

American River Flood Control District
CA CVFPB Encroachment Permit – Union Pacific Railroad Bridge Section
Replacement, American River South Levee
Staff Report

Discussion:

The Union Pacific Railroad submitted an application to replace the last wooden bridge section of the crossing on the American River. Previous sections of the bridge were replaced with concrete construction in 2006. The section to be replaced is approximately 200-feet long and connects to the American River South Levee. The bridge will be placed on driven piles in the floodway and augured and driven piles where the bridge is adjacent to the levee.

Key notes about the project:

- The piles placed adjacent to the levee will have pre-drilled holes done with an auger to a depth of 15-feet. The piles will be driven the last remaining 36-feet to get to resistant anchoring material.
- The annular space around the piles will be backfilled with 4000 psi concrete.
- All compaction around the abutment in the levee will be done to USACE levee compaction standards.
- The District's at-grade railroad crossing at this location will remain intact.

Recommendation:

The General Manager recommends that the Board of Trustees endorse the permit application for the Union Pacific Railroad Bridge Section Replacement.

APPLICATION FOR A CENTRAL VALLEY FLOOD PROTECTION BOARD ENCROACHMENT PERMIT

Application No. _____ (For Office Use Only)

1. Description of proposed work being specific to include all items that will be covered under the issued permit.

Union Pacific Railroad (UPRR) proposes to replace the existing railroad bridge at Milepost (MP) 92.12 on the Martinez Subdivision in the City of Sacramento, Sacramento County, California. Please see additional details in Attachment 2.

2. Project Location: Sacramento County, in Section 32 Township: 09 North (N) (S), Range: 05 East (E) (W), M. D. B. & M. Latitude: 38.58826 Longitude: -121.4504 Stream: American River, Levee: Yes Designated Floodway: N/A APN: 001-0170-003-0000

3. Stephen Cheney of Union Pacific Railroad; 1400 Douglas St. Name of Applicant / Land Owner Address Omaha NE 68179 (402) 544-3227 City State Zip Code Telephone Number slcheney@up.com E-mail

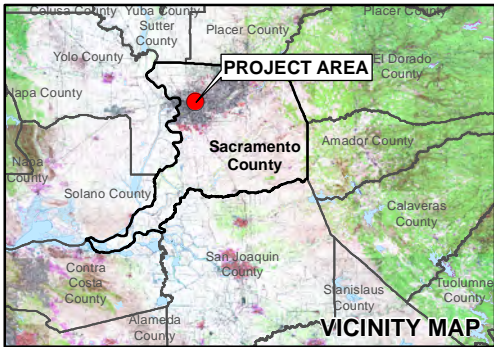
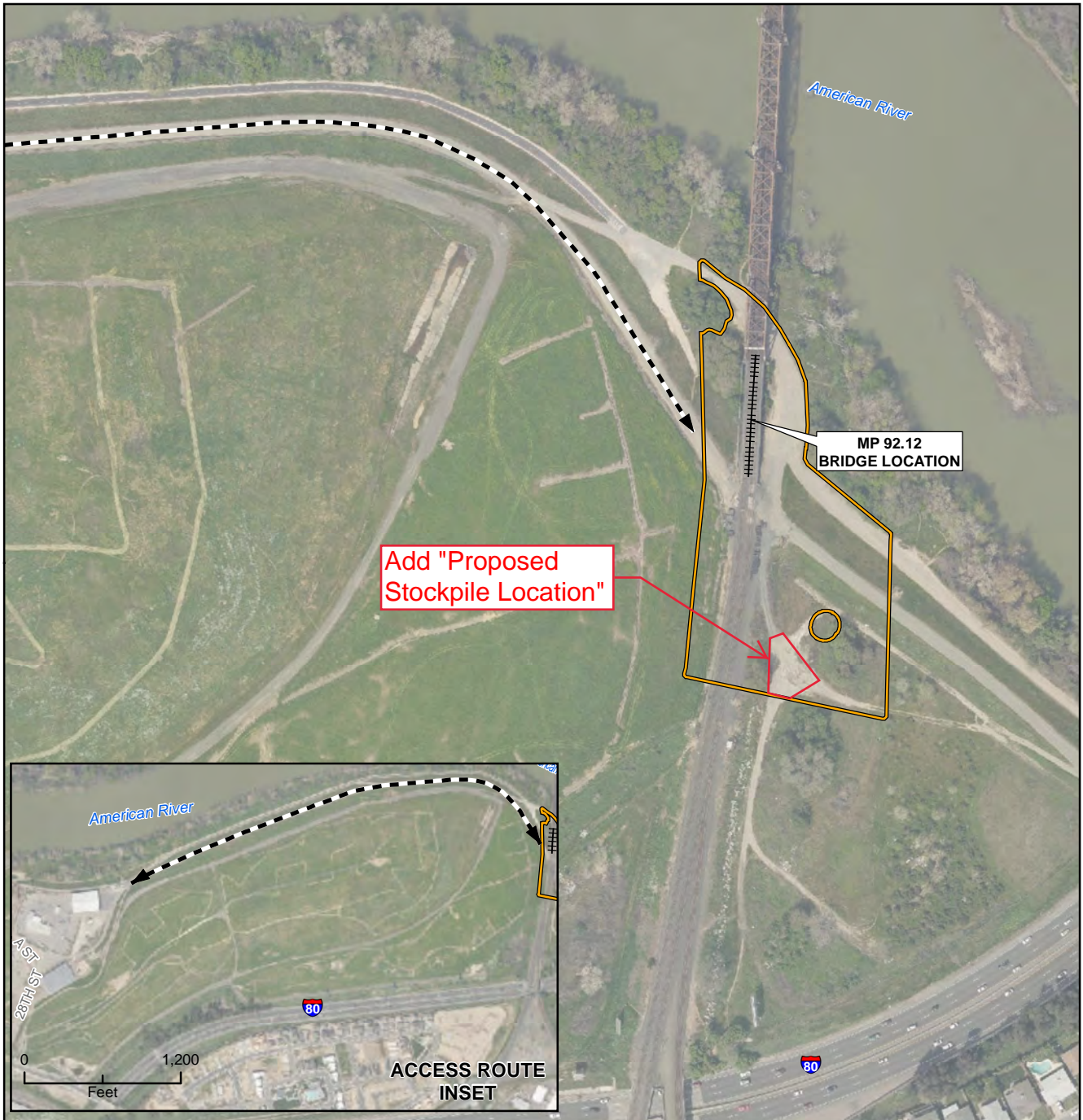
4. Michael Clary of Jacobs Engineering Group, Inc. Name of Applicant's Representative Company Sacramento CA 95833 (510) 610-3007 City State Zip Code Telephone Number michael.clary@jacobs.com E-mail

5. Endorsement of the proposed project from the Local Maintaining Agency (LMA):

We, the Trustees of American River Flood Control District approve this plan, subject to the following conditions: Name of LMA

- Conditions listed on back of this form Conditions Attached No Conditions

Trustee Date Trustee Date Trustee Date Trustee Date



- LEGEND**
- ##### MP 92.12 BRIDGE LOCATION
 - ↔ ACCESS ROUTE
 - ▭ PROJECT AREA (3.38 ACRES)

NOTE:
 SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY.

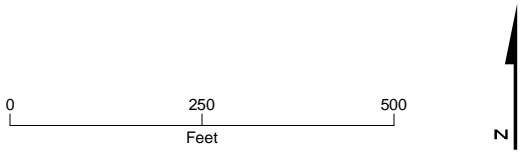
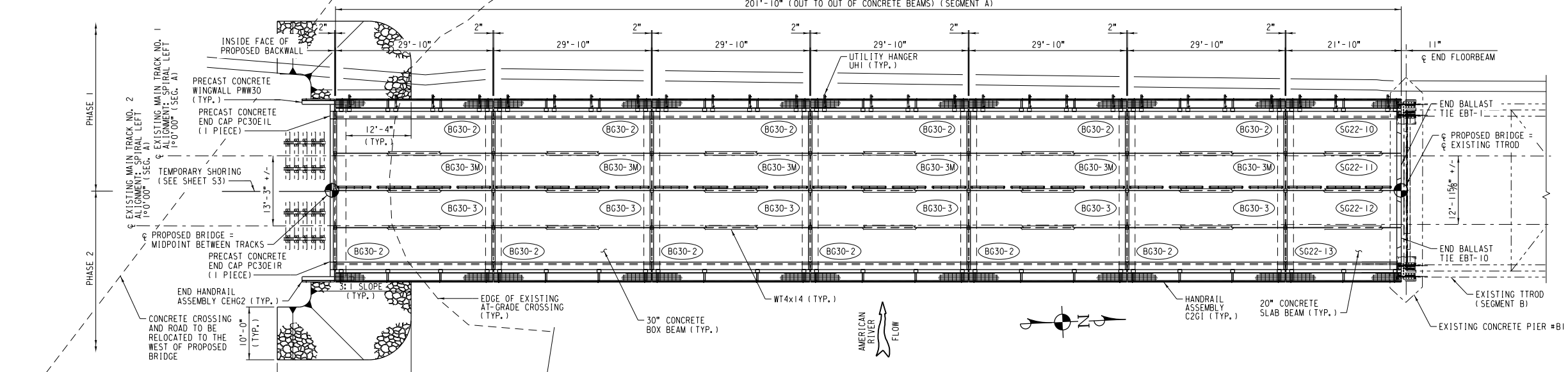


FIGURE 1
PROJECT AREA MAP
 PROJECT DESCRIPTION
 MP 92.12 BRIDGE PROJECT, MARTINEZ SUBDIVISION
 UNION PACIFIC RAILROAD
 SACRAMENTO COUNTY, CALIFORNIA

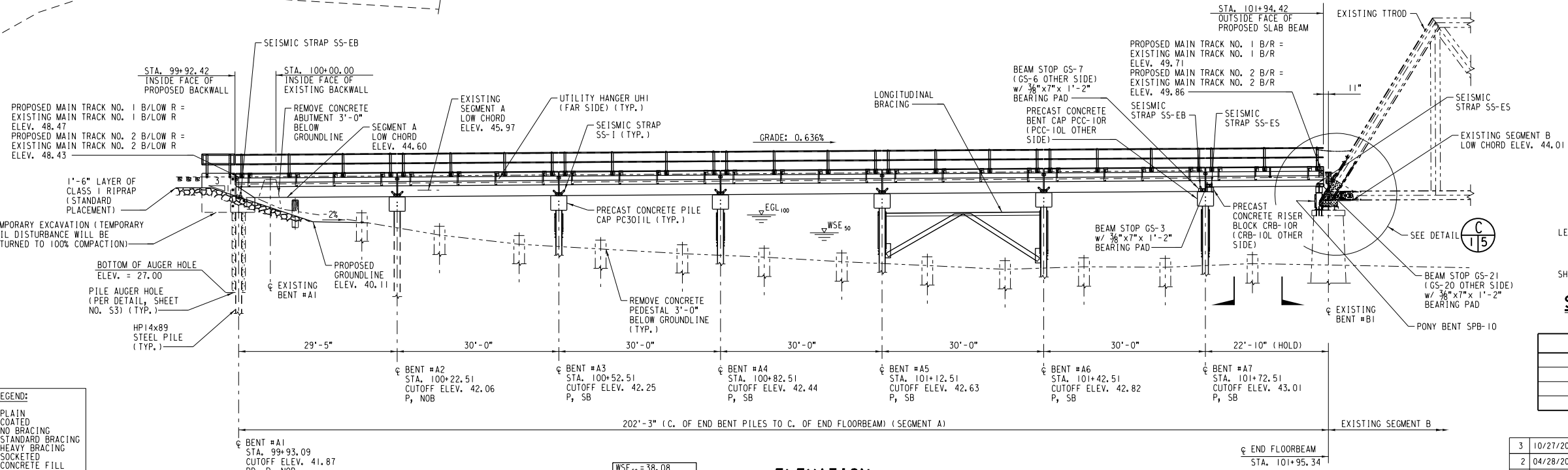
TO 10TH ST. (OAKLAND) (TIMETABLE WEST) TO ROSEVILLE (TIMETABLE EAST)



PLAN
SCALE: 1/2" = 1'-0"

NOTE:
LOCATION OF UTILITIES IS APPROXIMATE. LOCATION SHALL BE FIELD VERIFIED PRIOR TO CONSTRUCTION. NOTIFY THE STATE OF CALIFORNIA *CALL BEFORE YOU DIG* 811 NUMBER, (800) 642-2444, AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
KNOWN UTILITY CONTACT INFORMATION:
QWEST COMMUNICATIONS: 1-800-283-4237
KINDER MORGAN: 714-560-4411

— F/O — = FIBER OPTIC
— GAS — = GAS
— UTIL — = SIGNAL



ELEVATION
SCALE: 1/2" = 1'-0"

PILE LEGEND:
P = PLAIN
CT = COATED
NOB = NO BRACING
SB = STANDARD BRACING
HB = HEAVY BRACING
S = SOCKETED
CF = CONCRETE FILL
PD = PRE-DRILL

SECTION DESIGNATION

LETTER SERIES: SHEET NO. CUT ON: SHEET NO. SHOWN ON:

EST. WT. OF PRECAST CONCRETE	
PIER CAP PCC-10L	= 18,900 LB. (9.5 TON)
PIER CAP PCC-10R	= 18,900 LB. (9.5 TON)
RISER BLOCK CRB-10L	= 3,130 LB. (1.6 TON)
RISER BLOCK CRB-10R	= 3,130 LB. (1.6 TON)

NO.	DATE	REVISIONS
3	10/27/2023	REVISED SHORING AND LEVEL DETAILS
2	04/28/2023	TEMPORARY SHORING DETAILS
1	12/07/2022	MISCELLANEOUS UPDATES

COMPLETION STATUS: **FINAL** 04/20/2022
STATUS DATE

WILSON & COMPANY
APPROVED FOR UNION PACIFIC RAILROAD BY:
David A. Olson CONSULTANT ENGINEER 04/11/2022 DATE

PROJECT ID: 114282 WORK ORDER: 53010 C# NUMBER: 122544
LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

DRAWING SCHEDULE			
SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
S1	122544	GENERAL ARRANGEMENT	DESIGN
S2	122544	GENERAL NOTES AND BILL OF MATERIAL	DESIGN
S3	122544	PILE LAYOUT, PILE DRIVING DIAGRAMS & TEMPORARY SHORING	DESIGN
S4	122544	SECTIONS AND DETAILS (SHEET 1 OF 2)	DESIGN
S5	122544	SECTIONS AND DETAILS (SHEET 2 OF 2)	DESIGN
S6	122544	CLOSURE DETAILS	DESIGN
P1	122544	BEAM MODIFICATION DETAILS (SHEET 1 OF 2)	DESIGN
P2	122544	BEAM MODIFICATION DETAILS (SHEET 2 OF 2)	DESIGN
P3	122544	SLAB BEAM BALLAST DAM DETAILS	DESIGN
P4	122544	PRECAST CONCRETE PIER CAP DETAILS	DESIGN
P5	122544	CONCRETE RISER BLOCK CRB-10	DESIGN
F1	122544	STEEL PONY BENT SPB-10	DESIGN
M1	122544	NON-STANDARD MISCELLANEOUS STEEL DETAILS	DESIGN
T2	532100	GENERAL NOTES	STANDARD
T3	532100	GENERAL NOTES	STANDARD
A1	532100	CONSTRUCTION SEQUENCE (PHASE 1) & BEAM STOP INSTALLATION	STANDARD
A2	532100	CONSTRUCTION SEQUENCE (PHASE 1)	STANDARD
A3	532100	CONSTRUCTION SEQUENCE (PHASE 2)	STANDARD

DRAWING SCHEDULE (CONTINUED)			
SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
A4	532100	CONSTRUCTION SEQUENCE (PHASE 2)	STANDARD
A2	531100	STRUCTURE MARKER & NO TRESPASSING SIGN INSTALLATION DETAILS	STANDARD
B1	532100	30" CONCRETE BOX BEAM GENERAL ARRANGEMENT (PHASE 1)	STANDARD
B2	532100	30" CONCRETE BOX BEAM GENERAL ARRANGEMENT (PHASE 2)	STANDARD
B3	532100	30" CONCRETE BOX BEAM SECTIONS AND DETAILS (PHASE 1)	STANDARD
B4	532100	30" CONCRETE BOX BEAM SECTIONS AND DETAILS (PHASE 2)	STANDARD
B5	532100	30" CONCRETE BOX BEAM SPANS MISCELLANEOUS DETAILS	STANDARD
S1	532100	20" CONCRETE SLAB BEAM GENERAL ARRANGEMENT (PHASE 1)	STANDARD
S2	532100	20" CONCRETE SLAB BEAM GENERAL ARRANGEMENT (PHASE 2)	STANDARD
S3	532100	20" CONCRETE SLAB BEAM SECTIONS AND DETAILS (PHASE 1)	STANDARD
S4	532100	20" CONCRETE SLAB BEAM SECTIONS AND DETAILS (PHASE 2)	STANDARD
S5	532100	20" CONCRETE SLAB BEAM SPANS MISCELLANEOUS DETAILS	STANDARD
BR2	532131	TEMPORARY BALLAST RETAINER INSTALLATION DETAIL AND GEOMETRY TABLE	STANDARD
H1	531110	H-PILE INSTALLATION NOTES AND DETAILS	STANDARD
H2	531110	INTERIOR BENT H-PILE AND BRACING LAYOUT	STANDARD
H5	531110	LONGITUDINAL BRACING DETAILS	STANDARD
R1	531190	STANDARD RIPRAP PLACEMENT DETAILS	STANDARD

DRAWING SETS (MERGED)			
SET NO.	PLAN NO.	DESCRIPTION	TYPE
1	122540	6 SPAN PCB REPLACEMENT (SEGMENT A)	STANDARD
2	S1 OF S1	PILE DRIVING SKETCHES - PARALLEL AND PERPENDICULAR	DESIGN
3	FIG. 2	6 SPAN PCB REPLACEMENT - POTHOLING PLAN	DESIGN

POSTCONSTRUCTION COMPLIANCE
Constructor in charge of construction to provide to the office of Senior Manager Structures Design as-built drawings confirming that the project was constructed in compliance with the plans and indicating any construction variances.
SIGNED
In Charge of Construction _____ Date _____



DESIGNED BY: NAS/BWB
DRAWN BY: NAS/BWB
UPRR ENGINEER: DGW
SHEET NO.: S1 of S6

UNION PACIFIC RAILROAD
Office of Director Structures Design
LOCATION AND DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB
6 SPAN PCB & 1 SPAN PCS (20") x 202" REPLACING 14 SPAN TSTBD x 197" (SEGMENT A)
SHEET TITLE: GENERAL ARRANGEMENT

FILE NAME: P:\CONTR\2023\23-0022\23-0022.dwg Rev. 28.3.dwg

BILL OF MATERIAL						
REQ'D	PHASE 1	PHASE 2	UNIT	DESCRIPTION	ITEM NO	ORDERED BY
12	6	6	EA	30" X 29'-10" PRESTRESSED CONCRETE BOX BEAM BC30-2, TYPE 2 W/ SLOPED CURB (PER STD. PLAN NO. 531130 SHTS. BB1, BB2, BB3, & CC1)	511-7890	MGR BRIDGE PROJECTS
6		6	EA	30" X 29'-10" PRESTRESSED CONCRETE BOX BEAM BC30-3, TYPE 2 W/O SLOPED CURB (PER STD. PLAN NO. 531130 SHTS. BB1-BB3)	511-7861	
6	6		EA	30" X 29'-10" PRESTRESSED CONCRETE BOX BEAM BC30-3M, TYPE 2 W/O CURB (PER DETAIL AND MATERIAL SCHEDULE, SHEET NO. S7, STD. DWG. 531130 SHT. BB1-BB3 AND 532131 SHT. BR1-BR2)	122544-1	
1	1		EA	20" X 21'-10" PRESTRESSED CONCRETE SLAB GIRDER SG22-10, TYPE 2 W/ SLOPED CURB (PER DETAIL AND MATERIAL SCHEDULE, SHEET NO. S7, SHEET NO. S8, SHEET NO. P1, AND STD. PLAN NO. 531130 SHTS. SB1, SB2, & CC1)	122544-2	
1	1		EA	20" X 21'-10" PRESTRESSED CONCRETE SLAB GIRDER SG22-11, TYPE 2 W/O SLOPED CURB (PER DETAIL AND MATERIAL SCHEDULE, SHEET NO. S7, SHEET NO. S8, SHEET NO. P1, AND STD. PLAN NO. 531130 SHTS. SB1, SB2, & CC1)	122544-3	
1		1	EA	20" X 21'-10" PRESTRESSED CONCRETE SLAB GIRDER SG22-12, TYPE 2 W/O SLOPED CURB (PER DETAIL AND MATERIAL SCHEDULE, SHEET NO. S7, SHEET NO. S8, SHEET NO. P1, AND STD. PLAN NO. 531130 SHTS. SB1, SB2, & CC1)	122544-4	
1		1	EA	20" X 21'-10" PRESTRESSED CONCRETE SLAB GIRDER SG22-13, TYPE 2 W/ SLOPED CURB (PER DETAIL AND MATERIAL SCHEDULE, SHEET NO. S7, SHEET NO. S8, SHEET NO. P1, AND STD. PLAN NO. 531130 SHTS. SB1, SB2, & CC1)	122544-5	
1	1		EA	PRECAST CONCRETE END CAP PC30E1L, LEFT 1 PIECE, FOR 30" CONCRETE BOX BEAMS (PER STD. PLAN NO. 532140, SHT. 1)	511-0017	
1		1	EA	PRECAST CONCRETE END CAP PC30E1R, RIGHT 1 PIECE, FOR 30" CONCRETE BOX BEAMS (PER STD. PLAN NO. 532140, SHT. 2)	511-0018	
2	1	1	EA	PRECAST CONCRETE WINGWALL PWW30 FOR 30" CONCRETE BOX BEAMS (PER STD. PLAN NO. 531140 SHT. 1)	511-0001	
10	5	5	EA	PRECAST CONCRETE INTERIOR CAP PC30I1L, LEFT, WITH BEARING PADS FOR BOX BEAMS (PER STD. PLAN NO. 532150, SHT. 1 & STD. PLAN NO. 532160, SHT. 1 & STD. PLAN NO. 532170, SHT. NO. 3)	511-0051	
1	1		EA	PRECAST CONCRETE PILE CAP PCC-10L W/ BEARING PADS FOR BOX BEAMS AND SLAB BEAMS (PER DETAILS AND SCHEDULE, SHEET NO. P2, STD. PLAN NO. 532150 SHT. 1 AND 532170 SHT. 3)	122544-6	
1		1	EA	PRECAST CONCRETE PILE CAP PCC-10R W/ BEARING PADS FOR BOX BEAMS AND SLAB BEAMS (PER DETAILS AND SCHEDULE, SHEET NO. P2, STD. PLAN NO. 532150 SHT. 1 AND 532170 SHT. 3)	122544-7	
42	42		EA	HP14X89 X 60'-0" STEEL PILE WITH POINTS (ASTM A572 GRADE 50, PLAIN)	510-7595	
24	24		EA	C8X11.5 X 15'-0" STEEL BRACING (ASTM A572 GR. 50, PLAIN)	247-6361	
24	24		EA	C10 X 15.3 X 20'-0" STEEL BRACING (ASTM A572 GR. 50, PLAIN)	247-6649	
6	6		EA	W7 X 49.5 X 30'-0" STRUT (ASTM A572 GRADE 50) (FIELD CUT TO LENGTH)	513-7020	
12	12		EA	PLATE P-1 (ASTM A572) (PER STD. PLAN NO. 530000 SHT NO. A1-A7)	513-7022	
12	12		EA	BRACKET B-1 (PER STD. PLAN NO. 531110 SHTS. H1-H6)	513-7024	
12	12		EA	PL 1/2" X 12 X 2'-8" (ASTM A572 GRADE 50) (PER STD. PLAN NO. 530000 SHTS. A1-A7)	513-7026	
48	48		EA	PL 1/2" X 4 X 0'-6" (ASTM A572 GRADE 50) (PER STD. PLAN NO. 530000 SHTS. A1-A7)	513-7028	
10	5	5	EA	INTERIOR BENT BEAM STOP GS-2 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0595	
4	2	2	EA	END BENT BEAM STOP GS-3 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0596	
2	1	1	EA	BEAM STOP GS-6 (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0000	
2	1	1	EA	BEAM STOP GS-7 (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0002	
5	5		EA	BEAM STOP GS-10 (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0003	
4	4		EA	BEAM STOP GS-11 (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0004	
20	10	10	EA	SEISMIC STRAP SS-1 (PER STD. PLAN NO. 531180 SHT. 1-6)	510-0601	
4	2	2	EA	SEISMIC STRAP SS-EB (PER STD. PLAN NO. 531180 SHT. 1-6)	510-0602	
4	2	2	EA	SEISMIC STRAP SS-ES (PER STD. PLAN NO. 531180 SHT. 1-6)	510-0603	
12	6	6	EA	HANDRAIL ASSEMBLY C2G1 FOR 29'-10" CONCRETE INTERIOR SPAN, W/ GRATING (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0564	
2	1	1	EA	HANDRAIL ASSEMBLY C2G1 FOR 21'-10" CONCRETE INTERIOR SPAN, W/ GRATING (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0532	
2	1	1	EA	END HANDRAIL ASSEMBLY C2G2 FOR CONCRETE SPANS W/ GRATING (PER STD. PLAN NO. 531180, SHT. 4)	510-0108	
7	7		EA	DECK PLATE CDP1 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0590	
7	7		EA	DECK PLATE CDP2 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0591	
14	7	7	EA	DECK PLATE CDP3 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0592	
14	7	7	EA	DECK PLATE CDP4 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0593	
12	6	6	EA	INTERIOR DECK PLATE HOLD DOWN PLATE PL31, GALVANIZED (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0005	
2	1	1	EA	END BENT DECK PLATE HOLD DOWN PLATE PL32, GALVANIZED (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0006	
1	1		LOT	NON-STANDARD MISCELLANEOUS STEEL (PER SCHEDULE, SHEET NO. M1)	122544-8	
4	2	2	EA	PL 3/8" X 24 X 10' (A36, PLAIN)	510-7650	
63	21	42	EA	WT4X14X 10'-0" (ASTM A36, GALVANIZED PER ASTM A123)	510-0124	
27	27		EA	UTILITY HANGER UH1 FOR CONCRETE BEAMS (PER DETAILS, STD. PLAN NO. 533180, SHT. 6 & NOTES, STD. PLAN NO. 531100, SHT. 13)	510-0123	
30	20	10	EA	3/8" X 7" X 0'-7" ELASTOMERIC BEARING PAD (50 DUROMETER)	510-3635	
12	8	4	EA	3/8" X 7" X 1'-2" ELASTOMERIC BEARING PAD (50 DUROMETER)	510-3637	
108	54	54	EA	1/2" X 28" X 6'-4" PREMOLDED EXPANSION JOINT FILLER (PER ASTM D1751)	511-8213	
12	6	6	EA	1/2" X 18" X 6'-4" PREMOLDED EXPANSION JOINT FILLER (PER ASTM D1751)	511-8212	
8	4	4	EA	G108 DOWEL BAR (#8 X 1'-8", ASTM A615, GRADE 60)	512-2853	
1	1		EA	END BALLAST TIE EBT-1 (PER STD. DWG. 531130 SHT. BD1)	122544-9	
1		1	EA	END BALLAST TIE EBT-10 (PER DETAIL, SHEET NO. P3)	122544-10	
12	6	6	EA	1/2" DIA. EYEBOLT, 2" LONG SHANK WITH 1" I.D. EYE, PLAIN PATTERN GALVANIZED DROP FORGED STEEL (ASTM A489), WITH ZINC PLATED HEX NYLON INSERT LOCKNUT (ASTM A563) AND ZINC PLATED FLAT CIRCULAR WASHER (ASTM F436)	130-0370	
96	48	48	EA	RED HEAD EPCON C6+ 300Z EPOXY INJECTION CARTRIDGE, PART NO. C6P-30, USE GUNS D102(M) OR D202(P)	410-2148	

BILL OF MATERIAL (CON'T.)						
REQ'D	PHASE 1	PHASE 2	UNIT	DESCRIPTION	ITEM NO	ORDERED BY
102	51	51	EA	HIGH FLOW MIXING NOZZLE FOR RED HEAD C6P-30 OR A7P-28, PART NO. S75, 3/8" HOLES MIN.	410-2149	MGR BRIDGE PROJECTS
2	1	1	QT.	ZRC COLD GALVANIZING COMPOUND OR APPROVED ALTERNATIVE	513-3960	
60	30	30	TON	RIPRAP, CLASS 1 (PER NOTES, STD. PLAN NO. 531190, SHT. R1 OR R2)	562-2764	CONSTRUCTOR
100	50	50	TON	SEALANT-BALLAST (PER STD. DWG. 0010E)	562-5428	
1	1		LOT	AZ50-700 X 30'-0" TEMPORARY SHORING		
12	6	6	LIN. FT.	3/8" DIA. SAFETY CHAIN (5'-0" LENGTHS)		
6	3	3	EA	3/8" QUICK LINK FOR SAFETY CHAIN		
2	1	1	LOT	PL-400 CONSTRUCTION ADHESIVE FOR BEARING PADS (PER STD. PLAN NO. 532100 SHT. A1-A4)		
2	1	1	LOT	4,000 PSI NON-SHRINK CEMENTITIOUS GROUT		
2	1	1	LOT	4,000 PSI SELF-LEVELLING GROUT		
36	18	18	CU. YD.	SPECIAL LEVEE BACKFILL: COMPACTED SB-2 (ROADBASE MATERIAL) COMPACTED IN 6" LIFTS TO 95% MODIFIED PROCTOR		
12	6	6	CU. YD.	SPECIAL LEVEE: IMPERVIOUS CLAY CAP 2'-0" THICK, COMPACTED IN 6" LIFTS TO 95% MODIFIED PROCTOR		

EST. WT. OF STEEL PILING = 224,280 LB.
BULK MATERIAL QUANTITIES ARE ESTIMATED.

