



TECHNICAL MEMORANDUM

TO: BNSF Railway Company

FROM: Garrett Litteken, P.E., CFM; Tony Comerio, P.E., CFM

DATE: 05/20/2019

SUBJECT: 14R0057 – Bridge 3.1 over Sand Creek H&H Technical Summary

INTRODUCTION

This memorandum summarizes the hydraulic investigation for the proposed Bridge 3.1, which is part of BNSF's Sandpoint Junction Project. BNSF Proposed Bridge No. 3.1 crosses over Sand Creek near its confluence with Lake Pend Oreille in Sandpoint, ID in Bonner County. The proposed bridge will run parallel to the existing 148-foot, 3-span structure. The proposed structure will be constructed upstream of the existing, approximately 26.5-ft on center at its nearest point. FEMA floodplain mapping for Sand Creek indicates that hydraulics are predominantly backwater controlled. Hydrology and downstream boundary conditions were obtained from FEMA data. The FEMA Effective regulatory HEC-2 hydraulics model data along with site survey and LiDAR were utilized to develop a 1-D HEC-RAS model at the bridge.

The existing bridge, Highway 95, and Bridge St. were included in the analysis for floodplain impacts at the railroad bridge. A project location map is provided in Attachment A and site photos are provided in Attachment B.

The proposed bridge structure is within the FEMA regulatory floodway limits and is sufficiently sized to convey Sand Creek with no significant adverse impacts. The proposed bridge opening is less restrictive than the existing bridge. Sand Creek, in the vicinity of the project bridge, is a well maintained recreational area and debris drift is not anticipated to be an issue. The hydraulic analysis utilized HEC-RAS modeling to quantify hydraulic impacts of the proposed design.

DATA COLLECTION

The proposed rail bridge is located near Sand Creek's confluence with Lake Pend Oreille. Hydraulic modeling was extended upstream to include Highway 95 and Bridge St. in order to fully capture potential hydraulic influences of the proposed replacement design. In April 2018, a survey scan of the existing bridge was performed to capture structural details. In addition to the structural scan, hydraulic survey of Sand Creek was performed. Hydraulic survey was limited to the footprint of the existing and proposed rail structures. All survey data, which was used to create the hydraulic models, was collected using the North American Vertical Datum of 1988 (NAVD88).

Upstream channel information was acquired from a combination of LiDAR and FEMA regulatory models covering the project reach. The FEMA Flood Insurance Rate Map (FIRM), effective November 2009, shows the existing bridge is in a Zone AE. This means the floodplain and floodway have been delineated by detailed methods and include Base Flood Elevations (BFE) for the 100-year event. Hanson requested and received the effective HEC-2 model from the FEMA Engineering Library for the area of BNSF expansion. The regulatory FEMA HEC-2 hydraulic model

was used to define the downstream boundary conditions for this analysis. The effective HEC-2 model was developed prior to the completion of Highway 95 Bridge over Sand Creek and does not include model information for the structure. FEMA provided an updated model submitted in support of Conditional Letter of Map Revision (CLOMR) 04-10-0479R for construction of Highway 95. The model incorporated detailed survey of Bridge St., the existing rail bridge, and proposed plans for Highway 95.

In order to accurately depict the study area, the effective HEC-2 model was updated with an existing conditions model which utilized project survey and record bridge drawings. The existing conditions model reflects recent detailed survey, detailed bridge plans, georectified cross-sections, and acquisition of LiDAR. FEMA's CLOMR model was used to provide cross-section data upstream of the project survey, including bridge opening and overtopping information for Highway 95 and Bridge St. The FEMA FIRM and relevant excerpts from the FEMA FIS are provided in Attachment C.

Bonner County LiDAR was used to update the FEMA CLOMR HEC-RAS model floodplain topography above the normal pool water line. 2010 LiDAR data of Bonner County, Idaho was obtained from the USDA/NRCS National Geospatial Center of Excellence. The LiDAR data has a nominal point spacing of 1 meter based on Universal Transverse Mercator Zone 11, related to the North American Datum of 1983, and North American Vertical Datum of 1988 (NAVD88).

HYDROLOGY

The FEMA Effective HEC-2 model and Flood Insurance Study provided discharges for Sand Creek at the project bridge. Sand Creek has an approximate drainage area of 38.5-sq.mi. to its mouth at Lake Pend Oreille. Table 1 shows the resulting discharges from the FEMA FIS at the structure. Relevant excerpts from the FEMA FIS are provided in Attachment C.

Table 1 - Discharge-Frequency Comparison

Discharge (cfs)	
Frequency (Years)	FEMA Effective HEC-2 Model
10	1,455
50	2,280
100	2,820
500	4,015

HYDRAULICS

Hydraulics were developed from a combination of the FEMA model data, detailed bridge plans, LiDAR and project survey data. Three boundary conditions were analyzed to determine impacts under various Lake Pend Oreille backwater conditions. Boundary conditions include a normal depth solution, a summer pool backwater, and the FEMA regulatory backwater. A normal depth boundary slope of 0.0002-ft/ft was acquired from the Effective FEMA HEC-2 model and used to assess normal depth conditions. A known water surface boundary condition was used to establish starting water surface elevations for the backwater models. FEMA flood profiles for Sand Creek are provided in Appendix C, and starting water surface elevations are summarized in Table 2.

Table 2.

Table 2 – HEC-RAS Known Water Surface Boundary

Location	Source	Backwater	Boundary Condition Known W.S. (ft, NAVD88)
Sand Creek	FEMA FIS	Regulatory Pool (100-yr BFE)	2073.7
	Lake Pend Oreille	Summer Pool	2062.5

The US Army Corps of Engineers' HEC-RAS v.5.0.7 program was used to model the creek and Bridge 3.1. The model extends 300-ft downstream of the existing bridge to Sand Creek's confluence with Lake Pend Oreille. Survey of the bridges combined with photos and available construction drawings were used to accurately define the existing and proposed structures. The FEMA HEC-RAS CLOMR model was used to inform upstream bridge and channel geometry. The HEC-RAS model calculates water surface elevations along the Sand Creek floodplain for a 0.4-mile reach near the existing rail crossing. The existing 3-span bridge (48.3'-51.7'-48.3') has a total length of 148.23-feet from abutment to abutment. This establishes baseline conditions for comparison with the proposed replacement design. Existing bridge plans are provided in Attachment E.

A proposed conditions model was developed to analyze potential impacts from the construction of the proposed parallel bridge crossing upstream of the existing rail structure. Per HEC-RAS Hydraulic Reference Manual Version 5.0, the existing and proposed bridge were modeled as a combined bridge deck due to their proximity. The existing bridge was modeled as the downstream face of the hydraulic structure and the proposed bridge was modeled as the upstream face of the deck. The structures were sufficiently far apart that they were assumed not to impact the hydraulic opening of the parallel bridge face. The proposed structure provides a wider hydraulic opening than the existing bridge. The piers are sufficiently spaced that they are not anticipated to experience an aggregated hydraulic influence with the existing piers and abutments. A hydraulic cross-section location map is provided in Attachment D.

The proposed replacement structure utilizes a 11-span design and increased bridge main span length, which improves the hydraulic capacity of the structure. Due to the proximity of the structures, only four of the proposed bridge spans are able to actively convey flow. The proposed structure will provide an effective hydraulic opening of approximately 165.3-ft at its upstream face. Proposed bridge plans are provided in Attachment F.

FLOODPLAIN PERMITTING

The hydraulic model investigation indicates that the proposed rail bridge creates less than a 0.0-ft impact in the 100-year (1% annual chance flood) water surface elevation under normal depth conditions, less than a 0.0-ft impact under Lake Pend Oreille summer pool backwater conditions, and less than 0.0-ft impact under FEMA regulatory pool backwater conditions. Based on the results of the hydraulic investigation, the proposed structure meets the intent of FEMA "No-Rise" Certification criteria. A summary of HEC-RAS model output comparison between the existing and proposed conditions is provided in Attachment G. Certification that the proposed structure meets the intent of FEMA "no-rise" criteria and certification that the structure is designed in accordance with the General Standards of Bonner County Revised Code Section 14-501 is provided in Attachment H.

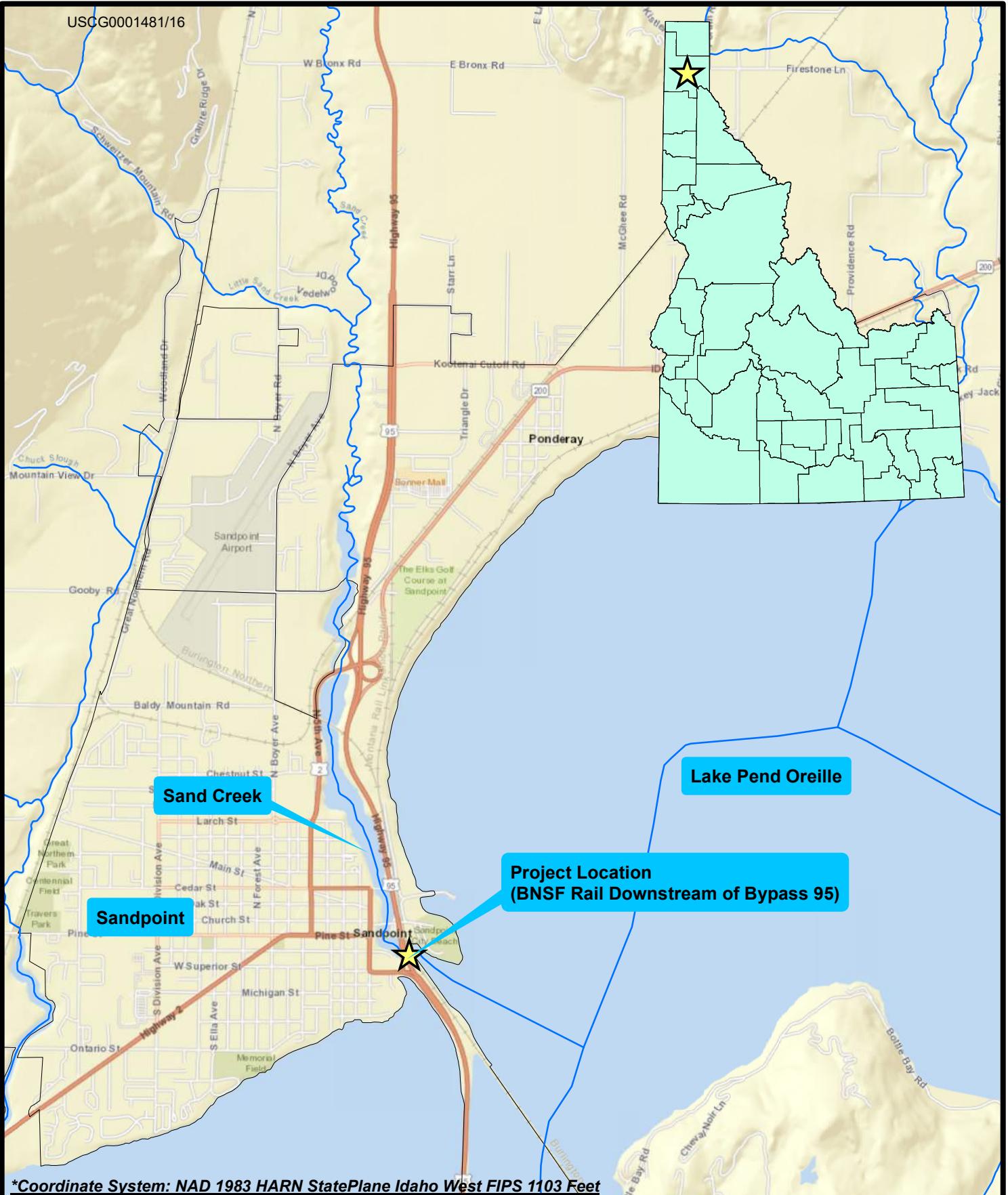
structure is designed in accordance with the General Standards of Bonner County Revised Code Section 14-501 is provided in Attachment H.

List of Attachments:

- Attachment A - Project Location Map
- Attachment B - Site Photos
- Attachment C - FEMA FIS and FIRM
- Attachment D - Hydraulic Cross-Section Map
- Attachment E - Existing Bridge Plans
- Attachment F - Proposed Bridge Plans
- Attachment G - HEC-RAS Output
- Attachment H – No-rise Certification and Design Certification

Attachment A – Project Location Map

USCG0001481/16



0 1,500 3,000
Feet

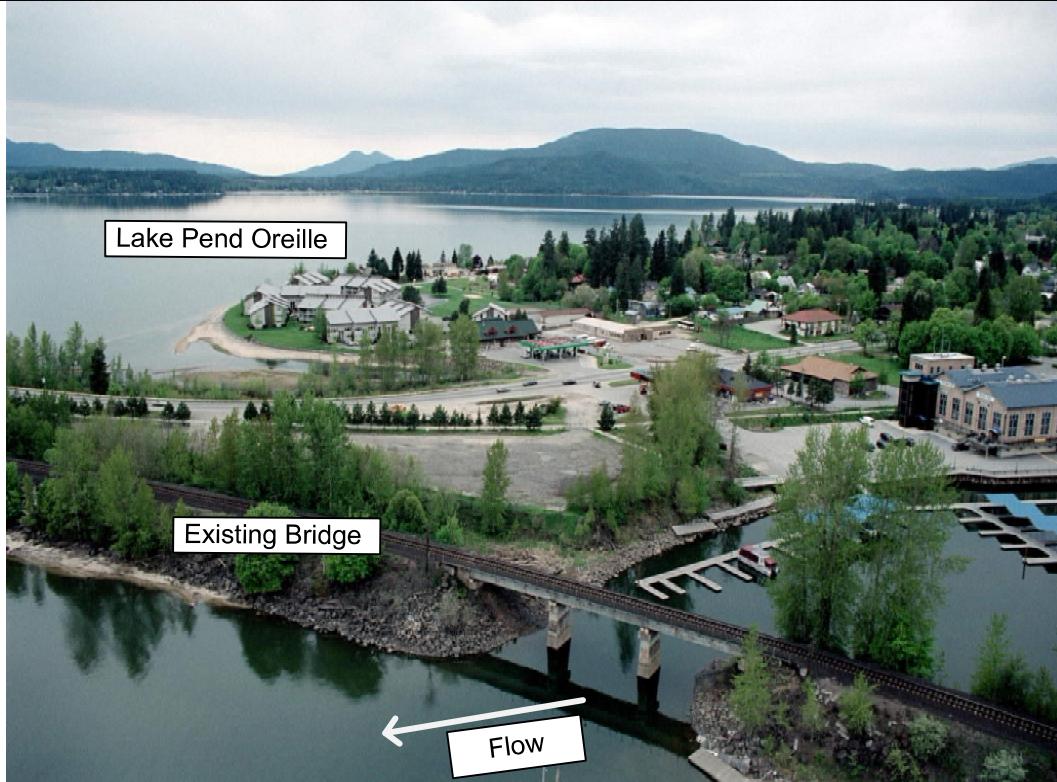
1 in = 3,000 ft



Project Location Map	
BNSF Railway Company Bridge 3.1 Over Sand Creek Sandpoint, Idaho	
Job Number: 14R0057	

Attachment B – Site Photos

Photograph 1 – Existing Bridge on Sand Creek at confluence with Lake Pend Oreille looking Upstream (west)



Photograph 2 – Left abutment of Existing Bridge looking Downstream (northeast)



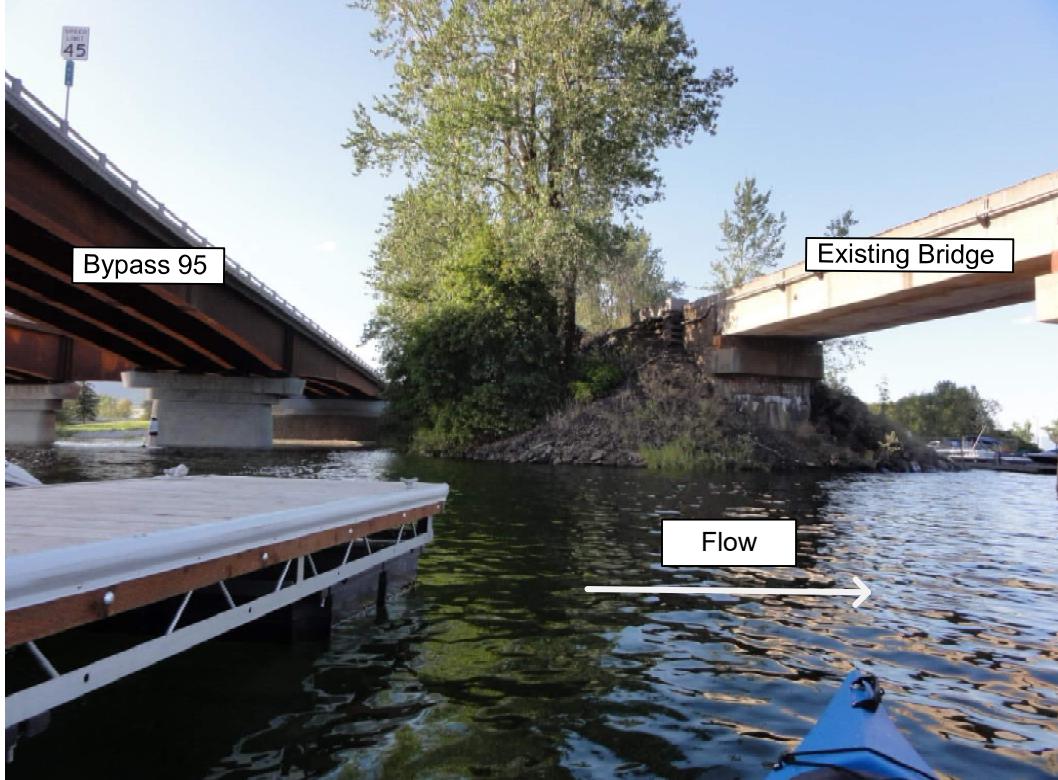
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Photographs



