Maricopa County
Department of
Transportation

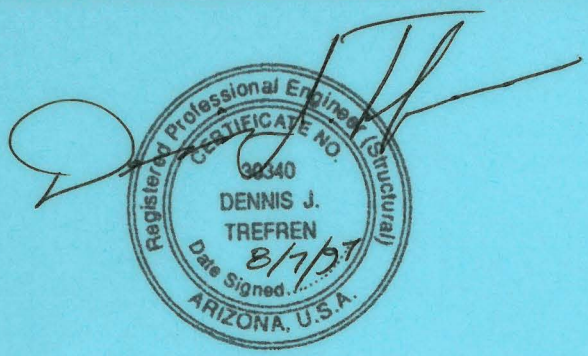
Bridge Scour Investigation
and
Design of Corrective Measures

Contract No. CY 1997-26
Work Order No. 80407

Final Report

Rittenhouse Road Bridge over Queen Creek

Submitted August 7, 1997



Prepared By:

INCA

INCA ENGINEERS, INC.
Wood/Patel & Associates
Maxim Technologies Inc.

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MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

ENGINEERING DIVISION

MEMORANDUM

FLOOD CONTROL DISTRICT
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C & C | KA
REMARKS

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Please Return to
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Phoenix, AZ 85009

DATE: August 8, 1997

TO: Tom Sonnemann, MCDOT
Amir Masowdi, MCDOT
Kofi Awumah, FCD

FROM: Philip Epstein

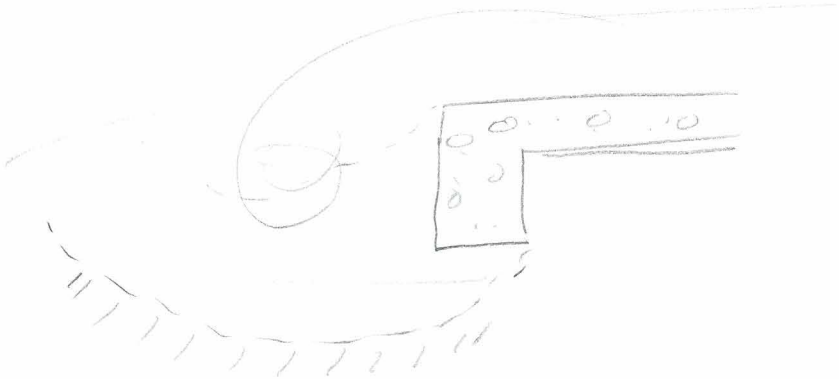
RE: Bridge Scour Investigation and Design of Corrective Measures - INCA Contract
MCDOT Work Order No. 80407

Transmitted for your review is a copy of the Final Report for the Rittenhouse Road Bridge at the Queen Creek Wash, including the Preliminary Report comments.

A meeting to discuss your comments has been scheduled for Monday, August 25, 1997, at 9:00 AM in the MCDOT Navajo Conference Room.

Please arrange for a representative to attend.

cc: Al Letzkus
Dennis Trefren, INCA



Concrete Pave
(a) Uplift forces
(b) Temp Stresses
(c) Drainage or nuisance flows
(d) Cosmetic Problem

MCDOT - ENGINEERING DIVISION
DESIGN REVIEW COMMENTS

PREL. REPORT

PROJECT NAME	RITTENHOUSE RD. BRIDGE AT QUEEN CREEK	SUBMITTAL	7-8-97
PROJECT NO.	30407	RETURN DATE	7-25-97
CONSULTANT	INCA ENGRS.	REVIEW BY	PE

ACTION CODES: A = WILL COMPLY B = CONSULTANT TO EVALUATE
C = MCDOT TO EVALUATE D = DISREGARD COMMENT

ITEM NO.	DWG SHT. PAGE NO.	COMMENT	DISPOSITIONS INTL.	DISPOSITIONS FINAL
1	ALT. NO. 1	SHOW WIDTH OF EXISTING BRIDGE PIER PILE TIP ELEVATION	A A	
2	ALT. NO 2	SAME ADD TRANSVERSE SECTION	A A	
3	ALT. NO 3	SAME AS 1	A	
4	5	CONCUR WITH RECOMMENDATION FOR ALTERNATE 3.		

Flood Control District
of Maricopa County
2801 West Durango
Phoenix, AZ 85009

Interoffice Memorandum

DATE: 7/24/97

SUBJECT: **Bridge Scour Investigation and Design of Corrective Measures**
Rittenhouse Road Bridge over Queen Creek - Preliminary Report
By INCA Engineers, Inc.

TO: Phil Epstein
From: Kofi Awumah FILE: RRBrdge1

The following are my comments on the above submittal.

1. On scour analysis, 4 feet was assumed for the long term scour. This assumption has to be justified with references or historical records. For example, long term scour depths determined for typical washes (in both discharge and geomorphology) could be referenced. Alternatively, a level two analysis could be performed to give an estimate for the long term degradation for this reach.

2. How was the representative bed material size, D50, determined?

3. The turn down of the concrete floor for Alternative 3 was set at 5 feet. This appears to be too low. The turn down must be set deeper than the computed scour depth (local + long term).

WOOD/PATEL

CIVIL ENGINEERS • HYDROLOGISTS • LAND SURVEYORS

Darrel E. Wood, P.E., R.L.S.
Ashok C. Patel, P.E., R.L.S.
James S. Campbell, P.E.
Gordon W. R. Wark, P.E.
Thomas R. Gettings, R.L.S.
Bruce Friedhoff, P.E.
Duane M. Hunn, P.E.
Scott A. Nelson, R.L.S.
Richard L. Hiner, P.E.
Fredrick K. Schneider, P.E.
Timothy A. Huval, P.E.
Michael J. Sexton, R.L.S.
Jack K. Moody, P.E.
Leslie J. Kland, P.E.

August 6, 1997

Dennis Trefren, P.E.
INCA Engineers, Inc.
1702 East Highland, Suite 207
Phoenix, Arizona 85016

INCA
AUG 06 1997
INCA ENGINEERS INC

RE: **FCDMC & MCDOT Comments**
Rittenhouse Road Bridge over Queen Creek
Initial Bridge Scour Report
WP #97629

Dear Mr. Trefren:

Wood/Patel has reviewed the comments from Kofi Awumah at the Flood Control District of Maricopa County (FCDMC) and Amir Masowdi at the Maricopa County Department of Transportation (MCDOT). We are pleased to offer the following responses:

Responses to Comments from Kofi Awumah (FCDMC):

Comment #1: *On scour analysis, 4 feet was assumed for the long term scour. This assumption has to be justified with references or historical records. For example, long term scour depths determined for typical washes (in both discharge and geomorphology) could be referenced. Alternatively, a level two analysis could be performed to give an estimate for the long term degradation for this reach.*

Response #1: The assumption of 4 feet for long term scour came from the Final Bridge Scour Report - Rittenhouse Road Bridge over Queen Creek, prepared by Cannon & Associates, Inc. July, 1996, Revised November 1996, and submitted to MCDOT. Upon reviewing this report, it was decided that, since no gravel mining was occurring downstream of the bridge, the long-term scour estimate of 4-feet from the existing report would be utilized for this study. Documentation for this assumption can be found in this report. The purpose of the current study is to review the existing report and recommend mitigation alternatives. It is not intended to duplicate the entire effort of the previous report.

Comment #2: *How was the representative bed material size, D_{50}, determined?*

Response #2: Documentation for the bed material size is contained in the report entitled Final Bridge Scour Report - Rittenhouse Road Bridge over Queen Creek, prepared by Cannon & Associates, Inc. July, 1996, Revised November 1996.

Comment #3: *The turn down of the concrete floor for Alternative 3 was set at 5 feet. This appears to be too low. The turn down must be set deeper than the computed scour depth (local + long term).*

Response #3: The purpose of the concrete floor is to prevent the formation of a local scour hole at either the piers or abutments. Since a local scour hole will not form with the floor in place, it is not necessary to design the turn down to be any deeper than the expected long-term scour depth plus an additional amount as a safety factor. The top of the proposed floor is set 4-feet below existing grade and there is a 5-foot cut-off wall on the floor. Thus, the bottom of the cut-off wall is set 9-feet below existing grade and 5-feet below the expected long-term degradation elevation.

Responses to Comments from Amir Masowdi (MCDOT):

Comment #1 A location map is highly recommended. Location maps are helpful in general.

Response #1 A location map will be provided.

