

**Meeting of the Central Valley Flood Protection Board
January 22, 2016**

**Staff Report – Encroachment Permit
California Department of Transportation
Kern River Channel, Kern County**

1.0 – ITEM

Consider approval of Permit No. 19063. (Attachment B)

2.0 – APPLICANT

California Department of Transportation (Cal Trans)

3.0 – LOCATION

The project is located where the Kern River Channel crosses underneath Paso Robles Highway (CA 46) east of Interstate 5. (Kern River Channel, Kern County, see Attachment A)

4.0 – DESCRIPTION

The applicant proposes to replace the existing Main Flood Canal Bridge (Bridge Number 50-0030) with a new and wider bridge (Br. No. 50-0523).

5.0 – PROJECT ANALYSIS

Cal Trans is proposing to replace the existing two-lane Main Flood Canal Bridge with a four-span cast-in-place reinforced concrete slab bridge with a structure depth of 1.75 feet, a bridge length of approximately 142 feet, and a width of approximately 93 feet. There will be three piers consisting of 12- 20 inch concrete piles (Attachment C).

5.1 – Hydraulic Analysis

The hydraulic characteristics of the proposed bridge are described in the hydraulic summary (Attachment D). The bridge was analyzed using Hec-Ras hydraulic model for both the existing and proposed conditions. Comparisons were made for the US Army Corps of Engineers channel design capacity of 3,000 cubic feet per second (cfs). The new bridge increases the freeboard by just over one (1) foot. The proposed soffit elevation of 240 feet will be 3.06 feet above the water surface elevation of 236.94 feet. Average velocities were calculated to be 4.3 feet per second.

Scour analysis was completed and the maximum scour depth is calculated to be 4.2 feet. Cal Trans will reinstall sacked concrete slope protection for the new abutment slopes.

Board staff has determined that the proposed project is expected to result in no adverse hydraulic impacts to the Kern River Channel and is in compliance with Title 23.

5.2 – Geotechnical Analysis

A geotechnical report was provided to support the depth of the abutments and piers. However, there are no levees involved in the area of this project; therefore, no adverse geotechnical impacts are expected to the Kern River Channel floodway (Attachment E).

6.0 – AGENCY COMMENTS AND ENDORSEMENTS

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

- Buena Vista Water Storage District endorsed the application on September 23, 2015.
- The U.S. Army Corps of Engineers (USACE) Sacramento District non-fed letter was received December 30, 2015, and indicated that the proposed work does not affect a federally constructed project but recommends channel capacity remain as described in the Kern River Intertie Operation and Maintenance Manual. The letter has been incorporated into the permit as Exhibit A.

7.0 – CEQA ANALYSIS

Board staff has prepared the following California Environmental Quality Act (CEQA) analysis:

The Board, as a responsible agency under CEQA, has reviewed Initial Study/Mitigated Negative Declaration (IS/MND) (SCH Number: 2003041036, April 2003) and Mitigation Measures for the State Route 46 4-Lane Widening Project prepared by the lead agency, Caltrans. These documents including project design may be viewed or downloaded from the Board website at <http://www.cvpfb.ca.gov/meetings/2016/01-22-2016.cfm> under a link for this agenda item. The documents are also available for review in hard copy at both Board and Caltrans offices.

Caltrans determined the project would not have a significant effect on the environment on May 12, 2005 and filed a Notice of Determination on May 18, 2005 with the State Clearinghouse. 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 aesthetics, biological resources and cultural resources. 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. On the issue of hydraulic impacts Cal Trans developed and applied a HEC-RAS hydraulic model. This model is considered one of the best available scientific tools for the purpose of evaluating water surface elevation changes developed by the proposed project

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

This project has no adverse effects on facilities of the SPFC. The project is consistent with the Central Valley Flood Protection Plan and current Title 23 standards because it is predicted to result in no adverse impacts to water surface elevations, channel velocities or geotechnical impacts to SPFC facilities.

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

Staff does not anticipate any future projects that would impact the bridge structure and channel based on research of plans and other projects in the area.

9.0 – STAFF RECOMMENDATION

Staff recommends that the Board:

Adopt: the CEQA findings;

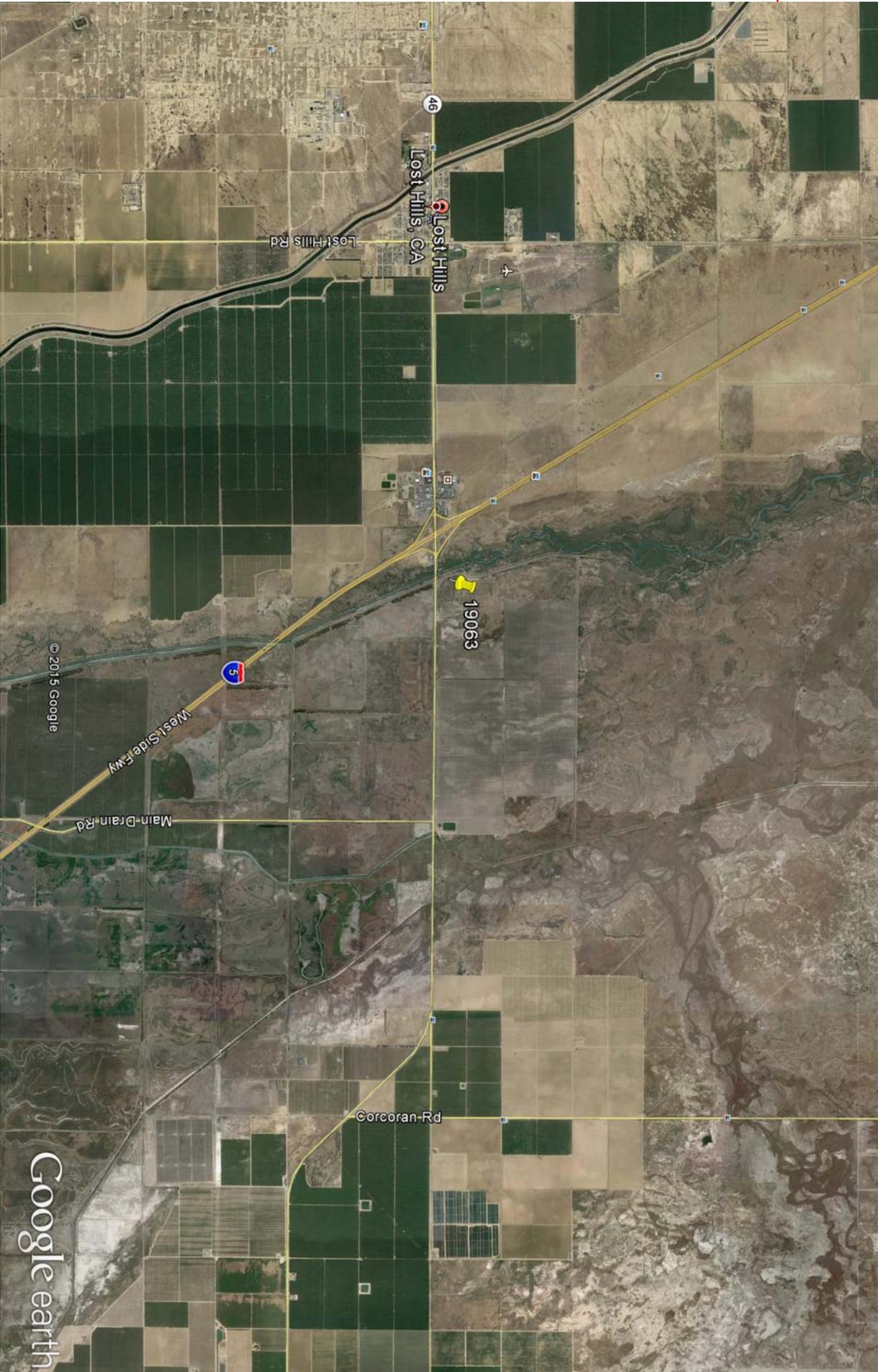
Approve: Encroachment Permit No. 19063, in substantially the form provided;

Direct: the Executive Officer to take the necessary actions to execute the permit and file a Notice of Determination pursuant to CEQA with the State Clearinghouse.

10.0 – LIST OF ATTACHMENTS

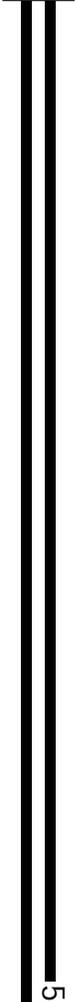
- A. Location Map and Photo
- B. Draft Permit No. 19063
- C. Design Plans
- D. Hydraulic Summary
- E. Geotechnical Report

Design Review:	Ilene Wellman-Barbree, PE, Senior Engineer, Permitting Branch
Environmental Review:	James Herota, Senior Environmental Scientist (Specialist)
Document Review:	Gary Lemon, P.E., Chief Permitting Section
	Mitra Emani, PE, Operation Branch Chief
Legal Review:	Nicole Rinke, Deputy Attorney General



Google Earth Pro

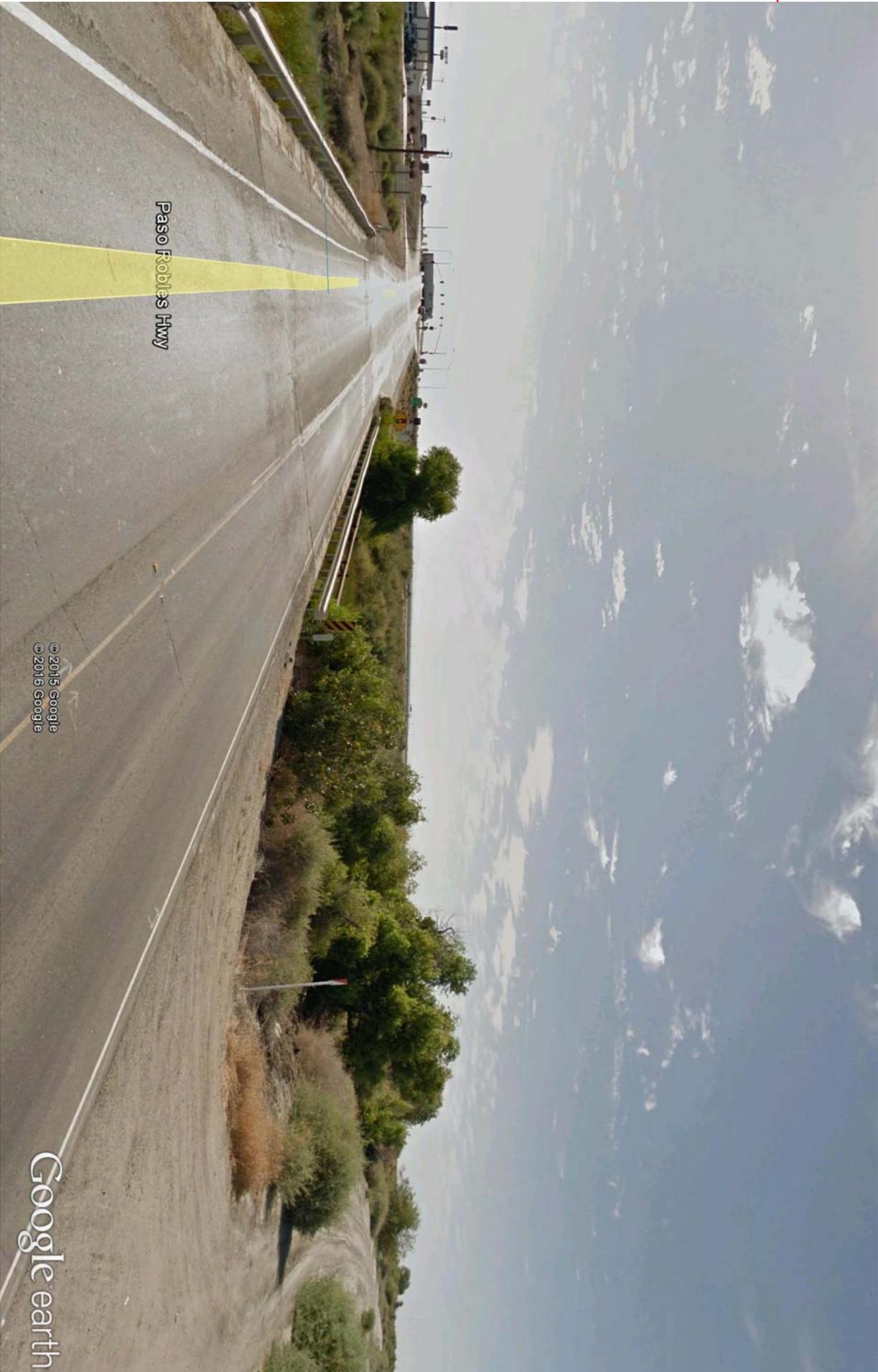
miles
km



5
9



Google earth



Google Earth Pro

feet
meters

10

5



Google earth

© 2015 Google
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Paso Robles Hwy