BNSF Railway Company
Bridge 3.1 Over Sand Creek
Sandpoint, Idaho

Photograph 3 – Left abutment of Existing Bridge looking north



Photograph 4 – Left abutment of Existing Bridge looking north



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Photographs



BNSF Railway Company
Bridge 3.1 Over Sand Creek
Sandpoint, Idaho

Photograph 5 – Left abutment of Existing Bridge looking north



Photograph 6 – Right abutment of Existing Bridge looking Downstream (southeast)



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Photographs



BNSF Railway Company
Bridge 3.1 Over Sand Creek
Sandpoint, Idaho

Attachment C – FEMA FIS and FIRM

National Flood Hazard Layer FIRMette

USGS000154416



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT



SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE)
Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X

Future Conditions 1% Annual Chance Flood Hazard Zone X

Area with Reduced Flood Risk due to Levee. See Notes. Zone X

Area with Flood Risk due to Levee Zone D

NO SCREEN Area of Minimal Flood Hazard Zone X

Effective LOMRs

Area of Undetermined Flood Hazard Zone D

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

20.2
17.5
Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

Digital Data Available

No Digital Data Available

Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/13/2018 at 5:34:49 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

FLOOD INSURANCE STUDY

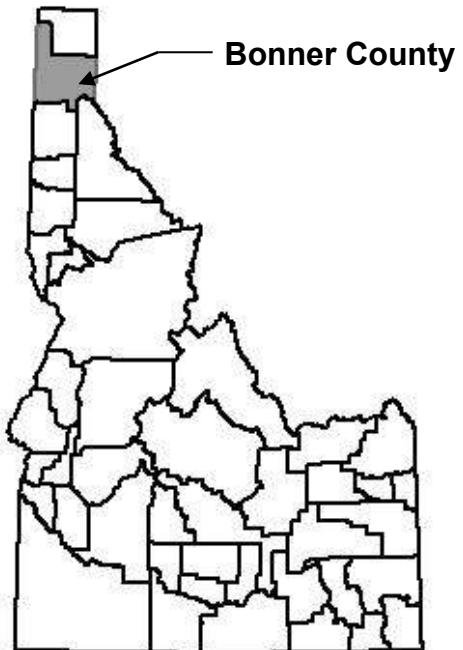


BONNER COUNTY, IDAHO AND INCORPORATED AREAS

COMMUNITY NAME
BONNER COUNTY, UNINCORPORATED AREAS
CLARK FORK, CITY OF
DOVER, CITY OF
EAST HOPE, CITY OF
HOPE, CITY OF
*KOOTENAI, CITY OF
OLDTOWN, CITY OF
PONDERAY, CITY OF
PRIEST RIVER, CITY OF
SANDBPOINT, CITY OF

*No Special Flood Hazard Areas Identified

COMMUNITY NUMBER
160206
160132
160006
160237
160238
160052
160073
160150
160026
160025



REVISED
July 7, 2014



Federal Emergency Management Agency
Flood Insurance Study Number
16017CV000B

Table 5. Summary of Discharges (continued)

Flooding Source and Location	Drainage Area (Square Miles)	<u>Peak Discharges (Cubic Feet per Second)</u>			
		10-Percent- Annual-Chance	2-Percent- Annual-Chance	1-Percent- Annual-Chance	0.2-Percent- Annual-Chance
Priest River					
At Mouth	907	9,050	10,550	11,100	12,200
Near McAbee Falls	861	8,500	10,000	10,600	11,900
Above Midpoint on Section Line 27/28	795	8,300	9,700	10,300	11,600
Above East River	726	8,000	9,400	10,000	11,200
Rapid Lightning Creek					
At Mouth	48.0	1,750	2,800	3,450	5,000
Above Cross Section BO	34.1	1,300	2,050	2,550	3,550
Above Spring Creek	28.6	1,150	1,750	2,150	3,000
Sand Creek North					
At Mouth	17.0	750	1,100	1,350	1,900
Sand Creek					
At mouth	38.5	1,455	2,280	2,820	4,015
Above Little Sand Creek	23.2	960	1,455	1,780	2,510
Above Schweitzer Creek	16.1	715	1,065	1,295	1,830
Above Cross Section AS	12.1	575	840	1,020	1,445
Above Cross Section AW	8.3	435	625	760	1,075
Above Swede Creek	6.8	375	535	660	915
Above Cross Section BC	4.0	260	395	470	660
Above Jack Creek	2.1	185	295	360	510
Spring Creek					
At Mouth	11.2	550	800	950	1,350
Above Cross Section AA	9.7	500	700	850	1,200

¹Flows Routed by Burlington Northern Railroad Embankment²Data Not Available

Table 6. Roughness Coefficients - Range of Manning's "n"

	<u>Channel</u>	<u>Overbank Flood Plain</u>
Clark Fork	0.031	0.060 to 0.120
Grouse Creek	0.055	0.070 to 0.140
Lightning Creek	0.048 to 0.070	0.080 to 0.250
Mosquito Creek	0.055 to 0.060	0.060 to 0.150
Pack River	0.048 to 0.055	0.085 to 0.175
Priest River	0.040 to 0.155	0.040 to 0.200
Rapid Lightning Creek	0.040 to 0.070	0.040 to 0.200
Sand Creek North	0.070 to 0.080	0.140 to 0.200
Sand Creek	0.045 to 0.065	0.045 to 0.200
Spring Creek	0.070 to 0.095	0.080 to 0.350

Starting water-surface elevations for all streams were calculated using slope-area methods. Backwater at confluences with larger river systems or lakes are shown at the most downstream reaches of the smaller tributary stream on the flood profiles.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed and do not fail.

Hydraulic analyses of the outlet structures for Cocalalla and Kelso Lakes were conducted in order to provide rating for outflow from the lakes. All structures were measured by field surveys.

It was agreed between the Federal Emergency Management Agency and the study contractor to consider wave height analyses for Lake Pend Oreille only. Significant wave height was calculated using procedures as outlined in ETL-1110-2-221 (References 16 and 17). Input for the calculations included wind direction, duration, and speed along with reservoir shape and size. The calculated wave height was added as a surcharge to the 1-percent-annual-chance stillwater lake elevation. No wave runup analysis was conducted. No analyses of wave height or runup were conducted for any of the additional lakes studied in Bonner County.

Streams and rivers, selected for study by approximate methods, were analyzed by some combination of these five criteria: (1) correlation considering size of drainage area, slope, vegetative cover, and hydraulic conditions with other streams studied by detailed methods within the region; (2) field reconnaissance and historical accounts using information provided by local residents familiar with flooded areas and boundaries during past flooding events; (3) correlation with the U.S. Geological Survey maps of flood-prone areas; (4) correlation with flood boundaries as outlined on the Special Flood Hazard Boundary Map for Bonner County (Reference 20); and (5) engineering judgment.

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum used for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD 29). With the completion of the North American Vertical Datum of 1988 (NAVD

88), many FIS reports and FIRMs are now prepared using NAVD 88 as the referenced vertical datum.

To accurately convert flood elevations for the streams and rivers in Bonner County from the current NGVD 29 datum to the newer NAVD 88 datum, the following procedure was implemented. Locations at the upstream and downstream ends of each flooding source, as well as at an intermediate location between these two end points, were evaluated using the COE CORPSCON (Reference 21) vertical datum conversion software. At each of the three points CORPSCON calculated the difference between NGVD 29 and NAVD 88 elevations. These three conversion factors were averaged to develop an average conversion factor for each flooding source. The final NAVD 88 elevations reported herein were computed by adding the calculated average conversion factor to the existing NGVD 29 data. Table 7 shows the conversion factor for each stream studied in detail.

Flood elevations shown in this FIS report and on the FIRMs are referenced to NAVD 88. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the NGVD and the NAVD, visit the National Geodetic Survey website at www.ngs.noaa.gov, or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242
(301) 713-4172 (fax)

Table 7. Vertical Datum Conversion Factors

<u>Stream Name</u>	Conversion from NGVD 29 to NAVD 88 (feet)			
	<u>Minimum Conversion</u>	<u>Maximum Conversion</u>	<u>Average Conversion</u> ¹	<u>Maximum Offset</u>
Clark Fork River	3.86	3.90	3.88	0.02
Grouse Creek	3.86	3.87	3.86	0.01
Lightning Creek	3.88	3.98	3.91	0.07
Mosquito Creek	3.87	3.88	3.88	0.00
Pack River	3.88	3.89	3.89	0.01
Pend Oreille River	3.85	3.87	3.86	0.01
Lake Pend Oreille	3.86	3.87	3.87	0.01
Priest River	3.90	3.95	3.92	0.03
Rapid Lightning Creek	3.90	3.93	3.91	0.02
Sand Creek North	3.86	3.88	3.87	0.01
Sand Creek	3.88	3.90	3.89	0.01
Spring Creek	3.88	3.96	3.92	0.04

¹ Used to convert elevation data from NGVD 29 to NAVD 88.

Temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purpose of establishing local vertical control. Although these monuments are not shown on the FIRM, they may be found in the Technical Support Data Notebook associated with the FIS report and the FIRMs for this community. Interested individuals

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Sand Creek								
A	-5,603	365	2,367	1.2	2,073.7	2,064.3 ²	2,064.6 ²	0.3
B	-5,203	273	1,649	1.7	2,073.7	2,064.4 ²	2,064.7 ²	0.3
C	-4,518	234	1,470	1.9	2,073.7	2,064.6 ²	2,064.9 ²	0.3
D	-3,640	359	2,060	1.4	2,073.7	2,064.8 ²	2,065.1 ²	0.3
E	-2,225	399	2,083	1.4	2,073.7	2,065.1 ²	2,065.4 ²	0.3
F	-1,615	639	3,574	0.8	2,073.7	2,065.2 ²	2,065.4 ²	0.2
G	-935	188	1,138	2.5	2,073.7	2,065.4 ²	2,065.6 ²	0.2
H	-315	301	1,811	1.6	2,073.7	2,065.7 ²	2,066.0 ²	0.3
I	264	416	2,418	1.2	2,073.7	2,065.8 ²	2,066.1 ²	0.3
J	874	471	2,568	1.1	2,073.7	2,066.0 ²	2,066.3 ²	0.3
K	1,596	103	535	5.3	2,073.7	2,067.8 ²	2,067.8 ²	0.0
L	1,951	99	416	6.8	2,073.7	2,068.8 ²	2,068.8 ²	0.0
M	2,366	285	2,449	1.2	2,073.7	2,070.0 ²	2,070.3 ²	0.3
N	3,176	330	2,608	1.1	2,073.7	2,070.0 ²	2,070.3 ²	0.3
O	3,846	288	2,282	1.2	2,073.7	2,070.2 ²	2,070.5 ²	0.3
P	4,200	265	2,500	1.1	2,073.7	2,071.7 ²	2,071.9 ²	0.2
Q	5,130	380	3,348	0.8	2,073.7	2,071.8 ²	2,072.0 ²	0.2
R	5,895	361	2,891	1.0	2,073.7	2,071.9 ²	2,072.1 ²	0.2
S	6,560	381	2,907	1.0	2,073.7	2,071.9 ²	2,072.1 ²	0.2
T	8,800	229	1,460	1.9	2,073.7	2,072.6 ²	2,073.0 ²	0.4
U	9,695	209	1,204	2.3	2,073.7	2,073.2 ²	2,073.7 ²	0.5
V	10,240	189	736	3.8	2,074.6	2,074.6	2,075.2	0.6
W	10,505	377	2,516	1.1	2,077.2	2,077.2	2,077.5	0.3
X	11,260	248	1,158	2.4	2,077.9	2,077.9	2,078.4	0.5
Y	12,535	141	479	3.7	2,082.0	2,082.0	2,082.6	0.6
Z	13,395	104	481	3.7	2,085.2	2,085.2	2,085.6	0.4
AA	14,160	188	1,133	1.6	2,086.5	2,086.5	2,087.0	0.5
AB	15,560	155	1,232	1.4	2,087.5	2,087.5	2,088.2	0.7

¹Feet above Burlington Northern Railroad²Elevation computed without consideration of backwater from Lake Pend Oreille

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY
 BONNER COUNTY, IDAHO
 AND INCORPORATED AREAS

FLOODWAY DATA

SAND CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Sand Creek (Con't)								
AC	16,090	114	975	1.8	2,087.8	2,087.8	2,088.5	0.7
AD	16,505	86	689	2.6	2,088.0	2,088.0	2,088.8	0.8
AE	16,870	101	667	2.7	2,088.4	2,088.4	2,089.2	0.8
AF	17,865	156	1,336	1.3	2,089.2	2,089.2	2,090.0	0.8
AG	20,385	150	792	2.2	2,091.7	2,091.7	2,092.7	1.0
AH	21,072	175	1,213	1.5	2,093.3	2,093.3	2,094.3	1.0
AI	22,092	416	2,155	0.8	2,093.9	2,093.9	2,094.9	1.0
AJ	23,437	220	827	2.2	2,095.3	2,095.3	2,095.9	0.6
AK	24,107	261	1,152	1.5	2,096.5	2,096.5	2,097.0	0.5
AL	25,252	179	764	2.3	2,098.0	2,098.0	2,098.5	0.5
AM	26,132	322	1,256	1.4	2,099.2	2,099.2	2,099.7	0.5
AN	26,697	164	482	2.7	2,100.6	2,100.6	2,101.0	0.4
AO	27,367	126	648	2.0	2,102.3	2,102.3	2,102.7	0.4
AP	28,312	320	1,313	1.0	2,103.4	2,103.4	2,103.9	0.5
AQ	30,392	107	494	2.6	2,106.8	2,106.8	2,107.4	0.6
AR	31,347	86	545	2.4	2,108.3	2,108.3	2,109.1	0.8
AS	33,030	236	1,014	1.3	2,110.9	2,110.9	2,111.7	0.8
AT	35,405	185	753	1.4	2,115.1	2,115.1	2,115.8	0.7
AU	36,260	106	515	2.0	2,116.8	2,116.8	2,117.5	0.7
AV	36,614	122	718	1.4	2,118.9	2,118.9	2,119.3	0.4
AW	37,604	59	323	3.2	2,120.8	2,120.8	2,121.7	0.9
AX	38,719	59	291	2.6	2,123.7	2,123.7	2,124.6	0.9
AY	39,549	116	615	1.2	2,124.9	2,124.9	2,125.8	0.9
AZ	39,850	76	426	1.8	2,125.7	2,125.7	2,126.2	0.5
BA	40,775	51	273	2.8	2,127.3	2,127.3	2,128.0	0.7
BB	41,755	61	350	1.9	2,129.4	2,129.4	2,130.3	0.9
BC	42,173	56	355	1.9	2,130.5	2,130.5	2,131.3	0.8

¹Feet above Burlington Northern Railroad

TABLE 8

FEDERAL EMERGENCY MANAGEMENT AGENCY
BONNER COUNTY, IDAHO
AND INCORPORATED AREAS

FLOODWAY DATA

SAND CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY (FEET NAVD)	WITHOUT FLOODWAY (FEET NAVD)	WITH FLOODWAY (FEET NAVD)	INCREASE (FEET)
Sand Creek (Con't)								
BD	42,743	46	146	3.2	2,131.9	2,131.9	2,132.8	0.9
BE	43,323	82	326	1.4	2,133.5	2133.49	2134.39	0.9
BF	44,298	29	132	3.6	2,136.3	2136.29	2137.09	0.9
BG	45,293	28	114	4.1	2,141.2	2141.19	2142.19	1.0
BH	45,993	48	215	2.2	2,143.3	2143.29	2143.99	0.7
BI	46,350	111	547	0.7	2,145.0	2144.99	2145.49	0.5
BJ	46,970	136	520	0.7	2,145.4	2145.39	2145.89	0.5
BK	47,805	112	268	1.3	2,147.4	2147.39	2147.79	0.4

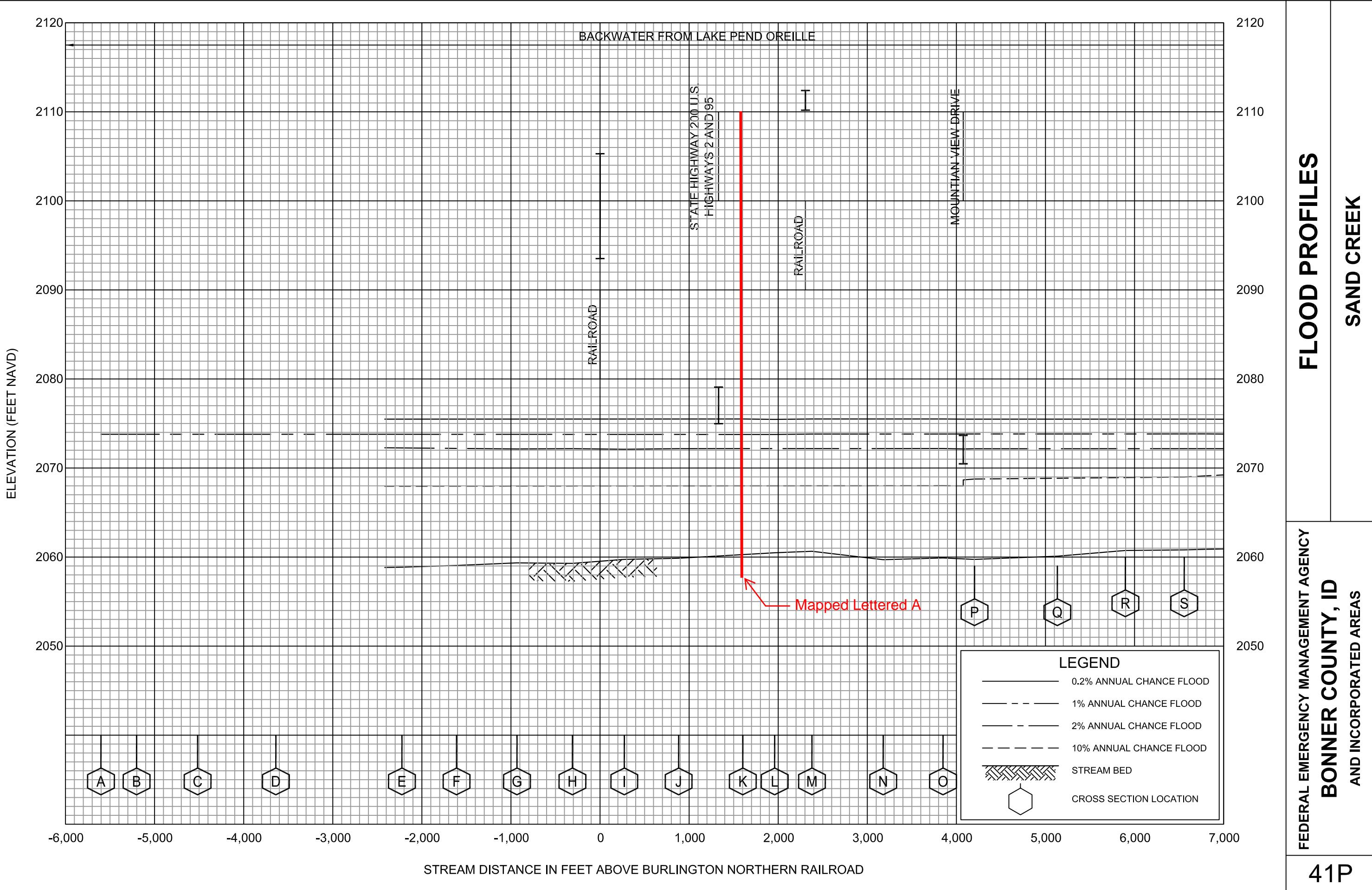
¹Feet above Burlington Northern Railroad

