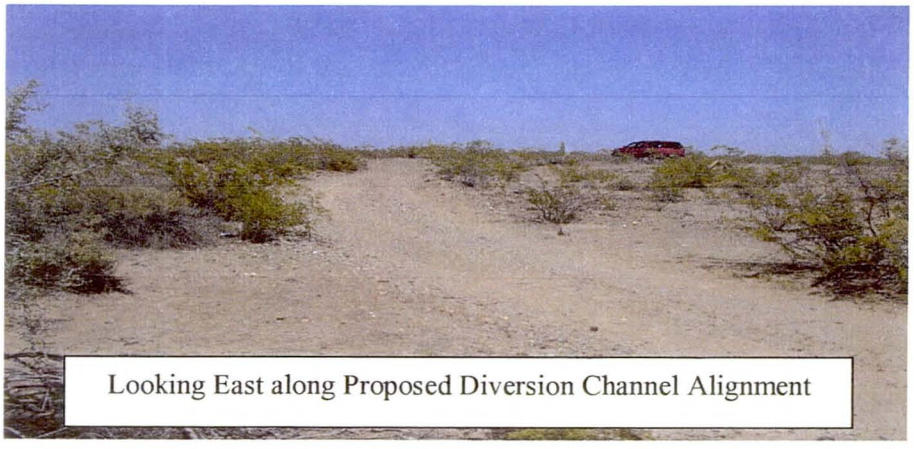
2004P048

DRAINAGE REPORT
FOR
THE CROSSRIVER AND RANCHO SILVERADO

PINNACLE PEAK DIVERSION CHANNEL
FOR
OFFSITE FLOWS
LOCATED ALONG THE PINNACLE PEAK ROAD EXTENDED ALIGNMENT
BETWEEN
123RD AVENUE AND McMICKEN OUTFALL WASH

June 1, 2004
Revised July 16, 2004, February 18, 2005 & July 26, 2005



Looking East along Proposed Diversion Channel Alignment

CVL Project No.: 99-0050-24-03

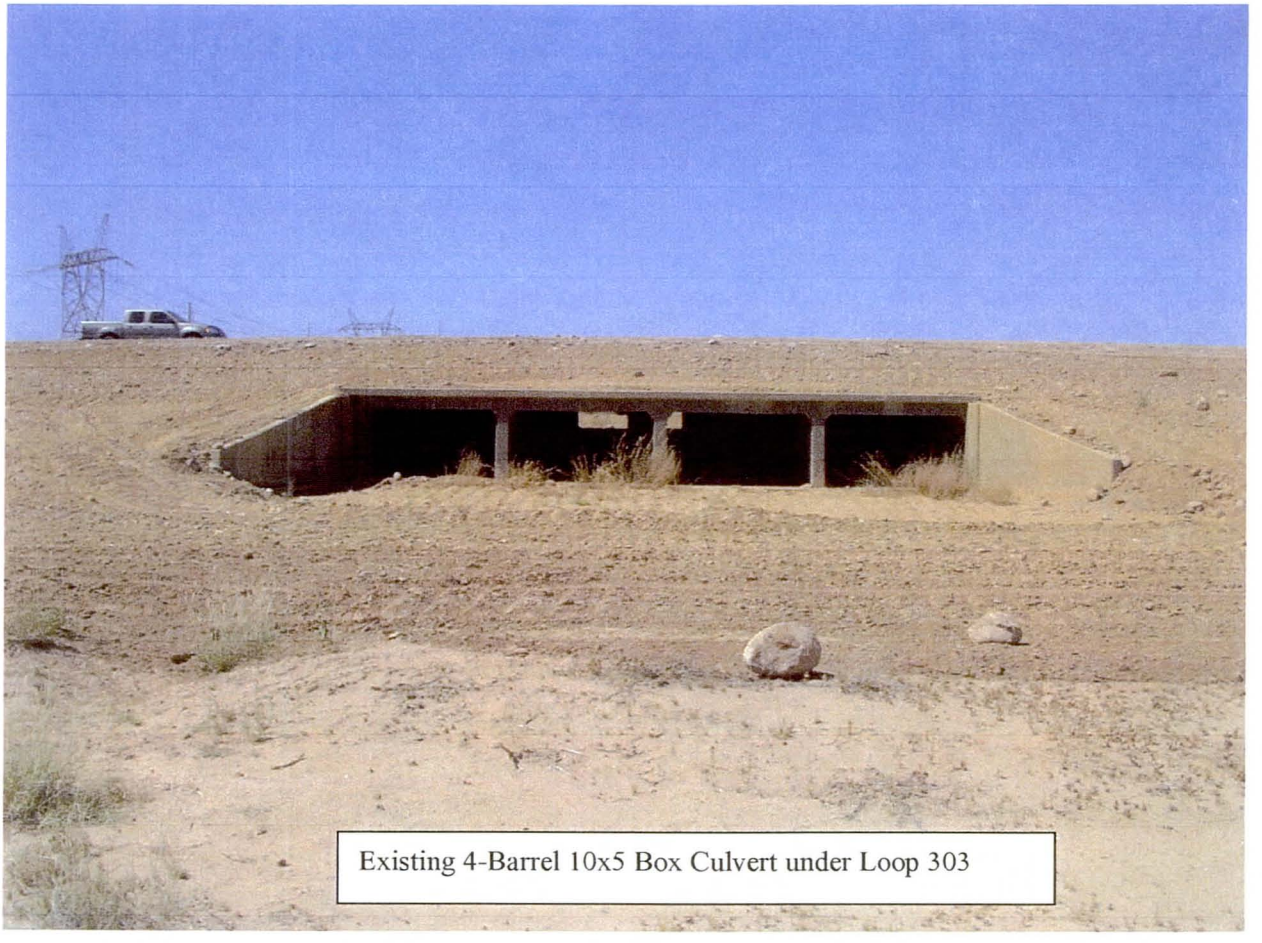
CONTENTS

APPENDICES

PINNACLE PEAK
DIVERSION CHANNEL FOR OFFSITE FLOWS
PINNACLE PEAK ROAD ALIGNMENT
FROM 123RD AVENUE TO McMICKEN OUTFALL WASH
DRAINAGE REPORT

1. INTRODUCTION

The calculations for the *Diversion Channel* water surface profile, determination of the cross-section and invert slope provide the basis for the drainage improvements shown of the plans. The *Diversion Channel* centerline stationing starts in the Pinnacle Peak Road extended alignment (Pinnacle Peak Road ends at 123rd Avenue) at a point 35 feet south of the north quarter corner of section 14, Township 4 north, Range 1 west and extends easterly along a line parallel to the north line of said section 14 to a point 35 feet south of the northeast corner of said section 14 (123rd Avenue) where this phase of the channel construction terminates. The next phase of the *Diversion Channel* will extend it to the existing 4-barrel 10x5 reinforced box culvert under Loop 303 and is a part of the *Dos Rios* offsite improvements. The *Vicinity Map* shows the *Diversion Channel's* location with respect to the adjacent, benefiting subdivisions which include *Dos Rios*, *Crossriver, Rancho Silverado Phase 1, Rancho Silverado Phase 2, Rio Sierra, and Sundero.*



Existing 4-Barrel 10x5 Box Culvert under Loop 303

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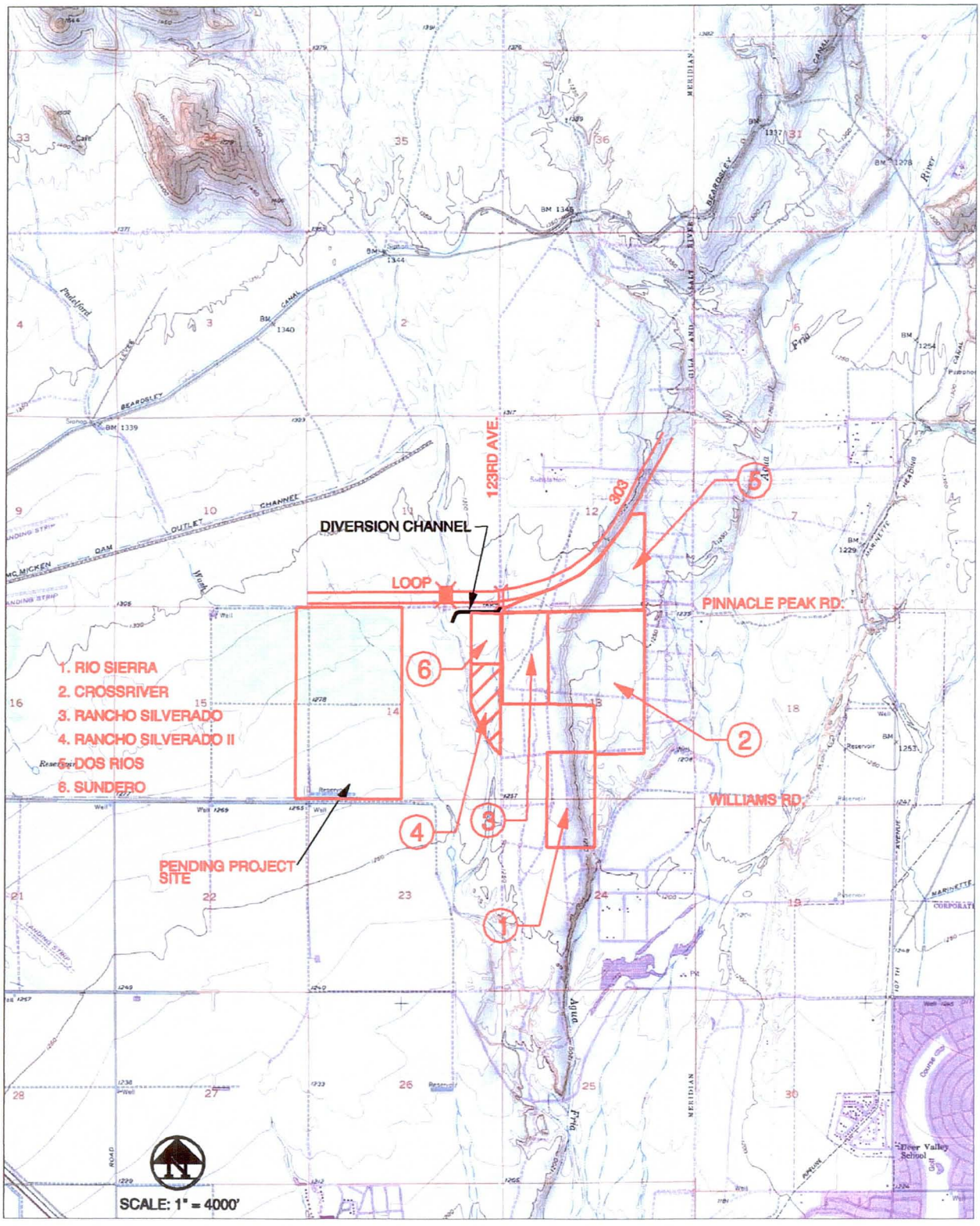


VICINITY MAP	McMICKEN DIVERSION CHANNEL	JOB NO 990050
4550 NORTH 12TH STREET PHOENIX, ARIZONA 85014 TELEPHONE (602) 264-6831	COE & VAN LOO PLANNING • ENGINEERING • LANDSCAPE ARCHITECTURE	1A OF 6

FILE: .DGN DATE:

The proposed trapezoidal channel cross-section has a 20-foot bottom, 4-foot depth and 1:1 side slopes. It is a concrete lined channel and will be maintained by the Home Owner's Associations of the benefiting subdivisions. The *Sundero* Subdivision located on the south side of the *Diversion Channel* will provide a block wall (controlled access) for that reach of the *Diversion Channel*. The 50-foot corridor, which includes a 20-foot waterline easement for Az American Waterworks and a 30-foot drainage easement, shall be fenced to control access and maintain safe conditions in the channel area. A waterline access and channel maintenance road is provided in the 20-foot easement.

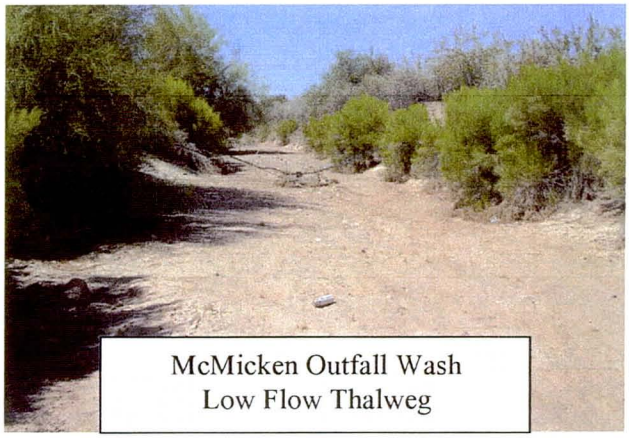
The runoff discharge of 392 cfs was taken from that work presented in *The Final Drainage Report for Estrella Roadway-Phase II*[1]. The drainage area, designated as 16, consists of 316.8 acres, varies in width from 1,200 to 2,600 feet, and extends northerly for 2-miles from Pinnacle Peak Road to Beardsley Canal.

2. SIMPLIFIED DESIGN PROCEDURES

A grade control is established for the *Diversion Channel* and design parameters are within those listed in Table 6.3[2].

3. INITIAL DATA

Existing Structures – The only existing structure associated with the *Diversion Channel* is the 4-barrel 10x5 box Culvert under Loop 303 which is shown on the previous page. The culvert discharge spreads and continues south as sheet flow.



McMicken Outfall Wash
Low Flow Thalweg

Existing Channel Characteristics – The 392 cfs discharge from the existing box culvert under Loop 303 spreads into a more or less sheet flow, but downstream forms a small channel that flows into the *McMicken Outfall Wash*.

Existing Grade Control – There is no existing grade control.

Existing Flood Performance Characteristics – The 100-year return event discharge spreads beyond the banks of the McMicken Outfall Wash. The banks can be seen in the photo.

Scour Observations – As can be seen in the photo, the McMicken Outfall Wash is rather stable with no visible signs of scour. The Diversion Channel Outfall Wash has some visible signs of scour.

Diversion Channel Outfall Wash

[1] Final Drainage Report for Estrella Roadway-Phase II, June 8, 1999, HDR Engineering, Inc/Ritoch-Powell Associates, Page 11.
[2] Drainage Design Manual for Maricopa County, Arizona, Volume II Hydraulics, January 28, 1996.

Existing Stream Development – The Diversion Channel Outfall Wash collects surrounding sheet flows and the scour marks indicate this wash is developing and will become larger with time.

First Flush Treatment Not Applicable – Much of the area near to the McMicken Outfall Wash and south of Loop 303 is currently being developed into residential subdivisions. However, the Diversion Channel will intercept only offsite runoff discharges that originate in the area north of Loop 303.

The only planned subdivision that could possibly impact flows in the proposed diversion channel is Dos Rios which is positioned between Loop 303 and Pinnacle Peak Road east of 123rd Avenue. The "FINAL DRAINAGE REPORT FOR DOS RIOS UNIT TWO" by Evolution Engineering, LLC says on page 6 "... Onsite runoff will be conveyed in the local streets with 10-year flows contained between the curbs and 100 year flows contained within the right-of-way. Streets will be used to direct runoff to onsite retention facilities which have been sized for the 100-year, 2-hour event. Offsite flows will be passed through the site in channels to be constructed with this project... "
The drainage area that contributes to the diversion channel is located north of Loop 303 and crosses under it thru 4-barrels of 10x5 box culvert. The purpose of the diversion channel is to carry only offsite flows from north of Loop 303 to a point of discharge in McMicken Wash. No onsite flows will discharge into the diversion channel.

4. COMPONENTS AND STRATEGIES

Channel – The existing washes flow in a direction generally south and southwest. When preparing concept plans, it was initially agreed among property owners of *Dos Rios, Crossriver, Rancho Silverado and Sundero together with* the FCDMC that it will be of mutual benefit to provide this *Diversion Channel.* The *Diversion Channel* will direct offsite runoff discharges into the McMicken Outfall Wash at a location about ½ mile north of its existing location.

Alignment – The *Diversion Channel* will parallel the north line of section 14, T4N, R1W and will be positioned on the south side of the section line on private property from 123rd Avenue to the FCDMC right-of-way line.

Grade Control Structure – As agreed to with FCDMC at the concept/criteria meeting of May 11, 2004, the expansion, outfall structure shall be located within FCD right-of-way but outside the floodplain limits. There is an existing swale/wash in this area where the expansion, outlet structure shall be located so it provides a safe non-eroding transition to the existing McMicken Outfall wash.

5. CONSIDERATION FOR RIGHT-OF-WAY

The *Sundero* Subdivision located on the south side of the *Diversion Channel* will provide a block wall (controlled access) for that reach of the *Diversion Channel.* Within FCDMC right-of-way and on the north side of the Sundero reach of the 50-foot corridor, which includes a 20-foot waterline easement for Arizona American Waterworks and a 30-foot drainage easement, the easement boundary shall be fenced to control access and maintain safe conditions in the channel area. A waterline access and channel maintenance road is provided in the 20-foot easement. In addition, a 20-foot TCE is provided for the construction period.

6. CHANNEL DESIGN

Concrete Lining – In order for the channel to fit into the provided easement 1:1 side slopes are required (Hydraulically) and thus a concrete lining (Reinforced Shotcrete) is required as shown in Table 6.3[3].

The concrete lining is designed in accordance with ADOT procedures[4]. The concrete lining shall be continuously reinforced without expansion or tooled joints (See Plans for Details). The mean velocity of channel flow is about 8.0 fps and thus requires a bottom slab thickness and a side slope thickness of 5-inches. However, maintenance vehicles will have access to the channel bottom thus requiring a minimum 6-inch thickness. Reinforcement shall be 6x6 – W 1.4x1.4 welded wire fabric in accordance with MAG Section 525 & 727. The guidelines require a longitudinal steel ratio of 0.30% and a transverse steel ratio of 0.25%; 6x6 – W1.4x1.4 provides a steel ratio of 0.364% which exceeds both of those minimum requirements.

Side slopes were selected from Table 2[4] corresponding to Case 2 subsurface conditions based on the Geotechnical Engineer's soil classification. The project Geotechnical Engineer says... *According to OSHA classification of Soils for Excavations Method- CFR, Title 29, Part 1926, Subpart P:*

> *The onsite soils are classfied as alluvial soils consisting of interbedded clays, silts and sands with gravel becoming more abundant with depth. The soils have greater than 12% silts and clay with plasticity. The unconfined compressive strength based on the blow counts is greater or equal to 1.5 Q. Therefore classifciation based on the chart is Type B which must not be sloped greater than 45 degrees or 1:1.*

Type of Cross Section – The channel cross section is trapezoidal in shape has a 20-foot bottom, 4-foot depth and 1:1 side slopes.

Location of Grade Control –The grouted riprap, expansion, outlet structure is set to provide a slope in the channel less than critical slope and the Froude Number less than or equal to 0.86. Its purpose is to spread the discharge as it enters the floodplain and control erosion. In addition, riprap is provided between the expansion structure and the floodway.

Hydrology – ***Dos Rios***, the upstream development, includes improvements to the upstream reach of the Diversion Channel between Pinnacle Peak Road and Loop 303. The upstream reach of the Diversion Channel is designed with a capacity of 392 cfs (100-year event) and it carries the same offsite flows that does the Pinnacle Peak Diversion Channel (subject channel). The 100-year event flow (392 cfs) is the offsite flow thru the existing 4-barrel 10x5 box culvert under loop 303. The 25-year event is 309 cfs and was calculated from the 24-hour precipitation ratio (392x3.0/3.8=309). The 392 cfs was taken from a report approved by MCDOT[5], and the FCDMC approved the 392 cfs for ***Dos Rios***. It follows that the Pinnacle Peak Diversion Channel should be designed for the same flow as was the upstream, ***Dos Rios*** reach.

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[3] Drainage Design Manual for Maricopa County, Arizona, Volume II Hydraulics, January 28, 1996, Page 6-33.
[4] ADOT, Urban Highways, Channel Lining Design Guidelines, February, 1989.
[5] Final Drainage Report-Volume 1 of 3, Estrella Roadway-Phase II, Prepared for MCDOT, June 8, 1999, HDR/Ritoch-Powell.

7. HYDRAULIC ANALYSIS

Water surface profile calculations – The *Diversion Channel* was modeled using the HEC-RAS computer program and cross sections are provided at 50-foot intervals. Simulation results are included in the Appendices A, B & C.

Two conditions were modeled in accordance with the criteria provided by the FCDMC at the pre-design meeting of May 11, 2004. The first HEC-RAS model, included in Appendix A, consist of the 100-year event (392 cfs) conveyed in the *Diversion Channel* and the downstream water surface control elevation (1282.73) corresponds to the 25-year event (4,758 cfs) in the McMicken outfall wash. The second HEC-RAS model, included in Appendix B, consist of the 25-year event (309 cfs) conveyed in the *Diversion Channel* and the downstream water surface control elevation (1283.2) corresponds to the 100-year event (6,023 cfs) in the McMicken Outfall Wash. The HEC-RAS model simulation output for the McMicken Outfall Wash is included in Appendices D.

Flood Control District's McMicken Outfall Wash HEC-2 Model – This model simulation output is included in Appendix D. The model was provided by the FCDMC for CVL's use on this project. The parameters were developed by FCDMC or their consultant. The model is identified as McMicken Channel Original, HEC-2 Floodplain & Floodway Analysis – Wittman ADMS, McMicken Dam Outlet Wash.

Manning's Roughness Coefficients – n values were selected from Table 6.11[6]. For the shotcrete channel, it was taken as *Shotcrete, good condition, close to Normal* with a corresponding value of 0.020. For grouted riprap, it was taken as 0.030. For plain riprap it was taken as 0.038.

Riprap between the Expansion Outlet Structure and the Floodway – The riprap is located mostly in the McMicken Outfall Wash floodplain and is designed for the SPF of 14,000 cfs. The riprap stone size, layer thickness, filter blanket calculations and scour analysis are shown on the spread sheets included in Appendix E. Riprap sizing is in accordance with the HEC-11 method described in the FCD Manual[7]. The spread sheet calculations include both the 100-year event of 6,023 cfs and the SPF of 14, 000 cfs. However, the riprap sizing, and scour depth determinations were based on the SPF of 14,000 cfs data.

Said FCD HEC-RAS model output, included in Appendix D, provides the McMicken Outfall Wash velocities for input into riprap spread sheet. The FCD model has two x-sections within the proposed construction area; the river stations are 2.937 located at the upper end of the proposed riprap, and 2.867 near the southerly end of the proposed riprap. The corresponding velocities are 8.3 fps and 7.44 fps. CVL selected the higher value of 8.3 fps corresponding to the x-section at river station 2.937. The x-sections are shown on plan sheet 1 of 3, and folded plan sheets are included in Appendix E.

Calculation of Scour Requirements - Since the Pinnacle Peak Diversion Channel is fully lined no scour is expected inside the channel. Where the channel enters the McMicken wash floodplain, however it will be subjected to scour from flows in the McMicken channel. In order to protect the end of the channel from erosion and scour associated with the McMicken wash flows, the scour depths associated with McMicken Wash were used in designing the thickened toe protection. The outside of the riprapped channel was protected using thickened toe bank protection as described in the

[6] Drainage Design Manual for Maricopa County, Arizona, Volume II Hydraulics, January 28, 1996.
[7] Drainage Design Manual for Maricopa County, Arizona, Volume II Hydraulics, January 28, 1996, Pages 6-38 thru 6-47.

Drainage Design Manual for Maricopa County, Volume II[8]. Sufficient volume was added to the thickened toe as well as protection at the downstream end of the channel to protect against erosion under the channel by McMicken Wash. Size calculations were performed to insure stability of the rock in flows from both McMicken Wash and from the Pinnacle Peak Channel. based on engineering judgement, the selected Stability Factor was then increased to a value of 1.7 which results in a rock size of 18" to insure stability during high flow events.

Scour depths were calculated using the methodology described in Pemberton and Laura (1984) published by the USBR. The calculations were performed using average conditions for flow in the channel for 50, 100, and SPF events. The scour calculations indicate that depths can reach to approximately 12 feet below the existing thalweg elevation. Protection measures were designed to protect to this depth of scour.