Comment #2 *In reference to HEC-2, HEC-RAS analysis, usually a plan view of the site under study is desirable.*

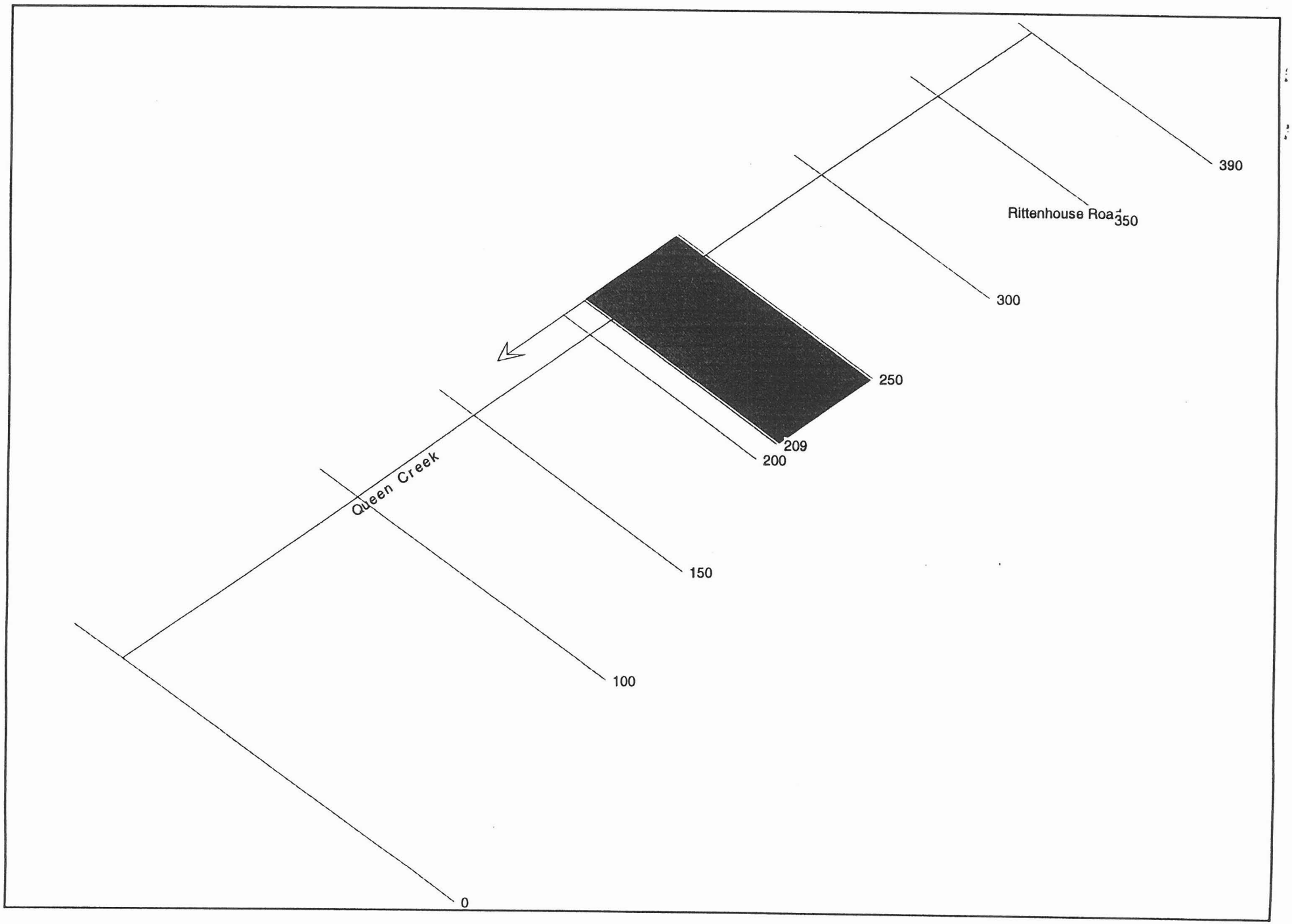
Response #2 As noted in the report, the HEC-RAS model was constructed by copying the single cross-section (included in the existing report by Cannon & Associates, Inc.) at the upstream face of the bridge to locations upstream and downstream of the structure. Cross-sections were not field surveyed for this site since the channel geometry through this reach is fairly consistent. A plan view showing the cross-section locations in the model will be provided.

Sincerely,

WOOD, PATEL & ASSOCIATES, INC.

Richard L. Hiner, P.E.
Project Engineer

GENCOR\97629LET.A06


390
Rittenhouse Road
350
300
250
209
200
Queen Creek
150
100
0

Amir Masowdi - MCDOT

From: Amir Masowdi - MCDOT
To: Phil Epstein - MCDOT
Cc: Ray Smith - MCDOT
Subject: Bridge Scour Evaluation & Design of Corrective measures WO#80407
Date: Monday, July 21, 1997 10:59AM

My review comments are as follows:

1. A location map is strongly recommended.
   Location maps are helpful in general.
2. In reference to HEC-2 / HEC- RAS analysis, usually a plan view of the site under study is desirable.

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Bridge Scour Investigation and Design of Corrective Measures

FINAL REPORT

INTRODUCTION

The Maricopa County Department of Transportation retained two consultants in 1995 under Work Order Number 80407 to evaluate the scour potential during 100 and 500 year flood events for existing bridges in their jurisdiction over waterways. The results of that study classified some of the bridges as scour critical.

INCA Engineers, Inc. was retained by the County to review the previous reports for five bridges classified as scour critical, determine the extent of scour damage, recommend methods to prevent scour damage, and prepare contract documents for scour countermeasures.

The Rittenhouse Road Bridge over Queen Creek was evaluated as scour critical by Cannon and Associates, Inc. and documented in their report dated November 1996.

Bridge Location and Description:

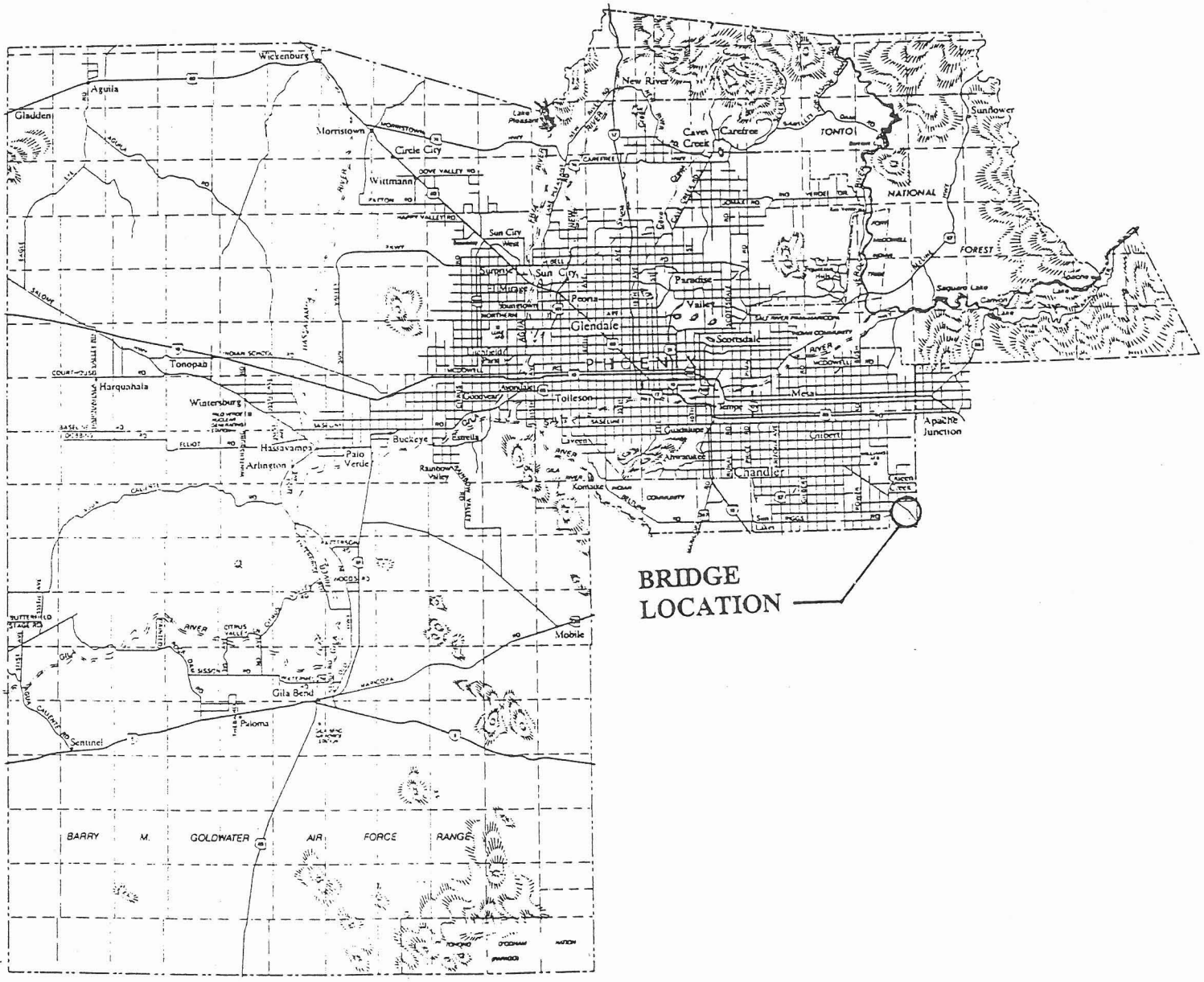
The Rittenhouse Road Bridge crossing of Queen Creek is located in the far southeast corner of Maricopa County in Section 25, T2S, R7E, Gila and Salt River Baseline and Meridian. It is located on Rittenhouse Road near the town of Queen Creek. The road parallels and is approximately 140 feet downstream of the Union Pacific Railroad (UPRR) crossing of Queen Creek. Refer to Location Map, Figure 1, on page 2.

REVIEW OF PREVIOUS REPORT

Cannon & Associates, Inc. performed a scour investigation and structural stability analysis of this site and submitted a report in December of 1996 documenting their findings. Wood/Patel has reviewed this report and offers the following comments:

- Since the bridge is constructed on approximately a 15° skew to the channel alignment, the measured width of the cross-section should have been corrected to account for this skew prior to performing hydraulic calculations. This correction results in a reduction in available cross-section width of approximately 6 feet, which causes a slight (0.25 foot) increase in the calculated Water Surface Elevation at the bridge.

Rittenhouse Road Bridge over Queen Creek
Location Map
Figure 1



- The bridge hydraulics and scour calculations were re-evaluated and it was determined that maximum pier scour increased approximately 0.9 feet for the 100-year event and 2.28 feet for the 500-year event.