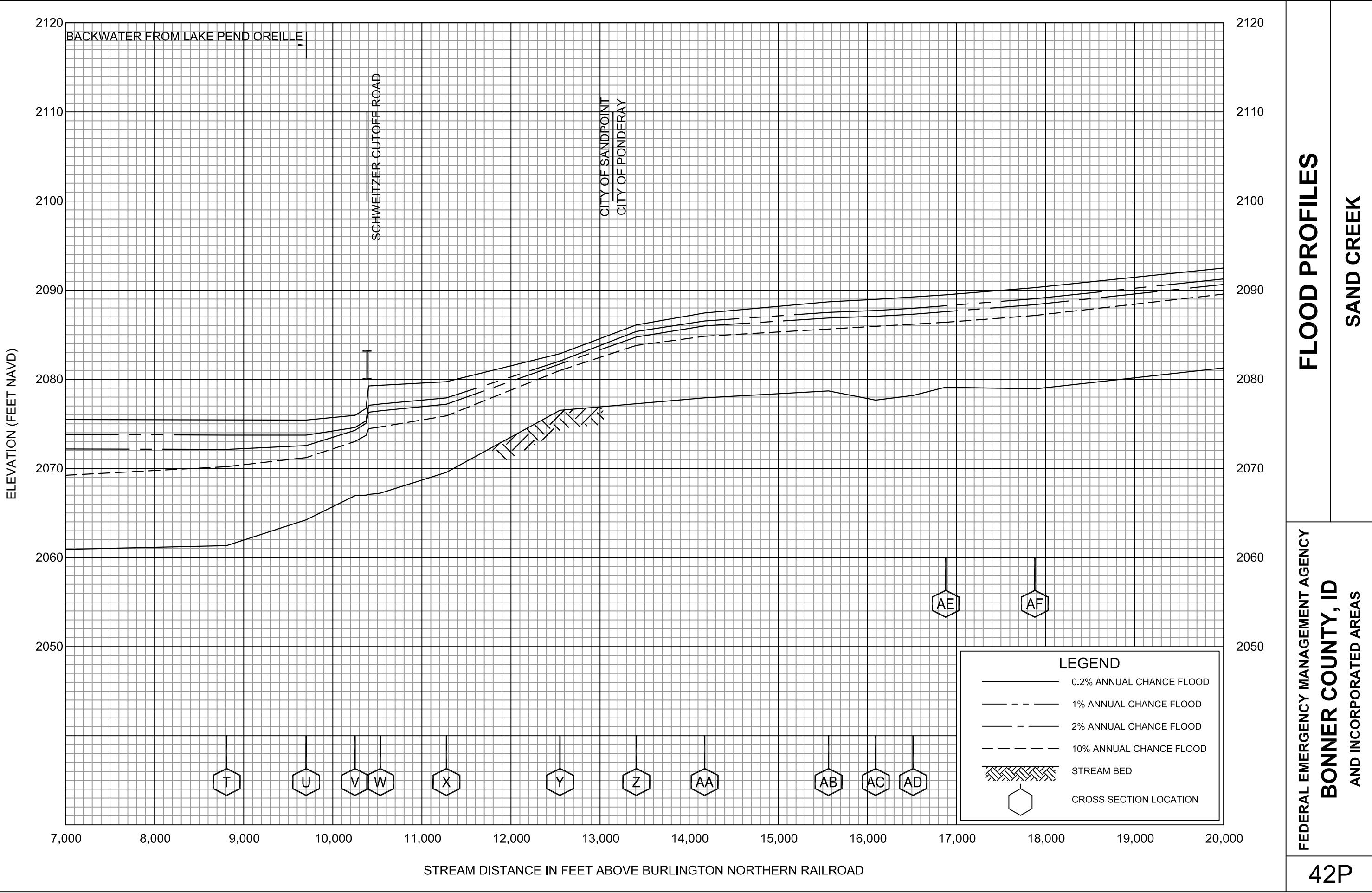
TABLE 8

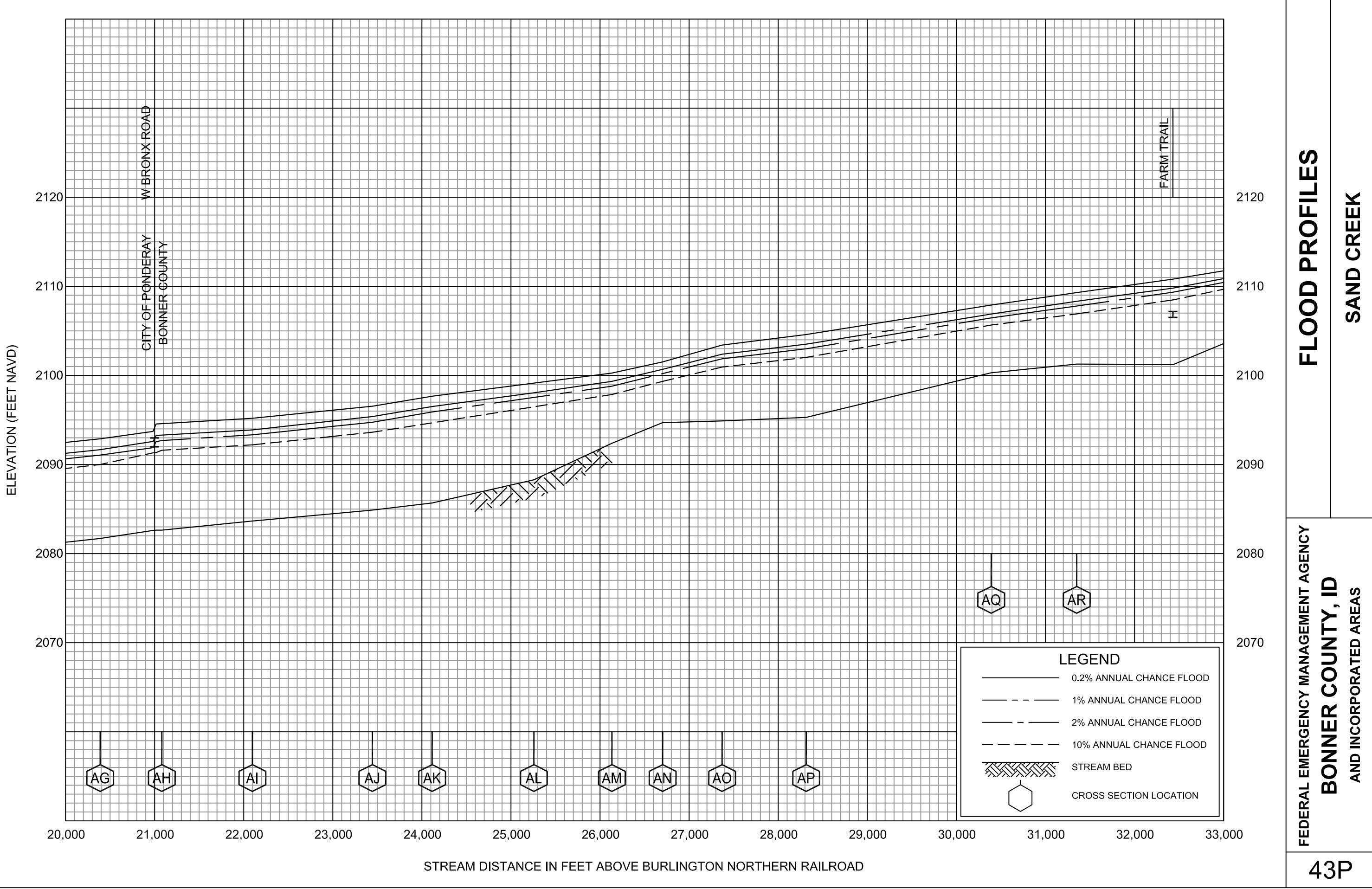
FEDERAL EMERGENCY MANAGEMENT AGENCY
BONNER COUNTY, IDAHO
AND INCORPORATED AREAS

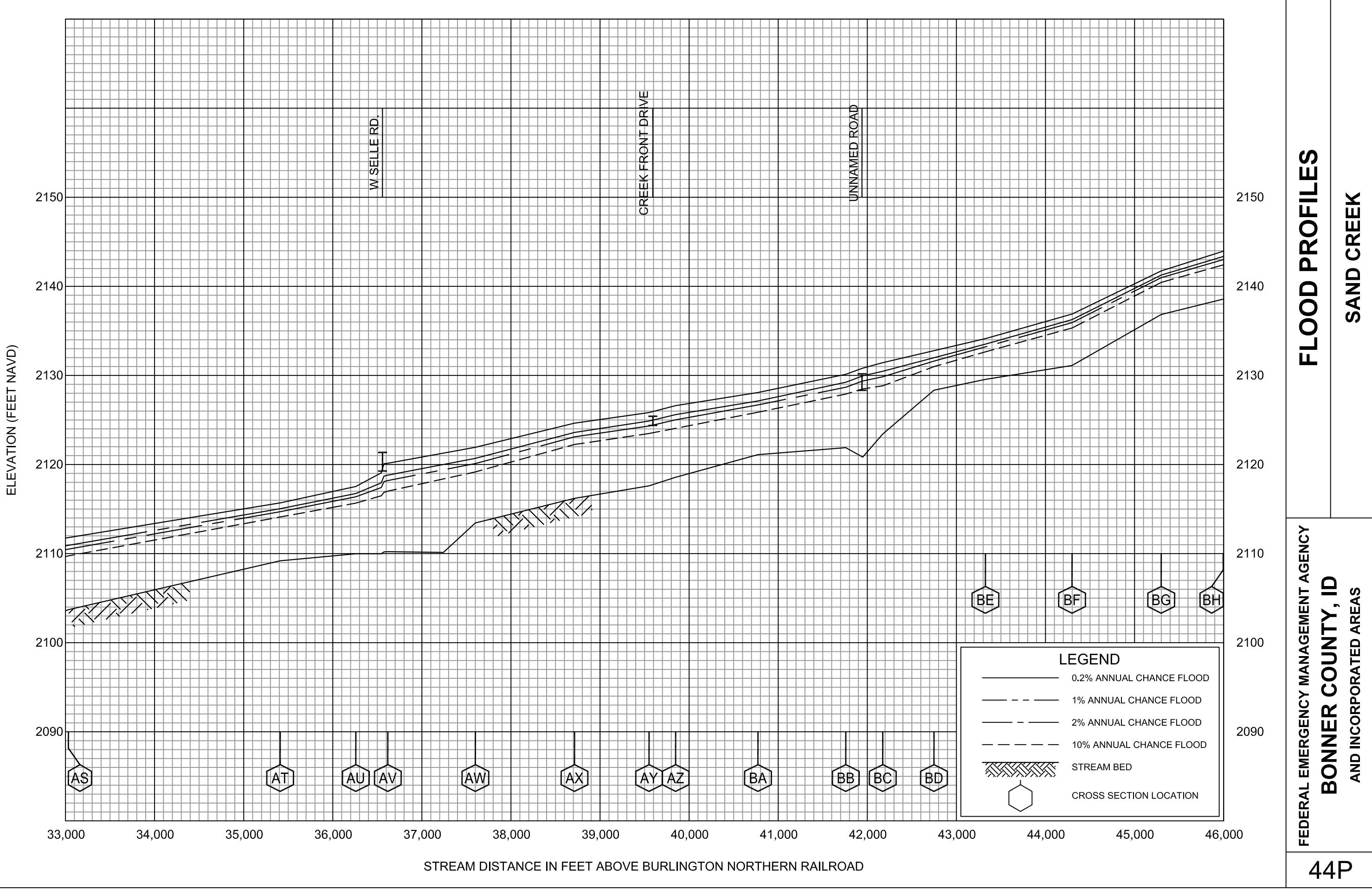
FLOODWAY DATA

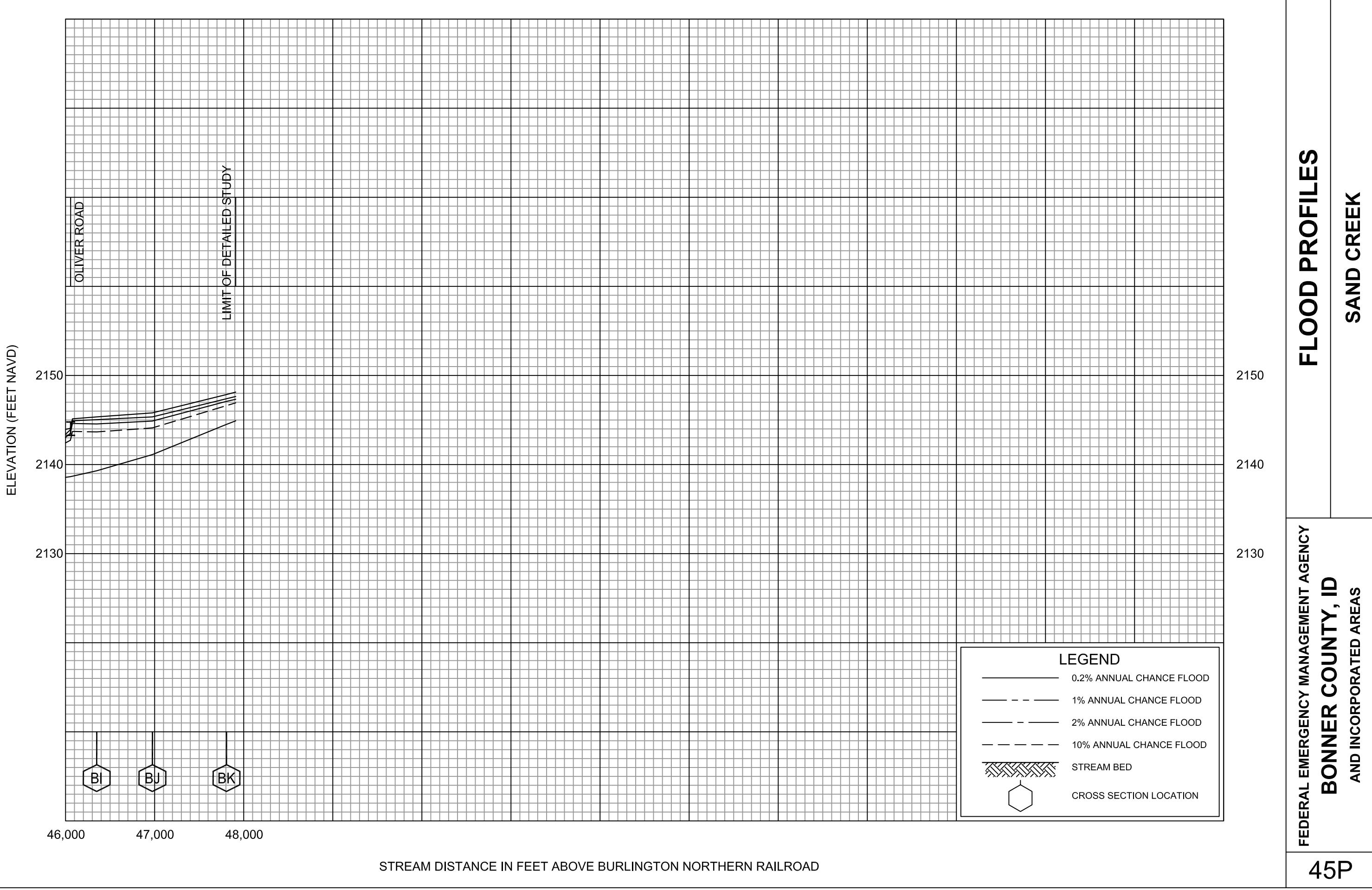
SAND CREEK



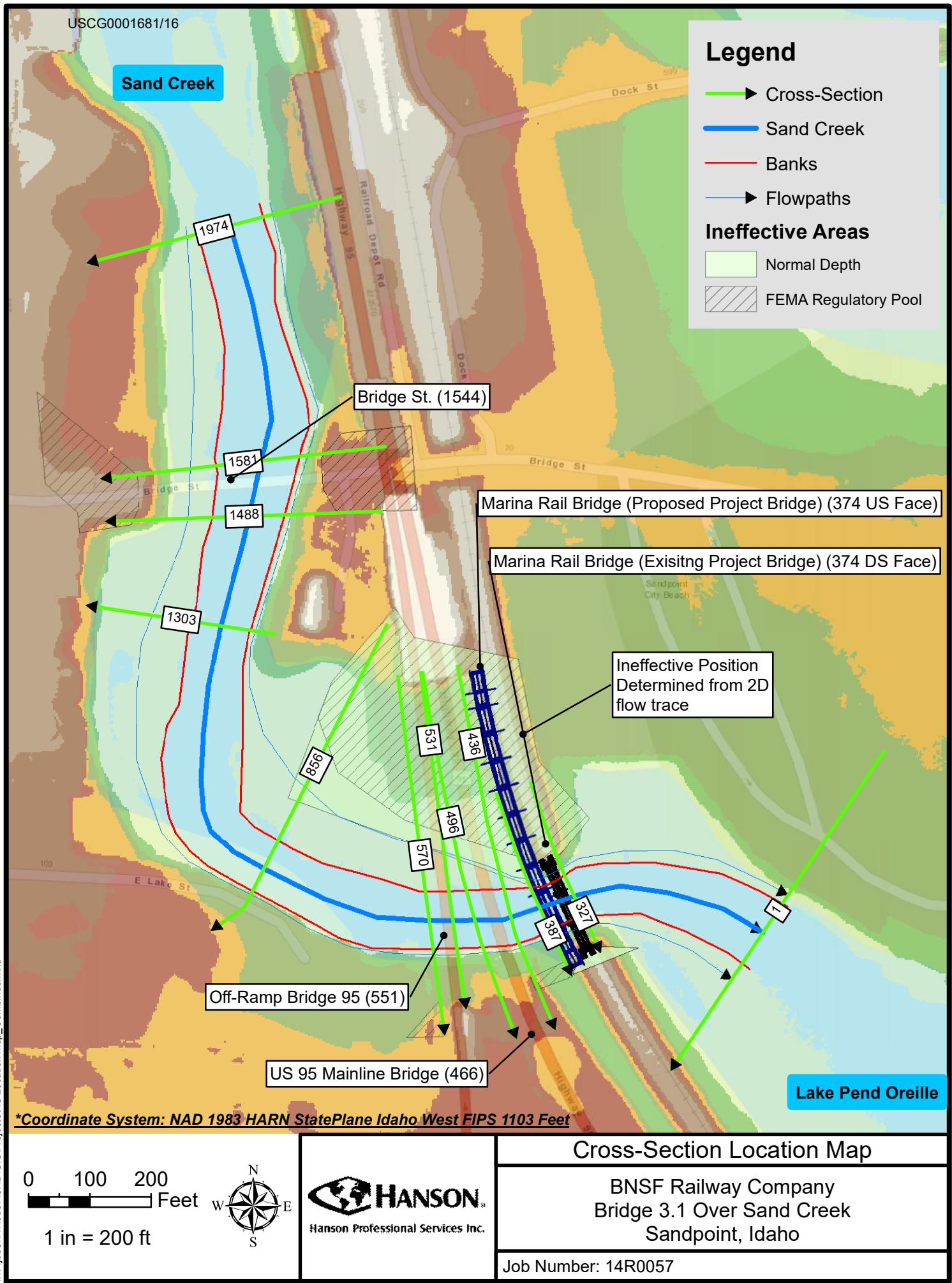




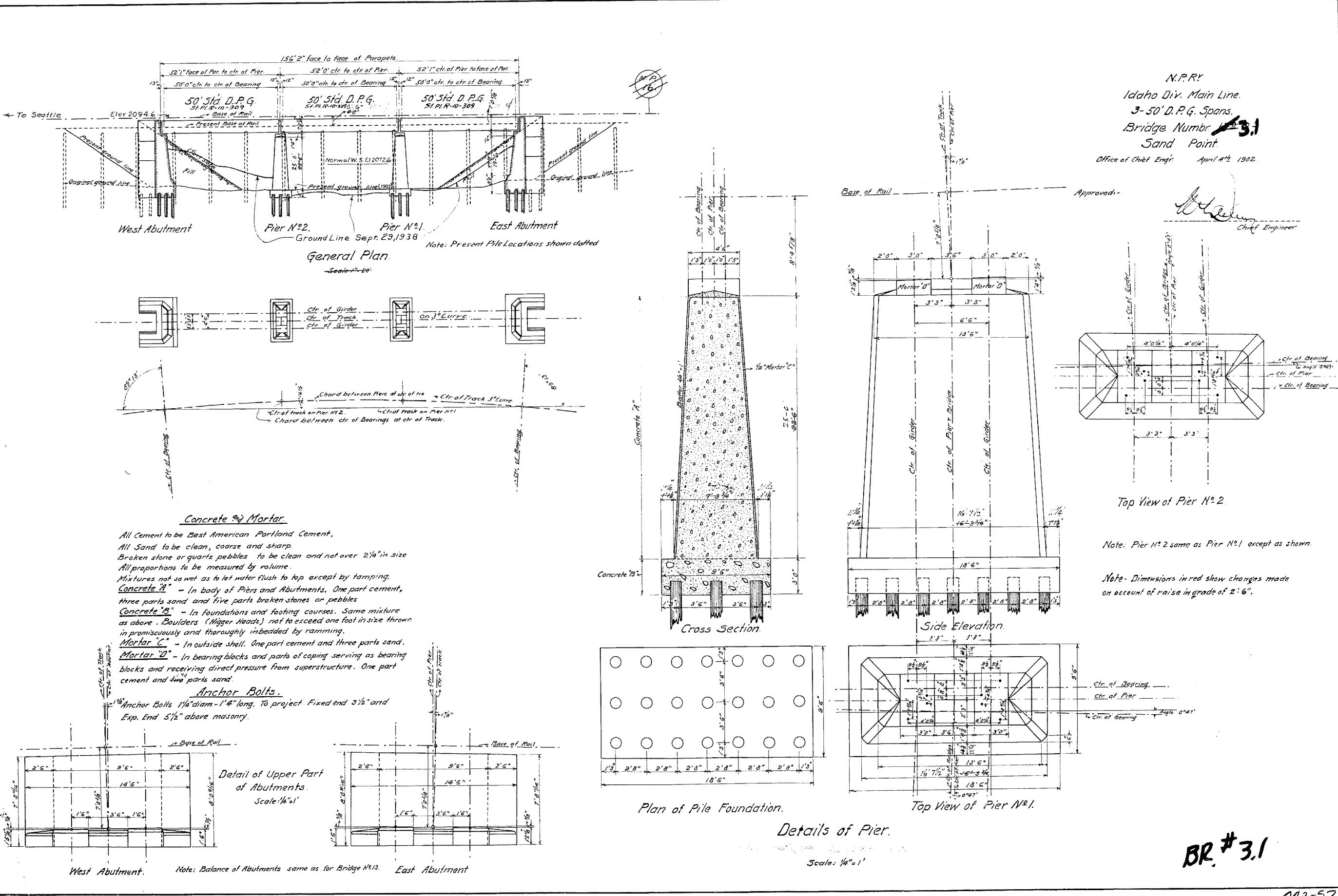




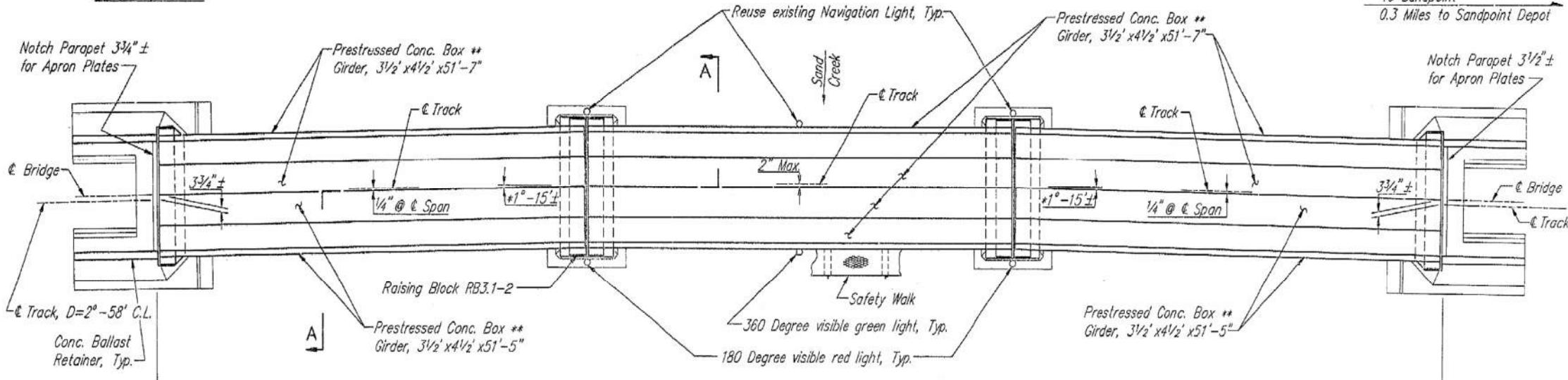
Attachment D: Hydraulic Cross-Section Map



Attachment E: Existing Bridge Plans



To Spokane

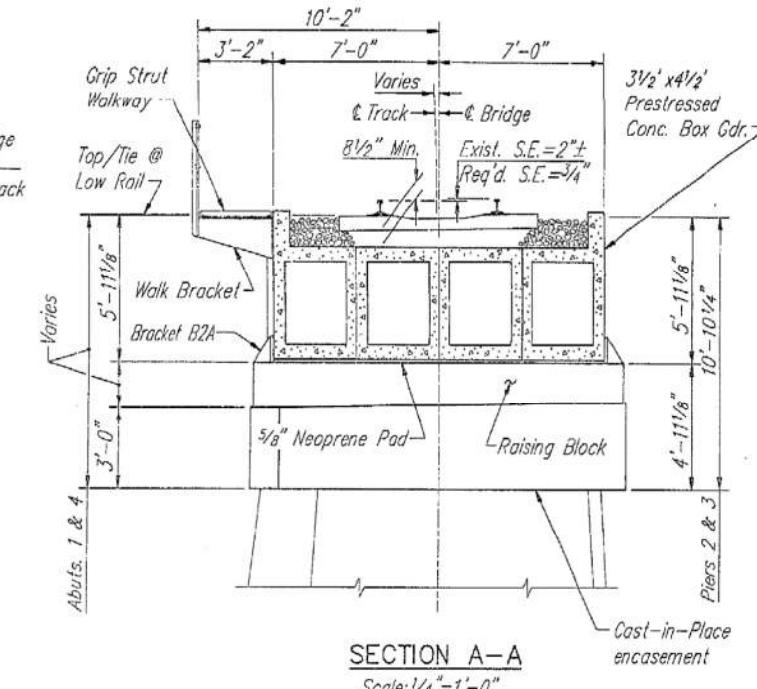


PLAN

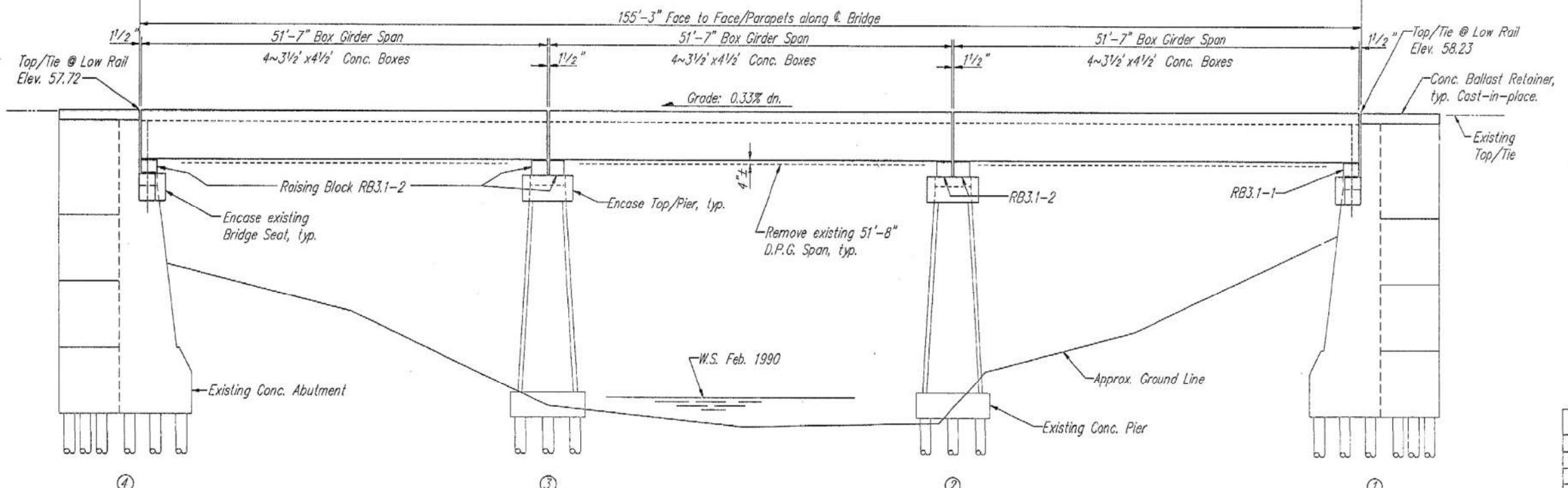
Face/Parapet
@ E Bridge,
Sta. 58+89.6 -

- * Adjust deflection angle so that Bridge is perpendicular to face of parapet at abutments.
- ** See Box Girder Layout, Plan 0045-3.1-8

Face/Parapet
@ E Bridge,
Sta. 57+34.3



SECTION A-A



ELEVATION

Scale: $\frac{1}{8}$ " = 1'-0"



HARRINGTON & CORTELYOU, INC.
Consulting Engineers

GENERAL NOTES

Design Loading: Coopers E80 (Superstructure)
New construction shown in heavy lines. Existing structure to be