Main Flood Canal Bridge

Bridge No. 50-0523

06-KER-046-PM 32.8

EA: 06-442541



Photo 1: Existing Main Flood Canal Bridge (Br. No. 50-0030).
(Elevation view - facing north looking downstream)



Photo 2: Standing on Top of Bridge Deck Looking Upstream at Channel.
(Note the amount of cattail vegetation in the main channel)

DRAFT

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

PERMIT NO. 19063 BD

This Permit is issued to:

California Department of Transportation (Caltrans)
2215 East Shields Avenue
Fresno, California 93726

To replace the existing Main Flood Canal Bridge (Br. No. 50-0030) with a new 92 feet 11-1/2 inch wide 4-span CIP RC slab bridge accommodating four 12 ft wide lanes, 10 ft shoulders on each side, and a 22 ft center median. The new bridge will have a new bridge designation (Br. No. 50-0523).

The project is located where the Kern River Channel crosses underneath Paso Robles Highway east of Interstate 5. (Section 58, T26S, R22E, MDB&M, Buena Vista Water Storage District, West Side Canal, Kern 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. 19063 BD

LIABILITY AND IMDEMNIFICATION

THIRTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board (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 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.

FOURTEEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the 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.

FIFTEEN: The Board and the Department of Water Resources shall not be held liable for damages to the permitted encroachment(s) resulting from releases of water from reservoirs, flood fight, operation, maintenance, inspection, or emergency repair.

AGENCY CONDITIONS

SIXTEEN: The permittee shall comply with all conditions set forth in the letter from the U.S. Army Corps of Engineers District Engineer dated December 29, 2015, which is attached to this permit as Exhibit A and is incorporated by reference.

SEVENTEEN: The permittee agrees to incur all costs for compliance with local, State, and Federal permitting. If any conditions issued by other agencies conflict with any of the conditions of this permit, then the permittee shall resolve conflicts between any of the terms and conditions that agencies might impose under the laws and regulations it administers and enforces.

EIGHTEEN: If the permittee does not comply with the conditions of the permit and enforcement by the Board is required, the permittee shall be responsible for bearing all costs associated with the enforcement action, including reasonable attorney's fees. Permittee acknowledges that State law allows the imposition of fines in enforcement matters.

PRE-CONSTRUCTION

NINETEEN: The permittee shall contact the Board by telephone at (916) 574-0609, and submit the enclosed postcard to schedule a preconstruction conference. Failure to do so at least 10 working days prior to start of work may result in delay of the project.

TWENTY: Prior to commencement of work, the permittee shall create a photo record, including associated descriptions, of the existing bridge site conditions. The photo record shall be certified (signed and stamped) by a licensed land surveyor or licensed civil engineer registered in the State of California and submitted to the Board within thirty (30) calendar days of beginning the project.

CONSTRUCTION

TWENTY-ONE: 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 Board.

TWENTY-TWO: No construction work of any kind shall be done during the flood season from November 1 to July 15 without prior approval of the Board, and shall be removed after completion of the project.

TWENTY-THREE: No material stockpiles, temporary buildings, access ramps, or equipment shall remain in the floodway during the flood season from November 1 to July 15.

TWENTY-FOUR: Cleared trees and brush shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1 to July 15.

TWENTY-FIVE: Piers, bents, and abutments being dismantled shall be removed to at least one (1) foot below the natural ground line and at least three (3) feet below the bottom of the low water channel.

TWENTY-SIX: Backfill material for excavations shall be placed in four (4) to six (6) inch layers and compacted to at least the density of the adjacent, firm, undisturbed material.

TWENTY-SEVEN: Revetment shall be uniformly placed and properly transitioned into the bank or adjacent revetment and in a manner which avoids segregation.

TWENTY-EIGHT: The revetment shall not contain any reinforcing steel, floatable, or objectionable material. Asphalt or other petroleum-based products may not be used as fill or erosion protection within the floodway.

TWENTY-NINE: All debris generated by this project shall be disposed of outside the floodway.

POST-CONSTRUCTION

THIRTY: Except with respect to the activities expressly allowed under this permit, the work area shall be restored to the condition that existed prior to start of work.

THIRTY-ONE: Within 120 days of completion of the project, the permittee shall submit to the Board and DWR a copy of as-built drawings, stamped and signed by a licensed civil engineer registered in the State of California, certifying the work was performed and inspected in accordance with the Board permit conditions and submitted drawings and specifications.

OPERATIONS AND MAINTENANCE

THIRTY-TWO: The permittee shall be responsible for repair of any damages to the channel, banks, and floodway due to construction, operation, or maintenance of the proposed project.

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

THIRTY-FOUR: All debris that may accumulate around the bridge supports and abutments within the floodway shall be completely removed from the floodway following each flood season.

THIRTY-FIVE: If the bridge is damaged to the extent that it may impair the project design channel capacity, it shall be repaired or removed prior to the next flood season.

THIRTY-SIX: If the permitted encroachment(s) result in any adverse hydraulic impact or scouring the permittee shall provide appropriate mitigation acceptable to the Board.

THIRTY-SEVEN: The permitted encroachment(s) shall not interfere with the flood conveyance capacity of the Kern River Channel. If the permitted encroachment(s) are determined by any agency responsible for operation or maintenance of the flood control project to interfere, the permittee shall be required, at permittee's cost and expense, to modify or remove the permitted encroachment(s)

under direction of the Board. If the permittee does not comply, the Board may modify or remove the encroachment(s) at the permittee's expense.

PROJECT ABANDONMENT, CHANGE IN PLAN OF FLOOD CONTROL

THIRTY-EIGHT: If the project, or any portion thereof, is to be abandoned in the future, the permittee shall abandon the project under direction of the Board, at the permittee's cost and expense.

THIRTY-NINE: The permittee may be required, at permittee's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted encroachment(s) if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with any present or future flood control plan or project or if damaged by any cause. If the permittee does not comply, the Board may perform this work at the permittee's expense.

END OF CONDITIONS



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

Flood Protection and Navigation Section (19063)

DEC 30 2015

Ms. Leslie M. Gallagher, Executive Officer
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, CA 95821

Dear Ms. Gallagher:

We have reviewed permit application number 19063 submitted by California Department of Transportation (Caltrans). This project includes replacing the existing Main Flood Canal Bridge with a new 92 foot 11-1/2 inch wide, 4-span CIP RC slab bridge accommodating four 12 foot wide lanes, with 10 foot shoulders on each side, and a 22 foot center median. The project also includes placing NPS 24 x 0.625 pipe pile foundations with pile extensions at all bent locations. The project is located where the Main Flood Canal crosses underneath Paso Robles Highway east of Interstate 5, at 35.616541°N 119.648988°W NAD83, Kern County, CA.

The proposed work does not affect a Federally constructed project, however, according to the Kern River Intertie Operation and Maintenance Manual, page 15, section 2, the capacity of the channels that existed prior to the construction of the intertie is required for the intertie project to function effectively. At the location of the proposed project, the channel capacity of the Buena Vista Flood Channel is estimated at 3,000 cfs as shown in Table 1, Estimated Channel Capacities. This proposed project shall not affect the ability of the channel to pass the 3,000 cfs flow.

A Section 10 and/or Section 404 permit (Non-Reporting NWP) has been issued for this work.

A copy of this letter is being furnished to Mr. Don Rasmussen, Chief, Flood Project Integrity and Inspection Branch, 3310 El Camino Avenue, Suite 200, Sacramento, CA 95821.

Sincerely,

Ryan Larson, P.E.
Chief, Flood Protection and Navigation Section

INDEX OF PLANS

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
 PROJECT PLANS FOR CONSTRUCTION ON
 STATE HIGHWAY
 IN KERN COUNTY
 NEAR LOST HILLS
 FROM 0.1 MILE EAST OF LAMBERSON AVE
 TO 0.9 MILE EAST OF
 ROUTE 46/5 SEPARATION
 TO BE SUPPLEMENTED BY STANDARD PLANS DATED 2010

DESIGN ENGINEER PETE PETRAKIS	PROJECT MANAGER MEHRAN AKHAVAN
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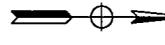
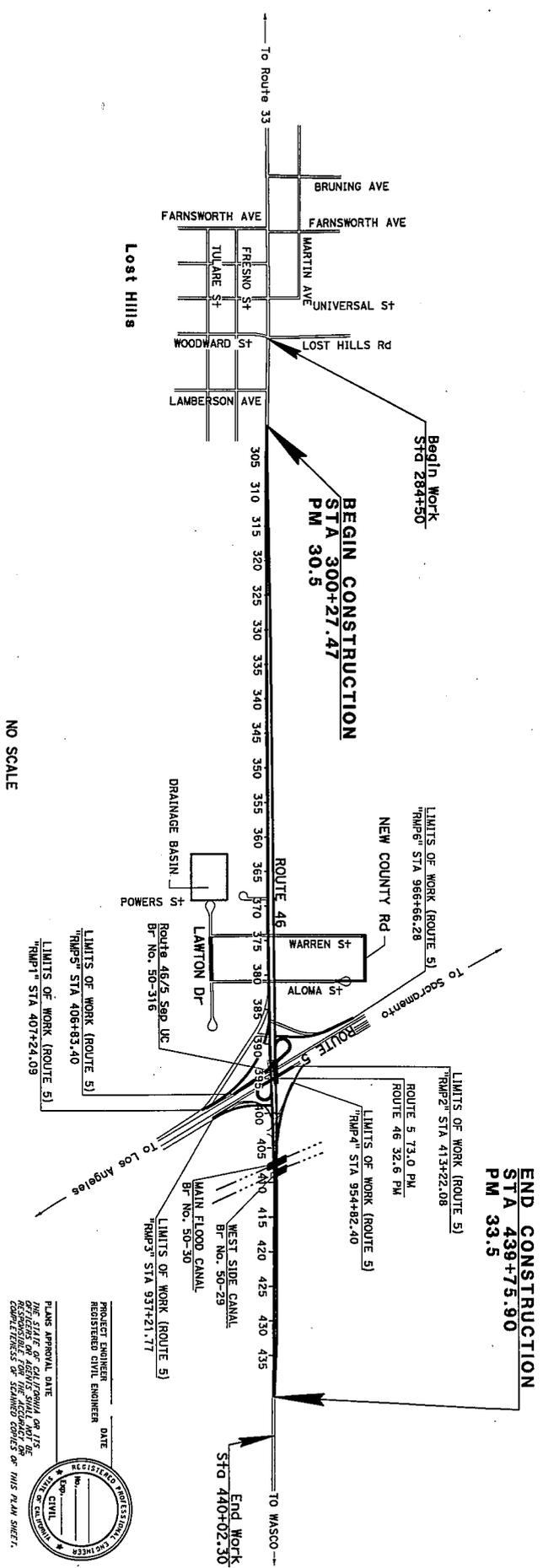
THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO BIDDERS."

