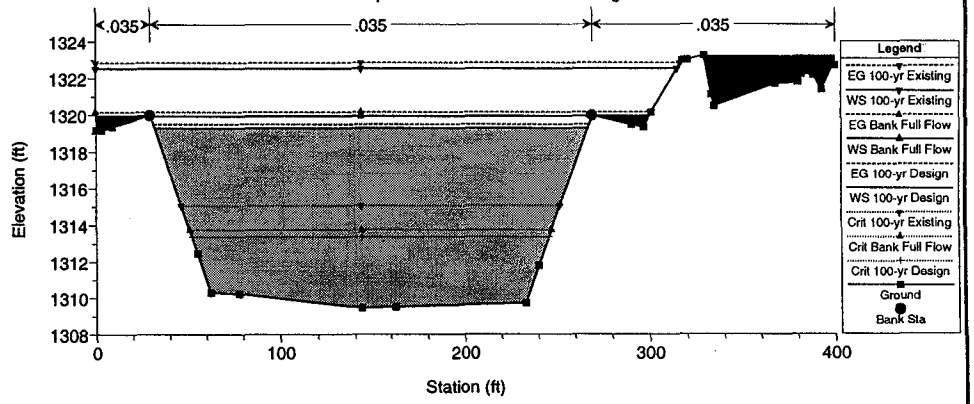

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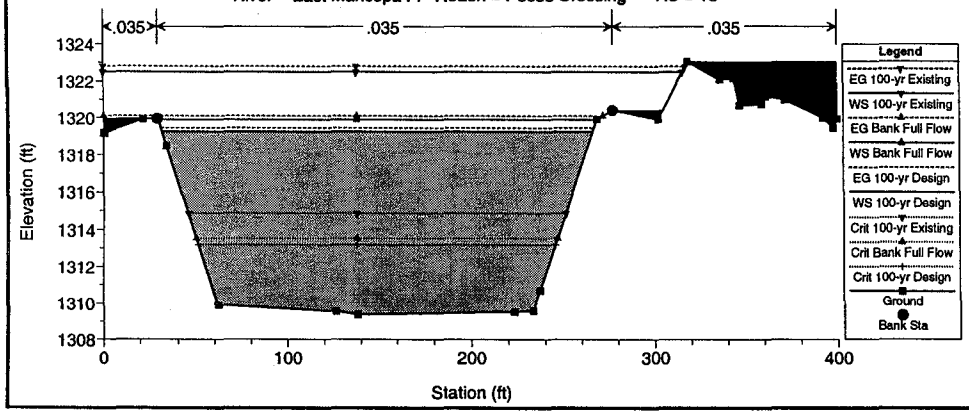

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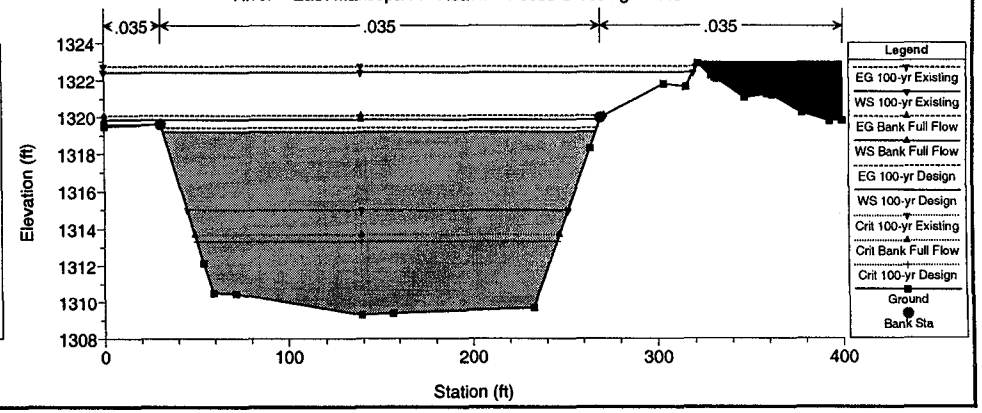

EMF / Pecos HEC RAS Plan: 5/21/2003 3:40:55 PM
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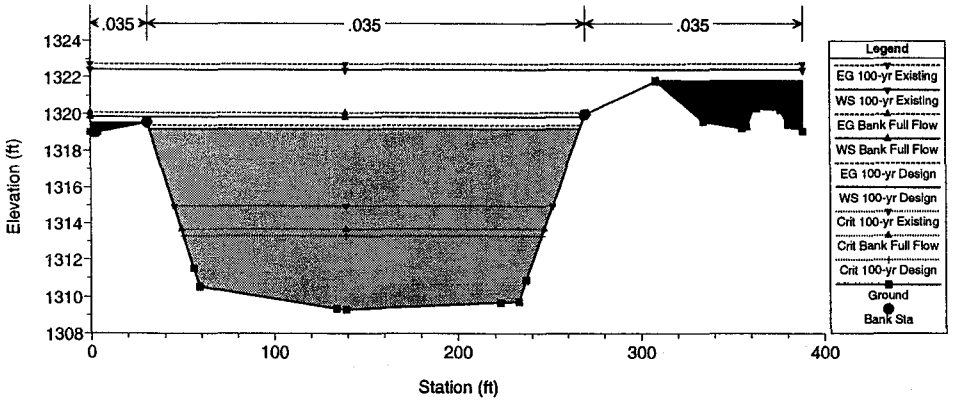
River = East Maricopa Fl Reach = Pecos Crossing RS = 11 Upstream of Proposed Pecos Road Bridge Crossing



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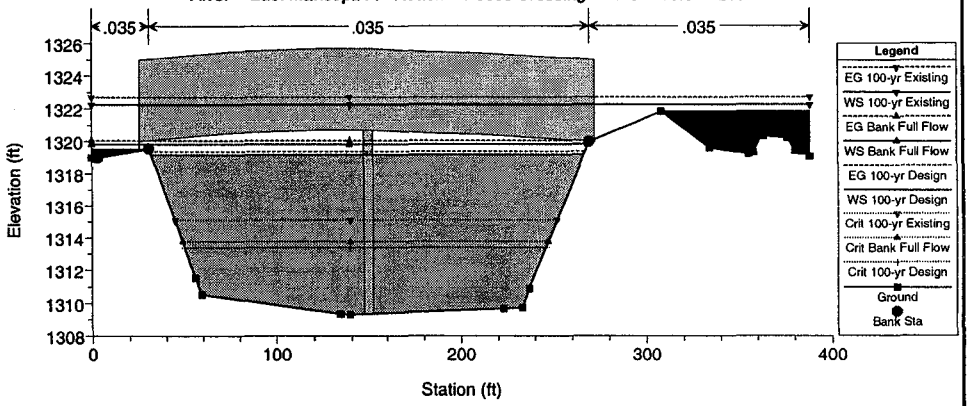

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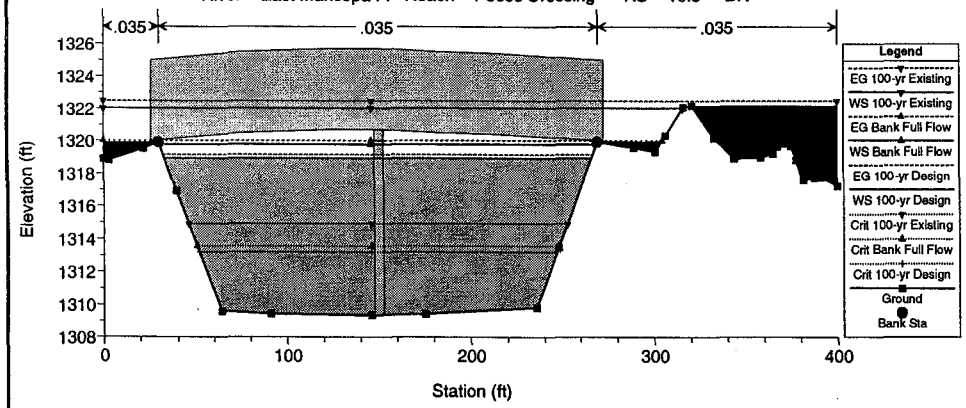
River = East Maricopa Fl Reach = Pecos Crossing RS = 10.5 BR



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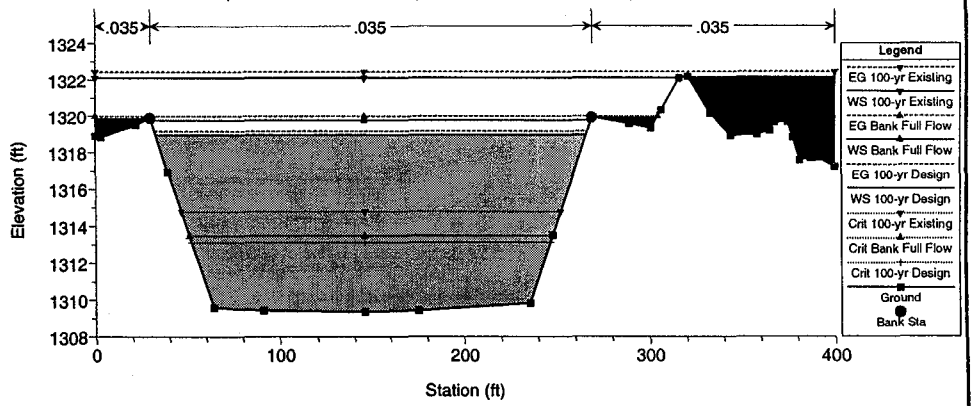
River = East Maricopa Fl Reach = Pecos Crossing RS = 10 Downstream of Proposed Pecos Road Bridge Crossing



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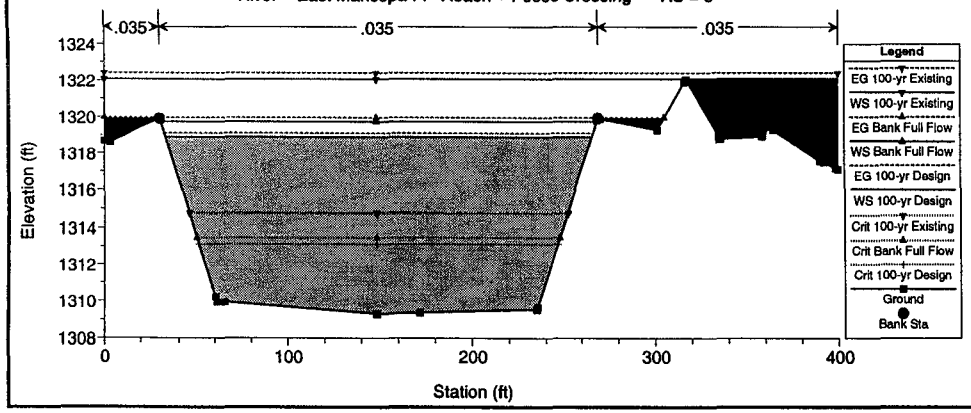
River = East Maricopa Fl Reach = Pecos Crossing RS = 9