retained shown in light solid lines. Portion of structure to be
removed shown in light dashed lines.

Bridge stationing and elevations based on Survey Notes
dated 11-28-89, Director Engineering Office, St. Paul, MN

REFERENCES

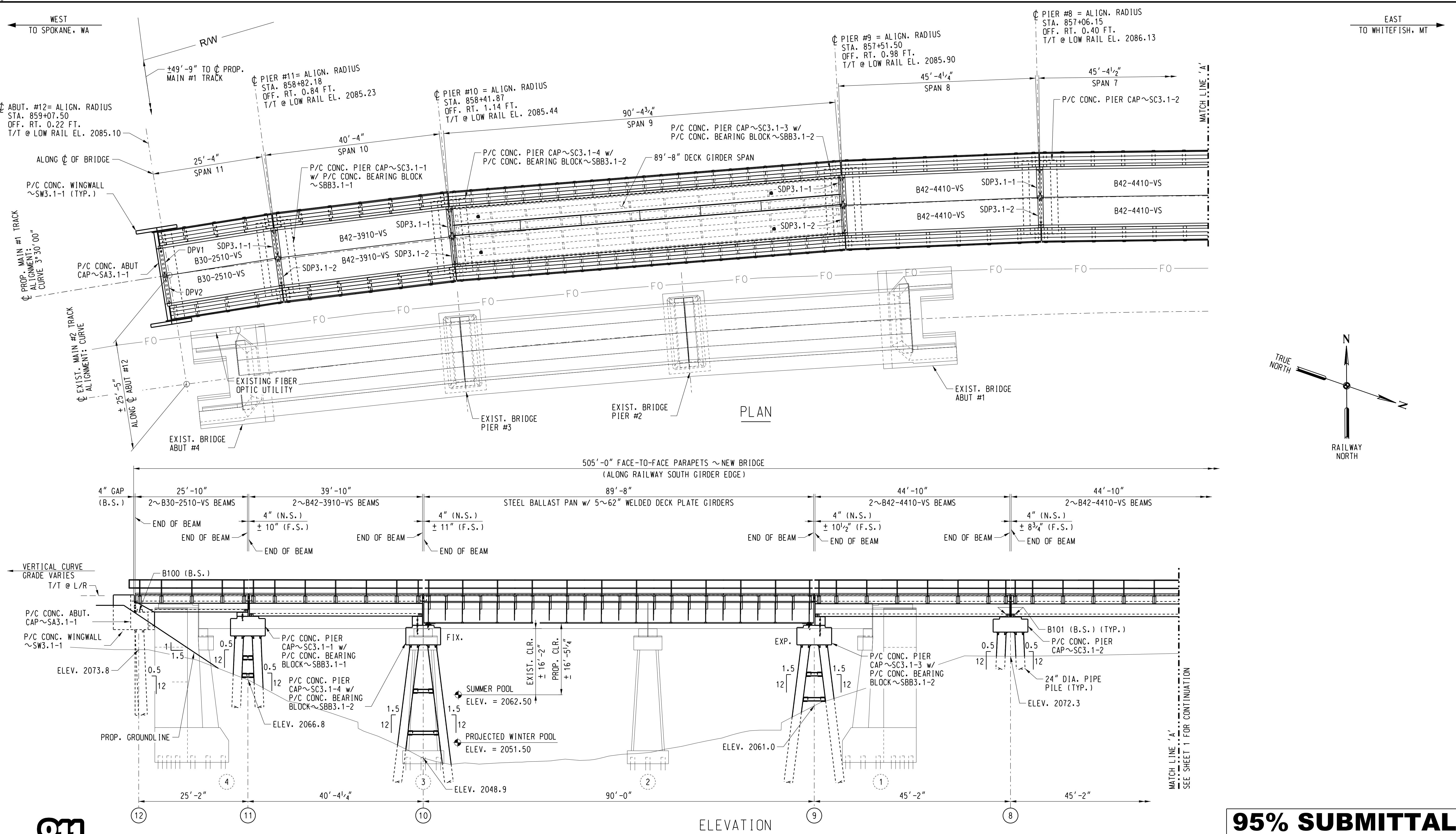
REFERENCES
Correspondence File ~ 110150-0045-3.1
SAC-FBI - 02-15-71

LIST OF DRAWINGS

PLAN NO.	TITLE
0045-3.1-1	General Plan ~ Replace Superstructure
0045-3.1-2	Raising Block Detail
0045-3.1-3	Pier Shaft & Abut. Modifications
0045-3.1-4	Ballast Retainer & Deck Details
0045-3.1-5	Field Erection Details
0045-3.1-6	Deck & Walk Details
0045-3.1-7	51'-7" Long Single P/S Box Girder
0045-3.1-8	51'-5" Long Single P/S Box Girder

LINE SEGMENT	0045	BURLINGTON NORTHERN RAILROAD COMPANY
AUTHORITY		SANDPOINT TO SPOKANE
DATE	July, 1990	BRIDGE 3.1
ACCEPTED:		NEAR SANDPOINT, ID
GENERAL PLAN ~ REPLACE SUPERSTRUCTURE		
J.P. McLean, K. Supt., BNSF Western Division		PLAN NO. 0045-3.1-1 SHEET 1 of 8

Attachment F: Proposed Bridge Plans



Know what's below.
Call before you dig.