SITE INVESTIGATION

On June 23, 1997, a review of the site conditions was conducted by Dennis Trefren, P.E., Richard Bruesch, P.E., and Dave Chapin, E.I.T. of INCA, Jeff Holzmeister, P.E. and Rick Hiner, P.E. of Wood/Patel, Dave Thomas, P.E. of Maxim Technologies and Tom Sonnemann, P.E. of MCDOT. Observations were noted as the following:

1. The Union Pacific Railroad (formerly Southern Pacific) right-of-way line is only 40 feet upstream. There appears to be a buried pipeline just east of the County/RR right-of-way line. There was evidence of recent work along the pipeline such as utility location paint, markers and new warning signs.

2. A fiber optic telephone line may be buried near the downstream right-of-way line located 40 feet from the roadway centerline.

3. Some areas of the existing sacked concrete abutment protection is undercut. The sacked concrete has failed between the two bridges.

4. Sacked concrete is not suitable for abutment protection.

5. It will be difficult to construct a scour countermeasure within the narrow right-of-way. There is only about 10 feet of clearance from the ends of the wingwalls to the right-of-way lines.

6. If possible, the countermeasure should connect to the railroad bridge abutments upstream. This will require railroad involvement for improvements in the railroad right-of-way.

HYDROLOGY RECOMMENDATIONS

Wood/Patel reviewed the hydrology from the Final Bridge Scour Assessment Report prepared by Cannon & Associates, Inc. The 100-year discharge of 3010 cfs (FCDMD) and 500-year discharge of 5150 cfs (USGS Regression Equation) seem reasonable for this bridge location.

HYDRAULICS RECOMMENDATIONS

The hydraulics performed in the Final Bridge Scour Assessment Report prepared by Cannon & Associates, Inc. used a single section to determine the hydraulic characteristics of the bridge crossing. Using this section, a HEC-RAS hydraulic model was constructed for the bridge site. Since the cross sections in the vicinity of the bridge are somewhat uniform, the single section was modified slightly to account for the bridge skew and was copied upstream and downstream (modifications were made as necessary based on field observations) as necessary to approximate

the Queen Creek channel. The model extends from the downstream side of the UPRR bridge to approximately 200 feet downstream of the Rittenhouse Road Bridge.

The computed water surface elevation at the upstream face of the bridge structure for the 100-year event is 1343.48 feet (vs. 1343.24 in the previous analysis) and 1344.74 feet (vs. 1344.48 in the previous analysis) for the 500 year event. This increase of approximately 0.25 feet appears to be due to the narrower cross section resulting from the skew adjustment.

The results of this analysis are presented in Appendix E.

SCOUR ANALYSIS

The most recent version of the HEC-RAS program (v. 2.0) has incorporated HEC-18 scour methodology into its programming. This feature was used to verify the scour results from the Final Bridge Scour Assessment Report prepared by Cannon & Associates, Inc. The long-term/general scour estimate of 4.0 feet was judged to be reasonable and was used without modification in Wood/Patel's estimate of scour at this site. The results of this analysis are presented below:

	100-year	**500-year**
Contraction Scour	0.10 feet	0.18 feet
Pier Scour	11.60 feet	14.30 feet
Long-Term Scour	4.00 feet	4.00 feet
Abutment Scour	0.00 feet	0.00 feet

The total scour at the abutments for the 100-year event is 4.10 feet (vs. 4.00 feet in the prior analysis) and for the 500-year event is 4.18 feet (vs. 4.00 feet in the prior analysis). This consists of long-term and contraction scour only; there was no abutment scour. The prior analysis did not yield any contraction scour.

ALTERNATIVE COUNTERMEASURES

The following is a discussion of the most feasible countermeasures.

Alternative 1:

This alternative consists of wire tied riprap placed on the channel bottom and on both banks from the downstream side of the railroad bridge to the downstream side of Rittenhouse Road Bridge.

Advantages of this alternative are:

- Provides for good flood control between both bridges.
- Deep excavations are not required in the channel bottom.

- Traffic interference during construction is minor.

Disadvantages are the following:

- Requires considerable railroad involvement and a temporary construction easement.
- Wire tied system is subject to corrosion and abrasion.
- Permanent features must be placed in the railroad right-of-way.

The estimated cost for this alternative is $230,000.

Alternative 2:

In order to minimize involvement with the railroad and to keep all permanent features within the existing County right-of-way, this alternative assumes the use of a reinforced concrete floor on the slopes and channel bottom directly below the bridge. The abutments will be sealed off by the use of driven sheet pile cutoff walls at each corner of the bridge.

The advantages of this alternative are:

- Requires minimal railroad involvement.
- Minimal temporary construction easements.
- Deep excavations are not required in the channel bottom.
- The use of a reinforced concrete section eliminates abrasion and corrosion.

Disadvantages are the following:

- High construction cost.
- Requires a specialty contractor to drive the steel sheet pile cutoff walls.
- The vibration due to driving of the sheet piles may be objectionable to the utility owners.
- Requires traffic control (i.e. lane closures) to facilitate sheet pile driving.
- Requires a temporary construction easement from the railroad and adjacent landowner.

The estimated cost for this alternative is $405,000.

Alternative 3:

This alternative is similar to Alternative 2 except the sheet pile cutoff walls are eliminated and the reinforced slab on the abutments are wrapped around the wingwalls. All permanent features are within the County's existing right-of-way. Temporary construction easements are required to construct the facility and to temporarily support the underground utilities on both sides of the bridge.

The advantages of this alternative are:

- Least costly alternative.
- All permanent facilities within the existing right-of-way.
- Small local contractors can construct this alternative.

Disadvantages are the following:

- Requires temporary support and protection for the underground utilities.
- Requires a relative deep excavation parallel to the existing roadway.
- The existing underground utilities are at the greatest risk to damage.
- Requires a temporary construction easement from the railroad and adjacent landowner.

The estimated cost for this alternative is $190,000.

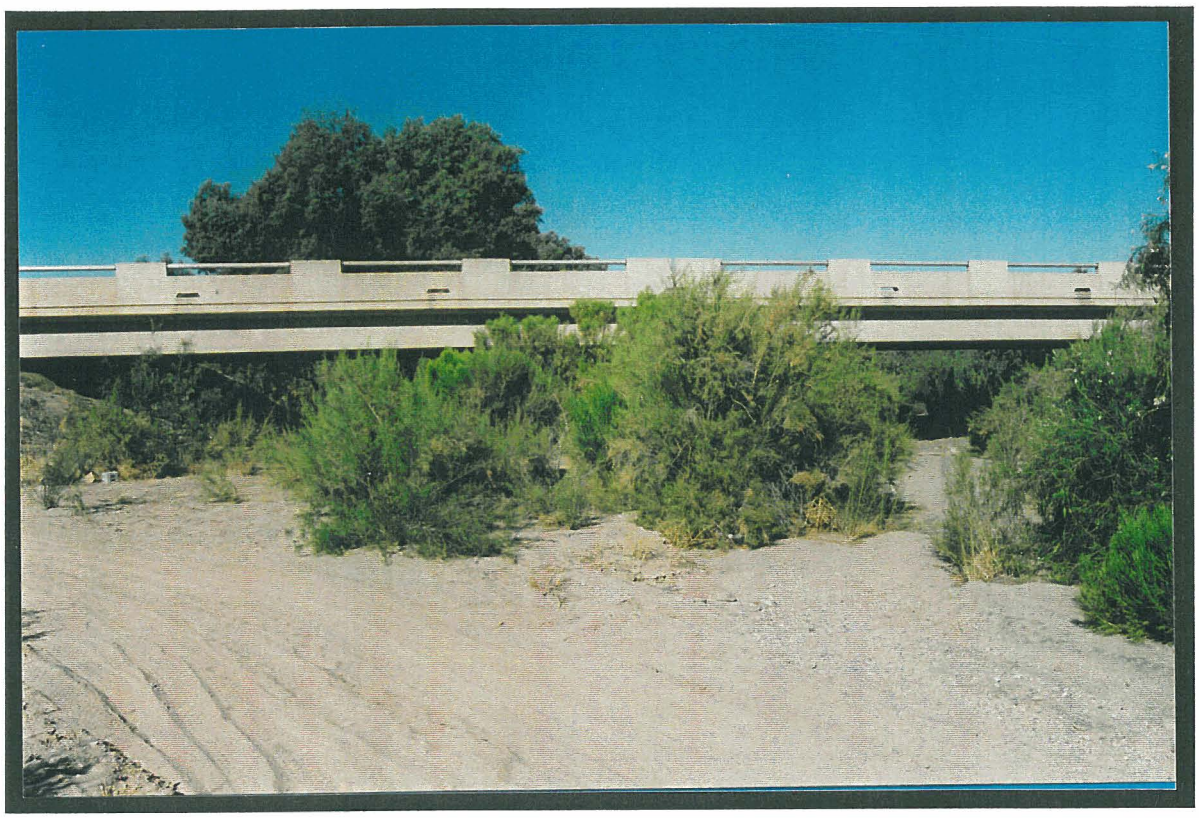
Alternative 4:

Philip Epstein, P.E., MCDOT Bridge Engineer, has stated that this bridge could be replaced once funds become available. Given this fact, the County could choose to do nothing and close the bridge when flooded.