BORDER LAST REVISED 9/30/2012 CALTRANS WEB SITE (S: HTTP://WWW.DOT.CA.GOV/

RELATIVE DIMENSION SCALE 0 1 2 3
 US UNIT 1" = 30.00 FT
 DIM FILE 23 08120001750001.dgn

UNIT 1436	PROJECT NUMBER & PHASE 08120001751
CONTRACT NO. 06-442544	PROJECT ID 0612000175

DATE PLOTTED 30-JUL-2015
 TIME PLOTTED 9:22-14



LOCATION MAP

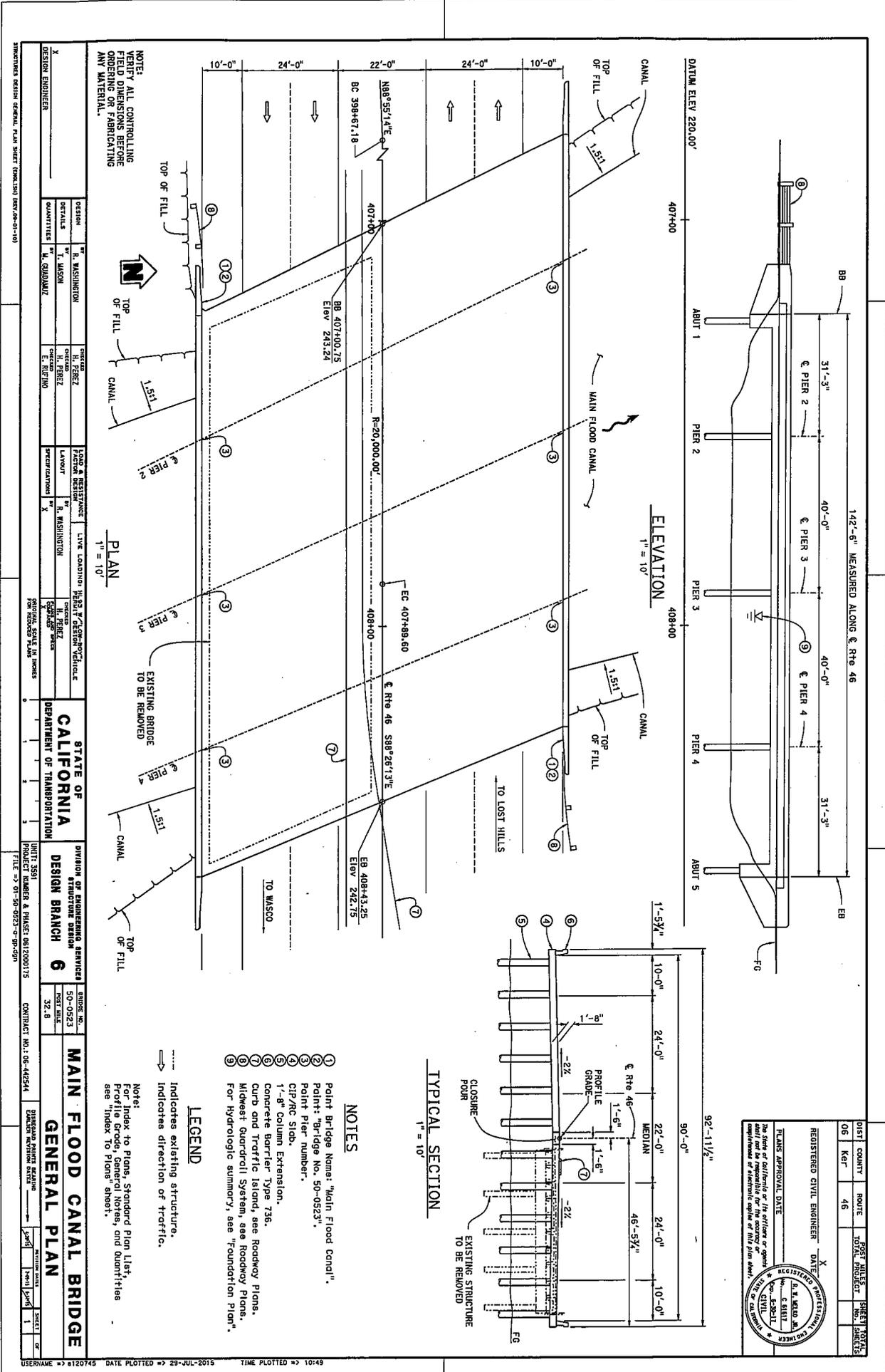
DIST	COUNTY	ROUTE	POST MILE TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
06	Ker	46	30.5/33.5	1	XXX

06-442544
 0612000175



PLANS APPROVAL DATE
 THE STATE OF CALIFORNIA, BY ITS
 OFFICERS OR AGENTS, SHALL NOT BE
 RESPONSIBLE FOR ANY ERRORS OR
 OMISSIONS OR FOR ANY CONSEQUENCES
 OF THIS PLAN SHEET.

PROJECT ENGINEER REGISTERED CIVIL ENGINEER DATE
 REGISTERED CIVIL ENGINEER DATE



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DESIGN ENGINEER: H. WASHINGTON
CHECKED BY: H. PEREZ
DESIGNER: H. WASHINGTON
CHECKED BY: H. PEREZ

DESIGN BRANCH: 6
PROJECT NUMBER & PHASE: 0812000175
CONTRACT NO.: 08-42544

DATE PLOTTED: 29-JUL-2015

STATE OF CALIFORNIA
DIVISION OF ENGINEERING SERVICES
DESIGN BRANCH 6

PROJECT NUMBER & PHASE: 0812000175
CONTRACT NO.: 08-42544

DATE PLOTTED: 29-JUL-2015

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DESIGN BRANCH 6

PROJECT NUMBER & PHASE: 0812000175
CONTRACT NO.: 08-42544

DATE PLOTTED: 29-JUL-2015

NOTE:
VERIFY ALL CONTROLLING
FIELD DIMENSIONS BEFORE
CONSTRUCTION OF FABRICATING
ANY MATERIAL.

LEGEND
--- Indicates existing structure.
--- Indicates direction of traffic.

NOTES
① Point Bridge Name: "Main Flood Canal".
② Point: "Bridge No. 50-0523".
③ Point Pier number.
④ GPR/C Slab.
⑤ 1'-8" Column Extension.
⑥ Concrete Barrier Type 736.
⑦ Curb and Traffic Island, see Roadway Plans.
⑧ Midwest Guardrail System, see Roadway Plans.
⑨ For Hydrologic summary, see "Foundation Plan".

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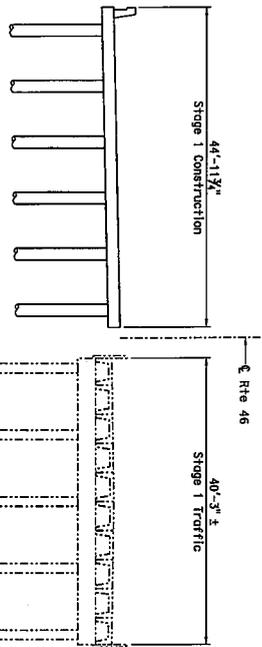
LEGEND
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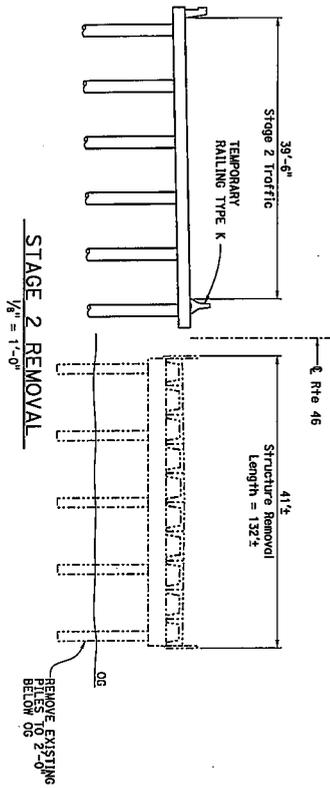
REGISTERED CIVIL ENGINEER
DATE: X
A. L. KELSO, M.
No. C 8881
Exp. 03/31/15
The State of California or its officers or agents
do not warrant the accuracy or quality of the
completion of electronic copies of this plan sheet.

PLANS APPROVAL DATE: X
A. L. KELSO, M.
No. C 8881
Exp. 03/31/15

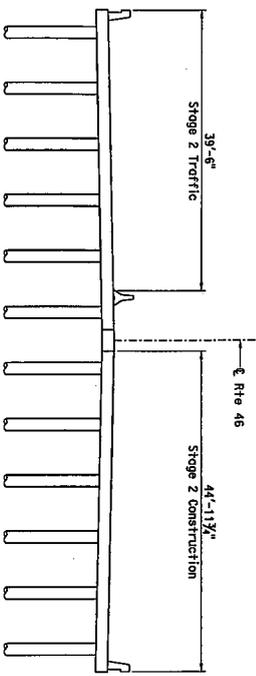
PROJECT COUNTY ROUTE POST MILES SHEET TOTAL
06 Kern 46 TOTAL PROJECT NO. SHEETS



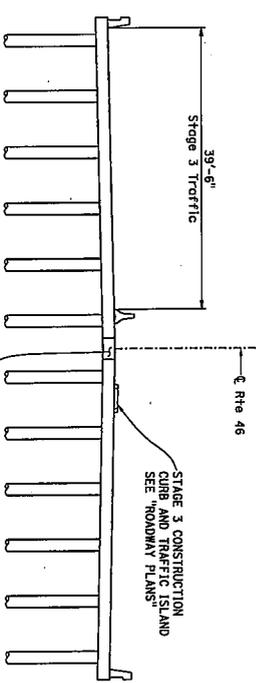
STAGE 1
1/8" = 1'-0"



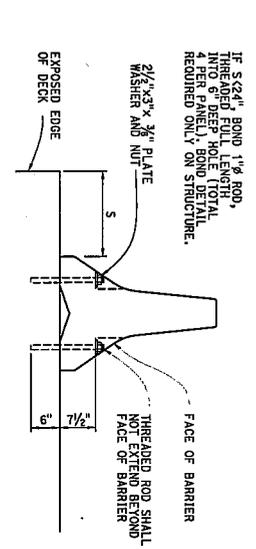
STAGE 2 REMOVAL
1/8" = 1'-0"



STAGE 2 CONSTRUCTION
1/8" = 1'-0"