ATTENTION !	
INFORMATION SHOWN ON THESE PLANS CONCERNING TYPE AND LOCATION OF UNDERGROUND OR ABOVE GROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE.	
THE SUPERVISOR OF STRUCTURES OR THE FOREMAN IN CHARGE WILL VERIFY THE LOCATION OF UNDERGROUND AND OVERHEAD UTILITIES BEFORE BEGINNING CONSTRUCTION AND PER THE BNSF ENGINEERING INSTRUCTIONS CHAPTER 26.	

NOTES:

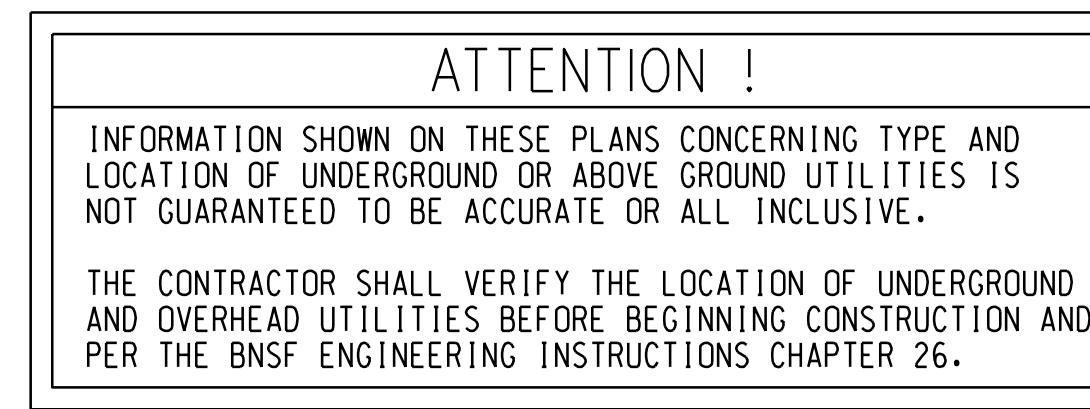
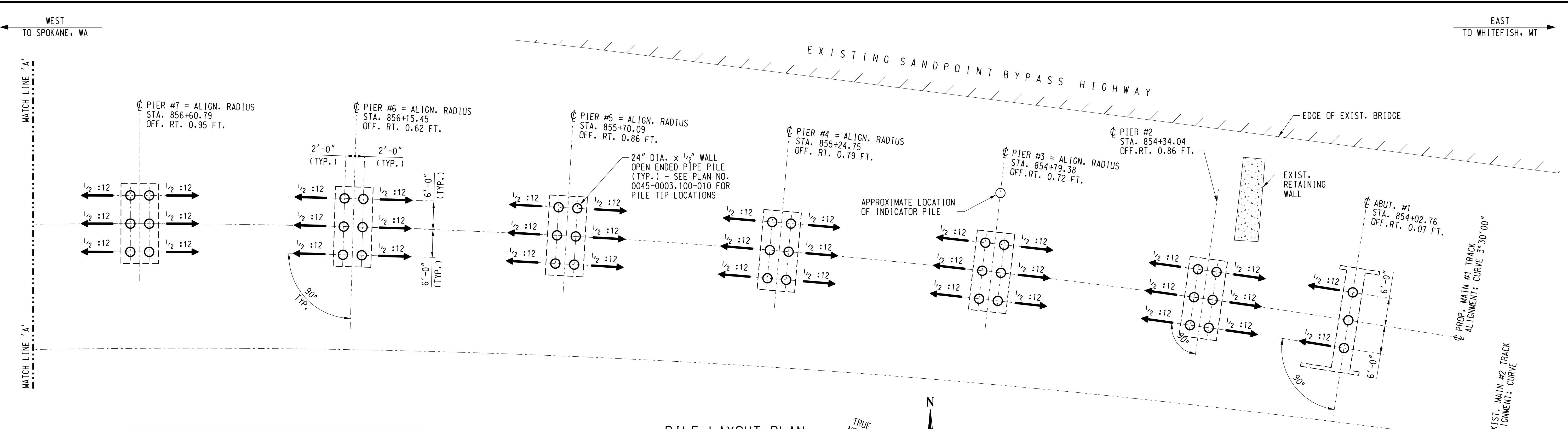
- EXISTING GROUNDLINE ELEVATIONS ARE APPROXIMATE.
- ALL TRACTION TREAD PANELS SHALL BE FIELD CUT TO MAINTAIN 2" GAP BETWEEN PANEL ENDS AT Ⓛ PIER CAP.
- SEE PLAN NO. 0045-0003.100-034 THRU -039 FOR LOCATIONS AND DETAILS OF HANDRAIL PANELS.
- PIER PROTECTION WALLS NOT SHOWN FOR CLARITY. SEE PLAN NO. 0045-0003.100-005 THRU -008.
- SEE PLAN NO. 0045-0003.100-033 FOR TRACTION TREAD PANEL LAYOUT.

DES: JEC
DRAWN: GTJ
CHECK: MAF
DATE: MAY 2019
AUTH: XXX-XXXX
LINE SEG: 0045

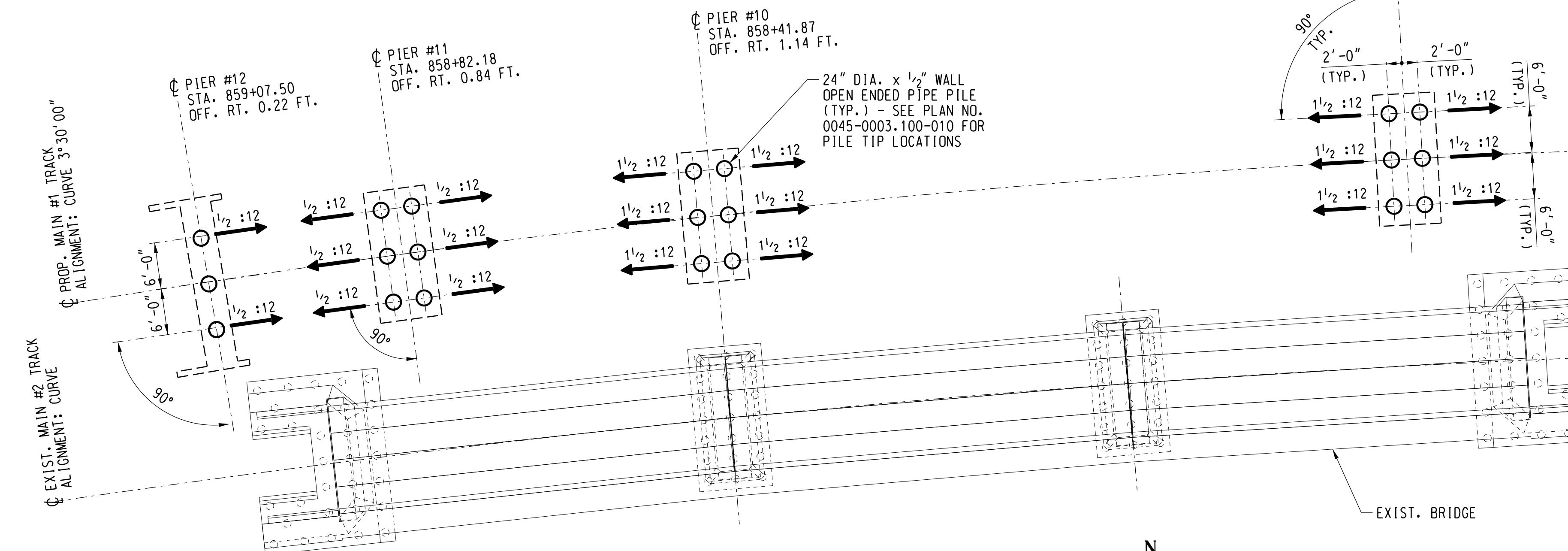
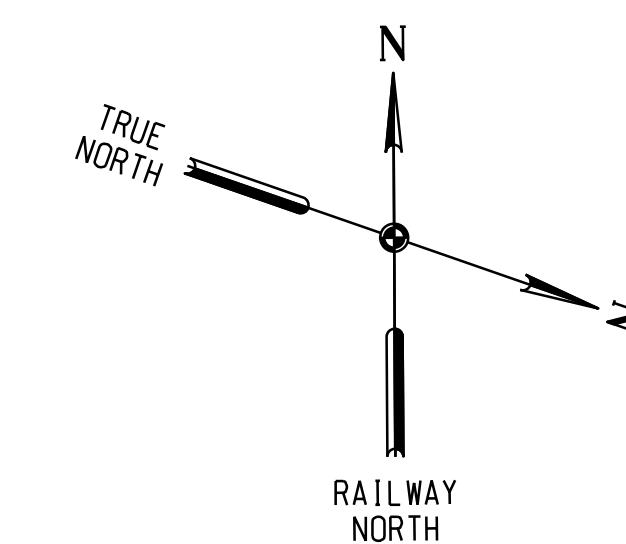
BNSF®
RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS
APPROVED:
ASST. DIRECTOR STRUCTURES DESIGN

95% SUBMITTAL
NOT FOR CONSTRUCTION
MAY 15, 2019

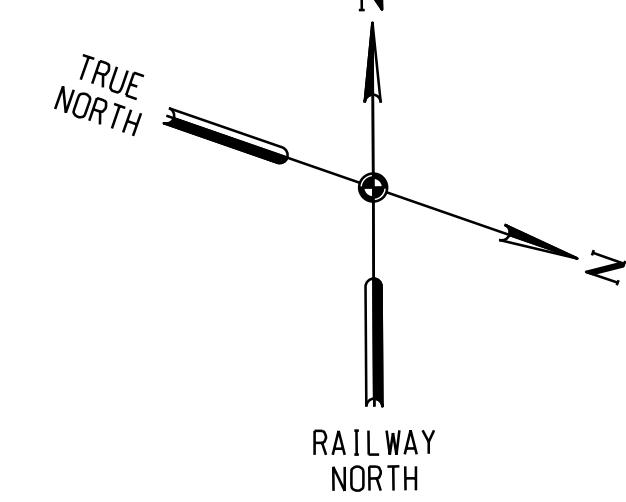
SANDPOINT JCT. TO LAKESIDE JCT.
BRIDGE NUMBER 3.1
OVER SAND CREEK NEAR SANDPOINT, ID
GENERAL PLAN & ELEVATION (2 OF 2)



PILE LAYOUT PLAN



PILE LAYOUT PLAN



WORK PLAN NO. 0045-0003.100-008 AND 0045-0003.100-009 TOGETHER.	
DES:	JEC
DRAWN:	GTJ
CHECK:	MAF
DATE:	MAY 2019
AUTH:	XXX-XXXX
LINE SEG:	0045

BNSF
RAILWAY
BRIDGE ENGINEERING KANSAS CITY, KS

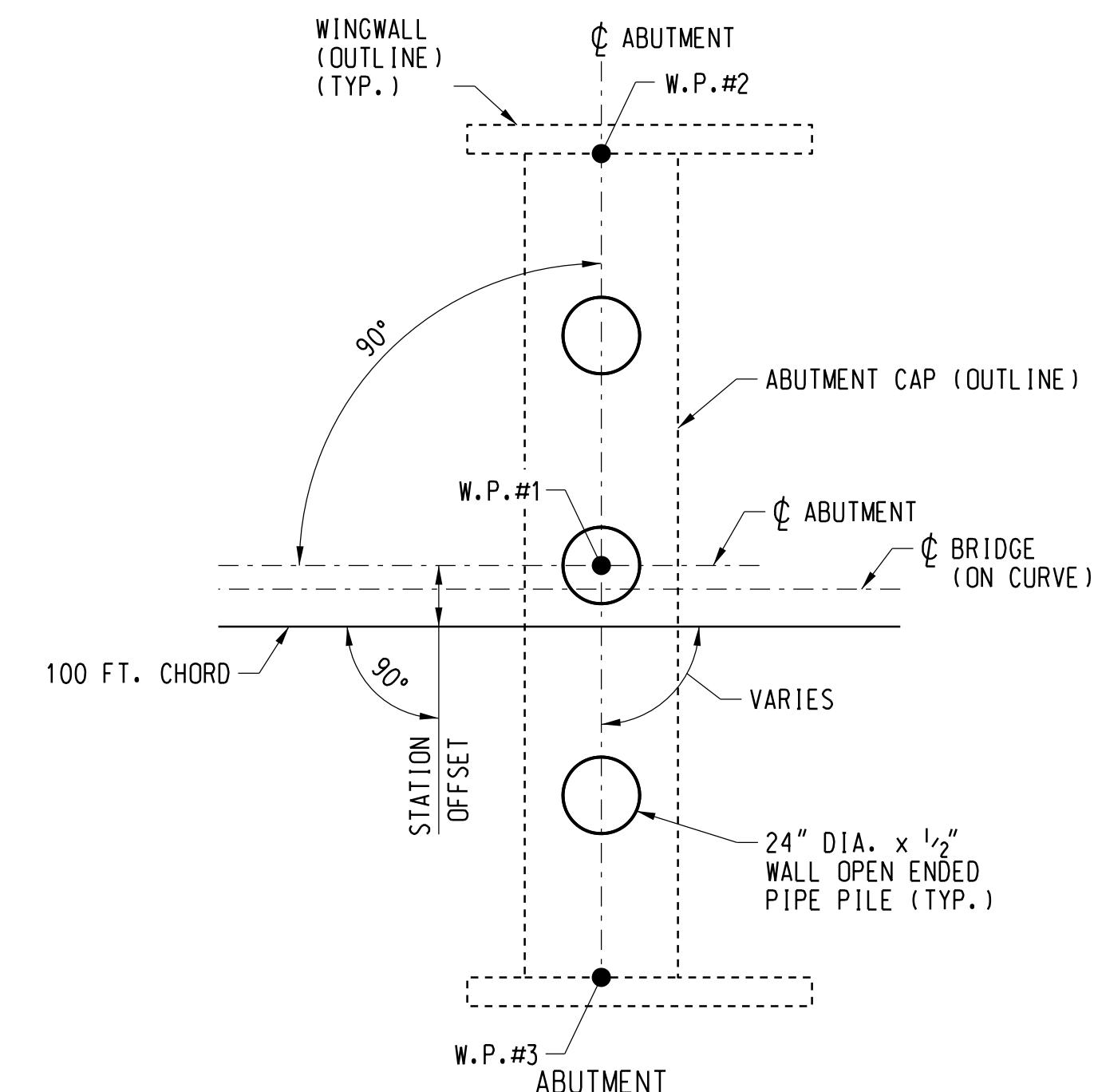
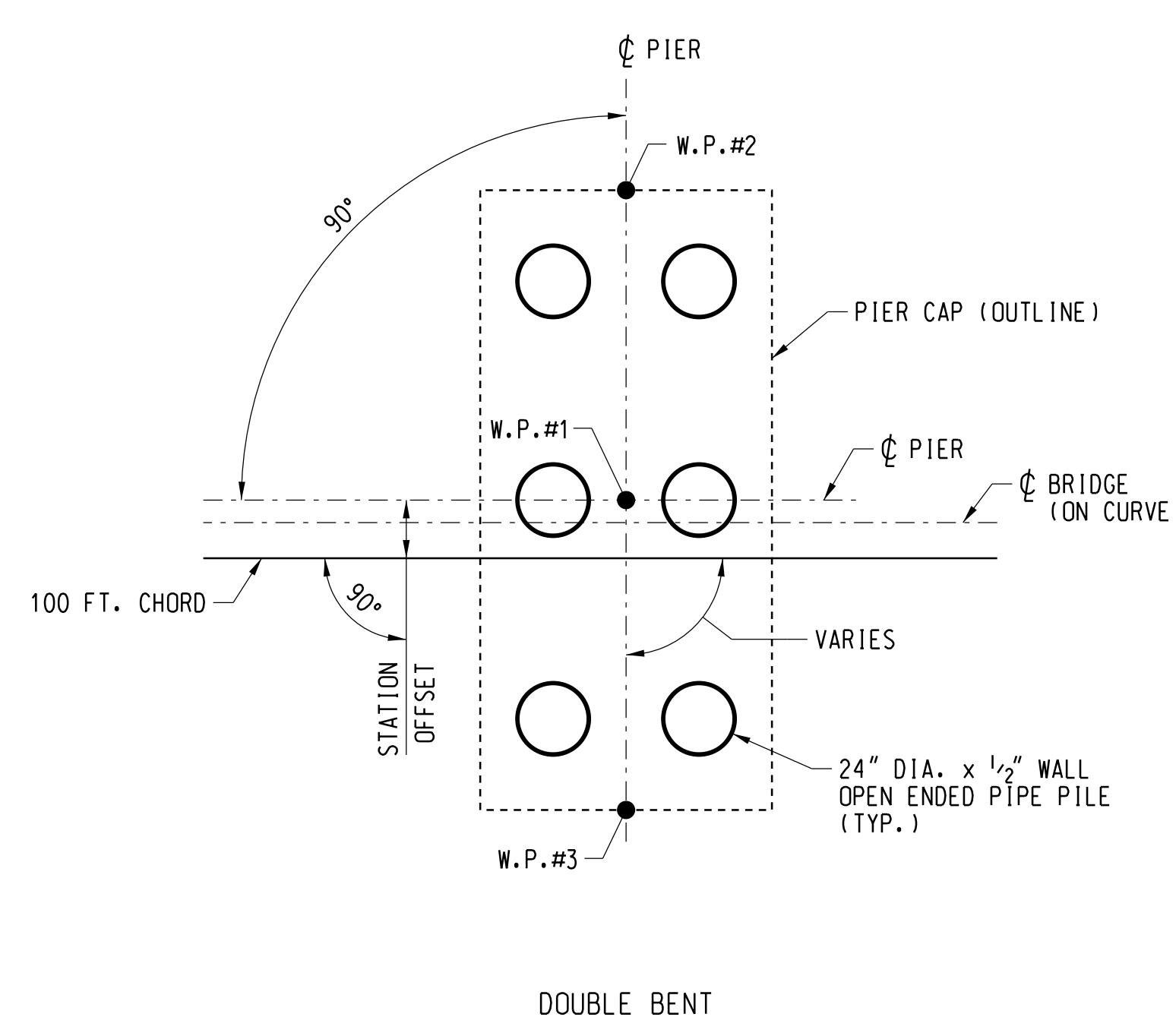
APPROVED:
ASST. DIRECTOR STRUCTURES DESIGN