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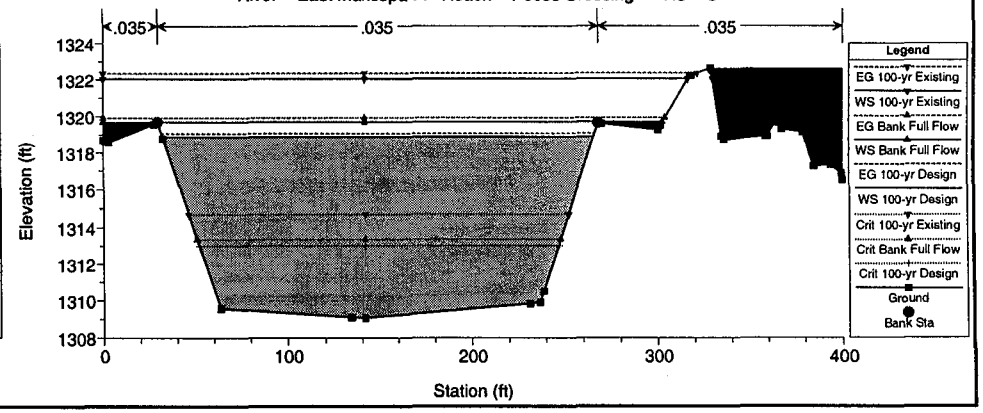

EMF / Pecos HEC RAS Plan: 5/21/2003 3:40:55 PM
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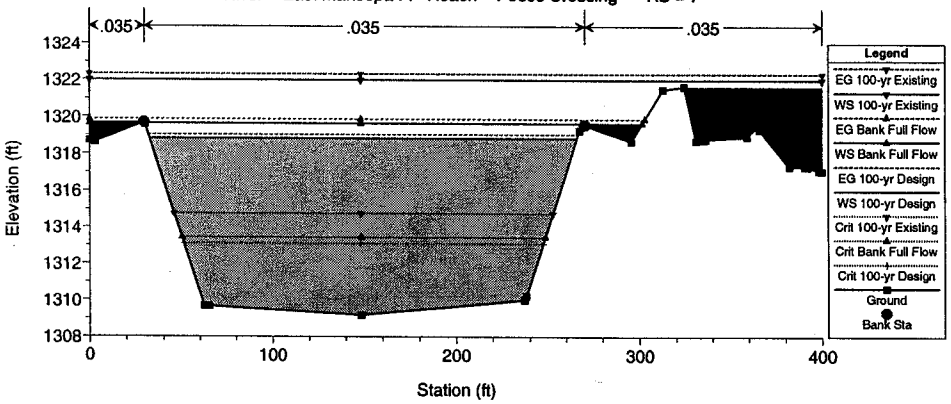

EMF / Pecos HEC RAS Plan: 5/21/2003 3:40:55 PM
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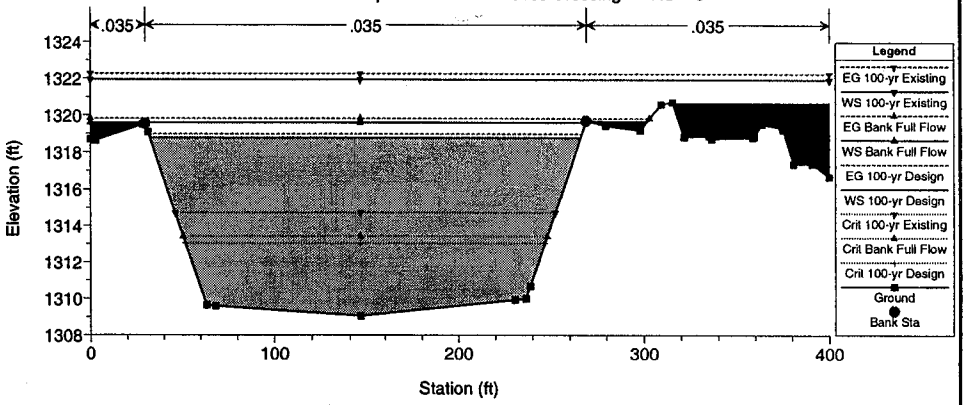
River = East Maricopa Fl Reach = Pecos Crossing RS = 6



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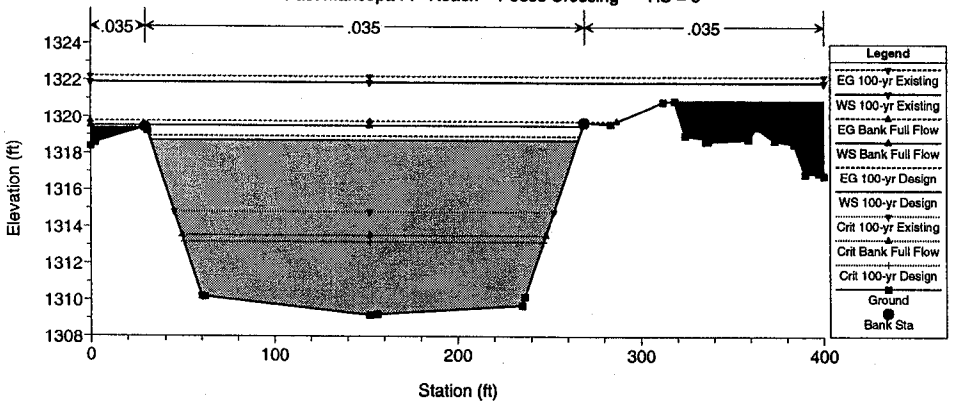

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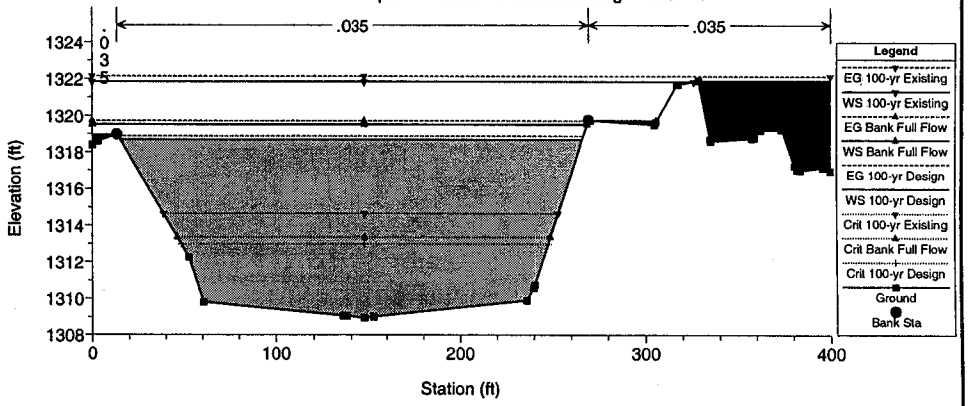
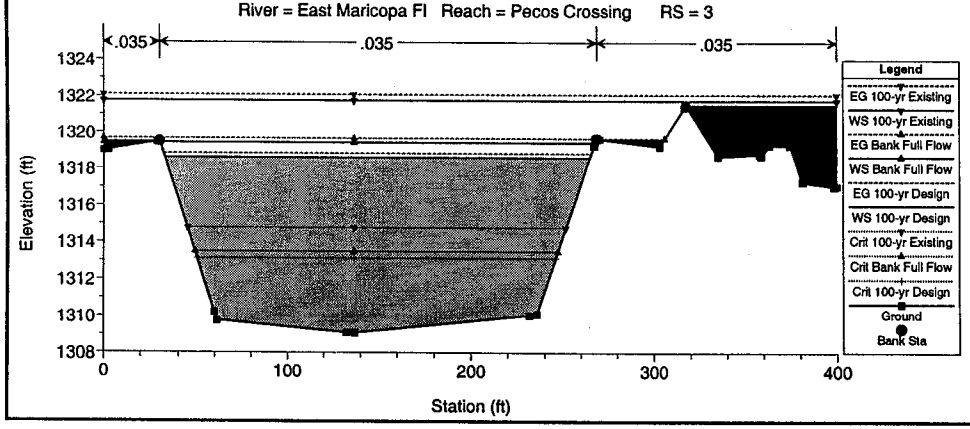


EMF / Pecos HEC RAS Plan: 5/21/2003 3:40:55 PM
Geom: EMF / Pecos Geom 01 Flow: Design Flow 6900; Existing Flow 12438
River = East Maricopa Fl Reach = Pecos Crossing RS = 3



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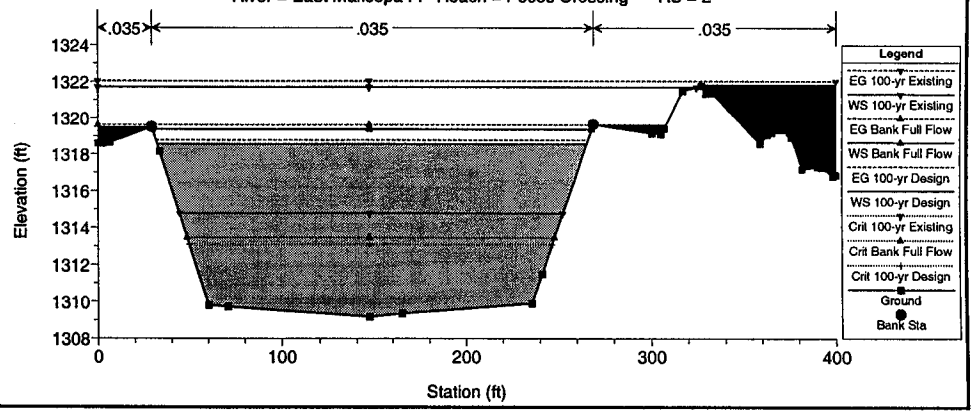
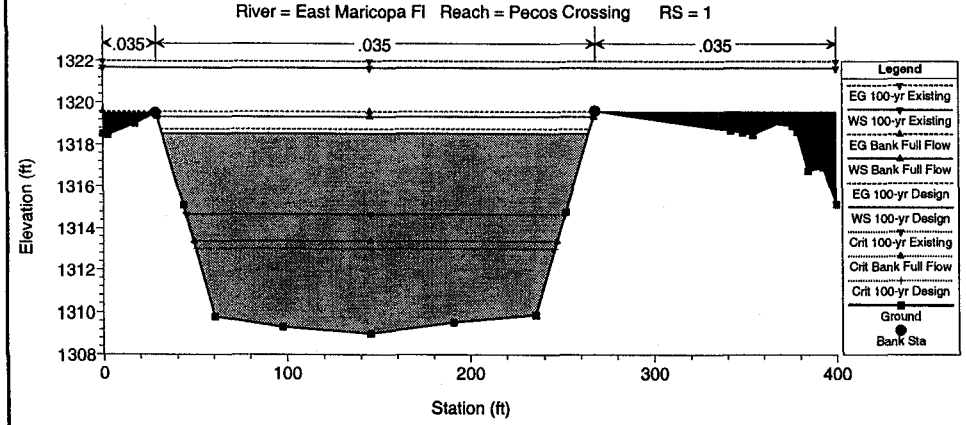
River = East Maricopa Fl Reach = Pecos Crossing RS = 2



EMF / Pecos HEC RAS Plan: 5/21/2003 3:40:55 PM

Geom: EMF / Pecos Geom 01 Flow: Design Flow 6900; Existing Flow 12438

River = East Maricopa Fl Reach = Pecos Crossing RS = 1



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                    HEC-RAS Version 3.1.1 May 2003
                     U.S. Army Corp of Engineers
                    Hydrologic Engineering Center
                      609 Second Street, Suite D
                     Davis, California 95616-4687
                            (916) 756-1104


          X     X  XXXXXX    XXXX        XXXX       XX      XXXX
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PROJECT DATA
Project Title: EMF / Pecos HEC RAS
Project File : PecosDesign.prj
Run Date and Time: 5/21/2003 3:40:55 PM