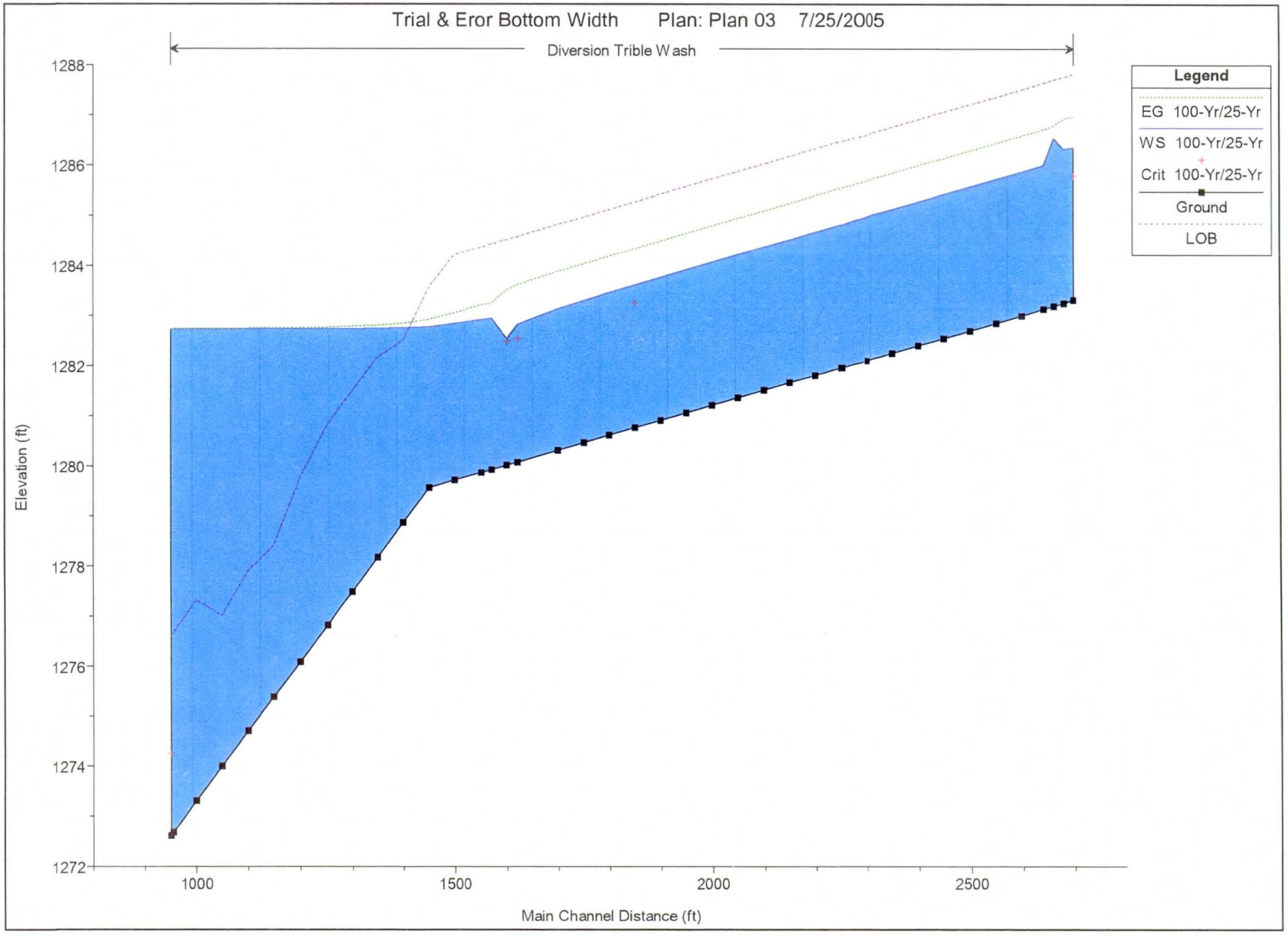
[8] Drainage Design Manual for Maricopa County, Arizona, Volume II Hydraulics, January 28, 1996, Pages 6-51 thru 6-53.

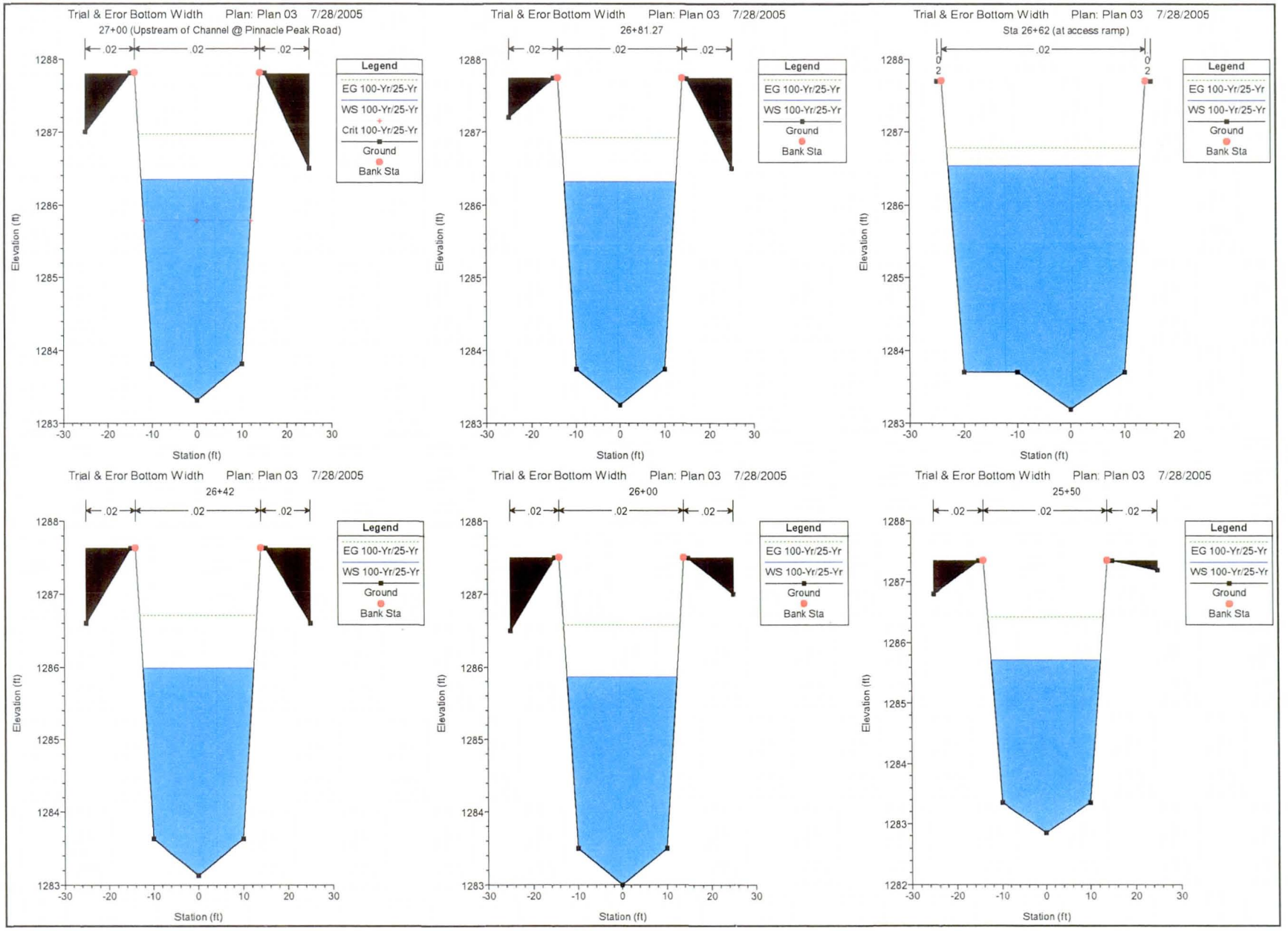
APPENDIX A

Diversion Channel
HEC-RAS Results
100-Yr/25-Yr

HEC-RAS Plan: Offsite River: Diversion Reach: Trible Wash Profile: 100-Yr/25-Yr

Reach	River Sta	Profile	Q Total	Min Ch El	Invert Slope	E.G. Elev	E.G. Slope	Max Chl Dpth	Vel Total	Crit Depth	Crit W.S.	Froude # Chl
			(cfs)	(ft)		(ft)	(ft/ft)	(ft)	(ft/s)	(ft)	(ft)	
Trible Wash	2700	100-Yr/25-Yr	392.00	1283.31	0.0032	1286.96	0.002398	3.03	6.31	2.47	1285.78	0.71
Trible Wash	2681.27	100-Yr/25-Yr	392.00	1283.25	0.0031	1286.91	0.002318	3.06	6.24			0.70
Trible Wash	2662	100-Yr/25-Yr	392.00	1283.19	0.0030	1286.78	0.000820	3.34	4.00			0.43
Trible Wash	2642	100-Yr/25-Yr	392.00	1283.13	0.0031	1286.70	0.003001	2.85	6.80			0.78
Trible Wash	2600	100-Yr/25-Yr	392.00	1283.00	0.0030	1286.58	0.002984	2.86	6.79			0.78
Trible Wash	2550.	100-Yr/25-Yr	392.00	1282.85	0.0030	1286.43	0.002979	2.86	6.78			0.78
Trible Wash	2500.	100-Yr/25-Yr	392.00	1282.70	0.0030	1286.28	0.002974	2.86	6.78			0.78
Trible Wash	2450.	100-Yr/25-Yr	392.00	1282.55	0.0030	1286.13	0.002969	2.86	6.78			0.78
Trible Wash	2400.	100-Yr/25-Yr	392.00	1282.40	0.0030	1285.98	0.002961	2.87	6.77			0.78
Trible Wash	2350.	100-Yr/25-Yr	392.00	1282.25	0.0030	1285.83	0.002952	2.87	6.76			0.78
Trible Wash	2300.	100-Yr/25-Yr	392.00	1282.10	0.0028	1285.68	0.002940	2.87	6.75			0.78
Trible Wash	2250.	100-Yr/25-Yr	392.00	1281.96	0.0030	1285.53	0.003001	2.85	6.80			0.78
Trible Wash	2200.	100-Yr/25-Yr	392.00	1281.81	0.0030	1285.38	0.003002	2.85	6.80			0.78
Trible Wash	2150.	100-Yr/25-Yr	392.00	1281.66	0.0030	1285.23	0.003004	2.85	6.80			0.79
Trible Wash	2100.	100-Yr/25-Yr	392.00	1281.51	0.0030	1285.08	0.003006	2.85	6.80			0.79
Trible Wash	2050.	100-Yr/25-Yr	392.00	1281.36	0.0030	1284.93	0.003008	2.85	6.81			0.79
Trible Wash	2000.	100-Yr/25-Yr	392.00	1281.21	0.0030	1284.78	0.003012	2.85	6.81			0.79
Trible Wash	1950.	100-Yr/25-Yr	392.00	1281.06	0.0030	1284.63	0.003019	2.85	6.81			0.79
Trible Wash	1900.	100-Yr/25-Yr	392.00	1280.91	0.0030	1284.48	0.003028	2.85	6.82			0.79
Trible Wash	1850.	100-Yr/25-Yr	392.00	1280.76	0.0030	1284.33	0.003042	2.84	6.83	2.49	1283.25	0.79
Trible Wash	1800.	100-Yr/25-Yr	392.00	1280.61	0.0030	1284.18	0.003064	2.84	6.85			0.79
Trible Wash	1750.	100-Yr/25-Yr	392.00	1280.46	0.0030	1284.02	0.003101	2.83	6.88			0.80
Trible Wash	1700.	100-Yr/25-Yr	392.00	1280.31	0.0031	1283.87	0.003190	2.81	6.94			0.81
Trible Wash	1621.46	100-Yr/25-Yr	392.00	1280.07	0.0028	1283.60	0.003619	2.71	7.24			0.86
Trible Wash	1600	100-Yr/25-Yr	392.00	1280.01	0.0032	1283.51	0.004305	2.59	7.66	2.47	1282.48	0.93
Trible Wash	1571.46	100-Yr/25-Yr	392.00	1279.92	0.0030	1283.27	0.001030	3.06	4.32			0.47
Trible Wash	1551.46	100-Yr/25-Yr	392.00	1279.86	0.0029	1283.23	0.002724	3.04	4.64			0.51
Trible Wash	1500.	100-Yr/25-Yr	392.00	1279.71	0.0030	1283.05	0.002874	3.13	3.65			0.42
Trible Wash	1450.	100-Yr/25-Yr	392.00	1279.56	0.0138	1282.92	0.001794	3.21	3.08			0.34
Trible Wash	1400.	100-Yr/25-Yr	392.00	1278.87	0.0140	1282.84	0.000842	3.89	2.36			0.24
Trible Wash	1350.	100-Yr/25-Yr	392.00	1278.17	0.0138	1282.81	0.000473	4.57	1.97			0.18
Trible Wash	1300	100-Yr/25-Yr	392.00	1277.48	0.0140	1282.78	0.000277	5.26	1.66			0.14
Trible Wash	1252.91	100-Yr/25-Yr	392.00	1276.82	0.0138	1282.77	0.000179	5.92	1.44			0.11
Trible Wash	1200	100-Yr/25-Yr	392.00	1276.09	0.0140	1282.76	0.000116	6.64	1.25			0.09
Trible Wash	1150	100-Yr/25-Yr	392.00	1275.39	0.0138	1282.75	0.000079	7.34	1.11			0.08
Trible Wash	1100	100-Yr/25-Yr	392.00	1274.70	0.0140	1282.75	0.000059	8.03	1.00			0.07
Trible Wash	1050	100-Yr/25-Yr	392.00	1274.00	0.0138	1282.74	0.000044	8.73	0.91			0.06
Trible Wash	1000	100-Yr/25-Yr	392.00	1273.31	0.0140	1282.74	0.000036	9.42	0.85			0.05
Trible Wash	954.33	100-Yr/25-Yr	392.00	1272.67	0.0139	1282.74	0.000029	10.06	0.79			0.05
Trible Wash	950	100-Yr/25-Yr	392.00	1272.61		1282.74	0.000028	10.12	0.79	1.64	1274.25	0.05


Trial & Eror Bottom Width Plan: Plan 03 7/25/2005
Diversion Trible Wash
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Crit 100-Yr/25-Yr
Ground
LOB
Elevation (ft)
1288
1286
1284
1282
1280
1278
1276
1274
1272
1000
1500
2000
2500
Main Channel Distance (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
27+00 (Upstream of Channel @ Pinnacle Peak Road)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
26+81.27
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
Sta 26+62 (at access ramp)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
26+42
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
26+00
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
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Crit 100-Yr/25-Yr
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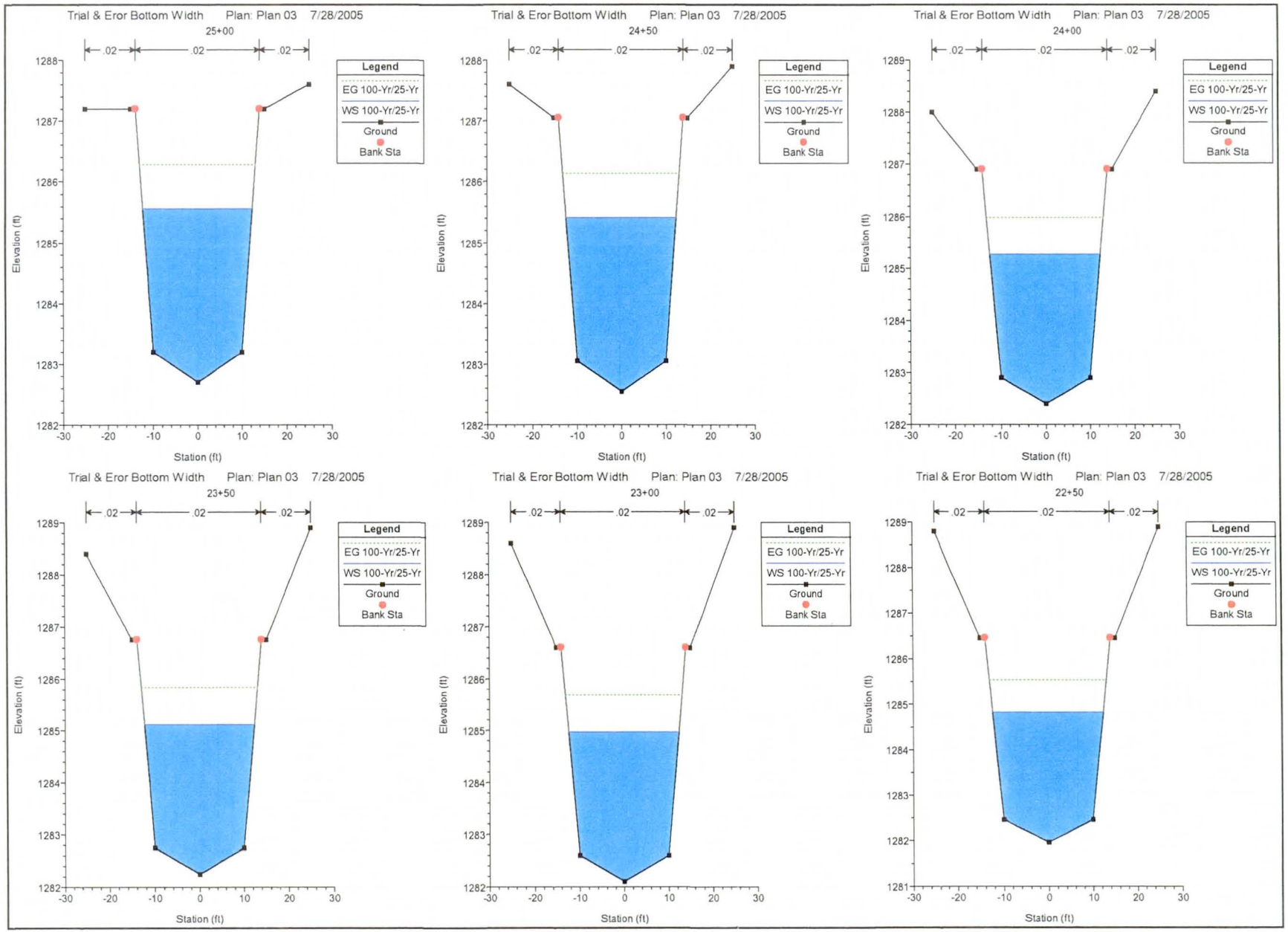
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WS 100-Yr/25-Yr
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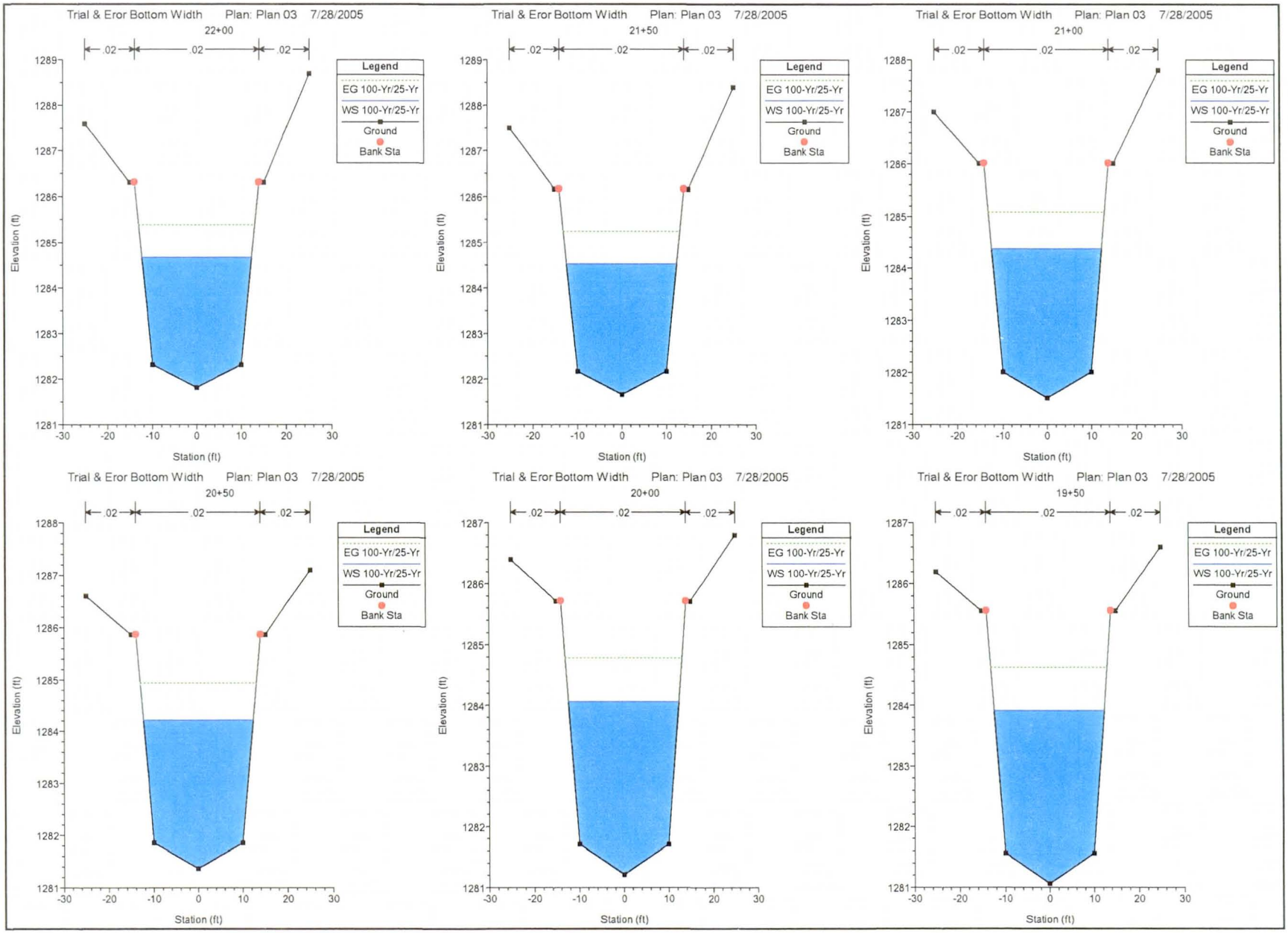
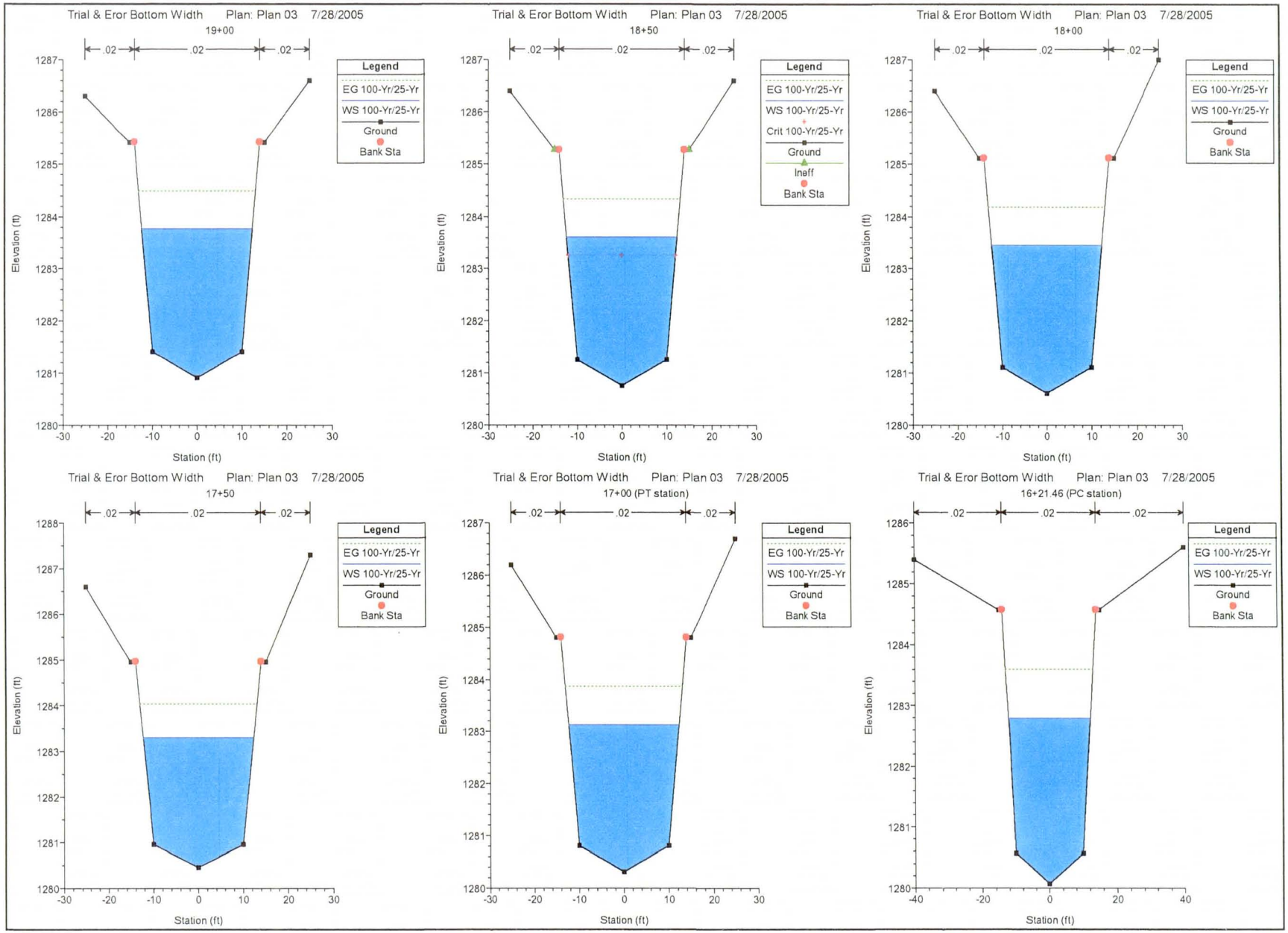
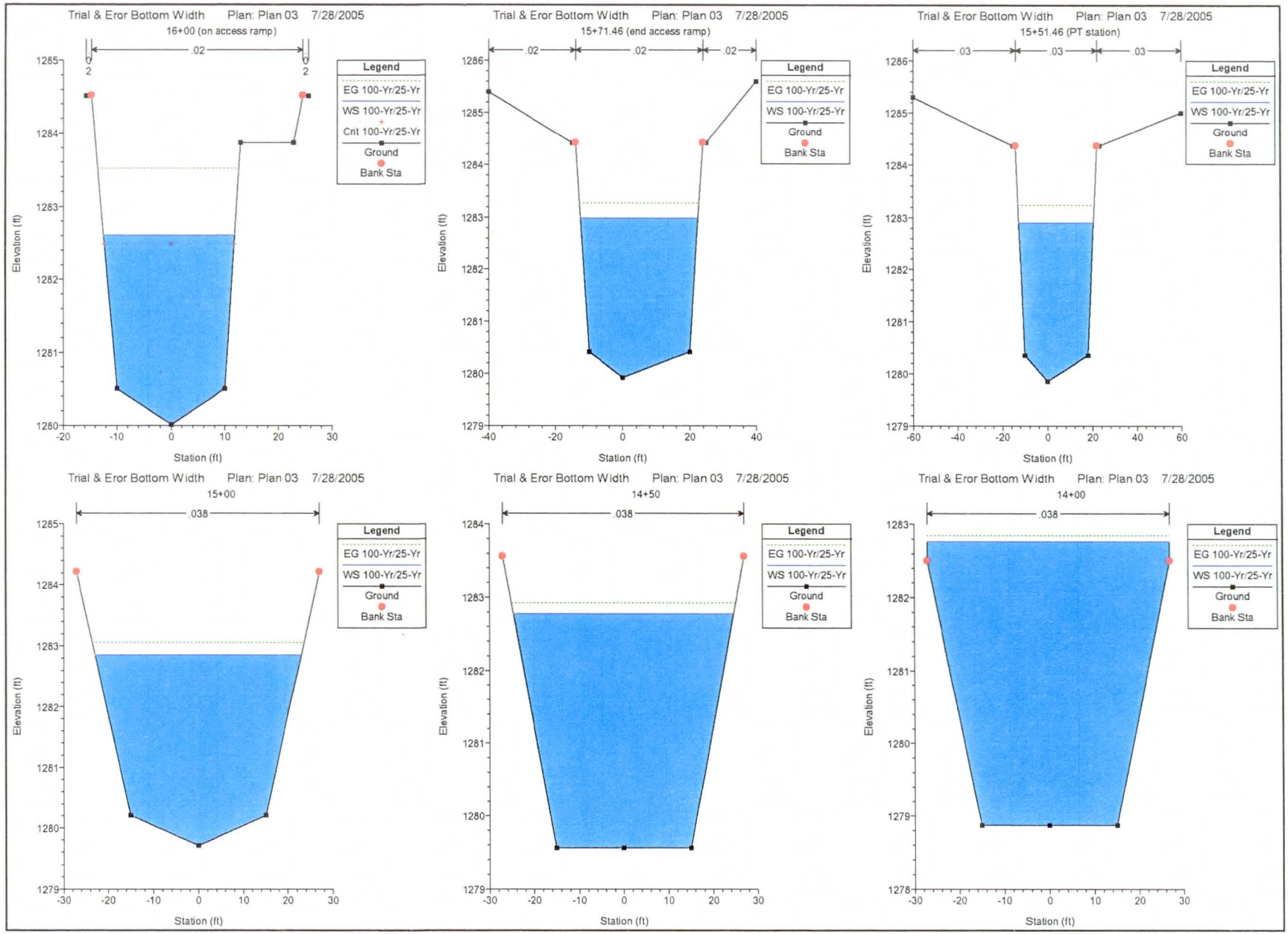
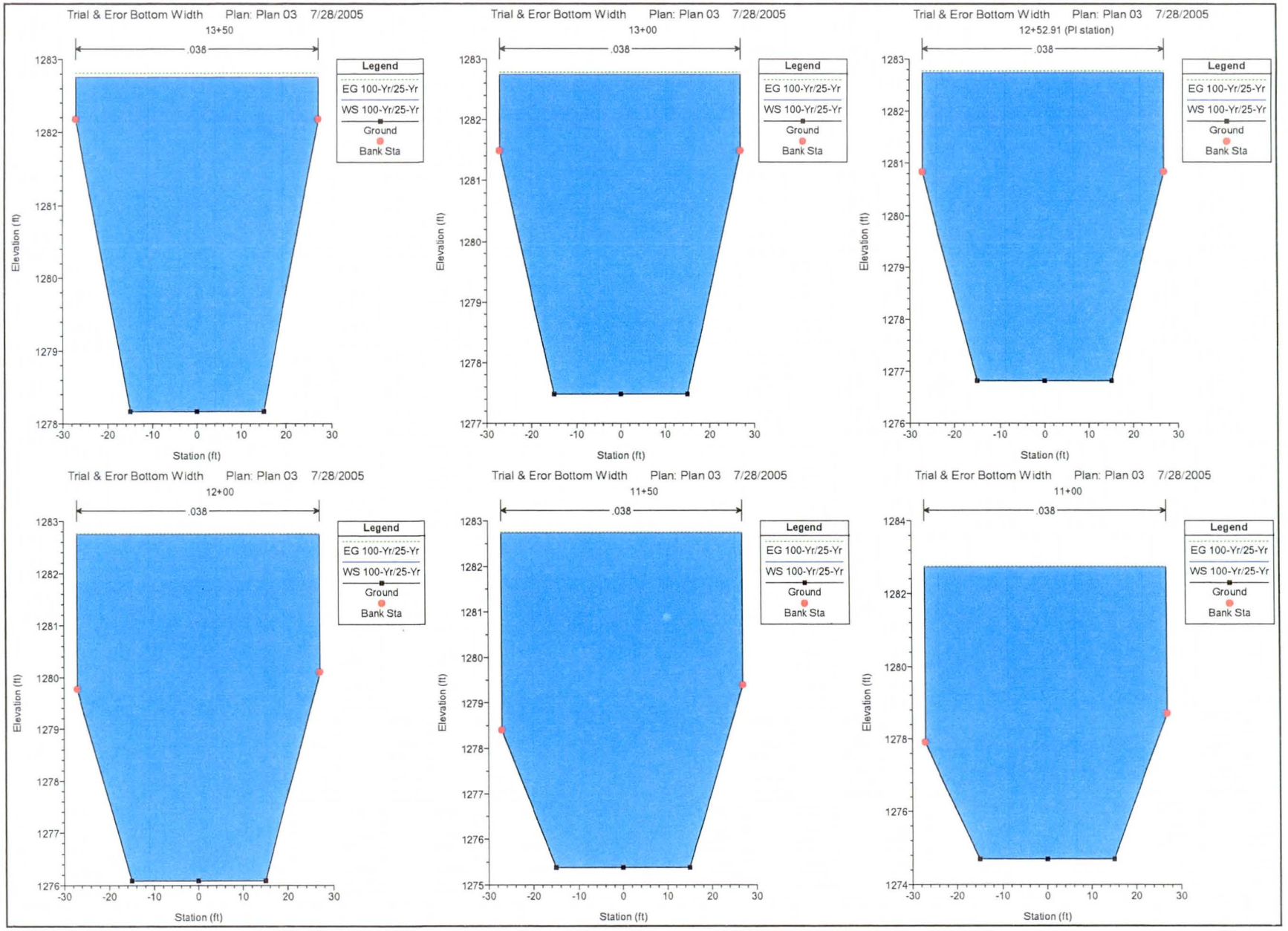
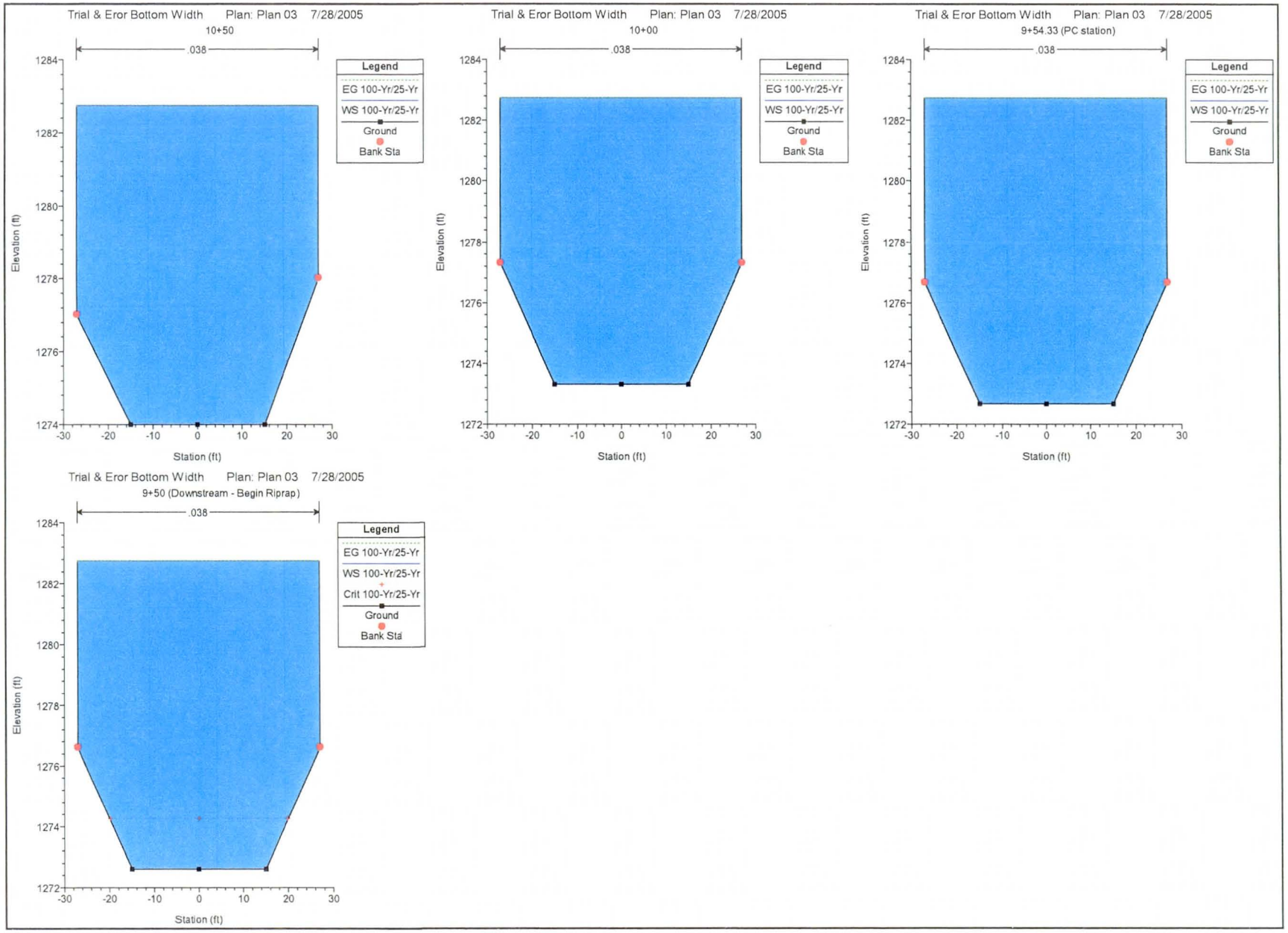
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
22+00
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
21+50
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
21+00
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
20+50
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
20+00
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
19+50
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
19+00
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
18+50
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Crit 100-Yr/25-Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
18+00
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
17+50
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
17+00 (PT station)
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
16+21.46 (PC station)
.02 .02 .02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
16+00 (on access ramp)
.02
.02
2
2
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Crit 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
15+71.46 (end access ramp)
.02
.02
.02
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
15+51.46 (PT station)
.03
.03
.03
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
15+00
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
14+50
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
14+00
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
13+50
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
13+00
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
12+52.91 (PI station)
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
12+00
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
11+50
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
11+00
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