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MAY 15, 2019

SANDPOINT JCT. TO LAKESIDE JCT.
BRIDGE NUMBER 3.1
OVER SAND CREEK NEAR SANDPOINT, ID

PILE LAYOUT PLAN

PLAN NO: 0045-0003.100-009 SHEET: 09 OF 39

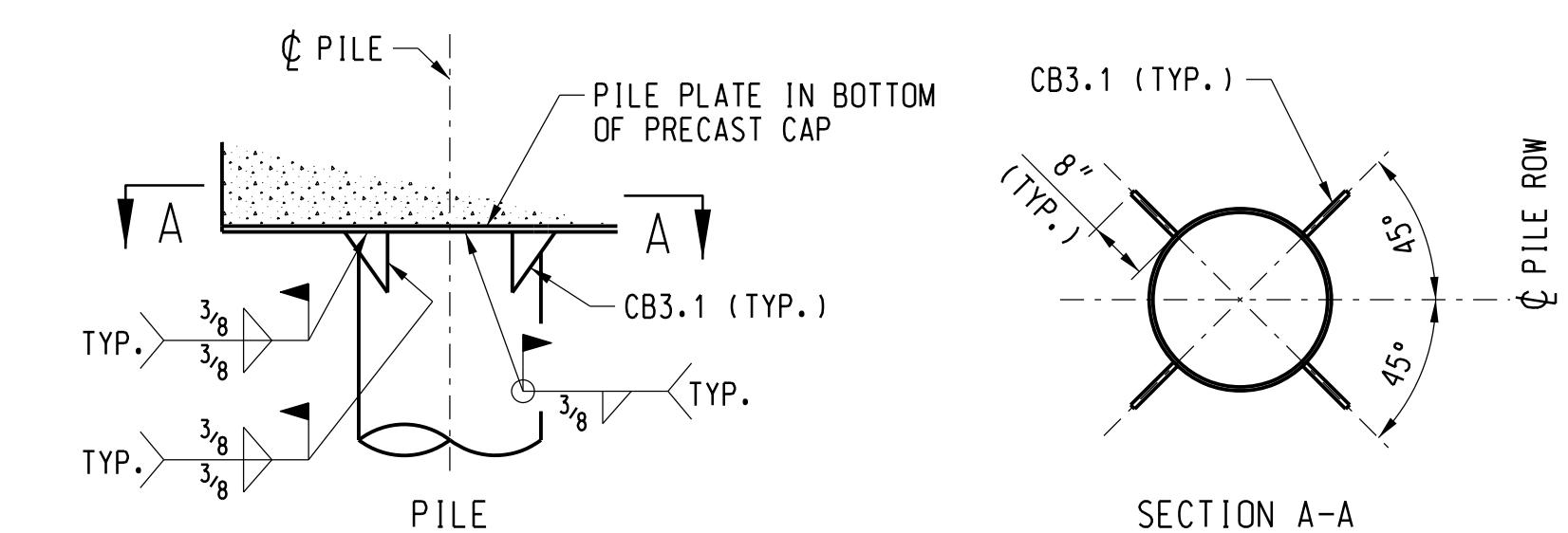


TYPICAL PILE LAYOUT DIAGRAMS - PIERS & ABUTMENTS

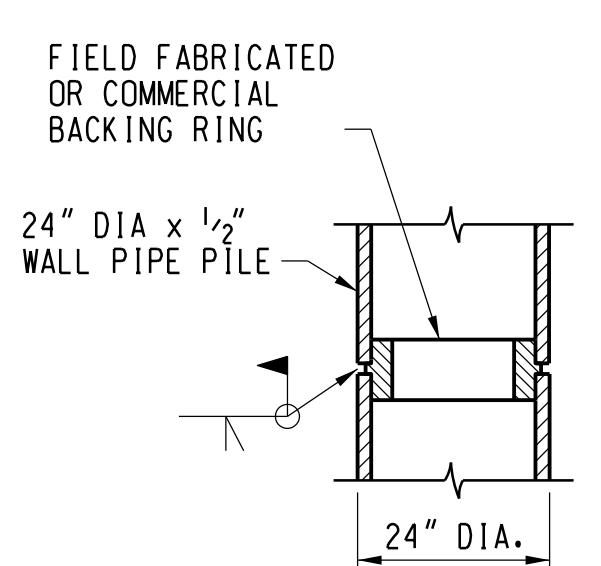
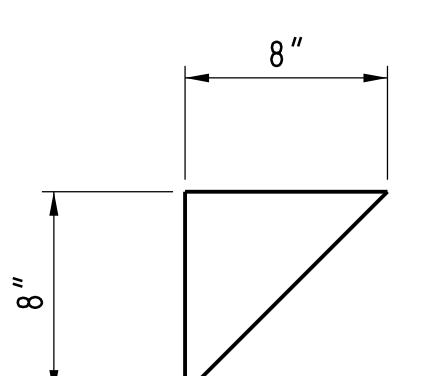
PILE BATTER NOT SHOWN

PILE NOTES:

- CONTRACTOR MAY PROPOSE AN ALTERNATE LOCATION OF THE INDICATOR PILE FOR APPROVAL OF THE ENGINEER.
- DYNAMIC PILE TESTING SHALL OCCUR AT ABUTMENT 1 AND PIERS 4, 7, 9 & 10. CONTRACTOR SHALL SELECT PILE AT EACH LOCATION FOR APPROVAL.
- PILE SPACINGS SHOWN ARE AT PILE CUTOFF ELEVATIONS.
- SYMBOL X:12 DENOTES DIRECTION AND AMOUNT OF PILE BATTER.
- USE TEMPLATE TO ENSURE PILE LOCATION DURING DRIVING IS REQUIRED.
- PILES SHALL MEET THE MATERIAL REQUIREMENTS OF A.S.T.M. A252, GRADE 3 (MOD) WITH A MINIMUM YIELD STRENGTH OF 50 KSI OR AN APPROVED EQUAL.
- PILES (AS NOTED IN THE TABLE OF ELEVATIONS) TO BE DRIVEN WITH REINFORCED TIPS (PILE POINTS) - VS700 BY VERSA STEEL INC. OR AN APPROVED EQUAL.
- NONDESTRUCTIVE TESTING - THE ENTIRE LENGTH OF THE COMPLETE JOINT PENETRATION GROOVE BUTT WELDS OF PILE SPLICES SHALL BE EXAMINED BY ULTRASONIC TESTING. THESE INSPECTIONS SHALL BE IN ACCORDANCE WITH THE STRUCTURAL WELDING CODE A.W.S. D1.1.
- AN EPOXY PROTECTIVE COATING SHALL BE APPLIED TO CONNECTION BARS, BRACING AND THE PILE SURFACE (INTERIOR AND EXTERIOR) FROM PILE CUTOFF TO GROUNDLINE. PROTECTIVE COATING THAT IS DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED WITH SIMILAR COATING AND APPLICATION PROCESS. THE EPOXY PROTECTIVE COATING SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 04620.

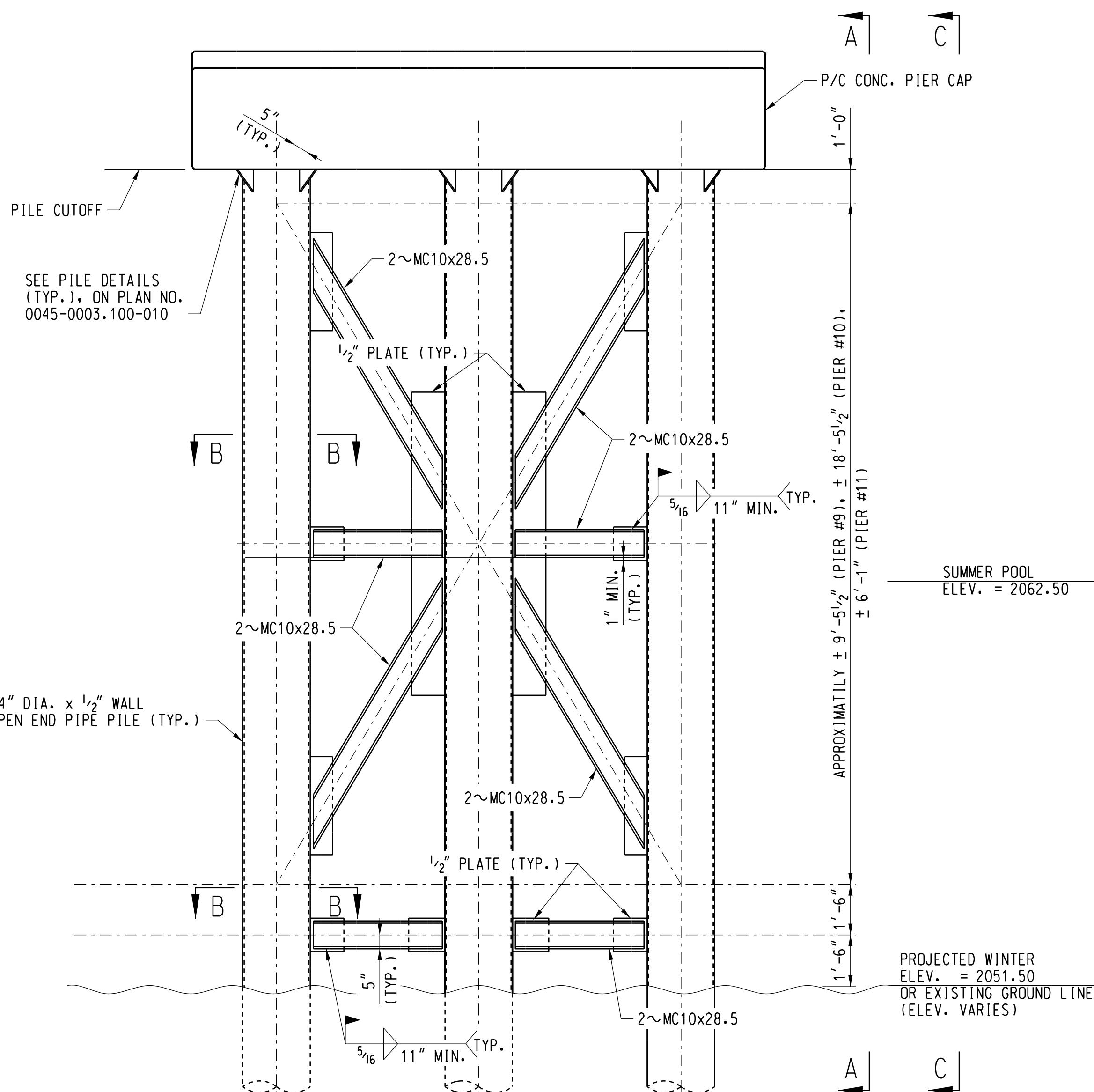
**PILE-TO-PIER DETAILS**

AFTER PRECAST CAP IS SET IN PROPER LOCATION, PLACE AND WELD 4~CB3.1'S PER PILE AS SHOWN, BURNING THE SIDE OF CB3.1 AS REQUIRED TO FIT BATTERED PILES. PAINT CB3.1'S & PILE PLATES AFTER WELDING.

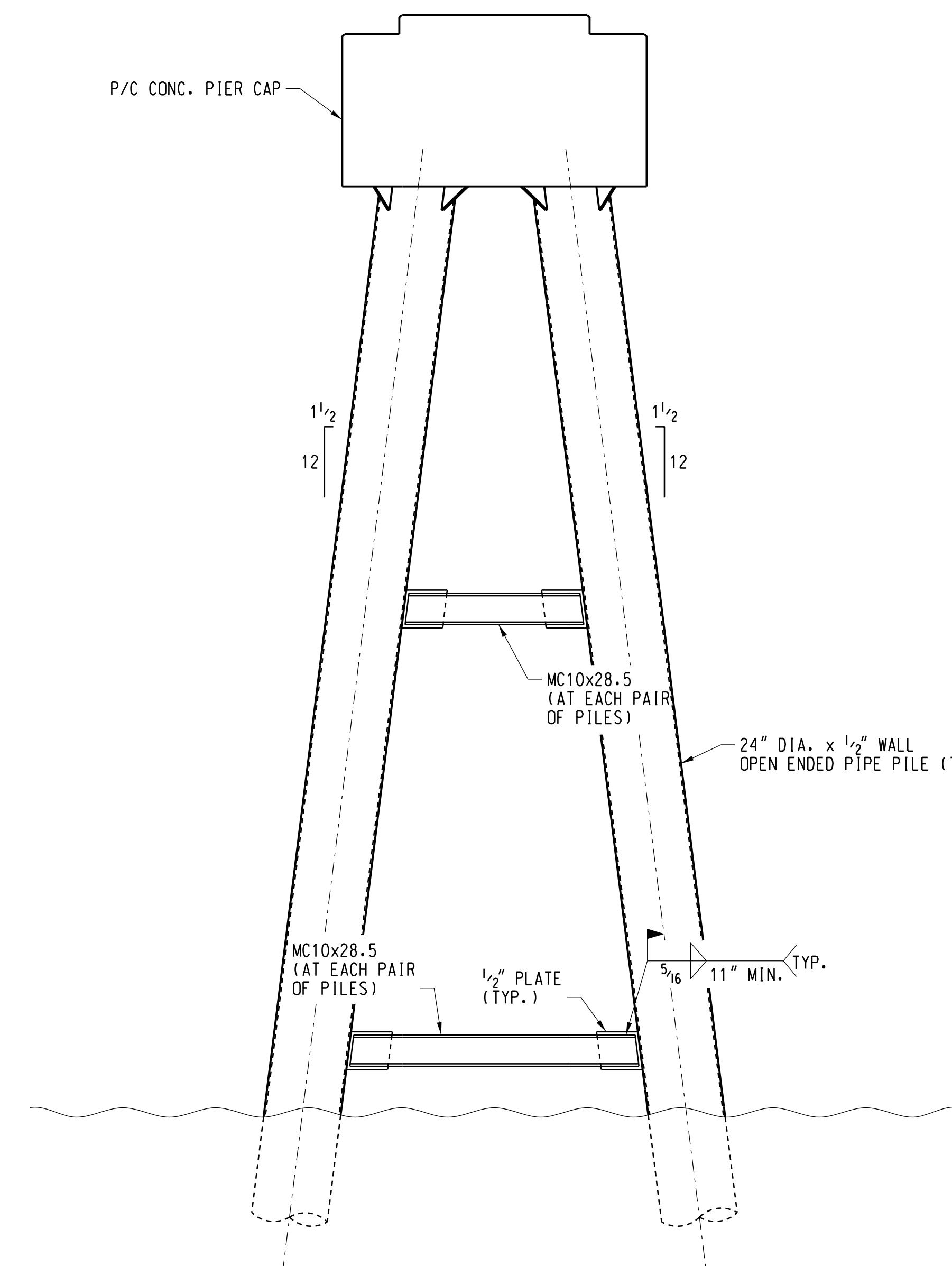
**PIPE PILE SPLICING DETAILS****CONNECTION BAR CB3.1**

1 BAR 8" x 3/4" x 0'-8"
WEIGHT = 6.8 LBS.

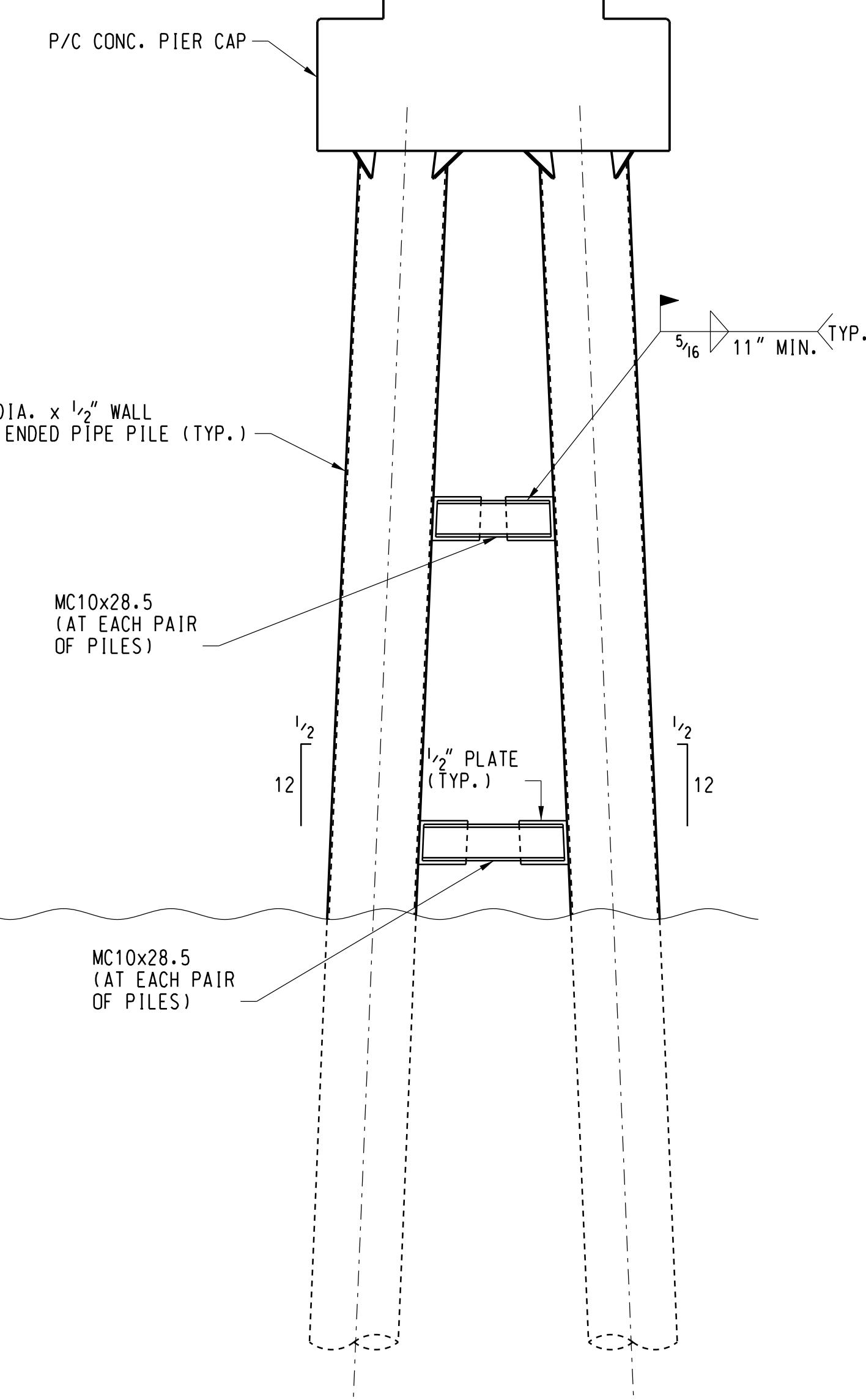
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NOT FOR CONSTRUCTION
MAY 15, 2019