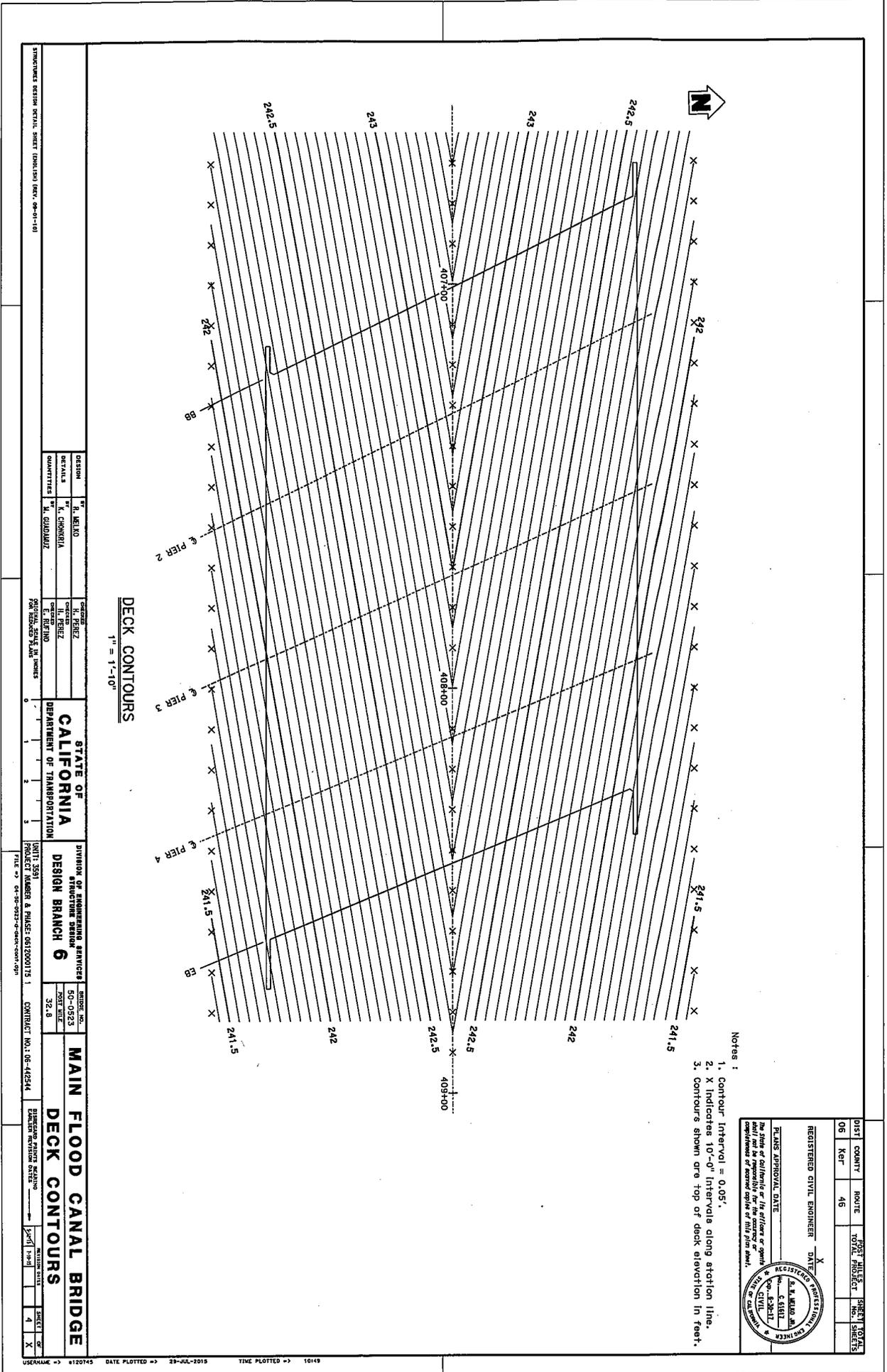
STAGE 3
1/8" = 1'-0"



TEMPORARY RAILING TYPE K ATTACHMENT DETAILS
NO SCALE

DIST	COUNTY	ROUTE	POST MILES	SHEET NO.	TOTAL SHEETS
06	Kern	46			
REGISTERED CIVIL ENGINEER			DATE	PROJECT NO.	
PLANS APPROVAL DATE				DATE OF THIS PLAN SHEET	

DESIGNER	H. MELIO	CHECKED	H. PEREZ
DETAILS	S. T. MASON/K. KORNBLAU	IN CHARGE	H. PEREZ
CONTRACTOR	H. GILBOUZZ	PROJECT NO.	05-39-032
SUPERVISOR		DATE	3/2/09
PROJECT NO.		DATE	3/2/09
STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION			
DIVISION OF ENGINEERING SERVICES		BRIDGE NO.	
DESIGN BRANCH 6		50-0923	
UNIT 3931		32.0	
PROJECT NUMBER & PHASE: 0510200175		CONTRACT NO.: 06-42544	
MAIN FLOOD CANAL BRIDGE CONSTRUCTION SEQUENCE			
DATE PLOTTED	29-JUL-2015	TIME PLOTTED	10:49



DECK CONTOURS

1" = 1'-10"

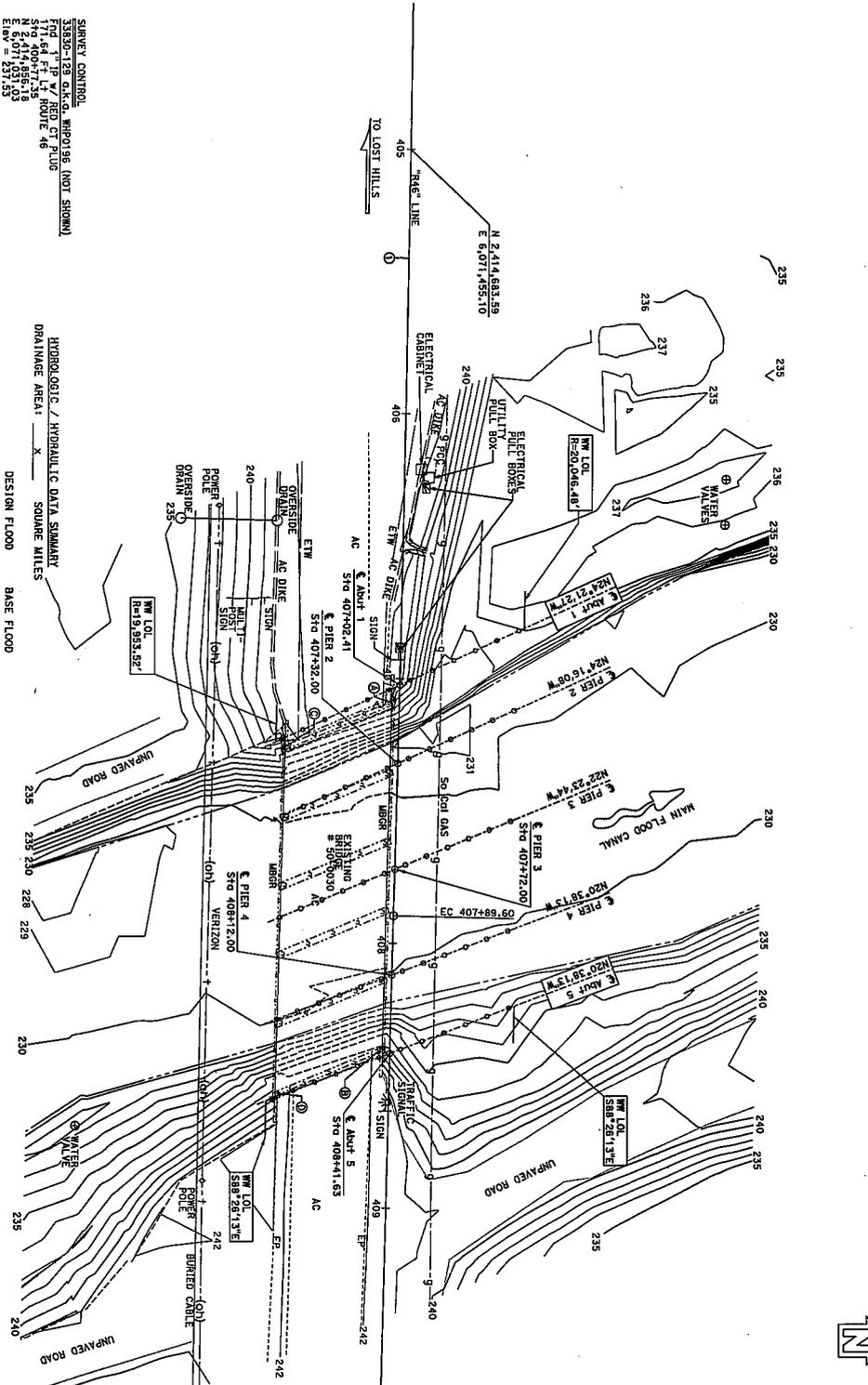
- Notes:
1. Contour Interval = 0.05'
 2. X indicates 10'-0" intervals along station line.
 3. contours shown are top of deck elevation in feet.

DIST	COUNTY	ROUTE	POST MILES	SHEET TOTAL
06	Kern	46	TOTAL PROJECT	NO. SHEETS
REGISTERED CIVIL ENGINEER			DATE	REGISTERED PROFESSIONAL ENGINEER
PLANS APPROVAL DATE				
No. of copies of this plan shall be furnished to the office of the State Engineer at the time of approval of this plan.				
REGISTERED CIVIL ENGINEER				
A. L. MENDOZA				
No. C-43812				
Exp. 12-31-11				

STRUCTURES DESIGN DETAIL SHEET (EMULSION) (REV. 08-01-10)		DESIGNER		CHECKED		DATE	
DETAILS		K. CHONGRUA		H. PEREZ		07-23-15	
QUANTITIES		M. GILQUANZ		H. PEREZ		07-23-15	
PROJECT NUMBER & PHASE		UNIT		SHEET		OF	
061200175 1		5591		32.8		4	
CONTRACT NO. 06-48254		PROJECT NO. 06-48254		SHEET NO. 32.8		OF 4	
PROJECT NAME		PROJECT NO.		SHEET NO.		OF	
MAIN FLOOD CANAL BRIDGE		06-48254		32.8		4	
DESIGN BRANCH		DESIGN BRANCH		DESIGN BRANCH		DESIGN BRANCH	
6		6		6		6	

CURVE DATA

No.	R	Δ	T	L
1	20000.00	02°38'33"	461.23	322.42



SURVEY CONTROL
 STATION 128
 POINT 119 W/ ABUT CT PILE
 171.64 FT. LT. ROUTE 46
 N 241°46'31.3" E
 S 89°41'46.9" W
 E 6,071,954.95
 ELEV = 239.13

HYDROLOGIC / HYDRAULIC DATA SUMMARY
 DRAINAGE AREA: X SQUARE MILES
 DESIGN FLOOD: X
 BASE FLOOD: X

FREQUENCY (FEAS)
 WATER SURFACE ELEV. (FEET): X
 WATER SURFACE ELEV. (FEET): X
 WATER SURFACE ELEV. (FEET): X
 WATER SURFACE ELEV. (FEET): X

BRIDGE LOCATION (CALCULATED)
 ① - 2.39 LT ROUTE 46, Stg 407309.46, Elev. = 241.60 ±
 ② - 2.50 LT ROUTE 46, Stg 408339.20, Elev. = 241.60 ±
 ③ - 43.36 LT ROUTE 46, Stg 407288.97, Elev. = 241.60 ±
 ④ - 43.48 LT ROUTE 46, Stg 408457.59, Elev. = 241.60 ±