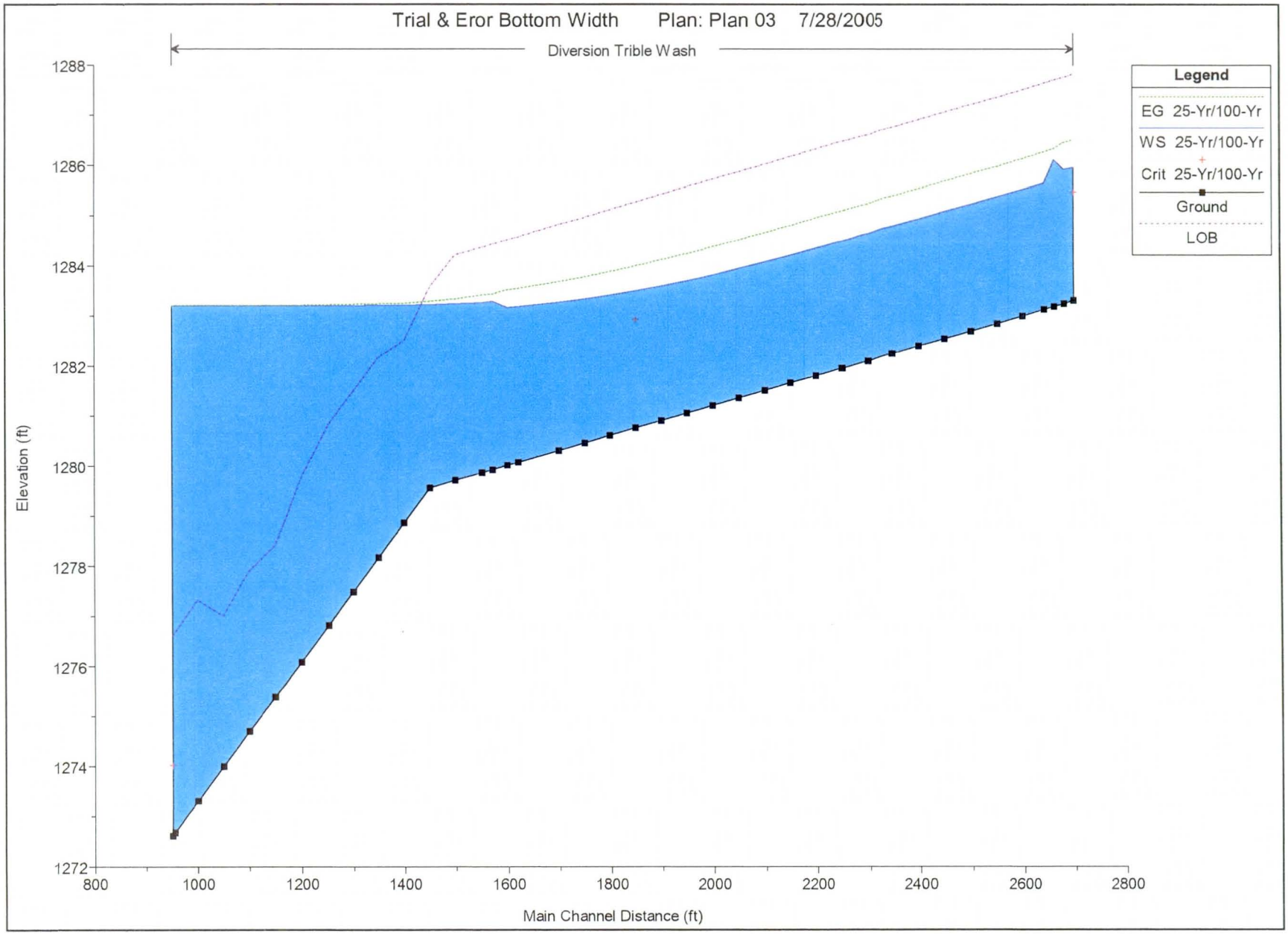

Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
10+50
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
10+00
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
9+54.33 (PC station)
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
9+50 (Downstream - Begin Riprap)
.038
Legend
EG 100-Yr/25-Yr
WS 100-Yr/25-Yr
Crit 100-Yr/25-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