DESIGN NOTES

- In the event of a conflict between the design plans and the standards, the design plans shall control.
- RIGHT-OF-WAY**
 - 140'+/- left and 160'+/- right of existing Main Track No. 1 centerline.
- LAYOUT**
 - Stationing: Sta. 100+00.00, East face of West backwall of existing Main Track No. 1, Bridge No. 92.12.
 - Elevation Datum: NAVD88.
 - Temporary Benchmark: Elev. 48.64, top Southwest corner of West abutment, Bridge No. 92.12, 22.74' right of existing Main Track No. 1 Centerline, Sta. 100+00.00.
 - Permanent Benchmark: Elev. 42.30, NGS benchmark W9, 25.40' right of existing Main Track No. 1 Centerline, Sta. 101+95.50.
 - Profile: No change in rail elevation.
 - Alignment: Spiral Left: 190'0" (Segment A), Tangent (Segment B).
 - Information used to prepare this drawing in addition to reference drawings: Location survey prepared by Olsson, dated 2/6/2020.

PILE DRIVING

- All HP14x89 piles shall be driven to 123 ton capacity. Estimated pile depth at tip to be Elev. -11.50.

DESIGN

- The proposed superstructure and substructure have been designed in accordance with the AREMA Manual for Railway Engineering, Chapter 8: Concrete Structures and Foundations, except longitudinal load, which is designed per the 1996 AREA Manual for Railway Engineering.
- This structure was designed for Cooper E80 Live Load plus impact with a 30" maximum total depth of ballast.
- This drawing was prepared using 8" (min.) of ballast under timber ties.

WELL-COMPACTED FILL

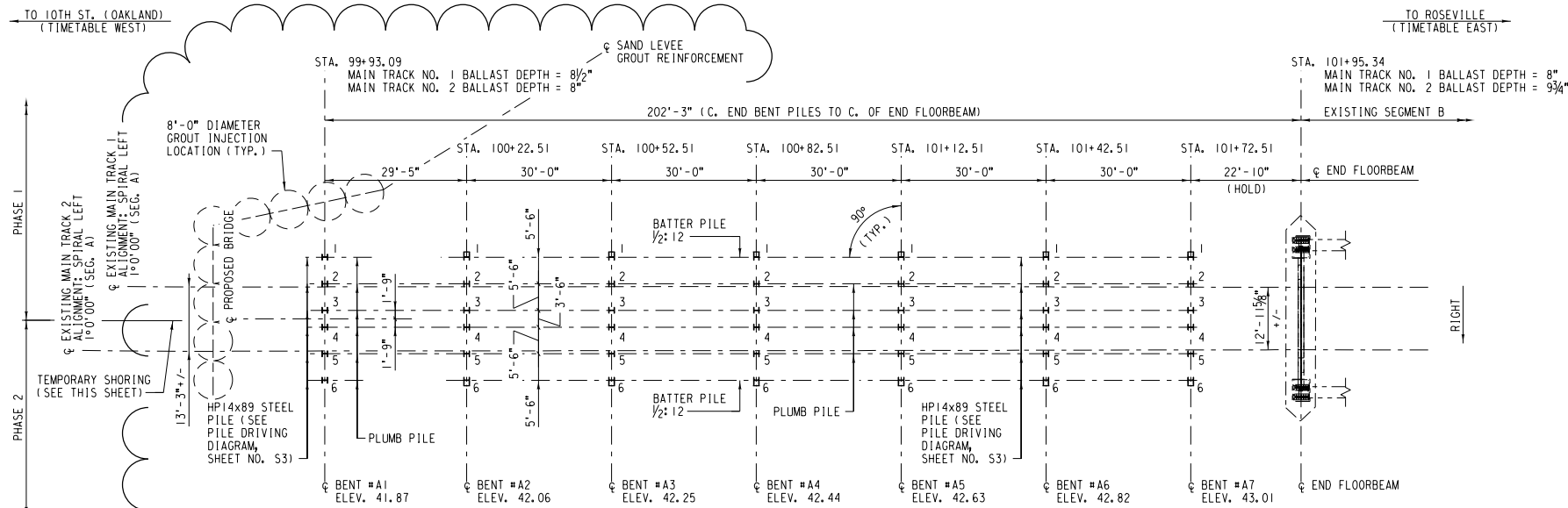
- Using roadbase material S8-2, spread and place fill in 6" loose lifts and compact to greater than or equal to 95% of maximum density at moisture contents between -2 and 3 percent of optimum obtained from ASTM D698.
- Fill shall be compacted using hand operated equipment such as vibrating plate or trench roller.

PROPOSED CONSTRUCTION SEQUENCE

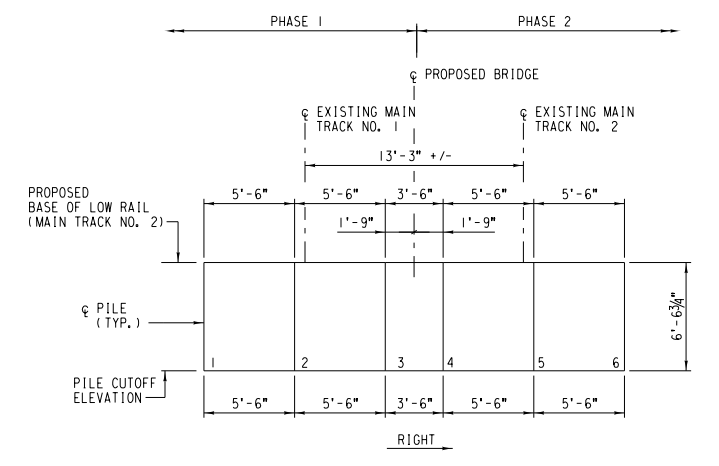
- ALL WORK TO BE PERFORMED BY CONSTRUCTOR, EXCEPT WHERE NOTED IN PARENTHESIS.
- PHASE 1:**
- IN TRACK WINDOWS, ADJUST STRINGERS AS REQUIRED TO DRIVE ALL PILES FOR PROPOSED BENTS.
 - SET PHASE 1 AND PHASE 2 CAPS.
 - INSTALL TEMPORARY SHORING AND BALLAST RETAINERS BETWEEN PHASE 1 AND PHASE 2 CONSTRUCTION LIMITS AS SHOWN.
 - ROUTE ALL TRAFFIC TO MAIN TRACK NO. 2. (RAILROAD)
 - REMOVE PHASE 1 PORTION OF THE EXISTING BRIDGE.
 - PLACE PROPOSED PHASE 1 END CAP ASSEMBLY, RISER BLOCK, PONY BENT, SUPERSTRUCTURE AND BALLAST RETAINERS.
 - BACKFILL BEHIND END BENT AND PLACE RIPRAP.
 - INSTALL BALLAST, TIES, RAIL AND OTM FOR MAIN TRACK NO. 1. (RAILROAD)
 - PLACE MAIN TRACK NO. 1 BACK IN SERVICE. (RAILROAD)
- PHASE 2:**
- CLOSE MAIN TRACK NO. 2 AND ROUTE ALL TRAFFIC TO MAIN TRACK NO. 1. (RAILROAD)
 - REMOVE PHASE 2 PORTION OF THE EXISTING BRIDGE.
 - PLACE PROPOSED PHASE 2 END CAP ASSEMBLY, RISER BLOCK, PONY BENT, AND SUPERSTRUCTURE.
 - BACKFILL BEHIND END BENT AND PLACE RIPRAP.
 - INSTALL BALLAST, TIES, RAIL AND OTM FOR MAIN TRACK NO. 2. (RAILROAD)
 - REMOVE TEMPORARY SHORING.
 - PLACE MAIN TRACK NO. 2 BACK IN SERVICE. (RAILROAD)
 - RESTORE AREA TO ORIGINAL CONDITION OR BETTER.

3	10/27/2023	REVISED SHORING AND LEVEE DETAILS
2	04/28/2023	TEMPORARY SHORING DETAILS
1	12/07/2022	CHANGE PILES TO 60'-0"
NO.	DATE	REVISIONS
COMPLETION STATUS:		
FINAL		04/20/2022
STATUS		DATE
WILSON & COMPANY		
APPROVED FOR UNION PACIFIC RAILROAD BY:		
<i>David A. Olson</i>		04/11/2022
CONSULTANT ENGINEER		DATE
PROJECT ID:	WORK ORDER:	CE NUMBER:
114282	53010	122544
LATITUDE: 38.58826°N		LONGITUDE: 121.45040°W

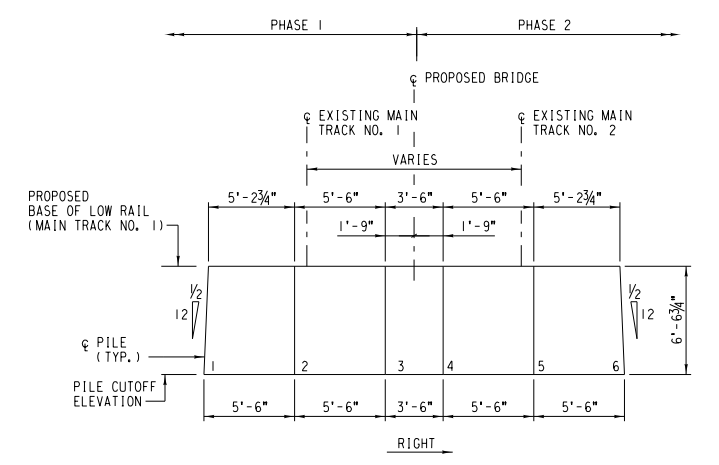
	DESIGNED BY: NAS/BWB	UNION PACIFIC RAILROAD Office of Director Structures Design
	DRAWN BY: NAS/BWB	
	UPRR ENGINEER: DGW	
	SHEET NO.: S2 of S6	
LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB		
6 SPAN PCB & 1 SPAN PCS (20') x 202' REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)		
SHEET TITLE: GENERAL NOTES AND BILL OF MATERIAL		



PILE LAYOUT
SCALE: 1/8" = 1'-0"
AT PILE CUTOFF

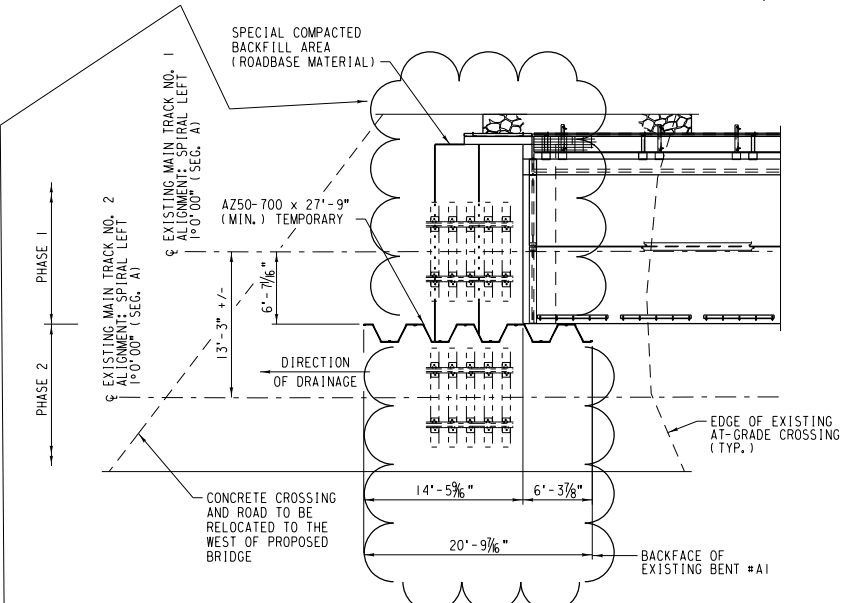


PILE DRIVING DIAGRAM
SCALE: NONE
BENT #A1

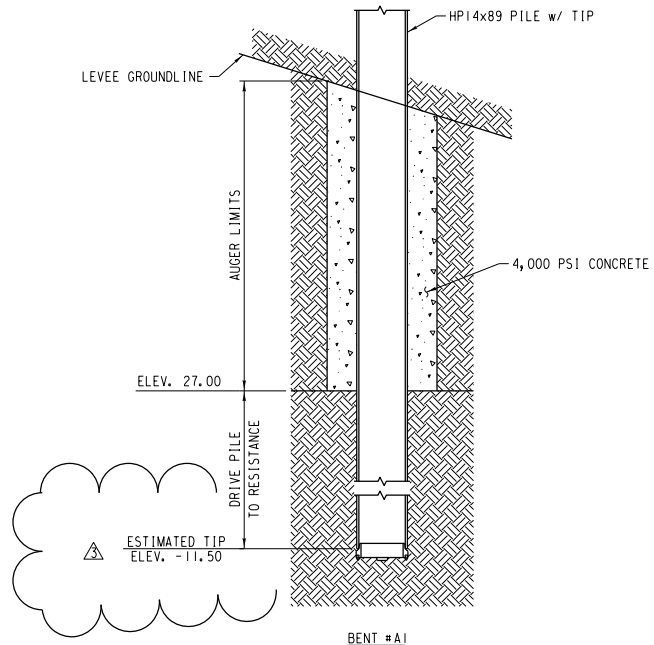


PILE DRIVING DIAGRAM
SCALE: NONE
BENTS #A2 THRU #A7

- NOTES:**
- DESIGN LOADS ARE BASED ON AREMA MANUAL FOR RAILWAY ENGINEERING, 2022, CHAPTER 8, CONCRETE STRUCTURES AND FOUNDATIONS.
BNSF-UPRR GUIDELINES FOR RAILROAD GRADE SEPARATION PROJECTS, 12/7/2021, WITH THE FOLLOWING PROVISIONS:
FREIGHT LIVE LOAD: COOPER E-80
PASSENGER LIVELOAD: COOPER E-60
FREIGHT F.S. = 1.3
PASSENGER F.S. = 1.5
DEFLECTION: 1/2" MAX.
 - STEEL SHEET PILING SHALL CONFORM TO ASTM A572, GRADE 50 (PLAIN).
 - SOIL PROPERTIES USED FOR DESIGN:
AMERICAN RIVER WATERSHED COMMON FEATURES GENERAL REEVALUATION REPORT, ATTACHMENT C, GEOTECHNICAL REPORT, DECEMBER 2015 USACOE, SACRAMENTO DISTRICT - TABLE F-2-1, PERMEABILITY AND STRENGTH SECTION FOR ANALYSIS.
 - EACH SHEET PILE SHALL BE DRIVEN VERTICALLY PLUMB WITHIN A HORIZONTAL TOLERANCE OF 1% OF ANY VERTICAL LENGTH MEASURED ALONG THE PILE. CARE SHALL BE PROVIDED TO PREVENT AND CORRECT ANY TENDENCY OF PILES TO TWIST OR GET OUT OF PLUMB. PILES SHALL ALSO BE ALIGNED PROPERLY TO MAINTAIN A "NORMAL" DRIVING WIDTH.
 - TRIM SHEETS AS REQUIRED TO FIT AGAINST EXISTING ABUTMENT.
 - HANDRAIL AND WINDWALL BEYOND NOT SHOWN.
 - SPECIAL BACKFILL TO CONSIST OF 6" LIFTS OF SB-2 (ROADBASE MATERIAL) COMPACTED TO 95% MODIFIED PROCTOR IN THE LIMITS OF THE STEPPED EXCAVATION.
 - RESTORE 2'-0" THICK CLAY CAP IF IMPACTED. SPREAD AND PLACE FILL IN 6 INCH LOOSE LIFTS AND COMPACT TO GREATER THAN OR EQUAL TO 95% OF MAXIMUM DENSITY AT MOISTURE CONTENTS BETWEEN -2 AND 3 PERCENT OF OPTIMUM OBTAINED FROM ASTM D698.

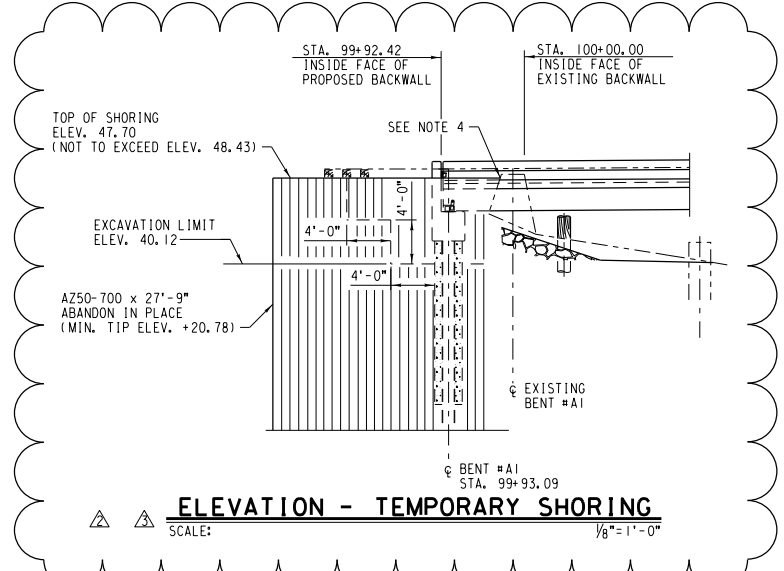


PLAN - TEMPORARY SHORING
SCALE: 1/8" = 1'-0"



PILE AUGER HOLE DETAIL
SCALE: NO SCALE
EST. VOLUME OF CONCRETE = 0.9 CU. YD. PER 5' SOCKET DEPTH

- PILE AUGER HOLE NOTES:**
- DEPTH OF PILE AUGER HOLE SHALL BE TO ELEV. 27.00.
 - PILING WITH TIP REINFORCEMENT SHALL BE PLACED INTO AUGERED HOLE AND DRIVEN TO RESISTANCE.
 - PILE SHALL BE ENCASED IN AUGERED HOLE WITH 4,000 PSI CONCRETE.



ELEVATION - TEMPORARY SHORING
SCALE: 1/8" = 1'-0"

3	10/27/23	REVISED SHORING AND LEVEE DETAILS
2	04/28/2023	TEMPORARY SHORING DETAILS
NO.	DATE	REVISIONS
COMPLETION STATUS:		
FINAL		04/20/2022
STATUS		DATE
WILSON & COMPANY		
APPROVED FOR UNION PACIFIC RAILROAD BY:		
<i>Paul A. Olsen</i>		04/11/2022
CONSULTANT ENGINEER		DATE
PROJECT ID:	WORK ORDER:	C# NUMBER:
114282	53010	122544
LATITUDE: 38.58826°N		LONGITUDE: 121.45040°W

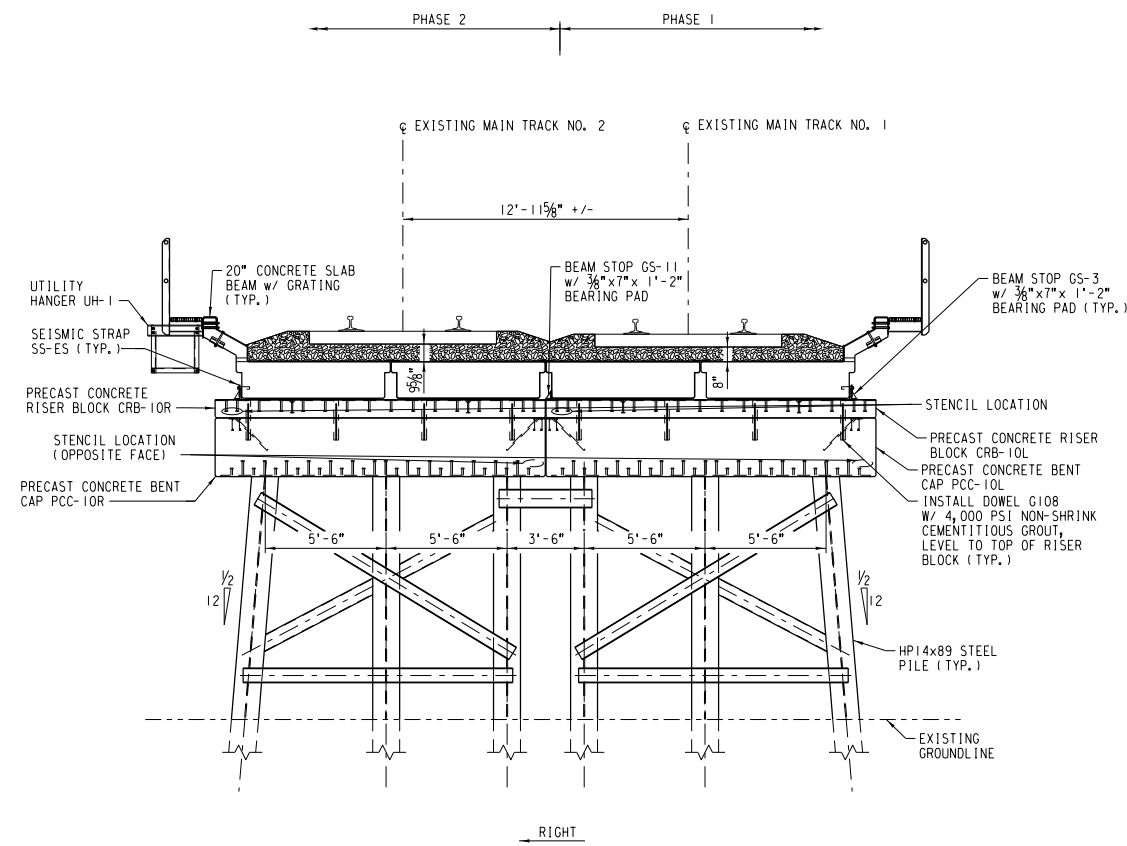
UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB

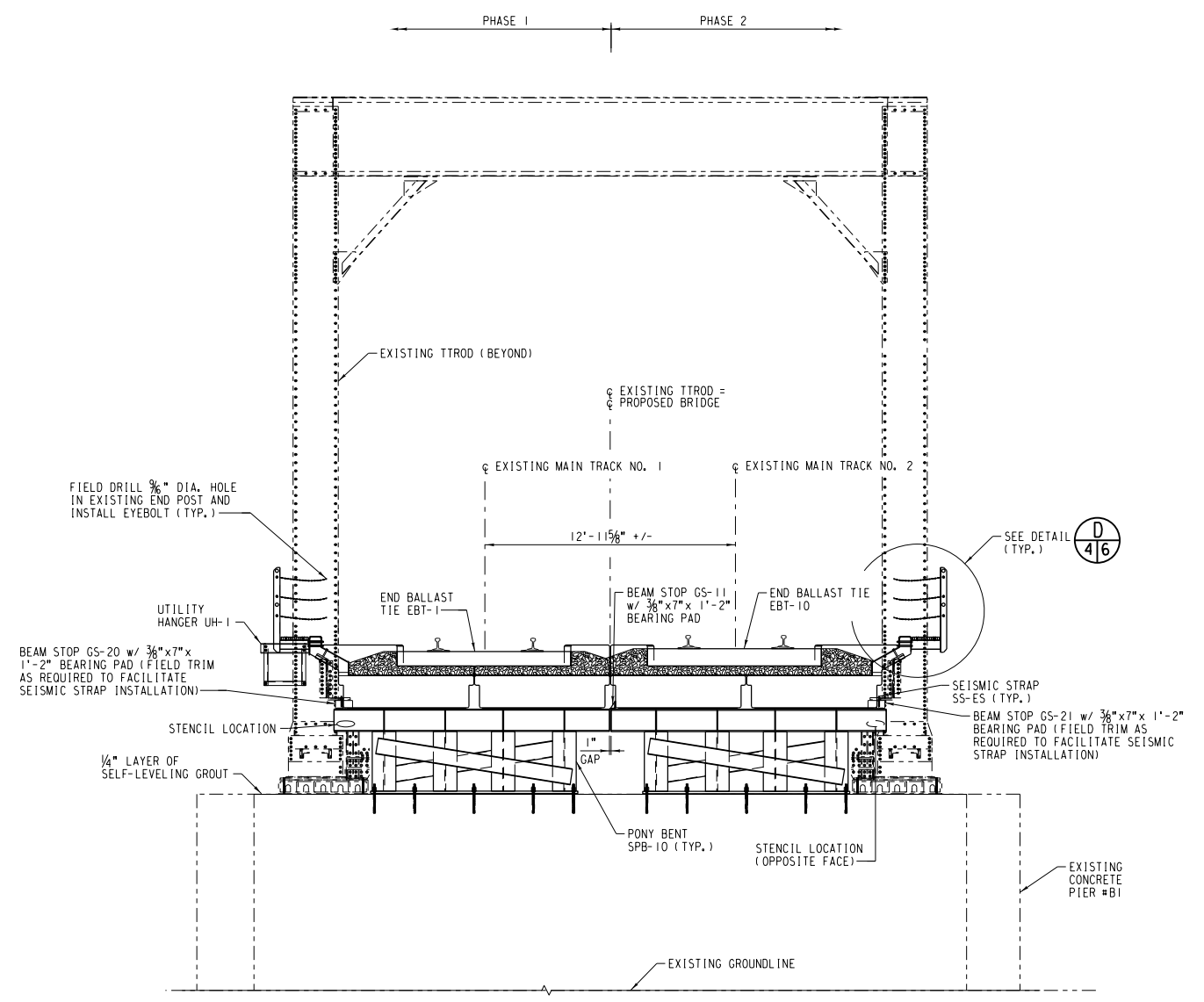
6 SPAN PCB & 1 SPAN PCS (20') x 202'
REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)

SHEET TITLE: PILE LAYOUT, PILE DRIVING DIAGRAMS & TEMPORARY SHORING DETAILS

DESIGNER BY: NAS/BWB	UNION PACIFIC RAILROAD Office of Director Structures Design
DRAWN BY: NAS/BWB	
UPRR ENGINEER: DGW	
SHT NO.: S3 of S6	



SECTION A
SCALE: 1/4" = 1'-0"



SECTION B
SCALE: 1/4" = 1'-0"