PRELIMINARY INVESTIGATION SECTION

SCALE: VERTICAL 1"=20'	PROPOSED: 1"=20'	DATE: 12/2014	CHECKED: H. PEREZ
DATE: 12/2014	DATE: 12/2014	DATE: 12/2014	DATE: 12/2014
DESIGNED: M. J. MASON	DRAWN: H. PEREZ	PROJECT NO.: 06-442544	CONTRACT NO.: 06-442544

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION

DESIGN BRANCH 6

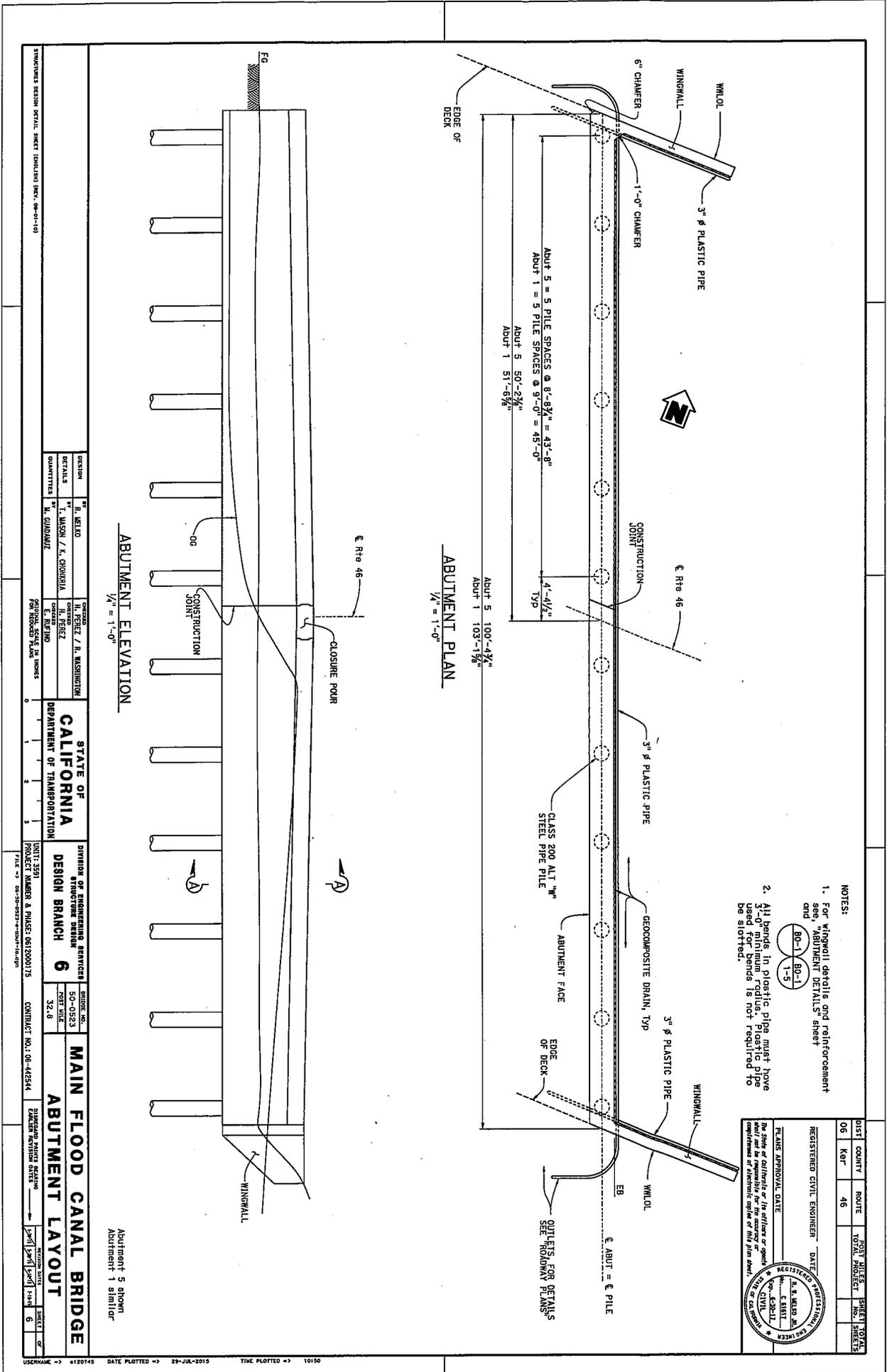
MAIN FLOOD CANAL BRIDGE
FOUNDATION PLAN

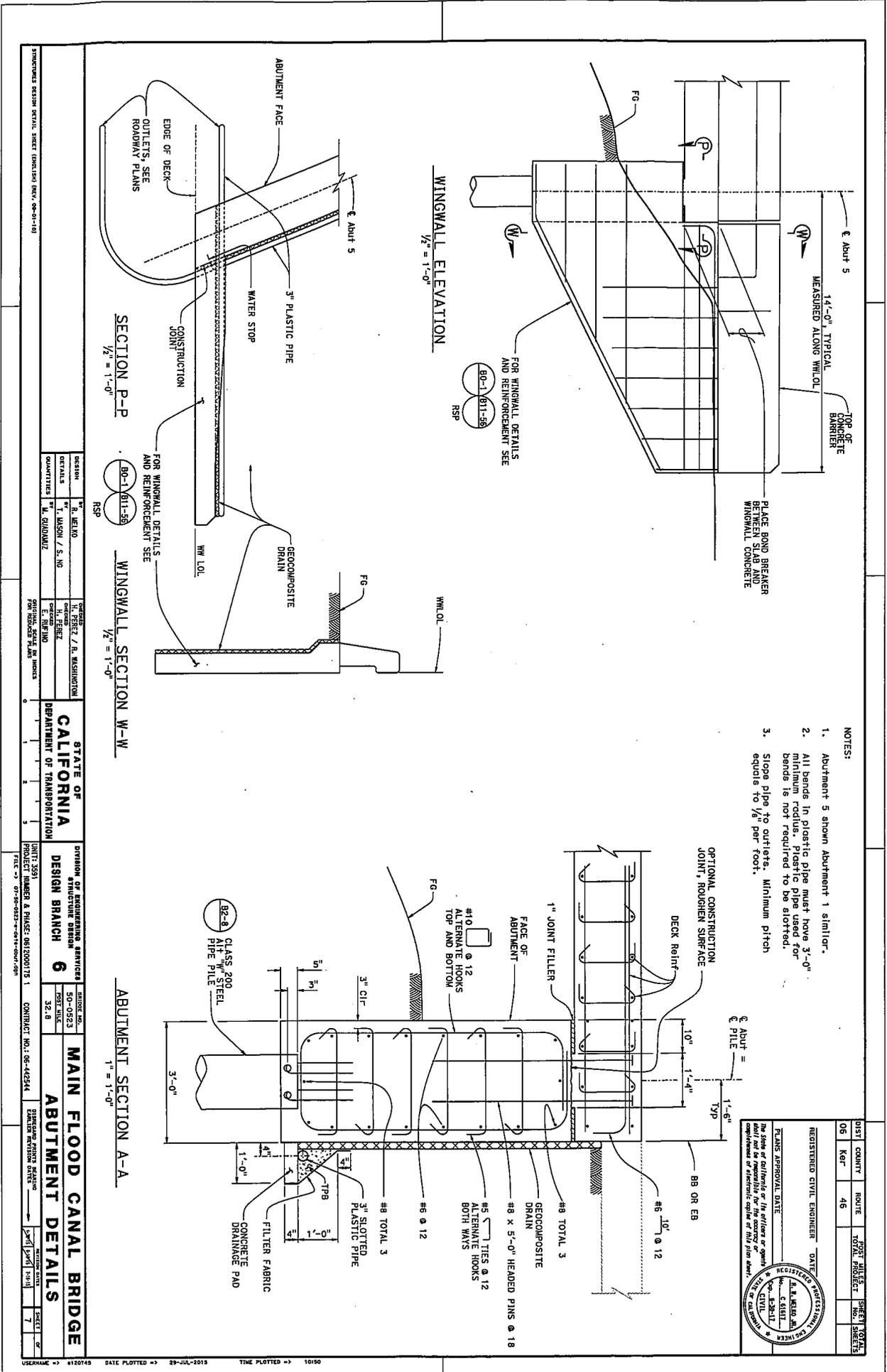
DATE PLOTTED => 29-JUL-2015

LEGEND
 ○ Dimpled Close 200 Alt. W/ Steel Pipe Pile

NOTE:
 For dimensions not shown, see
 "FOUNDATION LAYOUT" and
 "PIER LAYOUT" sheets.

REGISTERED CIVIL ENGINEER
 H. A. MASON
 No. 58892
 DATE: 12/2014





STRUCTURES SECTION DETAIL SHEET (FORM 100) (REV. 08-01-10)		STATE OF CALIFORNIA		DIVISION OF ENGINEERING SERVICES		PROJECT NO. 07-00-0225-1-01-001-001-001	
DESIGNER: R. MELLO		CALIFORNIA		DESIGN BRANCH 6		CONTRACT NO.: 06-44254	
CHECKER: T. MASON / S. NG		DEPARTMENT OF TRANSPORTATION		MAIN FLOOD CANAL BRIDGE		SHEET 7 OF 7	
QUANTITIES BY: R. GUZMANZ		PROJECT NUMBER & PHASE: 08/2001/12 1		ABUTMENT DETAILS		DATE PLOTTED: 23-JUL-2015	
ORIGINAL SCALE: AS SHOWN		UNIT: 591		SHEET NO. 7		FILE NO. 07-00-0225-1-01-001-001-001	

1.1 INTRODUCTION:

This submittal of the final hydraulic report for the Main Flood Canal Bridge Replacement Project represents the results of the floodplain analyses due to the proposed construction of the new Main Flood Canal Bridge. The Main Flood Canal Bridge Replacement Project is part of a much larger scope or work, which includes widening of State Route 46 (SR-46) from an existing two-lane roadway to a four-lane expressway with construction of five new bridges including the Main Flood Canal Bridge.

Project stakeholders, in addition to Caltrans, include the Central Valley Flood Protection Board (CVFPB), Buena Vista Water Storage District, and various State and Federal Resource Agencies. The CVFPB is responsible for enforcing appropriate standards for the protection of adopted flood control plans that will best protect the public from floods.

The United States Army Corps of Engineers' (USACE) one-dimensional river analysis software HEC-RAS (ver. 4.1.0) floodplain model was used for the evaluation of project flood impacts and the scour potential due to the proposed Main Flood Canal Bridge. Various HEC-RAS hydraulic plans were developed to address the project's technical and design requirements as well as Resource Agencies' compliance requirements.

The following is an overview of the HEC-RAS floodplain analyses that were prepared for the project to assess the flood impacts, as represented in the various HEC-RAS hydraulic plans:

- The assessment of the pre-project conditions (Existing Conditions) base flood elevations,
- The assessment of the post-project conditions (Proposed Conditions) base flood elevations, and
- The assessment of potential scouring through the proposed Main Flood Canal Bridge.

2.1 GENERAL:

This project is located at the existing Main Flood Canal Bridge (Br. No. 50-0030) in Kern County, California. The Main Flood Canal Bridge is located along SR-46 at post mile (PM) 32.8, approximately 2.1 miles east of the community of Lost Hills. See Figure 1 for a site map of the project and the Main Flood Canal Bridge location.

The project will replace the 58-year old existing Main Flood Canal Bridge with a four-span cast-in-place reinforced concrete slab bridge with a structure depth of 1.75 feet, a bridge length of approximately 142.0 feet, and a width of approximately 93.0 feet. The proposed bridge will maintain the same bridge name but will have a new bridge number designation (Br. No. 50-0523). The larger scope of the project is to convert the existing two-lane highway of SR-46 to a four-lane divided expressway from PM 7.30 to PM 29.70 and a four-lane conventional highway from PM 29.70 to PM 33.50. This project will improve traffic operations, improve traffic safety, and correct any deficiencies in the existing roadway in order to meet all current design standards for a four-lane expressway.