APPENDIX B

Diversion Channel
HEC-RAS Results
25-Yr/100-Yr

HEC-RAS Plan: Offsite River: Diversion Reach: Trible Wash Profile: 25-Yr/100-Yr

Reach	River Sta	Profile	Q Total	Min Ch El	Invert Slope	E.G. Elev	E.G. Slope	Max Chl Dpth	Vel Total	Crit Depth	Crit W.S.	Froude # Chl
			(cfs)	(ft)		(ft)	(ft/ft)	(ft)	(ft/s)	(ft)	(ft)	
Trible Wash	2700	25-Yr/100-Yr	309.00	1283.31	0.0032	1286.49	0.002471	2.64	5.89	2.16	1285.47	0.71
Trible Wash	2681.27	25-Yr/100-Yr	309.00	1283.25	0.0031	1286.44	0.002381	2.67	5.81			0.69
Trible Wash	2662	25-Yr/100-Yr	309.00	1283.19	0.0030	1286.32	0.000848	2.92	3.72			0.42
Trible Wash	2642	25-Yr/100-Yr	309.00	1283.13	0.0031	1286.25	0.002993	2.51	6.27			0.77
Trible Wash	2600	25-Yr/100-Yr	309.00	1283.00	0.0030	1286.12	0.002969	2.52	6.25			0.77
Trible Wash	2550.	25-Yr/100-Yr	309.00	1282.85	0.0030	1285.98	0.002960	2.52	6.25			0.77
Trible Wash	2500.	25-Yr/100-Yr	309.00	1282.70	0.0030	1285.83	0.002949	2.52	6.24			0.77
Trible Wash	2450.	25-Yr/100-Yr	309.00	1282.55	0.0030	1285.68	0.002935	2.52	6.23			0.76
Trible Wash	2400.	25-Yr/100-Yr	309.00	1282.40	0.0030	1285.53	0.002918	2.53	6.22			0.76
Trible Wash	2350.	25-Yr/100-Yr	309.00	1282.25	0.0030	1285.38	0.002895	2.53	6.20			0.76
Trible Wash	2300.	25-Yr/100-Yr	309.00	1282.10	0.0028	1285.23	0.002867	2.54	6.18			0.76
Trible Wash	2250.	25-Yr/100-Yr	309.00	1281.96	0.0030	1285.09	0.002897	2.53	6.20			0.76
Trible Wash	2200.	25-Yr/100-Yr	309.00	1281.81	0.0030	1284.94	0.002870	2.54	6.18			0.76
Trible Wash	2150.	25-Yr/100-Yr	309.00	1281.66	0.0030	1284.80	0.002835	2.55	6.16			0.75
Trible Wash	2100.	25-Yr/100-Yr	309.00	1281.51	0.0030	1284.65	0.002781	2.56	6.12			0.75
Trible Wash	2050.	25-Yr/100-Yr	309.00	1281.36	0.0030	1284.51	0.002713	2.58	6.07			0.74
Trible Wash	2000.	25-Yr/100-Yr	309.00	1281.21	0.0030	1284.37	0.002627	2.60	6.01			0.73
Trible Wash	1950.	25-Yr/100-Yr	309.00	1281.06	0.0030	1284.24	0.002504	2.64	5.91			0.71
Trible Wash	1900.	25-Yr/100-Yr	309.00	1280.91	0.0030	1284.11	0.002357	2.68	5.80			0.69
Trible Wash	1850.	25-Yr/100-Yr	309.00	1280.76	0.0030	1283.99	0.002191	2.73	5.66	2.17	1282.93	0.67
Trible Wash	1800.	25-Yr/100-Yr	309.00	1280.61	0.0030	1283.88	0.002011	2.80	5.50			0.64
Trible Wash	1750.	25-Yr/100-Yr	309.00	1280.46	0.0030	1283.77	0.001825	2.87	5.32			0.61
Trible Wash	1700.	25-Yr/100-Yr	309.00	1280.31	0.0031	1283.68	0.001641	2.96	5.14			0.58
Trible Wash	1621.46	25-Yr/100-Yr	309.00	1280.07	0.0028	1283.54	0.001358	3.11	4.82			0.53
Trible Wash	1600	25-Yr/100-Yr	309.00	1280.01	0.0032	1283.51	0.001295	3.15	4.74			0.52
Trible Wash	1571.46	25-Yr/100-Yr	309.00	1279.92	0.0030	1283.43	0.000452	3.37	3.04			0.32
Trible Wash	1551.46	25-Yr/100-Yr	309.00	1279.86	0.0029	1283.41	0.001135	3.39	3.21			0.33
Trible Wash	1500.	25-Yr/100-Yr	309.00	1279.71	0.0030	1283.34	0.001121	3.53	2.45			0.27
Trible Wash	1450.	25-Yr/100-Yr	309.00	1279.56	0.0138	1283.28	0.000698	3.66	2.06			0.21
Trible Wash	1400.	25-Yr/100-Yr	309.00	1278.87	0.0140	1283.25	0.000338	4.34	1.62			0.15
Trible Wash	1350.	25-Yr/100-Yr	309.00	1278.17	0.0138	1283.24	0.000203	5.04	1.38			0.12
Trible Wash	1300	25-Yr/100-Yr	309.00	1277.48	0.0140	1283.23	0.000125	5.72	1.18			0.09
Trible Wash	1252.91	25-Yr/100-Yr	309.00	1276.82	0.0138	1283.22	0.000084	6.38	1.04			0.08
Trible Wash	1200	25-Yr/100-Yr	309.00	1276.09	0.0140	1283.22	0.000057	7.11	0.91			0.06
Trible Wash	1150	25-Yr/100-Yr	309.00	1275.39	0.0138	1283.21	0.000040	7.81	0.81			0.05
Trible Wash	1100	25-Yr/100-Yr	309.00	1274.70	0.0140	1283.21	0.000030	8.50	0.74			0.05
Trible Wash	1050	25-Yr/100-Yr	309.00	1274.00	0.0138	1283.21	0.000023	9.20	0.68			0.04
Trible Wash	1000	25-Yr/100-Yr	309.00	1273.31	0.0140	1283.21	0.000019	9.89	0.64			0.04
Trible Wash	954.33	25-Yr/100-Yr	309.00	1272.67	0.0139	1283.21	0.000015	10.53	0.59			0.03
Trible Wash	950	25-Yr/100-Yr	309.00	1272.61		1283.21	0.000015	10.59	0.59	1.41	1274.02	0.03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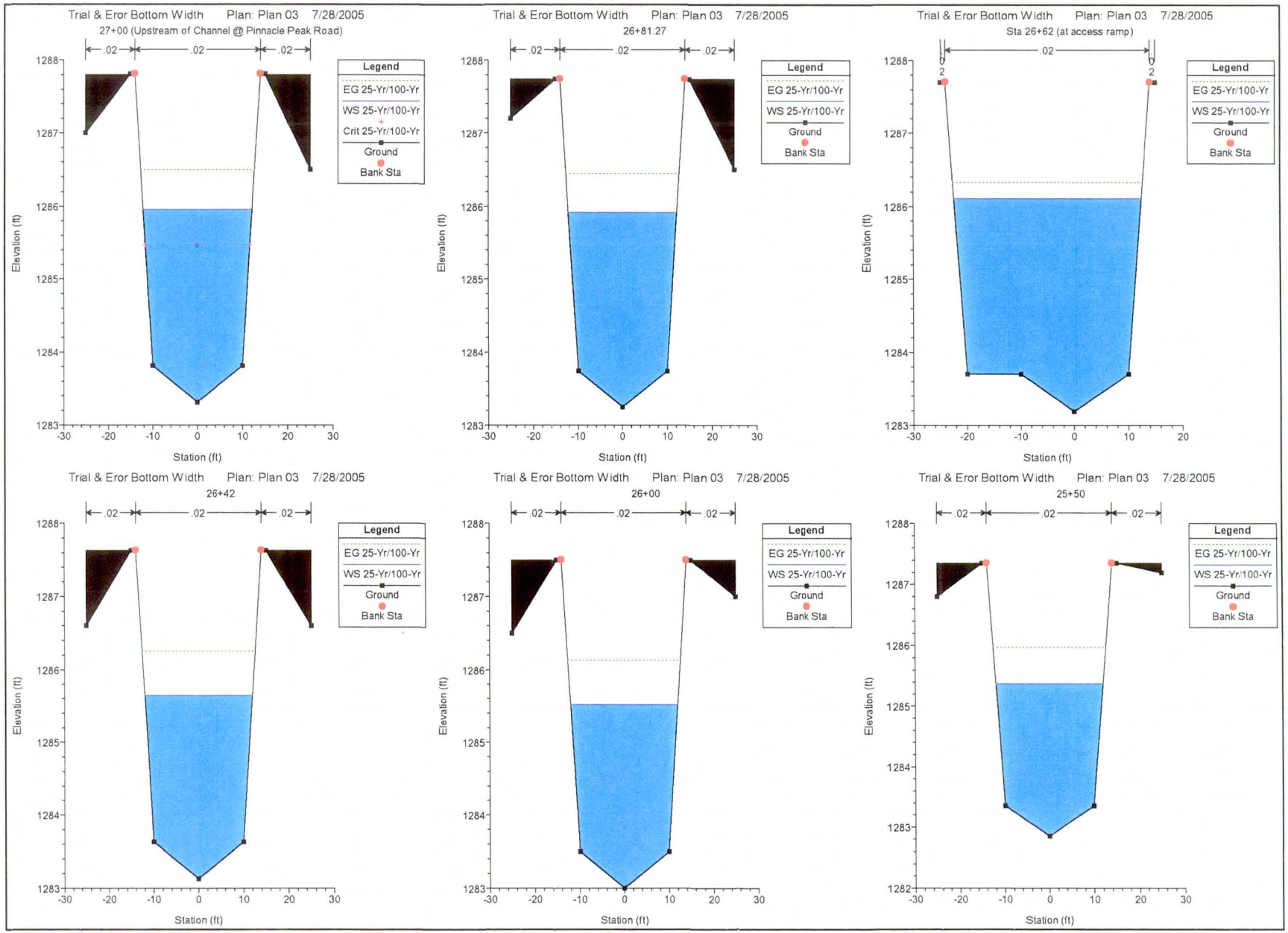
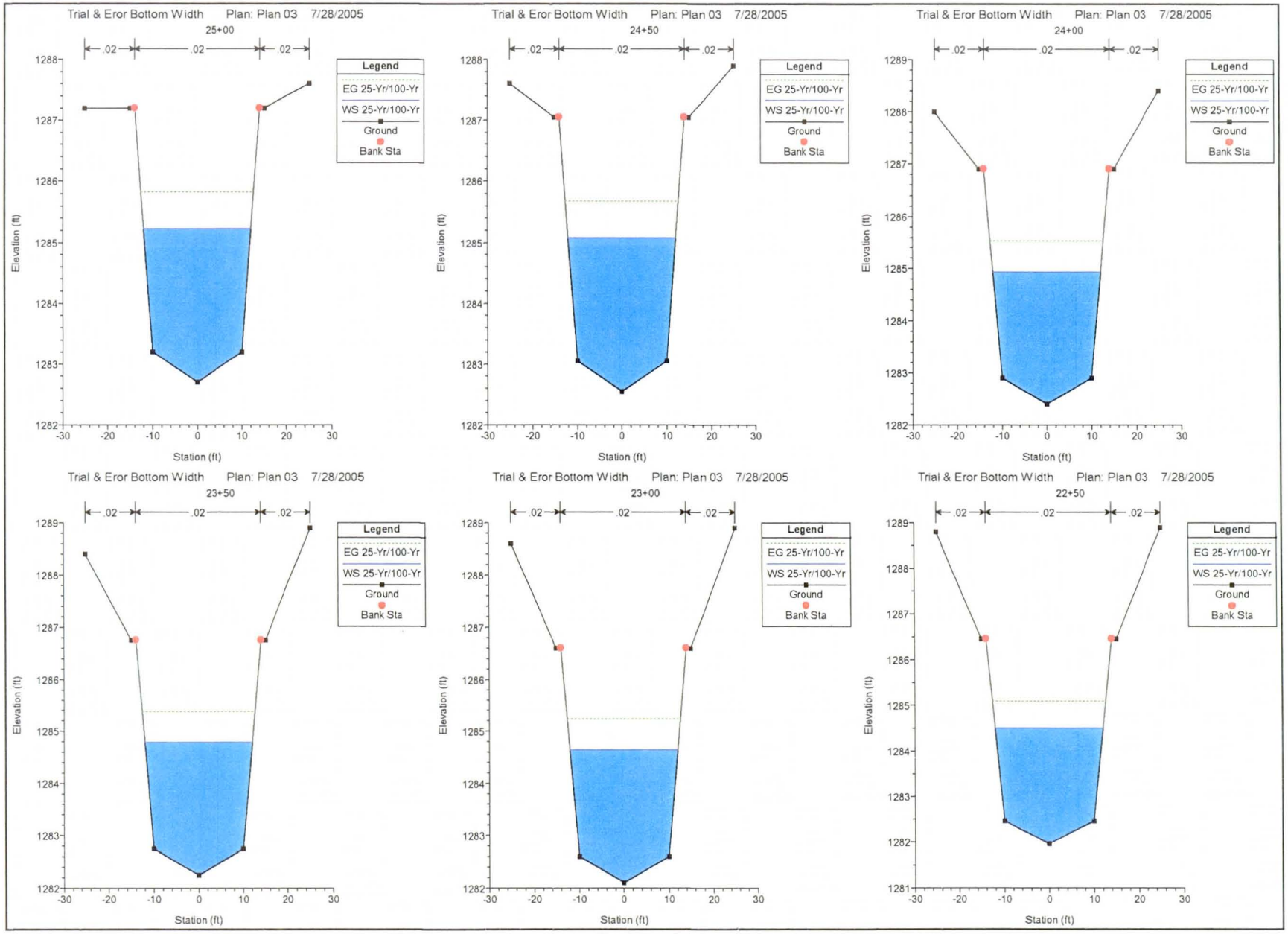
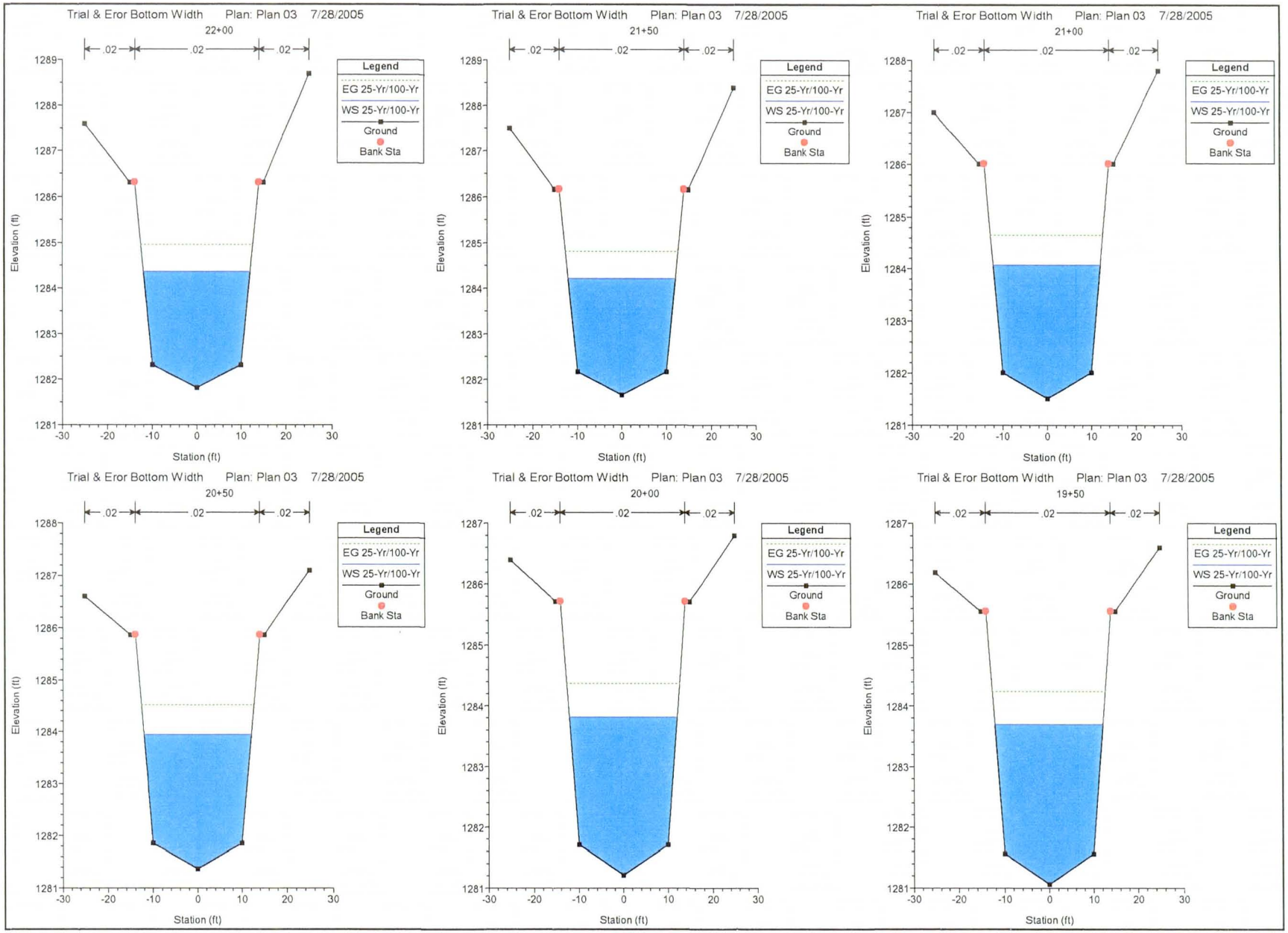
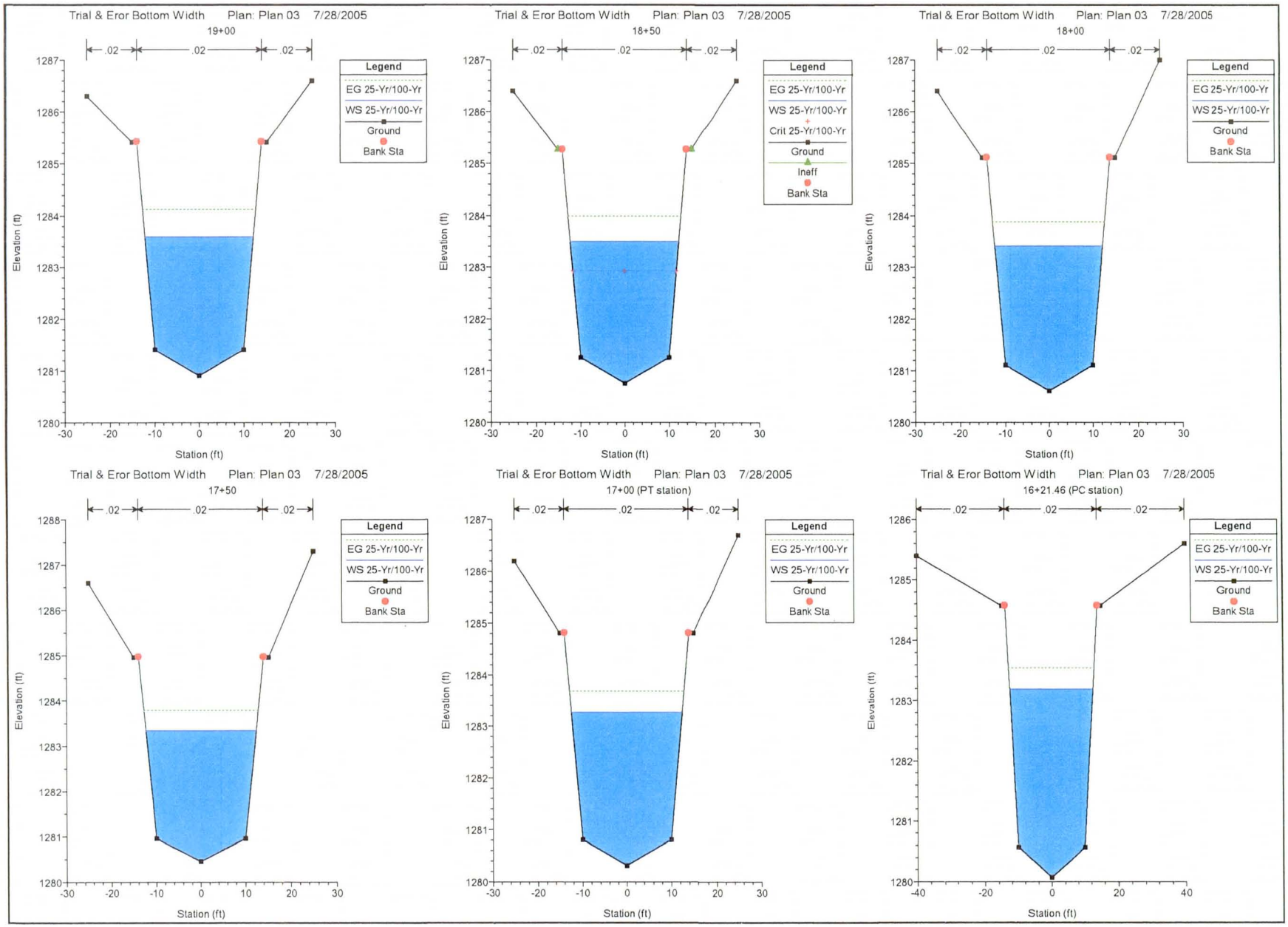
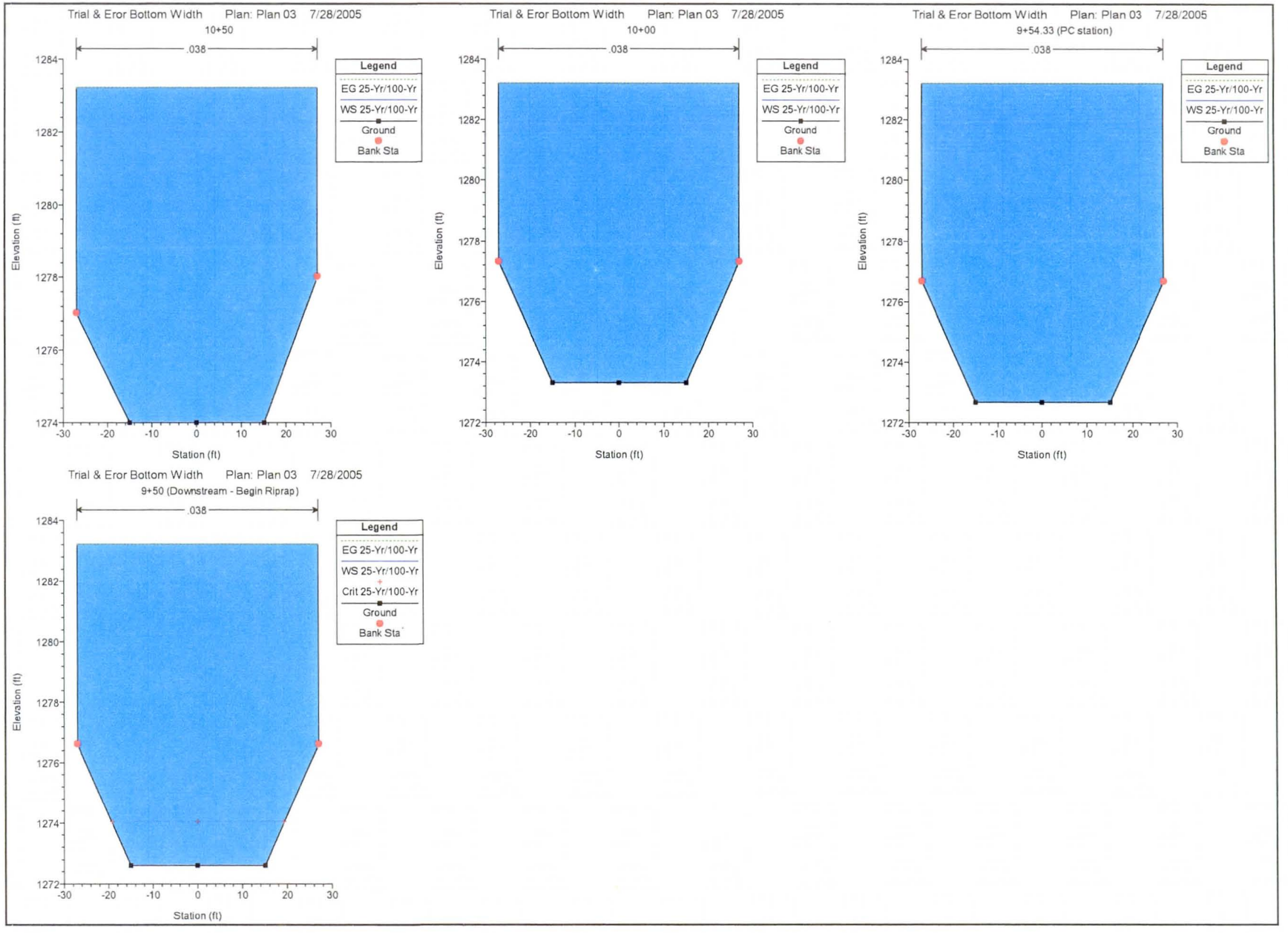
Diversion Trible Wash
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Crit 25-Yr/100-Yr
Ground
LOB
Elevation (ft)
1288
1286
1284
1282
1280
1278
1276
1274
1272
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
Main Channel Distance (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
27+00 (Upstream of Channel @ Pinnacle Peak Road)
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Crit 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
26+81.27
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
Sta 26+62 (at access ramp)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
26+42
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
26+00
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
25+50


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
25+00
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
24+50
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
24+00
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
23+50
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
23+00
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
22+50
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
22+00
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
21+50
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
21+00
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
20+50
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
20+00
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
19+50
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
19+00
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
18+50
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Crit 25-Yr/100-Yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
18+00
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
17+50
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
17+00 (PT station)
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
16+21.46 (PC station)
.02 .02 .02
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
10+50
.038
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
10+00
.038
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
9+54.33 (PC station)
.038
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
9+50 (Downstream - Begin Riprap)
.038
Legend
EG 25-Yr/100-Yr
WS 25-Yr/100-Yr
Crit 25-Yr/100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

APPENDIX C

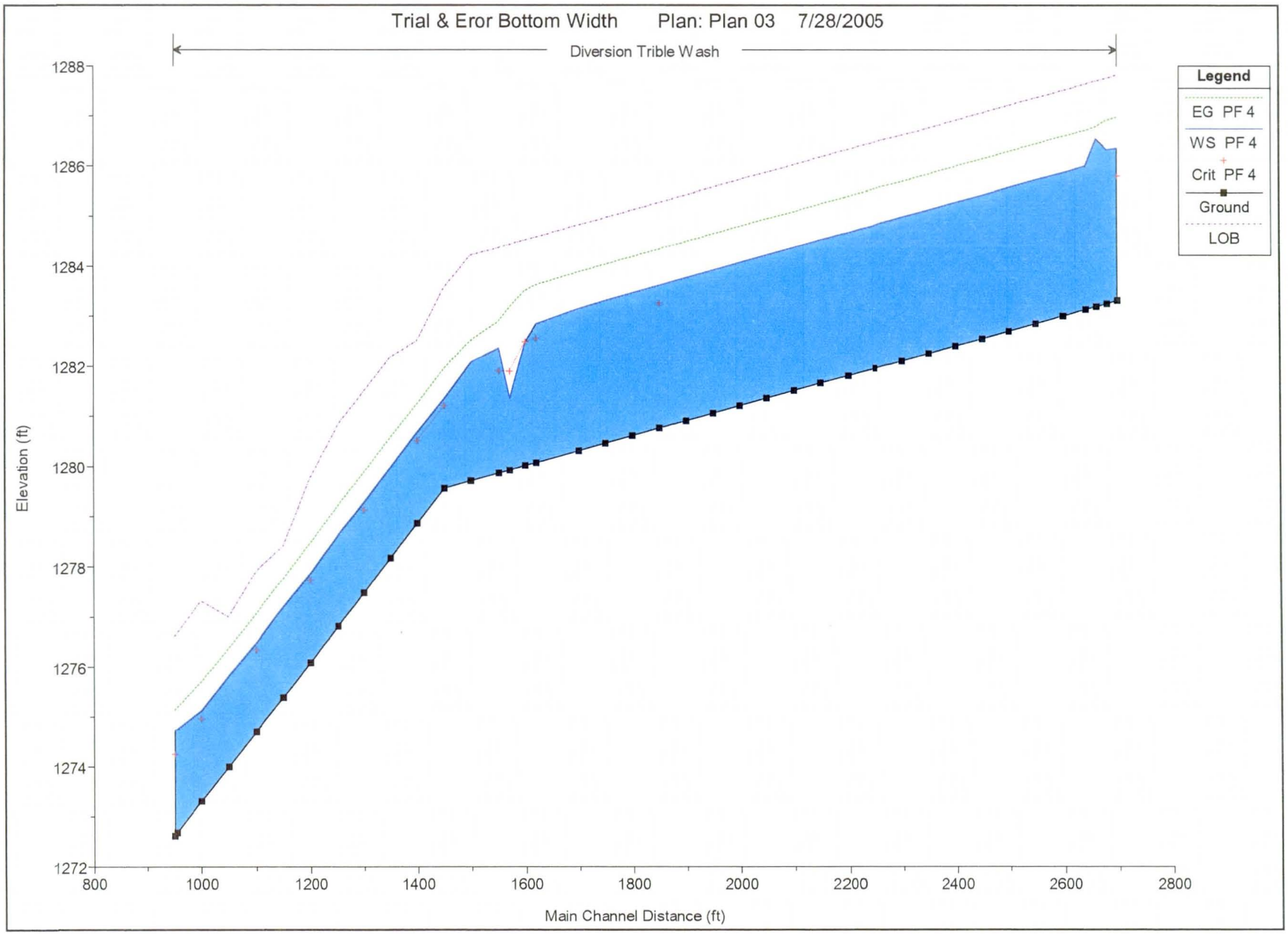
Diversion Channel
HEC-RAS Results
100-Yr

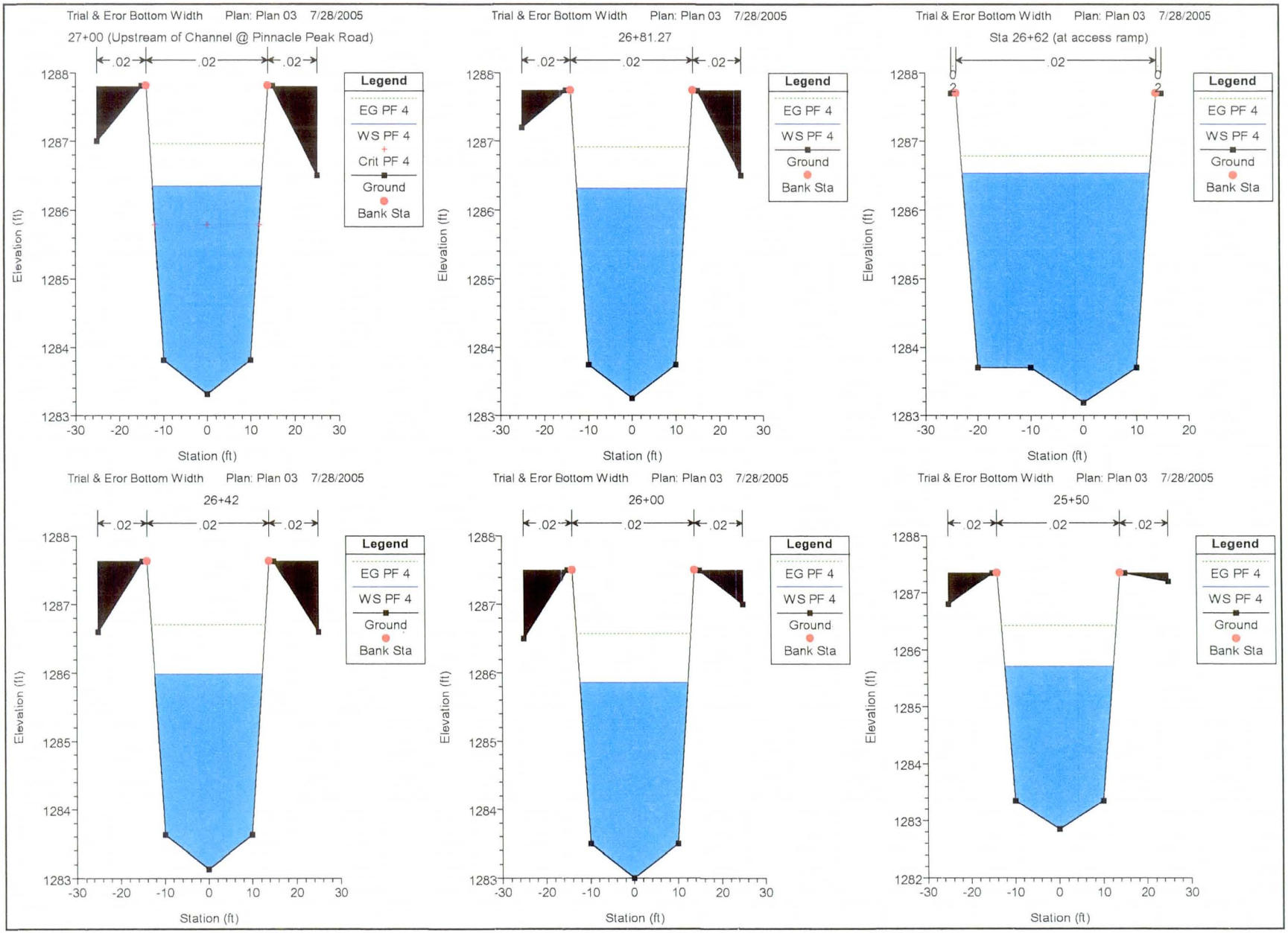
HEC-RAS Plan: Offsite River: Diversion Reach: Trible Wash Profile: PF 4

