

**Meeting of the Central Valley Flood Protection Board
September 28, 2012
Staff Report – Encroachment Permit
City of Reedley
Manning Avenue Bridge Replacement at Kings River, Fresno County**

1.0 – ITEM

Consider approval of Permit No. 18739 (Attachment B).

2.0 – APPLICANT

City of Reedley, Fresno County.

3.0 – LOCATION

The project is located in the City of Reedley, Fresno County, along Manning Avenue crossing the Kings River, about 11 miles east of State Route 99 south of Fresno (see Attachment A).

4.0 – DESCRIPTION

The applicant proposes to replace the existing bridge on Manning Avenue over the Kings River with a new bridge (Caltrans No. 42C 0010). The proposed bridge will be a three-span cast-in-place pre-stressed concrete box girder bridge approximately 440-feet long and 91.5-feet wide.

5.0 – PROJECT ANALYSIS

5.1 – Authority of the Board

- Title 23, §112, Regulated Streams, Table 8.1, §128, Bridges

The overall design of the proposed project is found to be in compliance with Title 23 standards as described in Sections 5.2 and 5.3 below. The existing bridge constructed

in 1929 will be replaced with a new structure that meets new structural standards under the Highway Bridge Rehabilitation and Replacement program of the Caltrans (see Attachment C).

5.2 – Hydraulic Analysis

The model used to perform a one-dimensional hydraulic analysis was the U.S. Army Corps of Engineers, Hydrologic Engineering Center River Analysis System (HEC-RAS). A Manning's roughness coefficient of 0.055 was used in the channel for both existing and proposed conditions. The analysis modeled the 100-year flood event with a design flow of 19,800 cfs (see Attachment D).

According to the modeling results the water surface elevation (WSE) in the vicinity of the proposed bridge during a 100-year flow will be 311.89 feet, which is about 0.15 feet lower than modeled with the existing bridge. This is due to a decrease in the number of piers in the replacement bridge design. The freeboard under the soffit of the new bridge is modeled to be 11.11 feet with a flow velocity of 2.8 feet per second. The analysis concluded that scouring is not critical and the hydraulic impact is negligible on the floodway for the proposed bridge project.

5.3 – Geotechnical Analysis

The liquefaction potential of the project site is considered relatively low due to the low seismicity of the general area. Staff reviewed the design plans and agreed with the applicant's conclusion that the proposed project would not result in any significant geotechnical impacts on the floodway. All work to be completed will be done in a manner that does not pose a threat to the structural integrity of the channel, structures, or floodway. Earthwork will be completed in compliance with the conditions of Draft Permit No. 18739 (Attachment B) and Title 23 Standards.

6.0 – AGENCY COMMENTS AND ENDORSEMENTS

The comments and endorsements associated with this project, from all pertinent agencies are shown below:

- The U.S. Army Corps of Engineers 208.10 comment letter has not been received for this application. Staff anticipates receipt of a letter indicating that the USACE District Engineer has no objection to the project, subject to conditions. Upon receipt of the letter, staff will review to ensure conformity with the permit language and incorporate it into the permit as Exhibit A.

7.0 – CEQA ANALYSIS

Board staff has prepared the following CEQA findings:

The Board, as a responsible agency under CEQA, has reviewed Initial Study/Mitigated Negative Declaration (IS/MND) (SCH Number: 2009051117, July 2009) and Mitigation Measures for the Manning Avenue Bridge Replacement Project prepared by the lead agency, the City of Reedley. These documents, including project design, may be viewed or downloaded from the Central Valley Flood Protection Board website at <http://www.cvfpb.ca.gov/meetings/2012/07-27-2012.cfm> under a link for this agenda item. These documents are also available for review in hard copy at the Board and the City of Reedley offices.

The City of Reedley has determined that the project would not have a significant effect on the environment at the Reedley City Council Meeting on August 25, 2009 with Resolution 2009-060, and subsequently filed a Notice of Determination on August 27, 2009 with the Fresno County Clerk. Board staff finds that although the proposed project could have a potentially significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. The project proponent has incorporated mandatory mitigation measures into the project plans to avoid identified impacts or to mitigate such impacts to a point where no significant impacts will occur. These mitigation measures are included in the project proponent's IS/MND and address impacts to air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, and noise. The description of the mitigation measures are further described in the adopted IS/MND.

8.0 – SECTION 8610.5 CONSIDERATIONS

1. Evidence that the Board admits into its record from any party, State or local public agency, or nongovernmental organization with expertise in flood or flood plain management:

The Board will make its decision based on the evidence in the permit application and attachments, this staff report, and any other evidence presented by any individual or group.

2. The best available science that related to the scientific issues presented by the executive officer, legal counsel, the Department or other parties that raise credible scientific issues.