Main Flood Canal Bridge**Bridge No. 50-0523****06-KER-046-PM 32.8****EA: 06-442541**

The existing Main Flood Canal Bridge (see Photo 1, page 19) is a five-span precast, pre-stressed concrete inverted “U” girder structure with a bituminous type wearing surface. The existing bridge is a two-lane roadway with an approximate width of 40 feet and bridge length of 132 feet. The support elements are reinforced concrete column bents and open diaphragm abutments. This structure has never been widened.

The Main Flood Canal Bridge spans the Kern River Flood Channel. This waterway is known as the Main Flood Canal by Caltrans but has also been historically referred to as the Buena Vista Slough, the Buena Vista Flood Channel, and the Kern River Flood Canal. This report will refer to the waterway as the Kern River Flood Channel.

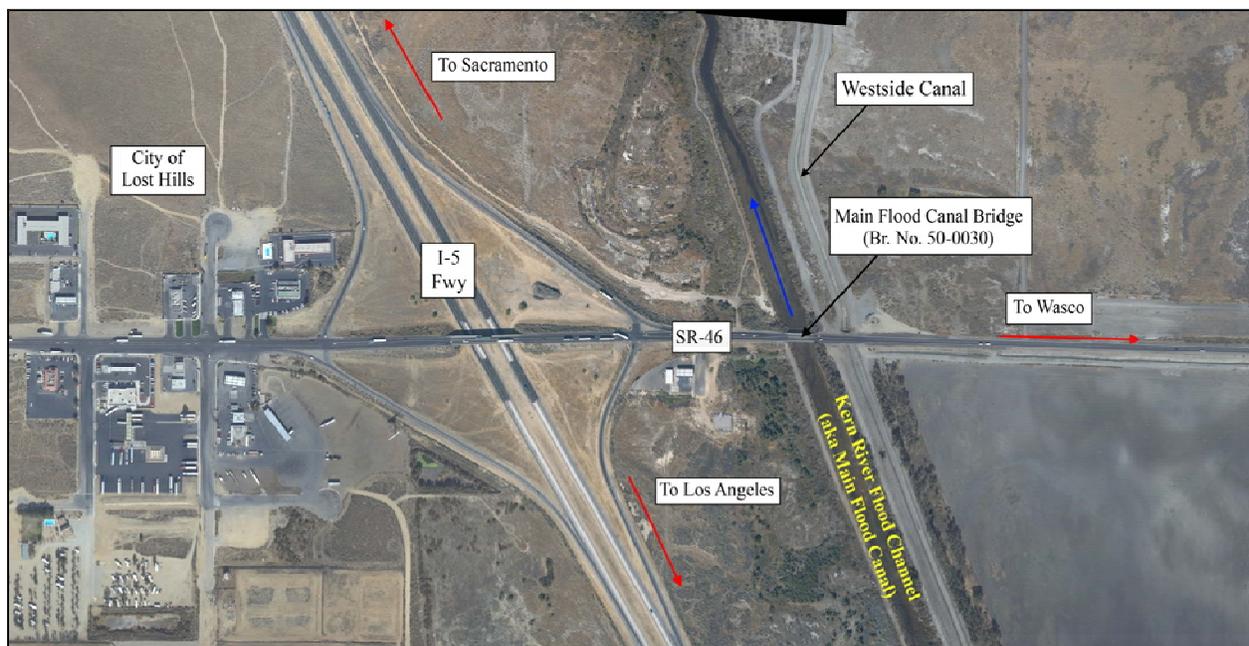


Figure 1: Site Map of Project Location.

The data and references of this final hydraulic report were obtained from the following sources:

- Caltrans’ Bridge Inspection Reports (BIRs).
- Preliminary Report for the Main Flood Canal Bridge (Br. No. 50-0030) from the California Division of Highways, Bridge Department, dated June 1953.
- Preliminary Report for the Kern River Flood Canal Bridges (Br. Nos. 50-0315 R/L) from the California Division of Highways, Bridge Department, dated September 1962.
- 1956 As-built General Plan; Layout and Details; Pile Details; and Log of Test Borings for the existing Main Flood Canal Bridge (Br. No. 50-0030).
- Design Advance Planning Study Plans for the proposed Main Flood Canal Bridge replacement from the Office of Bridge Design, Design Branch 6, dated December 2011.
- Topographical survey data provided by District 6 Survey Office, completed on March 2010 and Structure Design Preliminary Investigations - North Branch, completed on April 2014.
- Field photo documentation dated October 2001, March 2010, and April 2014.

- Historical channel cross sections for the Kern River Flood Channel at the upstream face of the Main Flood Canal Bridge dated January 1970, November 1993, October 2001, and March 2010.
- The Reclamation Board. (1985). “*Approval of Plans for Westfarmers – Application Number 14121 GM*”. Sacramento, CA: The State of California, Reclamation Board.
- United States Army Corps of Engineers (USACE). (1974). “*Detailed Project Report on Kern River-California Aqueduct Intertie, Kern County, California*”. Sacramento, CA: Department of the Army, Sacramento District, Corps of Engineers.
- USACE. (1974). “*Environmental Statement on Kern River-California Aqueduct Intertie, Kern County, California*”. Sacramento, CA: Department of the Army, Sacramento District, Corps of Engineers.
- USACE. (1978). “*Operation and Maintenance Manual for the Kern River-California Aqueduct Intertie, Kern County, California*”. Sacramento, CA: Department of the Army, Sacramento District, Corps of Engineers.

3.1 DESIGN OBJECTIVES:

This final hydraulic report addresses the introduced hydraulic and scour impacts of replacing the existing Main Flood Canal Bridge with a four-span cast-in-place reinforced concrete slab bridge and its effects on the Kern River Flood Channel and its adjoining floodplain.

To receive approval from the various project stakeholders for channel encroachment and to obtain the proper encroachment permits, this final hydraulic report also addresses the possible hydraulic impacts to the designated floodway of the Kern River Flood Channel.

In order to determine if the proposed project will have any adverse effects and to achieve the design objectives, a hydraulic model was developed using the USACE’s HEC-RAS floodplain model. Two specific hydraulic plans were modeled to cover all the aspects of the design and anticipated conditions:

1. Existing Conditions Plan (pre-project conditions), and
2. Proposed Conditions Plan (post-project conditions).

The Existing Conditions Plan floodplain analysis characterizes the hydraulic conditions at the existing Main Flood Canal Bridge and sets the baseline base flood elevations throughout the project location. The Proposed Conditions Plan floodplain analysis was developed to assess the post-project flood impacts and hydraulic conditions, relative to the construction of the proposed Main Flood Canal Bridge.

6.0 PROJECT/DESIGN DISCHARGES:

According to the USACE the channel design capacity of the Kern River Flood Channel, as it leaves Buena Vista Lake, diminishes progressively downstream due to diversions and groundwater recharge. Floodwaters leaving Buena Vista Lake are diverted to the Kern River Flood Channel at approximately 4,000 cfs. And by the time the Kern River Flood Channel reaches the Main Flood Canal Bridge the channel design capacity is approximately 3,000 cfs and 2,500 cfs when it reaches its terminus at Tulare Lake. Table 1 provides the design flood discharge for flows under the Main Flood Canal Bridge. It should be noted that the channel design capacities provided by the USACE for the Kern River Flood Channel (from Buena Vista Lake to Tulare Lake) are before the installation of the Kern River-California Aqueduct Intertie.

Table 1: Design Flood Discharge at the Main Flood Canal Bridge.

Flowrate Condition	Design Flood Discharge (cfs)
USACE Channel Design Capacity	3,000

Table 2: Upstream Hydraulic Results for the Main Flood Canal Bridge under Existing Conditions.

Design Flood Discharge (cfs)	Soffit Elevation (ft)	Water Surface Elevation (ft)	Average Channel Velocity (fps)	Available Freeboard (ft)
3,000	238.99	236.94	4.3	2.05

Table 3 summarizes the hydraulic results at the upstream face of the proposed Main Flood Canal Bridge. To provide more freeboard underneath the proposed bridge the entire roadway profile grade will be raised over 1.0 feet in order to meet the CVFPB's requirement that a proposed bridge must be at least 3.0 feet above the design floodplain. As can be seen in Table 3, the available freeboard is 3.06 feet for the proposed bridge. In addition, the proposed bridge with its wider bridge design had a zero increase to the baseline base flood elevation at the face of the bridge. However upstream of the face of the bridge there was a very small increase to the base flood elevations by 0.01 feet (see Section 8.2 for a further explanation). This increase is very minimal and can almost be seen as a zero rise. This rise in water surface elevations will not cause any backwater conditions that would adversely affect the channel or the floodway to pass its design flood discharge. In addition, analyzing the left overbank floodplain for the proposed conditions, the extent of the floodwaters had no changes in comparison to the existing conditions.

Table 3: Upstream Hydraulic Results for the New Main Flood Canal Bridge under Proposed Conditions.

Design Flood Discharge (cfs)	Calculated Soffit Elevation (ft)	Water Surface Elevation (ft)	Avg. Channel Velocity (fps)	Available Freeboard (ft)	L' Existing to Proposed	
					L' Water Surface Elevation (ft)	L' Avg. Channel Velocity (fps)
3,000	240.00	236.94	4.3	3.06	0.0	0.0

11.1 Local Scour:

Local scour involves the removal of bed material around piers, abutments, and embankments. It is caused by an acceleration of flow and resulting vortices induced by obstructions to the flow.

The proposed Main Flood Canal Bridge with its 16-inch piers, aligned with the flow and no debris/drift accumulation, resulted in local pier scour of approximately 3.1 to 3.2 feet depending on which pier. In addition, the abutments experienced no scour effects due to floodwaters not reaching the face of the abutments.

Table 5: Total Scour Analysis for the Proposed Main Flood Canal Bridge.

Substructure Component	Short-Term Scour Depths	Long-Term Scour Depths		Total Scour Depth (ft)
	Local Scour ¹ (ft)	Degradation (ft)	Contraction Scour (ft)	
Abutment 1	0.0	0.0	1.0	1.0
Pier 2	3.1	0.0	1.0	4.1
Pier 3	3.2	0.0	1.0	4.2
Pier 4	3.1	0.0	1.0	4.1
Abutment 5	0.0	0.0	1.0	1.0

Notes:

1 – Flood waters did not reach the face of the abutments; therefore, this local scour component was not analyzed.

12.0 CONCLUSIONS/RECOMMENDATIONS:

- The proposed construction of a new Main Flood Canal Bridge was analyzed through hydraulic modeling and determined not to cause any significant hydraulic or scour issues.
- The proposed Main Flood Canal Bridge will have a zero rise of the water surface elevation at the upstream edge of deck and will only raise upstream water surface elevations by 0.01 feet for approximately 706 feet until they converge back to existing conditions.
- The soffit elevation of the proposed bridge is approximately 240.0 feet.
- The available freeboard from bridge soffit to the floodwater surface elevation is 3.06 feet.
- Predicted total scour depths were calculated to be 1.0 feet for Abutment 1, 4.1 feet for Pier 2, 4.2 feet for Pier 3, 4.1 feet for Pier 4, and 1.0 feet for Abutment 5.
- It's recommended to reinstall slope protection for the new abutment slopes.