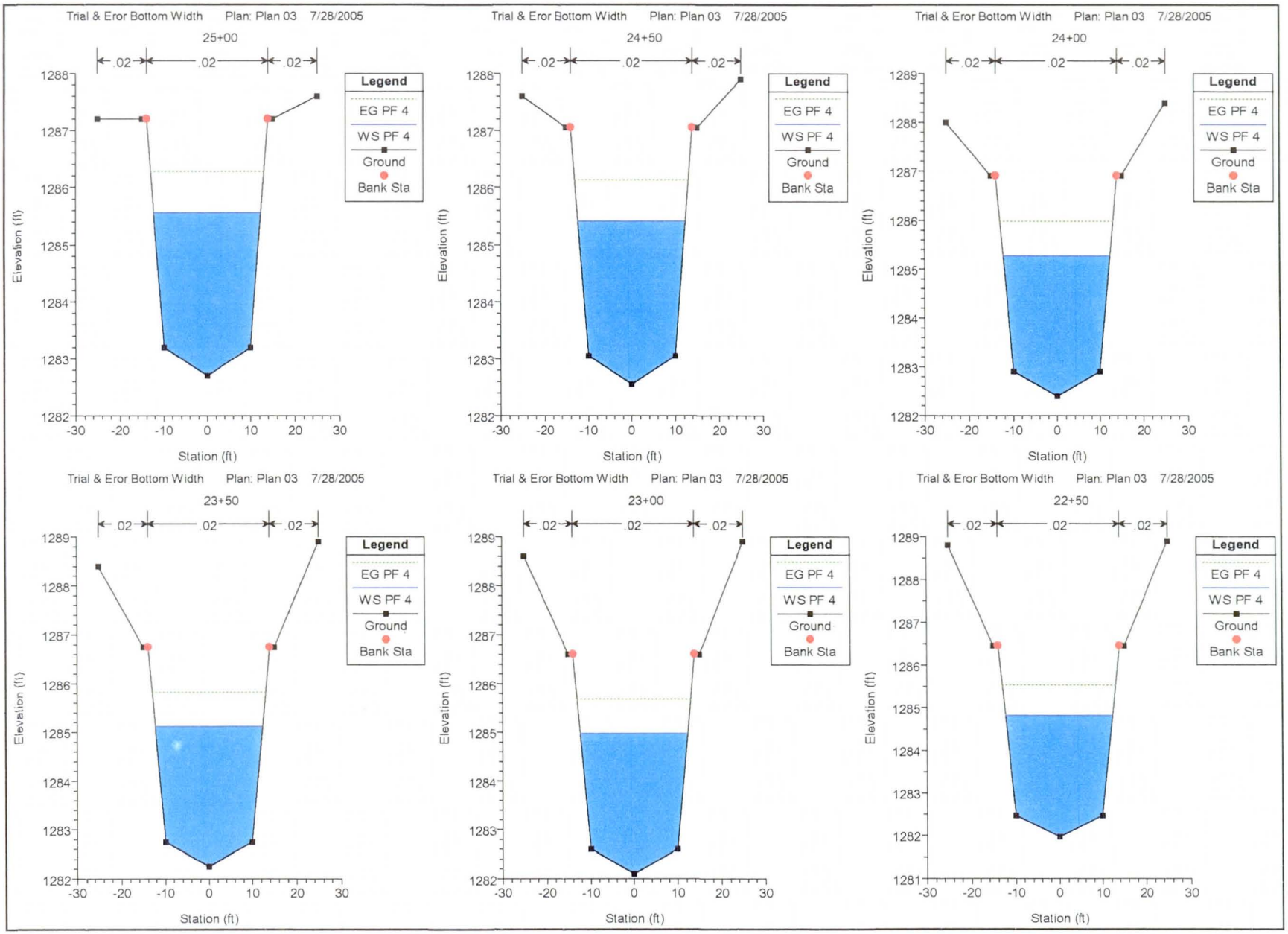
Reach	River Sta	Profile	Q Total	Min Ch El	Invert Slope	E.G. Elev	E.G. Slope	Max Chl Dpth	Vel Total	Crit Depth	Crit W.S.	Froude # Chl
			(cfs)	(ft)		(ft)	(ft/ft)	(ft)	(ft/s)	(ft)	(ft)	
Trible Wash	2700	PF 4	392.00	1283.31	0.0032	1286.96	0.002398	3.03	6.31	2.48	1285.79	0.71
Trible Wash	2681.27	PF 4	392.00	1283.25	0.0031	1286.91	0.002318	3.06	6.24			0.70
Trible Wash	2662	PF 4	392.00	1283.19	0.0030	1286.78	0.000820	3.34	4.00			0.43
Trible Wash	2642	PF 4	392.00	1283.13	0.0031	1286.70	0.003001	2.85	6.80			0.78
Trible Wash	2600	PF 4	392.00	1283.00	0.0030	1286.58	0.002983	2.86	6.79			0.78
Trible Wash	2550.	PF 4	392.00	1282.85	0.0030	1286.43	0.002979	2.86	6.78			0.78
Trible Wash	2500.	PF 4	392.00	1282.70	0.0030	1286.28	0.002974	2.86	6.78			0.78
Trible Wash	2450.	PF 4	392.00	1282.55	0.0030	1286.13	0.002968	2.86	6.78			0.78
Trible Wash	2400.	PF 4	392.00	1282.40	0.0030	1285.98	0.002961	2.87	6.77			0.78
Trible Wash	2350.	PF 4	392.00	1282.25	0.0030	1285.83	0.002952	2.87	6.76			0.78
Trible Wash	2300.	PF 4	392.00	1282.10	0.0028	1285.68	0.002940	2.87	6.75			0.78
Trible Wash	2250.	PF 4	392.00	1281.96	0.0030	1285.53	0.003000	2.85	6.80			0.78
Trible Wash	2200.	PF 4	392.00	1281.81	0.0030	1285.38	0.003001	2.85	6.80			0.78
Trible Wash	2150.	PF 4	392.00	1281.66	0.0030	1285.23	0.003002	2.85	6.80			0.78
Trible Wash	2100.	PF 4	392.00	1281.51	0.0030	1285.08	0.003002	2.85	6.80			0.78
Trible Wash	2050.	PF 4	392.00	1281.36	0.0030	1284.93	0.003003	2.85	6.80			0.78
Trible Wash	2000.	PF 4	392.00	1281.21	0.0030	1284.78	0.003005	2.85	6.80			0.79
Trible Wash	1950.	PF 4	392.00	1281.06	0.0030	1284.63	0.003008	2.85	6.81			0.79
Trible Wash	1900.	PF 4	392.00	1280.91	0.0030	1284.48	0.003012	2.85	6.81			0.79
Trible Wash	1850.	PF 4	392.00	1280.76	0.0030	1284.33	0.003018	2.85	6.81	2.49	1283.25	0.79
Trible Wash	1800.	PF 4	392.00	1280.61	0.0030	1284.18	0.003027	2.85	6.82			0.79
Trible Wash	1750.	PF 4	392.00	1280.46	0.0030	1284.03	0.003042	2.84	6.83			0.79
Trible Wash	1700.	PF 4	392.00	1280.31	0.0031	1283.88	0.003084	2.83	6.86			0.79
Trible Wash	1621.46	PF 4	392.00	1280.07	0.0028	1283.61	0.003341	2.77	7.05	2.47	1282.54	0.83
Trible Wash	1600	PF 4	392.00	1280.01	0.0032	1283.50	0.005134	2.47	8.12	2.47	1282.48	1.01
Trible Wash	1571.46	PF 4	392.00	1279.92	0.0030	1283.17	0.018557	1.43	10.84	1.97	1281.89	1.79
Trible Wash	1551.46	PF 4	392.00	1279.86	0.0029	1282.89	0.005587	2.50	5.85	2.05	1281.91	0.71
Trible Wash	1500.	PF 4	392.00	1279.71	0.0030	1282.51	0.008705	2.36	5.32			0.70
Trible Wash	1450.	PF 4	392.00	1279.56	0.0138	1281.95	0.014270	1.79	6.20	1.64	1281.20	0.88
Trible Wash	1400.	PF 4	392.00	1278.87	0.0140	1281.24	0.013510	1.81	6.03	1.63	1280.50	0.85
Trible Wash	1350.	PF 4	392.00	1278.17	0.0138	1280.56	0.013657	1.81	6.11			0.86
Trible Wash	1300	PF 4	392.00	1277.48	0.0140	1279.87	0.014095	1.79	6.18	1.64	1279.12	0.87
Trible Wash	1252.91	PF 4	392.00	1276.82	0.0138	1279.21	0.013571	1.81	6.10			0.86
Trible Wash	1200	PF 4	392.00	1276.09	0.0140	1278.46	0.014660	1.77	6.23	1.64	1277.73	0.89
Trible Wash	1150	PF 4	392.00	1275.39	0.0138	1277.75	0.013241	1.81	5.96			0.85
Trible Wash	1100	PF 4	392.00	1274.70	0.0140	1277.06	0.014364	1.77	6.14	1.63	1276.33	0.88
Trible Wash	1050	PF 4	392.00	1274.00	0.0138	1276.37	0.012857	1.83	5.90			0.83
Trible Wash	1000	PF 4	392.00	1273.31	0.0140	1275.70	0.013683	1.81	6.12	1.64	1274.95	0.86
Trible Wash	954.33	PF 4	392.00	1272.67	0.0139	1275.17	0.008502	2.07	5.22			0.69

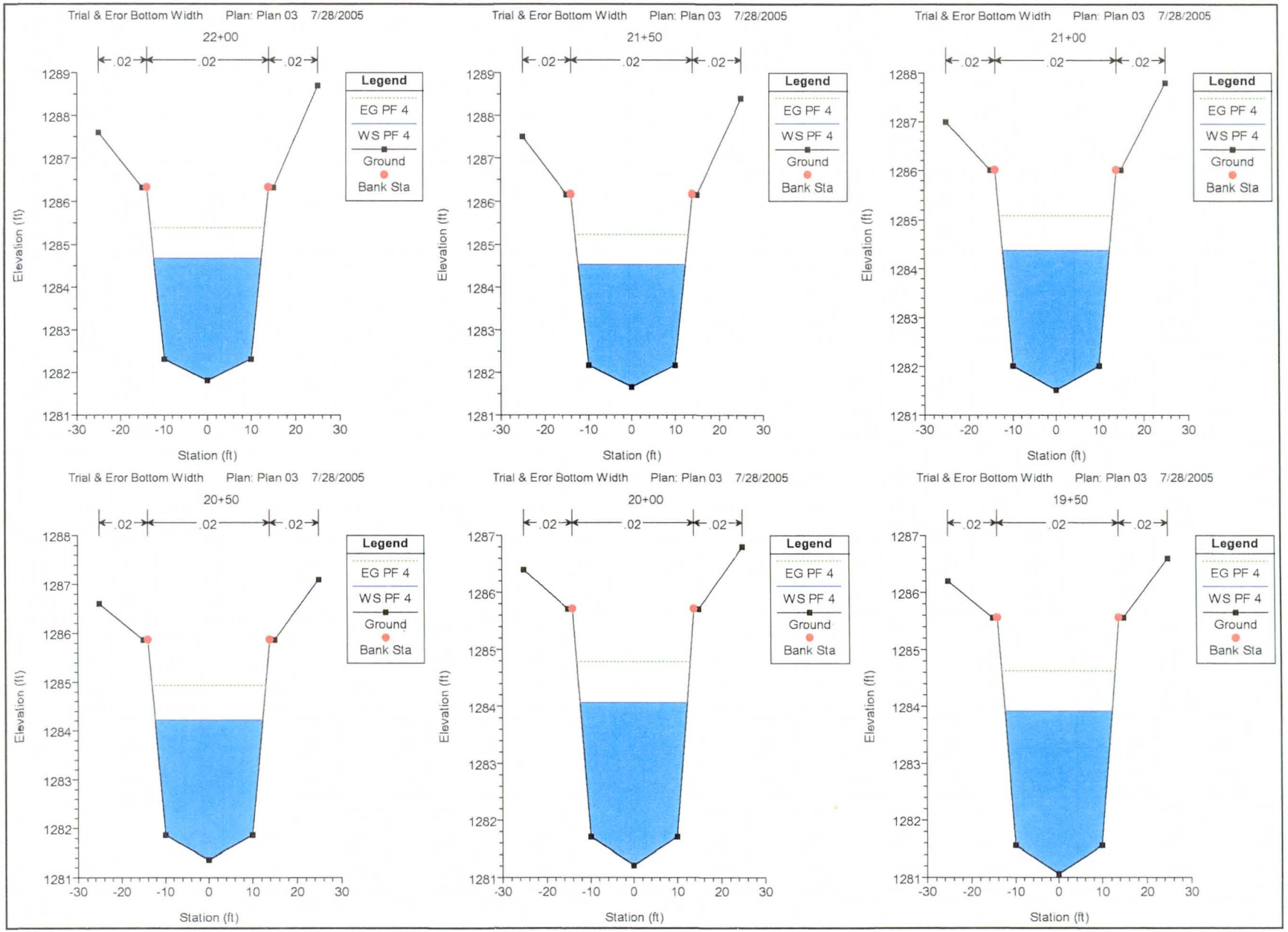
HEC-RAS Plan: Offsite River: Diversion Reach: Trible Wash Profile: PF 4 (Continued)

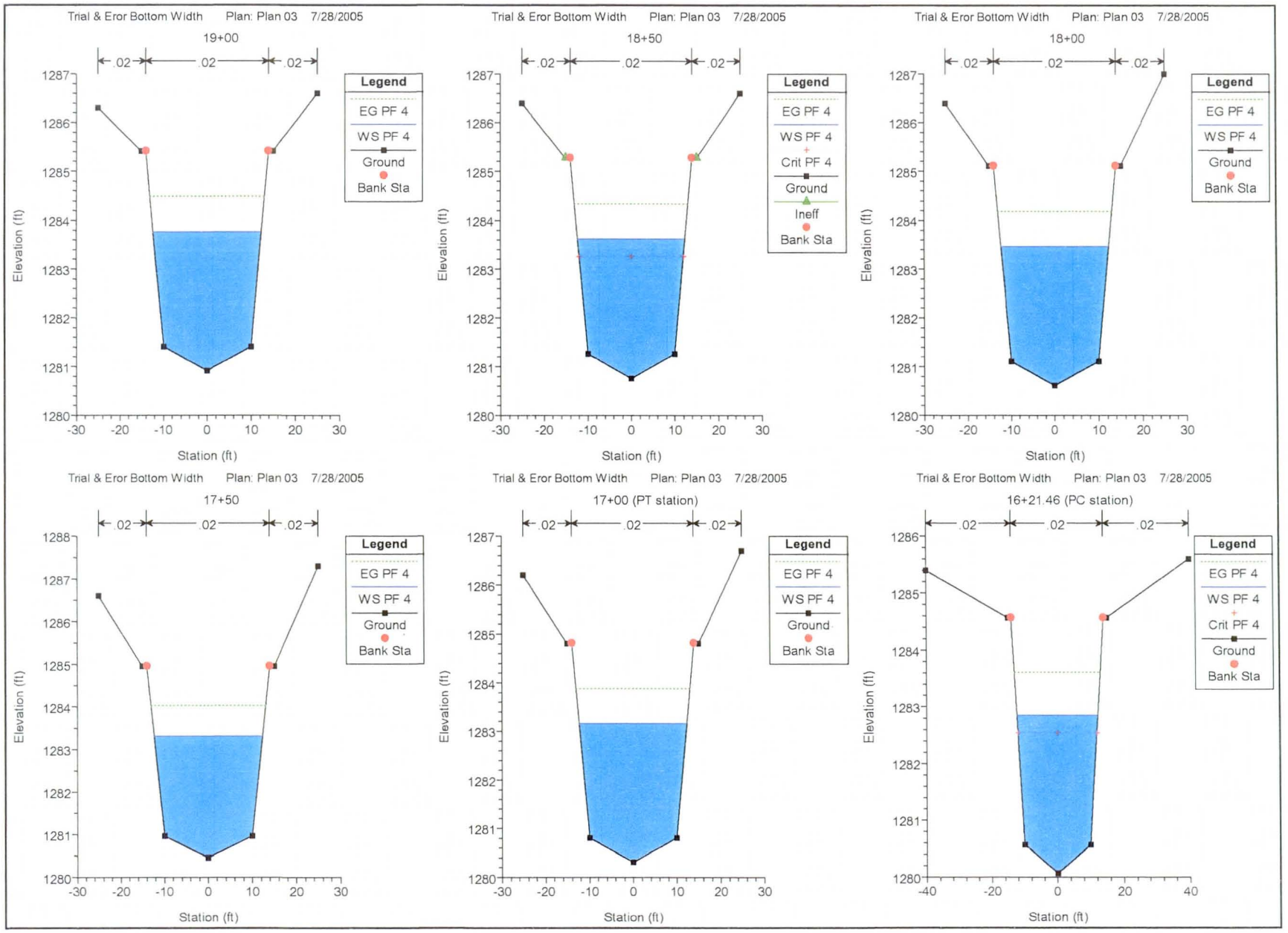
Reach	River Sta	Profile	Q Total	Min Ch El	Invert Slope	E.G. Elev	E.G. Slope	Max Chl Dpth	Vel Total	Crit Depth	Crit W.S.	Froude # Chl
			(cfs)	(ft)		(ft)	(ft/ft)	(ft)	(ft/s)	(ft)	(ft)	
Trible Wash	950	PF 4	392.00	1272.61		1275.13	0.008003	2.11	5.12	1.64	1274.25	0.67

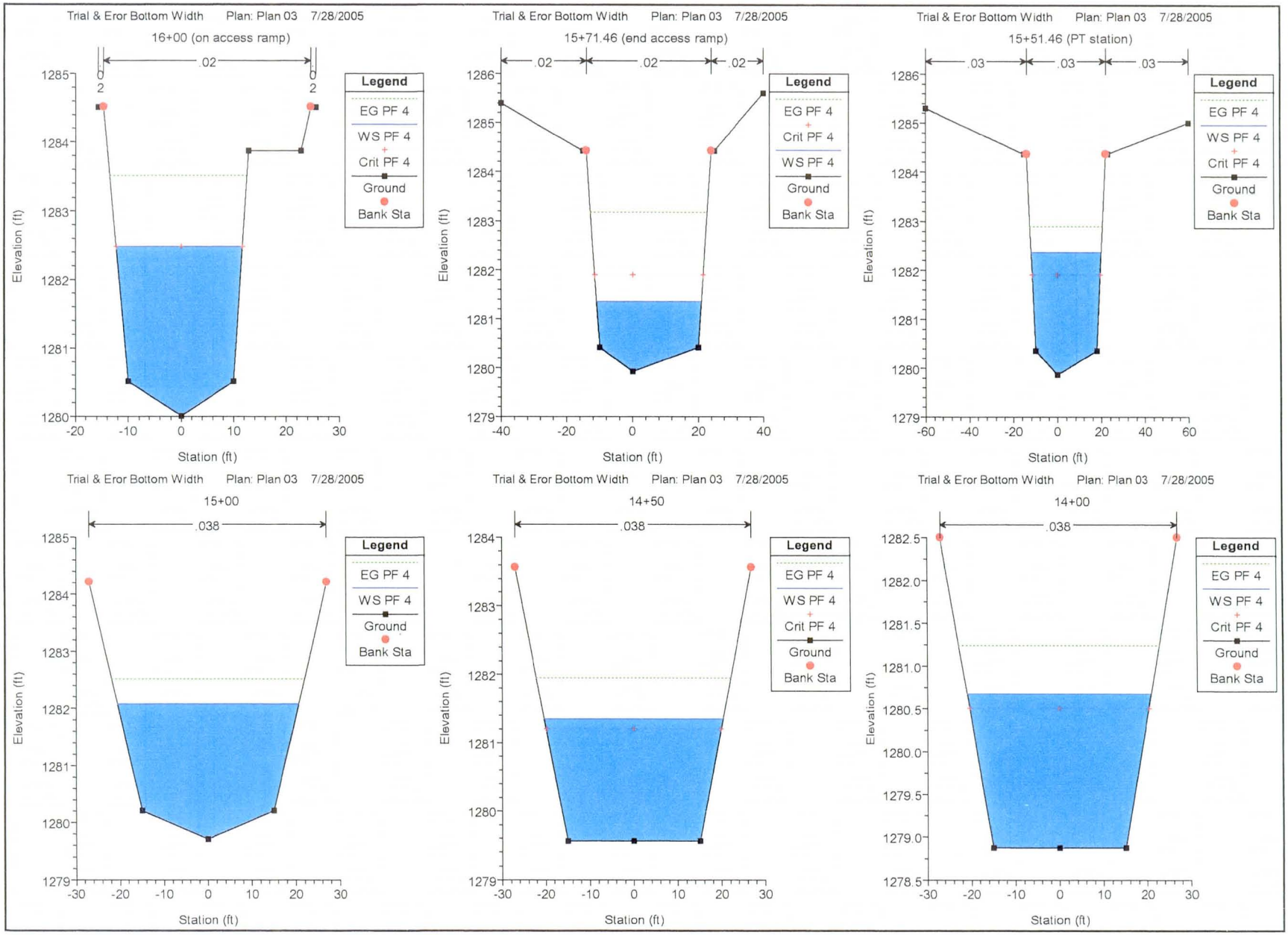

Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
Diversion Trible Wash
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
LOB
Elevation (ft)
1288
1286
1284
1282
1280
1278
1276
1274
1272
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
Main Channel Distance (ft)

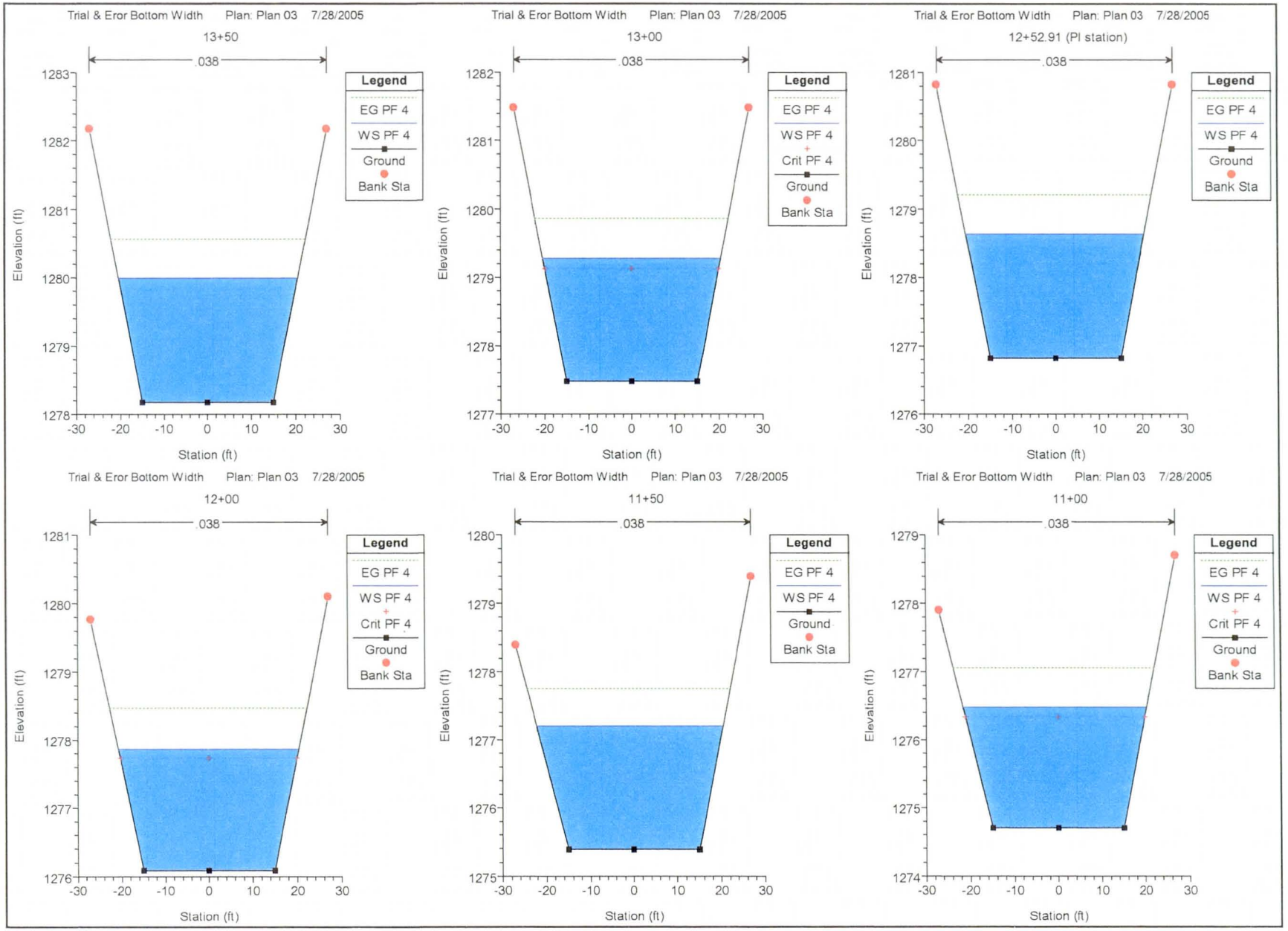

Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
27+00 (Upstream of Channel @ Pinnacle Peak Road)
.02 .02 .02
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
26+81.27
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
Sta 26+62 (at access ramp)
.02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
26+42
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
26+00
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
25+50
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)