Project in English units

Project Description:
******* Autodesk, Inc. HEC-2 Input Data file ********
****
Minimum Data Input **********

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PLAN DATA

Plan Title:
Plan File : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\PecosDesign.p03

Geometry Title: EMF / Pecos Geom 01
Geometry File : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\PecosDesign.g01

Flow Title : Design Flow 6900; Existing Flow 12438
Flow File : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\PecosDesign.f01

Plan Summary Information:

Number of:	Cross Sections =	17	Mulitple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	1	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculaton tolerance = 0.003
Maximum number of interations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed at all cross sections
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Design Flow 6900; Existing Flow 12438
Flow File : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\PecosDesign.f01

Flow Data (cfs)

River	Reach	RS	100-yr Design	Bank Full Flow	100-yr Existing
East Maricopa Fl	Pecos Crossing	17	6900	8000	12438
East Maricopa Fl	Pecos Crossing	1	6900	8000	12438

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
East Maricopa Fl	Pecos Crossing	100-yr Design	Normal S = 0.0005	Normal S = 0.0005
East Maricopa Fl	Pecos Crossing	Bank Full Flow	Normal S = 0.0005	Normal S = 0.0005
East Maricopa Fl	Pecos Crossing	100-yr Existing	Normal S = 0.0005	Normal S = 0.0005

GEOMETRY DATA

Geometry Title: EMF / Pecos Geom 01
Geometry File : w:\2002Projects\021734 - Pecos Road Bridge\Hydraulics\HEC-RAS\PecosDesign.g01

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 17

INPUT
Description:
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319.3	3.76	1319.3	17.63	1319.7	28.35	1320.1	42.21	1316.23
60.23	1310.9	99.98	1310.24	148.96	1309.45	192.41	1309.61	236	1310.18
247.87	1312.9	271.32	1317.67	284.08	1319.49	285.29	1319.49	293.17	1320.06
300.54	1319.9	308.27	1321.23	323.41	1322.81	330.43	1323.06	332.5	1321.96
343.87	1322	360.54	1321.01	369.17	1321.49	376.01	1321.51	380.81	1320.55
392.18	1321.2	398.71	1322.76	398.72	1322.76	400	1322.74		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	28.35	.035	293.17	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
28.35	293.17	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.61	28.35	1320.14	293.15	301.67	1320.07	329.98	400	1323.06

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 16

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319.6	15.86	1319.77	29.08	1320.16	45.36	1315.34	63.27	1310.4
112.94	1309.6	143.28	1309.43	182.86	1309.68	233.91	1309.86	257.08	1316.53
269.05	1320.1	280.46	1319.98	299.58	1319.63	306.04	1320.79	316.39	1322.52
320.99	1322.7	330.25	1323.02	332.98	1321.58	344.46	1320.61	361.38	1321.24
363.1	1321.5	368.93	1321.53	376.08	1321.54	380.46	1320.8	386.05	1319.68

```
  393.69  1321.4  398.79 1322.76     400 1322.74

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   29.08    .035  269.05    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         29.08  269.05              100     100     100              .1       .3
Blocked Obstructions      num=       3
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
       0   29.22 1320.34   269.1     400 1320.13  330.39   399.1 1323.04

CROSS SECTION


RIVER: East Maricopa Fl
REACH: Pecos Crossing     RS: 15

INPUT
Description:
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1319.2    3.28 1319.19   20.22 1319.92   29.45 1320.18   55.18 1313.09
   65.46  1310.1  117.22 1309.71  140.15 1309.44  208.97 1309.87  234.67 1309.95
  245.65  1313.1  269.02 1320.04  279.59 1319.79  280.73 1319.68  288.11 1319.49
  299.73  1319.6  306.04 1320.65  318.01  1322.8  321.68 1322.89  333.32 1321.41
  334.97  1320.5  342.43 1320.58  358.51 1320.67  360.04 1320.99  362.72 1321.46
  367.45  1321.4  376.42 1321.43   379.8 1320.82  386.46 1319.69  391.04 1320.71
  398.87  1322.7     400 1322.71

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   29.45    .035  269.02    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         29.45  269.02              100     100     100              .1       .3
Blocked Obstructions      num=       4
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
    -.61   29.46 1320.19  268.49  299.54 1319.68  268.94  304.95 1320.04
  323.29     400 1322.86

CROSS SECTION


RIVER: East Maricopa Fl
REACH: Pecos Crossing     RS: 14

INPUT
Description:
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1319.2    3.02 1319.17    8.74 1319.37   29.66 1319.98   55.08 1312.47
   62.21  1310.3   77.56 1310.23  143.89 1309.46  162.36  1309.5  233.35 1309.71
  240.33  1311.8  269.43 1319.99  290.48 1319.47  297.05 1319.36  301.22 1320.16
  317.79    1323  320.48 1323.01   329.6 1323.24  333.67 1321.12  334.95 1320.49
   367.9  1321.7  380.24 1321.81  382.29 1322.23  388.45  1322.2  392.97 1321.41
  398.96  1322.7     400  1322.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   29.66    .035  269.43    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         29.66  269.43              100     100     100              .1       .3
Blocked Obstructions      num=       3
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
    -.04    29.7 1319.98  269.44  300.12 1319.98  328.77     400 1323.23

CROSS SECTION
```

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 13

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319.2	.58	1319.17	21.6	1319.93	29.16	1319.96	33.72	1318.49
62.03	1309.9	126.45	1309.55	138.25	1309.36	223.23	1309.53	233.37	1309.57
237.47	1310.7	268.79	1319.94	277.63	1320.42	302.3	1319.94	318.68	1323.06
336.4	1322.1	343.78	1322.16	346.86	1320.68	358.85	1320.76	361.21	1321.17
371.57	1321	392.18	1320.01	397.93	1319.46	400	1319.95		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.16	.035	277.63	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.16	277.63	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.14	29.18	1319.97	277.54	304.69	1320.42	317.81	400	1323.06

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 12

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319.5	30.82	1319.6	54.06	1312.14	59.42	1310.52	71.63	1310.45
139	1309.3	156.51	1309.38	232.97	1309.69	263.92	1318.32	269.5	1319.97
303.51	1321.8	315.27	1321.65	315.36	1321.67	322.18	1322.89	329.24	1322.25
330.77	1322.2	330.79	1322.15	332.11	1322.08	346.95	1321.06	359	1321.23
360.12	1321.3	361.8	1321.18	378.01	1320.23	393.1	1319.76	399.43	1319.82
400	1319.8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	30.82	.035	269.5	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
30.82	269.5	30.95	31.53	33.12	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.06	30.78	1319.61	320.85	400	1322.98

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 11

INPUT
Description: Upstream of Proposed Pecos Road Bridge Crossing
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319	2.41	1318.95	2.61	1318.9	2.81	1318.95	3.21	1318.95
4.02	1319	31.09	1319.55	56.11	1311.52	59.45	1310.54	134.37	1309.35
139.59	1309.3	223.2	1309.68	233.23	1309.74	237.13	1310.9	269.62	1319.97
308.36	1321.8	308.41	1321.84	308.44	1321.84	308.46	1321.84	308.51	1321.83
334.5	1319.6	355.65	1319.22	358.24	1319.32	362.43	1320.4	362.71	1320.38
363.64	1320.3	376.37	1320.21	380.45	1319.42	384.31	1319.37	388.54	1319.07

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.035	31.09	.035	269.62	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
31.09	269.62	102.04	102.2	102.69	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.03	30.99	1319.55	308.07	388.54	1321.86

BRIDGE

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 10.5

INPUT
Description:
Distance from Upstream XS = 1
Deck/Roadway Width = 98
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 8

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
25.7	1325	1320	75.8	1325.5	1320.5	100.7	1325.6	1320.6
125	1325.7	1320.7	150.3	1325.7	1320.7	182	1325.5	1320.5
213.3	1325.4	1320.4	272.5	1325	1320			

Upstream Bridge Cross Section Data
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319	2.41	1318.95	2.61	1318.9	2.81	1318.95	3.21	1318.95
4.02	1319	31.09	1319.55	56.11	1311.52	59.45	1310.54	134.37	1309.35
139.59	1309.3	223.2	1309.68	233.23	1309.74	237.13	1310.9	269.62	1319.97
308.36	1321.8	308.41	1321.84	308.44	1321.84	308.46	1321.84	308.51	1321.83
334.5	1319.6	355.65	1319.22	358.24	1319.32	362.43	1320.4	362.71	1320.38
363.64	1320.3	376.37	1320.21	380.45	1319.42	384.31	1319.37	388.54	1319.07

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	31.09	.035	269.62	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
31.09	269.62	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.03	30.99	1319.55	308.07	388.54	1321.86

Downstream Deck/Roadway Coordinates
num= 8

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
25.7	1325	1320	75.8	1325.5	1320.5	100.7	1325.6	1320.6
125	1325.7	1320.7	150.3	1325.7	1320.7	182	1325.5	1320.5
213.3	1325.4	1320.4	272.5	1325	1320			

Downstream Bridge Cross Section Data
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.9	2.93	1318.83	21.97	1319.52	29.81	1319.9	39.15	1316.94
64.12	1309.6	91.11	1309.44	146.13	1309.37	175.24	1309.44	235.7	1309.82
247.88	1313.5	269.36	1319.93	289.18	1319.58	300.79	1319.34	306.38	1320.33
316.22	1322.1	320.92	1322.18	332.88	1320.14	343.93	1318.92	358.4	1318.99
365.09	1319.2	367.67	1319.64	374.81	1319.67	377.57	1318.83	381.32	1317.59
387.29	1317.7	391.18	1317.73	400	1317.23				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.81	.035	269.36	.035

Bank Sta: Left	Right	Coeff Contr.	Expan.
29.81	269.36	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.03	29.75	1319.9	269.32	304.35	1319.94	320.24	400	1322.17

```
Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  1

Pier Data
Pier Station     Upstream=   150.3    Downstream=   150.3
Upstream     num=       2
    Width   Elev    Width   Elev
       5    1305       5    1322
Downstream     num=       2
    Width   Elev    Width   Elev
       5    1305       5    1322

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum                Cd   =     1.2
       Yarnell                 KVal =      .9
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: East Maricopa Fl
REACH: Pecos Crossing     RS: 10

INPUT
Description: Downstream of Proposed Pecos Road Bridge Crossing
Station Elevation Data    num=      28
```

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.9	2.93	1318.83	21.97	1319.52	29.81	1319.9	39.15	1316.94
64.12	1309.6	91.11	1309.44	146.13	1309.37	175.24	1309.44	235.7	1309.82
247.88	1313.5	269.36	1319.93	289.18	1319.58	300.79	1319.34	306.38	1320.33
316.22	1322.1	320.92	1322.18	332.88	1320.14	343.93	1318.92	358.4	1318.99
365.09	1319.2	367.67	1319.64	374.81	1319.67	377.57	1318.83	381.32	1317.59
387.29	1317.7	391.18	1317.73	400	1317.23				

```
Manning's n Values        num=       3
```

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.81	.035	269.36	.035

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         29.81  269.36             67.01   66.95   66.89              .1       .3
Blocked Obstructions     num=       3
```

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.03	29.75	1319.9	269.32	304.35	1319.94	320.24	400	1322.17

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CROSS SECTION
```