The accepted industry standards for the work proposed under this permit as regulated by Title 23 have been applied to the review of this permit.

3. Effects of the decision on the facilities of the State Plan of Flood Control, and consistency of the proposed project with the Central Valley Flood Protection Plan as adopted by Board Resolution 2012-25 on June 29, 2012:

Since the proposed project does not impair the structural or hydraulic functions of the Kings River floodway, the project has no adverse effect on facilities of the State Plan of Flood Control, and is consistent with the Central Valley Flood Protection Plan.

4. Effects of reasonable projected future events, including, but not limited to, changes in hydrology, climate, and development within the applicable watershed:

There are no foreseeable projected future events that would impact this project.

9.0 – STAFF RECOMMENDATION

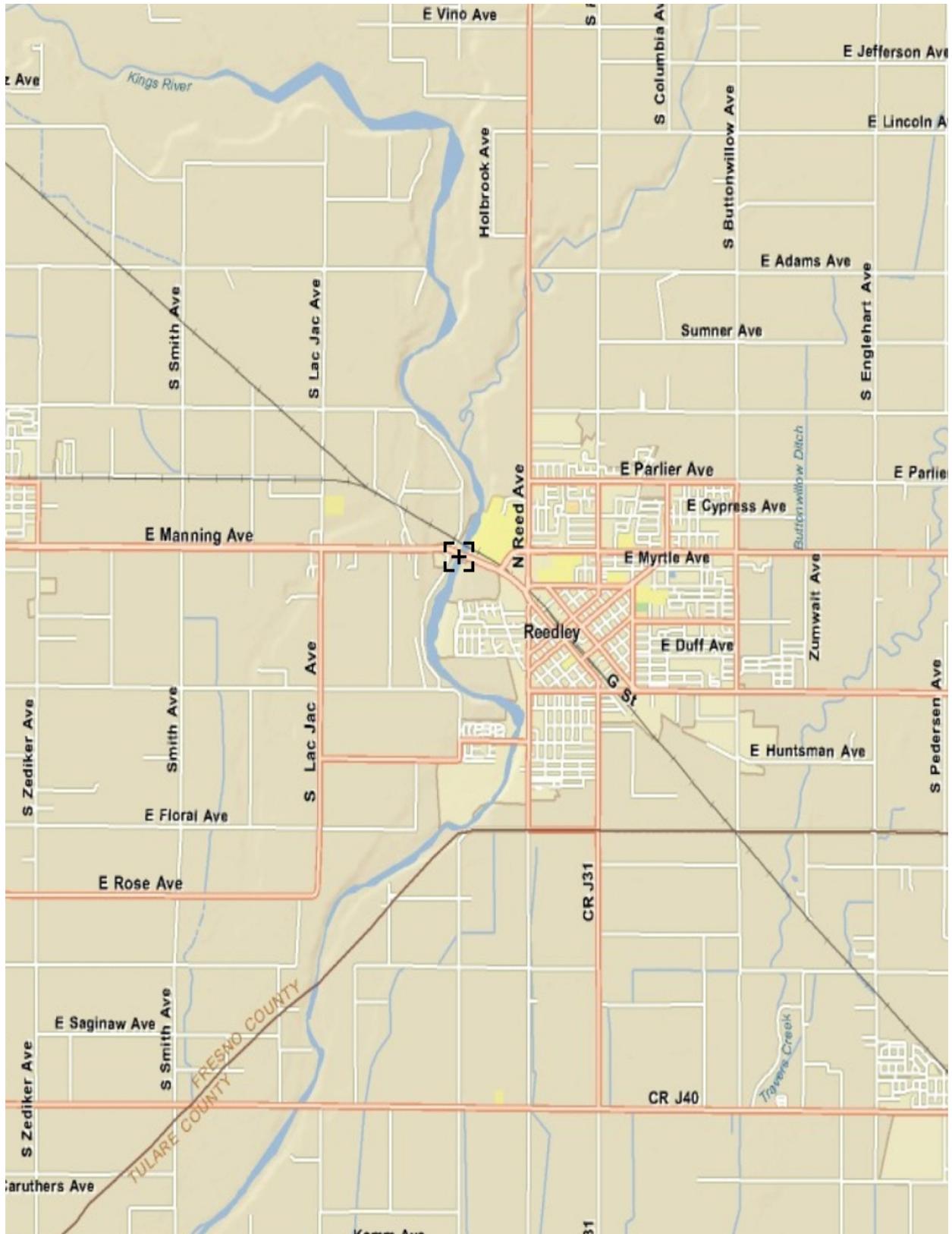
Staff recommends that the Board adopt the CEQA findings, approve the permit conditioned upon receipt of a U.S. Army Corps of Engineers comment letter indicating that the District Engineer has no objection to the project subject to any conditions provided, and direct staff to file a Notice of Determination with the State Clearinghouse.