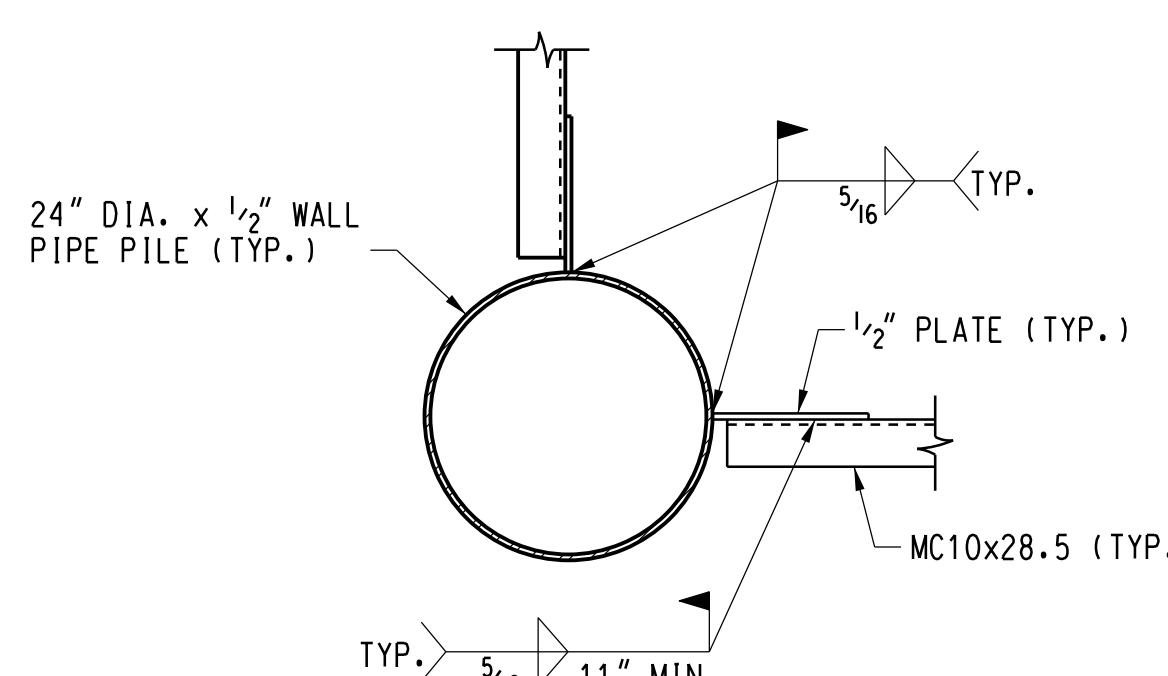
TYPICAL SECTION AT PIERS #9 THRU #11
(LOOKING RY WEST)



ELEVATION A-A (PIERS #9 & #10)



ELEVATION C-C (PIER #11)



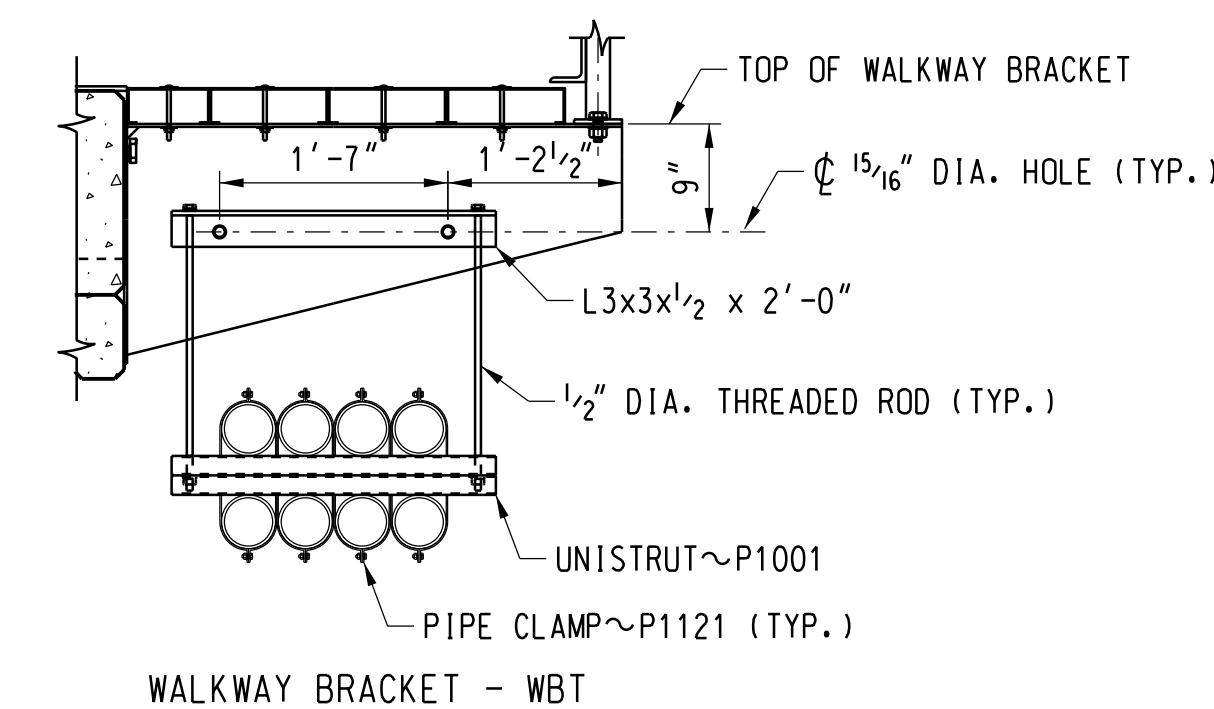
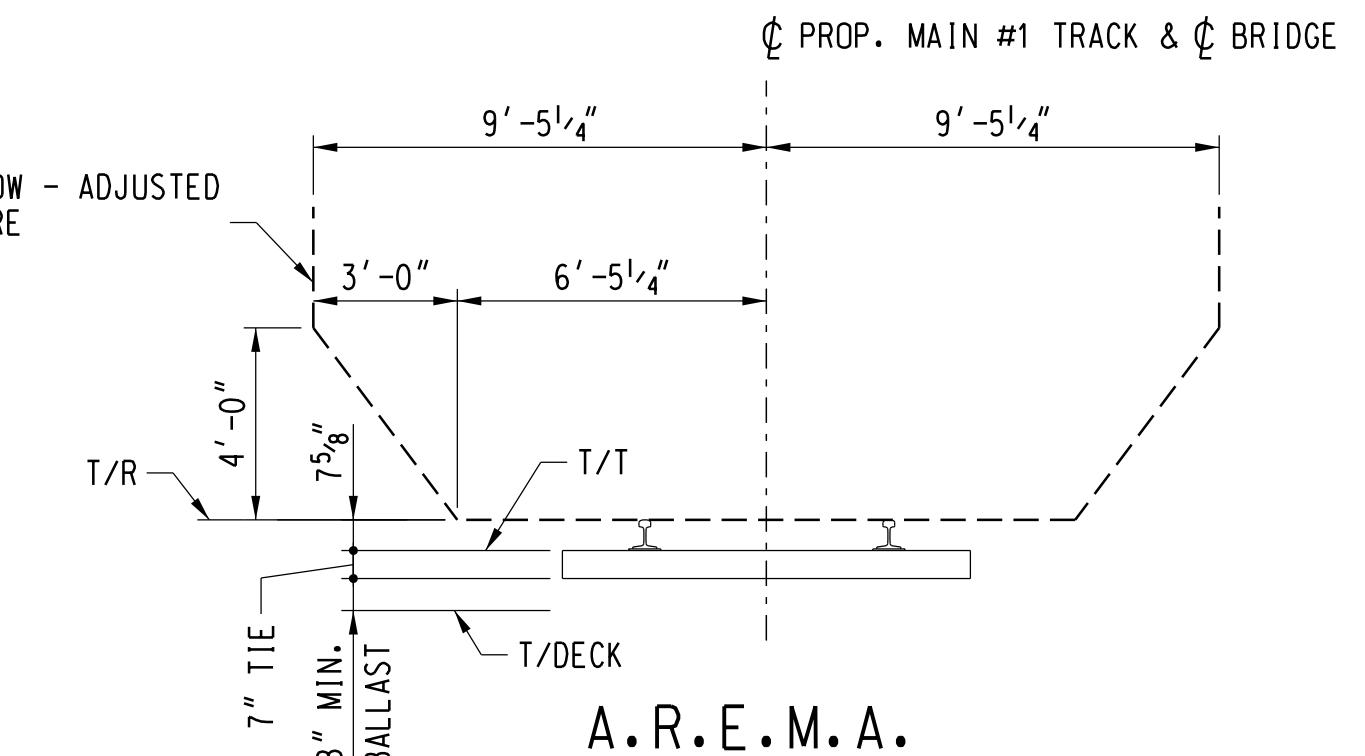
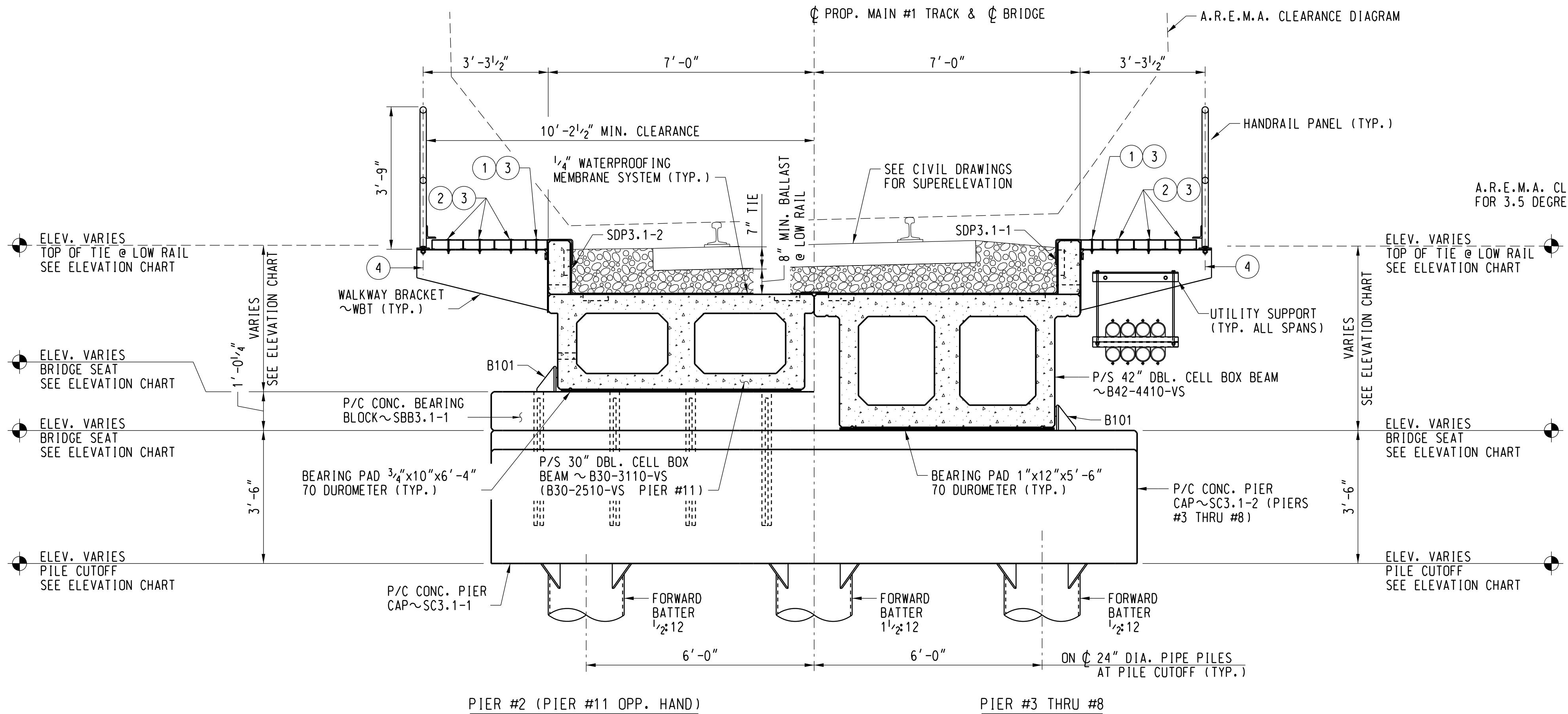
SECTION B-B

NOTES:

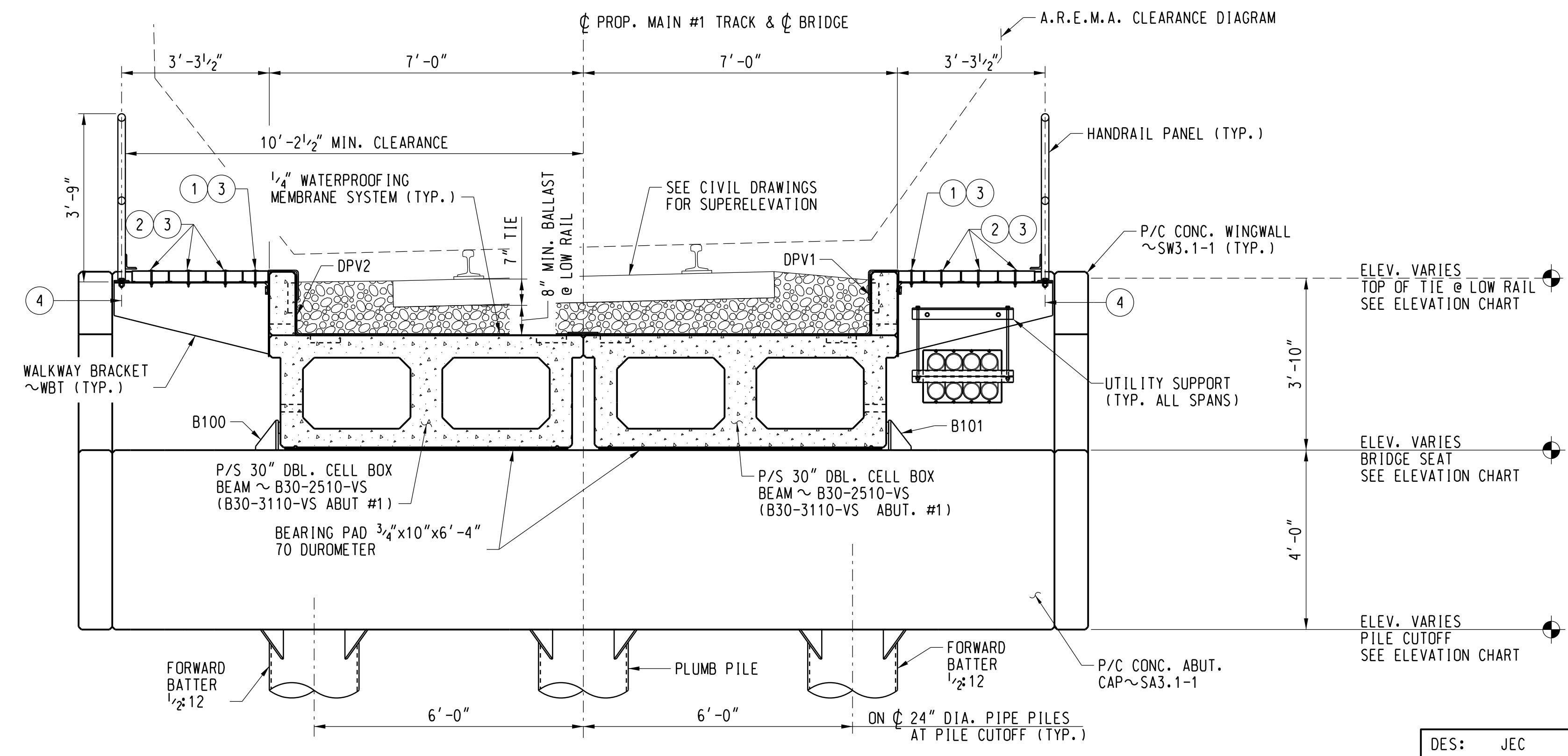
1. SEE PLAN NO. 0045-0003.100-010 FOR ADDITIONAL NOTES ON PILING, CONNECTION BARS AND BRACING.
2. ALL BRACING SHALL BE INSTALLED PRIOR TO SUBSTANTIAL COMPLETION OF THE BRIDGE.