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 9

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.7	.56	1318.7	3.2	1318.63	3.24	1318.63	29.65	1319.91
60.31	1310.2	61.11	1309.95	61.13	1309.95	65.28	1309.92	148.26	1309.31
148.57	1309.3	171.68	1309.37	235.24	1309.54	235.59	1309.65	269.31	1319.94
270.33	1319.9	301.57	1319.3	316.19	1321.9	316.97	1322.03	317.48	1322.05
334.92	1319	335.15	1318.82	336.08	1318.82	358.48	1318.94	358.83	1319
363.02	1319.5	364	1319.46	364.54	1319.3	389.92	1317.56	390.97	1317.57
392.22	1317.5	398.69	1317.17	400	1317.11				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.65	.035	269.31	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.65	269.31	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.06	29.6	1319.91	269.15	304.86	1319.94	317.2	400	1322.13

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 8

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.7	1.44	1318.62	2.79	1318.58	27.32	1319.58	29.63	1319.69
32.55	1318.8	63.53	1309.58	134.04	1309.11	141.86	1309.07	231.2	1309.83
236.72	1309.9	238.77	1310.51	268.31	1319.66	270.04	1319.6	300.44	1319.26
301.66	1319.5	317.66	1322.22	318.42	1322.23	328.99	1322.63	334.74	1318.91
336.29	1318.7	358.59	1318.91	358.96	1318.95	359.72	1318.94	363.83	1319.65
367.48	1319.3	378.73	1319.12	384.92	1317.25	393.75	1317.32	399.45	1316.87
400	1316.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.63	.035	268.31	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.63	268.31	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
.11	29.63	1319.7	268.32	302.25	1319.66	329.98	400	1322.62

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 7

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.7	2.5	1318.63	2.69	1318.62	3.06	1318.63	29.55	1319.69
29.96	1319.6	62.43	1309.68	65.08	1309.66	148.21	1309.17	148.37	1309.17
237.14	1310	238.13	1310.2	267.46	1319.26	270.24	1319.57	295.47	1318.68
312.68	1321.5	324.32	1321.66	330.94	1318.71	334.83	1318.89	335.12	1318.75
336.15	1318.8	336.36	1318.78	358.9	1318.91	364.27	1319.5	365.2	1319.48
365.69	1319.3	382.02	1317.3	390.45	1317.31	391.41	1317.31	392.04	1317.28
398.24	1317.1	400	1317.08						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.55	.035	270.24	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.55	270.24	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
.18	29.67	1319.7	270.11	300.74	1319.58	325.11	400	1321.64

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 6

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.7	2.2	1318.66	2.83	1318.64	28.57	1319.51	30.01	1319.55
31.55	1319.1	63.19	1309.64	68.18	1309.59	146.85	1309.05	230.71	1309.93
236.56	1310	239.03	1310.69	269.34	1319.7	279.74	1319.45	298.13	1319.18
309.3	1320.6	315.55	1320.72	321.77	1318.83	335.12	1318.87	336.61	1318.72
358.65	1318.8	358.85	1318.84	359.4	1318.83	363.85	1319.51	374.82	1319.31
375.28	1319.2	380.87	1317.36	390.72	1317.35	391.29	1317.36	400	1316.66

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	30.01	.035	269.34	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
30.01	269.34	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	29.91	1319.56	269.32	301.76	1319.71	314.76	400	1320.68

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 5

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.4	2.13	1318.57	2.59	1318.6	29.47	1319.42	30.72	1319.23
60.18	1310.2	61.79	1310.18	152.1	1309.19	152.57	1309.19	156.31	1309.23
234.99	1309.7	236.44	1310.18	269.14	1319.71	283.46	1319.64	312.13	1320.84
318.4	1320.9	324.11	1319	335.29	1318.84	335.58	1318.68	336.7	1318.68
358.64	1318.8	358.94	1318.8	363.12	1319.44	373.18	1318.73	383.7	1318.53
389.68	1316.9	397.08	1316.98	400	1316.81				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.47	.035	269.14	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.47	269.14	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	29.5	1319.43	269.13	285.49	1319.71	317.2	400	1320.93

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 4

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.4	2.52	1318.59	3.24	1318.6	13.63	1318.97	52.73	1312.25
60.67	1309.8	135.97	1309.07	137.45	1309.06	148.13	1308.97	153.01	1309.01
236.24	1309.9	239.7	1310.55	240.4	1310.75	269.63	1319.77	270.61	1319.75
304.9	1319.5	305.59	1319.65	317.31	1321.68	317.98	1321.69	328.92	1321.89
335	1318.7	335.3	1318.59	357.43	1318.75	358.7	1318.76	358.94	1318.79
362.48	1319.2	373.48	1319.24	374.12	1319.24	380.67	1317.26	382.24	1317.03
383.91	1317	396.04	1317.13	400	1316.97				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	13.63	.035	269.63	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
13.63	269.63	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	13.62	1318.98	269.52	305.75	1319.78	327.55	400	1321.93

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 3

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1319	1.87	1319.03	2.49	1319.02	28.67	1319.46	29.99	1319.51
59.92	1310.2	61.27	1309.75	132.53	1309.11	136.99	1309.08	231.96	1310.04
235.84	1310.1	267.55	1319.26	268.92	1319.66	270.48	1319.64	303.39	1319.24
316.89	1321.4	317.41	1321.5	317.92	1321.51	335.15	1318.69	357.76	1318.82
358.77	1318.7	358.93	1318.73	363.26	1319.28	374.29	1319.29	374.64	1319.29
381.03	1317.3	381.24	1317.29	381.51	1317.29	398.33	1317.04	398.49	1317.02
398.6	1317	400	1317.06						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	29.99	.035	268.92	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.99	268.92	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
.04	30.01	1319.52	268.91	306.04	1319.66	318.42	400	1321.54

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 2

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.6	2.83	1318.6	6.31	1318.66	29.4	1319.51	33.71	1318.17
60.24	1309.8	70.82	1309.72	147.7	1309.18	165.09	1309.35	235.9	1309.9
241.41	1311.5	269.14	1319.66	300.6	1319.17	305.16	1319.12	307.04	1319.42
317.21	1321.5	327.22	1321.77	329.77	1321.35	333.11	1321.37	358.93	1318.61
362.86	1319.1	363.49	1319.2	365.08	1319.2	375.09	1319.21	376	1318.93
381.98	1317.2	390.17	1317.3	392.44	1317.27	398.49	1316.84	400	1316.88

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

0	.035	29.4	.035	269.14	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
29.4	269.14	100	100	100	.1	.3

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.08	29.32	1319.51	269.1	308.31	1319.66	326.33	400	1321.86

CROSS SECTION

RIVER: East Maricopa Fl
REACH: Pecos Crossing RS: 1

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1318.5	2.79	1318.44	17.63	1318.99	28.84	1319.51	43.8	1315.12
60.79	1309.8	97.99	1309.32	145.66	1308.99	191.18	1309.53	235.94	1309.88
252.08	1314.8	268.55	1319.61	342.32	1318.68	348.94	1318.56	354.6	1318.47
370.31	1319.1	373.41	1319.06	374	1319.14	375.47	1319.14	376.34	1318.89
378.81	1318.6	384.59	1316.75	393.03	1316.93	400	1315.16		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	28.84	.035	268.55	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
28.84	268.55	0	0	0	.1	.3

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
-.04	28.8	1319.51	267.88	400	1319.6

SUMMARY OF MANNING'S N VALUES

River:East Maricopa Fl

Reach	River Sta.	n1	n2	n3
Pecos Crossing	17	.035	.035	.035
Pecos Crossing	16	.035	.035	.035
Pecos Crossing	15	.035	.035	.035
Pecos Crossing	14	.035	.035	.035
Pecos Crossing	13	.035	.035	.035
Pecos Crossing	12	.035	.035	.035
Pecos Crossing	11	.035	.035	.035
Pecos Crossing	10.5	Bridge		
Pecos Crossing	10	.035	.035	.035
Pecos Crossing	9	.035	.035	.035
Pecos Crossing	8	.035	.035	.035
Pecos Crossing	7	.035	.035	.035
Pecos Crossing	6	.035	.035	.035
Pecos Crossing	5	.035	.035	.035
Pecos Crossing	4	.035	.035	.035
Pecos Crossing	3	.035	.035	.035
Pecos Crossing	2	.035	.035	.035
Pecos Crossing	1	.035	.035	.035

SUMMARY OF REACH LENGTHS

River: East Maricopa Fl

Reach	River Sta.	Left	Channel	Right

Pecos Crossing	17	100	100	100
Pecos Crossing	16	100	100	100
Pecos Crossing	15	100	100	100
Pecos Crossing	14	100	100	100
Pecos Crossing	13	100	100	100
Pecos Crossing	12	30.95	31.53	33.12
Pecos Crossing	11	102.04	102.2	102.69
Pecos Crossing	10.5	Bridge		
Pecos Crossing	10	67.01	66.95	66.89
Pecos Crossing	9	100	100	100
Pecos Crossing	8	100	100	100
Pecos Crossing	7	100	100	100
Pecos Crossing	6	100	100	100
Pecos Crossing	5	100	100	100
Pecos Crossing	4	100	100	100
Pecos Crossing	3	100	100	100
Pecos Crossing	2	100	100	100
Pecos Crossing	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: East Maricopa Fl

Reach	River Sta.	Contr.	Expan.
Pecos Crossing	17	.1	.3
Pecos Crossing	16	.1	.3
Pecos Crossing	15	.1	.3
Pecos Crossing	14	.1	.3
Pecos Crossing	13	.1	.3
Pecos Crossing	12	.1	.3
Pecos Crossing	11	.1	.3
Pecos Crossing	10.5	Bridge	
Pecos Crossing	10	.1	.3
Pecos Crossing	9	.1	.3
Pecos Crossing	8	.1	.3
Pecos Crossing	7	.1	.3
Pecos Crossing	6	.1	.3
Pecos Crossing	5	.1	.3
Pecos Crossing	4	.1	.3
Pecos Crossing	3	.1	.3
Pecos Crossing	2	.1	.3
Pecos Crossing	1	.1	.3

DRAFT

Level 1 Bridge Scour Calculations

PIER SCOUR CALCULATION SHEET

Consultant: **Wood, Patel & Associates, Inc.** Project # **021734** **Sheet # 1 of 1**

References: **FHWA's HEC-18 (Fourth edition) and Interum Procedure for Estimating Pier Scour with Debris**

Project Name: **Pecos Road Bridge Scour @ EMF** Date: **05/22/2003**

Engineer: **R. Hiner** Checked By: _____ Structure #: _____

HYDROLOGIC/HYDRAULIC PARAMETERS

Return Interval	**100**	yrs.	Hydraulics Source	FEMA HEC-2	
Hydrology Source	FCDMC		Flow Top Width (T)	230	ft.
Discharge (Q)	6900	cfs	Flow Area (A)	1874	ft^2
Water Surface Elev.	1319.17	ft.	Channel Slope (S)	0.00050	ft/ft
Thalweg Elevation	1309.30	ft.	Max. Velocity (Vm)	5.00	ft/sec
Max. Depth of Flow (Y1)	**9.87**	ft.	Froude Number (Fr)	**0.30838**	(Vm^2*T/g*A)^.5

PIER SCOUR CALCULATIONS

Pier Type: Stemwall _____ Columns x
Foundation Type: Spread Ftng _____ Piles/Drilled Shaft x

K1 = 1.1 Correction factor for pier nose shape (assume square nose pier K1=1.1 Table 2, pg. 40, HEC-18. For multiple column piers and stemwalls skewed to the flow, K1=1.0)

Angle of Attack (theta) = 0 degrees (0 degrees for circular columns considered independantly)
0 radians (15 degree min. for stemwall piers if potential channel meandering)

Pier Width (Wp) = 5 ft. Number of Columns/Piles per bent: 2

Dist. Between Columns = 20 ft. (Clear space must exceed 5 pier diameters for independent analysis)

Debris Blockout (Wd) = 4 ft. (Based on debris potential; low = 2 ft., medium = 3 ft., high = 4 ft.)