10.0 – LIST OF ATTACHMENTS

- A. Location Map
- B. Draft Permit No. 18739
- C. General and Foundation Plan
- D. Profile and HEC-RAS Output

Technical Review:	Sergio Guillen, Atkins
Staff Recommendations:	Lee Sungho
Environmental Review:	James Herota
Document Review:	David R. Williams, PE, Eric Butler, PE, Len Marino, PE

ATTACHMENT A – LOCATION MAP





DRAFT

STATE OF CALIFORNIA
THE RESOURCES AGENCY
THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 18739 BD

This Permit is issued to:

City of Reedley
1733 Ninth Street
Reedley, California 93654

To replace the existing Manning Avenue Bridge over the Kings River, which is 440 ft. long, 89 ft. - 4 in. wide, with 40 to 80 ft. spans; located on Manning Avenue approximately 11 miles east of Interstate 99 south of Fresno; with a new 3-span, cast-in-place, pre-stressed concrete box girder bridge, approximately 440 ft. long, with a full deck width of 91.5 ft that will accommodate 4 travel lanes and shoulders, and pier column width of 6 ft. into an 8 ft. shaft; planting of riparian vegetation onsite.

At the intersection of the Kings River and Manning Avenue in Reedley, CA (Section 21, 22, 27, & 28, T15S, R23E, W, Kings River Conservation District, Kings River, Fresno County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

(SEAL)

Dated: _____

Executive Officer

GENERAL CONDITIONS:

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any

other land.

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 18739 BD

THIRTEEN: All work approved by this permit shall be in accordance with the submitted drawings and specifications except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of the Central Valley Flood Protection Board.

FOURTEEN: The permittee shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Department of Water Resources or any other agency responsible for maintenance.

FIFTEEN: The permittee shall contact the Department of Water Resources, Inspection Branch by telephone, (916) 574-0609, and submit the enclosed postcard to schedule a preconstruction conference. The permittee shall also contact the Central Valley Flood Protection Board's Construction Supervisor at (916) 574-2646 for quality assurance inspection. Failure to do so at least 10 working days prior to start of work may result in delay of the project.

SIXTEEN: The Central Valley Flood Protection Board and Department of Water Resources shall not be held liable for any damages to the permitted encroachment(s) resulting from flood fight, operation, maintenance, inspection, or emergency repair.

SEVENTEEN: The permittee should contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, 1325 J Street, Sacramento, California 95814, telephone (916) 557-5250, as

compliance with Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act may be required.

EIGHTEEN: The permittee shall be responsible for repair of any damages to the project levee and other flood control facilities due to construction, operation, or maintenance of the proposed project.

NINETEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California, including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection Board's approval of this permit, including but not limited to claims filed pursuant to the California Environmental Quality Act. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

TWENTY: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

TWENTY-ONE: If the project, or any portion thereof, is to be abandoned in the future, the permittee or successor shall abandon the project under direction of the Central Valley Flood Protection Board and Department of Water Resources, at the permittee's or successor's cost and expense.

TWENTY-TWO: The permittee shall provide supervision and inspection services acceptable to the Central Valley Flood Protection Board. A professional engineer registered in the State of California shall certify that all work was inspected and performed in accordance with submitted drawings, specifications, and permit conditions.

TWENTY-THREE: Upon completion of the project, the permittee shall submit as-built drawings to: Department of Water Resources, Flood Project Inspection Section, 3310 El Camino Avenue, Suite Rm 256, Sacramento, California 95821.

TWENTY-FOUR: No construction work of any kind shall be done during the flood season from November 1 to July 15 without prior approval of the Central Valley Flood Protection Board.

TWENTY-FIVE: A temporary bench mark, set to a known datum, shall be placed at the project site during construction.

TWENTY-SIX: Temporary staging, formwork, stockpiled material and/or equipment shall not remain in the floodway during the flood season from November 1st to July 15.

TWENTY-SEVEN: The work area shall be restored to the condition that existed prior to start of work.

TWENTY-EIGHT: If the bridge is damaged to the extent that it may impair the channel or floodway capacity, it shall be repaired or removed prior to the next flood season.

TWENTY-NINE: If the planted trees result in an adverse hydraulic impact, the permittee will provide appropriate mitigation.

THIRTY: Trees, brush, sediment, and other debris shall be kept cleared from the bridge site and disposed of outside the floodway to maintain the design flow capacity and flowage area.