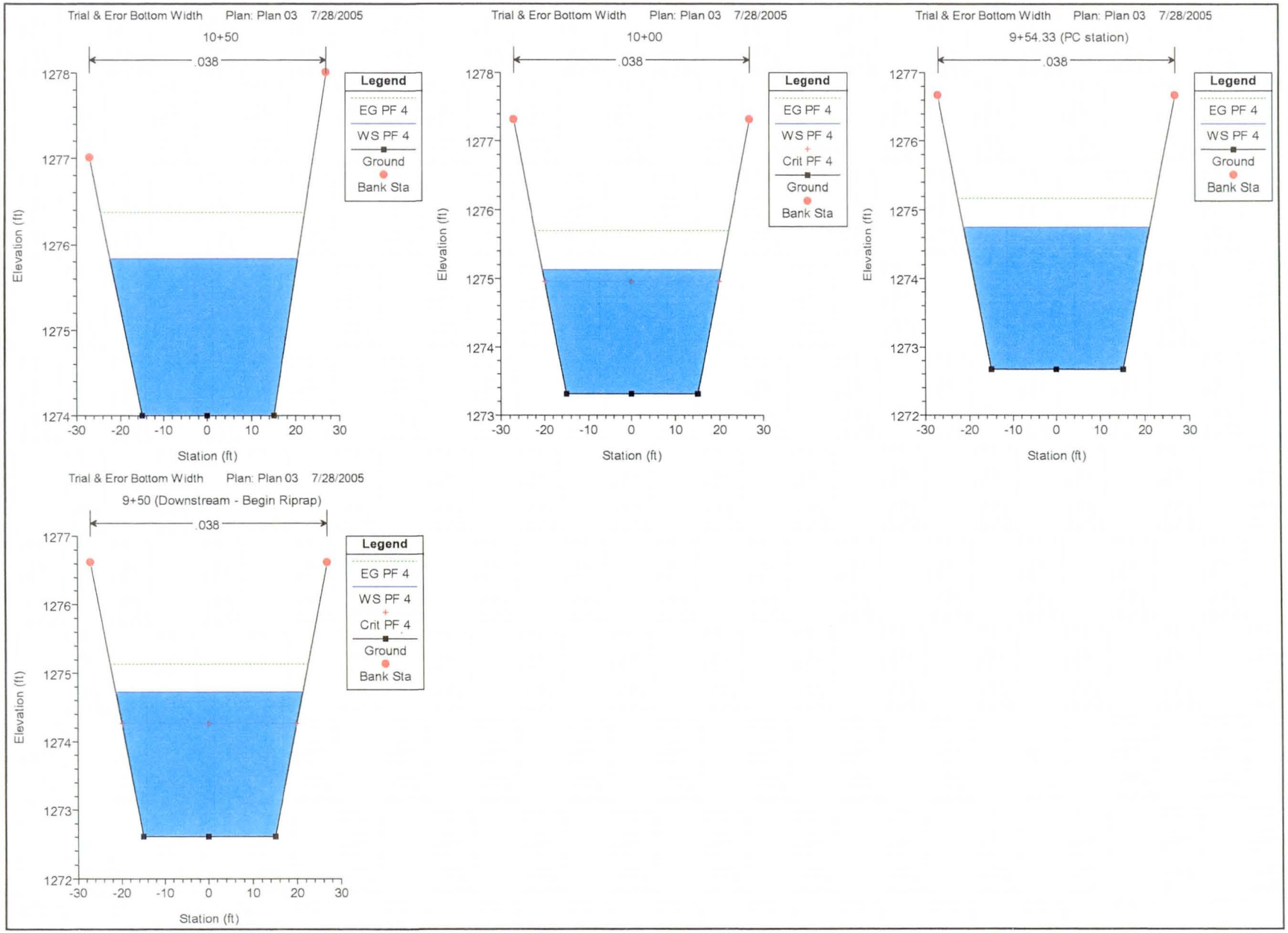

Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
25+00
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
24+50
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
24+00
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
23+50
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
23+00
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
22+50
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
22+00
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
21+50
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
21+00
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
20+50
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
20+00
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
19+50
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
19+00
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
18+50
.02 .02 .02
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
18+00
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
17+50
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
17+00 (PT station)
.02 .02 .02
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
16+21.46 (PC station)
.02 .02 .02
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
16+00 (on access ramp)
.02
2
2
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
15+71.46 (end access ramp)
.02
.02
.02
Legend
EG PF 4
Crit PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
15+51.46 (PT station)
.03
.03
.03
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
15+00
.038
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
14+50
.038
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
14+00
.038
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
13+50
.038
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
13+00
.038
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
12+52.91 (PI station)
.038
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
12+00
.038
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
11+50
.038
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
11+00
.038
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)


Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
10+50
.038
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
10+00
.038
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
9+54.33 (PC station)
.038
Legend
EG PF 4
WS PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)
Trial & Eror Bottom Width Plan: Plan 03 7/28/2005
9+50 (Downstream - Begin Riprap)
.038
Legend
EG PF 4
WS PF 4
Crit PF 4
Ground
Bank Sta
Elevation (ft)
Station (ft)

APPENDIX D

HEC-RAS RESULTS
McMICKEN WASH

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

100 yr
25 yr
SPF

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.554	PF 1	5087.00	1305.80	1314.24		1314.34	0.000360	2.72	2843.94	807.63	0.19
Reach-1	4.554	PF 5	4019.00	1305.80	1313.51		1313.59	0.000358	2.52	2296.82	708.56	0.19
Reach-1	4.554	PF 6	14000.00	1305.80	1317.99		1318.15	0.000376	3.71	6973.40	1192.78	0.21
Reach-1	4.457	PF 1	5087.00	1305.50	1314.10		1314.17	0.000290	2.27	3439.52	1223.89	0.17
Reach-1	4.457	PF 5	4019.00	1305.50	1313.35		1313.42	0.000314	2.16	2600.30	1017.49	0.17
Reach-1	4.457	PF 6	14000.00	1305.50	1317.89		1317.98	0.000244	2.83	8739.57	1463.08	0.17
Reach-1	4.36	PF 1	5087.00	1305.00	1313.95		1314.02	0.000279	2.22	3515.72	1125.57	0.17
Reach-1	4.36	PF 5	4019.00	1305.00	1313.20		1313.26	0.000306	2.12	2717.74	982.82	0.17
Reach-1	4.36	PF 6	14000.00	1305.00	1317.77		1317.86	0.000241	2.86	8805.95	1487.79	0.17
Reach-1	4.254	PF 1	5087.00	1304.80	1313.46		1313.70	0.001398	3.96	1368.51	456.05	0.35
Reach-1	4.254	PF 5	4019.00	1304.80	1312.65		1312.89	0.001879	3.97	1029.50	377.56	0.39
Reach-1	4.254	PF 6	14000.00	1304.80	1317.39		1317.63	0.000710	4.36	5182.95	1146.55	0.28
Reach-1	4.148	PF 1	5087.00	1304.50	1313.34		1313.40	0.000213	2.02	3141.46	913.98	0.15
Reach-1	4.148	PF 5	4019.00	1304.50	1312.50		1312.55	0.000231	1.91	2440.13	747.48	0.15
Reach-1	4.148	PF 6	14000.00	1304.50	1317.28		1317.38	0.000219	2.84	7435.28	1145.18	0.16
Reach-1	4.053	PF 1	5087.00	1303.50	1312.70		1313.12	0.002342	5.15	1025.44	363.94	0.45
Reach-1	4.053	PF 5	4019.00	1303.50	1311.86		1312.27	0.001800	5.10	787.37	163.97	0.41
Reach-1	4.053	PF 6	14000.00	1303.50	1316.68		1317.13	0.001227	5.91	3685.49	891.56	0.37
Reach-1	4.015	PF 1	5087.00	1303.00	1311.83		1312.58	0.002684	6.97	730.07	127.59	0.51
Reach-1	4.015	PF 5	4019.00	1303.00	1311.28		1311.85	0.002221	6.08	661.31	123.15	0.46
Reach-1	4.015	PF 6	14000.00	1303.00	1314.31	1314.31	1316.50	0.005756	12.24	1327.27	407.56	0.79
Reach-1	3.945	PF 1	6023.00	1302.00	1310.40		1311.25	0.004268	8.12	1268.68	544.45	0.64
Reach-1	3.945	PF 5	4758.00	1302.00	1309.81		1310.62	0.004491	7.71	971.30	468.30	0.64
Reach-1	3.945	PF 6	14000.00	1302.00	1312.84		1313.68	0.003295	9.28	3223.17	999.64	0.60
Reach-1	3.879	PF 1	6023.00	1299.00	1309.09		1309.62	0.004109	6.25	1225.25	381.69	0.45
Reach-1	3.879	PF 5	4758.00	1299.00	1308.65		1309.07	0.003515	5.50	1071.37	338.88	0.41
Reach-1	3.879	PF 6	14000.00	1299.00	1310.88		1311.94	0.006587	9.43	2458.44	1005.37	0.60
Reach-1	3.816	PF 1	6023.00	1296.50	1307.80		1308.29	0.004003	7.11	1858.85	996.50	0.46
Reach-1	3.816	PF 5	4758.00	1296.50	1307.42		1307.89	0.003757	6.66	1492.09	923.92	0.44

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

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.816	PF 6	14000.00	1296.50	1309.44		1309.96	0.004638	8.72	3629.65	1151.83	0.51
Reach-1	3.737	PF 1	6023.00	1294.50	1305.12		1305.90	0.008062	9.36	1469.46	855.52	0.63
Reach-1	3.737	PF 5	4758.00	1294.50	1304.73		1305.57	0.008304	9.14	1144.58	807.86	0.63
Reach-1	3.737	PF 6	14000.00	1294.50	1307.00		1307.58	0.006386	9.79	3279.65	1053.58	0.58
Reach-1	3.656	PF 1	6023.00	1292.00	1302.90		1303.28	0.004401	6.54	1819.04	790.83	0.46
Reach-1	3.656	PF 5	4758.00	1292.00	1302.42		1302.82	0.004712	6.41	1445.48	754.33	0.47
Reach-1	3.656	PF 6	14000.00	1292.00	1304.82		1305.26	0.004397	7.82	3470.26	910.62	0.48
Reach-1	3.563	PF 1	6023.00	1290.50	1300.28		1300.90	0.005298	8.06	1596.19	757.64	0.52
Reach-1	3.563	PF 5	4758.00	1290.50	1299.92		1300.48	0.004775	7.40	1329.63	699.47	0.49
Reach-1	3.563	PF 6	14000.00	1290.50	1302.08		1302.75	0.005933	9.85	3178.34	979.32	0.57
Reach-1	3.465	PF 1	6023.00	1288.50	1297.41		1297.99	0.006301	7.86	1552.00	750.36	0.56
Reach-1	3.465	PF 5	4758.00	1288.50	1296.90		1297.55	0.007108	7.88	1182.52	696.83	0.58
Reach-1	3.465	PF 6	14000.00	1288.50	1299.71		1300.17	0.004446	8.16	3549.42	983.88	0.49
Reach-1	3.354	PF 1	6023.00	1286.30	1295.03		1295.40	0.003087	5.90	1721.57	595.40	0.40
Reach-1	3.354	PF 5	4758.00	1286.30	1294.39		1294.75	0.003215	5.64	1362.73	530.04	0.40
Reach-1	3.354	PF 6	14000.00	1286.30	1297.38		1297.87	0.003390	7.53	3357.25	770.71	0.44
Reach-1	3.247	PF 1	6023.00	1282.30	1291.67		1292.74	0.007627	9.67	1141.77	546.42	0.63
Reach-1	3.247	PF 5	4758.00	1282.30	1291.24		1292.17	0.006752	8.73	925.67	448.70	0.58
Reach-1	3.247	PF 6	14000.00	1282.30	1293.54		1294.83	0.009301	12.40	2408.31	781.23	0.72
Reach-1	3.14	PF 1	6023.00	1280.30	1288.71		1289.10	0.004803	6.83	1783.18	775.79	0.49
Reach-1	3.14	PF 5	4758.00	1280.30	1288.26		1288.67	0.005078	6.67	1439.11	749.86	0.49
Reach-1	3.14	PF 6	14000.00	1280.30	1290.87		1291.25	0.003843	7.47	3571.12	850.00	0.46
Reach-1	3.011	PF 1	6023.00	1277.00	1285.91		1286.20	0.004333	6.21	1714.44	567.59	0.45
Reach-1	3.011	PF 5	4758.00	1277.00	1285.44		1285.70	0.004219	5.80	1456.64	534.37	0.44
Reach-1	3.011	PF 6	14000.00	1277.00	1288.16		1288.59	0.004736	8.08	3254.70	789.26	0.50
Reach-1	2.937	PF 1	6023.00	1276.00	1283.96		1284.33	0.004768	6.71	1680.36	615.10	0.48
Reach-1	2.937	PF 5	4758.00	1276.00	1283.46		1283.82	0.004953	6.45	1378.80	590.84	0.49
Reach-1	2.937	PF 6	14000.00	1276.00	1286.12		1286.61	0.004913	8.37	3129.61	735.26	0.52

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

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2.867	PF 1	6023.00	1274.00	1282.43		1282.79	0.003337	5.36	1672.58	670.28	0.40
Reach-1	2.867	PF 5	4758.00	1274.00	1282.00		1282.31	0.003054	4.87	1398.76	609.30	0.38
Reach-1	2.867	PF 6	14000.00	1274.00	1284.24		1284.82	0.004412	7.44	3100.17	872.60	0.48
Reach-1	2.774	PF 1	6023.00	1270.50	1279.30		1280.26	0.008983	8.79	1092.16	551.68	0.66
Reach-1	2.774	PF 5	4758.00	1270.50	1278.64	1278.12	1279.73	0.010761	8.85	761.57	456.96	0.70
Reach-1	2.774	PF 6	14000.00	1270.50	1282.05		1282.67	0.004812	8.41	2955.45	757.86	0.51
Reach-1	2.691	PF 1	6023.00	1269.00	1277.26		1277.74	0.003516	5.90	1293.30	377.50	0.42
Reach-1	2.691	PF 5	4758.00	1269.00	1276.59		1277.01	0.003495	5.45	1053.83	334.45	0.41
Reach-1	2.691	PF 6	14000.00	1269.00	1279.76		1280.58	0.004334	8.22	2432.53	518.00	0.49
Reach-1	2.588	PF 1	6023.00	1265.50	1273.79		1274.89	0.008441	9.58	1011.25	406.03	0.65
Reach-1	2.588	PF 5	4758.00	1265.50	1273.30		1274.26	0.007806	8.75	823.65	348.61	0.62
Reach-1	2.588	PF 6	14000.00	1265.50	1276.23		1277.44	0.008079	11.55	2297.93	621.26	0.67
Reach-1	2.486	PF 1	6023.00	1263.00	1270.72		1271.25	0.005074	6.37	1282.23	431.03	0.49
Reach-1	2.486	PF 5	4758.00	1263.00	1270.09		1270.60	0.005550	6.11	1017.08	408.28	0.50
Reach-1	2.486	PF 6	14000.00	1263.00	1273.72		1274.34	0.003914	7.56	2863.73	640.75	0.46
Reach-1	2.395	PF 1	6023.00	1258.50	1268.36		1268.95	0.004432	7.21	1274.30	356.61	0.48
Reach-1	2.395	PF 5	4758.00	1258.50	1267.78		1268.30	0.004163	6.60	1072.91	334.36	0.46
Reach-1	2.395	PF 6	14000.00	1258.50	1271.35		1272.22	0.004766	9.47	2641.53	625.00	0.53
Reach-1	2.31	PF 1	6023.00	1255.50	1265.98		1266.67	0.005835	8.32	1226.72	366.75	0.55
Reach-1	2.31	PF 5	4758.00	1255.50	1265.24		1265.97	0.006522	8.19	965.37	344.90	0.57
Reach-1	2.31	PF 6	14000.00	1255.50	1269.06		1269.94	0.005470	10.22	2562.55	607.33	0.56
Reach-1	2.208	PF 1	6023.00	1253.00	1263.87		1264.30	0.003228	6.60	1395.42	314.90	0.41
Reach-1	2.208	PF 5	4758.00	1253.00	1263.24		1263.60	0.002907	5.92	1205.68	292.62	0.39
Reach-1	2.208	PF 6	14000.00	1253.00	1266.71		1267.39	0.003934	8.94	2718.81	504.88	0.48
Reach-1	2.118	PF 1	6273.00	1251.00	1261.87		1262.35	0.005298	6.78	1389.10	406.91	0.50
Reach-1	2.118	PF 5	4956.00	1251.00	1261.21		1261.71	0.005583	6.66	1127.79	391.86	0.51
Reach-1	2.118	PF 6	14000.00	1251.00	1264.94		1265.48	0.004002	7.84	3157.04	767.88	0.47
Reach-1	2.034	PF 1	6273.00	1247.50	1258.61	1257.81	1259.62	0.008167	9.74	978.71	236.60	0.63
Reach-1	2.034	PF 5	4956.00	1247.50	1257.83	1257.25	1258.82	0.008474	9.42	797.89	225.08	0.64

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

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2.034	PF 6	14000.00	1247.50	1261.71	1259.99	1263.12	0.008495	12.21	1809.99	313.54	0.68
Reach-1	1.949	PF 1	6273.00	1247.00	1252.46	1252.17	1254.09	0.019756	10.23	613.41	159.12	0.92
Reach-1	1.949	PF 5	4956.00	1247.00	1251.84	1251.54	1253.26	0.019186	9.55	518.74	145.82	0.89
Reach-1	1.949	PF 6	14000.00	1247.00	1255.14	1254.95	1257.57	0.018333	12.53	1129.15	226.71	0.94
Reach-1	1.858	PF 1	6273.00	1243.80	1249.50		1250.14	0.004005	6.41	978.94	216.48	0.53
Reach-1	1.858	PF 5	4956.00	1243.80	1248.87		1249.40	0.003951	5.87	844.09	210.79	0.52
Reach-1	1.858	PF 6	14000.00	1243.80	1252.43		1253.53	0.004126	8.40	1669.40	264.91	0.57
Reach-1	1.788	PF 1	6273.00	1242.00	1247.52		1248.35	0.005780	7.30	859.39	205.83	0.63
Reach-1	1.788	PF 5	4956.00	1242.00	1246.91		1247.62	0.005893	6.74	735.05	201.35	0.62
Reach-1	1.788	PF 6	14000.00	1242.00	1250.37		1251.77	0.005338	9.49	1485.35	260.92	0.65
Reach-1	1.708	PF 1	6273.00	1240.00	1245.39		1246.13	0.004643	6.87	913.19	202.94	0.57
Reach-1	1.708	PF 5	4956.00	1240.00	1244.73		1245.36	0.004719	6.35	780.97	198.01	0.56
Reach-1	1.708	PF 6	14000.00	1240.00	1248.40		1249.66	0.004460	8.99	1559.71	237.54	0.60
Reach-1	1.593	PF 1	6273.00	1237.50	1243.09		1243.68	0.003440	6.18	1015.61	211.48	0.50
Reach-1	1.593	PF 5	4956.00	1237.50	1242.42		1242.92	0.003392	5.66	876.19	206.17	0.48
Reach-1	1.593	PF 6	14000.00	1237.50	1246.12		1247.18	0.003605	8.27	1693.05	237.86	0.54
Reach-1	1.479	PF 1	6273.00	1235.50	1240.99		1241.59	0.003506	6.20	1015.60	220.77	0.50
Reach-1	1.479	PF 5	4956.00	1235.50	1240.32		1240.82	0.003550	5.70	870.08	212.11	0.49
Reach-1	1.479	PF 6	14000.00	1235.50	1243.93		1245.00	0.003604	8.35	1720.13	258.61	0.55
Reach-1	1.381	PF 1	6273.00	1233.50	1239.35		1239.89	0.003044	5.88	1067.05	218.50	0.47
Reach-1	1.381	PF 5	4956.00	1233.50	1238.71		1239.16	0.002885	5.33	930.19	212.14	0.45
Reach-1	1.381	PF 6	14000.00	1233.50	1242.19		1243.22	0.003278	8.17	1761.76	286.62	0.52
Reach-1	1.307	PF 1	6273.00	1232.30	1236.70	1236.26	1237.83	0.010290	8.53	739.38	228.91	0.81
Reach-1	1.307	PF 5	4956.00	1232.30	1236.27	1235.82	1237.19	0.009990	7.70	644.45	220.46	0.78
Reach-1	1.307	PF 6	14000.00	1232.30	1238.41	1238.41	1240.81	0.012862	12.51	1161.24	260.16	0.97
Reach-1	1.286	PF 1	6273.00	1231.00	1234.89	1234.89	1236.33	0.016796	9.63	651.53	230.06	1.01
Reach-1	1.286	PF 5	4956.00	1231.00	1234.46	1234.46	1235.70	0.017293	8.94	554.46	223.79	1.00
Reach-1	1.286	PF 6	14000.00	1231.00	1236.96	1236.96	1239.24	0.013905	12.12	1165.23	275.19	0.99

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

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	0.579	PF 6	14000.00	1192.50	1201.97		1202.82	0.007052	7.41	1889.86	514.30	0.68
Reach-1	0.527	PF 1	6522.00	1193.00	1198.15	1197.34	1198.77	0.009134	6.35	1027.58	429.23	0.72
Reach-1	0.527	PF 5	5152.00	1193.00	1197.60		1198.22	0.009049	6.30	817.29	342.46	0.72
Reach-1	0.527	PF 6	14000.00	1193.00	1199.59		1200.56	0.009873	7.88	1776.33	568.51	0.79
Reach-1	0.437	PF 1	6522.00	1188.00	1194.66		1195.13	0.006240	5.51	1184.15	458.27	0.60
Reach-1	0.437	PF 5	5152.00	1188.00	1194.38		1194.75	0.005666	4.87	1056.99	457.13	0.56
Reach-1	0.437	PF 6	14000.00	1188.00	1196.46		1197.21	0.005022	6.96	2012.86	465.57	0.59
Reach-1	0.35	PF 1	6522.00	1184.50	1190.91		1191.62	0.009481	6.78	990.70	446.35	0.74
Reach-1	0.35	PF 5	5152.00	1184.50	1190.39	1190.07	1191.09	0.011800	6.72	773.25	390.37	0.81
Reach-1	0.35	PF 6	14000.00	1184.50	1191.93	1191.93	1193.45	0.014713	10.07	1497.81	555.39	0.97
Reach-1	0.238	PF 1	6522.00	1180.00	1186.21		1186.56	0.007486	4.77	1366.61	754.34	0.62
Reach-1	0.238	PF 5	5152.00	1180.00	1186.12		1186.36	0.005529	3.97	1297.04	751.23	0.53
Reach-1	0.238	PF 6	14000.00	1180.00	1187.60		1188.11	0.005359	5.72	2447.48	801.13	0.58
Reach-1	0.159	PF 1	6522.00	1178.00	1183.84	1182.99	1184.13	0.004599	4.29	1521.04	683.81	0.51
Reach-1	0.159	PF 5	5152.00	1178.00	1183.22		1183.56	0.008227	4.68	1101.91	673.06	0.64
Reach-1	0.159	PF 6	14000.00	1178.00	1184.56		1185.31	0.008445	6.95	2014.69	692.48	0.72
Reach-1	0.107	PF 1	6522.00	1176.00	1181.02	1181.02	1181.68	0.023083	6.51	1001.59	806.95	1.03
Reach-1	0.107	PF 5	5152.00	1176.00	1181.40	1180.82	1181.64	0.005856	3.92	1314.31	810.35	0.54
Reach-1	0.107	PF 6	14000.00	1176.00	1182.67	1181.89	1183.22	0.006523	5.94	2358.33	845.76	0.63
Reach-1	0	PF 1	6522.00	1172.00	1176.64	1175.49	1176.79	0.002765	3.15	2067.97	1007.30	0.39
Reach-1	0	PF 5	5152.00	1172.00	1175.20	1175.20	1175.85	0.021919	6.47	796.28	623.71	1.01
Reach-1	0	PF 6	14000.00	1172.00	1176.40	1176.40	1177.31	0.019237	7.67	1825.87	1005.18	1.00

APPENDIX E

Riprap/Scour & Plan Sheets

CROSSRIVER - PINNACLE PEAK
DIVERSION CHANNEL RIPRAP DESIGN
AT McMICKEN OUTFALL WASH
HEC-11 METHOD

HEC/RAS DATA - SEE McMICKEN WASH HEC/RAS IN APPENDIX D						
Flood Event	River Station	"Q" cfs	Velocity fps	Hyd Depth Left OB	Hyd Depth Channel	Hyd Depth Right OB
SPF	2.937	14,000	8.37	3.56	8.12	4.18
100-yr	2.937	6,023	6.82	2.76	6.56	4.09
SPF	2.867	14,000	7.44	2.90	7.37	2.00
100-yr	2.867	6,023	5.94	2.64	6.02	1.89

Riprap sizing is in accordance with the HEC-11 Method as described in:
Drainage Design Manual for maricopa County, Arizona, Volume II Hydraulics, Jan 28, 1996, Pages 6-38 thru

Thickened Riprap Toe Calculations are in accordance with:
Drainage Design Manual for maricopa County, Arizona, Volume II Hydraulics, Jan 28, 1996, Pages 6-51 thru

RIPRAP CHARACTERISTIC SIZE d_{50}											
V_a	V_a^3	D_{avg}	$D_{avg}^{0.5}$	θ	$SIN^2\theta$	Φ	$SIN^2\Phi$	$\sin^2\theta/\sin^2\Phi$	K_1	$K_1^{1.5}$	d_{50}
8.37	586	8.12	2.85	26.6	0.20048815	39	0.3960441	0.50622688	0.70	0.59	0.35
6.82	317	6.56	2.56	26.6	0.20048815	39	0.3960441	0.50622688	0.70	0.59	0.21

Stability Factor - Correction Factor					Corrected	STONE SIZE		RIPRAP	FILTER BLANKET		
Specific Gravity Ss	Correction Factor Csg	Stability Factor SF	Correction Factor Csf	Correction Factor C	d_{50} feet	Max Inches	Min Inches	Thickness Inches	% Retained #40 Sieve	Type I Thickness	Type II Thickness
2.4	1.28	1.7	1.69	2.16	0.75	18	4	18	55*	Not Req'd	6-Inches
2.4	1.28	1.7	1.69	2.16	0.45	11	2	11	55*	Not Req'd	6-Inches

*Taken from Soils Report

RIPRAP GRADATION LIMITS					
Stone Size Range In Inches		Stone Weight Range In Lbs		Per Cent Gradation Smaller	$W_{50} = (\pi * d_{50}^3/6)\gamma$
15	18	168	265	100	34
14	15	101	168	100	34
11	13	67	92	85	"
9	10	34	50	50	"
4	5	3	7	15	"

TOE PROTECTION - VOLUME & DIMENSIONS				
Riprap Thickness T-Inches	Toe Thickness H-feet	Scour Depth in feet	Volume for 2:1 Slope	Length Req'd for Volume
18	4.5	12	60	13

CROSSRIVER DIVERSION CHANNEL TOE DOWN DESIGN - HEC-RAS RESULTS
May 2005

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

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # C	Hydr Dept (ft)	Top W Chnl (ft)
Reach-1	3.011	PF 1	14000	1277	1288.16		1288.59	0.004736	8.08	3254.7	789.26	0.5	8.06	53
Reach-1	2.937	PF 1	14000	1276	1286.12		1286.61	0.004913	8.37	3129.61	735.26	0.52	8.12	65
Reach-1	2.867	PF 1	14000	1274	1284.24		1284.82	0.004412	7.44	3100.17	872.6	0.48	7.37	157