Length of Pier (L) = 4 ft. Coefficient for bed condition K3= 1.1 (Table 1, pg. 39)

Effective Pier Length (L') = 6 ft. (sum of pier diameters plus debris width)

Effective Pier Width (a) = 9.00 ft. (The greater of Wp*cos(theta)+Wd or (Wp*cos(theta)+Wd)/2+L'sin(theta))

K2 = 1.0 (For stemwall, multiple column, and single column piers K2=1.0)

K4 = 1.0 (Armoring factor for bed material. If unknown, assume K4=1.0)

Colorado State University Equation (HEC-18 pg. 52)

$$Y_s = Y_1 2.0 K_1 K_2 K_3 K_4 \left(\frac{a}{Y_1}\right)^{0.65} Fr^{0.43}$$

Depth of Pier Scour Hole = **13.56** ft.
Elev. @ Btm of Scour Hole= **1295.74** ft.
Elev. @ Bottom of Footing= _____ ft.
Elev. @ Min. Tip of Pile= _____ ft.

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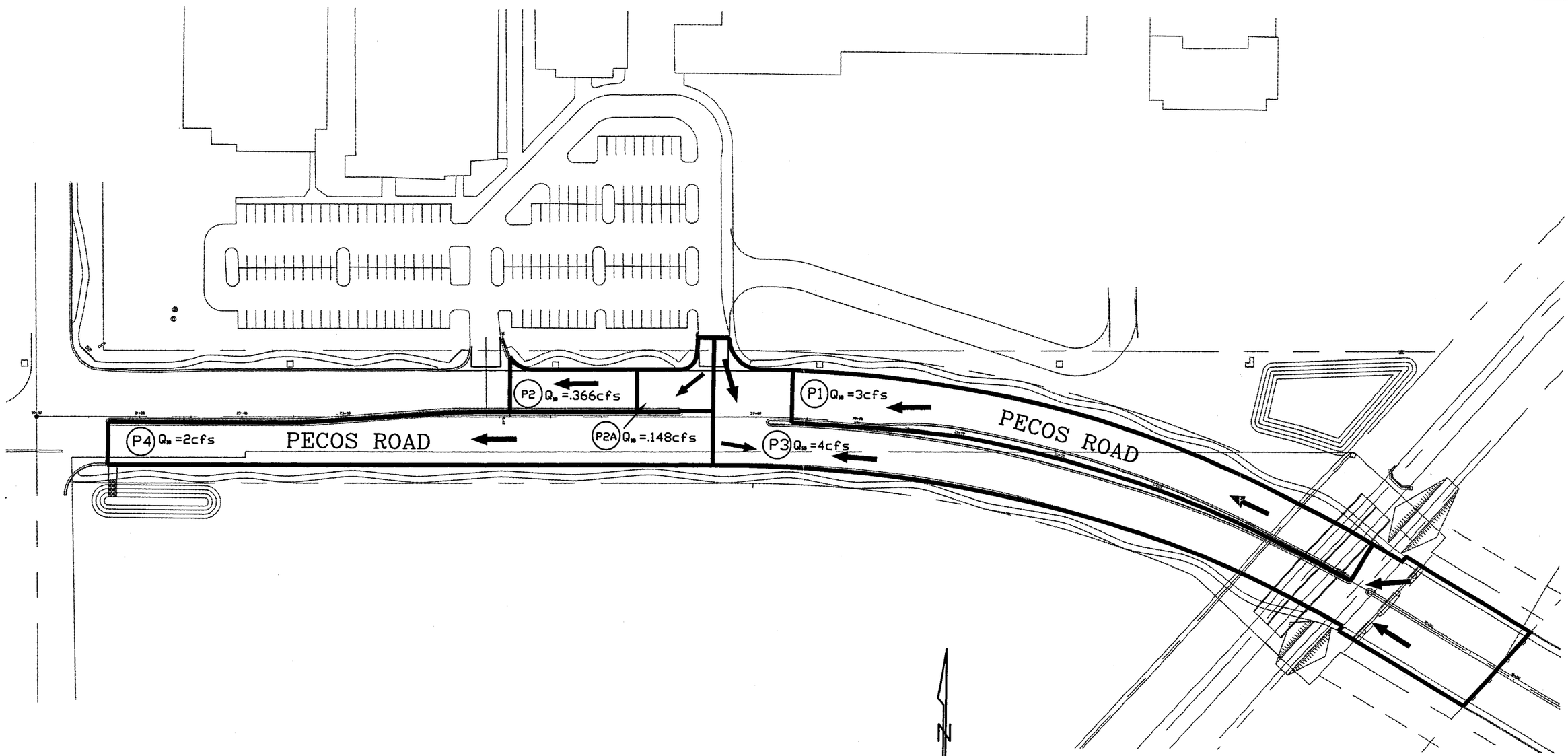
APPENDIX B

Pavement Drainage Calculations



LEGEND

(P1)	CONCENTRATION POINT IDENTIFICATION
Q_{100} =3cfs	ESTIMATED 10YR FLOWRATE
←	FLOW DIRECTION ARROW
▬	SUB-BASIN BOUNDARY

N

0 50 100 200

Scale in Feet

V:/2002/021734/Project Support/Hydro/Exhibits/PecosDrainage.dwg

PECOS ROAD
DRAINAGE MAP

Wood, Patel & Associates, Inc.
2051 West Northern, Suite 100
Phoenix, Arizona 85021 (602) 335-8500

DRAWN BY: P. LOPEZ	PLATE #
JOB NO: 021734	DATE: 5/22/2003

DRAFT

On-Site Hydrology (Rational Method)

Flood Control District of Maricopa County
Drainage Design Manual Rational Method

Computed by: PLOPEZ Date: 5/15/2003

LOCATION DATA

Location: PECOS ROAD STA 27+05 WB

Project Name: PECOS ROAD Subarea id: P1

Drainage Area Cover: URBAN

DESIGN DATA

Drainage Area	0.7182	acres
Watercourse Length	684.3900	feet
Top Elevation	1327.1910	feet
Bottom Elevation	1316.8390	feet
Slope	0.015	feet/feet
Roughness Coefficient (Kb)	0.0409	
10-year, 6-Hour Rainfall	1.8900	inches

Hydrological Summary Table

Parameter	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Q (cfs)	2	3	3	4	5	5
C	0.950	0.950	0.950	0.950	0.950	0.950
Tc (min)	8.0	7.0	6.6	6.1	5.8	5.5
i (in/hr)	3.0	4.1	4.8	6.0	6.9	8.0

Flood Control District of Maricopa County
Drainage Design Manual Rational Method

Computed by: PLOPEZ Date: 5/15/2003

LOCATION DATA

Location: PECOS ROAD STA 24+60WB

Project Name: PECOS ROAD Subarea id: P2

Drainage Area Cover: URBAN

DESIGN DATA TRANSITION

Drainage Area	0.2040	acres
Watercourse Length	263.0000	feet
Top Elevation	1318.0000	feet
Bottom Elevation	1315.8600	feet
Slope	0.008	feet/feet
Roughness Coefficient (Kb)	0.0443	
10-year, 6-Hour Rainfall	1.8900	inches

Hydrological Summary Table

Parameter	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Q (cfs)	1	1	1	1	1	2
C	0.950	0.950	0.950	0.950	0.950	0.950
Tc (min)	6.0	5.3	5.0	5.0	5.0	5.0
i (in/hr)	3.3	4.5	5.4	6.4	7.3	8.2

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-21-2003

PROJECT NAME- 021734 TRACS NO.- _____
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 24+60 WB P2 CHECKER - _____ PAGE _____
Ver 3.40: December 1995

*** RATIONAL EQN: Q=CIA ***

DRAINAGE AREA--ACRES--A	=	0.204
Runoff Coefficient---C	=	0.950
RAINFALL INTENSITY--Inches/Hour--I	=	1.890
Discharge-CFS--Q	=	0.366

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-21-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 25+85 WB P2A CHECKER - PAGE
Ver 3.40: December 1995

*** RATIONAL EQN: Q=CIA ***

DRAINAGE AREA--ACRES--A	=	0.083
Runoff Coefficient---C	=	0.950
RAINFALL INTENSITY--Inches/Hour--I	=	1.890
Discharge-CFS--Q	=	0.148

Flood Control District of Maricopa County
Drainage Design Manual Rational Method

Computed by: PLOPEZ Date: 5/21/2003

LOCATION DATA

Location: PECOS ROAD STA 27+35 EB

Project Name: PECOS ROAD Subarea id: P3

Drainage Area Cover: URBAN

DESIGN DATA

Drainage Area	1.1270	acres
Watercourse Length	870.4600	feet
Top Elevation	1327.1130	feet
Bottom Elevation	1315.2061	feet
Slope	0.014	feet/feet
Roughness Coefficient (Kb)	0.0397	
10-year, 6-Hour Rainfall	1.8900	inches

Hydrological Summary Table

Parameter	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Q (cfs)	3	4	5	6	7	8
C	0.950	0.950	0.950	0.950	0.950	0.950
Tc (min)	9.3	8.3	7.7	7.1	6.7	6.4
i (in/hr)	2.8	3.8	4.5	5.7	6.6	7.6

Flood Control District of Maricopa County
Drainage Design Manual Rational Method

Computed by: PLOPEZ Date: 5/15/2003

LOCATION DATA

Location: PECOS ROAD STA 20+70 EB

Project Name: PECOS ROAD Subarea id: P4

Drainage Area Cover: URBAN

DESIGN DATA

Drainage Area	0.6180	acres
Watercourse Length	634.0000	feet
Top Elevation	1316.8400	feet
Bottom Elevation	1314.0000	feet
Slope	0.004	feet/feet
Roughness Coefficient (Kb)	0.0413	
10-year, 6-Hour Rainfall	1.8900	inches

Hydrological Summary Table

Parameter	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Q (cfs)	2	2	2	3	4	4
C	0.950	0.950	0.950	0.950	0.950	0.950
Tc (min)	12.0	10.6	9.9	9.0	8.6	8.1
i (in/hr)	2.5	3.4	4.1	5.2	6.0	6.9