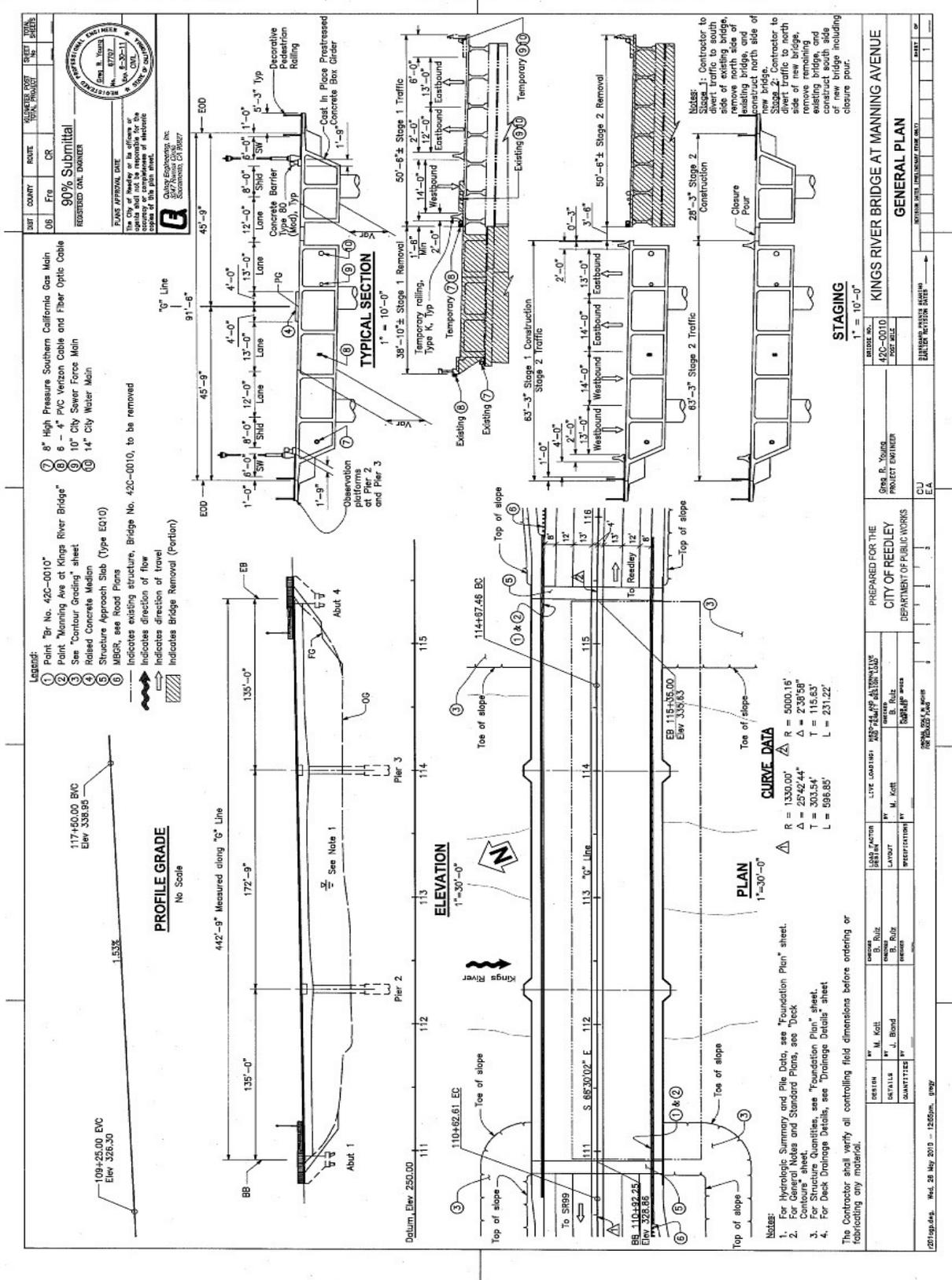
THIRTY-ONE: After each period of high water, debris that accumulates at the site shall be completely removed from the floodway.

THIRTY-TWO: In the event trees and brush are cleared, they shall be properly disposed of either by burning or removing from the floodway prior to the flood season.