PREFERRED ALTERNATIVE

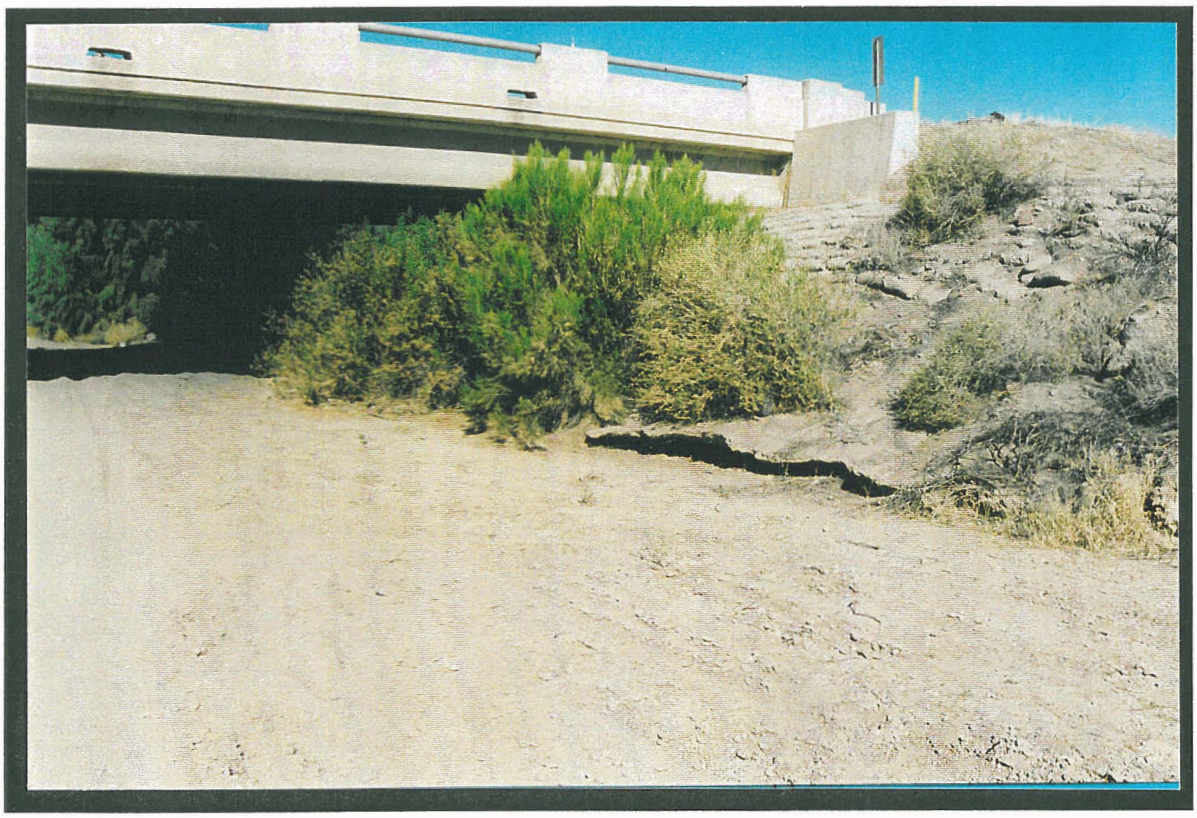
We recommend Alternative 3 to be constructed since it offers the best scour protection at the lowest cost.

Appendix A
Photographs



Upstream Side of Bridge Looking Downstream

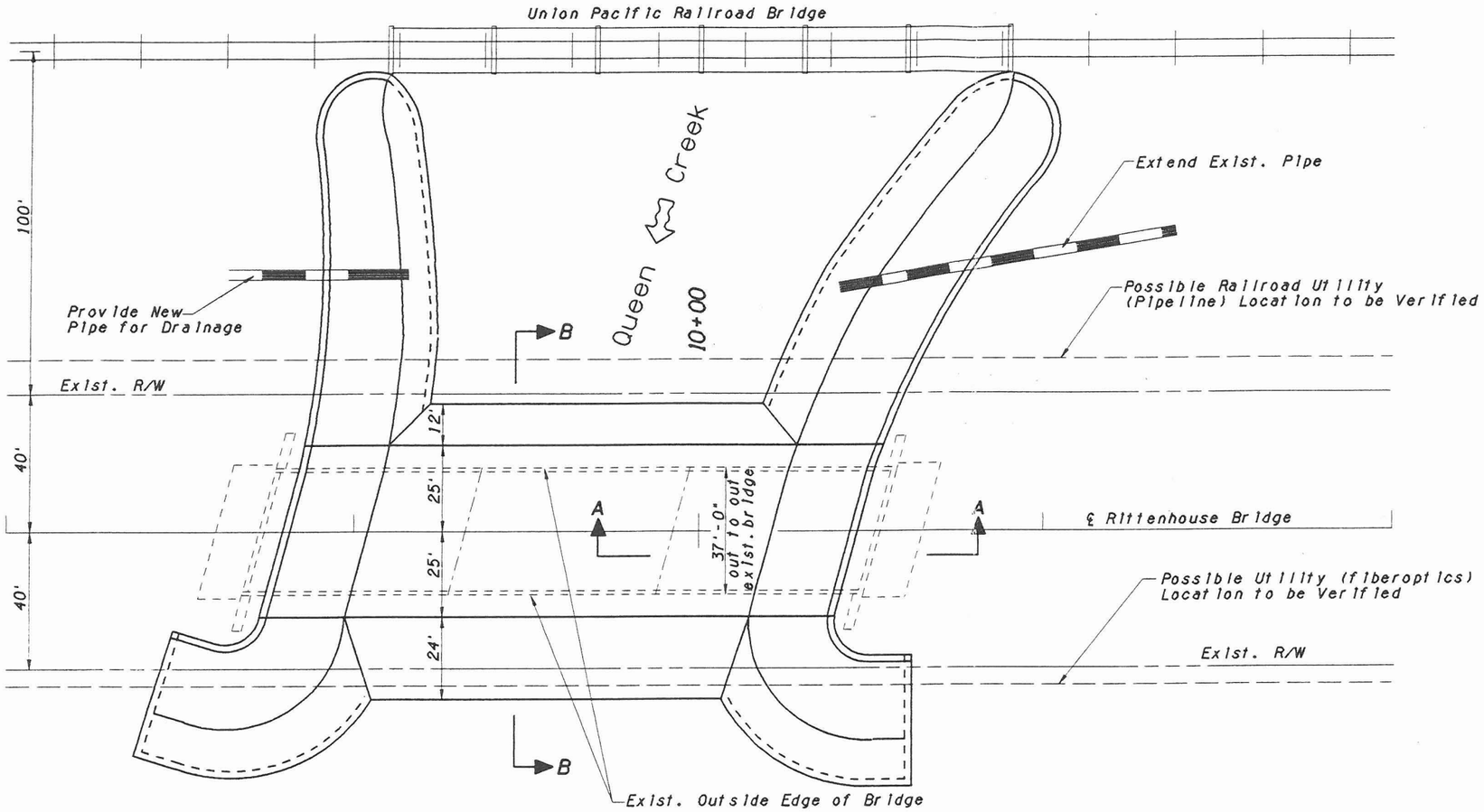
Typical Pier



Slope Protection Failure

Appendix B
Alternative 1 Details

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.				



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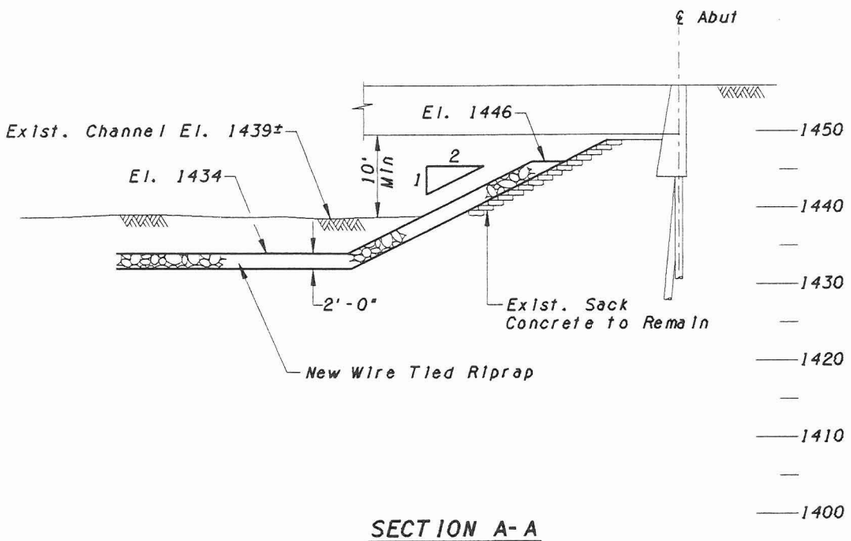
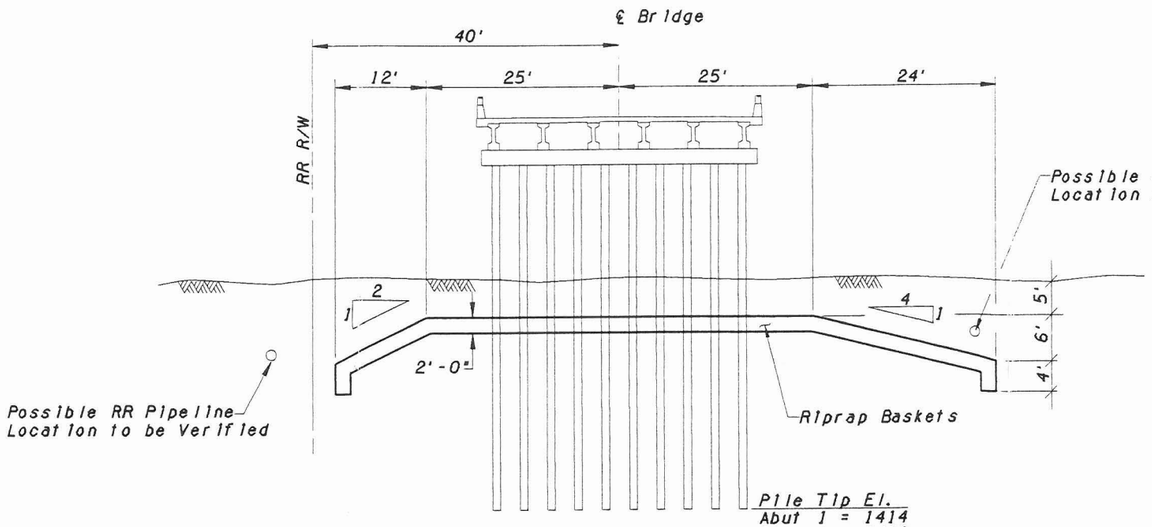