Street Capacity Calculations

DRAFT

PECOS ROAD
INFRASTRUCTURE
WEST BOUND
STREET CAPACITY
CALCULATIONS
DATE: 22 MAY 2003

Pecos West Bound
Street Capacity

STA	Road Way Grade %	Cross Slope (ft/ft)	Spread (ft)	Velocity (ft/s)	Q_{allow} (cfs)	Q_{10} (cfs)
2585	0.2486	0.0114	23.50	1.45	4.46	1
2600	0.2486	0.0140	23.50	1.69	6.60	1
2625	0.2486	0.0184	23.50	1.99	9.96	1
2705	0.2486	0.0340	13.71	2.12	6.82	3
2735	0.2486	0.0400	11.86	2.14	6.06	3
2900	0.4747	0.0400	11.86	2.96	8.38	2
2950	1.1024	0.0400	11.86	4.12	11.66	2
3000	1.7302	0.0400	11.86	5.28	14.94	2
3050	2.358	0.0400	11.86	6.43	18.22	2
3075	2.6719	0.0400	11.86	7.01	19.87	2
3100	2.76	0.0400	11.86	7.13	20.19	1
3165	2.7598	0.0400	11.86	7.13	20.19	1
3200	2.4518	0.0400	11.86	6.69	18.94	1
3250	2.0117	0.0400	11.86	6.05	17.14	1
3280	1.7476	0.0400	11.86	5.67	16.07	1
3300	1.5716	0.0370	12.71	5.35	16.11	1
3350	1.1315	0.0263	17.49	4.45	17.82	1
3370	0.9555	0.0225	19.58	4.06	18.05	1
3400	0.6914	0.0170	23.50	3.19	15.11	1

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 25+85 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.249
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.011
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.011
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	4.461
SPREAD-Ft.--T	=	23.500
Average Velocity-V-fps	=	1.446
FLOW in Gutter-CFS--Q	=	0.813
% Flow in Gutter-CFS	=	18.226
Velocity of Flow in Gutter-fps	=	2.020
Depth at Curb Line-Inches--d	=	3.901

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 26+00 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.249
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.014
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.014
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	6.604
SPREAD-Ft.--T	=	23.500
Average Velocity-V-fps	=	1.689
FLOW in Gutter-CFS--Q	=	1.152
% Flow in Gutter-CFS	=	17.438
Velocity of Flow in Gutter-fps	=	2.320
Depth at Curb Line-Inches--d	=	4.696

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 26+25 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.249
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.018
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.018
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	9.962
SPREAD-Ft.--T	=	23.500
Average Velocity-V-fps	=	1.988
FLOW in Gutter-CFS--Q	=	1.674
% Flow in Gutter-CFS	=	16.800
Velocity of Flow in Gutter-fps	=	2.693
Depth at Curb Line-Inches--d	=	5.756

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 27+05 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.249
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.034
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.034
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	6.816
SPREAD-Ft.--T	=	13.706
Average Velocity-V-fps	=	2.119
FLOW in Gutter-CFS--Q	=	1.805
% Flow in Gutter-CFS	=	26.474
Velocity of Flow in Gutter-fps	=	2.775
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-16-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 27+35 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.249
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	6.060
SPREAD-Ft.--T	=	11.862
Average Velocity-V-fps	=	2.139
FLOW in Gutter-CFS--Q	=	1.803
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	2.773
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 29+00 WEST BOUND CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.475
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	8.376 ← Q_{ALLOW}
SPREAD-Ft.--T	=	11.862 ←
Average Velocity-V-fps	=	2.957
FLOW in Gutter-CFS--Q	=	2.492
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	3.833
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-16-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- TECOS RD DESIGNER - P.L.
LOCATION - STA 30475 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.672
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	19.866 ←
SPREAD-Ft.--T	=	11.862
Average Velocity-V-fps	=	7.014
FLOW in Gutter-CFS--Q	=	5.911
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	9.090
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-2003

PROJECT NAME- _____ TRACS NO.- _____
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 31+00 WEST BOUND CHECKER - _____ PAGE _____
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.760
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	20.191 ← Q_{ALLOW}
SPREAD-Ft.--T	=	11.862 ←
Average Velocity-V-fps	=	7.129
FLOW in Gutter-CFS--Q	=	6.008
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	9.239
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-16-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 31+65 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.760
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	20.190
SPREAD-Ft.--T	=	11.862
Average Velocity-V-fps	=	7.128
FLOW in Gutter-CFS--Q	=	6.008
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	9.239
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-16-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PEDS ED DESIGNER - P.L.
LOCATION - STA 32+80 NB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.748
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	16.067
SPREAD-Ft.--T	=	11.862
Average Velocity-V-fps	=	5.673
FLOW in Gutter-CFS--Q	=	4.781
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	7.352
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 33+00 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.572
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.037
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.037
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	16.106
SPREAD-Ft.--T	=	12.709
Average Velocity-V-fps	=	5.352
FLOW in Gutter-CFS--Q	=	4.534
% Flow in Gutter-CFS	=	28.152
Velocity of Flow in Gutter-fps	=	6.973
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 33+50 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.132
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.026
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.026
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	17.822
SPREAD-Ft.--T	=	17.487
Average Velocity-V-fps	=	4.447
FLOW in Gutter-CFS--Q	=	3.848
% Flow in Gutter-CFS	=	21.589
Velocity of Flow in Gutter-fps	=	5.917
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 33+70 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.956
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.023
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.023
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	18.053
SPREAD-Ft.--T	=	19.583
Average Velocity-V-fps	=	4.061
FLOW in Gutter-CFS--Q	=	3.536
% Flow in Gutter-CFS	=	19.586
Velocity of Flow in Gutter-fps	=	5.438
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 34+00 WB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.691
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.017
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.017
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	15.111
SPREAD-Ft.--T	=	23.500
Average Velocity-V-fps	=	3.191
FLOW in Gutter-CFS--Q	=	2.558
% Flow in Gutter-CFS	=	16.931
Velocity of Flow in Gutter-fps	=	4.335
Depth at Curb Line-Inches--d	=	5.491

PECOS ROAD
INFRASTRUCTURE
EAST BOUND
STREET CAPACITY
CALCULATIONS
DATE: 22 MAY 2003

Pecos East Bound
Street Capacity

STA	Road Way Grade %	Cross Slope (ft/ft)	Spread (ft)	Velocity (ft/s)	Q_{allow} (cfs)	Q_{10} (cfs)
2100	0.2468	0.025	18.13	2.07	8.59	2
2400	0.2468	0.0250	18.13	2.07	8.59	2
2705	-0.7264	0.0340	13.71	3.62	11.64	4
2735	0.2468	0.0400	11.86	2.13	6.04	4
2880	0.2599	0.0400	11.86	2.19	6.20	4
2900	0.506	0.0400	11.86	3.05	8.65	4
2950	1.1338	0.0400	11.86	4.22	11.96	4
3000	1.7616	0.0400	11.86	5.39	15.28	4
3050	2.3894	0.0400	11.86	6.56	18.59	4
3075	2.7761	0.0400	11.86	7.15	20.25	4
3100	2.833	0.0400	11.86	7.22	20.46	3
3165	2.8105	0.0400	11.86	7.19	20.38	3
3200	2.5025	0.0400	11.86	6.76	19.13	3
3250	2.0624	0.0400	11.86	6.13	17.36	3
3280	1.7983	0.0400	11.86	5.75	16.30	3
3300	2.4945	0.0370	12.71	6.74	20.29	3
3350	1.9774	0.0263	17.49	5.88	23.55	3
3400	0.6694	0.0250	18.13	3.41	14.13	3

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 24+00 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.247
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.025
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.025
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	8.586
SPREAD-Ft.--T	=	18.130
Average Velocity-V-fps	=	2.073
FLOW in Gutter-CFS--Q	=	1.797
% Flow in Gutter-CFS	=	20.933
Velocity of Flow in Gutter-fps	=	2.764
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 27+05 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.726
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.034
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.034
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	11.639
SPREAD-Ft.--T	=	13.706
Average Velocity-V-fps	=	3.618
FLOW in Gutter-CFS--Q	=	3.081
% Flow in Gutter-CFS	=	26.474
Velocity of Flow in Gutter-fps	=	4.739
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - B.L.
LOCATION - STA 27+35 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.247
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	6.038 ←
SPREAD-Ft.--T	=	11.862 ←
Average Velocity-V-fps	=	2.132
FLOW in Gutter-CFS--Q	=	1.797
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	2.763
Depth at Curb Line-Inches--d	=	6.000 ←

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 28+80 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.260
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	6.196 ←
SPREAD-Ft.--T	=	11.862 ←
Average Velocity-V-fps	=	2.188
FLOW in Gutter-CFS--Q	=	1.844
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	2.835
Depth at Curb Line-Inches--d	=	6.000 ←

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 29+00 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.506
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	8.645 ←
SPREAD-Ft.--T	=	11.862 ←
Average Velocity-V-fps	=	3.052
FLOW in Gutter-CFS--Q	=	2.572
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	3.956
Depth at Curb Line-Inches--d	=	6.000 ←

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 30+75 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.776
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	20.250 ←
SPREAD-Ft.--T	=	11.862 ←
Average Velocity-V-fps	=	7.149
FLOW in Gutter-CFS--Q	=	6.025
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	9.266
Depth at Curb Line-Inches--d	=	6.000 ←

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-2003

PROJECT NAME- _____ TRACS NO.- _____
HIGHWAY NAME- PECOS RD 021734 DESIGNER - P.L.
LOCATION - STA 31+00 EAST BOUND CHECKER - _____ PAGE _____
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.833
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	20.455 ← Q_{ALLOW}
SPREAD-Ft.--T	=	11.862 ←
Average Velocity-V-fps	=	7.222
FLOW in Gutter-CFS--Q	=	6.086
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	9.360
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 31+65 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.810
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	20.375 ←
SPREAD-Ft.--T	=	11.862 ←
Average Velocity-V-fps	=	7.194
FLOW in Gutter-CFS--Q	=	6.063
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	9.323
Depth at Curb Line-Inches--d	=	6.000 ←

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-15-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 32+80 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.798
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	16.298
SPREAD-Ft.--T	=	11.862
Average Velocity-V-fps	=	5.754
FLOW in Gutter-CFS--Q	=	4.850
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	7.458
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 33+00 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	2.494
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.037
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.037
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	20.287
SPREAD-Ft.--T	=	12.709
Average Velocity-V-fps	=	6.741
FLOW in Gutter-CFS--Q	=	5.711
% Flow in Gutter-CFS	=	28.152
Velocity of Flow in Gutter-fps	=	8.783
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 33+50 ER CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	1.977
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.026
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.026
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	23.552
SPREAD-Ft.--T	=	17.487
Average Velocity-V-fps	=	5.877
FLOW in Gutter-CFS--Q	=	5.085
% Flow in Gutter-CFS	=	21.589
Velocity of Flow in Gutter-fps	=	7.820
Depth at Curb Line-Inches--d	=	6.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 34+00 EB CHECKER - PAGE
Ver 3.40: December 1995

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.669
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.025
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.025
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	14.131
SPREAD-Ft.--T	=	18.130
Average Velocity-V-fps	=	3.412
FLOW in Gutter-CFS--Q	=	2.958
% Flow in Gutter-CFS	=	20.933
Velocity of Flow in Gutter-fps	=	4.549
Depth at Curb Line-Inches--d	=	6.000

Catch Basin Calculations

DRAFT

PECOS ROAD
INFRASTRUCTURE
STREET RUNOFF
CALCULATIONS
DATE: 22 MAY 2003

Concentration Point	Station[5]	Catch Basin	Catch Basin Size	Q_{10} (cfs)	Max $Q_{interception}$[4] (cfs)
P1[1]	27+35 WB	On-Grade	6' Wing	3	5.44
P2[2]	24+60 WB	-	-	0.37	-
P2A[2]	24+85 WB	On-Grade	3' Wing	0.15	5.05
P3	27+35 EB	Sump	3' Wing	4	9.15
P4	21+00 EB	On-Grade[3]	8' Curb Opening	2	2

1.) Note: Road is superelevated resulting in runoff flowing towards the median.