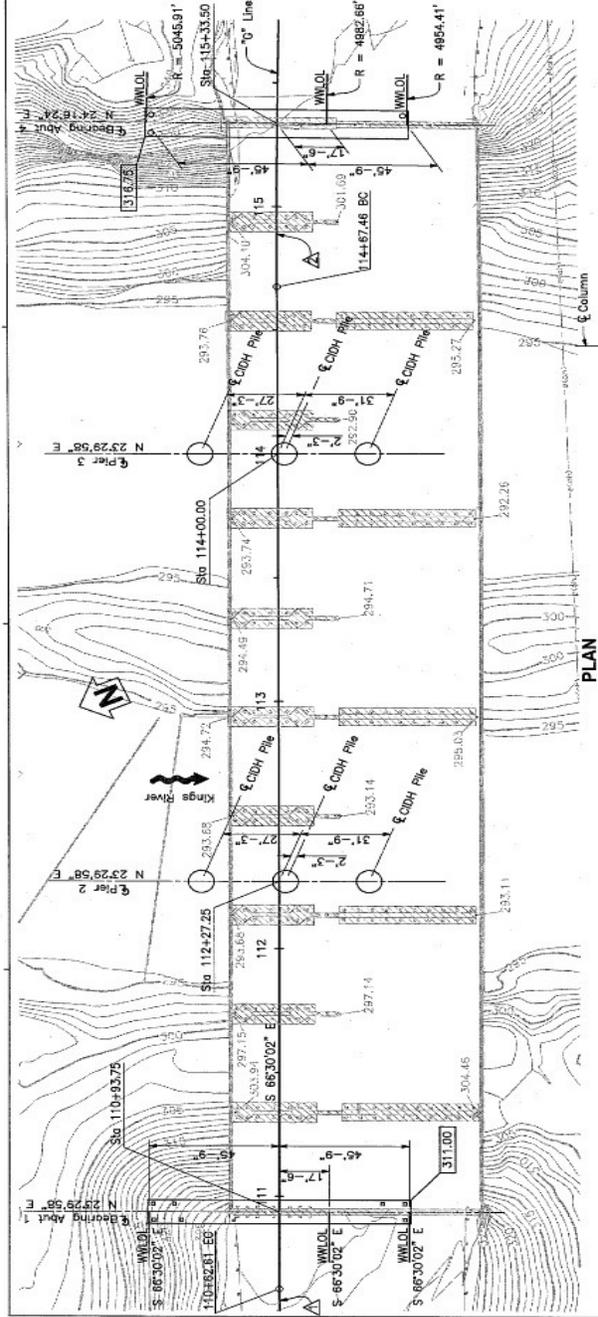
THIRTY-THREE: The ground surface shall be kept clear of fallen trees, branches, and debris.

THIRTY-FOUR: The mitigation measures approved by the CEQA lead agency and the permittee are found in its Mitigation and Monitoring Reporting Program (MMRP) adopted by the CEQA lead agency. The permittee shall implement all such mitigation measures.

THIRTY-FIVE: The permittee shall comply with all conditions set forth in the letter from the Department of the Army dated XXXX, 2012, which is attached to this permit as Exhibit A and is incorporated by reference.



DIST COUNTY ROUTE SHEET NO. TOTAL SHEETS
 06 Fts CR
90% Submittal
 REGISTERED CIVIL ENGINEER
 PLANS APPROVAL DATE
 THE City of Reedy or its officers or agents, hereby certifies that the accuracy and completeness of electronic copies of this plan sheet.
 QUALITY ENGINEERING, INC.
 1000 W. 10th Street
 Savannah, GA 31407
 REG. NO. 10000



- LEGEND**
- Indicates existing bridge to be removed
 - Indicates Direction of Flow
 - Indicates bottom of footing elevation
 - Indicates 108" Cast-In-Drilled-Hole Concrete Piling
 - Indicates 24" Cast-In-Drilled-Hole Concrete Piling (not all piles shown)
 - Indicates Class 200 AH "X" Concrete Piling (not all piles shown)

QUANTITIES

CURVE DATA

$\Delta R = 1330.00'$ $\Delta A = 2542.44'$ $\Delta T = 303.54'$ $\Delta L = 596.85'$
 $R = 5000.16'$ $\Delta = 2'38.58"$ $T = 115.63'$ $L = 231.22'$

BENCHMARK DATA

No.	NORTHING	EASTING	ELEVATION	LINE	STATION	OFFSET
311	2103470.25	6425177.16	351.53	"6"	115+77.16	321.48' LT
48	21032419.12	6424856.77	305.94	"6"	111+61.23	137.95' RT
47	21032771.21	6424172.88	318.81	"6"	112+15.62	28.57' LT

PILE DATA TABLE

LOCATION	PILE TYPE	DESIGN LOADING (SERVICE)	NOMINAL RESISTANCE		DESIGN TIP ELEVATION	SPECIFIED TIP ELEVATION
			COMPRESSION (kips)	TENSION (kips)		
ABUT 1	Class 200 AH "X"	100 Tons	400	N/A	250.0 (1), 281.0 (2)	250.0
PIER 2	108" CDH Concrete Pile	N/A	5350	N/A	190.0 (1), 210.0 (2)	190.0
PIER 3	108" CDH Concrete Pile	N/A	5350	N/A	190.0 (1), 210.0 (2)	190.0
ABUT 4	24" CDH Concrete Pile	100 Tons	400	N/A	287.0 (1), 287.0 (2)	287.0