SECTION A-A



SECTION B-B

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

RITTENHOUSE ROAD BRIDGE @ QUEEN CREEK

PRELIMINARY NOT FOR CONSTRUCTION

	BY	DATE
DESIGNED		
DRAWN	RON WIETZEMA	7/08/97
CHECKED		

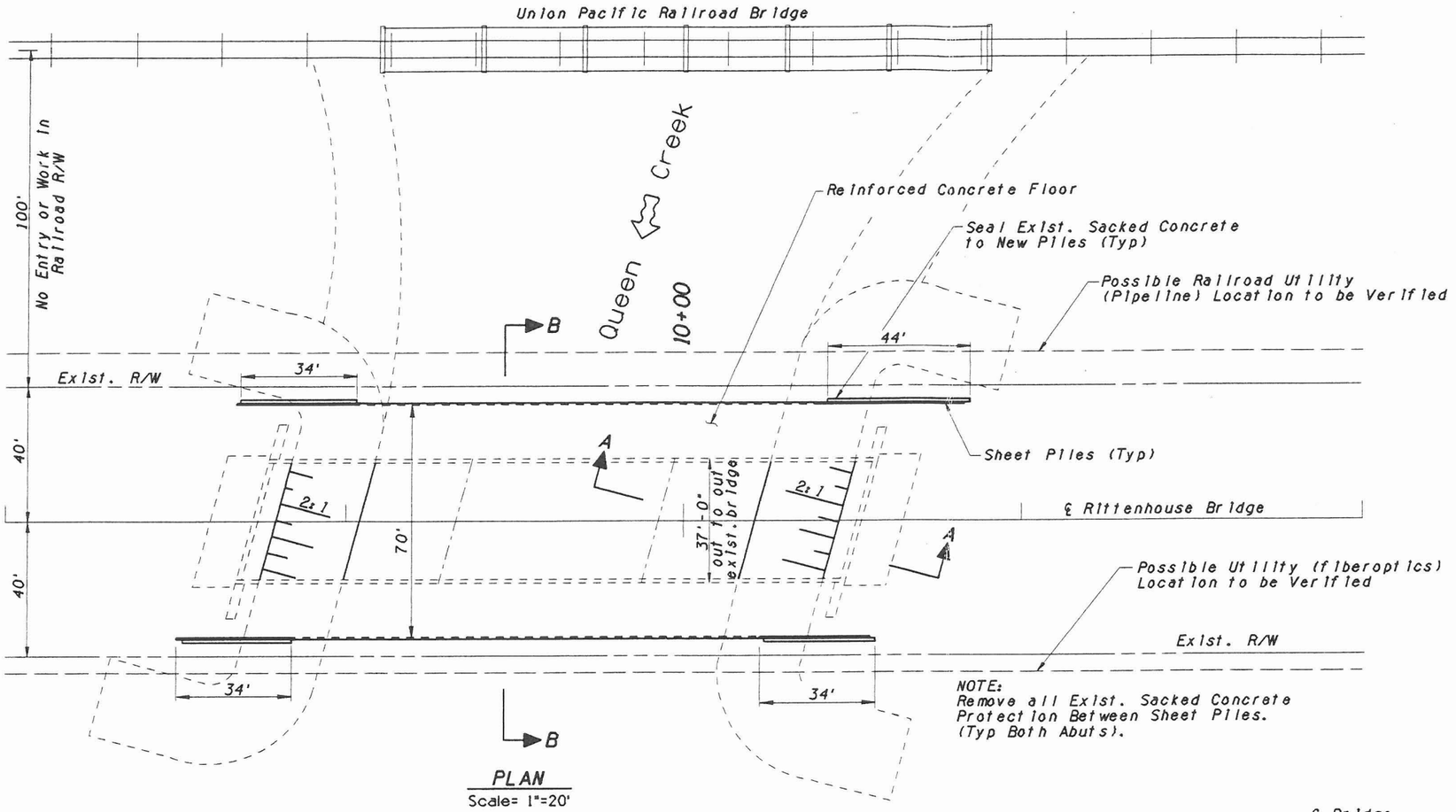
INCA
INCA ENGINEERS INC.

ALTERNATIVE NO. 1

SHEET OF

Appendix C
Alternative 2 Details

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.				



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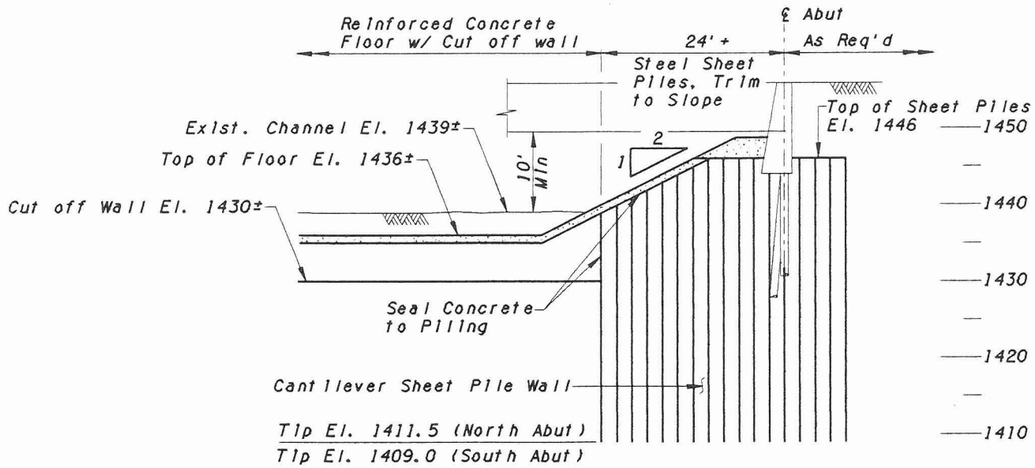
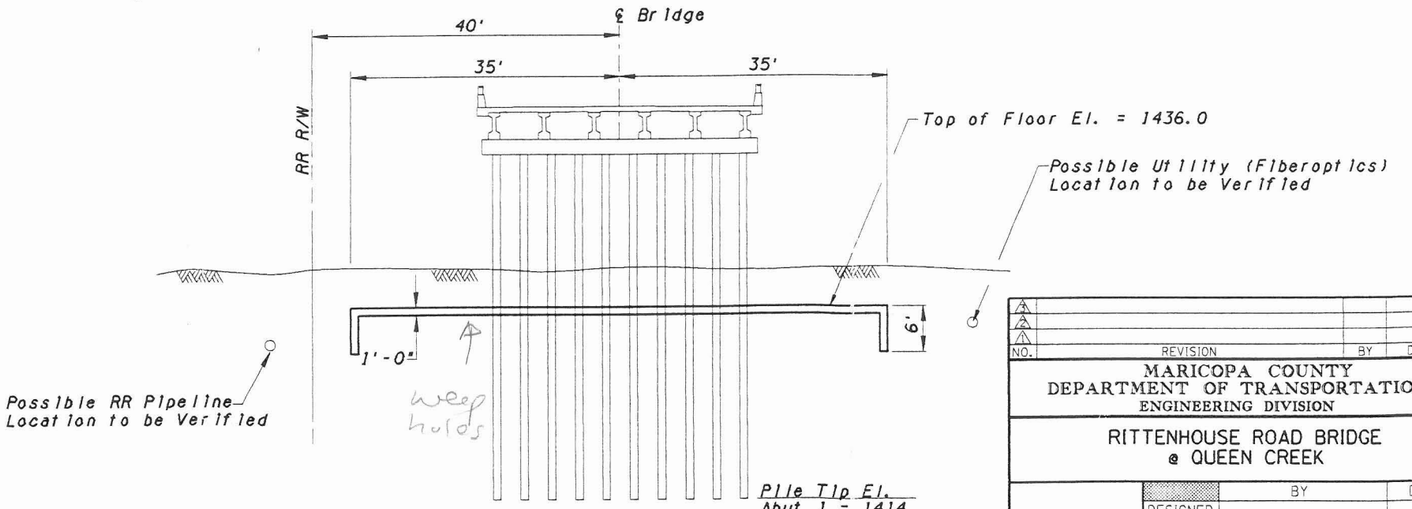