2.) Note: Road is transitioning from normal crown to superelevation, catch basin is located upstream of the 0% cross-slope location to minimize the runoff in the flat area.

3.) Note: Scupper is used to remove runoff from the roadway.

4.) Note: Maximum catch basin flow interception at full curb flow.

5.) Note: WB = west bound; EB = east bound.

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-19-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - R.L.
LOCATION - STA 25+85 WB CHECKER - PAGE 1/2
Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.249
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.011
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.011
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	1.000 ← Q_{10}
SPREAD-Ft.--T	=	12.762
Average Velocity-V-fps	=	1.029
FLOW in Gutter-CFS--Q	=	0.348
% Flow in Gutter-CFS	=	34.795
Velocity of Flow in Gutter-fps	=	1.445
Depth at Curb Line-Inches--d	=	2.533

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	1.000
Gutter Velocity at INLET-fps	=	1.849
GUTTER FLOW at INLET-CFS--Q	=	0.606
Depth at INLET Curb Line-Inches--d	=	4.267
Local Gutter Depression-Inches	=	2.000
Length of opening: TOTAL Intercept--Ft.	=	5.554 ←
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.767	0.767	0.233
→6.583	1.000	1.000 ←	0.000
9.583	1.000	1.000	0.000
13.583	1.000	1.000	0.000
20.583	1.000	1.000	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-21-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 25+85 WB CHECKER - PAGE 2/2
Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.249
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.011
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.011
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	17.296
SPREAD-Ft.--T	=	39.400
Average Velocity-V-fps	=	2.015
FLOW in Gutter-CFS--Q	=	1.805
% Flow in Gutter-CFS	=	10.433
Velocity of Flow in Gutter-fps	=	2.775
Depth at Curb Line-Inches--d	=	6.000 ← FULL CURB FLOW

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	17.296
Gutter Velocity at INLET-fps	=	3.106
GUTTER FLOW at INLET-CFS--Q	=	2.361
Depth at INLET Curb Line-Inches--d	=	7.931
Local Gutter Depression-Inches	=	2.000
Length of opening: TOTAL Intercept--Ft.	=	37.722
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.142	2.461	14.835
→ 6.583	0.292	5.049 ← $Q_{MAX\ INT.}$	12.247
9.583	0.410	7.091	10.205
13.583	0.552	9.552	7.744
20.583	0.758	13.115	4.181

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-19-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 27+35 WB CHECKER - PAGE 1/2
Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.249
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	3.000 ← Q_{10}
SPREAD-Ft.--T	=	9.080
Average Velocity-V-fps	=	1.799
FLOW in Gutter-CFS--Q	=	1.136
% Flow in Gutter-CFS	=	37.877
Velocity of Flow in Gutter-fps	=	2.307
Depth at Curb Line-Inches--d	=	4.665

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	3.000
Gutter Velocity at INLET-fps	=	2.600
GUTTER FLOW at INLET-CFS--Q	=	1.499
Depth at INLET Curb Line-Inches--d	=	6.376
Local Gutter Depression-Inches	=	2.000
Length of opening: TOTAL Intercept--Ft.	=	8.956 ←
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.532	1.596	1.404
6.583	0.908	2.725	0.275
→9.583	1.000	3.000 ←	0.000
13.583	1.000	3.000	0.000
20.583	1.000	3.000	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-21-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 27+35 WB CHECKER - PAGE 2/2
Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.249
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	6.065
SPREAD-Ft.--T	=	11.862
Average Velocity-V-fps	=	2.141
FLOW in Gutter-CFS--Q	=	1.805
% Flow in Gutter-CFS	=	29.755
Velocity of Flow in Gutter-fps	=	2.775
Depth at Curb Line-Inches--d	=	6.000 ← FULL FLOW

CURB OPENING--ADOT STD. C-15.20

Flow-CFS--Q	=	6.065
Gutter Velocity at INLET-fps	=	3.060
GUTTER FLOW at INLET-CFS--Q	=	2.273
Depth at INLET Curb Line-Inches--d	=	7.785
Local Gutter Depression-Inches	=	2.000
Length of opening: TOTAL Intercept--Ft.	=	13.344
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.377	2.285	3.779
6.583	0.706	4.281	1.784
→ 9.583	0.898	5.444 ← $Q_{MAX\ INT}$	0.621
13.583	1.000	6.065	0.000
20.583	1.000	6.065	0.000

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-19-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- FEIBS RD DESIGNER - P.L.
LOCATION - STA 27+35 EB CHECKER - PAGE 1/2
Ver 3.40: December 1995

CURB OPENING INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Flow-CFS--Q	=	4.000 ← Q_{10}
Local Gutter Depression-Inches	=	2.000
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	d(weir)	d(orifice)	d(INLET)	SPREAD
3.083	6.360	6.627	6.627	9.002
→ 6.583	4.609	1.499	4.609 ←	4.797
9.583	3.814	0.707	3.814	3.141
13.583	3.154	0.352	3.154	1.766
20.583	2.480	0.153	2.480	1.177

*** d(INLET) is Greater of WEIR or ORIFICE Depth.! ***

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-20-2003

PROJECT NAME- 021754 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 27+35 EB CHECKER - PAGE 2/2
Ver 3.40: December 1995

CURB OPENING INLET--IN SUMP

GUTTER FLOW HYDRAULICS

GUTTER DESCRIPTION

Roadway Cross-Slope-Ft./Ft.--Sx	=	0.040
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.040
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Capture Ratio -- CURB OPENING	=	0.800
Depth at INLET Curb Line-Inches--d	=	6.000 ← FULL CURB FLOW
Local Gutter Depression-Inches	=	2.000
SPREAD-Ft.--T	=	11.862

LENGTH	Q(weir)	Q(orifice)	Q(INLET)
3.083	5.642	4.736	4.736
→ 6.583	9.148	10.112	9.148 ← $Q_{MAX\ INT}$
9.583	12.153	14.720	12.153
13.583	16.159	20.865	16.159
20.583	23.170	31.617	23.170

*** Q(INLET) is Lesser of WEIR or ORIFICE flow.! ***

ARIZONA DEPARTMENT OF TRANSPORTATION
DRAINAGE DESIGN SECTION

05-19-2003

PROJECT NAME- 021734 TRACS NO.-
HIGHWAY NAME- PECOS RD DESIGNER - P.L.
LOCATION - STA 21+00 EB CHECKER - PAGE
Ver 3.40: December 1995

CURB OPENING INLET -- ON GRADE

GUTTER FLOW HYDRAULICS
GUTTER DESCRIPTION

Roadway Grade-% Per cent--G	=	0.250
Roadway Cross-Slope-Ft./Ft.--Sx	=	0.025
Shoulder Width-Ft.--	=	1.417
Shoulder Slope-Ft./Ft.--Ss	=	0.025
Gutter Width-Ft.--W	=	1.417
Gutter Slope-Ft./Ft.--Sw	=	0.058
Gutter Depression-Inches--	=	0.986
Manning's 'N	=	0.016
Flow-CFS--Q	=	2.000 ← Q_{10}
SPREAD-Ft.--T	=	10.332
Average Velocity-V-fps	=	1.463
FLOW in Gutter-CFS--Q	=	0.722
% Flow in Gutter-CFS	=	36.076
Velocity of Flow in Gutter-fps	=	1.929
Depth at Curb Line-Inches--d	=	3.661

CURB OPENING--ADOT STD. C-15.20

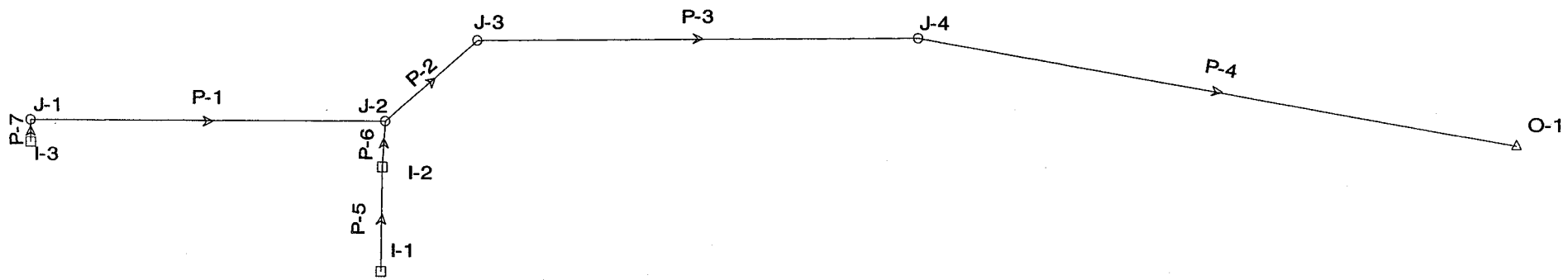
Flow-CFS--Q	=	2.000 ← Q_{10}
Gutter Velocity at INLET-fps	=	2.264
GUTTER FLOW at INLET-CFS--Q	=	1.041
Depth at INLET Curb Line-Inches--d	=	5.387
Local Gutter Depression-Inches	=	2.000
Length of opening: TOTAL Intercept--Ft.	=	7.758 ←
Capture Ratio -- CURB OPENING	=	0.800

LENGTH	Efficiency	Q(Captured)	Q(By-Pass)
3.083	0.598	1.196	0.804
6.583	0.967	1.933	0.067
9.583	1.000	2.000	0.000
13.583	1.000	2.000	0.000
20.583	1.000	2.000	0.000

Storm Drain Models (StormCAD™)

DRAFT

Scenario: Base



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Project Engineer: Network Administrator
StormCAD v5.0 [5.0010]
Page 1 of 1

Calculation Results Summary

==========
Scenario: Base

>>>> Info: Subsurface Network Rooted by: O-1
>>>> Info: Subsurface Analysis iterations: 1
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
I-2	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
I-1	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00
I-3	Generic Inlet	Generic Default 100%	0.00	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: O-1

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-4	1	24 inch	Circular	250.00	7.50	5.35	1,311.62	1,310.08
P-3	1	24 inch	Circular	184.63	7.50	5.00	1,312.64	1,311.71
P-2	1	24 inch	Circular	51.82	7.50	5.02	1,313.00	1,312.76
P-6	1	18 inch	Circular	18.87	7.00	3.96	1,313.42	1,313.31
P-1	1	18 inch	Circular	148.52	0.50	3.23	1,314.14	1,313.31
P-5	1	18 inch	Circular	44.00	4.00	3.70	1,313.79	1,313.74
P-7	1	18 inch	Circular	8.88	0.50	2.31	1,314.29	1,314.24

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
O-1	7.50	1,309.16	1,309.16	1,309.16
J-4	7.50	1,316.67	1,311.70	1,311.62
J-3	7.50	1,316.33	1,312.76	1,312.64
J-2	7.50	1,317.78	1,313.31	1,313.00
I-2	7.00	1,317.03	1,313.74	1,313.42
J-1	0.50	1,316.81	1,314.22	1,314.14
I-1	4.00	1,315.12	1,313.88	1,313.79
I-3	0.50	1,316.71	1,314.37	1,314.29