Note: Design Tip Elevation is controlled by the following demands:
 (1) Compression, (2) Lateral Loads

HYDROLOGIC SUMMARY

Drainage area: 1792 Square Miles

Design Flood	50	100
Base Flood	14,500	19,800

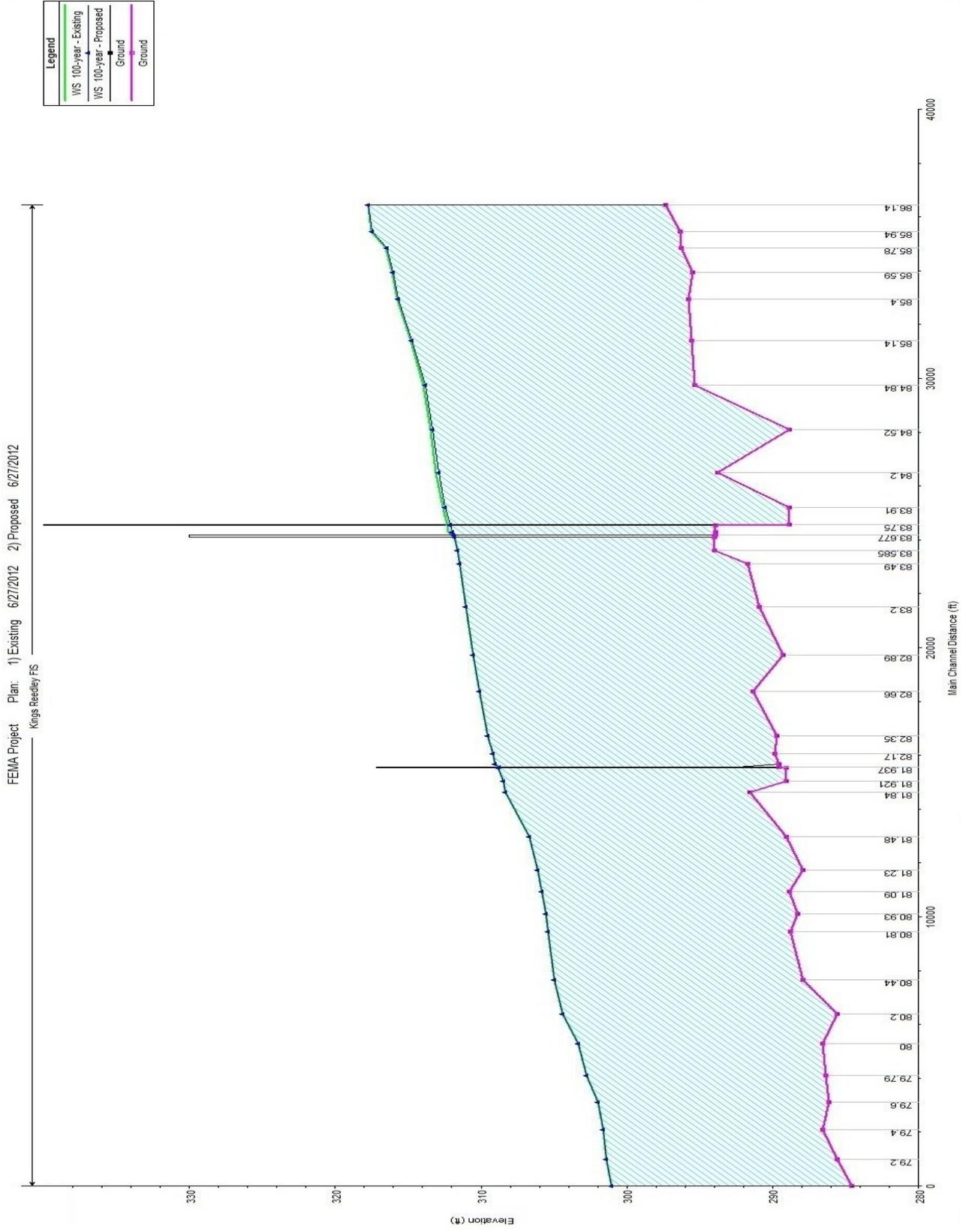
LIMITS OF PAYMENT FOR EARTHWORK AT PIERS

No Scale

Frequency (years) 50 100
 Discharge (cubic feet per second) 14,500 19,800
 Water Surface Elevation at Bridge (ft) 309.4 311.9
 Flood plain data based upon information available when the plans were prepared and are shown to meet Federal requirements. The accuracy of said information is not warranted by the City of Reedy and interested or affected parties should make their own investigations.