SECTION A-A
NTS



SECTION B-B

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

RITTENHOUSE ROAD BRIDGE
@ QUEEN CREEK

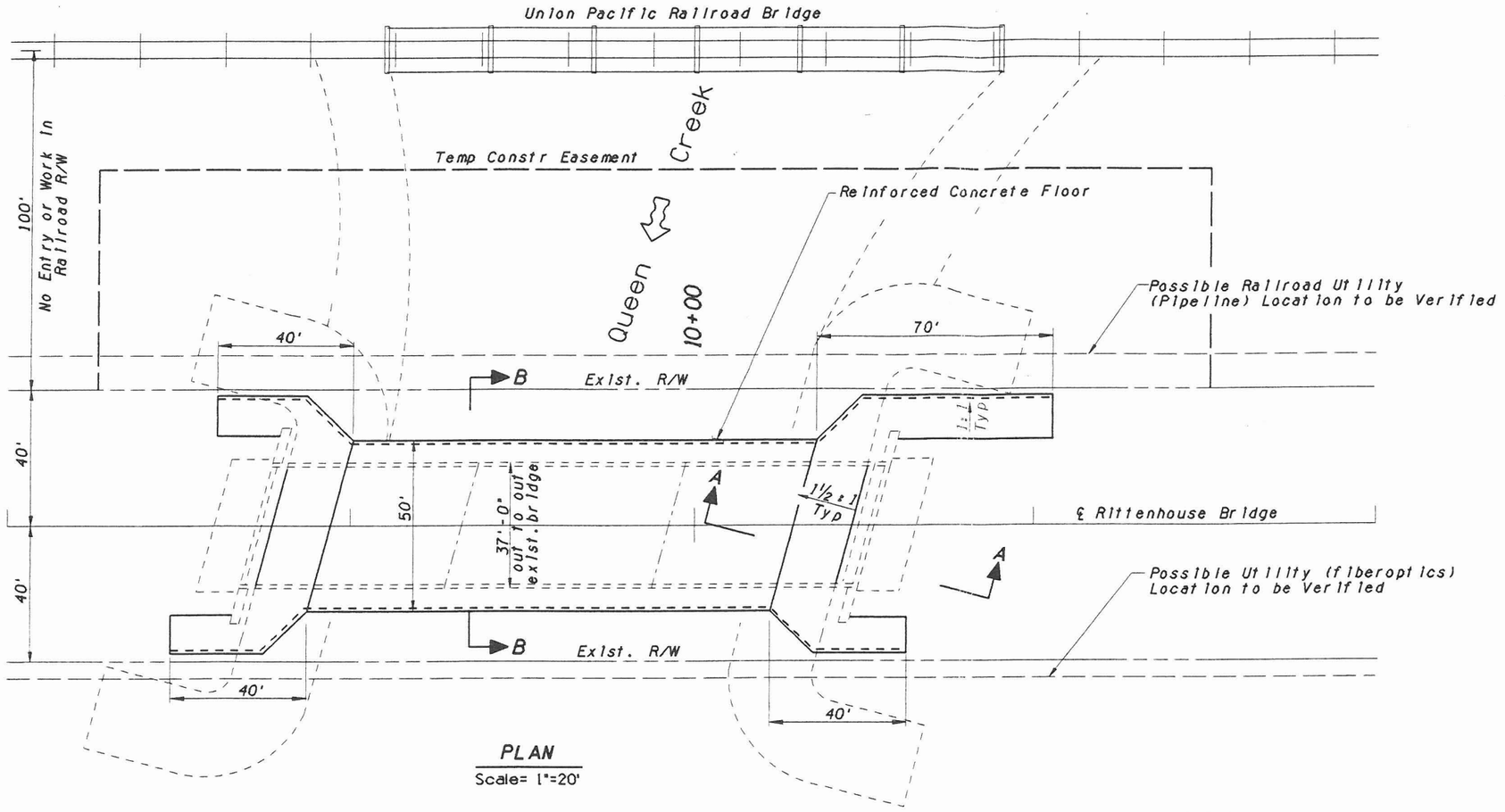
		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED		
	DRAWN	RON WIETZEMA	7/08/97
	CHECKED		

INCA ENGINEERS INC.

ALTERNATIVE NO. 2 — SHEET OF

Appendix D
Alternative 3 Details

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ.				



PLAN

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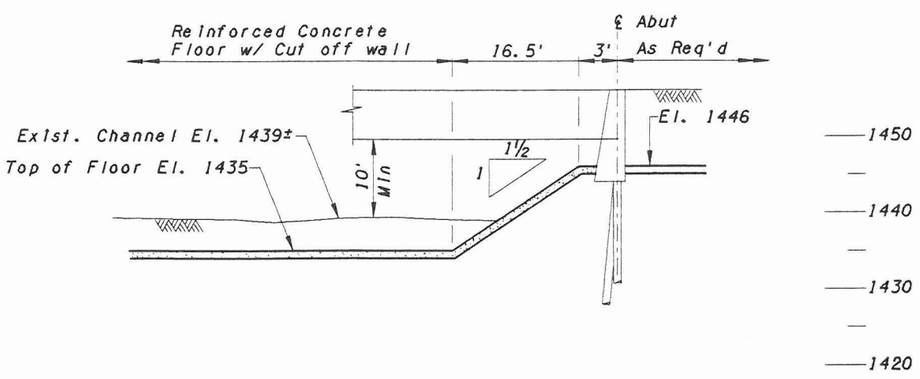
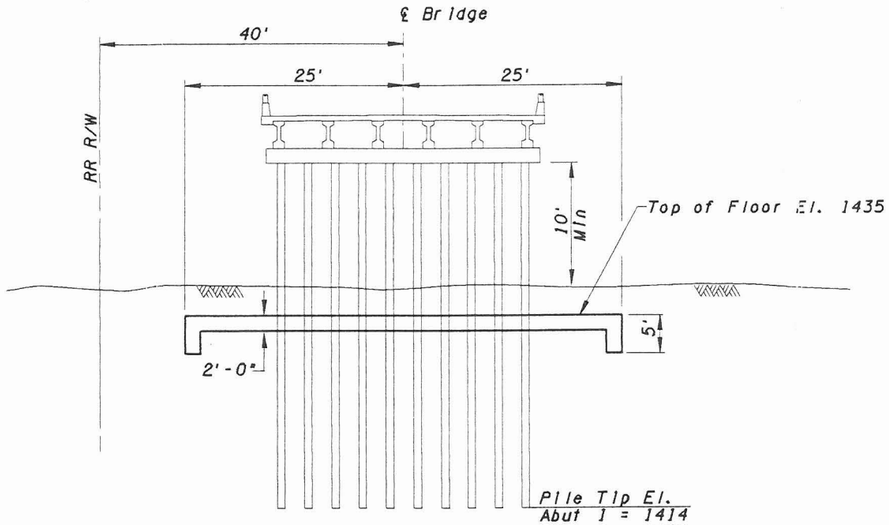


SECTION A-A



Pile Tip El.
Abut 1 = 1414
Pier 1 = 1406
Pier 2 = 1408
Abut 2 = 1409

SECTION B-B

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

RITTENHOUSE ROAD BRIDGE
@ QUEEN CREEK

PRELIMINARY
NOT FOR
CONSTRUCTION

	BY	DATE
DESIGNED		
DRAWN	RON WIETZEMA	7/08/97
CHECKED		

INCA ENGINEERS INC.

ALTERNATIVE NO. 3

SHEET OF

Appendix E
Hydraulic Calculations

HEC-RAS

100-year Discharge

Contraction Scour

	Channel
Input Data	
Average Depth (ft):	3.36
Approach Velocity (ft/s):	6.21
Br Average Depth (ft):	3.31
BR Opening Flow (cfs):	3010.00
BR Top WD (ft):	140.89
Grain Size D50 (ft):	0.0014
Approach Flow (cfs):	3010.00
Approach Top WD (ft):	144.21
K1 Coefficient:	0.690
Results	
Scour Depth Ys (ft):	0.10
Critical Velocity (ft/s):	1.50
Equation:	Live

Pier Scour

All piers have the same scour depth

Input Data	
Pier Shape:	Round nose
Pier Width (ft):	5.33
Grain Size D50 (ft):	0.00138
Depth Upstream (ft):	4.53
Velocity Upstream (ft/s):	7.31
K1 Nose Shape:	1.00
Pier Angle:	5.00
Pier Length (ft):	39.00
K2 Angle Coef:	1.30
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.50000
K4 Armouring Coef:	1.00
Results	
Scour Depth Ys (ft):	11.60
Froude #:	0.60
Equation:	CSU

equation

Long-Term Scour

Assumed	4.00

Abutment Scour 0.00

Combined Scour Depths

Pier + Contraction + Long-Term Scour (ft):

Total Scour (ft) 15.71

HEC-RAS

500-year Discharge

Contraction Scour

	Channel
Input Data	
Average Depth (ft):	4.50
Approach Velocity (ft/s):	7.67
Br Average Depth (ft):	4.39
BR Opening Flow (cfs):	5150.00
BR Top WD (ft):	145.84
Grain Size D50 (ft):	0.0014
Approach Flow (cfs):	5150.00
Approach Top WD (ft):	149.33
K1 Coefficient:	0.690
Results	
Scour Depth Ys (ft):	0.18
Critical Velocity (ft/s):	1.58
Equation:	Live