NO.	DATE	REVISIONS

COMPLETION STATUS: **FINAL** DATE: 04/20/2022

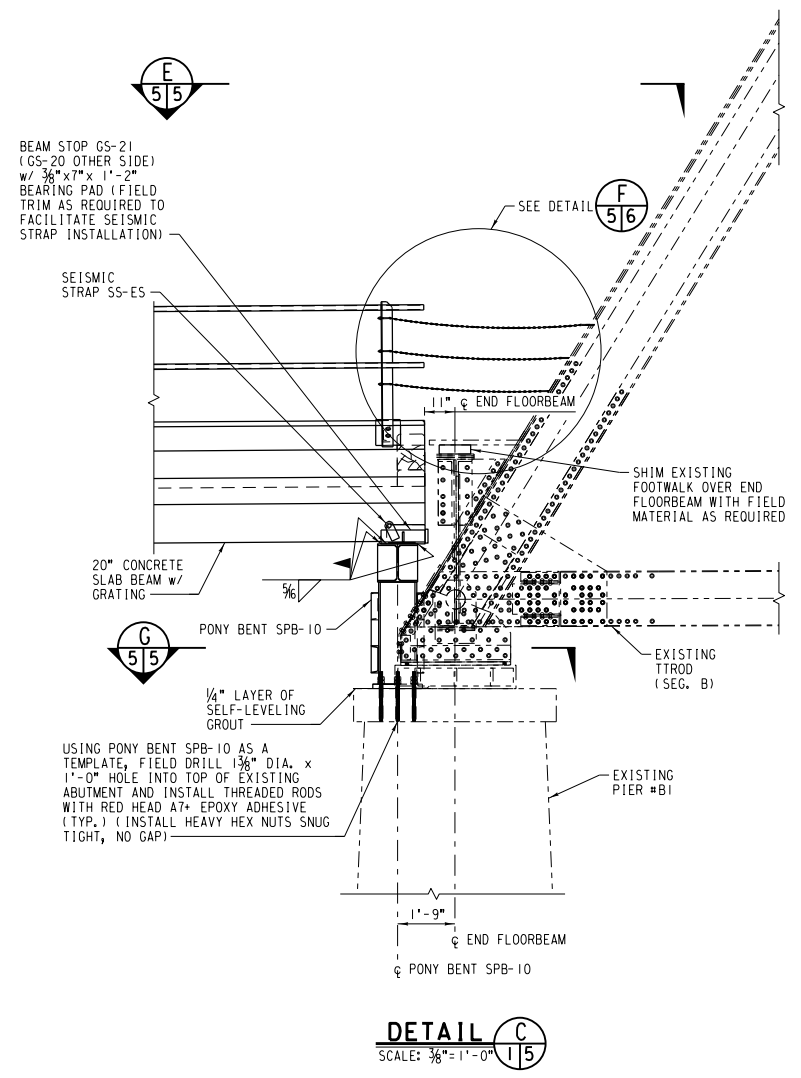
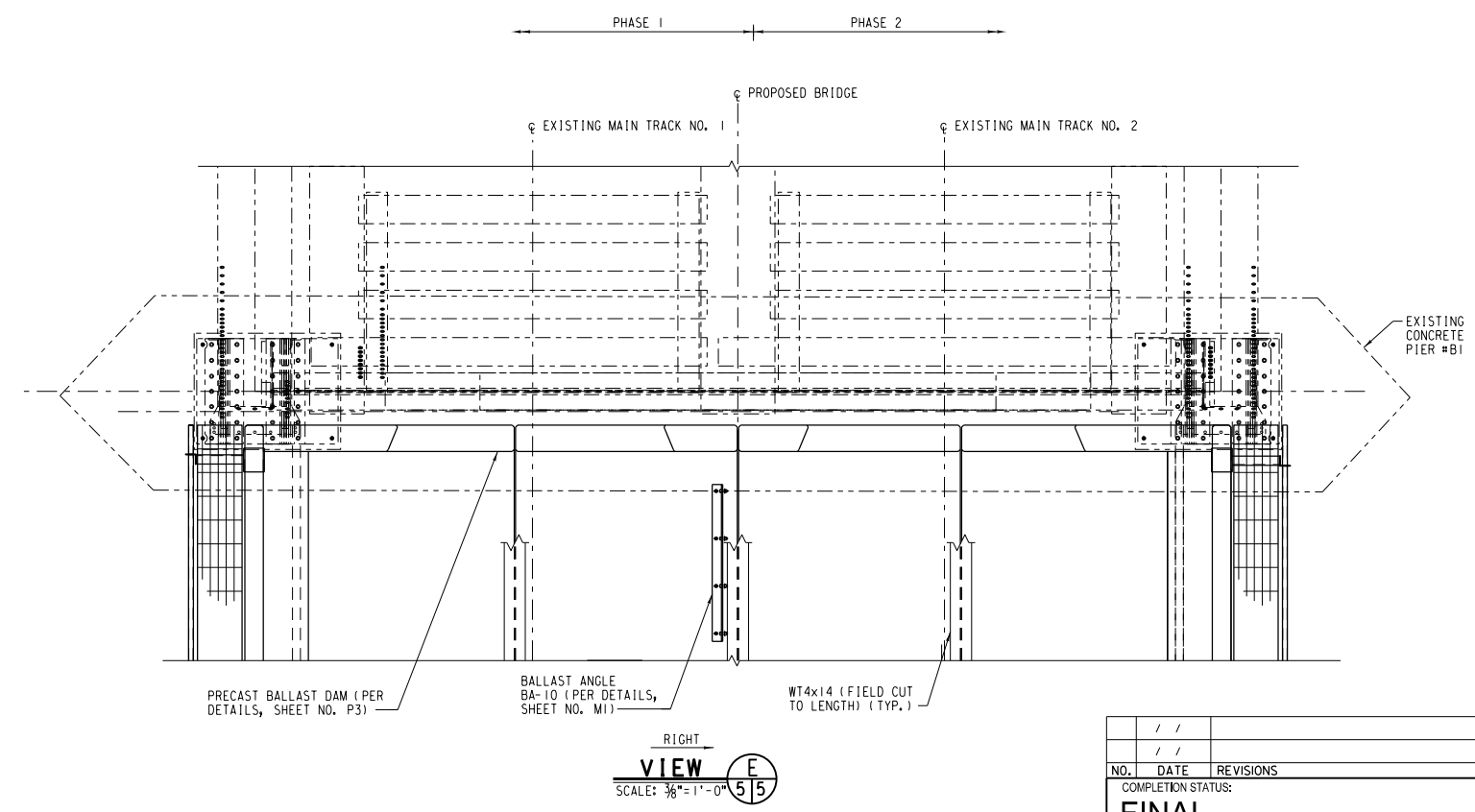
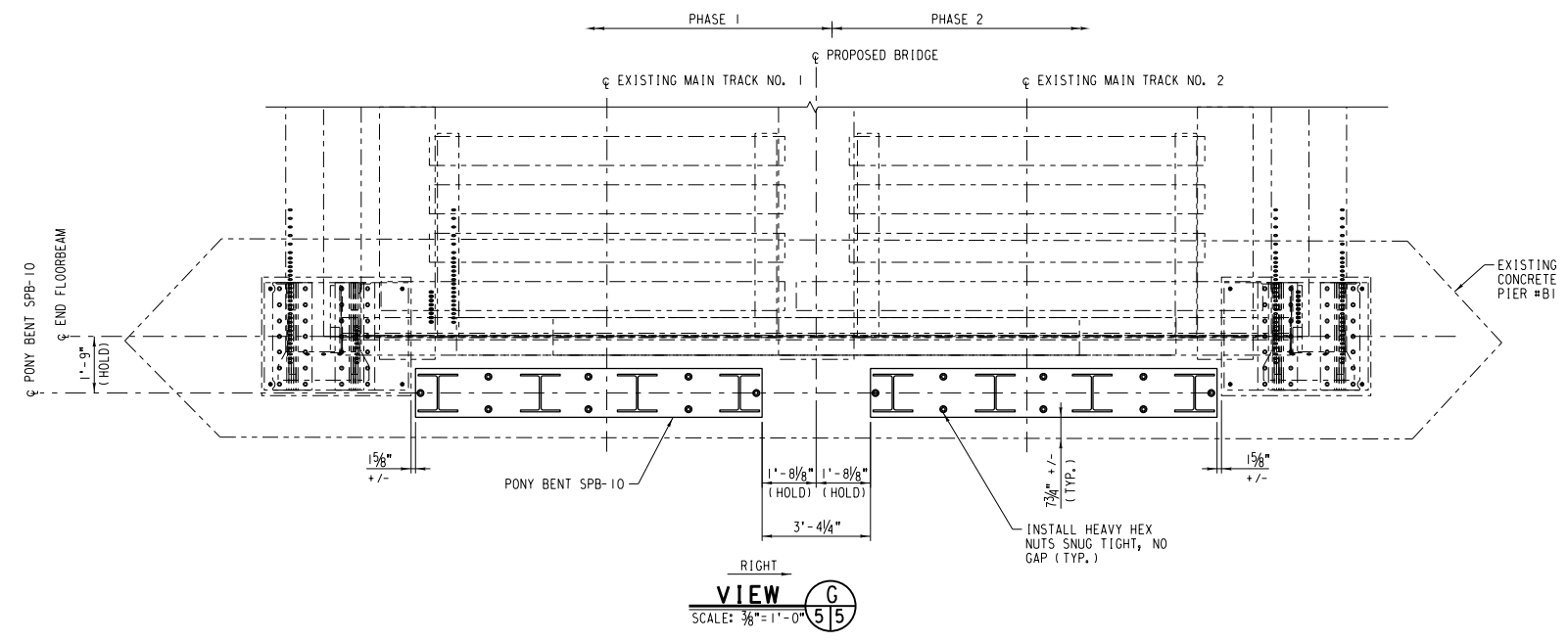
APPROVED FOR UNION PACIFIC RAILROAD BY: *Quail A. Olson* DATE: 04/11/2022
CONSULTANT ENGINEER

PROJECT ID: 114282 WORK ORDER: 53010 C/E NUMBER: 122544

LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

	DSN/CHK BY: NAS/BWB	UNION PACIFIC RAILROAD Office of Director Structures Design
	DRAWN/CHK BY: NAS/BWB	
UPRR ENGINEER: DGW	LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB 6 SPAN PCB & 1 SPAN PCS (20') x 202' REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)	
SHT NO.: S4 of S6	SHEET TITLE: SECTIONS AND DETAILS (SHEET 1 OF 2)	

FILE NAME: P:\UNION\mt2022\baa Rev. 28.3.dgn



NO.	DATE	REVISIONS

COMPLETION STATUS: **FINAL** DATE: 04/20/2022

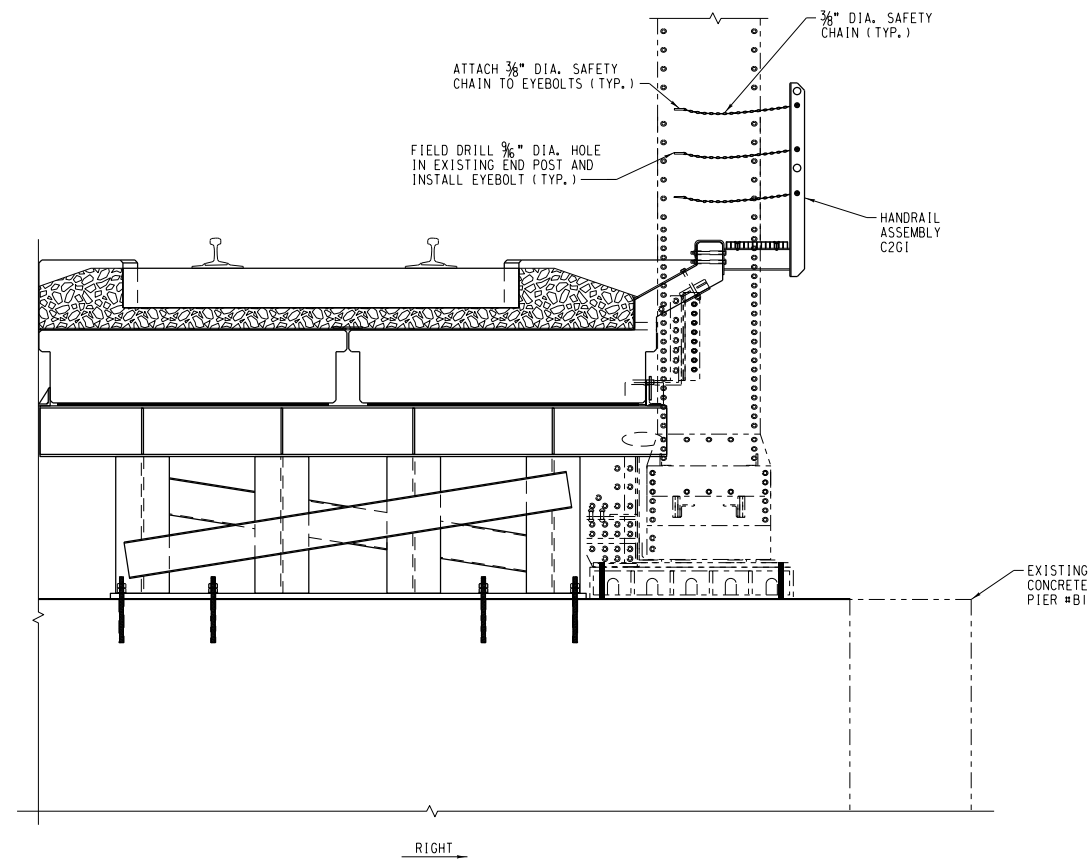
APPROVED FOR UNION PACIFIC RAILROAD BY: *Paul A. Olsen* DATE: 04/11/2022
CONSULTANT ENGINEER

PROJECT ID: 114282 WORK ORDER: 53010 C E NUMBER: 122544

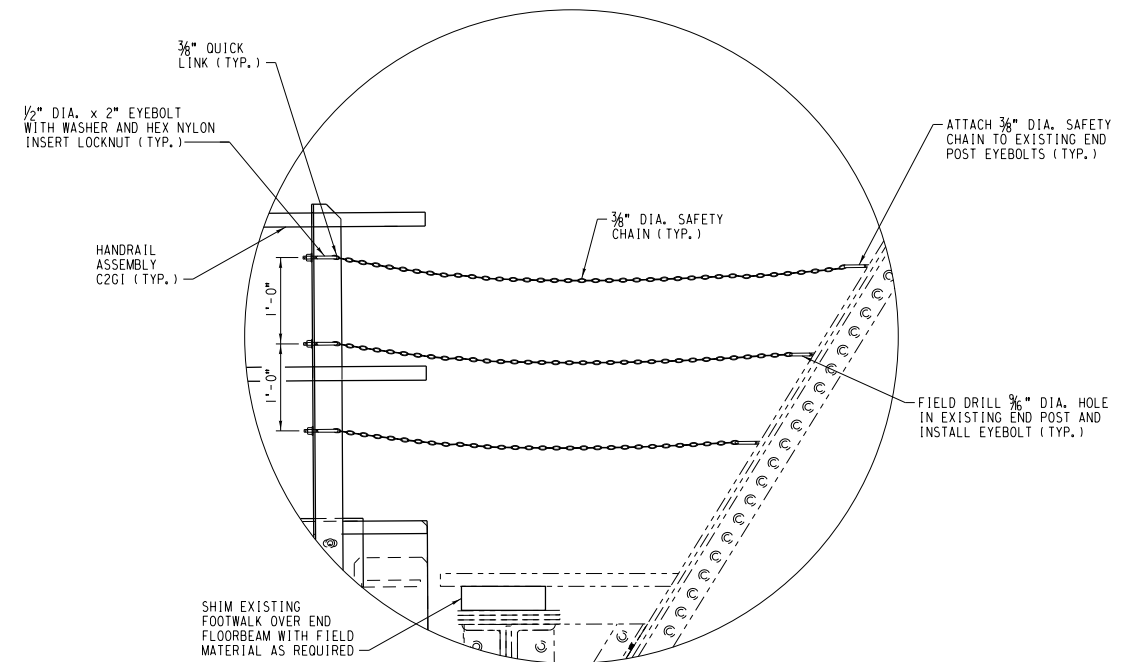
LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

	DSN/CHK BY: NAS/BWB	UNION PACIFIC RAILROAD Office of Director Structures Design LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB 6 SPAN PCB & 1 SPAN PCS (20') x 202' REPLACING 14 SPAN TSTBD x 197' (SEGMENT A) SHEET TITLE: SECTIONS AND DETAILS (SHEET 2 OF 2)
	DRAWN/CHK BY: NAS/BWB	
	UPRR ENGINEER: DGW	
	SH1 NO.: S5 of S6	

FILE NAME: P:\DGN\mt509212.dgn Rev. 28.3.dgn



DETAIL D
SCALE: 1/2"=1'-0" 4/6



DETAIL F
SCALE: 1"=1'-0" 5/6

NO.	DATE	REVISIONS

COMPLETION STATUS:
FINAL STATUS DATE: 04/20/2022

WILSON & COMPANY
APPROVED FOR UNION PACIFIC RAILROAD BY:
Paul A. Chen CONSULTANT ENGINEER DATE: 04/11/2022

PROJECT ID: 114282 WORK ORDER: 53010 C/E NUMBER: 122544
LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

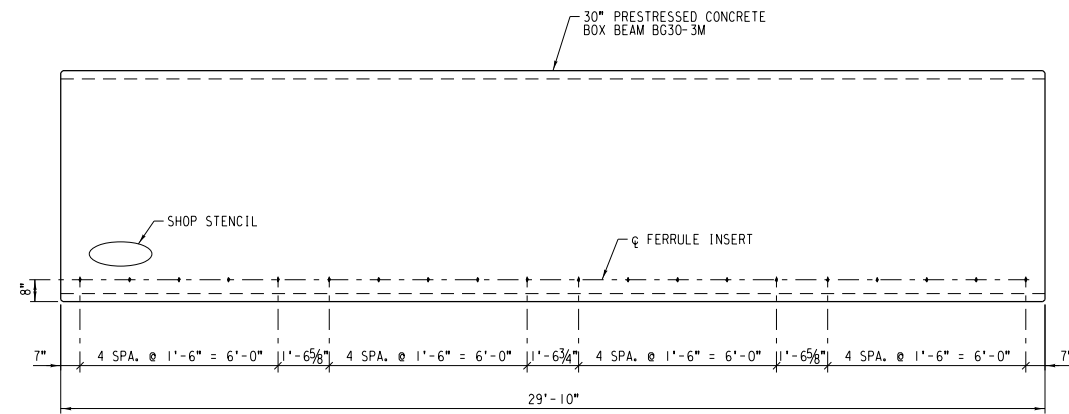
	DESIGNED BY: NAS/BWB	UNION PACIFIC RAILROAD Office of Director Structures Design
	DRAWN BY: NAS/BWB	
	UPRR ENGINEER: DGW	
	SHT NO.: S6 of S6	
LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB 6 SPAN PCB & 1 SPAN PCS (20') x 202' REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)		SHEET TITLE: CLOSURE DETAILS

FILE NAME: P:\USON\mt2022\baa Rev. 283.dgn

MATERIAL SCHEDULE (BOX BEAM MODIFICATION)		
REQUIRED PER BG30-3M	UNIT	DESCRIPTION
20	EA.	FERRULE INSERTS DAYTON/RICHMOND TYPE F-57 NC FOR 3/4" DIA. BOLT, ELECTRO-GALVANIZED OR APPROVED ALTERNATE.
4	EA.	BALLAST ANGLE BA-1 (LAI=6'-5", N=4) (PER STD. PLAN NO. 532131 SHT. BR1)
20	EA.	3/4" DIA. x 2" ASTM A307 BOLT GRADE A HEX BOLT WITH FLAT CIRCULAR WASHER (ASTM F436) AND REGULAR SPRING LOCKWASHER (McMASTER CARR NO. 91102A036 OR APPROVED ALTERNATE), EACH COMPONENT HOT DIP OR MECHANICALLY ZINC COATED
20	EA.	3/4" DIA. x 2 1/2" A307 GRADE A HVY. HEX. BOLT, w/ FLAT CIRCULAR WASHER (F436), AND ELASTIC LOCKNUT (MIL-DTL-32258), EA. COMPONENT HOT DIP OR MECHANICALLY ZINC COATED

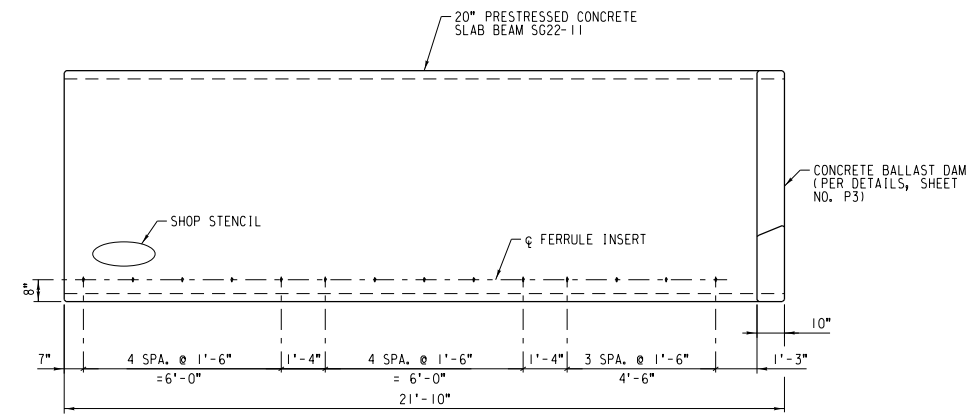
MATERIAL SCHEDULE (SLAB BEAM MODIFICATION)		
REQUIRED PER SG22-11	UNIT	DESCRIPTION
14	EA.	FERRULE INSERTS DAYTON/RICHMOND TYPE F-57 NC FOR 3/4" DIA. BOLT, ELECTRO-GALVANIZED OR APPROVED ALTERNATE.
2	EA.	BALLAST ANGLE BA-1 (LAI=6'-5", N=4) (PER STD. PLAN NO. 532131 SHT. BR1)
1	EA.	BALLAST ANGLE BA-10 (LAI=4'-11", N=3) (PER DETAILS, SHEET NO. M1)
14	EA.	3/4" DIA. x 2" ASTM A307 BOLT GRADE A HEX BOLT WITH FLAT CIRCULAR WASHER (ASTM F436) AND REGULAR SPRING LOCKWASHER (McMASTER CARR NO. 91102A036 OR APPROVED ALTERNATE), EACH COMPONENT HOT DIP OR MECHANICALLY ZINC COATED
14	EA.	3/4" DIA. x 2 1/2" A307 GRADE A HVY. HEX. BOLT, w/ FLAT CIRCULAR WASHER (F436), AND ELASTIC LOCKNUT (MIL-DTL-32258), EA. COMPONENT HOT DIP OR MECHANICALLY ZINC COATED

NOTE:
FOR DETAILS NOT SHOWN
SEE STD. DWG. 532131.



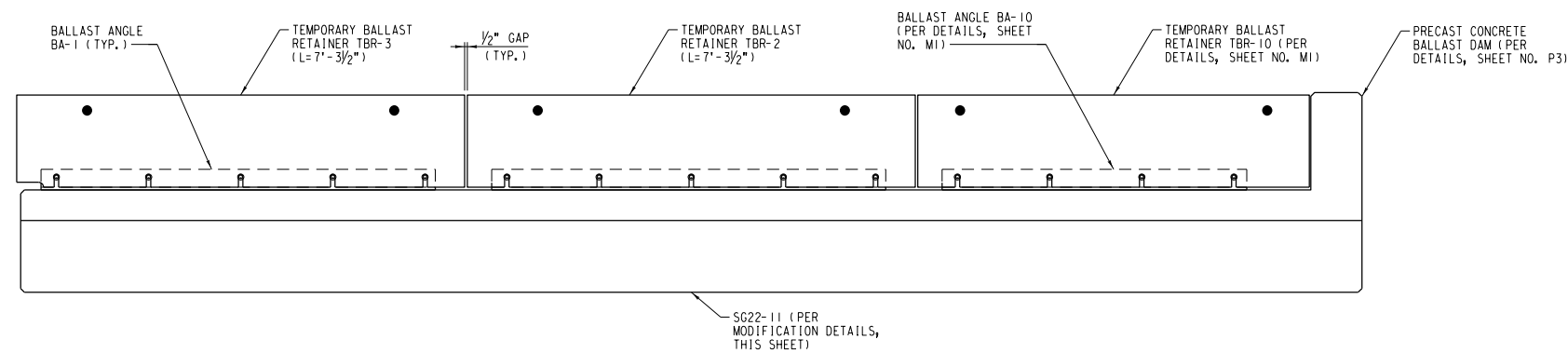
BOX BEAM BG30-3M MODIFICATIONS

SCALE: 3/8" = 1'-0"



SLAB BEAM SG22-11 MODIFICATIONS

SCALE: 3/8" = 1'-0"



TEMPORARY BALLAST RETAINER INSTALLATION DETAIL - SG22-11

SCALE: 3/4" = 1'-0"

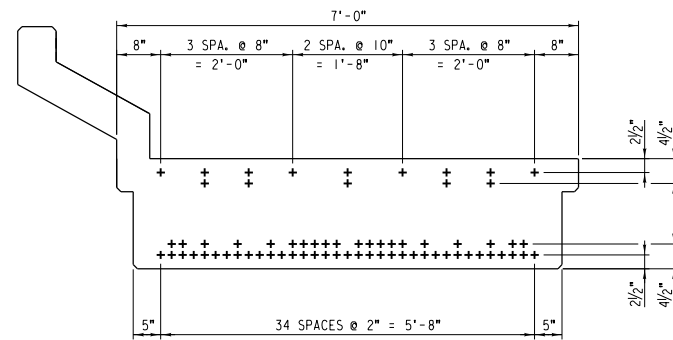
NO.	DATE	REVISIONS

COMPLETION STATUS: **FINAL** STATUS DATE: 04/20/2022

WILSON & COMPANY
APPROVED FOR UNION PACIFIC RAILROAD BY:
Quaid A. Olson CONSULTANT ENGINEER DATE: 04/11/2022

PROJECT ID: 114282 WORK ORDER: 53010 C/E NUMBER: 122544
LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

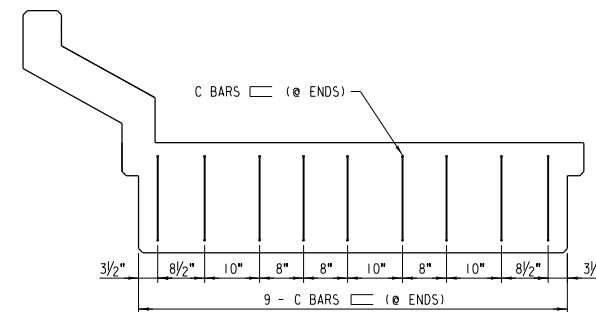
	DSN/CHK BY: NAS/BWB	UNION PACIFIC RAILROAD Office of Director Structures Design
	DRAWN/CHK BY: NAS/BWB	
	UPRR ENGINEER: DGW	
	SHT NO.: P1 of P5	
LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB 6 SPAN PCB & 1 SPAN PCS (20') x 202' REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)		SHEET TITLE: BEAM MODIFICATION DETAILS (SHEET 1 OF 2)



SLAB BEAM SG22 STRAND PATTERN

SCALE: $\frac{3}{4}'' = 1'-0''$

+ (69-1/2" DIA. 270 KSI STRANDS)
f'c = 8.5 ksi, f'ci = 6 ksi



SLAB BEAM SG22 END REINFORCING MODIFICATION DETAIL

SCALE: $\frac{3}{4}'' = 1'-0''$

- NOTES:**
1. THIS MODIFICATION REPLACES 6 - C BARS (Ø ENDS).
 2. OTHER SLAB BEAM REINFORCING NOT SHOWN FOR CLARITY.
 3. MINIMALLY ADJUST LOCATIONS OF THESE BARS IF REQUIRED.