Main Flood Canal Bridge
 Bridge No. 50-0523
 06-KER-046-PM 32.8
 EA: 06-442541

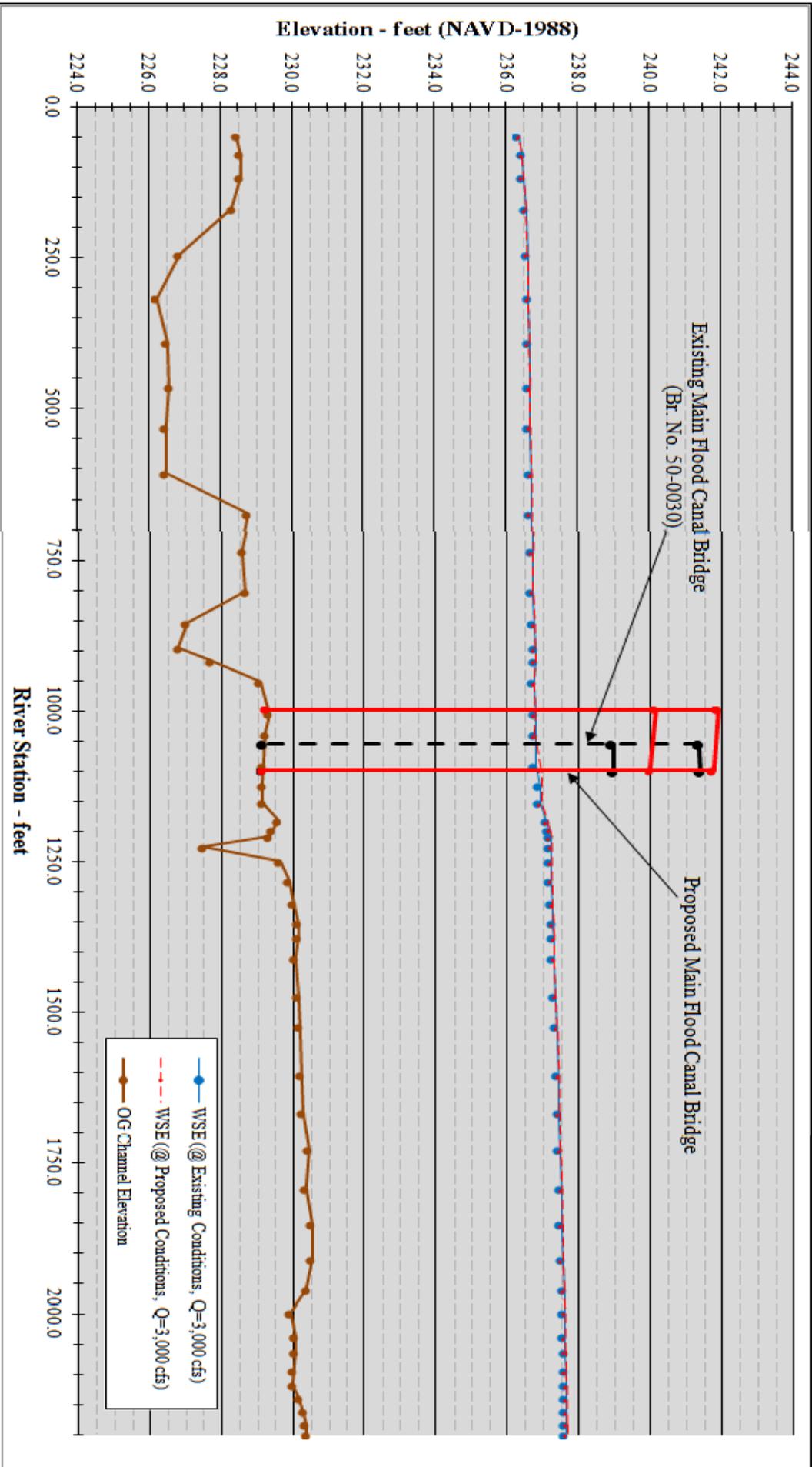


Figure 4: Profile of Kern River Flood Channel Showing the Existing and Proposed Conditions.

Memorandum

*Serious drought
Help Save Water!*

To: MR. GARY BLAKESLEY
Bridge Design Branch 6
Office of Bridge Design North/Central
Structure Design
Division of Engineering Services MS 9-4

Date: July 3, 2015

Attention: Rich Melko

File: 06-KER-46-PM 32.8
06-442541
EFIS: 0612000175
Main Flood Canal Bridge (Replace)
Bridge No.: 50-0523

From: *MH* MENG-HSI HUNG/SUNNY YANG *S.Y.*
Transportation Engineers
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

H. Nikou
HOOSHMAND NIKOUI
Chief, Branch A
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

MATTHEW GAFFNEY *MG*
Engineering Geologist
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

Subject : **Final Foundation Report (FFR)**

This Final Foundation Report is prepared in response to your request dated October 14, 2014, for the proposed four-span Main Flood Canal Bridge replacement project on State Route 46 (SR46) PM 32.8 in the town of Lost Hills, Kern County. See the Location Map in Figure 1 for details.

1. SCOPE OF WORK

The following tasks were performed for the preparation of this Foundation Report:

- Review of as-built Log of Test Borings (LOTBs) plans of the existing bridge structures;
- Geologic literature study;
- General Plan study;
- Field geotechnical exploration, including drilling 2 exploratory borings at the project site, performing Standard Penetration Test (SPT) and Pocket Penetrometer (PP) Test, and collecting soil samples;
- Laboratory testing of selected samples, including particle size analysis and moisture content, plasticity index, and corrosion tests;

MR. GARY BLAKESLEY

Attn: Richard Melko

July 3, 2015

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- Foundation design analysis; and
- Preparation of this report.

2. PROJECT DESCRIPTION

The proposed Main Flood Canal Bridge Replacement project is part of the Segment 4A of the Route 46 Improvement Projects. The structure of the existing bridge, built in 1956, is a four-span and 44 feet wide PC P/S concrete inverted “U” girders on pile bents and open diaphragm abutments, all funded on concrete piles. The proposed new Main Flood Canal Bridge (the Bridge) will replace the existing bridge with a new 92 feet 11-½ inches wide bridge and will accommodate four 12 feet wide lanes, 10 feet shoulders on each side, and a 22 feet center median. The bridge is proposed as a 4-span CIP RC slab bridge with a 1 foot 8 inches structure depth and will span the existing Main Flood Canal. The bridge will be 142 feet long, 10 feet longer than the existing bridge so that the new supports will not be placed on top of the old supports, thereby preventing potential conflicts between the old and the new piles and pile extensions. The span configuration is 31 feet-40 feet- 40 feet- 31 feet. Diaphragm abutments founded on Class 200, Alt “W” piles are proposed at the BB and the EB of the bridge. In addition, NPS 24x0.625 pipe pile foundations with pile extensions are proposed at all bent locations.

3. EXCEPTIONS TO POLICY

There is no known exception to Department policy relating to the investigation or design of the proposed structure.

4. FIELD INVESTIGATIONS

Caltrans Drilling Services performed four rotary borings in the adjacent area to the existing bridge site in December 2014. Two borings, namely, RC-14-004 and RC-14-005 were located near the BB and EB of the existing bridge, respectively. The other borings RC-14-006 and RC-14-007 were conducted adjacent to the existing West Side Canal Bridge and approximately 120 and 240 feet, respectively, east to the EB of the existing bridge. Borings RC-14-006 and RC-14-007 are not presented in this report due to their distances to the bridge; however, groundwater information obtained at boring RC-14-007 was utilized in the foundation design and analysis for the bridge.

A summary of total depths, surface elevations, and completion dates for both RC-14-004 and RC-14-005 borings are shown in Table 1.

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 Attn: Richard Melko
 July 3, 2015
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Table 1

Boring ID	Total Depth (ft)	Surface Elevation (ft)	Date of Completion
RC-14-004	71.5	242.0	12/18/2014
RC-14-005	61.5	240.8	12/17/2014

In both borings, Standard Penetration Tests (SPT) were generally conducted at 5-foot interval in soil strata. Pocket Penetrometer (PP) Tests were performed on soil samples showing apparent cohesion. Soil samples were selected at various depths for laboratory tests to update soil information. Refer to the LOTBs in the structure plans for more information.

5. LABORATORY TESTING PROGRAM

The laboratory testing program consists of 25 moisture content tests, 9 mechanical analyses, 5 plasticity index tests, and 1 corrosion tests for soil samples obtained from borings RC-14-004 and RC-14-005.

6. SITE GEOLOGY AND SUBSURFACE CONDITIONS

6.1 Physical Settings

The project is located in the southern portion of the San Joaquin Valley about 40 miles east northeast of the city of Bakersfield. SR 46 runs east-west and Interstate 5 runs approximately north-south. The Main Flood Canal Bridge is approximately at elevation of 242 feet. The valley drops about 2 feet per mile for about three miles to the east, to the flats of the San Joaquin Valley. To the west the elevation rises to the Lost Hills Oil Fields at elevation 650, and past that the beginning of the Coast Range Mountains.

This portion of California and the San Joaquin Valley is arid and receives less 8.0 inches of rain per year.¹ When it does rain, the valley is drained mainly to the Kern River and its many tributaries to the north.

6.2 Regional Geology

As mentioned above, the project is located within the San Joaquin Valley, which is part of the Great Valley Geomorphic Province of Central California. The San Joaquin Valley comprises the southern two-thirds of the Great Valley of California. Situated between the towering Sierra Nevada on the east, the Diablo and Temblor Ranges to the west, and the Tehachapi Mountains to

¹ <http://www.idcide.com/weather/ca/lost-hills.htm>

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July 3, 2015

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the south, the valley is a trough created by tectonic forces related to the collision of the Pacific and North American Plates. The trough is filled with marine sediments overlain by continental sediments, up to thousands of feet deep, deposited largely by streams draining the mountains, and partially in lakes that formed and have since been drained or evaporated off on the valley floor.²

The Bakersfield and Lost Hills area are well known oil producing regions within the San Joaquin Valley. Special consideration should be taken if drilling deep shafts.

6.3 Site Geology

At the site the subsurface consists of fan deposits and basin deposits that have accumulated at the base of the slopes of the Lost Hills.³ The log of test borings from the three structures, show that the subsurface consists of sand, silty sand, clayey sand and clay. All these deposits are consistent with fan and basin deposits. The relative portion of the Bakersfield Geologic Map is presented in Figure 2.

6.4 Subsurface Conditions

The foundation investigations includes drilling two vertical rotary borings, namely, RC-14-004 and RC-14-005, were conducted near the existing Main Flood Canal Bridge by rotary wash drilling methods.

Boring RC-14-004 is located on the west side of the existing bridge. Based on the LOTBs, the subsurface materials at RC-14-004 consist of approximately 9 feet of medium dense sandy silt underlain by alternate layers with varying depths of soft to very stiff clay and medium dense to very dense sand soils. The PP readings of clay layers ranges from 0.5 to 3.0 tsf.

Boring RC-14-005 is located on the east side of the existing bridge, subsurface materials consist of approximately 18 feet of stiff to very stiff lean clay/ sandy lean clay underlain by medium dense to very dense poorly-graded sand/poorly-graded sand with silt and an intermediate layer of stiff lean clay with sand. The PP readings of all clay soils range from 1.5 to 3.75 tsf.

Please refer to the LOTBs in the structure plans for details.