PREPARED FOR THE CITY OF REEDLEY DEPARTMENT OF PUBLIC WORKS
 PROJECT ENGINEER: Greg R. Young
 PROJECT NO.: 42C-0010
 SHEET NO.: 3 OF 3
 DATE: 18 May 2010 - 12:47 Pm. 2010

ATTACHMENT D – PROFILE AND HEC-RAS OUTPUT



FINAL DRAFT

APPENDIX F – HEC-RAS OUTPUT

HEC-RAS Plan: Plan35 River: Kings Reach: Reedley FIS													
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 #	Chl	Froude #
79	100-year	19800	284.55	301.06	291.94	301.16	0.000387	3.13	8126.44	879.25	0.15		0.15
79	50-year	14500	284.55	291.02	291.02	293.01	0.025729	11.49	1312.77	337.87	0.97		0.97
79.2	100-year	19800	285.55	301.38		301.43	0.000188	2.22	11111.08	995.77	0.1		0.1
79.2	50-year	14500	285.55	295.4		295.51	0.000806	3.23	5589.38	864.62	0.19		0.19
79.4	100-year	19800	286.55	301.6		301.71	0.000323	2.74	7680.26	695.26	0.13		0.13
79.4	50-year	14500	286.55	296.3		296.48	0.000983	3.43	4320.67	576.53	0.21		0.21
79.6	100-year	19800	286.15	301.97		302.28	0.000878	4.5	4496.96	370.01	0.22		0.22
79.6	50-year	14500	286.15	297.49		297.88	0.001818	4.96	2940.92	335.9	0.29		0.29
79.79	100-year	19800	286.35	302.75		302.89	0.000431	3.5	7047.8	631.24	0.16		0.16
79.79	50-year	14500	286.35	298.88		299.07	0.000819	3.99	4627.77	617.97	0.2		0.2
80	100-year	19800	286.55	303.32		303.67	0.000964	4.9	4691.34	587.55	0.23		0.23
80	50-year	14500	286.55	299.98		300.37	0.001435	5.01	3039.21	402.48	0.27		0.27
80.2	100-year	19800	285.55	304.39		304.53	0.000635	3.14	6912.65	948.36	0.17		0.17
80.2	50-year	14500	285.55	301.58		301.75	0.001083	3.3	4538.53	746.09	0.22		0.22
80.44	100-year	19800	287.95	304.95		305.05	0.000293	2.84	8380.66	793.04	0.13		0.13
80.44	50-year	14500	287.95	302.36		302.45	0.000339	2.69	6393.77	743.69	0.13		0.13
80.81	100-year	19800	288.75	305.41		305.48	0.000187	2.33	9560.33	738.65	0.1		0.1
80.81	50-year	14500	288.75	302.85		302.91	0.000189	2.09	7724.04	698.63	0.1		0.1
80.93	100-year	19800	288.25	305.53		305.64	0.000284	2.84	8080.83	693.06	0.13		0.13
80.93	50-year	14500	288.25	302.98		303.08	0.000306	2.65	6323.56	684.15	0.13		0.13

FINAL DRAFT

81.09	100-year	19800	288.85	305.82	305.94	0.000452	3.05	7525.32	763.68	0.15
81.09	50-year	14500	288.85	303.32	303.43	0.000604	3.03	5622.54	756.7	0.17
81.23	100-year	19800	287.95	306.13	306.25	0.000369	2.8	7211.22	597.8	0.14
81.23	50-year	14500	287.95	303.7	303.8	0.000381	2.54	5797.07	566.07	0.14
81.48	100-year	19800	289.05	306.66	307.18	0.001397	5.79	3553.51	568.11	0.27
81.48	50-year	14500	289.05	304.29	304.69	0.001306	5.1	2845.61	231.07	0.26
81.84	100-year	19800	291.55	308.31	308.51	0.000493	3.77	6081.58	576.46	0.17
81.84	50-year	14500	291.55	305.84	306	0.000507	3.42	4759.51	492.31	0.16
81.921	100-year	19800	289.05	308.49	308.73	0.000498	3.87	5116.46	304.52	0.17
81.921	50-year	14500	289.05	306.03	306.2	0.000433	3.31	4375.3	297.06	0.15
81.937		Bridge								
82.06	100-year	19800	289.55	309.04	309.16	0.000338	2.98	7476.73	661.24	0.14
82.06	50-year	14500	289.55	306.48	306.59	0.000369	2.76	5822.43	631	0.14
82.17	100-year	19800	289.85	309.15	309.35	0.000435	3.89	6498.64	674.53	0.16
82.17	50-year	14500	289.85	306.61	306.78	0.000446	3.57	4920.76	564.72	0.16
82.35	100-year	19800	289.73	309.51	309.64	0.000405	2.98	6683.58	533.25	0.15
82.35	50-year	14500	289.73	306.96	307.07	0.000398	2.71	5383.12	487.97	0.14
82.66	100-year	19800	291.35	310.09	310.22	0.000307	3.14	7114.4	521.06	0.13
82.66	50-year	14500	291.35	307.52	307.63	0.000296	2.81	5804.3	502.03	0.13
82.89	100-year	19800	289.29	310.52	310.62	0.000293	2.6	7627.32	559.6	0.12
82.89	50-year	14500	289.29	307.95	308.04	0.000306	2.34	6203.86	550.41	0.12
83.2	100-year	19800	290.95	311.04	311.12	0.000259	2.33	8551.8	705.95	0.12
83.2	50-year	14500	290.95	308.5	308.57	0.000284	2.14	6796.49	677.94	0.12