- NOTES:**
1. FOR DETAILS NOT SHOWN SEE STD. PLAN NO. 531130 SHEETS SBI-SB3.
 2. STRAND PATTERN APPLIES TO SG22-10, SG22-11, SG22-12 AND SG22-13.

NO.	DATE	REVISIONS

COMPLETION STATUS:
FINAL 04/20/2022
STATUS DATE

WILSON & COMPANY

APPROVED FOR UNION PACIFIC RAILROAD BY:
Paul A. Chen 04/11/2022
CONSULTANT ENGINEER DATE

PROJECT ID: 114282	WORK ORDER: 53010	C/E NUMBER: 122544
-----------------------	----------------------	-----------------------

LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

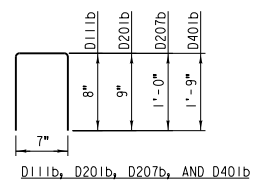
	DESIGN/CHK BY: NAS/BWB	UNION PACIFIC RAILROAD Office of Director Structures Design
	DRAWN/CHK BY: NAS/BWB	
	UPRR ENGINEER: DGW	
	SHT NO.: P2 of P5	
LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB		6 SPAN PCB & 1 SPAN PCS (20') x 202' REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)
SHEET TITLE: BEAM MODIFICATION DETAILS (SHEET 2 OF 2)		

NOTES:

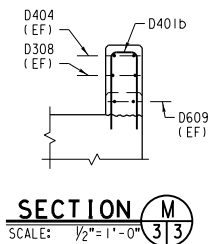
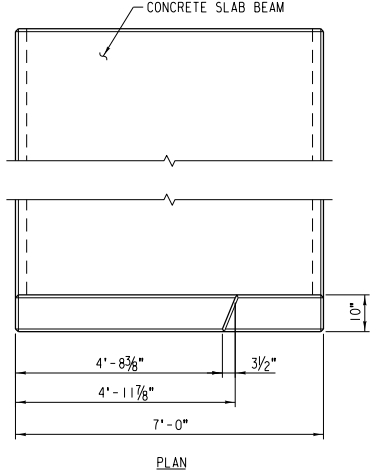
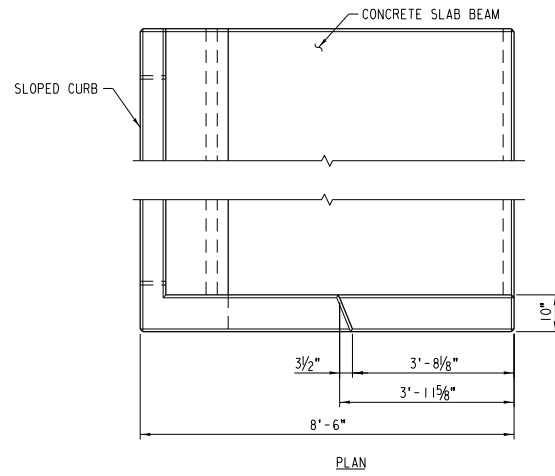
- VERTICAL BALLAST DAM REINFORCING CONNECTING TO THE BEAM CONCRETE SHALL BE CAST IN WITH THE BEAM. DRILLING AND DOWELING OF VERTICAL BARS INTO THE BEAM IS NOT PERMITTED.
- BALLAST DAM REINFORCING CONNECTING TO THE CONCRETE CURB MAY BE CAST IN OR DRILLED AND DOWELED INTO THE CURB.
- ESTIMATED WEIGHT OF PRECAST CONCRETE ADDED PER BEAM
 SG22-10: 880 LB.
 SG22-11: 750 LB.
 SG22-12: 845 LB.
 SG22-13: 960 LB.
- EF = EACH FACE

BALLAST DAM MATERIAL SCHEDULE					
REQ'D.	REQ'D.	REQ'D.	REQ'D.	UNIT	DESCRIPTION
SG22-10	SG22-11	SG22-12	SG22-13	CU. YD.	4,000 PSI CONCRETE (PER NOTES, STD. PLAN NO. 531100 SHEET T3)
0.3	0.2	0.2	0.3	LOT	REINFORCING STEEL (PER NOTES, STD. PLAN NO. 531100 SHEET T3 AND SCHEDULE, SHEET NO. P3)

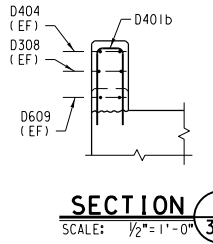
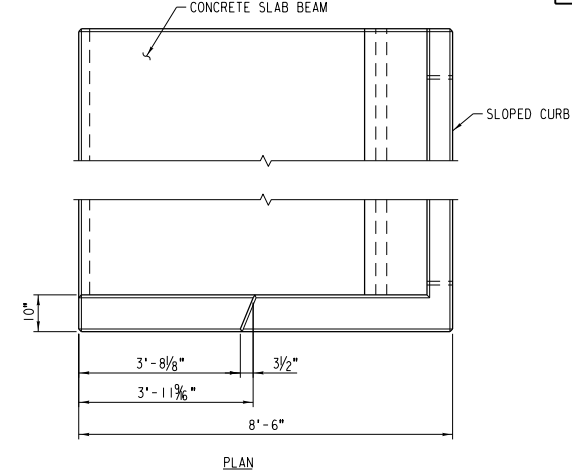
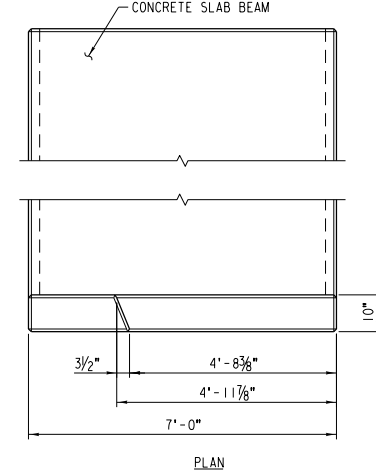
BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)



NOTE:
 BAR DESIGNATIONS CONSIST OF BAR SIZE & LENGTH FOLLOWED BY THE LETTER "b" IF BENT. BAR SIZES ARE REPRESENTED BY THE LETTERS A THROUGH L CORRESPONDING TO BAR SIZE #2 THROUGH #18. BAR LENGTHS ARE GIVEN IN FEET AND INCHES; THE LAST TWO DIGITS ARE INCHES.

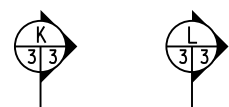


SECTION M
SCALE: 1/2"=1'-0" 3/3

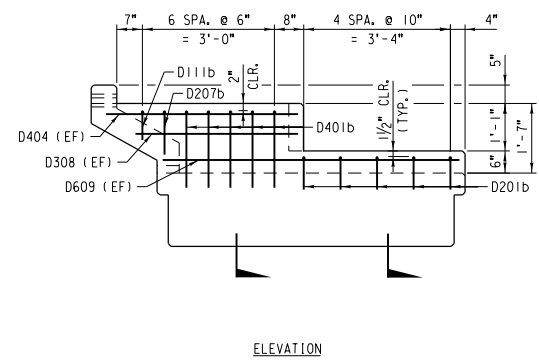


SECTION M
SCALE: 1/2"=1'-0" 3/3

SG22-10 SHOWN. SG22-11 SIMILAR.



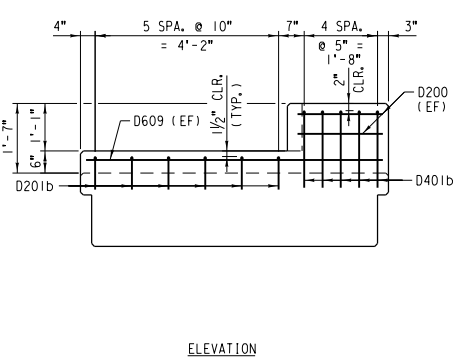
SG22-13 SHOWN. SG22-12 SIMILAR.



SG22-13
SCALE: 1/2"=1'-0"

REINFORCING SCHEDULE				
REQ'D.	MARK	SIZE	LENGTH	SHAPE
1	D111b	#5	1'-11"	□
5	D201b	#5	2'-1"	□
1	D207b	#5	2'-7"	□
2	D308	#5	3'-8"	—
5	D401b	#5	4'-1"	□
2	D404	#5	4'-4"	—
2	D609	#5	6'-9"	—

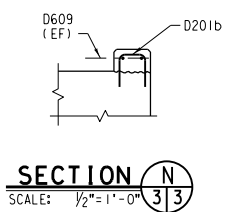
EST. WT. OF REINFORCING STEEL = 70 LB.



SG22-12
SCALE: 1/2"=1'-0"

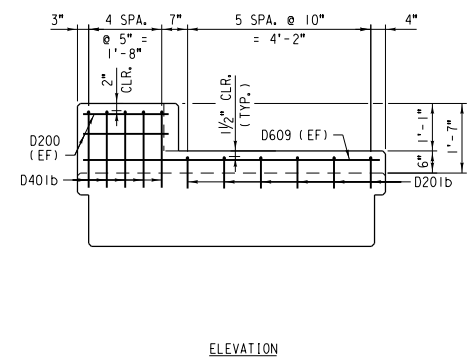
REINFORCING SCHEDULE				
REQ'D.	MARK	SIZE	LENGTH	SHAPE
4	D200	#5	2'-0"	—
6	D201b	#5	2'-1"	□
5	D401b	#5	4'-1"	□
2	D609	#5	6'-9"	—

EST. WT. OF REINFORCING STEEL = 60 LB.



SECTION N
SCALE: 1/2"=1'-0" 3/3

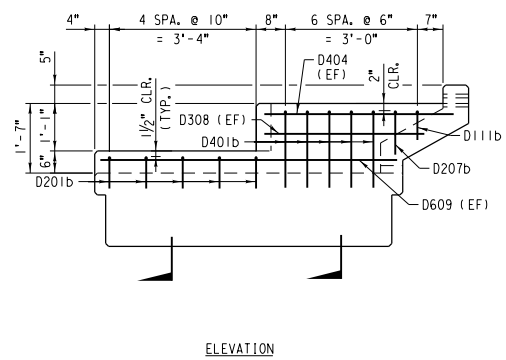
SG22-13 SHOWN. SG22-12 SIMILAR.



SG22-11
SCALE: 1/2"=1'-0"

REINFORCING SCHEDULE				
REQ'D.	MARK	SIZE	LENGTH	SHAPE
4	D200	#5	2'-0"	—
6	D201b	#5	2'-1"	□
5	D401b	#5	4'-1"	□
2	D609	#5	6'-9"	—

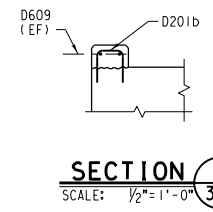
EST. WT. OF REINFORCING STEEL = 60 LB.



SG22-10
SCALE: 1/2"=1'-0"

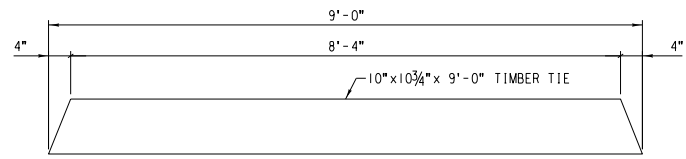
REINFORCING SCHEDULE				
REQ'D.	MARK	SIZE	LENGTH	SHAPE
1	D111b	#5	1'-11"	□
5	D201b	#5	2'-1"	□
1	D207b	#5	2'-7"	□
2	D308	#5	3'-8"	—
5	D401b	#5	4'-1"	□
2	D404	#5	4'-4"	—
2	D609	#5	6'-9"	—

EST. WT. OF REINFORCING STEEL = 70 LB.



SECTION N
SCALE: 1/2"=1'-0" 3/3

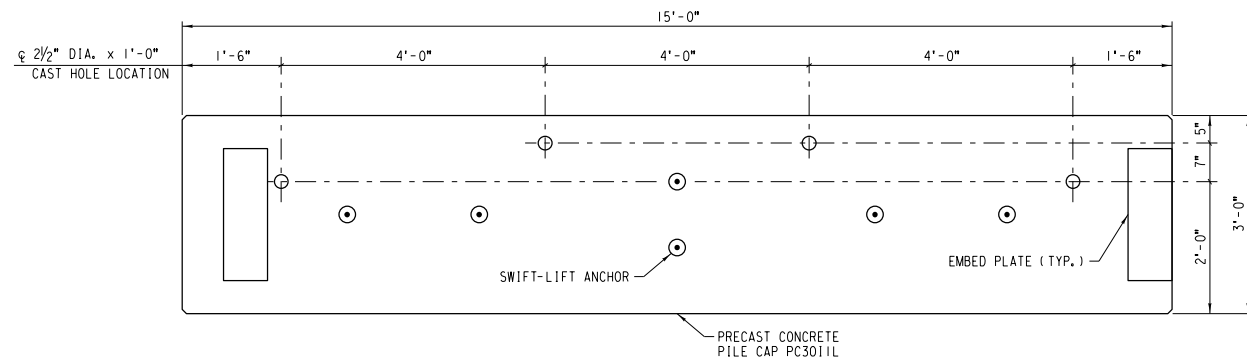
SG22-10 SHOWN. SG22-11 SIMILAR.



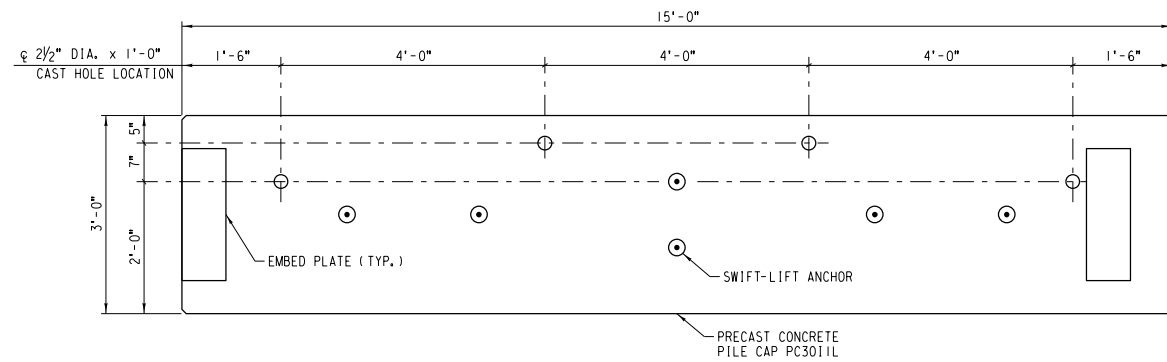
END BALLAST TIE EBT-10
SCALE: 3/4"=1'-0"

NO.	DATE	REVISIONS
COMPLETION STATUS:		
FINAL		04/20/2022
STATUS		DATE
WILSON & COMPANY		
APPROVED FOR UNION PACIFIC RAILROAD BY:		
<i>Quail A. Olson</i>		04/11/2022
CONSULTANT ENGINEER		DATE
PROJECT ID:	WORK ORDER:	C/E NUMBER:
114282	53010	122544
LATITUDE: 38.58826°N		LONGITUDE: 121.45040°W

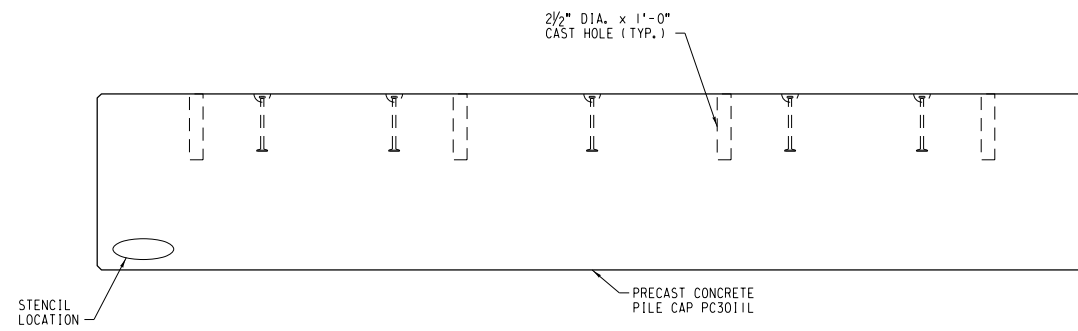
	DSN/CHK BY: NAS/BWB	UNION PACIFIC RAILROAD Office of Director Structures Design
	DRAWN/CHK BY: NAS/BWB	
	UPRR ENGINEER: DGW	
	SHT NO.: P3 of P5	
LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB 6 SPAN PCB & 1 SPAN PCS (20') x 202' REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)		SHEET TITLE: SLAB GIRDER BALLAST DAM DETAILS



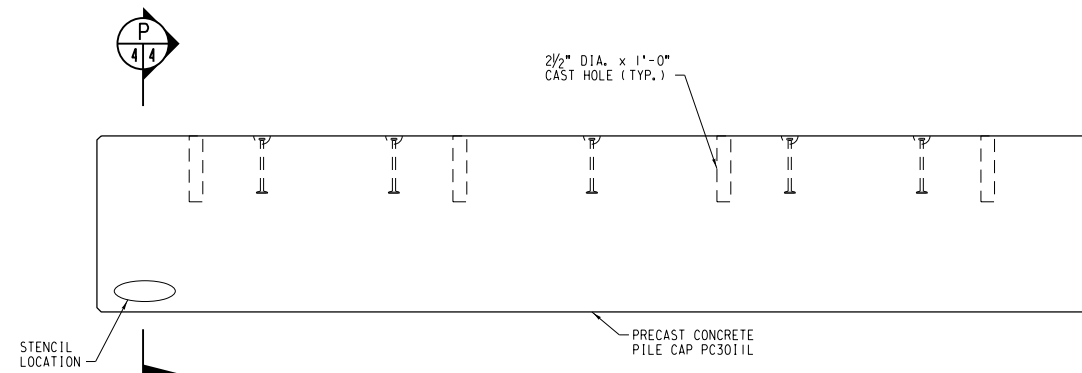
FRAMING - PLAN



FRAMING - PLAN



FRAMING - ELEVATION



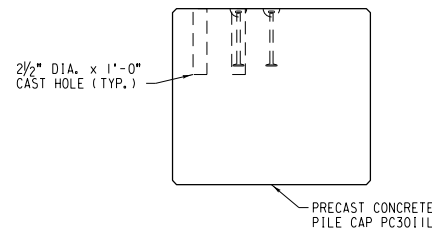
FRAMING - ELEVATION

PRECAST CONCRETE BENT CAP PCC-10L

SCALE: 3/4"=1'-0" EST. WT. = 18,900 LB. EA. SCALE: 3/4"=1'-0"

PRECAST CONCRETE BENT CAP PCC-10R

SCALE: 3/4"=1'-0" EST. WT. = 18,900 LB. EA. SCALE: 3/4"=1'-0"



SECTION P
SCALE: 3/4"=1'-0"

PCC-10R SHOWN, PCC-10L SIMILAR.

- NOTES:**
- MINIMALLY ADJUST REINFORCING AS REQUIRED TO CLEAR EMBEDDED ITEMS AND CAST HOLES.
 - FOR REINFORCING AND DETAILS NOT SHOWN, SEE STD. PLAN NO. 532150, SHT. 1.

NO.	DATE	REVISIONS

COMPLETION STATUS: **FINAL** STATUS DATE: 04/20/2022

APPROVED FOR UNION PACIFIC RAILROAD BY: *Quail A. Chen* CONSULTANT ENGINEER DATE: 04/11/2022

PROJECT ID: 114282 WORK ORDER: 53010 C/E NUMBER: 122544

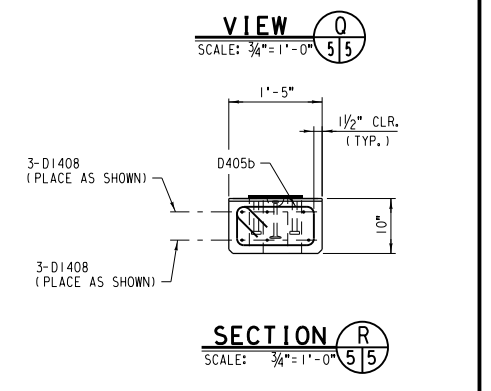
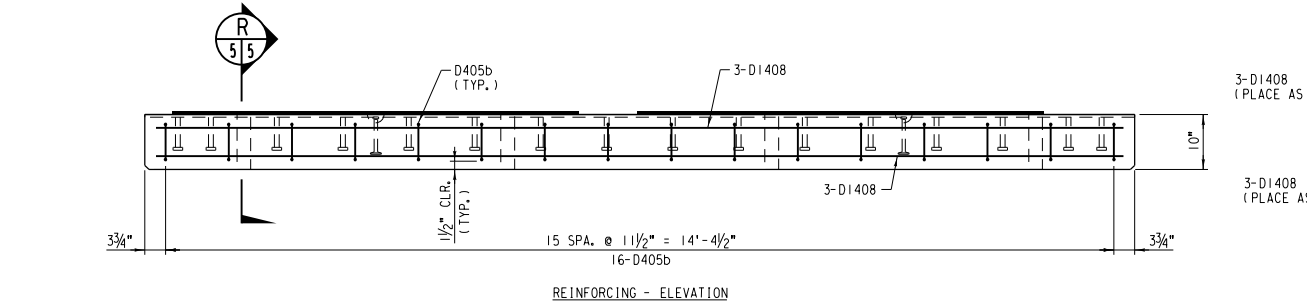
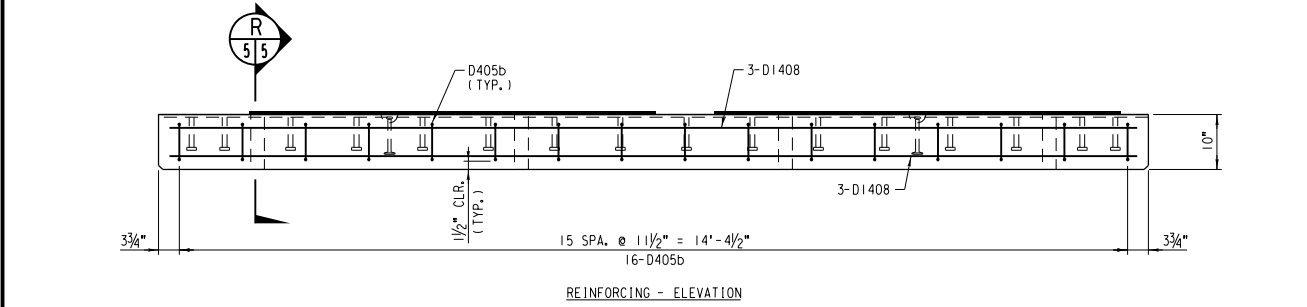
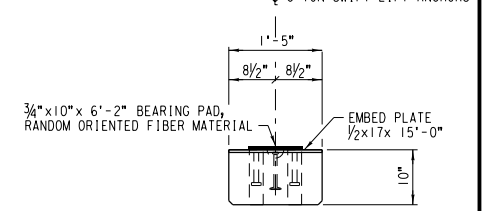
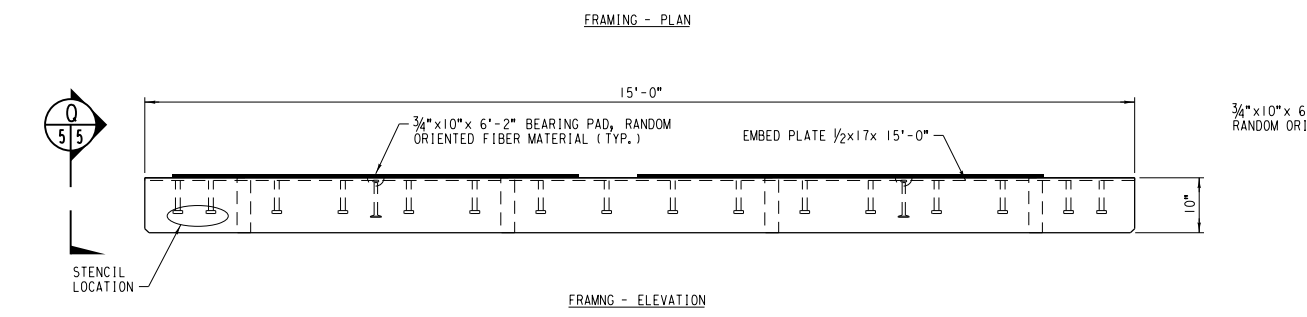
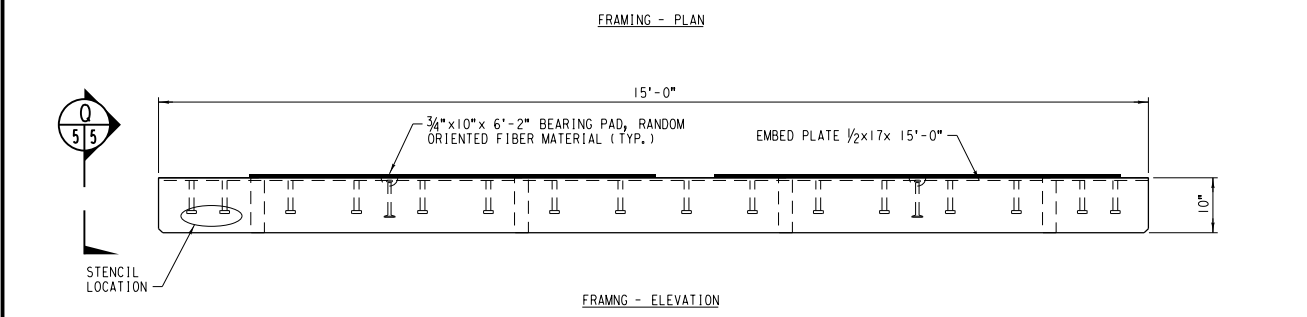
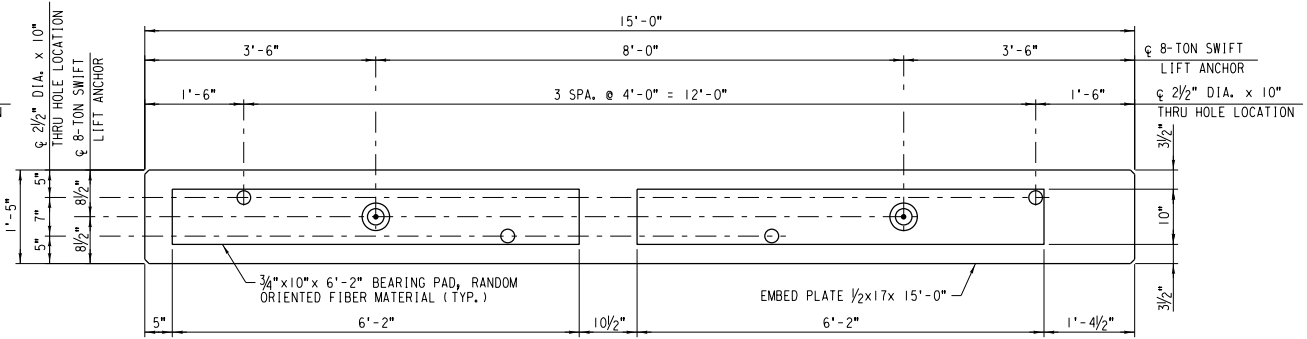
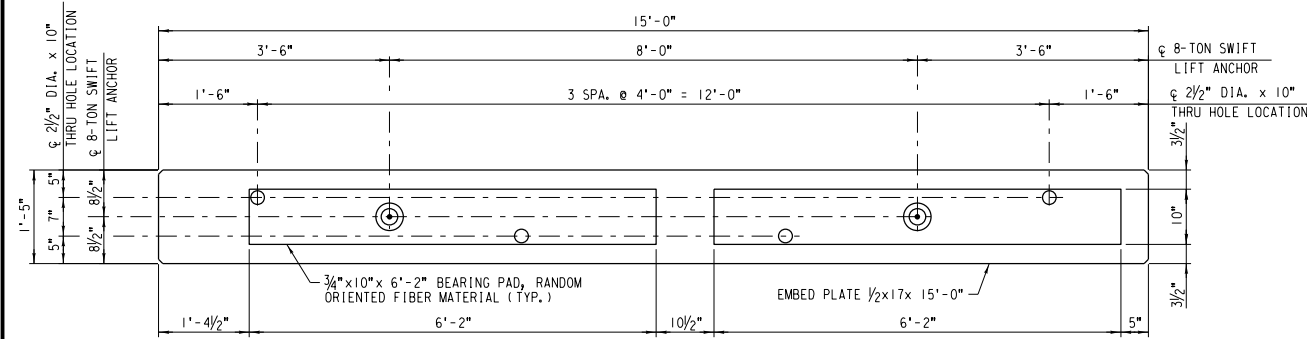
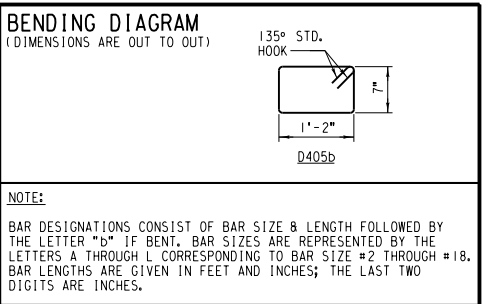
LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