Pier Scour

All piers have the same scour depth

Input Data	
Pier Shape:	Square nose
Pier Width (ft):	5.33
Grain Size D50 (ft):	0.00138
Depth Upstream (ft):	5.79
Velocity Upstream (ft/s):	8.81
K1 Nose Shape:	1.10
Pier Angle:	5.00
Pier Length (ft):	39.00
K2 Angle Coef:	1.30
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.50000
K4 Armouring Coef:	1.00
Results	
Scour Depth Ys (ft):	14.30
Froude #:	0.64
Equation:	CSU

equation

Long-Term Scour

Assumed	4.00

Abutment Scour 0.00

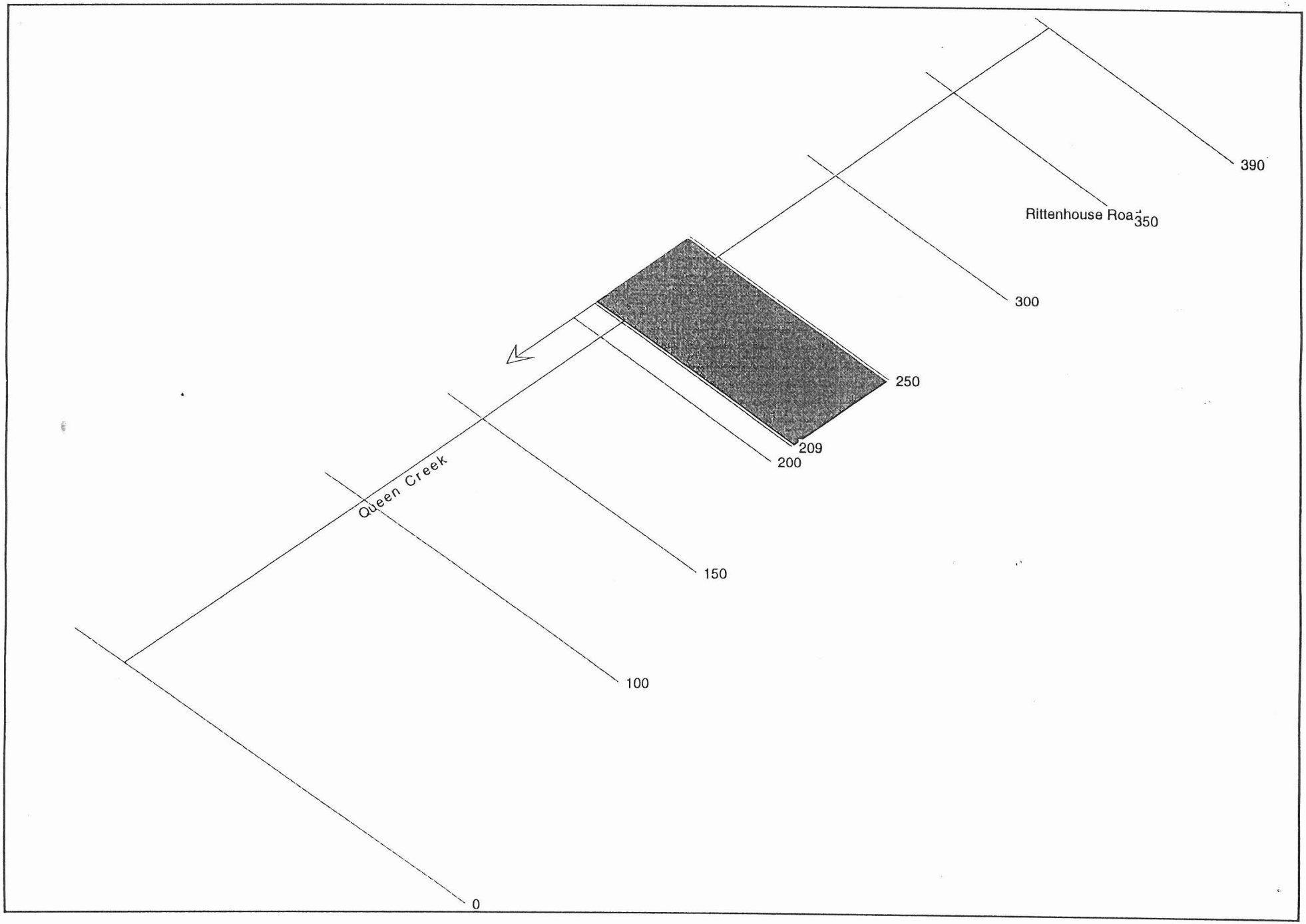
Combined Scour Depths

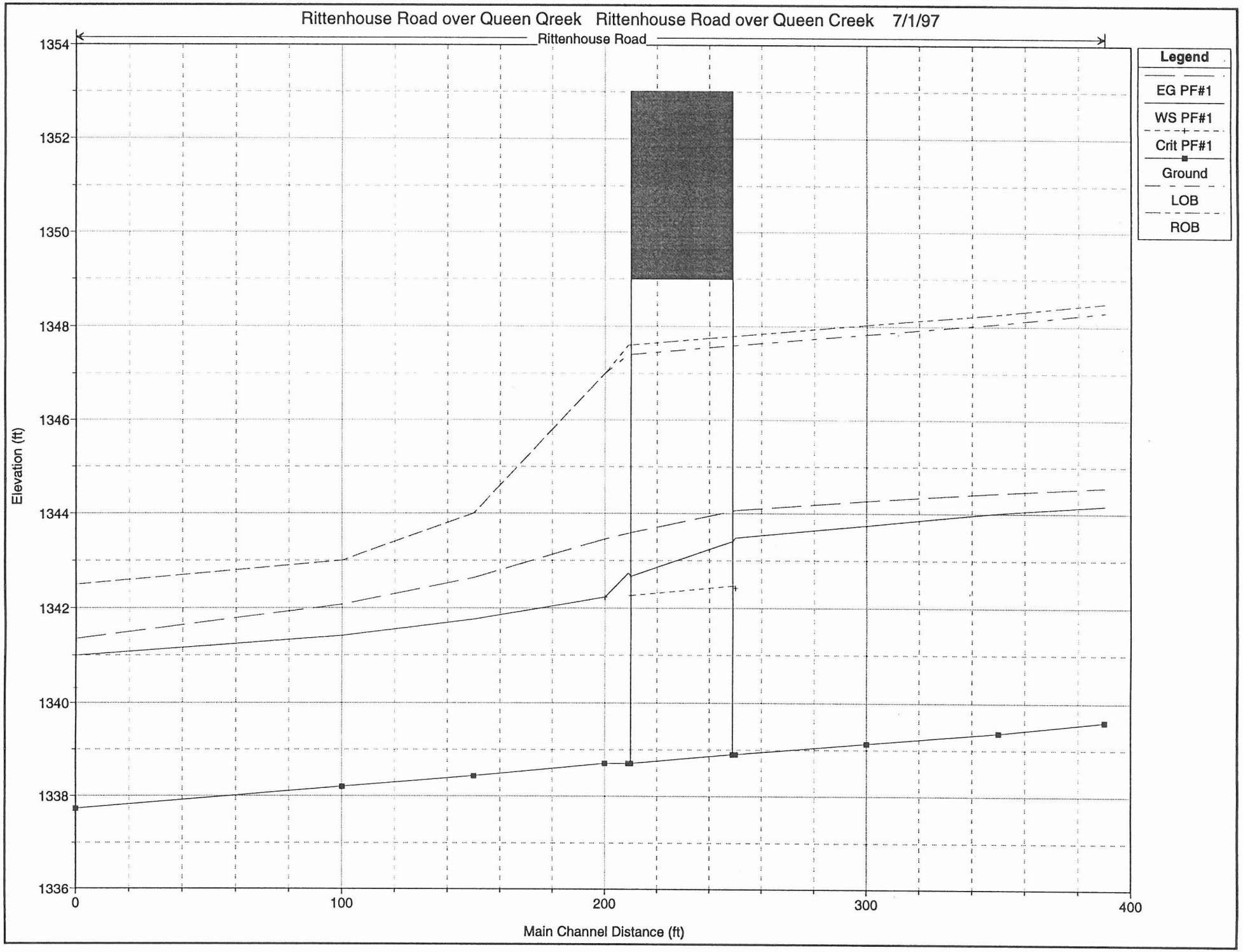
Pier + Contraction + Long-Term Scour (ft):