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

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # C	Q Channe (cfs)	Top W Chnl (ft)
Reach-1	2.937	SPF	14000	1276	1286.12		1286.61	0.004913	8.37	3129.61	735.26	0.52	4419.07	65
Reach-1	2.937	100 YR	6023	1276	1284.56		1285	0.004325	6.82	1378.28	330	0.47	2907.73	65
Reach-1	2.937	50 YR	4747	1276	1283.46		1283.82	0.004955	6.45	1376.06	590.62	0.49	2287.12	65
Reach-1	2.937	PF 4	2835	1276	1282.49		1282.88	0.005736	6.1	830.18	543.95	0.51	1780.9	65
Reach-1	2.867	SPF	14000	1274	1284.24		1284.82	0.004412	7.44	3100.17	872.6	0.48	8618.52	157
Reach-1	2.867	100 YR	6023	1274	1282.89		1283.4	0.003685	5.94	1131.7	240	0.43	5616.23	157
Reach-1	2.867	50 YR	4747	1274	1282		1282.31	0.003044	4.86	1397.72	609.05	0.38	3915.13	157
Reach-1	2.867	PF 4	2835	1274	1280.84		1281.13	0.003452	4.36	768.09	453.63	0.39	2724.09	157

Calculation of General Scour Depths - English Units (ft)

26-Jul-05

McMicken Wash
X-Sect 2.867
Method not Applicable

Stream Values

Incised / Bankfull Q cfs	Qi	1000
Incised / Bankfull Width	Wi	65
Incised / Bankfull q cfs/ft	qi	15.38
Depth of Incision	di	4
Competent Veloc.(p. 38 USBR)	Vc	2.5
Design Q (Channel)		4419
Design Channel Width		65
Design Flow / Width	qf	67.98
Average Depth	dm	8.12
Average Velocity	Vm	8.37
Neill's m - 0.67 Sand to 0.85 Coarse Grave	m	0.75
D50 - mm		1
D85 - mm		25
D90 - mm		50
USBR - Lacey Z (p 36 USBR)	Zl	0.6
Neill Z (p. 36 USBR)	Zn	0.5
Blench Z (p. 36 USBR)	Zb	0.6
Blench "zero bed factor" (p35)	Fbo	8.5

Average Scour Depth	7.6
Safety Factor	1.3
Toe Down below Thalweg	9.8

Meth. Used

Average of Similar Values	5.0	3,4,5,6
Long Term Scour	3.7	
Bed Form Scour	0.7	
Bend Scour	0	
Low Flow Incisement	1	
Safety Factor	1.3	
Recommended Toe Dow	12.1	

Recommended Toe Down 12.1 Feet

Scour Depths

1 Neill - Incised — ds = Z*df

df = di*(qf/qi)^m

	di		qf		m		df	Z	
df =	4	x (	67.98	) ^	0.75	=	12.2	0.5	6.1
			15.38						
			qi						

2 Neill - Competent Velocity

ds = dm((Vm/Vc)-1)

	dm		Vm			ds	
ds =	8.12	x ((	8.37	) -	1) =	19.1	19.1
			2.5				
			Vc				

3 USBR - D90 Method — 50% of Average Flow Depth (dm)

ds = Z*dm

	Z		dm	ds	
ds =	0.6	x	8.12	4.9	4.9

4 Lacey — ds = Z*dm

dm=0.47*(Q/f)^1/3

			Q			dm	Z	
dm =	0.45	x (	4419	)	0.33 =	6.1	0.6	3.7
			1.8					
			f					

			Dm = D50			f	
f =	1.76	*	1	^	0.5 =	1.8	

5 Blench - Zero Bed Factor — ds = Z*dfo

dfo = qf ^(2/3) / Fbo^(1/3)

		qf			dfo	Z	
dfo =		67.98	^	0.67 =	8.2	0.6	4.9
		8.5	^	0.33			
		Fbo					

6 Abbot - SW Streams

ds = K * (qi)^0.24
K = 2.45

			qi			ds	
ds =	2.45	*	67.98	^	0.24 =	6.7	6.7

Summary of Calculations for Varying Conditions

McMicken X-Section	Return Period	Q	Toe Down
2.937	500	14000	12.1
	100	6023	11.5
	50	4747	10.9
2.867	500	14000	11.9
	100	6023	11.2
	50	4747	10.6

Calculation Values: See attached HEC-RAS Results

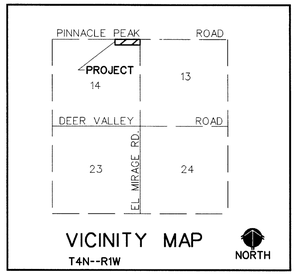
	SPF	
Variable	2.937	2.867
Channel Q	4419	8618
Channel Width	65	157
Average Depth	8.12	7.38
Average Velocity	8.37	7.44
Toe Down	12.1	11.9

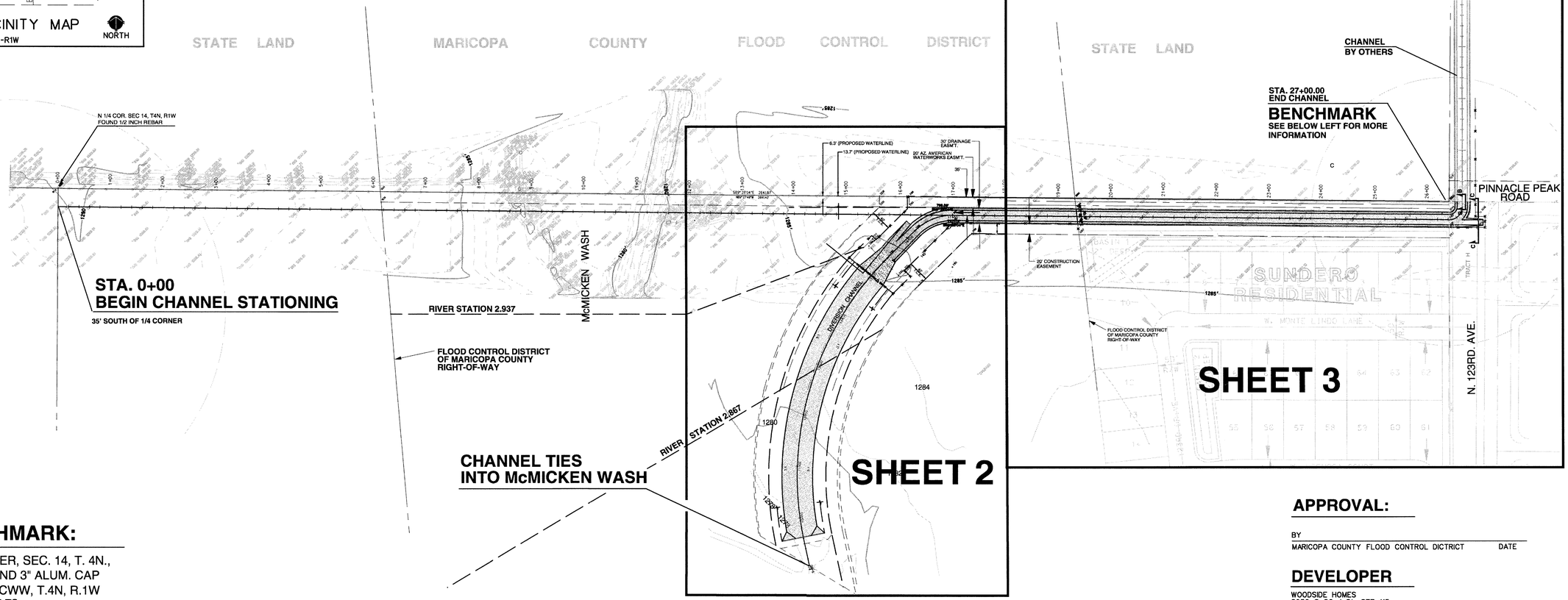
	100 Year	
Variable	2.937	2.867
Channel Q	2908	5616
Channel Width	65	157
Average Depth	6.56	6.02
Average Velocity	6.82	5.94
Toe Down	11.3	11.2

	50 Year	
Variable	2.937	2.867
Channel Q	2287	3915
Channel Width	65	157
Average Depth	5.77	5.13
Average Velocity	6.1	4.86
Toe Down	10.9	10.6

Methodology Adapted from "Computing Degradation and Local Scour", US Bureau of Reclamation, Ernest L. Pemberton and Joseph M. Lara, January 1984

RANCHO SILVERADO & CROSSRIVER OFF-SITE DIVERSION CHANNEL TO McMICKEN OUTFALL WASH





BENCHMARK:

N.E. CORNER, SEC. 14, T. 4N.,
R.1W. FOUND 3" ALUM. CAP
STAMPED CWW, T.4N, R.1W
ELEV. 1287.78

SHEET INDEX:

FLOOD CONTROL DISTRICT NOTES

1. ALL CONSTRUCTION WITHIN FLOOD CONTROL DISTRICT (DISTRICT) RIGHTS-OF-WAY JURISDICTION SHALL CONFORM TO THE LATEST MARICOPA ASSOCIATION OF GOVERNMENTS' (MAG) SPECIFICATIONS, UNLESS THE STRUCTURE INVOLVED IS A DAM. IF THE STRUCTURE IS A DAM, SPECIAL PERMIT REQUIREMENTS WILL APPLY. DAM SHALL MEAN A STRUCTURE THAT IS UNDER THE JURISDICTION OF THE ARIZONA DEPARTMENT OF WATER RESOURCES AND IS DEFINED IN ARIZONA REVISED STATUTES 45-1201.
2. CONTRACTOR MUST OBTAIN NECESSARY DISTRICT PERMIT PRIOR TO COMMENCEMENT OF CONSTRUCTION WITHIN DISTRICT RIGHT-OF-WAY AND MAINTAIN A COPY OF THE PERMIT ON THE PROJECT SITE AT ALL TIMES.
3. NOTIFY THE DISTRICT'S PERMITS INSPECTOR AT (602) 506-4727 OR (602) 506-4723 AT LEAST 48 HOURS PRIOR TO ANY WORK BEING PERFORMED IN THE DISTRICT'S RIGHT-OF-WAY
4. CONTRACTOR PERFORMING EXCAVATION OPERATIONS IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UNDERGROUND UTILITIES.
5. ALL COMPACTION AND BACKFILL WITHIN THE DISTRICT'S RIGHT-OF-WAY SHALL CONFORM TO THE LATEST MAG SPECIFICATIONS UNLESS STIPULATED OTHERWISE IN THE DISTRICT'S PERMIT.
6. ANY DAMAGE TO DISTRICT'S STRUCTURES, EQUIPMENT, MATERIALS, VEGETATION, AND/OR PROPERTY SHALL BE REPLACED AND/OR REPAIRED IN-KIND TO THE SATISFACTION OF THE DISTRICT.

ENGINEER NOTES

THESE PLANS ARE NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS THE APPROVAL BLOCK HAS BEEN SIGNED BY THE APPROPRIATE AGENCIES. ALL WORK SHALL CONFORM TO THE CURRENT MARICOPA ASSOCIATION OF GOVERNMENTS (M.A.G.) SPECIFICATIONS AND STANDARD DETAILS TOGETHER WITH THE SUPPLEMENT OF THE APPROPRIATE AGENCY AND ADOT STANDARD DRAWING WHERE NOTED ON PLANS.

THE CONTRACTOR SHALL MAKE NO CLAIM AGAINST THE OWNER OR THE ENGINEER REGARDING ALLEGED INACCURACY OF CONSTRUCTION STAKES SET BY THE ENGINEER UNLESS ALL SURVEY STAKES SET BY THE ENGINEER ARE MAINTAINED INTACT AND CAN BE VERIFIED AS TO THEIR ORIGIN. IF, IN THE OPINION OF THE ENGINEER, THE STAKES ARE NOT MAINTAINED INTACT AND CANNOT BE VERIFIED AS TO THEIR ORIGIN, ANY REMEDIAL WORK REQUIRED TO CORRECT ANY ITEM OR IMPROPER CONSTRUCTION WORK IN THIS DEVELOPMENT SHALL BE PERFORMED AT THE SOLE EXPENSE OF THE RESPONSIBLE CONTRACTOR OR SUBCONTRACTOR.

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

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

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

THE ENGINEER WILL MAKE FIELD RECORD DRAWING MEASUREMENTS OF THE WORK UPON NOTIFICATION BY THE CONTRACTOR THAT THE WORK IS COMPLETE AND READY FOR RECORD DRAWING SURVEY.

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

ALL EARTHWORK CONSTRUCTION SHALL CONFORM TO THE LATEST M.A.G. STANDARD DETAILS AND/OR SPECIFICATIONS INCLUDING ANY SUPPLEMENTS THERETO AND THE SOILS REPORT PREPARED BY: PSI ENGINEERING, CONSULTING TESTING

DATA FOR EARTHWORK CALCULATIONS IS PROVIDED IN THE SOILS REPORT AND (IF APPLICABLE) ANY SUPPLEMENTS THERETO.

OWNER/CONTRACTOR IS RESPONSIBLE FOR SURVEY VERIFICATION OF EXISTING HORIZONTAL AND VERTICAL CONDITIONS PRIOR TO START OF CONSTRUCTION. A DEVIATION IN EXISTING CONDITIONS MUST BE BROUGHT TO THE ATTENTION OF COE & VAN LOO BEFORE CONSTRUCTION STARTS.

COE & VAN LOO WILL NOT BE RESPONSIBLE FOR REMOVAL, REPLACEMENT, OR OTHER MODIFICATIONS THAT MAY BE REQUIRED AS A RESULT OF EXISTING CONDITIONS NOT PROPERLY VERIFIED AND CONFIRMED.

SHOULD AN ERROR BE FOUND IN THE HORIZONTAL & VERTICAL CONDITIONS, COE & VAN LOO WILL BE NOTIFIED AND CONSTRUCTION WILL NOT PROCEED UNTIL REVISIONS/MODIFICATIONS HAVE BEEN PREPARED AND SUBMITTED BY COE & VAN LOO.

IN THE EVENT THAT COLLAPSING SOILS ARE ENCOUNTERED, OVEREXCAVATION REMOVAL AND REPLACEMENT WITH COMPACTED FILL SHALL BE REQUIRED.

QUANTITIES FOR CONSTRUCTION PURPOSES SHALL BE PROVIDED BY THE CONTRACTOR. ESTIMATED QUANTITIES SHOWN ARE FOR AGENCY REVIEW ONLY.

EXISTING UTILITIES:

NONE

FUTURE UTILITIES:

ARIZONA AMERICAN

APPROVAL:

BY
MARICOPA COUNTY FLOOD CONTROL DICTRICT DATE

DEVELOPER

WOODSIDE HOMES
8950 S. 52nd St., STE. 115
TEMPE, AZ 85284
(480) 755-0801

ENGINEER:

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

AS-BUILT CERTIFICATION:

I HEREBY CERTIFY THAT THE "RECORD DRAWING" MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION OR AS NOTED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED LAND SURVEYOR / ENGINEER DATE

REGISTRATION NUMBER

100' 50' 0 100'
SCALE: 1" = 100'

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

n:\990050\land\sdc01.dgn

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

DIVERSION CHANNEL
FOR RANCHO SILVERADO & CROSSRIVER

COVER SHEET

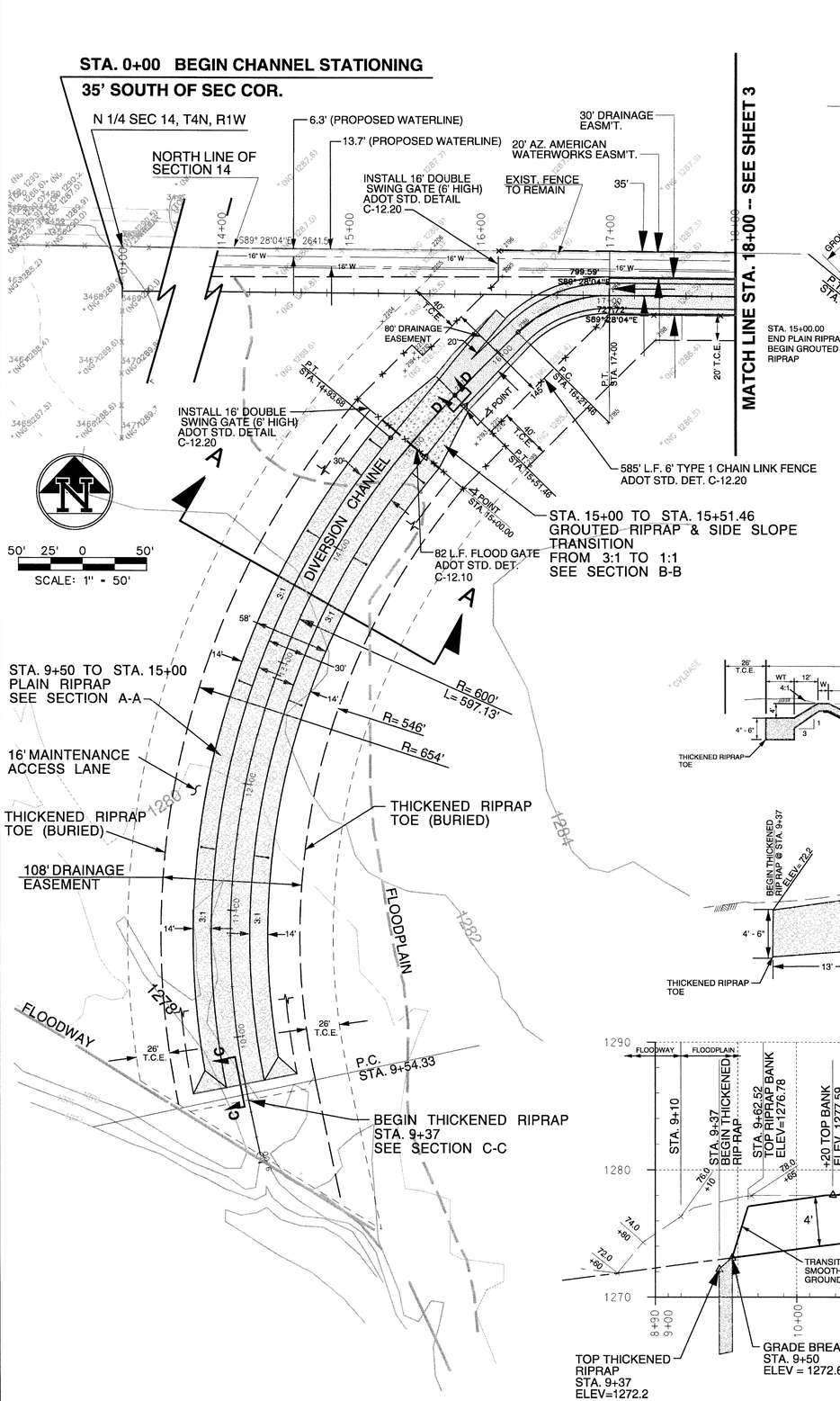
	BY	DATE	REVISIONS
DESIGNED	S. GARCIA		
DRAWN	K. KENNY		
CHECKED	P. SIDERS		
DATE	10/28/02		

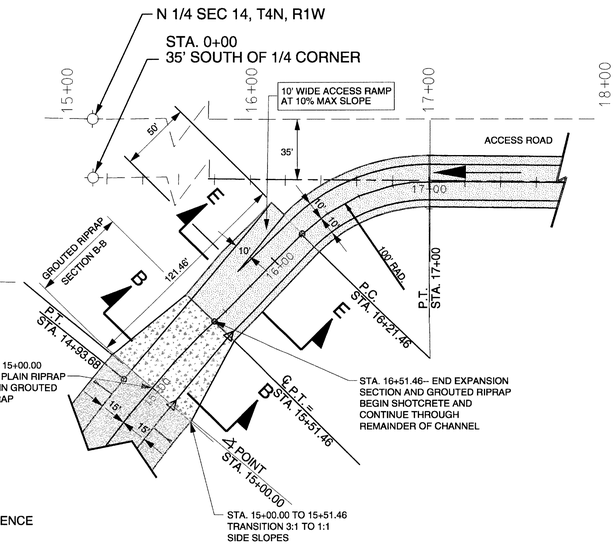
REGISTERED LAND SURVEYOR
CERTIFICATE NO.
7531
CHARLES D. SCOTT
Date Signed 7-29-03
ARIZONA U.S.A.

CVL

SHEET
1 OF 3

990050-





℄ CURVE DATA
R = 100.00'
Δ = 45°
L = 78.54'
T = 41.42'

TRANSITION DETAIL
SCALE: 1"= 40'

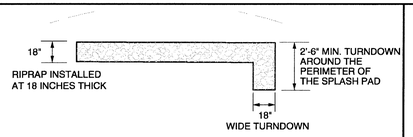
PLAIN RIPRAP NOTES

1. RIP RAP SHALL BE IN ACCORDANCE WITH M.A.G. SECTION 703.
2. ALL STONES COMPOSING THE RIPRAP SHALL HAVE A SPECIFIC GRAVITY EQUAL TO OR EXCEEDING 2.4 IN ACCORDANCE WITH STANDARD TEST ASTM C127.
3. CERTIFIED LABORATORY TEST SHALL BE PROVIDED BY THE CONTRACTOR IN ACCORDANCE WITH ASTM C127 AND SHALL INCLUDE THE DURABILITY INDEX TEST AND THE DURABILITY ABSORPTION RATIO (DAR). THE DAR SHALL BE GREATER THAN 23. DAR LESS THAN 10 SHALL BE REJECTED. FOR DAR BETWEEN 10 AND 23:
   A). MATERIAL SHALL BE ACCEPTED FOR A DURABILITY INDEX OF 52 OR GREATER
   B). MATERIAL SHALL BE REJECTED FOR A DURABILITY INDEX OF 51 OR LESS.
4. THE STONES SHALL BE ANGULAR IN SHAPE. NOT MORE THAN 25 PERCENT OF THE STONES SHALL HAVE A LENGTH MORE THAN 2.5 TIMES THE BREADTH. IF THE CONTRACTOR WERE TO PROVIDE RIVER ROCK WITHOUT A CRUSER TO PRODUCE ANGULAR ROCK, STONE SIZE AND RIPRAP THICKNESS SHALL BE INCREASED 25%.
5. RIPRAP CHARACTERISTIC STONE SIZE - d50 SHALL BE 9-INCHES. THE MAXIMUM STONE SIZE SHALL BE 18-INCHES. THE MINIMUM STONE SIZE SHALL BE 4-INCHES.
6. THE GRADATION COEFFICIENT, G, SHALL EQUAL 1.5. RIPRAP GRADATION LIMITS SHALL BE ACCORDING TO THE FOLLOWING TABLE:

RIP RAP GRADATION LIMITS				
Stone Size Range In Inches		Stone Weight Range In Lbs		Percent of Gradation
16	18	168	265	100
14	15	101	168	90
11	13	67	92	85
9	10	34	50	50
4	5	3	7	15

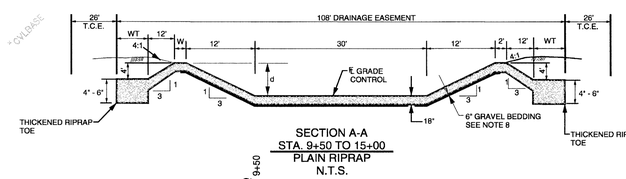
7. THE RIPRAP LAYER THICKNESS SHALL BE 18-INCHES MIN.
8. THE GRAVEL BEDDING SHALL BE 4-INCHES THICK AND THE GRADATION SHALL BE TYPE II ACCORDING TO THE FOLLOWING TABLE:

Standard Sieve Size	Type I	Type II
3-inches		90 to 100
1½ inches		
¾ inch		20 to 90
⅜ inch	100	
# 4 (4.75 mm)	95 to 100	0 to 20
# 16 (1.18 mm)	45 to 80	
# 50 (0.30 mm)	10 to 30	
# 100 (0.15 mm)	2 to 10	
# 200 (0.075 mm)	0 to 2	0 to 3

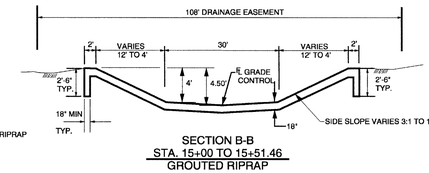


GROUTED RIPRAP DETAIL
N.T.S.