FINAL DRAFT

83.49	100-year	19800	291.68	311.45	311.55	0.000275	2.59	7655.19	547.87	0.12
83.49	50-year	14500	291.68	308.93	309.02	0.000269	2.3	6301.11	529.06	0.12
83.585	100-year	19800	294	311.59	311.73	0.000411	3.21	6807.91	596.62	0.15
83.585	50-year	14500	294	309.07	309.2	0.000449	2.98	5332.45	575.81	0.15
83.677		Bridge								
83.7	100-year	19800	293.9	311.97	312.09	0.000349	2.78	7115.78	547.58	0.14
83.7	50-year	14500	293.9	309.46	309.56	0.000363	2.52	5763.34	527.72	0.13
83.701	100-year	19800	293.9	311.96	312.09	0.00045	2.88	6886.67	547.55	0.14
83.701	50-year	14500	293.9	309.45	309.56	0.000464	2.62	5542.06	513.66	0.14
83.702	100-year	19800	293.9	311.97	312.1	0.000449	2.88	6891.7	547.61	0.14
83.702	50-year	14500	293.9	309.46	309.57	0.000463	2.61	5546.92	513.79	0.14
83.704	100-year	19800	293.9	311.98	312.1	0.000347	2.78	7123.95	547.67	0.14
83.704	50-year	14500	293.9	309.47	309.57	0.000362	2.51	5771.36	527.92	0.13
83.75		Bridge								
83.91	100-year	19800	288.84	312.42	312.56	0.000435	2.96	6715.98	580.75	0.15
83.91	50-year	14500	288.84	309.95	310.06	0.000471	2.71	5346.8	529.32	0.15
84.2	100-year	19800	293.75	312.9	312.99	0.000254	2.63	8236.86	715.8	0.12
84.2	50-year	14500	293.75	310.43	310.51	0.000258	2.36	6630.82	593.71	0.12
84.52	100-year	19800	288.82	313.32	313.4	0.000251	2.35	9031.76	1013.97	0.11
84.52	50-year	14500	288.82	310.87	310.94	0.000275	2.17	6766.86	770.63	0.12
84.84	100-year	20500	295.35	313.8	314.02	0.00051	3.93	5854.46	497.03	0.17
84.84	50-year	15000	295.35	311.39	311.55	0.000462	3.36	4820.39	407.68	0.16

FINAL DRAFT

85.14	100-year	20500	295.55	314.72	315.02	0.000724	4.77	5056.13	411.17	0.2
85.14	50-year	15000	295.55	312.26	312.5	0.000721	4.29	4067.04	388.4	0.2
85.4	100-year	20500	295.75	315.65	315.78	0.00037	3.39	7936.99	910.9	0.14
85.4	50-year	15000	295.75	313.19	313.32	0.000417	3.26	6038.47	749.44	0.15
85.59	100-year	20500	295.45	316.01	316.24	0.000515	3.88	5630.48	539.18	0.17
85.59	50-year	15000	295.45	313.6	313.78	0.000488	3.39	4497.8	401.67	0.16
85.78	100-year	20500	296.25	316.46	317.14	0.001628	6.76	3305.74	292.33	0.29
85.78	50-year	15000	296.25	314.07	314.61	0.001551	5.95	2656.44	252.36	0.28
85.94	100-year	20500	296.35	317.43	317.54	0.000264	2.96	8881.15	873.12	0.12
85.94	50-year	15000	296.35	314.9	315	0.000281	2.76	6790.48	793.28	0.12
86.14	100-year	20500	297.35	317.71	317.82	0.000293	2.79	8059.02	1000.59	0.13
86.14	50-year	15000	297.35	315.2	315.3	0.000302	2.52	6179.32	554.29	0.13