	DESIGN/CHK BY: NAS/BWB	<p align="center">UNION PACIFIC RAILROAD</p> <p align="center">Office of Director Structures Design</p> <p align="center">LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB</p> <p align="center">6 SPAN PCB & 1 SPAN PCS (20') x 202'</p> <p align="center">REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)</p> <p align="center">SHEET TITLE: PRECAST CONCRETE PIER CAP DETAILS</p>
	DRAWN/CHK BY: NAS/BWB	
	UPRR ENGINEER: DGW	
	SHT NO.: P4 of P5	

RISER BLOCK MATERIAL SCHEDULE			
REQ'D. PER CRB-10R	REQ'D. PER CRB-10L	UNIT	DESCRIPTION
0.7	0.7	CU. YD.	4,000 PSI CONCRETE (PER NOTES, STD. PLAN NO. 531100 SHEET T3)
1	1	LOT	REINFORCING STEEL (PER NOTES, STD. PLAN NO. 531100 SHEET T3 AND SCHEDULE, SHEET NO. P5)
1	1	EA.	EMBED PLATE 1/2x17x 15'-0" (PER DETAIL, SHEET NO. P5)
2	2	EA.	8-TON SWIFT LIFT ANCHOR, L=6 3/4" (PER NOTES, STD. PLAN NO. 531100 SHEET T3 AND DETAIL SHEET NO. P5)
2	2	EA.	3/4" x 10" x 6'-2" BEARING PAD, RANDOM ORIENTED FIBER MATERIAL (PER NOTES, STD. PLAN NO. 531100 SHEET T3)

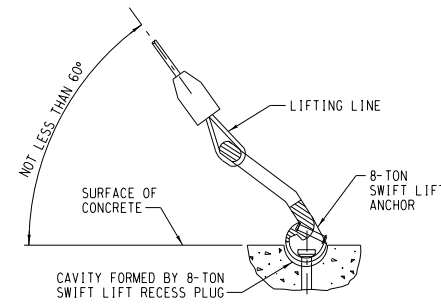
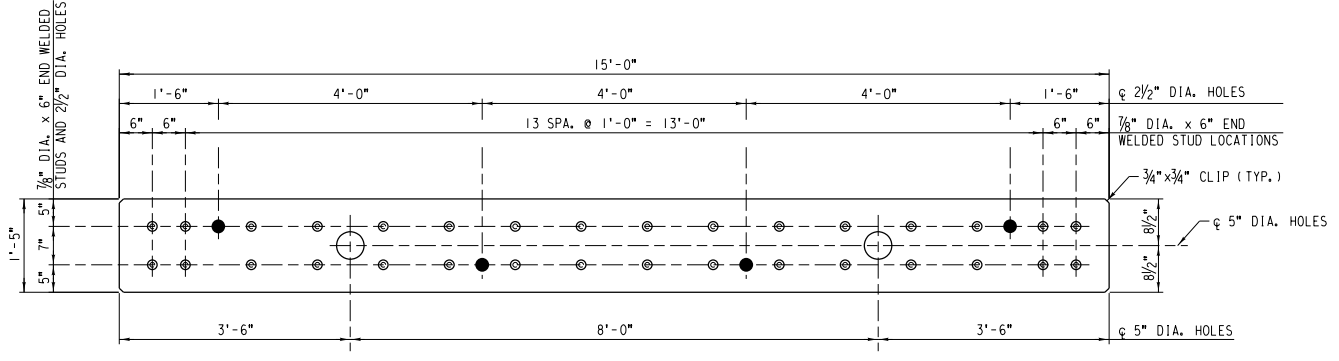
REINFORCING SCHEDULE					
REQ'D. PER CRB-10R	REQ'D. PER CRB-10L	MARK	SIZE	LENGTH	SHAPE
16	16	D405b	#5	4'-5"	□
6	6	D1408	#5	14'-8"	—

EST. WT. OF REINFORCING STEEL = 170 LB. PER PIECE



PRECAST CONCRETE RISER BLOCK CRB-10R
SCALE: 3/4"=1'-0" EST. WT. = 3,130 LB. EA.

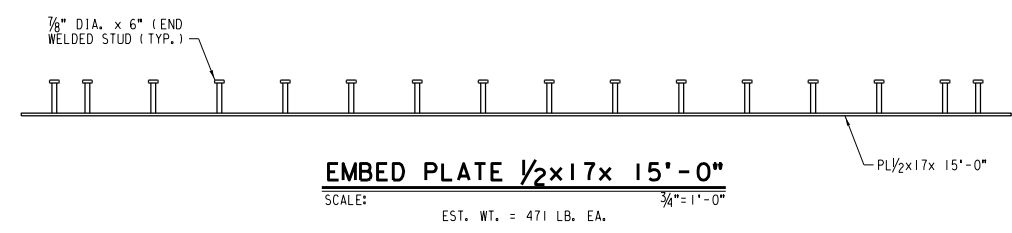
PRECAST CONCRETE RISER BLOCK CRB-10L
SCALE: 3/4"=1'-0" EST. WT. = 3,130 LB. EA.



LIFTING DETAIL
SCALE: NONE

NOTE:
8-TON SWIFT LIFT RECESS PLUGS, ANCHORS AND LIFTING EYES ARE AVAILABLE FROM DAYTON SUPERIOR CORP., 1125 BYERS ROAD, MIAMI SBURG, OHIO 45342, TELEPHONE (937) 866-0711. THE MATERIALS FOR THIS LIFTING SYSTEM ARE NOT INCLUDED IN THE BILL OF MATERIAL BUT ARE TO BE ORDERED AS REQUIRED.

- NOTES:**
- MINIMALLY ADJUST REINFORCING AS REQUIRED TO CLEAR EMBEDDED ITEMS.
 - FABRICATOR MAY PROPOSE ALTERNATE LIFTING SYSTEM IF PREFERRED. ALTERNATE SYSTEM SHALL BE EASILY AND QUICKLY REMOVABLE IN THE FIELD IF THERE IS PROJECTION ABOVE TOP OF EMBED PLATE.
 - ELASTOMERIC BEARING PADS SHALL BE BONDED TO STEEL WITH REMA TIPTOP SC2000 OR APPROVED ALTERNATE. APPLY PER MANUFACTURER RECOMMENDATIONS.
 - TOP STEEL SURFACE SHALL BE BLAST CLEANED TO SSPC-C6, COMMERCIAL (SAND) BLAST CLEANING, PRIOR TO BONDING.



EMBED PLATE 1/2x17x 15'-0"
SCALE: 3/4"=1'-0" EST. WT. = 471 LB. EA.



DESIGNER: NAS/BWB
DRAWN BY: NAS/BWB
UPRR ENGINEER: DGW
SHEET NO.: P5 of P5

UNION PACIFIC RAILROAD
Office of Director Structures Design

COMPLETION STATUS: **FINAL** DATE: 04/20/2022

APPROVED FOR UNION PACIFIC RAILROAD BY: *Paul A. Olsen* DATE: 04/11/2022
CONSULTANT ENGINEER

PROJECT ID: 114282 WORK ORDER: 53010 C/E NUMBER: 122544

LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB
6 SPAN PCB & 1 SPAN PCS (20') x 202'
REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)

SHEET TITLE: CONCRETE RISER BLOCK CRB-10

STRUCTURAL STEEL NOTES

All requirements shown on these drawings shall be accomplished as specified in the most current edition of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.

Material shall conform to the following requirements:

HP Shapes	ASTM A572
Stiffener Plates & Channels	ASTM A36 or Better
Base Plates	ASTM A36 or Better
Bearing Pads	Elastomeric Pad (50 Durometer)
Threaded Rods	ASTM F1554 Grade 36

PAINTING:

Structural steel shall not be painted.

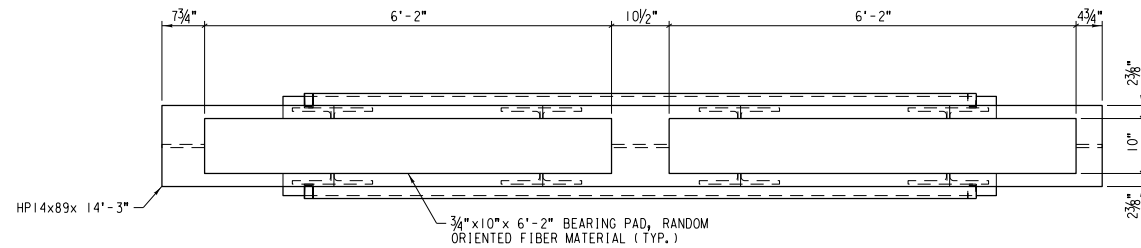
WELDING:

Welding shall be by the arc process per AREMA Manual for Railway Engineering and AWS D1.1 Structural Welding Code. Welding shall be performed by qualified welders.

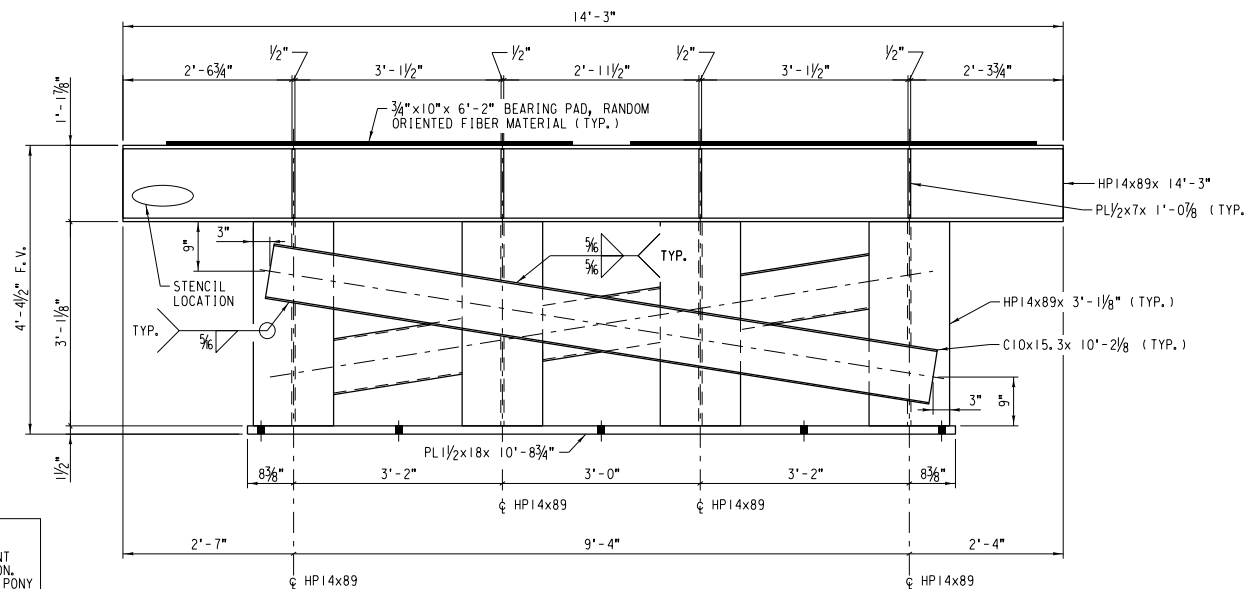
MATERIAL SCHEDULE

(PER PONY BENT SPB-10)

REQ'D	UNIT	DESCRIPTION
4	EA.	HP14x89 x 3'-1 1/8" STEEL PILE (ASTM A572 GRADE 50, PLAIN)
1	EA.	HP14x89 x 14'-3" STEEL PILE (ASTM A572 GRADE 50, PLAIN)
2	EA.	C10x15.3 x 10'-2 1/8" (ASTM A572 GRADE 50, PLAIN)
1	EA.	PL1 1/2x18 x 10'-8 3/4" (A709, GRADE 50W)
2	EA.	3/4" x 10" x 6'-2" BEARING PAD, RANDOM ORIENTED FIBER MATERIAL (PER NOTES, STD. PLAN NO. 531100 SHEET T3)
1	LOT	REMA SC2000 BONDING CEMENT OR APPROVED ALTERNATE
8	EA.	1/4" DIA. x 1'-6" ALL-THREAD ROD (ASTM F1554 GR. 36) WITH 2-HEAVY HEX NUTS (A563, LUBRICATED) AND FLAT CIRCULAR WASHER (F436)



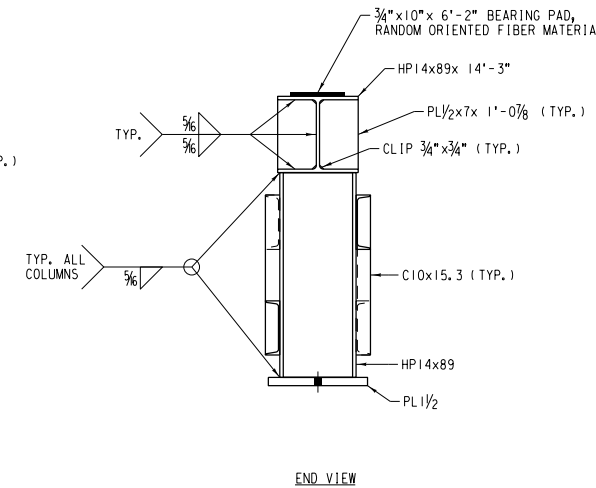
PLAN



ELEVATION

NOTES:

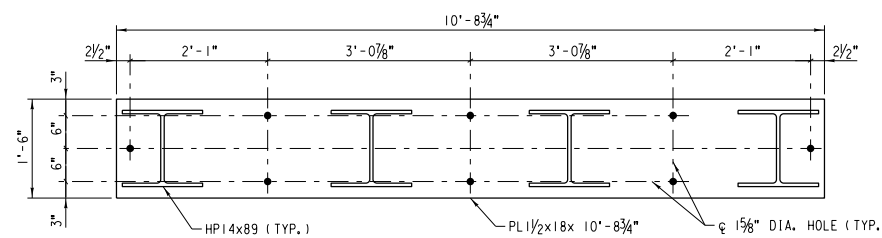
- ELASTOMERIC BEARING PADS SHALL BE BONDED TO STEEL WITH REMA TIPTOP SC2000 OR APPROVED ALTERNATE. APPLY PER MANUFACTURER RECOMMENDATIONS.
- TOP STEEL SURFACE SHALL BE BLAST CLEANED TO SSPC-6, COMMERCIAL (SAND) BLAST CLEANING, PRIOR TO BONDING.



END VIEW

NOTE:
CONSTRUCTOR SHALL FIELD VERIFY PONY BENT HEIGHT REQUIREMENTS PRIOR TO FABRICATION. SUBMIT FIELD MEASUREMENTS AND PROPOSED PONY BENT HEIGHTS TO THE RAILROAD FOR APPROVAL PRIOR TO FABRICATION.

NOTE:
F. V. = FIELD VERIFY



BOTTOM PLAN

PONY BENT SPB-10
SCALE: 3/4" = 1'-0"
EST. WT. = 3,768 LB. EA.

NO.	DATE	REVISIONS

COMPLETION STATUS: **FINAL** 04/20/2022
STATUS DATE

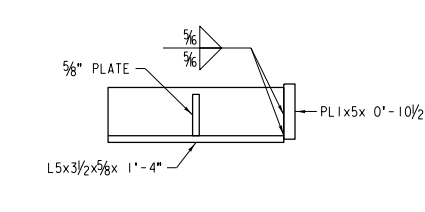
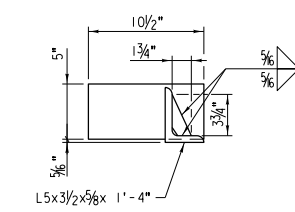
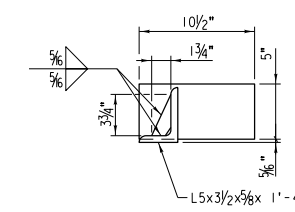
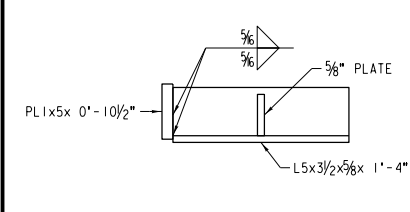
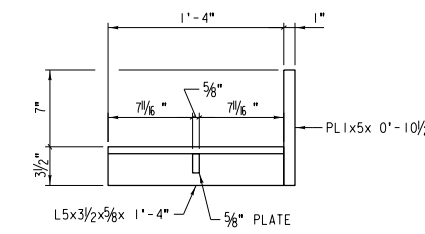
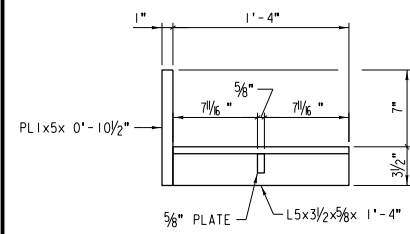
WILSON & COMPANY
APPROVED FOR UNION PACIFIC RAILROAD BY:
Paul A. Olson 04/11/2022
CONSULTANT ENGINEER DATE

PROJECT ID: 114282 WORK ORDER: 53010 C/E NUMBER: 122544
LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

	DESIGN/CHK BY: NAS/BWB	UNION PACIFIC RAILROAD Office of Director Structures Design
	DRAWN/CHK BY: NAS/BWB	
	UPRR ENGINEER: DGW	
	SHT NO.: F1 of F1	
LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB 6 SPAN PCB & 1 SPAN PCS (20') x 202' REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)		SHEET TITLE: STEEL PONY BENT SPB-10

NON-STANDARD MISCELLANEOUS STEEL SCHEDULE

REQ'D.	UNIT	DESCRIPTION
1	EA.	BEAM STOP GS-20 (PER DETAILS, SHEET NO. M1)
1	EA.	BEAM STOP GS-21 (PER DETAILS, SHEET NO. M1)
1	EA.	TEMPORARY BALLAST RETAINER TBR-1 (L1 = 9'-2 1/2") (PER NOTES AND DETAILS, STD. PLAN NO. 532131 SHEET B1)
12	EA.	TEMPORARY BALLAST RETAINER TBR-2 (L2 = 7'-6") (PER NOTES AND DETAILS, STD. PLAN NO. 532131 SHEET B1)
11	EA.	TEMPORARY BALLAST RETAINER TBR-3 (L3 = 7'-4 3/4") (PER NOTES AND DETAILS, STD. PLAN NO. 532131 SHEET B1)
1	EA.	TEMPORARY BALLAST RETAINER TBR-2 (L2 = 7'-3 1/2") (PER NOTES AND DETAILS, STD. PLAN NO. 532131 SHEET B1)
1	EA.	TEMPORARY BALLAST RETAINER TBR-3 (L3 = 7'-3 1/2") (PER NOTES AND DETAILS, STD. PLAN NO. 532131 SHEET B1)
1	EA.	TEMPORARY BALLAST RETAINER TBR-10 (PER NOTES, STD. PLAN NO. 532131 SHEET B1 AND DETAILS, SHEET NO. M1)

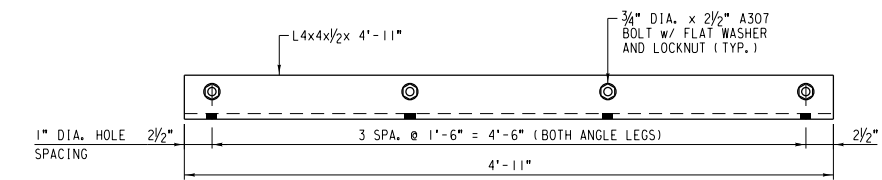


BEAM STOP GS-20

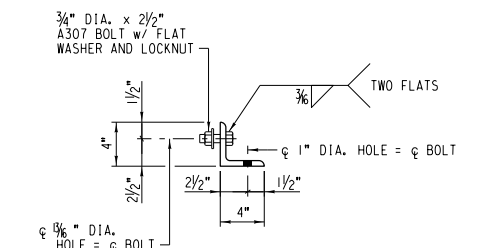
SCALE: 1/2" = 1'-0"
EST. WT. = 38.5 LB. EA.

BEAM STOP GS-21

SCALE: 1/2" = 1'-0"
EST. WT. = 38.5 LB. EA.



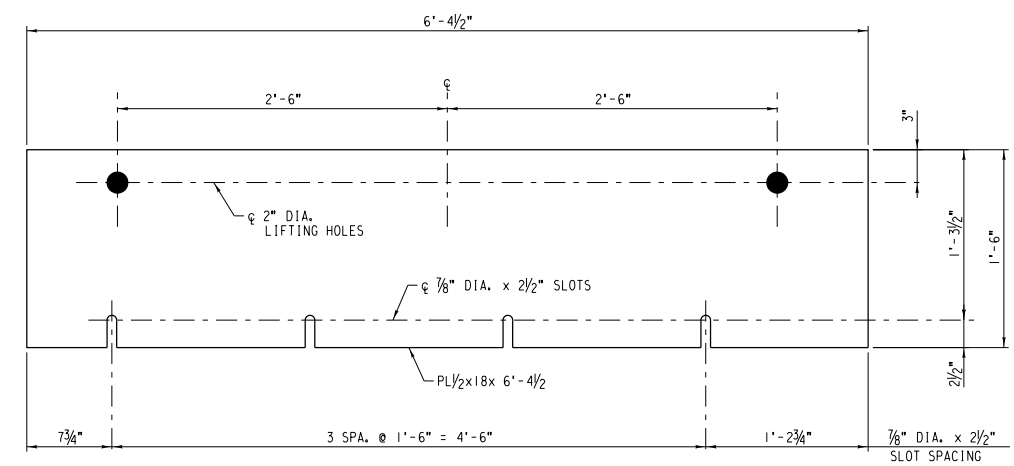
ELEVATION



SECTION

BALLAST ANGLE BA-10

SCALE: 1/2" = 1'-0"
EST. WT. = 63.0 LB. EA.



ELEVATION

TEMPORARY BALLAST RETAINER TBR-10

SCALE: 1/2" = 1'-0"
EST. WT. = 196 LB. EA.

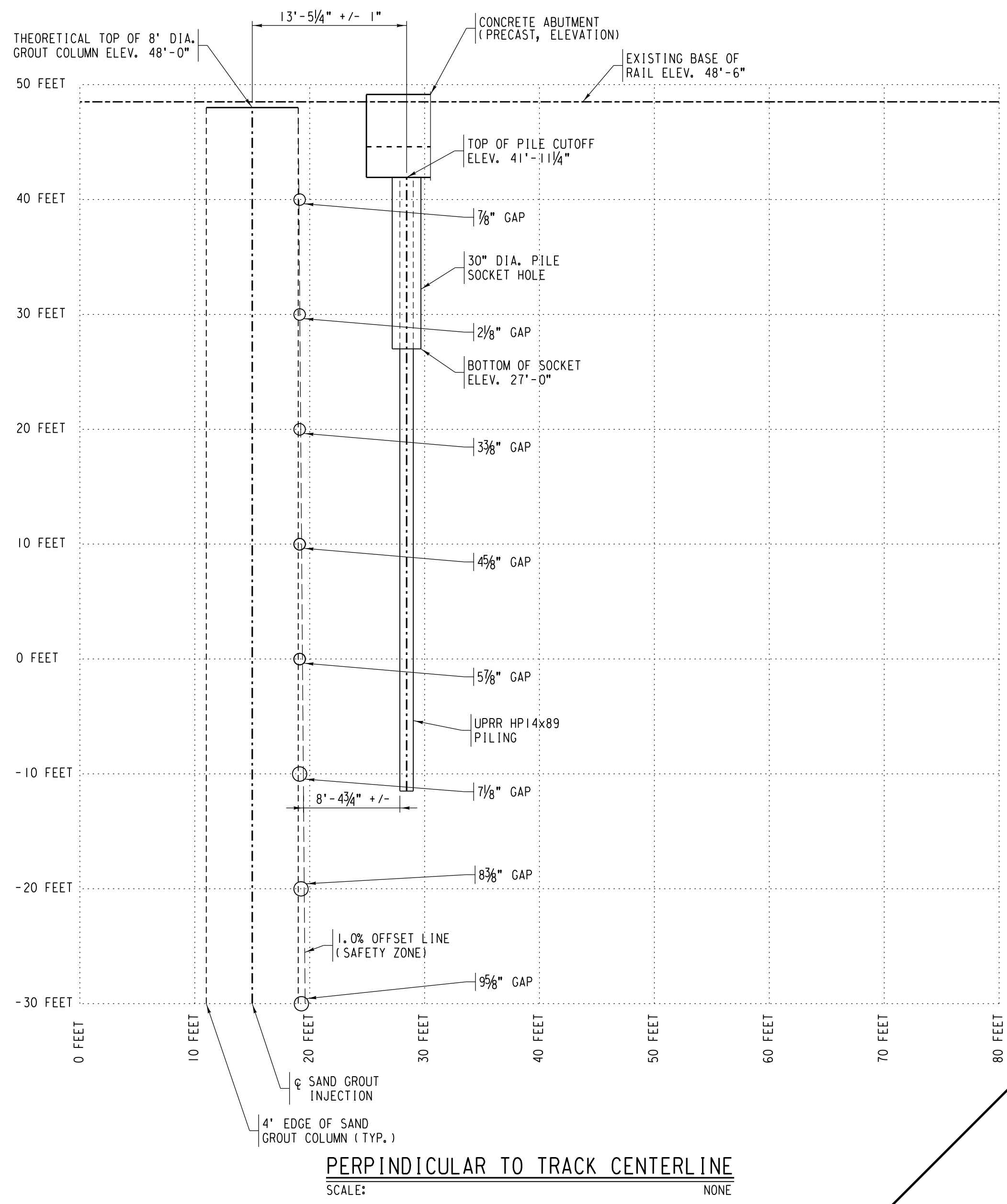
NO.	DATE	REVISIONS

COMPLETION STATUS: **FINAL** 04/20/2022
STATUS DATE

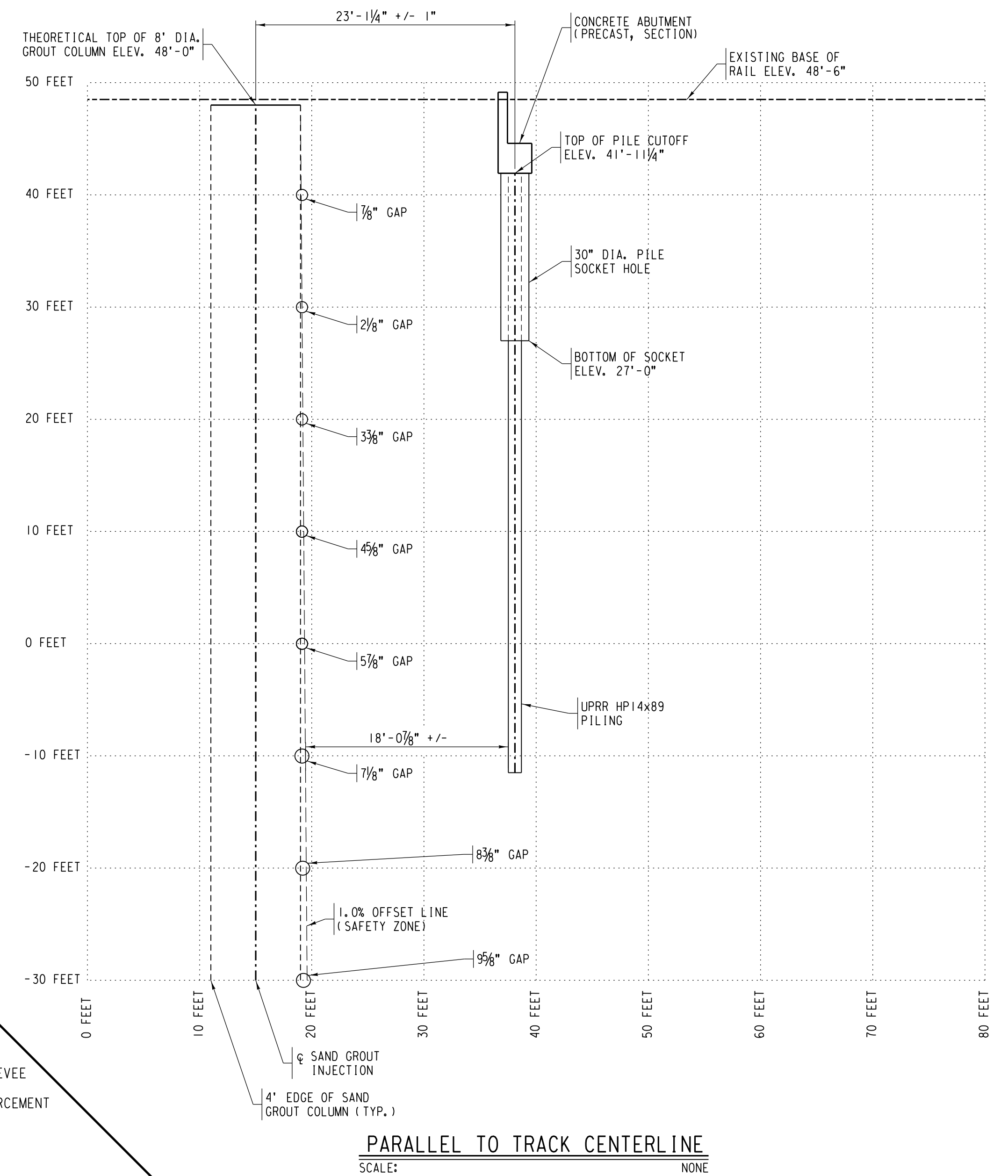
APPROVED FOR UNION PACIFIC RAILROAD BY:
Paul A. Olson CONSULTANT ENGINEER 04/11/2022 DATE