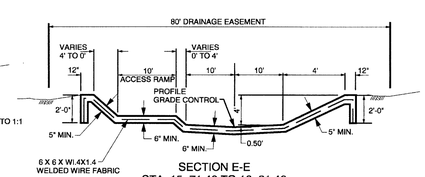
1) RIPRAP BED SHALL BE INSTALLED @ 1.5 FEET THICK. TURNDOWNS SHALL BE INSTALLED AROUND THE PERIMETER OF THE RIPRAP APRON AT A DEPTH OF 2.5 FEET.
2) RIPRAP SHALL BE OBTAINED FROM ANY SOURCE APPROVED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCD), AND SHALL BE REASONABLY WELL GRADED BETWEEN FOUR AND FIFTEEN INCHES, WITH NOT LESS THAN 40% NOR MORE THAN 70% SIX INCHES IN SIZE.
3) RIPRAP SHALL BE PLACED TO PRODUCE A SURFACE IN WHICH THE TOPS OF THE INDIVIDUAL RIPRAP DO NOT VARY MORE THAN PLUS TWO INCHES FROM TRUE GRADE. DOUBLE DECKING OF THIN FLAT RIPRAP WILL NOT BE PERMITTED.
4) GROUT SHALL FULLY PENETRATE TO BASE OF RIPRAP. CONTRACTOR SHALL USE A PENCIL VIBRATOR TO ENSURE FULL GROUT PENETRATION.
5) GROUT SHALL BE COMPOSED OF CEMENT, SAND, AND WATER MIXED IN THE PROPORTIONS AS DIRECTED. THE ESTIMATED CEMENT CONTENT REQUIREMENT PER CUBIC YARD OF GROUT SHALL BE EIGHT SACK MIX PER MAG SPECIFICATION 220.5. THE WATER CONTENT OF THE MIX SHALL NOT EXCEED EIGHT AND A HALF GALLONS PER SACK OF CEMENT. SLUMP OF GROUT MIX SHALL BE BETWEEN SEVEN AND EIGHT INCHES DEPENDING ON PLACEMENT LOCATION SCENARIO PLUS OR MINUS.
6) PLACEMENT AND BROOMING OF THE GROUTED SURFACE SHALL BE SUCH THAT THE OUTER LAYER OF ROCKS PROJECTS 1/3 TO 1/4 THEIR DIAMETER ABOVE THE GROUTED SURFACE. AFTER THE TOP COURSE HAS STIFFENED, THE ENTIRE SURFACE SHALL BE RE-BROOMED TO ELIMINATE RUNS IN THE TOP COURSE AND TO FILL VOIDS CAUSED BY SLOUGHING OF THE LAYERS OF GROUT.
7) REPRESENTATIVE OF FCD IS REQUIRED TO BE ONSITE DURING GROUTING OPERATIONS. CONTRACTOR SHALL CONTACT FCD 48 HOURS PRIOR TO GROUTING.
8) CONTRACTOR SHALL CLEAN SURFACE OF RIPRAP STONE PROJECTING ABOVE GROUT TO MATCH ANY EXISTING RIPRAP. SURFACE SHALL BE CLEANED BY AIR-WATER BLASTING OR OTHER APPROVED METHOD. CLEANING SHALL REMOVE ALL GROUT, CEMENT PASTE, AND DISCOLORATIONS CAUSED BY GROUT, WITHOUT DAMAGING THE GROUT TO REMAIN IN PLACE.
9) THE GROUT SHALL BE PERMITTED TO SET A MINIMUM OF ONE HOUR BEFORE AIR-WATER BLASTING IS COMMENCED. THE AIR-WATER BLASTING SHALL BE AT RIGHT ANGLES TO THE SURFACE OF THE STONE.
10) CONTRACTOR SHALL APPLY A CLEAR CURING COMPOUND TO ENTIRE SURFACE OF NEW GROUTED RIPRAP.



SECTION A-A
STA. 9+50 TO 15+00
PLAIN RIPRAP
N.T.S.



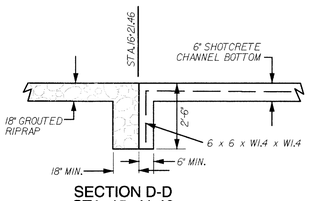
SECTION B-B
STA. 15+00 TO 15+51.46
GROUTED RIPRAP
N.T.S.



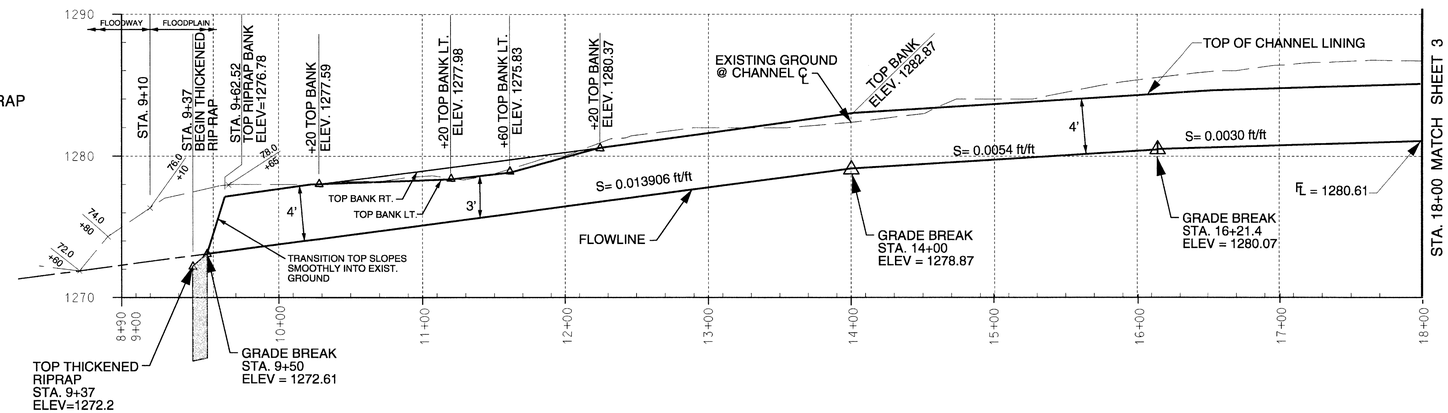
SECTION E-E
STA. 15+71.46 TO 16+21.46
PNEUMATICALLY PLACED MORTAR (SHOTCRETE MAG SPEC 525)
N.T.S.

SECTION C-C
STA. 9+37 TO 9+50

Sta. To Sta.	Variable Riprap Dimensions		
	d	W	WT
9+50 - 10+20	4'	2'	13'
10+20 - 11+20	4' - 3'	2' - 6'	13'
11+20 - 11+60	3'	6'	13'
11+60 - 12+20	3' - 4'	6' - 2'	13'
12+20 - 14+00	4'	2'	10'
14+00 - 15+00	4'	2'	10'



SECTION D-D
STA. 15+41.46



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

DIVERSION CHANNEL
FOR RANCHO SILVERADO & CROSSRIVER

DESIGNED	S. GARCIA	REVISIONS	DATE	BY
DRAWN	K. KENNY			
CHECKED	P. SIDERS			
DATE	10/28/02			

CHANNEL PLANS

REGISTERED PROFESSIONAL ENGINEER
CERTIFICATE NO.
7551
CHARLES DEE SCOTT
Date Signed 10-28-02
ARIZONA U.S.A.

CVL

SHEET 2 OF 3

990050

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

N:\990050LAND*SD02

STATE LAND
MARICOPA COUNTY
FLOOD CONTROL DISTRICT

STATE LAND

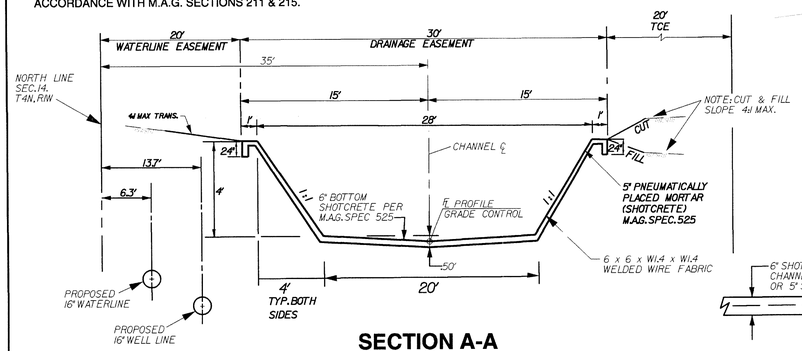
TRILBY WASH
DETENTION AREA
BK 63 OF MAPS, PAGE 31

MATCH LINE STA. 18+00 -- SEE SHEET 2

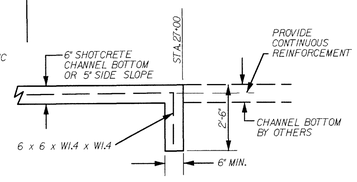
30' DRAINAGE EASM'T.
20' AZ. AMERICAN WATERWORKS EASM'T.
35'
6.3' (PROPOSED WATERLINE)
13.7' (PROPOSED WATERLINE)
NORTH LINE OF NE 1/4 SEC 14
EXISTING FENCE TO REMAIN
DIVERSION CHANNEL ℄
30' DRAINAGE EASEM'T.
BENCHMARK
NE COR., SEC. 14
SEE SHT 1 FOR DETAIL
25' RADIUS
EAST LINE SEC. 14 T4N, R1W
EXISTING FENCE
STA. 27+00 TO EXISTING 4-10'x5' BOX CULVERT UNDER LOOP 303 SHOTCRETE LINED CHANNEL BY OTHERS
50' EASEMENT BY OTHERS
28+00
FENCE NORTH OF SECTION LINE BY OTHERS
140 L.F. 6' TYPE 1 CHAIN LINK FENCE. ADOT STD. DET. C-12.20
INSTALL 14' SINGLE SWING GATE (6' HIGH) ADOT STD DETAIL C-12.20
10' WIDE ACCESS RAMP 10% MAX. SLOPE
40'
E. 1/4 COR. SEC. 14 & W. 1/4 COR. SEC. 13 T4N, R1W, FD 3" ALUM. CAP
PINNACLE PEAK RD.
2637.01'
TRACT H
123RD AVE.
2642.43'
E. 1/4 COR. SEC. 14 & W 1/4 COR. SEC. 13 T4N, R1W, FD 3" ALUM. CAP
STA. 18+00 TO 19+35
135 L.F. CHAIN LINK FENCE
ADOT STD. DET. C-12.20
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY RIGHT OF WAY
20' T.C.E.
STA. 19+35 TO 26+42
6' BLOCK WALL BY OTHERS
PROVIDE 710 L.F. 6' CHAIN LINK FENCE ADOT STD. DET. 16-12.20 DURING INTERIM PERIOD
STA. 18+00 TO STA. 27+00
20' SHOTCRETE LINED CHANNEL
SEE SECTION A-A
S= 0.0030
SUNDERO RESIDENTIAL
1290

NOTE:

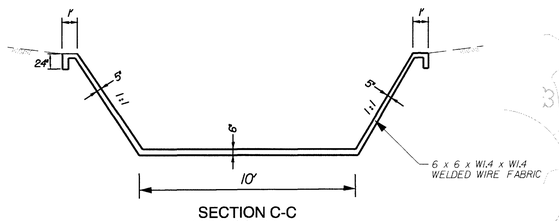
1. CHANNEL LINING SHALL BE CONTINUOUSLY REINFORCED WITHOUT EXPANSION OR TOOLED JOINTS EXCEPT AS FOLLOWS: CONSTRUCTION JOINTS SHALL BE LOCATED AT THE END OF A DAY'S POUR OR WHEN CONCRETE PLACEMENT STOPS FOR MORE THAN 45 MINUTES AND BETWEEN LONGITUDINAL PAVING STRIPS. LONGITUDINAL CONSTRUCTION JOINTS SHALL BE LOCATED 1-FOOT UP THE SIDE SLOPE AND IN THE BOTTOM SLAB AS DICTATED BY CHANNEL WIDTH BUT NOT WITHIN THE LOW FLOW SECTION. REINFORCING STEEL SHALL BE CONTINUOUS THROUGH LINING CONSTRUCTION JOINTS AND THROUGH JOINTS WITH BOX CULVERTS AND OTHER HYDRAULIC STRUCTURES.
2. EARTHWORK FOR OPEN CHANNEL SHALL BE IN ACCORDANCE WITH M.A.G. SECTIONS 211 & 215.



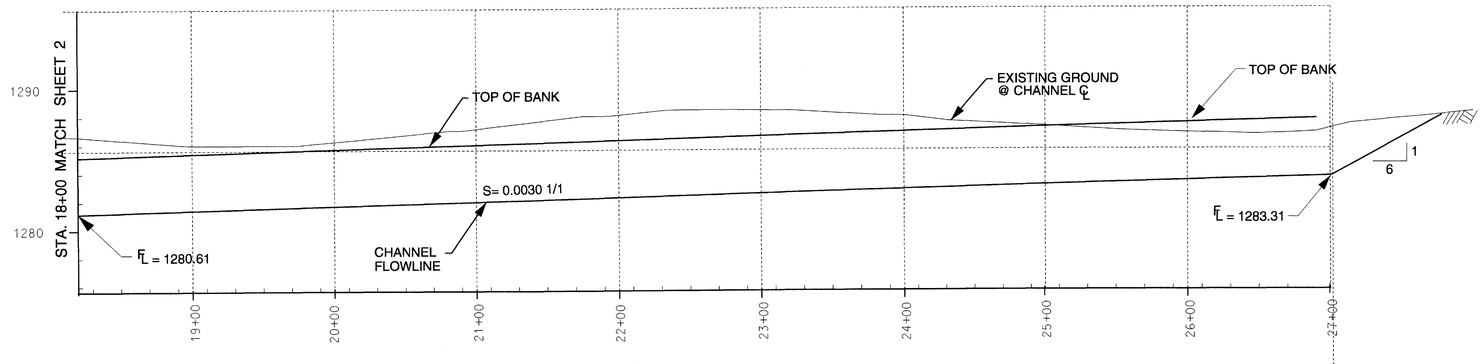
SECTION A-A
LOOKING EAST
STA. 16+21.46 TO STA. 27+00
N.T.S.



SECTION B-B
WHERE CHANNEL TIES INTO EXIST. CHANNEL



SECTION C-C
ACCESS RAMP



50' 25' 0 50'
SCALE: 1" = 50'

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

N:990050-LAND-SD04

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

DIVERSION CHANNEL
FOR RANCHO SILVERADO & CROSSRIVER

	BY	DATE	REVISIONS
DESIGNED	S. GARCIA		
DRAWN	K. KENNY		
CHECKED	P. SIDERS		
DATE	10/28/02		

CHANNEL PLANS

REGISTERED PROFESSIONAL ENGINEER
CERTIFICATE NO
7551
CHARLES DEE SCOTT
DATE SIGNED 10/28/02
ARIZONA U.S.A.

CVL

SHEET 3 OF 3

990050

PERMIT ROUTING SLIP

Routed: 8/5/05

Project Name. Crossriver & Rancho Sierra Diversion Channel

Location. McMicken Dam Outlet Wash & Pinnacle Peak Rd

Permit No. 2004-7048

(Please charge your review time to this PCN and Activity)
PCN No. Rwp-Rev
Activity. 001-04-600

To: MAG, BIZ, MAO, WFR, MCR, JHH, KWG.

From: ALH

Please review and return comments and red-lined changes to my attention by:

Date. 8/17/05

* revised plans

COE & VAN LOO CONSULTANTS, INC.

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Founded 1958 by
P.E. Coe, P.E. (1915-1977)
H.W. Van Loo, P.E.

July 29, 2005

Ms. Angie Hardesty
Right-of-Way Permit Specialist
Administration Division
Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, AZ 85009

Re: Permit 2004P048 – Crossriver and Rancho Silverado
Pinnacle Peak Diversion Channel – McMicken Outfall Wash
CVL Project No: 99-0050-24-03

Dear Ms. Hardesty:

We submitted plans to FCDMC on February 23, 2005, and received your review comments via e-mail on April 1, 2005. Those requested analyses, additions and changes to the plans and drainage report have been completed. Seven sets of revised plans and drainage reports together with 2-copies of the revised legal description are submitted herewith for your review and approval.

Each reviewer's statement (quote) is repeated here, followed by our explanation of each issue addressed:

Michael Greenslade – Dam Safety Engineer

1. *The Drainage Report dated February 18, 2005 indicates on Page 4 of 5 that the riprap in the McMicken Outfall Wash is designed for the SPF of 14,000 cfs. Appendix E (not C as indicated in the report) appears to indicate that a Design Q of 6,023 cfs was used in the scour analysis. The consultant needs to provide clarification.*

CVL reply:
The riprap was designed for the SPF of 14,000 cfs. The Q, river station, and velocity have been added to the riprap design spread sheet.

2. *The scour analysis provides a recommended toe down of 9.3 feet. I am assuming this is the basis for the design of the cutoff shown in Section C-C on Sheet 2 of 3. If my assumption is correct, how were the cutoff depths shown on the table for Section A-A on the same sheet determined?*

3550 NORTH 12TH STREET PHOENIX, ARIZONA 85014-4291 (602) 264-6831 FAX (602) 264-0928

CVL reply:
They were determined from the scour depth calculations included in the report. However, Gary Freeman suggested a different approach that was more readily accepted by FCD at the meeting of April 19, 2005, as follows:

The outside of the riprapped channel will be protected using thickened toe bank protection as described in the Drainage Design Manual for Maricopa County, Volume II, pages 6-51 thru 6-53. Sufficient volume was added to the thickened toe as well as protection at the downstream end of the channel to protect against erosion under the channel by McMicken Wash flows.

3. *The design now includes riprap breaks shown on the plan view and Section E-E on Sheet 2 of 3. Why were these included and how were the depths shown in the adjacent table determined?*

CVL reply:
The breaks are obviated by the thickened toe and edge concept described in Item 2 above.

4. *If the purpose of the plain riprap cutoffs and riprap breaks is to protect against scour, would they not be unstable if scour occurred and they were exposed? Would not the use of gabions, concrete, CLSM, soil cement or some other type of structure that can stand vertically once scour has removed the supporting adjacent soil be more appropriate and stable?*

CVL reply:
The breaks are obviated by the thickened toe and edge concept described in Item 2 above.

5. *Are the soils stable enough to allow for the excavation of 14 foot deep trenches and the placement of riprap?*

CVL reply:
The deep excavations are obviated by the thickened toe and edge concept described in Item 2 above.

6. *As stated above, the Drainage Report indicates that the riprap was designed for the SPF of 14,000 cfs. The riprap has a D_{50} of 0.75 feet and maximum size of 1.5 feet. The riprap channel itself has a thickness of 1.5 feet. I do not see where in the Drainage Report Stability of the channel itself is demonstrated (i.e., the riprap is stable under the design flows). Please confirm that this design is acceptable with the Engineering Division.*

CVL reply:
Riprap sizing is in accordance with the HEC-11 Method as described in Drainage Design Manual for Maricopa County, Arizona, Volume II Hydraulics, Jan 28, 1996, Pages 6-38 thru 6-47, the reference has been added to the report.

7. *Where the riprap channel meets the McMicken Outlet wash floodway (Sta.9+07) a 10.5 foot deep by 4 foot wide cutoff is apparently included for scour protection of the plain riprap channel from McMicken Outlet Wash flows. Is an energy dissipater required to control scour within the McMicken Outlet Wash floodway from flows exiting from the plain riprap channel? Please confirm that this design is acceptable with the Engineering Division.*

   CVL reply:
   A consensus was reached at the FCD meeting of April 19, 2005. An energy dissipater is not needed.

8. *Finally, the consultant's response to Comment 6 states that a future District project will redo the plain riprap. What project is this? While we will be studying this area as part of the Trilby Wash Feasibility Study with the Corps that **may** result in a project, I am not aware of any other District Project?*

   CVL reply:
   We stand corrected.

Dave Degerness – Hydrology

1. *Appendix E that contains the riprap calculations appears to have the correct procedure applied based upon the FHWA HEC11, Design of Rip Rap Revetment. Without a reference section in the report it is difficult to tell if this is the case. A reference section should be added listing all technical resources utilized for design should be added to the report.*

   CVL reply:
   The following reference has been added to the report:
   Riprap sizing is in accordance with the HEC-11 Method as described in Drainage Design Manual for Maricopa County, Arizona, Volume II Hydraulics, Jan 28, 1996, Pages 6-38 thru 6-47.

2. *Appendix E also contains scour calculations. Please add all technical references used for calculation of scour to the report.*

   CVL reply:
   The following has been added to page 6 of the report:
   Scour depths were calculated using the methodology described in Pemberton and Laura (1984) published by the USBR. The calculations were performed using average conditions for flow in the channel for 50, 100, and SPF events. The scour calculations indicate that depths can reach to approximately 12 feet below the existing thalweg elevation. Protection measures were designed to protect to this depth of scour.

3. *I don't know for what channel or flow rate the riprap calculations were based upon. It appears that the calculations were based upon the proposed diversion channel because of the Va value of 8.3 ft/sec and Davg value of 3.9 feet that are given in the spreadsheet table. These values are very close to the HEC-RAS output table for the diversion channel. They are nowhere close to the values given for the SPF event of 14,000 in the HEC-RAS output table provided for the McMicken Wash Outfall Channel. Page 4 of the report states that the riprap "is designed for the SPF of 14,000 cfs." Please rework calculations or provide explanation as to what was done.*

CVL reply:
The riprap was designed for the McMicken Wash SPF of 14,000 cfs. The Q, river station, and velocity have been added to the riprap design spread sheet. Also, a statement of such appears on page 5 of the report.

The spread sheet shows a hydraulic depth of 8.12 feet, changed from 3.9. But it only makes the d_{50} smaller. We have used the 8.12-feet.

4. *Appendix E that contains the general scour calculations appears to have been based upon a flow rate of 6023 cfs. It should have been done for the SPF flow of 14,000 cfs. Provide explanation or rework the general scour equations*

CVL reply:
The spread sheet has been reworked for the 14, 000 cfs.

5. *There are several values in the scour worksheet that do not arithmetically add up based upon previously presented values. These include the toe down below thalweg, long term scour and the recommended toe down. Please clarify the situation or provide new values.*

CVL reply:
Gary Freeman has reworked these values.

6. *How do the two spreadsheets behind the general scour spreadsheet relate to the general scour spreadsheet? There are values presented in these sheets that are not placed on the general scour sheet. Please clarify.*

CVL reply:
I was just another method to compare values. They were all reasonable close. To reduce confusion, we have eliminated the extra sheets.

7. *In general the report needs to explain the design process much better. How do the calculations for scour relate to the plans presented for review? For example, a value of 9.3 feet was calculated for scour/toe down. Section c-c on sheet 2 of the plans has a toe down of 10.5 feet. Are these related, please explain?*

   CVL reply:
   Additional narrative has been added to the report explaining the process.

   It requires 10.5 feet to put protection to a point 9.5 feet below the McMicken Wash thalweg.

   However, the deep excavations are obviated by the thickened toe and edge concept described in Michael Greenslade's Item 2 above.

8. *Sheet 2 of the plans has a table of variable riprap dimension. How were these values acquired and why are they so different?*

   CVL reply:
   Most of the values in the table have been obviated by the thickened toe and edge concept described in Michael Greenslade's Item 2 above.

9. *Sheet 2 has riprap breaks on the east side of the diversion channel. Please explain the purpose of the breaks.*

   CVL reply:
   The breaks are obviated by the thickened toe and edge concept described in Michael Greenslade's Item 2 above.

10. *If scours does occur what will prevent the riprap from falling off from the diversion channel and into the McMicken Wash Outfall Channel? Maybe a riprap or gabion mattress would be more appropriate at the outfall to the McMicken Wash*

    CVL reply:
    The outside of the riprapped channel will be protected using thickened toe bank protection as described in the Drainage Design Manual for Maricopa County, Volume II, pages 6-51 thru 6-53. Sufficient volume was added to the thickened toe as well as protection at the downstream end of the channel to protect against erosion under the channel by McMicken Wash flows.

11. *Please provide all digital HEC-RAS models of the diversion channel and the McMicken Wash Channel to the FCD.*

CVL reply:
A disk will be submitted with the report and plans.

12. *It may be appropriate to provide some sort of riprap protection in the McMicken Channel to prevent formation of a scour hole where the diversion channel enters the McMicken Channel. Please investigate the possibility of this feature in the design of the diversion channel.*

CVL reply:
We think the following takes care of that concern:
The outside of the riprapped channel will be protected using thickened toe bank protection as described in the Drainage Design Manual for Maricopa County, Volume II, pages 6-51 thru 6-53. Sufficient volume was added to the thickened toe as well as protection at the downstream end of the channel to protect against erosion under the channel by McMicken Wash flows.

13. *The floodway depicted on the plans appears to be quite different than the one in the FCD GIS database. The floodway on the plans has a northwest to southeast trending orientation. The FCD floodway is pretty much north to south in its orientation. Please check to see that you have the correct floodway and floodplain because this will affect where the channel is terminated.*

CVL reply:
This has been checked and we believe it to be correct.

Mike Ramirez – O & M Branch

1. *The Home Owners' Association need to be aware that they shall be responsible for the maintenance of the the entire Diversion Channel Improvement from the upper end @ sta. 27+00.00 to sta. 9+40 where the Diversion Channel Improvement ties into the McMicken Wash. The Home Owners' Association will be responsible for any silt sediment deposit and debris removal as part of the structural/ maintenance responsibilities. Also in regards to the Consultant's comment that states that a access ramp to be provided by others at the upper end of the channel needs more specific detail . The O&M recommends that ingress & egress ramps be provided and that the fencing should encompass the entire perimeter of the channel improvement, including a breakaway fence @ sta. 9+07.00 on the proposed plans.*

In addition, the home owner's association needs to understand that after any large storm event, they must inspect the channel and address any maintenance issues that may have arisen after the storm event. This can include; accumulated sediment, trash & debris removal, and erosion from sheet flows that could affect the integrity of the concrete structure.

We will also need a letter from the Home Owners Association stating that they will maintain the entire channel.

CVL reply:
The Home Owner's Association does not exist at this time. However, the developer (Woodside Homes) has assumed full responsibility. Stipulations shall place full responsibility on the Home Owner's Association. CVL and Woodside Home's attorney are in the process of putting an agreement together.

It turns out that Dos Rios was not required to provide an access ramp on the upper end of the Diversion Channel. Therefore, two access ramps have been added, one on each end.

At the meeting of April 19, 2005 attendees were: Angie Hardesty, Dave Degerness, Warren Rosebraugh, Gary Freeman and Charley Scott. The consensus was that the plain riprap portion in the floodplain should not be fenced.

Incidentally, Mike Ramirez was invited but he had a prior commitment and was not at that meeting. But, Angie Hardesty followed up with him on the fencing issue.

Sincerely,

COE & VAN LOO
Consultants, Inc.

Charley Dee Scott, P.E., R.L.S.
Project Manager

CDS:se