² Smith, A.R., 1964, Geologic map of California : Bakersfield sheet, Scale 1:250,000

³ ibid

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7. GROUNDWATER

The groundwater was measured at approximately 19 feet below the ground surface, corresponding to elevation 222.2 feet, at the aforementioned boring RC-14-007, which is located approximately 240 feet east to the bridge, on December 10, 2014. In addition, based on the monitored data (years 2006 to 2009) of a well, located about 900 feet southeast to the existing bridge, shown on the website of the California Department of Water Resources, the groundwater elevation may reach elevation of 232 feet, corresponding to about 9 feet below the ground surface, in this project area. Please note that groundwater level typically fluctuates with season and correlates with the local hydrology, geology and topography.

8. LIQUEFACTION

Liquefaction is a phenomenon in which loose, saturated, fine-grained granular soils behave like a fluid when subjected to high intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow groundwater; (2) low-density, fine, sandy soils; and, (3) high-intensity ground motion. Saturated, loose and medium dense, cohesionless soils exhibit the liquefaction potential, while dense cohesionless soil and cohesive soil exhibit the lowest, negligible liquefaction potential. Effects of liquefaction on ground surface include sand boils, settlement and lateral spreading.

Refer to the Final Seismic Design Recommendations and Soil Springs (FSDRSS) memo submitted to your office, dated April 16, 2015, prepared by Hossain Salimi of our office, the liquefaction potential of the bridge site is considered minimal.

9. SCOUR EVALUATION

Referring to the Structures Final Hydraulic Report (SFHR), dated July 15, 2014, by Rick Macala of the Structures Hydraulics and Hydrology, the anticipated total scour depth at each proposed support is summarized in Table 2.

Table 2 Anticipated Total Scour Depth

Support	Total Scour Depth (ft)
Abut 1	1.0
Bent 2	4.1
Bent 3	4.2
Bent 4	4.1
Abut 5	1.0

MR. GARY BLAKESLEY
 Attn: Richard Melko
 July 3, 2015
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10. CORROSION EVALUATION

Corrosion studies are conducted in accordance with the requirements of California Test Method No. 643. Caltrans currently considers a site to be corrosive to foundation elements if one or more of the following conditions exist:

Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less.

The results of corrosion tests conducted by the Materials Engineering Testing Services (METS) of Caltrans on representative samples of the materials encountered in our investigation are summarized in Table 3.

Table 3 Soil Corrosion Test Summary

<i>Boring</i>	<i>SIC Number</i>	<i>Sample Depth (ft)</i>	<i>Resistivity (Ohm-Cm)</i>	<i>pH</i>	<i>Chloride Content (ppm)</i>	<i>Sulfate Content (ppm)</i>
RC-14-004	RC14404	22 - 23	1522	6.6	-	-

Based on the test results, this site is considered non-corrosive.

11. SEISMIC RECOMMENDATIONS

Refer to the aforementioned FSDRSS memo, prepared by Hossain Salimi of our Office for the final seismic design recommendations. For clarification or additional information on seismic design aspects of the project, please consult with Hossain Salimi at (916) 227-7147.

12. FOUNDATION RECOMMENDATIONS

12.1 Foundation Design Data and Loads

Foundation Design Data Sheet and Foundation Design Loads provided by Caltrans Structure Design for the Bridge are shown in Table 4 and Table 5, respectively.

MR. GARY BLAKESLEY
 Attn: Richard Melko
 July 3, 2015
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Table 4

Foundation Design Data Sheet							
Support No.	Pile Type	Finish Grade Elevation (ft)	Cut-off Elevation (ft)	Pile Cap Size (ft)		Permissible Settlement Under Service Load (in)*	Number of Piles Per Support
				B	L		
Abut 1	Class 200, Alt "W"	238.9	235.9	3	103	1"	12
Bent 2	NPS 24x0.625	230.0	230.0	Pile Extension		1"	12
Bent 3	NPS 24x0.625	230.0	230.0	Pile Extension		1"	12
Bent 4	NPS 24x0.626	230.0	230.0	Pile Extension		1"	12
Abut 5	Class 200, Alt "W"	236.5	233.5	3	101	1"	12

* Based on Caltrans current practice, the total permissible settlement is one inch for structures with continuous spans or multi-column bents, and two inches for simple span structures.

Table 5

Foundation Design Loads										
Support No.	Service-I Limit State (kips)		Strength/Construction Limit State (Controlling Group, kips)				Extreme Event Limit State (Controlling Group, kips)			
	Total Load*	Permanent Load**	Compression		Tension		Compression		Tension	
			Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile
Abut 1	800	565	1130	100	0	0	n/a	n/a	n/a	n/a
Bent 2	210 (/pile)	100 (/pile)	320 (/pile)	320	0	0	170	170	0	0
Bent 3	210 (/pile)	100 (/pile)	320 (/pile)	320	0	0	170	170	0	0
Bent 4	210 (/pile)	100 (/pile)	320 (/pile)	320	0	0	170	170	0	0
Abut 5	800	565	1130	100	0	0	n/a	n/a	n/a	n/a

* Total Load = Permanent Loads + Transient Loads

** Permanent Loads = see Section 3 of AASHTO 4th edition and CA Amendments

MR. GARY BLAKESLEY
 Attn: Richard Melko
 July 3, 2015
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Based on the structure design data and loads information as well as site and subsurface conditions for the bridge, Class 200, Alt “W” pile foundation are recommended for both Abutment 1 and Abutment 5, and NPS 24x0.625 pipe piles with pile extensions are recommended for foundations at Bents 2, 3, and 4.

12.2 File Data Table

Abutment and bent foundations are designed based on LRFD methods. The design tip and specified tip elevations as well as the required nominal driving resistance for piles at each support are listed in the “Foundation Design Recommendations” table shown in Table 6.

Table 6

Foundation Design Recommendations												
Support Location	Pile Type	Cut-off Elev. (ft)	Service-I Limit State Loads per Support (kips)		Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance (kips)				Design Tip Elev. (ft)	Specified Tip Elev. (ft)	Required Nominal Driving Resistance (kips)
			Total	Permanent		Strength/Construction		Extreme Event				
						Comp. ($\phi = 0.7$)	Tension ($\phi = 0.7$)	Comp. ($\phi = 1$)	Tension ($\phi = 1$)			
Abut 1	Class 200, Alt “W”	235.9	800	565	1	140	0	N/A	N/A	183.9 (a-I) TBD (d)	183.9	320
Bent 2	PP NPS 24 x0.625	230.0	210 (/pile)	100 (/pile)	1	460	0	170	N/A	174.5 (a-I) 187.0 (a-II) TBD (d)	174.5	700
Bent 3	PP NPS 24 x0.625	230.0	210 (/pile)	100 (/pile)	1	460	0	170	N/A	174.5 (a-I) 187.0 (a-II) TBD (d)	174.5	710
Bent 4	PP NPS 24 x0.625	230.0	210 (/pile)	100 (/pile)	1	460	0	170	N/A	174.5 (a-I) 187.0 (a-II) TBD (d)	174.5	710
Abut 5	Class 200, Alt “W”	233.5	800	565	1	140	0	N/A	N/A	202.5 (a-I) TBD (d)	202.5	280

Notes:

- 1) Design tip elevations are controlled by: (a-I) Compression (Strength Limit), (a-II) Compression (Extreme Event), (d) Lateral Load.
- 2) Design tip elevation for Lateral Load is to be determined (TBD) by Caltrans Structure Design.

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A summary of pile foundation design for the proposed Main Flood Canal Bridge (Replacement) is presented in the “Pile Data Table” (Table 7).

Table 7

Pile Data Table						
Location	Pile Type	Nominal Resistance (kips)		Design Tip Elevation (ft)	Specified Tip Elevation (ft)	Required Nominal Driving Resistance (kips)
		Compression	Tension			
Abut 1	Class 200, Alt “W”	140	N/A	183.7 (a) TBD (d)	183.9	320
Bent 2	NPS 24 x0.625	460	N/A	174.5 (a) TBD (d)	174.5	700
Bent 3	NPS 24 x0.625	460	N/A	174.5 (a) TBD (d)	174.5	710
Bent 4	NPS 24 x0.625	460	N/A	174.5 (a) TBD (d)	174.5	710
Abut 5	Class 200, Alt “W”	140	N/A	183.3 (a) TBD (d)	202.5	280

Notes:

- 1) *Design tip elevations are controlled by: (a) Compression, (d) Lateral Load, respectively.*
- 2) *Design tip elevation for Lateral Load is to be determined (TBD) by Caltrans Structure Design.*

12.3 Design Criteria

“APILE” (Version 2014 6.2) computer program by Ensoft, Inc. was used to facilitate the calculations on design axial tips of driven piles in this project. Calculations for each driven pile are mainly based on subsurface information using U.S. Federal Highway Administration (FHWA) and American Petroleum Institute (API) Recommended Practice 2A (2007) computation methods for Class 200, Alt “W” and NPS 24x0.625 pipe piles, respectively. Those calculation methods are included in the “APILE Version 2014 6.2” computer program by Ensoft, Inc.

12.4 Settlement

Based on our estimate, the total permissible support settlement under service load for each support is less than 1 inch.

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12.5 Others

- 1) At the abutments, where new fill material is being placed, a waiting period for embankment consolidation settlement is required prior to abutment pile installation. For more details, refer to the Geotechnical Design Report of this project.
- 2) Per the aforementioned SFHR, it is recommended to reinstall slope protection for the new abutment slopes.
- 3) Protection measures may need to be applied on the outer surfaces of a pile where pile exposure is anticipated to prevent severe corrosion which may result in structure instability.

13. GENERAL NOTES TO DESIGNER

- 1) The Structure Design engineer shall indicate the design pile tip elevation for lateral resistance in the pile data table.
- 2) If the design tip elevation for lateral resistance is lower than the design tip elevation for compression at any support, contact the Office of Geotechnical Design West (OGDW) for additional recommendations.
- 3) A pile drivability evaluation study will be conducted for the proposed piles at Bent 2 and Bent 4.

14. CONSTRUCTION CONSIDERATIONS

- 1) Contractor should perform a test boring to an elevation equal or lower than 145 feet deep at the proposed bridge site between Bent 3 and Bent 4 locations and furnish an LOTBs plan to our office for possible foundation design revision.
- 2) The Contractor shall provide a driving system submittal including drivability analysis for approval prior to installing the piles.
- 3) Pile Dynamic Analysis (PDA) will be required for the first piles driven at Bent 2, Bent 4 and Abutment 5 on this project to assure the quality of production piles and possible adjustments to the pile tip elevations can be evaluated. The Foundation Testing Branch should be contacted to identify the specific requirements for the test.
- 4) If a refusal driving condition is encountered before reaching the specified tip, our office shall be notified in order to evaluate possible pile tip elevation adjustments.

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- 5) If the nominal resistance is not achieved at the specified tip elevation, a minimum waiting period of 48 hours is required for restrike. Our office shall be notified in order to evaluate possible pile tip elevation adjustments. A cold hammer is not allowed to be used in the restrike.
- 6) The OGDW should be invited to a pre-construction meeting.

15. DISCLAIMER AND CONTACT INFORMATION

The recommendations contained in this report are based on specific project information regarding structure type, location, and design loads that have been provided by the Office of Structure Design West. If any conceptual changes are made during final project design, the Office of Geotechnical Design – West, Design Branch A should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Meng-Hsi Hung at (510) 286-7245, Sunny Yang at (510) 286-4808 or Hooshmand Nikoui, Branch Chief at (510) 286-4811.

c: TPokrywka, HNikoui, CRisden, MGaffney, SYang, HSalimi, Daily File

Meng-Hsi Hung /mm