Total Scour (ft) 18.48

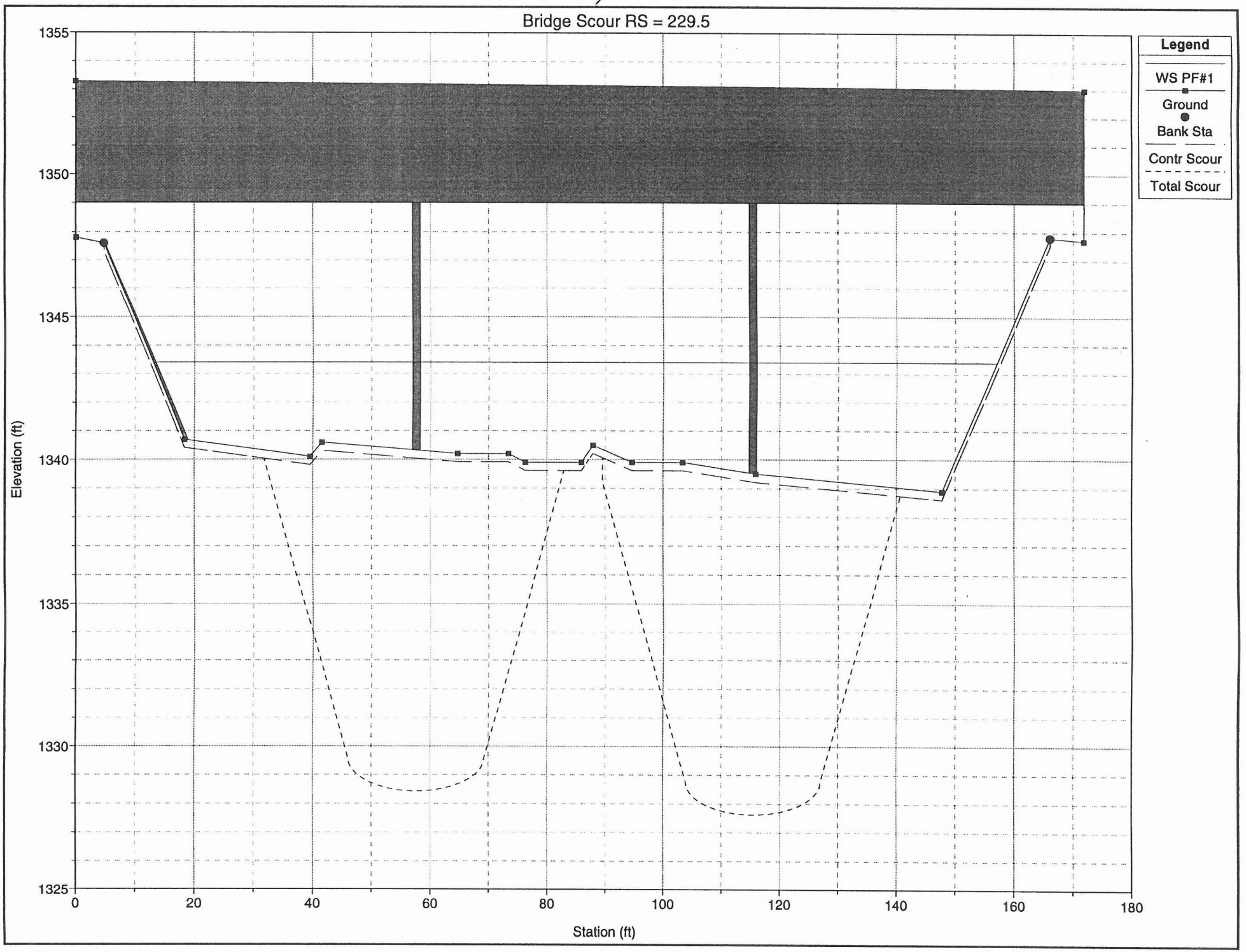
HEC-RAS Plan: Rittenhouse River: Queen Creek Reach: Rittenhouse Road

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Rittenhouse Road	390	3010.00	1339.60	1344.32		1344.65	0.002091	4.62	651.69	169.21	0.41
Rittenhouse Road	390	5150.00	1339.60	1345.75		1346.26	0.002187	5.77	893.11	169.23	0.44
Rittenhouse Road	350	3010.00	1339.37	1343.90		1344.51	0.004408	6.25	481.85	144.13	0.60
Rittenhouse Road	350	5150.00	1339.37	1345.18		1346.10	0.004527	7.69	670.07	149.29	0.64
Rittenhouse Road	300	3010.00	1339.13	1343.69		1344.29	0.004327	6.21	484.66	144.21	0.60
Rittenhouse Road	300	5150.00	1339.13	1344.96		1345.87	0.004498	7.67	671.44	149.33	0.64
Rittenhouse Road	250	3010.00	1338.90	1343.48	1342.42	1344.07	0.004226	6.16	488.24	144.31	0.59
Rittenhouse Road	250	5150.00	1338.90	1344.74	1343.49	1345.65	0.004458	7.65	673.32	149.38	0.63
Rittenhouse Road	229.5	Bridge									
Rittenhouse Road	209	3010.00	1338.71	1342.74		1343.58	0.007379	7.34	410.30	142.12	0.76
Rittenhouse Road	209	5150.00	1338.71	1343.88		1345.13	0.007376	8.97	574.31	146.69	0.80
Rittenhouse Road	200	3010.00	1338.71	1342.23	1342.23	1343.45	0.013613	8.86	339.91	140.83	1.00
Rittenhouse Road	200	5150.00	1338.71	1343.29	1343.29	1345.00	0.012300	10.50	490.35	145.35	1.01
Rittenhouse Road	150	3010.00	1338.43	1341.76		1342.64	0.011109	7.53	399.72	182.35	0.90
Rittenhouse Road	150	5150.00	1338.43	1342.50	1342.50	1343.93	0.012712	9.58	537.33	188.73	1.00
Rittenhouse Road	100	3010.00	1338.20	1341.41		1342.08	0.009003	6.54	460.39	222.13	0.80
Rittenhouse Road	100	5150.00	1338.20	1342.12		1343.19	0.010206	8.28	621.74	231.02	0.89
Rittenhouse Road	0	3010.00	1337.73	1341.00	1340.31	1341.35	0.004676	4.78	629.47	297.34	0.58
Rittenhouse Road	0	5150.00	1337.73	1341.84	1340.98	1342.36	0.004677	5.82	885.08	311.46	0.61

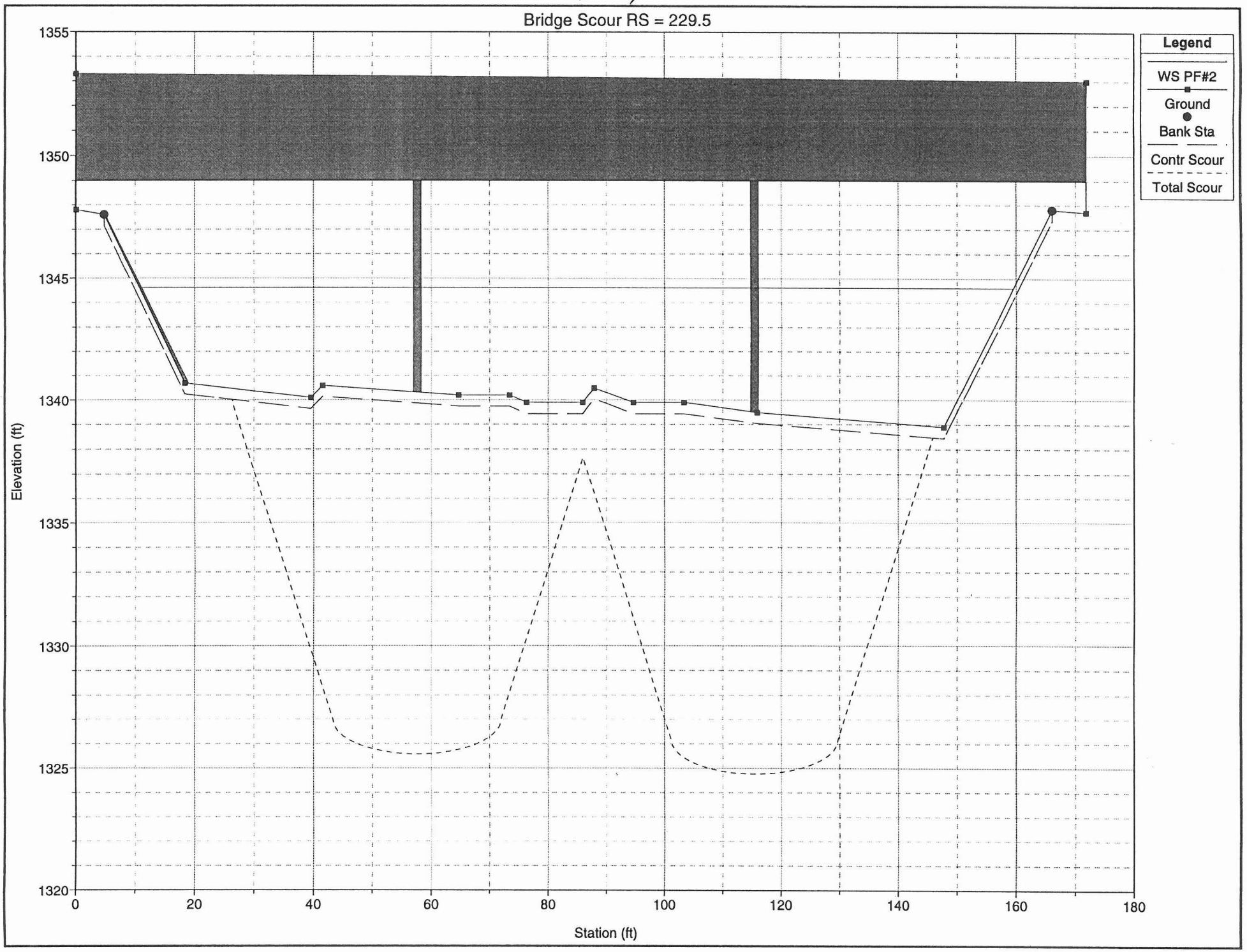

390
Rittenhouse Road
350
300
250
209
200
Queen Creek
150
100
0


Rittenhouse Road over Queen Qreek Rittenhouse Road over Queen Creek 7/1/97
Rittenhouse Road
Legend
EG PF#1
WS PF#1
Crit PF#1
Ground
LOB
ROB
Elevation (ft)
1354
1352
1350
1348
1346
1344
1342
1340
1338
1336
0
100
200
300
400
Main Channel Distance (ft)

100 yr


Bridge Scour RS = 229.5
Legend
WS PF#1
Ground
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
1355
1350
1345
1340
1335
1330
1325
0
20
40
60
80
100
120
140
160
180
Station (ft)

500yr


Bridge Scour RS = 229.5
Legend
WS PF#2
Ground
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
1355
1350
1345
1340
1335
1330
1325
1320
0
20
40
60
80
100
120
140
160
180
Station (ft)

REVIEW MEETING
INCA / RITTENHOUSE RD

NAME	AGENCY	PHONE
TOM SONNEMANN	MCDOT	506-4880
DAVID CHAPIN	INCA	277-8161
Dennis Trefren	INCA	" "
Richard Hiner	Wood/Patel	234-1344
NING MAO	FCD	506-1501
KOFI AWUMAH	FCD	506-1501

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