PROJECT ID: 114282 WORK ORDER: 53010 C/E NUMBER: 122544
LATITUDE: 38.58826°N LONGITUDE: 121.45040°W

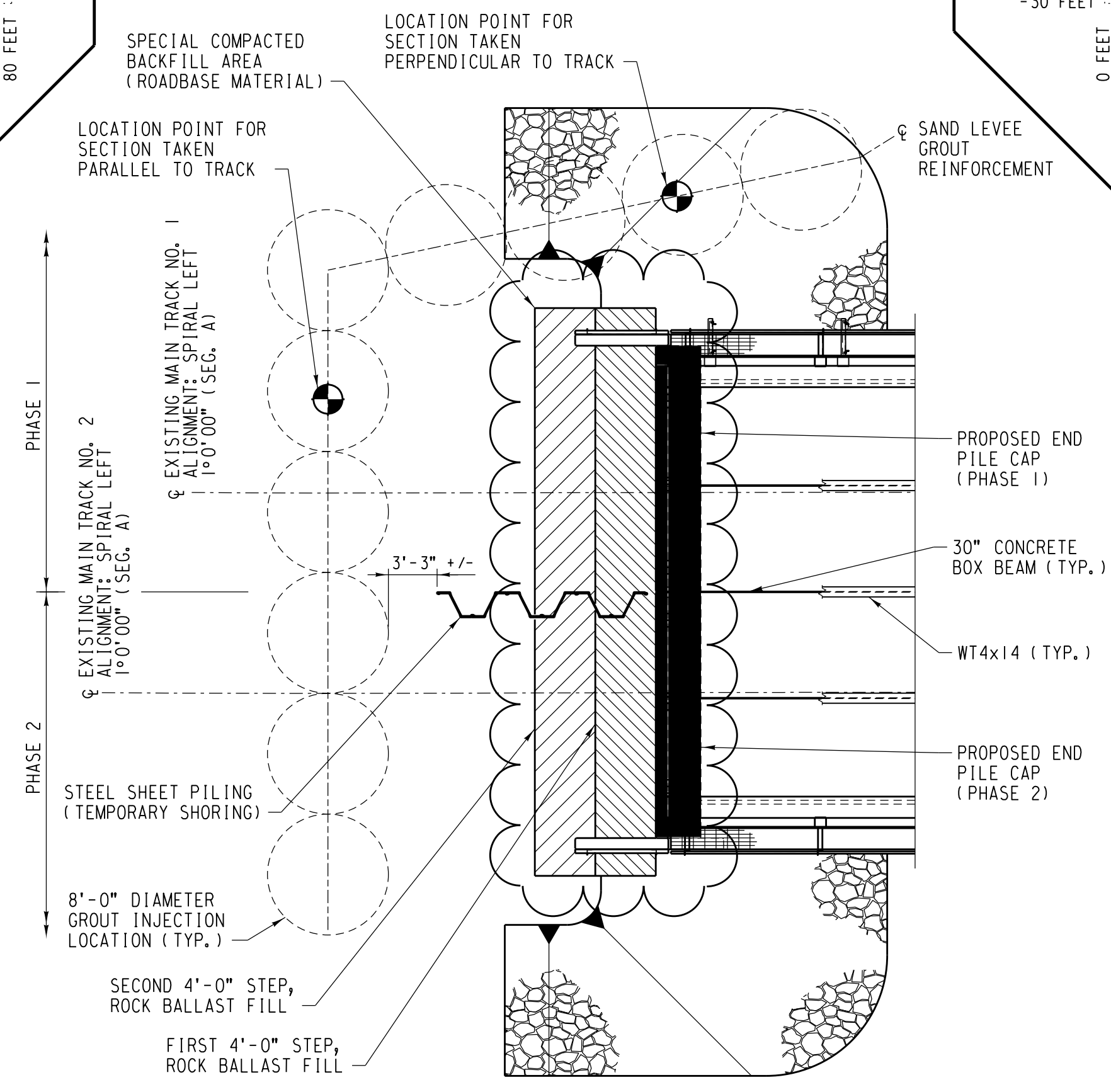
	DSN/CHK BY: NAS/BWB	<p>UNION PACIFIC RAILROAD Office of Director Structures Design</p> <p>LOCATION & DESCRIPTION: BRIDGE 92.12, MARTINEZ SUB</p> <p>6 SPAN PCB & 1 SPAN PCS (20') x 202' REPLACING 14 SPAN TSTBD x 197' (SEGMENT A)</p> <p>SHEET TITLE: NON-STANDARD MISCELLANEOUS STEEL DETAILS</p>
	DRAWN/CHK BY: NAS/BWB	
	UPRR ENGINEER: DGW	
	SHT NO.: M1 of M1	



PERPENDICULAR TO TRACK CENTERLINE
SCALE: NONE



PARALLEL TO TRACK CENTERLINE
SCALE: NONE



PLAN AT ABUTMENT
SCALE: 1/8" = 1'-0"

NO.	DATE	REVISIONS
COMPLETION STATUS:		
FINAL (IFC)		
STATUS		DATE
BUILDING AMERICA®		
APPROVED FOR UNION PACIFIC RAILROAD BY:		
PATRICK J. PROSOSKI		DATE
DESIGN ENGINEER OF RECORD		
PROJECT ID:	WORK ORDER:	C/E NUMBER:
	53010	XXXXXX
LATITUDE: 38.58826°N		LONGITUDE: 121.45040°W

	DSNCHK BY: PGP/PGP	UNION PACIFIC RAILROAD Office of Director Structures Design
	DRAWNCHK BY: KDM/PGP	
	UPRR ENGINEER: PGP	
	SHT NO.: S1 of S1	
LOCATION & DESCRIPTION: PILE DRIVING SKETCHES - PARRALEL AND PERPENDICULAR TO MAIN LINE #1 CENTERLINE		BRIDGE 92.12 MARTINEZ SUB
SHEET TITLE: GENERAL ARRANGEMENT		

TO ELVAS 8
10TH ST (OAKLAND)
(TIMETABLE WEST)

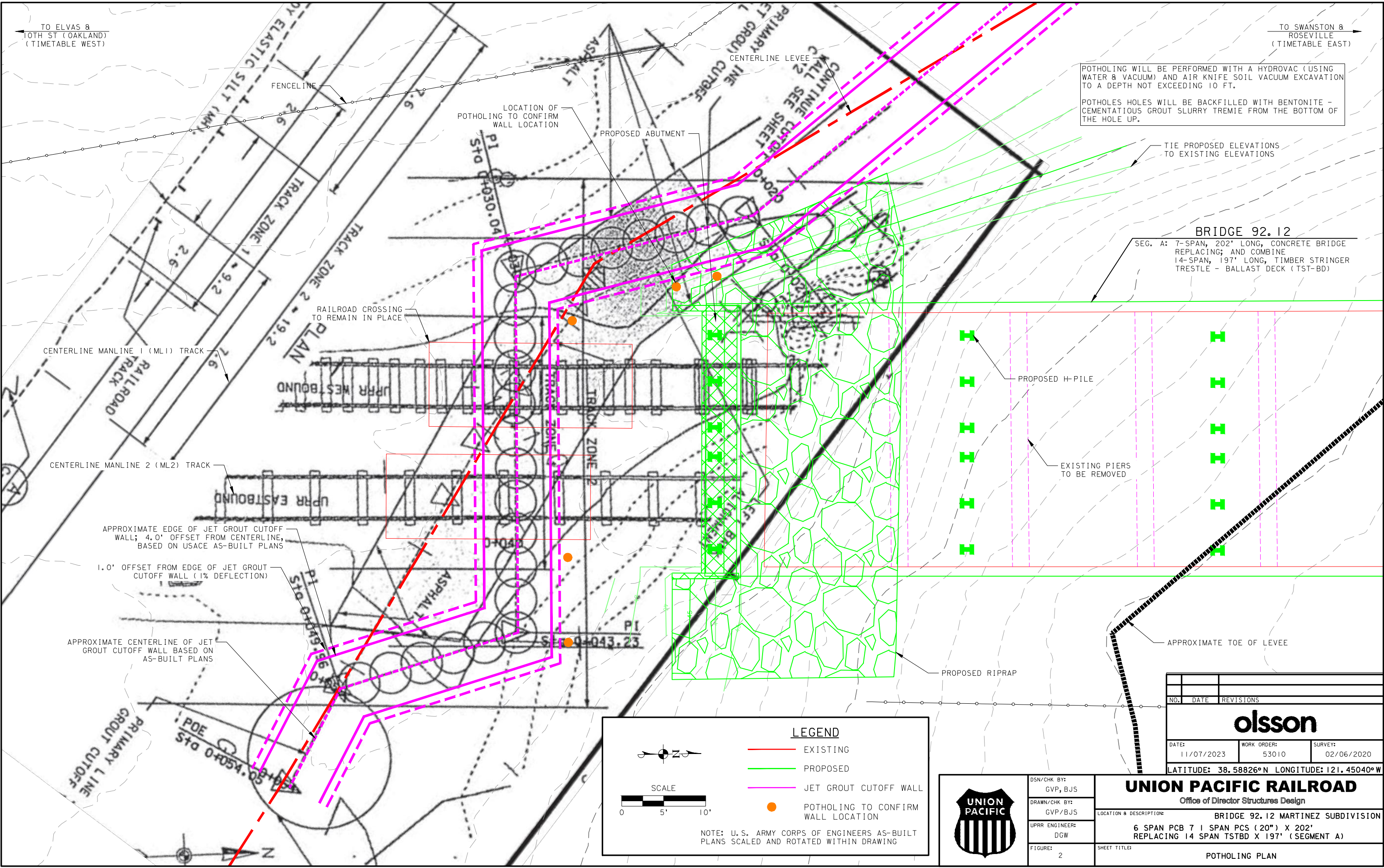
TO SWANSTON 8
ROSEVILLE
(TIMETABLE EAST)

POTHOLING WILL BE PERFORMED WITH A HYDROVAC (USING WATER & VACUUM) AND AIR KNIFE SOIL VACUUM EXCAVATION TO A DEPTH NOT EXCEEDING 10 FT.
POTHOLE HOLES WILL BE BACKFILLED WITH BENTONITE - CEMENTATIOUS GROUT SLURRY TREMIE FROM THE BOTTOM OF THE HOLE UP.

TIE PROPOSED ELEVATIONS TO EXISTING ELEVATIONS

BRIDGE 92.12

SEG. A: 7-SPAN, 202' LONG, CONCRETE BRIDGE REPLACING; AND COMBINE 14-SPAN, 197' LONG, TIMBER STRINGER TRESTLE - BALLAST DECK (TST-BD)



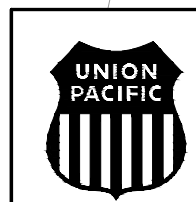
LEGEND

- EXISTING
- PROPOSED
- - - JET GROUT CUTOFF WALL
- POTHOLING TO CONFIRM WALL LOCATION

NOTE: U.S. ARMY CORPS OF ENGINEERS AS-BUILT PLANS SCALED AND ROTATED WITHIN DRAWING

SCALE: 0 5' 10'

NO.	DATE	REVISIONS
olsson		
DATE:	WORK ORDER:	SURVEY:
11/07/2023	53010	02/06/2020
LATITUDE: 38.58826°N LONGITUDE: 121.45040°W		



DSN/CHK BY: GVP, BJS	UNION PACIFIC RAILROAD Office of Director Structures Design
DRAWN/CHK BY: GVP/BJS	
UPRR ENGINEER: DGW	
FIGURE: 2	
LOCATION & DESCRIPTION: BRIDGE 92.12 MARTINEZ SUBDIVISION	
6 SPAN PCB 7 1 SPAN PCS (20") X 202' REPLACING 14 SPAN TSTBD X 197' (SEGMENT A)	
SHEET TITLE: POTHOLING PLAN	

HYDROLOGIC & HYDRAULIC EVALUATION

Bridge 92.12, Martinez Subdivision



Prepared for:

Union Pacific Railroad Company
Structures Design
Omaha, Nebraska

April 2022

Olsson Project No. 019-39260

CVFPB Encroachment Permit Application

olsson

TABLE OF CONTENTS

Executive Summary	1
1. Introduction	1
2. Site Description	1
3. Hydrology	2
4. Hydraulic Design Criteria.....	2
5. Bridge Hydraulics	3
6. Scour Analysis	6
7. Local Maintaining Agency (LMA).....	7
8. References.....	7
Appendix A	8
Figures	8
Appendix B	9
FEMA Flood Insurance Rate Map (FIRM)	9
Appendix C	10
Bridge Survey Photolog.....	10
Appendix D	11
O&M and HEC-RAS Output Table.....	11

EXECUTIVE SUMMARY

Olsson has conducted a hydrologic and hydraulic evaluation for UPRR Bridge 92.12 on the Martinez Subdivision. The bridge is situated within the City of Sacramento in Sacramento County, California. The purpose of this evaluation was to determine the hydraulic capacity of the existing structure and to make a recommendation for an appropriately sized replacement structure in compliance with UPRR's standard hydraulic design criteria and regulatory requirements. Results of this investigation and replacement recommendations are summarized below:

- The bridge is located along UPRR's mainline track running generally in a geographic north to south direction through the study area.
- UPRR Bridge 92.12 currently consists of a 13-Span, 197 ft long, Timber Stringer Trestle (Segment A); a 5-Span, 844 ft long, Through Truss Riveted (Segment B), and a 47-Span, 1,402 ft long, Prestressed Concrete Box Girder (Segment C), for a total bridge length of 2,442 feet over the American River.
- The proposed replacement is only for Segment A, as Segments B and C are structurally adequate and will remain in place.
- Bridge 92.12 spans the main channel and overbank area of the American River. UPRR Bridge 92.12 is located within a FEMA and CVFPB designated floodway.
- The area in the vicinity of UPRR Bridge 92.12 is bordered by a system of federal levees used for flood protection. The project levees are located outside the existing abutments and was designed by the U.S. Army Corps of Engineers.
- According to USGS stream gage 11447000 located 2 miles upstream of Bridge 92.12 along the American River, the total drainage area is 1,936 square miles.
- UPRR Bridge 92.12 is located within a FEMA-designated Zone AE floodplain/floodway, special flood hazard areas subject to inundation by the 1% annual chance (100-year) flood, as shown on the Flood Insurance Rate Map (FIRM) for Sacramento County, California and Incorporated Areas (Map Number 06067 C 0180 J, effective date June 16, 2015).

- The design discharges for the 100-year event was taken directly from the FEMA FIS for Sacramento County at the mouth of the American River. The American River USACE Operation and Maintenance Manual (O&M) design flow is 180,000 cfs. The design discharges used in the analysis of UPRR Bridge 92.12 are $Q_{100} \approx 157,000$ cfs and $Q_{O\&M} \approx 180,000$ cfs.
- The hydraulic analysis was based on utilizing the effective HEC-RAS 4.1.0 model developed as part of the American River (AME) Hydraulic Model Development study and incorporating Olsson's bridge survey information (corrected-effective).
- The replacement structure along Segment A of Bridge 92.12, as selected by UPRR, consists of a 7 – Span, 202-ft long bridge replacing the existing 13 – Span, 197-ft long bridge. The proposed bridge will have an opening area of 46,344 ft², a slight decrease when compared to the existing bridge due to a lower low chord elevation.
- The proposed bridge replacement was designed such that it results in a “*adverse impact condition*” for both the 100-year and O&M runoff event.

The Hydrologic and Hydraulic Evaluation report should be read in its entirety, and an understanding of the findings and recommendations should not be based solely on this executive summary.

1. INTRODUCTION

The Union Pacific Railroad Company (UPRR) is proposing to replace Bridge 92.12, Martinez Subdivision, located with the City of Sacramento, in Sacramento County California. UPRR's track in the vicinity of Bridge 92.12 provides passenger commuter and freight services, with Bridge 92.12 crossing the main channel and overbank area of the American River.

The purpose of the proposed project is to replace the existing timber spans at UPRR Bridge 92.12 in compliance with UPRR's standard hydraulic design criteria and regulatory requirements including a "no adverse impacts" condition for the 100-year and O&M runoff events. The timber bents and spans are deteriorating and have nearly reached the end of their useful life and now require replacement. This report summarizes results of the hydrologic and hydraulic modeling and evaluations, leading to the decision on the replacement structure.

2. SITE DESCRIPTION

UPRR Bridge 92.12 is located on the Martinez Subdivision of the Roseville Division in Sacramento County, California. The bridge is located on a tangent section of Union Pacific Railroad (UPRR) track running generally in a north-south direction through the study area. The bridge serves UPRR's single mainline track through the site. More specifically, the bridge is located at latitude 38.58826° N and longitude 121.45040° W. Bridge 92.12 spans the main channel of the American River.

As observed during Olsson's 6 February 2020 site visit, the existing hydraulic structure at UPRR Bridge 92.12 consists of a 13-Span, 197 ft long, Timber Stringer Trestle (Segment A); a 5-Span, 844 ft long, Through Truss Riveted (Segment B), a and a 47-Span, 1,402 ft long, Prestressed Concrete Box Girder (Segment C), for a total bridge length of 2,442 feet over the American River. The area in the vicinity of UPRR Bridge 92.12 is bordered by a system of federal levees used for flood protection. The project levees are located outside the existing abutments and was designed by the U.S. Army Corps of Engineers. UPRR Bridge 92.12 is located within a FEMA and CVFPB designated floodway. The project levee is located just outside the existing geographic south abutment (TT West) along Segment A.

UPRR Bridge 92.12 is located within a FEMA-designated Zone AE floodplain/floodway, special flood hazard areas subject to inundation by the 1% annual chance (100-year) flood, as shown

on the Flood Insurance Rate Map (FIRM) for Sacramento County, California and Incorporated Areas (Map Number 06067 C 0180 J, effective date June 16, 2015).

A photolog showing current conditions at the site (February 2020 site visit) is included in Appendix C of this report.

3. HYDROLOGY

The area in the vicinity of UPRR Bridge 92.12 is bordered by a system of federal levees used for flood protection. UPRR Bridge 92.12 is currently located within the American River floodway. The project levee is located just outside the existing geographic south abutment (TT West).

According to USGS stream gage 11447000 located 2 miles upstream of Bridge 92.12 along the American River, the total drainage area is 1,936 square miles.

The design discharges for the 100-year event was taken directly from the FEMA FIS for Sacramento County at the mouth of the American River. The American River USACE Operation and Maintenance Manual (O&M) design flow is 180,000 cfs. The design discharges used in the analysis of UPRR Bridge 92.12 are $Q_{100} \approx 157,000$ cfs and $Q_{O\&M} \approx 180,000$ cfs.

4. HYDRAULIC DESIGN CRITERIA

The current criteria for hydraulic evaluation of UPRR bridges and culverts were used to determine the drainage capacity and adequacy of the existing structure(s) and to analyze proposed replacement structures. The hydraulic design criteria are as follows:

1. For all cases, the opening will be sized, if possible, so that the 50-year floodwater surface elevation (WSE) will be no higher than the crown of the culvert (top of opening) or the low chord of the bridge, whichever is applicable.
2. For all cases, the opening will be sized, if possible, so the 100-year floodwater energy grade line elevation (EGL) will not rise above the adjacent track subgrade elevation, which is generally estimated as two feet below the base of rail elevation at the lowest point in the cross section.

3. If the replacement structure is located in an urban or developed area, both the UPRR criteria and local flood flow criteria shall be evaluated, and the more conservative/ restrictive of the two shall be adopted in sizing the replacement structure.
4. If the existing bridge or culvert opening exceeds that required by the foregoing limits, a smaller section will be recommended using these limits.
5. If the existing bridge or culvert opening does not meet the hydraulic design criteria, a larger opening will be proposed. This enlargement will be lateral to the extent possible. If it is found that insufficient channel area exists to meet the criteria, even with the maximum widening, consideration will be given to adding relief structures on the overbank floodplain, raising the railroad grade, or other alternatives.

In addition to the above hydraulic design criteria, the replacement structure was designed in compliance with local, state, and federal regulatory requirements, including a “*no adverse impacts*” condition for the 100-year and O&M runoff events.

5. BRIDGE HYDRAULICS

The hydraulic modeling and analyses performed for this study was based on the survey of existing conditions for UPRR Bridge 92.12, and the surrounding floodplain. Survey information was compiled to represent plan and profile data along the track, the existing structure(s), adjacent levees, and surrounding waterway sections. Olsson’s survey was based on NAVD 1988 datum.

The hydraulic analysis was based on utilizing the effective HEC-RAS 4.1.0 model developed as part of the American River (AME) Hydraulic Model Development study. After a review of the regulatory HEC-RAS geometry obtained from the model, the bridge geometry for UPRR Bridge 92.12 was found to be different than the actual bridge geometry surveyed by Olsson’s on 6 February 2020. Specifically, the HEC-RAS regulatory model bridge geometry was updated based on the site survey of the bridge.

As such, a corrected effective geometry titled “CE_American_River” was created to represent the bridge geometry of UPRR Bridge 92.12 as surveyed by Olsson. Subsequently, the post project geometry “PP_American_River” incorporates the corrected effective geometry and UPRR’s proposed replacement structure of UPRR Bridge 92.12. UPRR Bridge 92.12 is represented at HEC-RAS River Station 3.715 along the AME; R1 Reach.

The replacement structure along Segment A of Bridge 92.12, as selected by UPRR, consists of a 7 – Span, 202-ft long bridge replacing the existing 13 – Span, 197-ft long bridge. The proposed bridge will have an opening area of 46,344 ft², a slight decrease when compared to the existing bridge due to a lower low chord elevation.

Based on the hydrologic and hydraulic evaluation, the Corrected Effective WSE₁₀₀ and WSE_{O&M} at the upstream face of the existing bridge were computed to be 40.95 ft and 42.21 ft (NAVD 1988). It is noted that the lowest low chord elevation of the existing bridge along Segment B is 44.01 ft, and the lowest base-of-rail elevation is 47.11 ft. The corresponding computed Post Project WSE₁₀₀ and WSE_{O&M} associated with the proposed bridge are 40.95 ft and 42.20 ft respectively. The proposed low chord elevation is 44.65 ft. See Tables 1 and 2, which summarizes the Corrected Effective and Post Project Water Surface Elevations (WSE) for varying frequency events.

Table 1: 100-year WSE Summary - American River.

Cross Section	Frequency	WSE _{CE_AME}	WSE _{PP_AME}	Δ WSE _{CE - PP}
3.949	100-year	41.18	41.18	0.00
3.735	100-year	41.07	41.07	0.00
3.718	100-year	40.95	40.95	0.00
3.715	UPRR Bridge 92.12: Martinez Subdivision			
3.710	100-year	40.93	40.93	0.00
3.688	100-year	40.96	40.96	0.00
3.600	100-year	40.37	40.37	0.00
3.477	100-year	40.16	40.16	0.00

Table 2: O&M WSE Summary - American River.

Cross Section	Frequency	WSE _{CE_AME}	WSE _{PP_AME}	Δ WSE _{CE - PP}
3.949	O&M	42.47	42.46	-0.01
3.735	O&M	42.35	42.35	0.00
3.718	O&M	42.21	42.20	-0.01
3.715	UPRR Bridge 92.12: Martinez Subdivision			
3.710	O&M	42.18	42.18	0.00
3.688	O&M	42.22	42.22	0.00
3.600	O&M	41.60	41.60	0.00
3.477	O&M	41.36	41.36	0.00

The low chord elevation for the existing bridge along Segment A is 45.97 ft and the proposed low chord elevation along Segment A is 44.65 ft. It should be noted the lowest low chord is along Segment B over the channel is 44.01 ft. Table 3 below summarizes the amount of freeboard for the 100-year and O&M flood event.

Table 3: Freeboard - American River at UPRR Bridge 92.12 Martinez Subdivision.

Frequency	Existing Segment A Low Chord Elevation	Proposed Segment A Low Chord Elevation	Proposed WSE (ft)	Post Project Freeboard (ft)
100-year	45.97	44.65	40.95	+3.70
O&M	45.97	44.65	42.20	+2.45

The bridge has structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. The bridge pilings are designed to rely on friction for capacity; and as such, the pilings will not be subject to any flotation, buoyancy, lateral movement or collapse. All components below the base flood elevation shall be constructed with material and utility equipment resistant to flood damage. Overall, the design and methods of construction are in accordance with commonly accepted standard and practice within the design and construction communities.

The existing concrete piers and timber spans will be replaced/removed as part of the proposed project. The proposed h-piles required for the proposed bridge will be along the existing mainline track. The existing piers and footings will be removed to at least 3' below natural ground line.

Figure 1 shows the upstream face profile of the existing and proposed bridges and relevant features/elevations.

6. SCOUR ANALYSIS

A scour analysis for existing and proposed conditions has been performed for the bridge replacement along Segment A. Copies of the HEC-RAS Hydraulic Design calculation reports and cross sections for both existing and proposed conditions are located within Appendix D.

The following information details the elements of the scour analysis computations. The HEC-18 equations within HEC-RAS were utilized for the scour analysis. The D_{50} utilized for the scour calculations was estimated based on soil properties observed during the site. The estimated scour calculated by HEC-RAS for the proposed conditions along Segment A is 4.7 ft. The existing bridge velocity is 4.35 ft/s, compared to the proposed bridge velocity of 4.34 ft/s.

7. LOCAL MAINTAINING AGENCY (LMA)

The American River Flood Control District (ARFCD) has jurisdiction over the American River project levee.