==========
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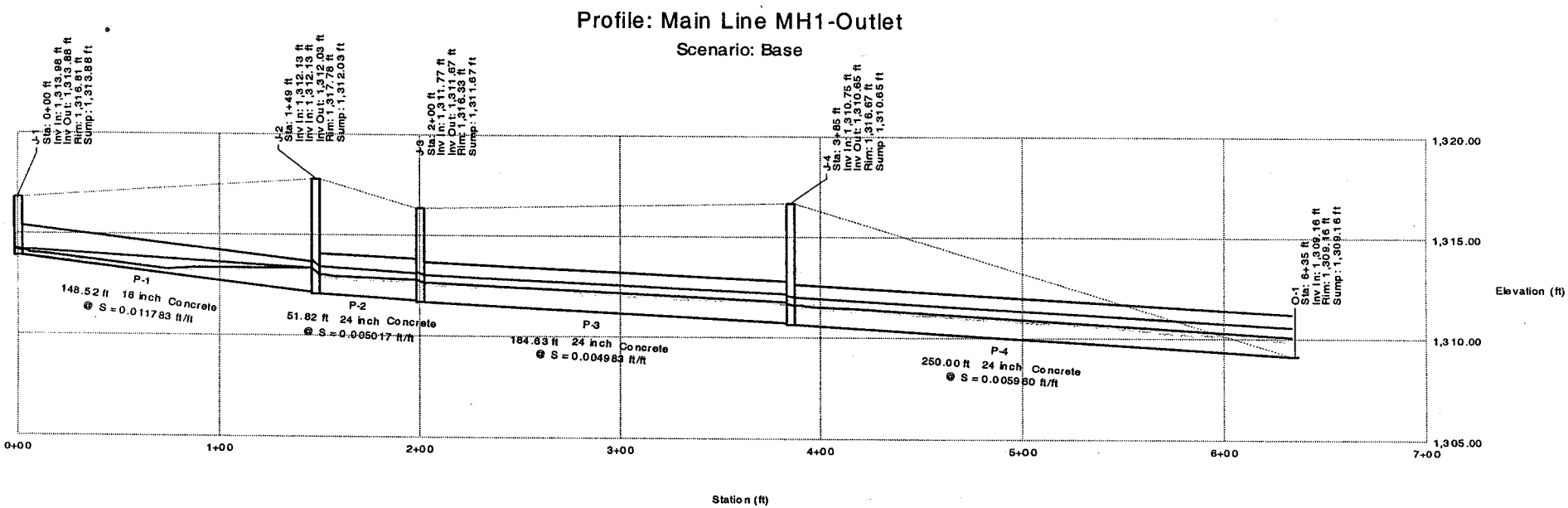
Scenario: Base

Combined Pipe\Node Report

Label	Upstream Node	Downstream Node	Section Size	Length (ft)	Mannings n	Full Capacity (cfs)	Total System Flow (cfs)	Upstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Invert Elevation (ft)	Downstream Ground Elevation (ft)	Constructed Slope (ft/ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Average Velocity (ft/s)	Velocity In (ft/s)	Velocity Out (ft/s)
P-1	J-1	J-2	18 inch	148.52	0.013	11.40	0.50	1,313.88	1,316.81	1,312.13	1,317.78	0.011783	1,314.14	1,313.31	3.23	2.42	0.34
P-2	J-2	J-3	24 inch	51.82	0.013	16.02	7.50	1,312.03	1,317.78	1,311.77	1,316.33	0.005017	1,313.00	1,312.76	5.02	4.94	4.85
P-3	J-3	J-4	24 inch	184.63	0.013	15.97	7.50	1,311.67	1,316.33	1,310.75	1,316.67	0.004983	1,312.64	1,311.71	5.00	4.94	5.00
P-4	J-4	O-1	24 inch	250.00	0.013	17.46	7.50	1,310.65	1,316.67	1,309.16	1,309.16	0.005960	1,311.62	1,310.08	5.35	4.94	5.35
P-5	I-1	I-2	18 inch	44.00	0.013	6.13	4.00	1,312.45	1,315.12	1,312.30	1,317.03	0.003409	1,313.79	1,313.74	3.70	2.41	2.29
P-6	I-2	J-2	18 inch	18.87	0.013	6.40	7.00	1,312.20	1,317.03	1,312.13	1,317.78	0.003710	1,313.42	1,313.31	3.96	4.56	4.71
P-7	I-3	J-1	18 inch	8.88	0.013	7.05	0.50	1,314.02	1,316.71	1,313.98	1,316.81	0.004505	1,314.29	1,314.24	2.31	2.31	2.42

Profile
Scenario: Base



Title: Pecos Rd Storm Drain
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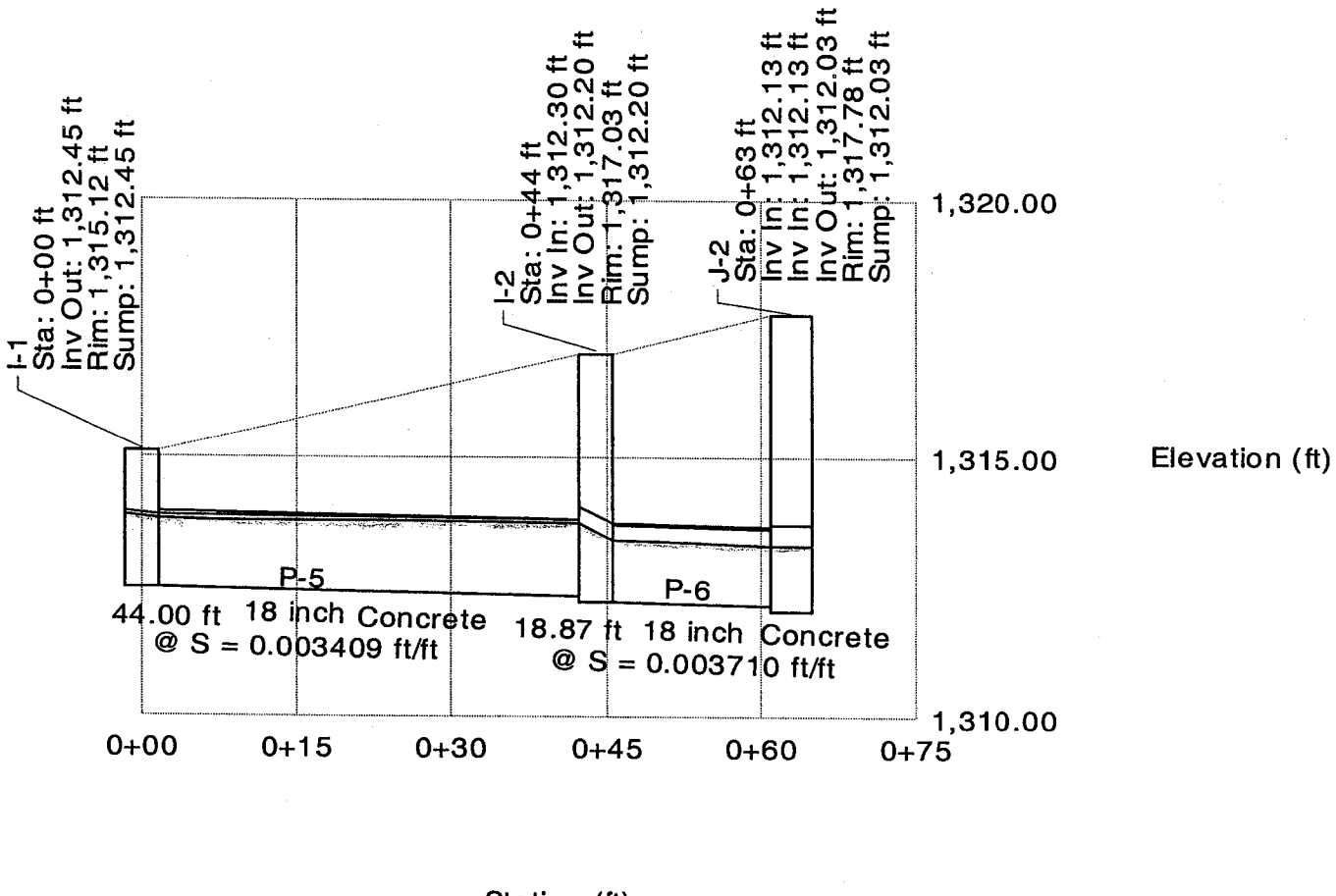
Project Engineer: Network Administrator
StormCAD v5.0 [5.0010]
Page 1 of 1

Profile: CB1 - MH2

Scenario: Base



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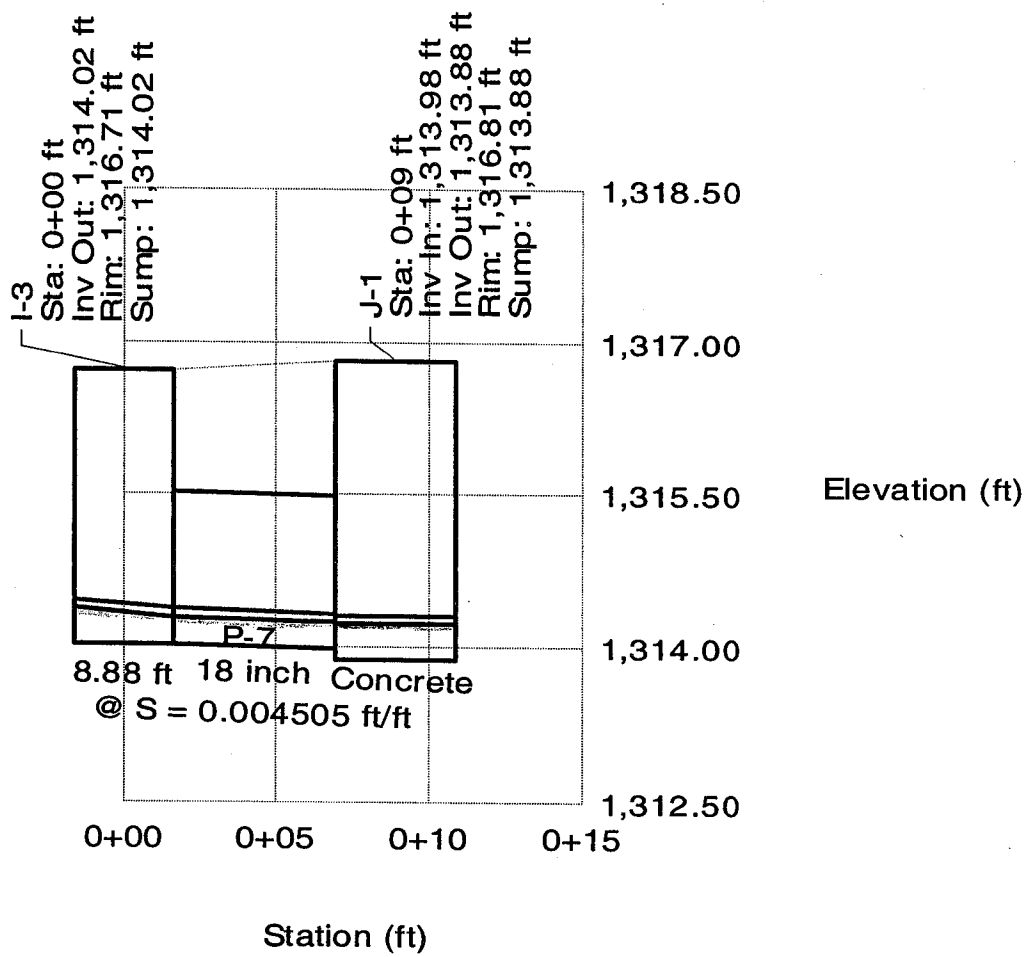
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