8. REFERENCES

FEMA, Flood Insurance Rate Map (FIRM) for Sacramento County, effective June 16th, 2015.

U.S. Army Corps of Engineers (USACE), January 2010. HEC-RAS River Analysis System. Version 4.1.0.

APPENDIX A

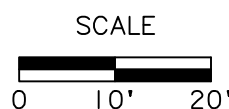
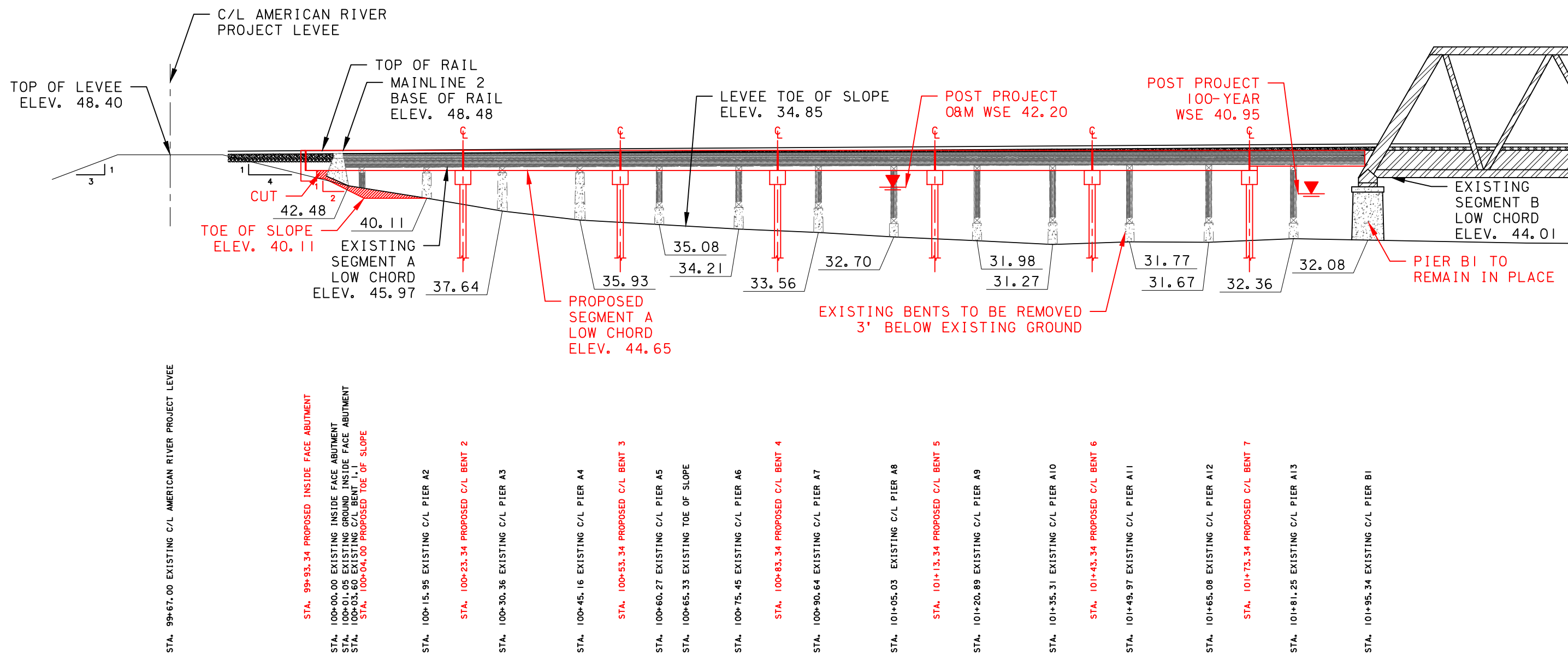
Figures

TO ELVAS &
10TH ST. (OAKLAND)
(TIMETABLE WEST)

TO SWANSTON &
ROSEVILLE
(TIMETABLE EAST)

BRIDGE 92.12 - MARTINEZ SUBDIVISION

PROPOSED: 7-SPAN, 202' LONG, CONCRETE BRIDGE REPLACING THE EXISTING 13-SPAN, 197' LONG, TIMBER BRIDGE



AMERICAN RIVER
RM 3.7
NAVD 1988

PROJECT: 019-3926
DRAWN BY: DRC
DATE: 04/11/2022

PROPOSED SEGMENT A BRIDGE ELEVATION

olsson

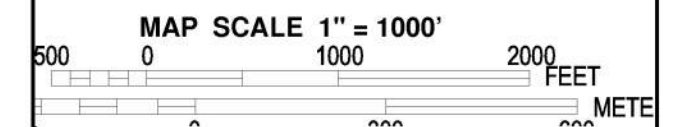
601 P Street, Suite 200
P.O. Box 94809
Lincoln, NE 68501-4808
TEL: 402.474.6311
FAX: 402.474.6180
www.olssonassociates.com

FIGURE

1

APPENDIX B

FEMA Flood Insurance Rate Map (FIRM)



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0180J

FIRM
FLOOD INSURANCE RATE MAP
SACRAMENTO COUNTY,
CALIFORNIA
AND INCORPORATED AREAS

PANEL 180 OF 705
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
SACRAMENTO, CITY OF 060266 0180 J

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER
06067C0180J
MAP REVISED
JUNE 16, 2015

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Bridge 92.12
Martinez Sub



42-73-000m N

NOTE: THIS AREA FROM THE 1-PERCENT ANNUAL CHANCE OR GREATER FLOOD HAZARD BY A LEVEE SYSTEM. OVERTOPPING OR FAILURE OF ANY LEVEE SYSTEM IS POSSIBLE. FOR ADDITIONAL INFORMATION, SEE THE "ACCREDITED LEVEE NOTE" IN NOTES TO USERS.

42-72-000m N

NOTE: THIS AREA IS SHOWN AS BEING PROTECTED FROM THE 1-PERCENT-ANNUAL-CHANCE OR GREATER FLOOD HAZARD BY A LEVEE SYSTEM. OVERTOPPING OR FAILURE OF ANY LEVEE SYSTEM IS POSSIBLE. FOR ADDITIONAL INFORMATION, SEE THE "ACCREDITED LEVEE NOTE" IN NOTES TO USERS.

ON THIS PANEL IS LOCATED THE RANGE 4 EAST AND TOWNSHIP 5 EAST.

NOTE: THIS AREA IS SHOWN AS BEING PROTECTED FROM THE 1-PERCENT-ANNUAL-CHANCE OR GREATER FLOOD HAZARD BY A LEVEE SYSTEM. OVERTOPPING OR FAILURE OF ANY LEVEE SYSTEM IS POSSIBLE. FOR ADDITIONAL INFORMATION, SEE THE "ACCREDITED LEVEE NOTE" IN NOTES TO USERS.

JOINS PANEL 0183

42-71-000m N

FLOOD INSURANCE STUDY

FEDERAL EMERGENCY MANAGEMENT AGENCY

VOLUME 1 OF 4



SACRAMENTO COUNTY, CALIFORNIA AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
CITRUS HEIGHTS, CITY OF	060765
ELK GROVE, CITY OF	060767
FOLSOM, CITY OF	060263
GALT, CITY OF	060264
ISLETON, CITY OF	060265
RANCHO CORDOVA, CITY OF	060772
SACRAMENTO, CITY OF	060266
SACRAMENTO COUNTY UNINCORPORATED AREAS	060262



FEMA

REVISED:

JULY 19, 2018

FLOOD INSURANCE STUDY NUMBER

06067CV001D

Version Number 2.3.3.0

Table 9: Levees

Community	Flooding Source	Levee Location	Levee Owner	USACE Levee	Levee ID	Covered Under PL84-99 Program?	FIRM Panel(s)
Elk Grove, City of	Cosumnes River	*	City of Elk Grove	No	8235	*	06067C0315
		*	City of Elk Grove	No	8396	*	06067C0315
		*	City of Elk Grove	Yes	8236	*	06067C0315
	Laguna Creek West Drainage Outfall Channel	*	City of Elk Grove	Yes	8360	*	06067C0315
Rancho Cordova, City of	American River	*	*	No	8114	*	06067C0202 06067C0205
Sacramento, City of	American River	*	American River Flood Control District	Yes	8043	*	06067C0157 06067C0160 06067C0176 06067C0180
		*	American River Flood Control District	Yes	8134	*	06067C0176 06067C0177 06067C0180
		*	CA DWR	Yes	8254	*	06067C0183 06067C0184 06067C0195 06067C0205
		*	RD 1000	Yes	8052	*	06067C0157 06067C0176
	Arcade Creek	*	American River Flood Control District	Yes	8170	*	06067C0064 06067C0177
		*	American River Flood Control District	Yes	8171	*	06067C0064 06067C0177
	Dry Creek	*	American River Flood Control District	Yes	8325	*	06067C0061
	East Drainage Canal	*	City of Sacramento	No	8178	*	06067C0045 06067C0157
		*	City of Sacramento	No	8197	*	06067C0045

* Data Not Available

Table 10: Summary of Discharges

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharges (cfs)			
			10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
American River	At mouth	*	*	*	157,000	*
	Just Upstream of confluence with the Natomas Main Drainage East Channel	*	*	*	145,000	*
	At Greenback Lane	2,100	115,000	115,000	115,000	425,000
	At Nimbus Dam	1,890	*	*	180,000	*
Arcade Creek	*	40	2,900	4,280	5,000	6,750
		33	2,800	4,100	4,700	6,250
		18	1,800	2,650	3,100	4,800
Arcade Creek South Branch	*	26	350	740	950	1,440
Brooktree Creek	*	3.5	540	1,200	1,540	2,320
Carmichael Creek	*	32	362	837	1,045	1,650
Chicken Ranch Slough	*	41.3	550	860	1,030	1,380
Cosumnes River	At Twin Cities Road (Route 104)	820	*	*	70,600	*
Cosumnes River Above Dillard Road	At Dillard Road	536	34,200	66,800	82,900	125,000
Coyle Creek	*	1.6	365	720	920	1,360
Cripple Creek	*	10.0	960	1,460	1,720	2,680
Dry Creek	At mouth	116.0	*	*	9,600	*
	*	87.0	6,020	10,050	14,000	24,500

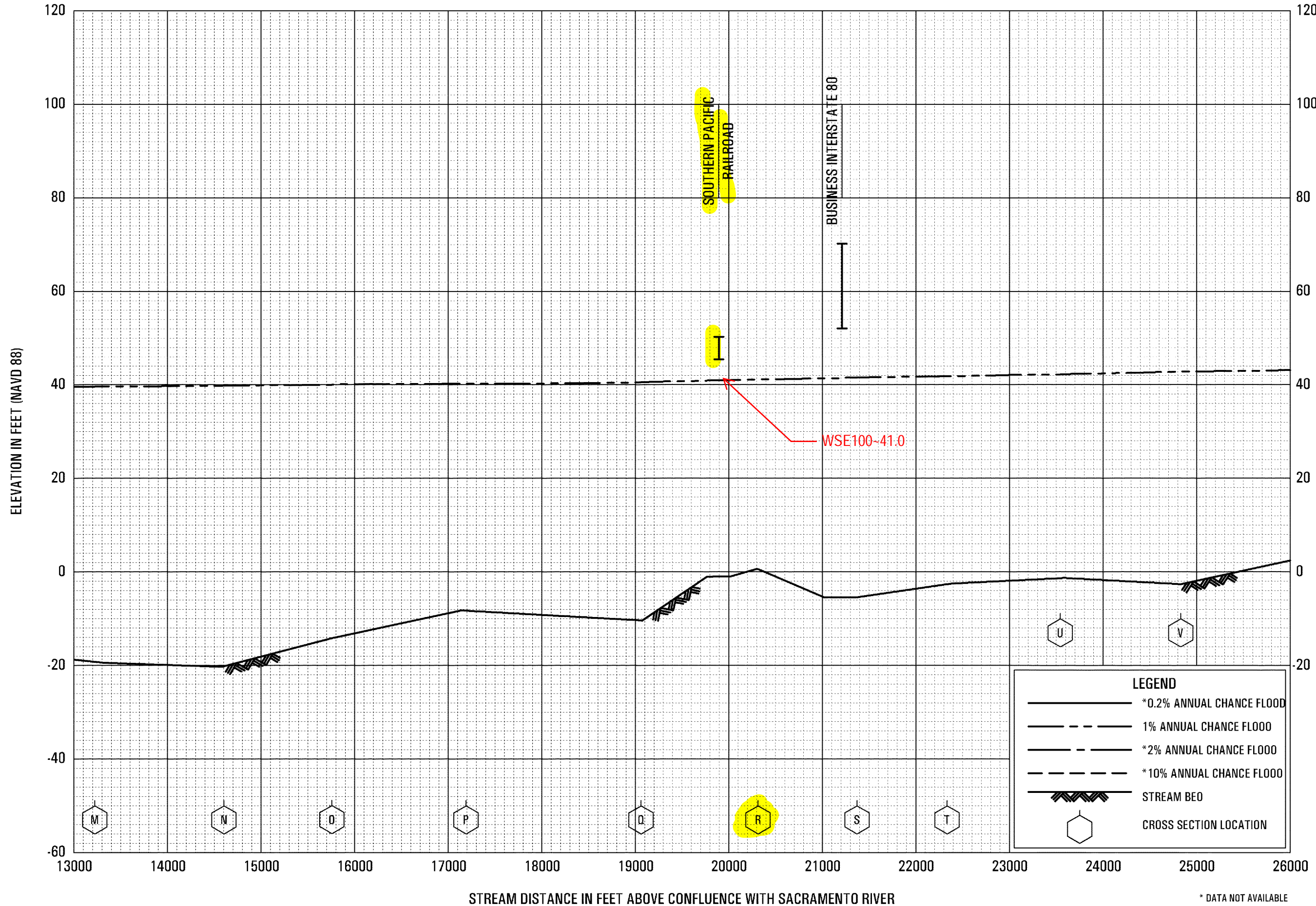
*Data Not Available

Table 24: Floodway Data

LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	232	2,827	42,475	4.6	33.7	33.7	33.7	0.0
B	950	2,491	34,587	5.7	33.9	33.9	33.9	0.0
C	1,088	2,493	37,728	5.2	34.0	34.0	34.0	0.0
D	2,503	2,354	40,490	4.8	34.8	34.8	34.8	0.0
E	3,992	2,329	40,238	4.9	35.3	35.3	35.3	0.0
F	5,343	2,487	36,405	5.4	35.8	35.8	35.8	0.0
G	6,706	2,650	40,273	4.9	36.4	36.4	36.4	0.0
H	7,909	2,568	43,897	4.5	36.9	36.9	36.9	0.0
I	9,235	2,658	41,148	4.8	37.3	37.3	37.3	0.0
J	10,296	2,328	29,820	6.0	37.6	37.6	37.6	0.0
K	11,706	2,425	44,219	4.1	38.9	38.9	38.9	0.0
L	12,302	2,429	45,688	3.9	39.5	39.5	39.5	0.0
M	13,221	2,436	42,261	4.2	39.7	39.7	39.7	0.0
N	14,604	2,535	46,098	3.9	39.9	39.9	39.9	0.0
O	15,756	2,638	45,445	3.9	40.1	40.1	40.1	0.0
P	17,192	2,441	41,717	4.3	40.3	40.3	40.3	0.0
Q	19,061	2,331	34,168	5.3	40.6	40.6	40.6	0.0
R	20,312	2,019	39,438	4.5	41.2	41.2	41.2	0.0
S	21,368	1,987	39,141	4.6	41.6	41.6	41.6	0.0
T	22,334	2,492	41,635	4.3	41.9	41.9	41.9	0.0
U	23,544	3,119	40,266	4.5	42.3	42.3	42.3	0.0
V	24,832	3,190	49,878	3.6	42.9	42.9	42.9	0.0

¹Feet above confluence with Sacramento River

TABLE 24	FEDERAL EMERGENCY MANAGEMENT AGENCY SACRAMENTO COUNTY, CALIFORNIA AND INCORPORATED AREAS	FLOODWAY DATA
		FLOODING SOURCE: AMERICAN RIVER



FLOOD PROFILES
AMERICAN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
SACRAMENTO COUNTY, CA
AND INCORPORATED AREAS

* DATA NOT AVAILABLE

APPENDIX C

Bridge Survey Photolog

UPRR BRIDGE SURVEY – PHOTOLOG



PHOTO 1: Top of Mainline 1 profile from near 92.12, looking TT East.



PHOTO 2: Top of Mainline 1 profile from 92.12, looking TT West.

UPRR BRIDGE SURVEY – PHOTOLOG



PHOTO 3: Top of Mainline 2 profile from Bridge 92.12, looking TT East.



PHOTO 4: Top of Mainline 2 profile from Bridge 92.12, looking TT West.

UPRR BRIDGE SURVEY – PHOTOLOG



PHOTO 5: View of upstream face of bridge Segment A, looking TT East.



PHOTO 6: View of upstream face of bridge Segment B, looking TT East.

UPRR BRIDGE SURVEY – PHOTOLOG



PHOTO 7: View of downstream face of Seg. A and fence, looking TT East.



PHOTO 8: View of upstream face of Seg. A and fence, looking TT East.

UPRR BRIDGE SURVEY – PHOTOLOG



PHOTO 9: View of upstream face of Seg. A, looking TT East.



PHOTO 10: View of upstream face of Seg. A, looking TT West.

UPRR BRIDGE SURVEY – PHOTOLOG



PHOTO 11: View of upstream face of Seg. A, looking TT East.



PHOTO 12: View of upstream face of Seg. A, looking TT East.

UPRR BRIDGE SURVEY – PHOTOLOG



PHOTO 23: View of Pier B1, looking TT North.



PHOTO 24: View of Pier B1, looking TT North.

UPRR BRIDGE SURVEY – PHOTOLOG



PHOTO 33: View of levee near TT West abutment, looking TT North.

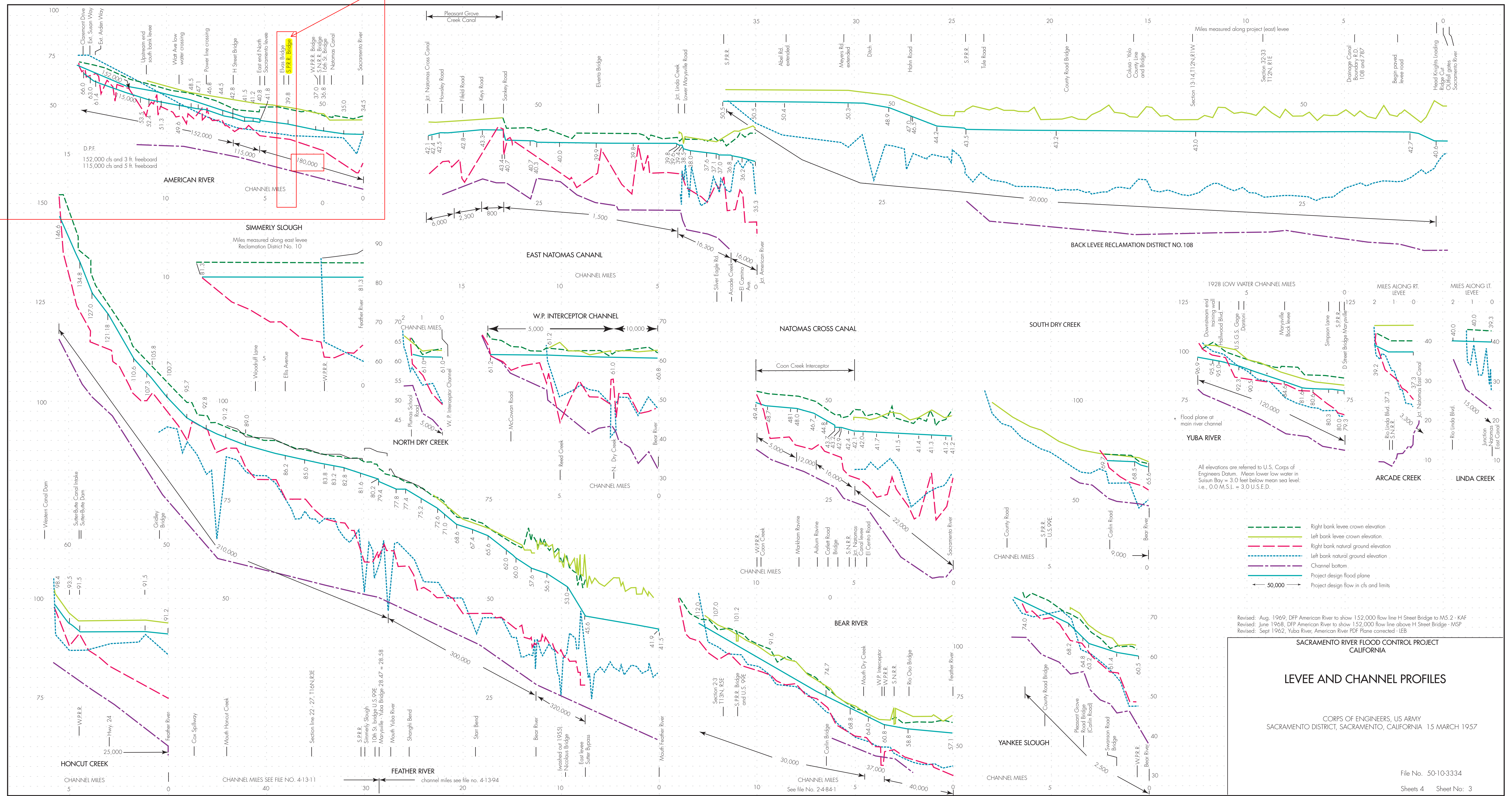


PHOTO 34: View of levee near TT West abutment, looking TT South.

APPENDIX D

O&M and HEC-RAS Output Table

Assumed NGVD 1929 Datum. Add 2.4' for NAVD 1988 Datum
Elev. 42.2 Design Project Flood

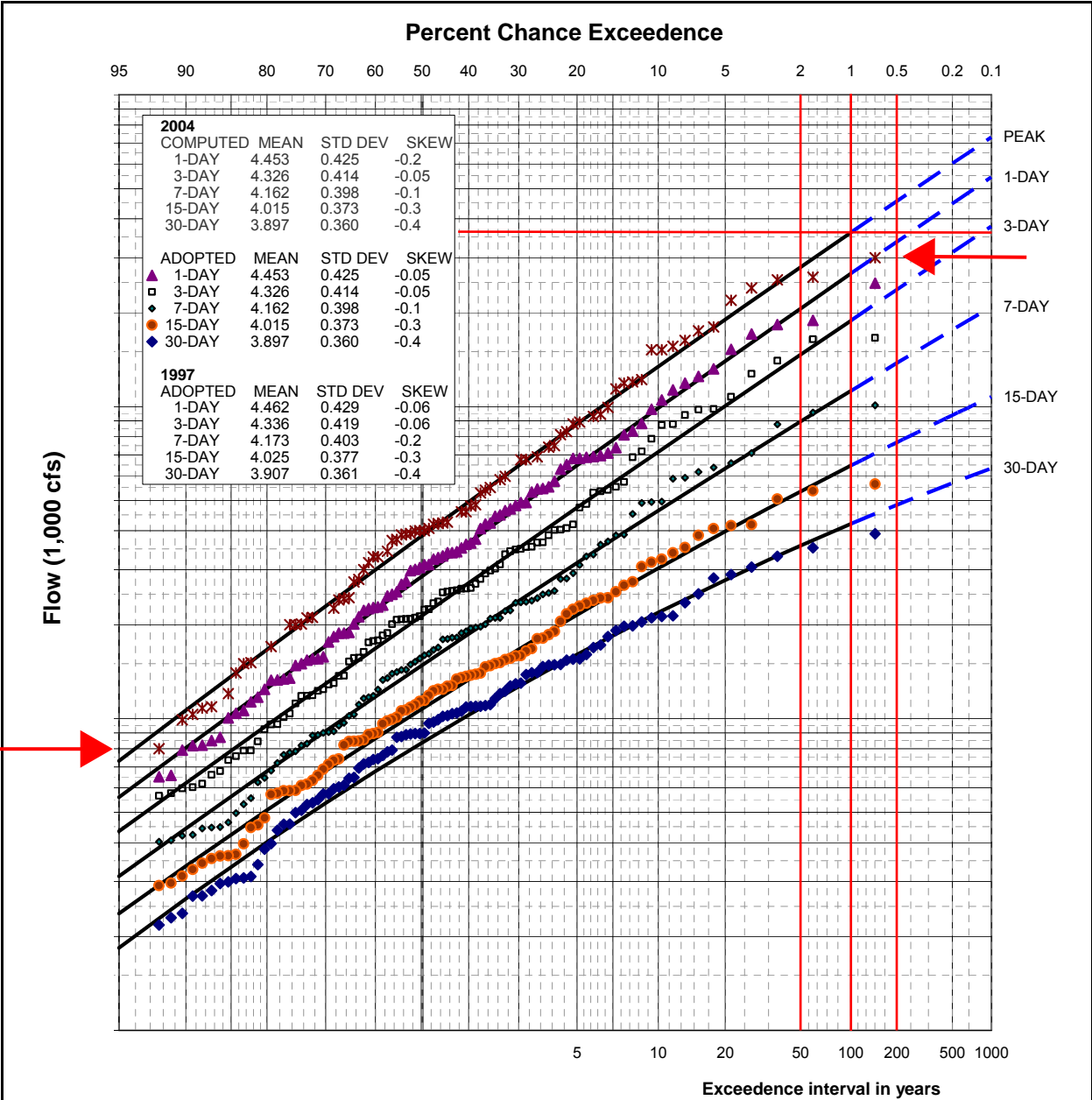


Revised: Aug. 1969, DFP American River to show 152,000 flow line H Street Bridge to MS 2 - KAF
 Revised: June 1968, DFP American River to show 152,000 flow line above H Street Bridge - MSP
 Revised: Sept 1962, Yuba River, American River PDF Plane corrected - LEB

SACRAMENTO RIVER FLOOD CONTROL PROJECT CALIFORNIA

LEVEE AND CHANNEL PROFILES

CORPS OF ENGINEERS, US ARMY
 SACRAMENTO DISTRICT, SACRAMENTO, CALIFORNIA 15 MARCH 1957



NOTES:

- Adjusted USGS gage 11446500 to account for daily change in storage at upstream reservoirs (potential channel, out-of-channel, or storage losses neglected).
- Median plotting positions.
- Computed Probability
- No adjustments for outliers.
- Drainage area: 1,888 sq. mi.
- Period of record: 1905-2004.

AMERICAN RIVER WATERSHED PROJECT
COMMON FEATURES
GENERAL REEVALUATION REPORT

**RAIN FLOOD FREQUENCY CURVES
AMERICAN RIVER AT FAIR OAKS
UNREGULATED CONDITIONS**

FIGURE A-2




USGS Home
 Contact USGS
 Search USGS

National Water Information System: Web Interface

USGS Water Resources

Data Category:
 Geographic Area:

Click to hide News Bulletins

- **Notice** - The USGS Water Resources Mission Area's priority is to maintain the safety and well-being of our communities, including providing critical situational awareness in times of flooding in all 50 U.S. states and additional territories. Our hydrologic monitoring stations continue to send data in near real-time to NWISWeb, and we are continuing critical water monitoring activities to protect life and property on a case-by-case basis. The health and safety of the public and our employees are our highest priorities, and we continue to follow guidance from the White House, the CDC, and state and local authorities.
- [Introducing The Next Generation of USGS Water Data for the Nation](#)
- [Full News](#) 

Peak Streamflow for the Nation

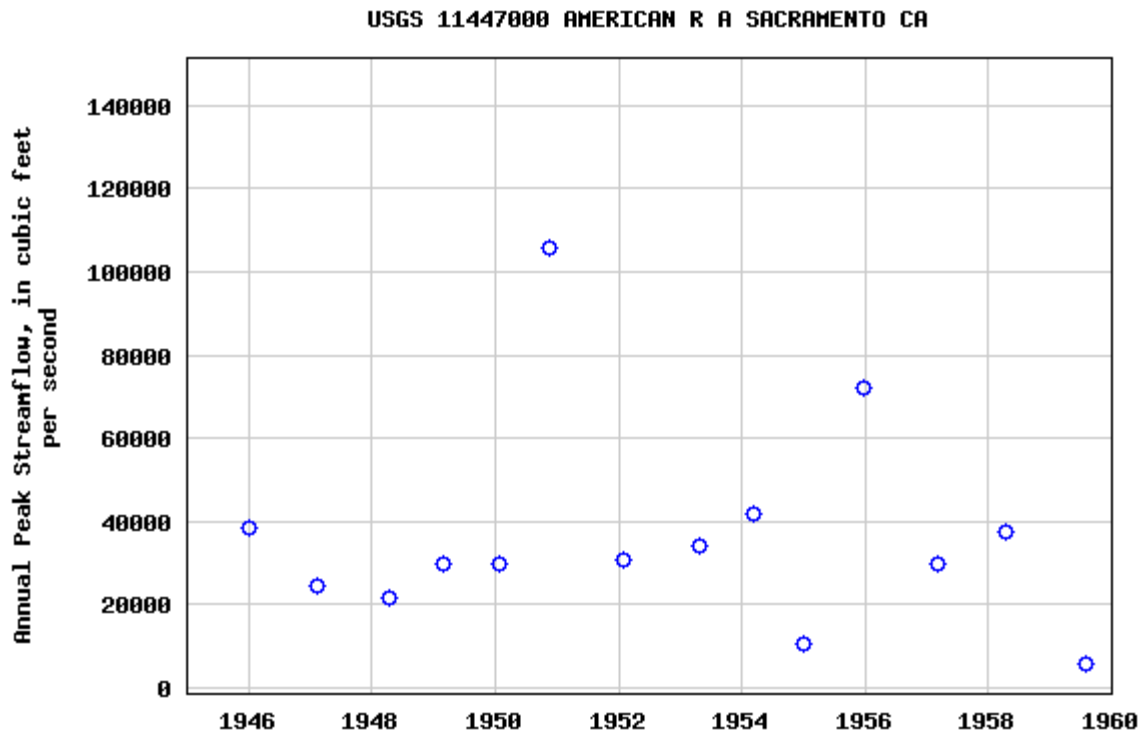
USGS 11447000 AMERICAN R A SACRAMENTO CA

Available data for this site

Sacramento County, California
 Hydrologic Unit Code 18020111
 Latitude 38°34'05", Longitude 121°25'20" NAD27
 Drainage area 1,936 square miles

Output formats

Table
Graph
Tab-separated file
peakfq (watstore) format
Reselect output format



[Download a presentation-quality graph](#)

[Questions about sites/data?](#)

[Feedback on this web site](#)

[Automated retrievals](#)

[Help](#)

[Data Tips](#)

[Explanation of terms](#)

[Subscribe for system changes](#)

[News](#)

[Accessibility](#)

[Plug-Ins](#)

[FOIA](#)

[Privacy](#)

[Policies and Notices](#)

[U.S. Department of the Interior](#) | [U.S. Geological Survey](#)

Title: Surface Water for USA: Peak Streamflow

URL: <https://nwis.waterdata.usgs.gov/nwis/peak?>



Page Contact Information: [USGS Water Data Support Team](#)

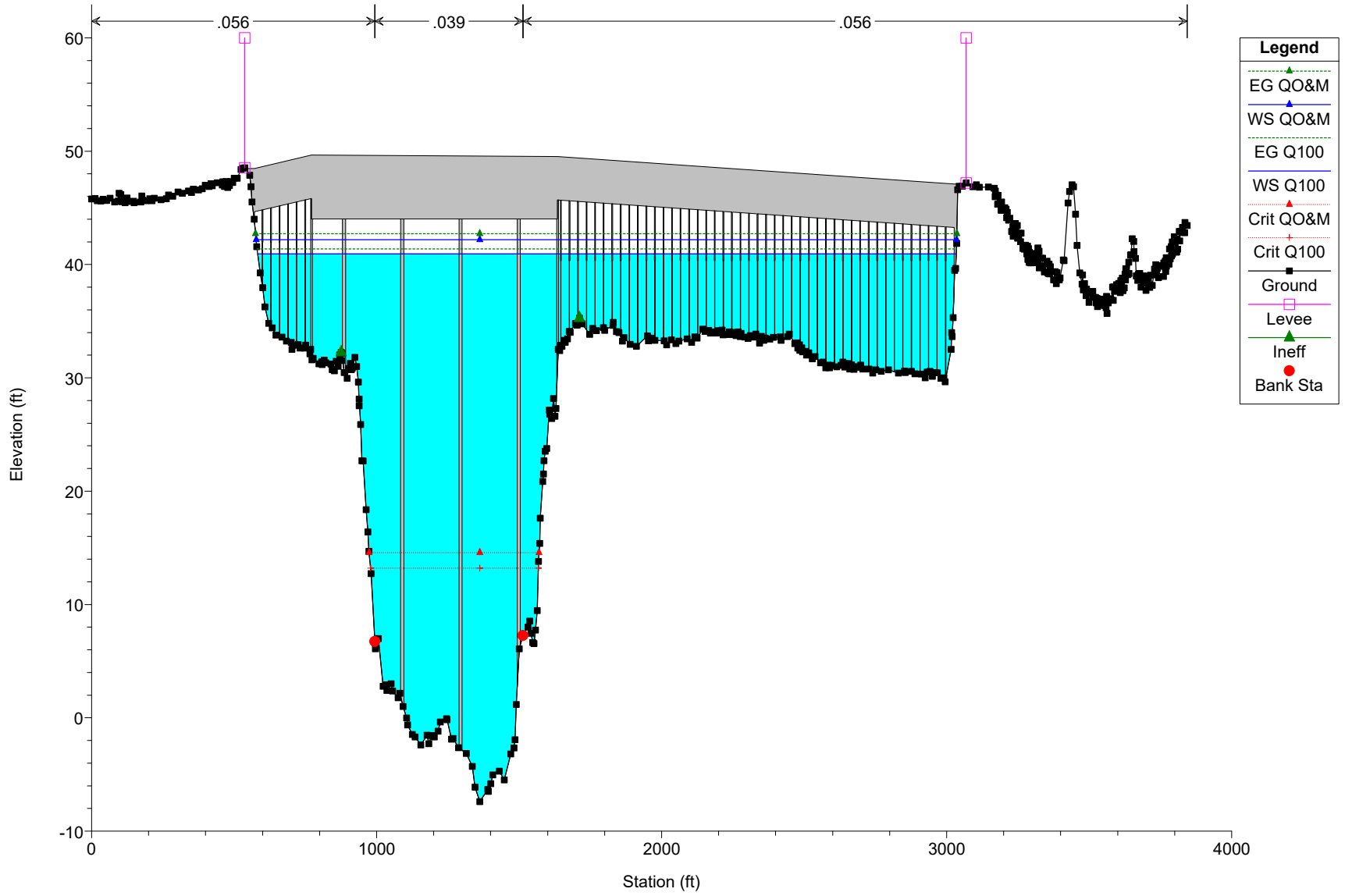
Page Last Modified: 2020-05-06 12:23:48 EDT

0.41 0.29 nadww01

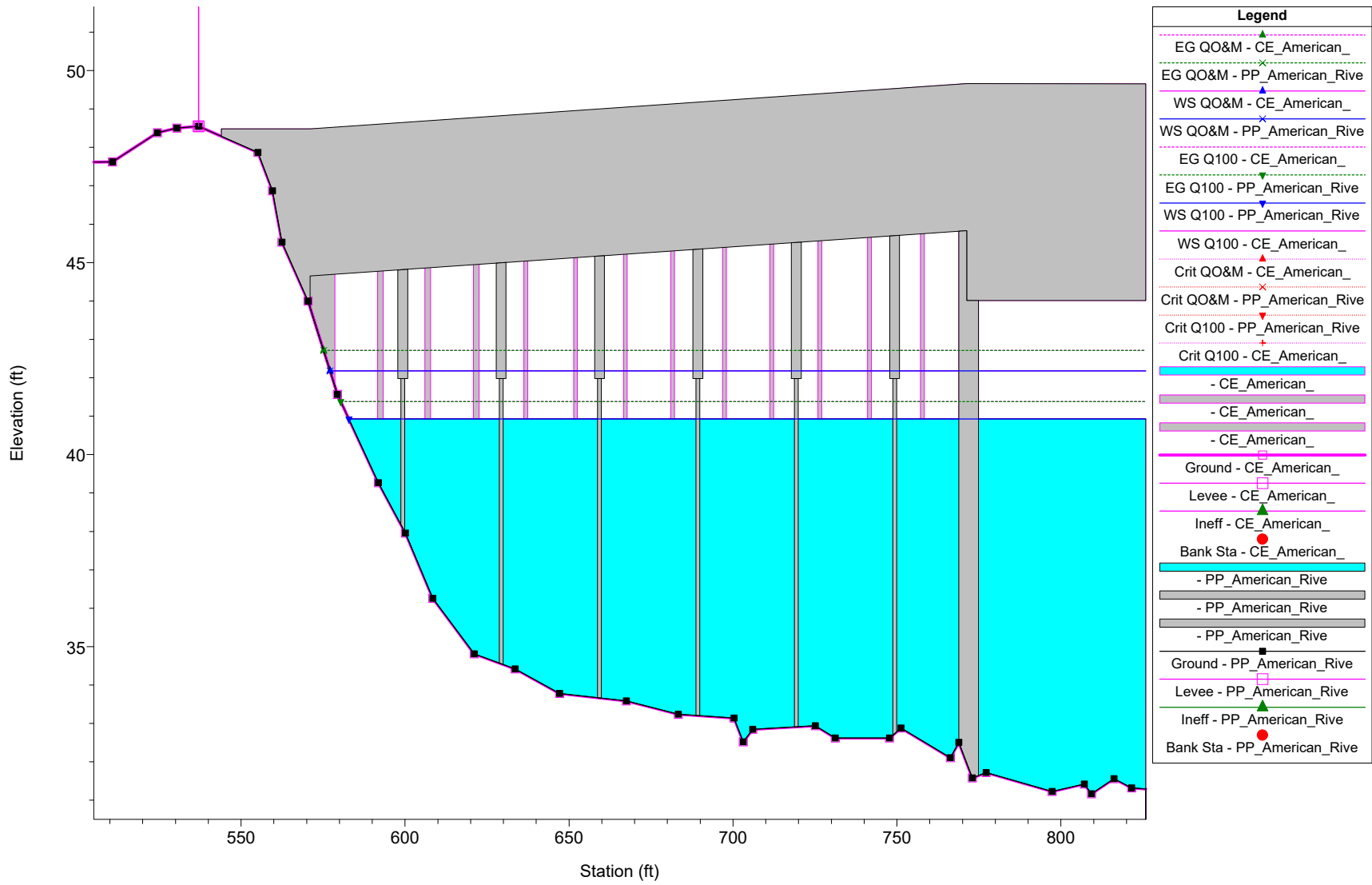
mtz9212_HEC RAS Plan: PP_American_River 4/8/2022

Geom: PP_American_River Flow: FIS Flow

River = AME Reach = R1 RS = 3.715 BR Railroad Bridge (AME-060) - UPRR Bridge 92.12



mtz9212_HEC RAS Plan: 1) PP_American_Rive 2) CE_American_
 Geom: PP_American_River Flow: FIS Flow
 River = AME Reach = R1 RS = 3.715 BR Railroad Bridge (AME-060) - UPRR Bridge 92.12



Plan: CE_American_ AME R1 RS: 3.715 Profile: Q100

E.G. US. (ft)	41.39	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	40.95	E.G. Elev (ft)	41.38	41.39
Q Total (cfs)	157000.00	W.S. Elev (ft)	40.93	40.93
Q Bridge (cfs)	157000.00	Crit W.S. (ft)	13.22	12.51
Q Weir (cfs)		Max Chl Dpth (ft)	48.32	49.46
Weir Sta Lft (ft)		Vel Total (ft/s)	4.07	4.07
Weir Sta Rgt (ft)		Flow Area (sq ft)	38596.05	38605.15
Weir Submerg		Froude # Chl	0.14	0.14
Weir Max Depth (ft)		Specif Force (cu ft)	584120.60	594638.20
Min El Weir Flow (ft)	47.12	Hydr Depth (ft)	17.28	17.41
Min El Prs (ft)	46.58	W.P. Total (ft)	3648.54	3631.49
Delta EG (ft)	0.04	Conv. Total (cfs)	9274208.0	9517225.0
Delta WS (ft)	0.02	Top Width (ft)	2234.00	2216.83
BR Open Area (sq ft)	46432.08	Frctn Loss (ft)		
BR Open Vel (ft/s)	4.07	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.19	0.18
Br Sel Method	Yarnell	Power Total (lb/ft s)	0.00	0.00

Plan: CE_American_ AME R1 RS: 3.715 Profile: QO&M

E.G. US. (ft)	42.71	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	42.21	E.G. Elev (ft)	42.71	42.72
Q Total (cfs)	180000.00	W.S. Elev (ft)	42.18	42.18
Q Bridge (cfs)	180000.00	Crit W.S. (ft)	14.58	13.89
Q Weir (cfs)		Max Chl Dpth (ft)	49.57	50.71
Weir Sta Lft (ft)		Vel Total (ft/s)	4.35	4.35
Weir Sta Rgt (ft)		Flow Area (sq ft)	41401.83	41388.96
Weir Submerg		Froude # Chl	0.15	0.15
Weir Max Depth (ft)		Specif Force (cu ft)	640133.60	650749.60
Min El Weir Flow (ft)	47.12	Hydr Depth (ft)	18.50	18.62
Min El Prs (ft)	46.58	W.P. Total (ft)	3813.45	3795.46
Delta EG (ft)	0.04	Conv. Total (cfs)	9882664.0	10130600.0
Delta WS (ft)	0.02	Top Width (ft)	2238.28	2222.62
BR Open Area (sq ft)	46432.08	Frctn Loss (ft)		
BR Open Vel (ft/s)	4.35	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.22	0.21
Br Sel Method	Yarnell	Power Total (lb/ft s)	0.00	0.00

Plan: PP_American_Rive AME R1 RS: 3.715 Profile: Q100

E.G. US. (ft)	41.38	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	40.95	E.G. Elev (ft)	41.38	41.38
Q Total (cfs)	157000.00	W.S. Elev (ft)	40.93	40.93
Q Bridge (cfs)	157000.00	Crit W.S. (ft)	13.22	12.51
Q Weir (cfs)		Max Chl Dpth (ft)	48.32	49.46
Weir Sta Lft (ft)		Vel Total (ft/s)	4.06	4.06
Weir Sta Rgt (ft)		Flow Area (sq ft)	38675.14	38687.36
Weir Submerg		Froude # Chl	0.14	0.14
Weir Max Depth (ft)		Specif Force (cu ft)	584381.90	594995.10
Min El Weir Flow (ft)	47.12	Hydr Depth (ft)	17.25	17.39
Min El Prs (ft)	45.83	W.P. Total (ft)	3574.72	3557.13
Delta EG (ft)	0.04	Conv. Total (cfs)	9296530.0	9543415.0
Delta WS (ft)	0.02	Top Width (ft)	2242.53	2224.80
BR Open Area (sq ft)	46343.63	Frctn Loss (ft)		
BR Open Vel (ft/s)	4.06	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.19	0.18
Br Sel Method	Yarnell	Power Total (lb/ft s)	0.00	0.00

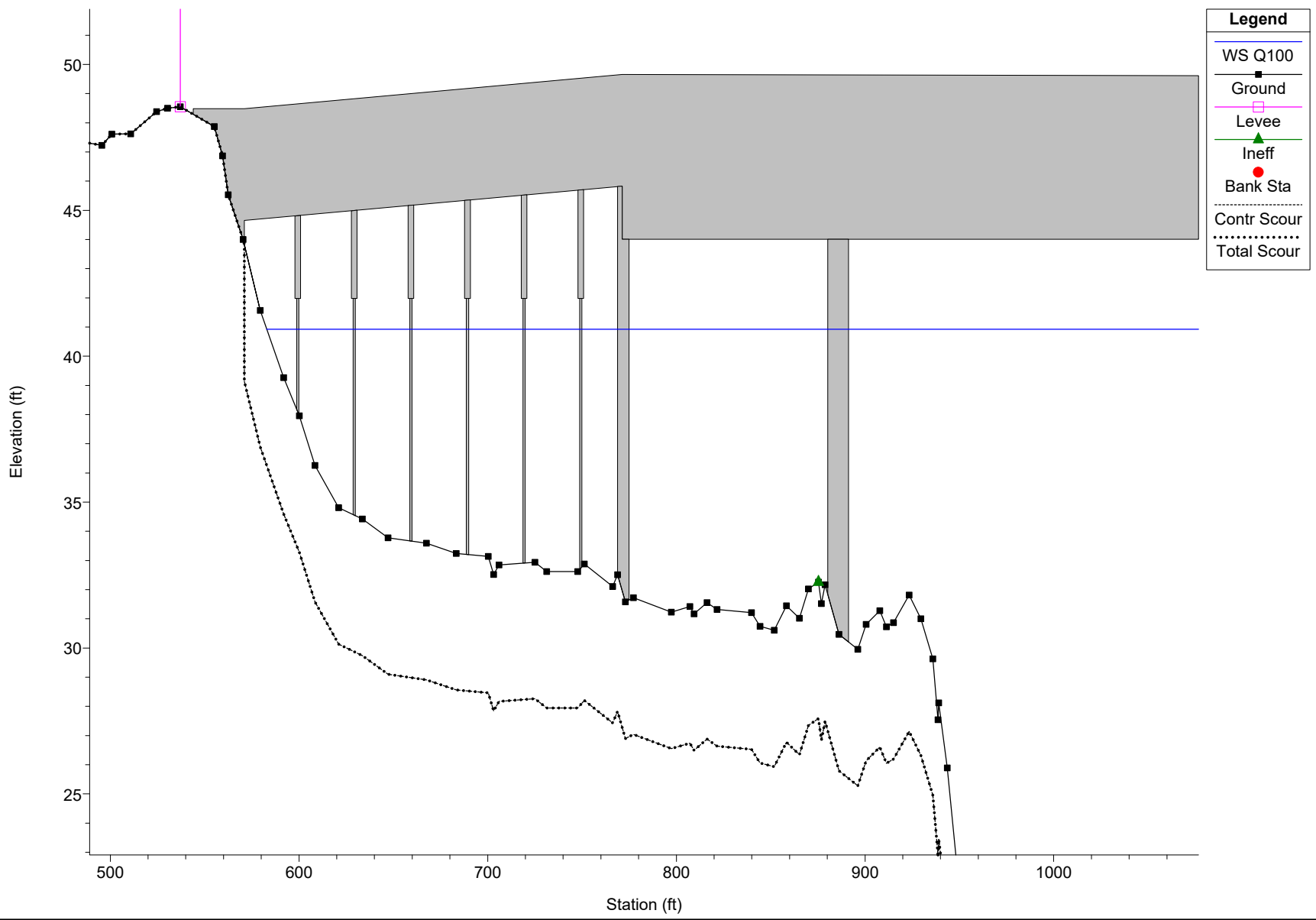
Plan: PP_American_Rive AME R1 RS: 3.715 Profile: QO&M

E.G. US. (ft)	42.70	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	42.20	E.G. Elev (ft)	42.71	42.71
Q Total (cfs)	180000.00	W.S. Elev (ft)	42.18	42.18
Q Bridge (cfs)	180000.00	Crit W.S. (ft)	14.58	13.89
Q Weir (cfs)		Max Chl Dpth (ft)	49.57	50.71
Weir Sta Lft (ft)		Vel Total (ft/s)	4.34	4.34
Weir Sta Rgt (ft)		Flow Area (sq ft)	41489.66	41478.18
Weir Submerg		Froude # Chl	0.15	0.14
Weir Max Depth (ft)		Specif Force (cu ft)	640473.60	651187.90
Min El Weir Flow (ft)	47.12	Hydr Depth (ft)	18.54	18.70
Min El Prs (ft)	45.83	W.P. Total (ft)	3737.08	3717.07
Delta EG (ft)	0.04	Conv. Total (cfs)	9908692.0	10160130.0
Delta WS (ft)	0.02	Top Width (ft)	2237.29	2218.42
BR Open Area (sq ft)	46343.63	Frctn Loss (ft)		
BR Open Vel (ft/s)	4.34	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.23	0.22
Br Sel Method	Yarnell	Power Total (lb/ft s)	0.00	0.00

HEC-RAS River: AME Reach: R1 (Continued)

Reach	River Sta	Profile	Plan	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
R1	4.006 AME-0660	Q100	CE_American_	157000.00	4.16	41.44	20.69	41.95	0.000260	6.78	36461.36	2603.25	0.20
R1	4.006 AME-0660	QO&M	PP_American_Rive	180000.00	4.16	42.79	22.20	43.36	0.000285	7.27	39020.64	2611.26	0.21
R1	4.006 AME-0660	QO&M	CE_American_	180000.00	4.16	42.79	22.20	43.36	0.000285	7.27	39022.05	2611.26	0.21
R1	3.992 AME-0650	Q100	PP_American_Rive	157000.00	0.80	41.46	18.52	41.91	0.000206	6.16	38009.46	1863.62	0.18
R1	3.992 AME-0650	Q100	CE_American_	157000.00	0.80	41.47	18.52	41.91	0.000206	6.16	38010.60	1863.62	0.18
R1	3.992 AME-0650	QO&M	PP_American_Rive	180000.00	0.80	42.81	19.94	43.32	0.000230	6.65	40519.47	1869.21	0.19
R1	3.992 AME-0650	QO&M	CE_American_	180000.00	0.80	42.81	19.94	43.32	0.000230	6.65	40520.86	1869.22	0.19
R1	3.989			Bridge									
R1	3.970 AME-0630	Q100	PP_American_Rive	157000.00	1.56	41.21	18.71	41.66	0.000208	6.09	37409.51	1821.40	0.18
R1	3.970 AME-0630	Q100	CE_American_	157000.00	1.56	41.21	18.71	41.66	0.000208	6.09	37410.66	1821.40	0.18
R1	3.970 AME-0630	QO&M	PP_American_Rive	180000.00	1.56	42.49	20.13	43.01	0.000233	6.59	39751.84	1827.71	0.19
R1	3.970 AME-0630	QO&M	CE_American_	180000.00	1.56	42.49	20.13	43.01	0.000233	6.59	39753.24	1827.71	0.19
R1	3.965			Lat Struct									
R1	3.96			Lat Struct									
R1	3.949 AME-0620	Q100	PP_American_Rive	157000.00	3.12	41.18	19.61	41.63	0.000219	6.14	37496.91	2647.35	0.18
R1	3.949 AME-0620	Q100	CE_American_	157000.00	3.12	41.18	19.61	41.63	0.000219	6.14	37498.12	2647.35	0.18
R1	3.949 AME-0620	QO&M	PP_American_Rive	180000.00	3.12	42.46	20.90	42.98	0.000244	6.63	39972.88	2654.39	0.19
R1	3.949 AME-0620	QO&M	CE_American_	180000.00	3.12	42.47	20.90	42.99	0.000244	6.63	39974.37	2654.39	0.19
R1	3.735 AME-0610	Q100	PP_American_Rive	157000.00	-3.54	41.07	14.10	41.41	0.000135	5.11	46026.58	2890.49	0.14
R1	3.735 AME-0610	Q100	CE_American_	157000.00	-3.54	41.07	14.10	41.41	0.000135	5.11	46028.46	2890.49	0.14
R1	3.735 AME-0610	QO&M	PP_American_Rive	180000.00	-3.54	42.35	15.26	42.73	0.000150	5.50	49728.55	2898.81	0.15
R1	3.735 AME-0610	QO&M	CE_American_	180000.00	-3.54	42.35	15.26	42.73	0.000150	5.50	49730.84	2898.81	0.15
R1	3.718 AME-0600	Q100	PP_American_Rive	157000.00	-7.39	40.95	12.76	41.38	0.000160	5.83	40809.05	2450.90	0.16
R1	3.718 AME-0600	Q100	CE_American_	157000.00	-7.39	40.95	12.76	41.39	0.000160	5.83	40810.67	2450.90	0.16
R1	3.718 AME-0600	QO&M	PP_American_Rive	180000.00	-7.39	42.20	14.06	42.70	0.000180	6.30	43898.00	2458.16	0.17
R1	3.718 AME-0600	QO&M	CE_American_	180000.00	-7.39	42.21	14.06	42.71	0.000180	6.30	43899.97	2458.16	0.17
R1	3.715			Bridge		UPRR Bridge 92.12 Martinez							
R1	3.710 AME-0580	Q100	PP_American_Rive	157000.00	-8.53	40.93	12.02	41.35	0.000149	5.62	40882.88	2462.54	0.15
R1	3.710 AME-0580	Q100	CE_American_	157000.00	-8.53	40.93	12.02	41.35	0.000149	5.62	40882.88	2462.54	0.15
R1	3.710 AME-0580	QO&M	PP_American_Rive	180000.00	-8.53	42.18	13.35	42.67	0.000169	6.10	44041.99	2568.15	0.16
R1	3.710 AME-0580	QO&M	CE_American_	180000.00	-8.53	42.18	13.35	42.67	0.000169	6.10	44041.99	2568.15	0.16
R1	3.702			Lat Struct									
R1	3.69			Lat Struct									
R1	3.688 AME-0570	Q100	PP_American_Rive	157000.00	-7.44	40.96	15.06	41.31	0.000157	5.68	47044.16	2707.25	0.16

Bridge Scour RS = 3.715



Contraction Scour

	Left	Channel	Right
Input Data			
Average Depth (ft):	8.70	39.25	9.34
Approach Velocity (ft/s):	1.27	5.11	1.35
Br Average Depth (ft):	10.35	42.58	10.19
BR Opening Flow (cfs):	8193.22	124226.10	24580.63
BR Top WD (ft):	386.84	486.85	1368.84
Grain Size D50 (mm):	0.10	0.10	0.10
Approach Flow (cfs):	4575.71	129334.80	23089.49
Approach Top WD (ft):	414.35	645.24	1830.90
K1 Coefficient:	0.690	0.690	0.690
Results			
Scour Depth Ys (ft):	4.68	3.47	1.85
Critical Velocity (ft/s):	1.11	1.43	1.12
Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth	
Input Data	
Pier Shape:	Round nose
Pier Width (ft):	1.17
Grain Size D50 (mm):	0.10000
Depth Upstream (ft):	42.41
Velocity Upstream (ft/s):	5.83
K1 Nose Shape:	1.00
Pier Angle:	
Pier Length (ft):	35.00
K2 Angle Coef:	
K3 Bed Cond Coef:	1.10
Grain Size D90 (mm):	0.20000
K4 Armouring Coef:	1.00
Set K1 value to 1.0 because angle > 5 degrees	
Results	
Scour Depth Ys (ft):	
Froude #:	
Equation:	CSU equation

Abutment Scour

	Left	Right
Input Data		
Station at Toe (ft):	571.08	3026.42
Toe Sta at appr (ft):	523.70	3104.43
Abutment Length (ft):	414.35	1830.90
Depth at Toe (ft):	-2.88	2.73
K1 Shape Coef:	1.00 - Vertical abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	414.35	1830.90
Avg Depth Obstructed Ya (ft):	8.70	9.34
Flow Obstructed Qe (cfs):	4575.71	23089.49
Area Obstructed Ae (sq ft):	3605.91	17095.85
Results		
Scour Depth Ys (ft):		10.84

Froude #:		0.16
Equation:	Default	HIRE

Combined Scour Depths

Pier Scour + Contraction Scour (ft):	Left Bank:
	Channel:
	Right Bank:
Right abutment scour + contraction scour (ft):	12.70

HYDROLOGIC & HYDRAULIC EVALUATION – UPRR BRIDGE 92.12: MARTINEZ SUBDIVISION

Sacramento, California

April 2022

Olsson Project No. 019-39260