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NOT FOR CONSTRUCTION
MAY 15, 2019

DES: JEC
DRAWN: GTJ
CHECK: MAF
DATE: MAY 2019
AUTH: XXX-XXXX
LINE SEG: 0045



UTILITY SUPPORT DETAIL



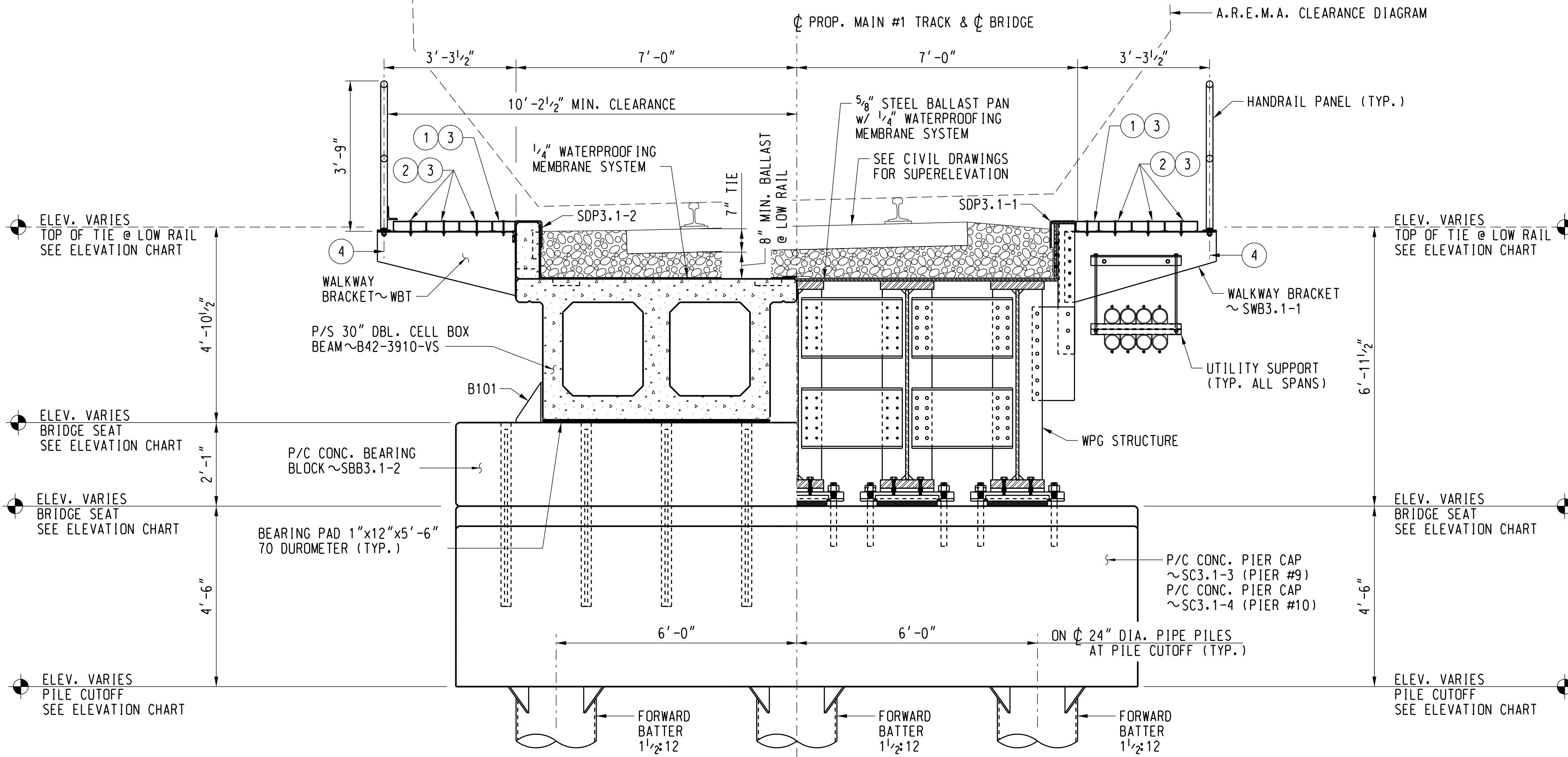
NOTES:

- ① 1~3"x7"x13 GA. TRACTION TREAD SAFETY GRATING
- ② 1~3"x10"x13 GA. TRACTION TREAD SAFETY GRATING
- ③ FASTEN GRATING TO WALKWAY BRACKET WITH:
1~3/8" DIA. 4" CARRIAGE BOLT
1~WASHER (3/8" I.D. x 7/8" O.D.)
1~LOCK NUT, SELF LOCKING NYLON INSERT
- ④ FASTEN HANDBR. PANEL TO BRACKET WITH:
2~3/4" DIA. x 2 1/4" BOLTS
4~WASHERS (13/16" I.D. x 1 1/16" O.D.)
2~LOCK NUTS, CENTER LOCKING, ZINC PLATED

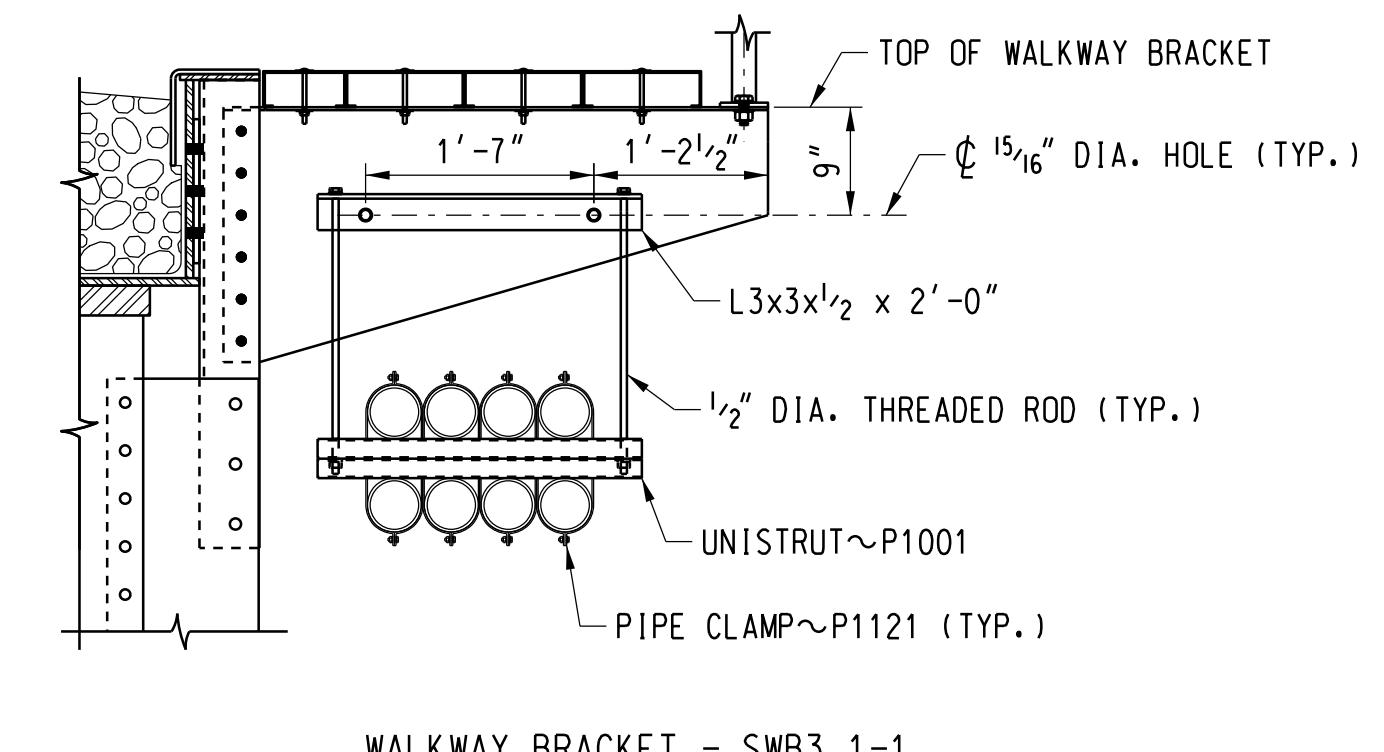
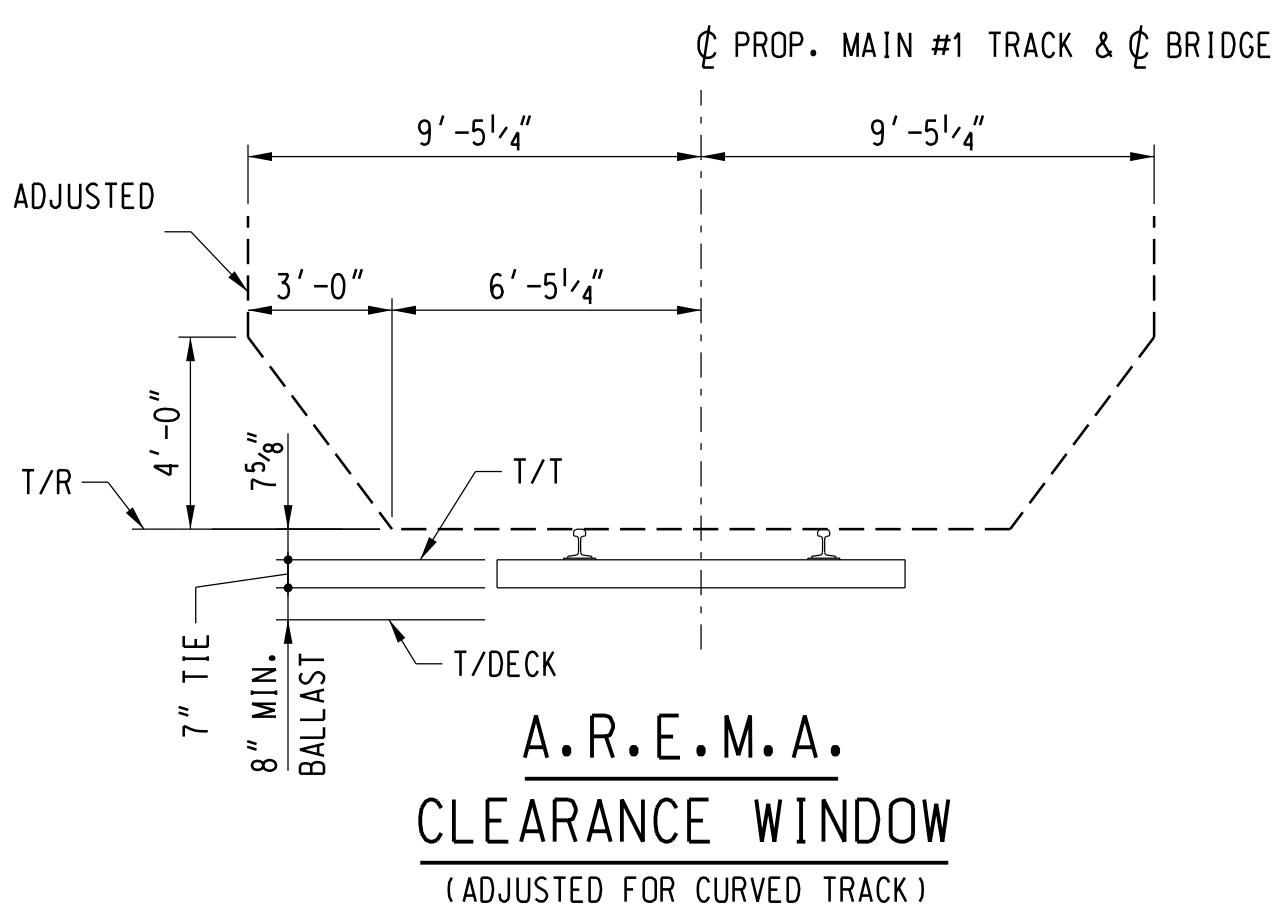
* FOR ELEVATION CHART SEE PLAN NO. 0045-0003.100-010

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NOT FOR CONSTRUCTION
MAY 15, 2019

DES: JEC	BNSF RAILWAY	SANDPOINT JCT. TO LAKESIDE JCT.
DRAWN: GTJ	BRIDGE ENGINEERING KANSAS CITY, KS	BRIDGE NUMBER 3.1
CHECK: MAF		OVER SAND CREEK NEAR SANDPOINT, ID
DATE: MAY 2019		TYPICAL SECTIONS -
AUTH: XXX-XXXX		ABUT. #1 & #12, PIER #2 THRU #8 & #11
LINE SEG: 0045	APPROVED: ASST. DIRECTOR STRUCTURES DESIGN	PLAN NO: 0045-0003.100-012
		SHEET: 12 OF 39



A.R.E.M.A. CLEARANCE WINDOW - ADJUSTED
FOR 3.5 DEGREE OF CURVATURE



UTILITY SUPPORT DETAILS

NOTES:

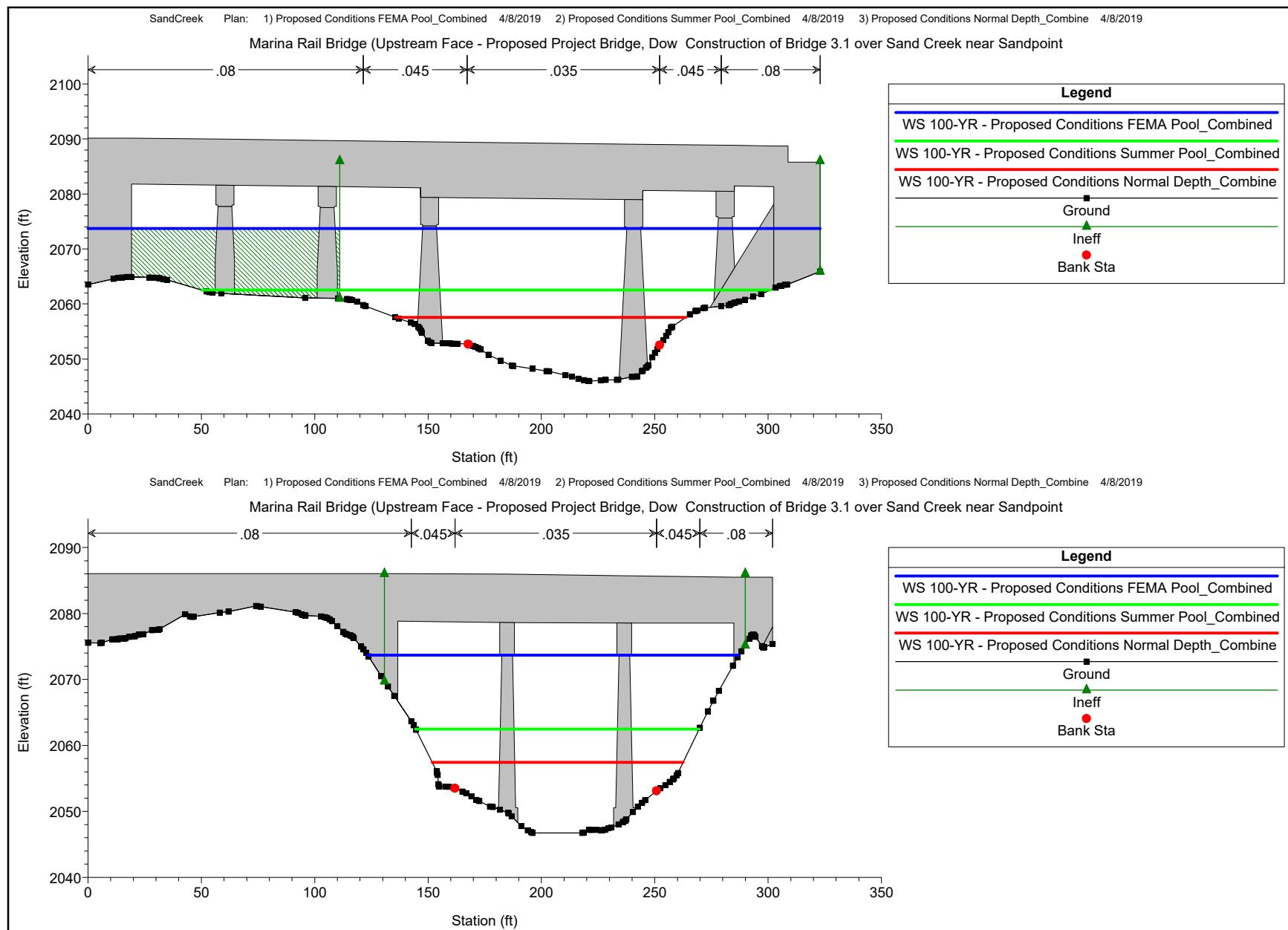
- ① 1~3" x 7" x 13 GA. TRACTION TREAD SAFETY GRATING
- ② 1~3" x 10" x 13 GA. TRACTION TREAD SAFETY GRATING
- ③ FASTEN GRATING TO WALKWAY BRACKET WITH:
1~3/8" DIA. 4" CARRIAGE BOLT
1~WASHER (3/8" I.D. x 7/8" O.D.)
1~LOCK NUT, SELF LOCKING NYLON INSERT
- ④ FASTEN HANDRAIL PANEL TO BRACKET WITH:
2~3/4" DIA. x 2 1/4" BOLTS
4~WASHERS (13/16" I.D. x 1 7/16" O.D.)
2~LOCK NUTS, CENTER LOCKING, ZINC PLATED

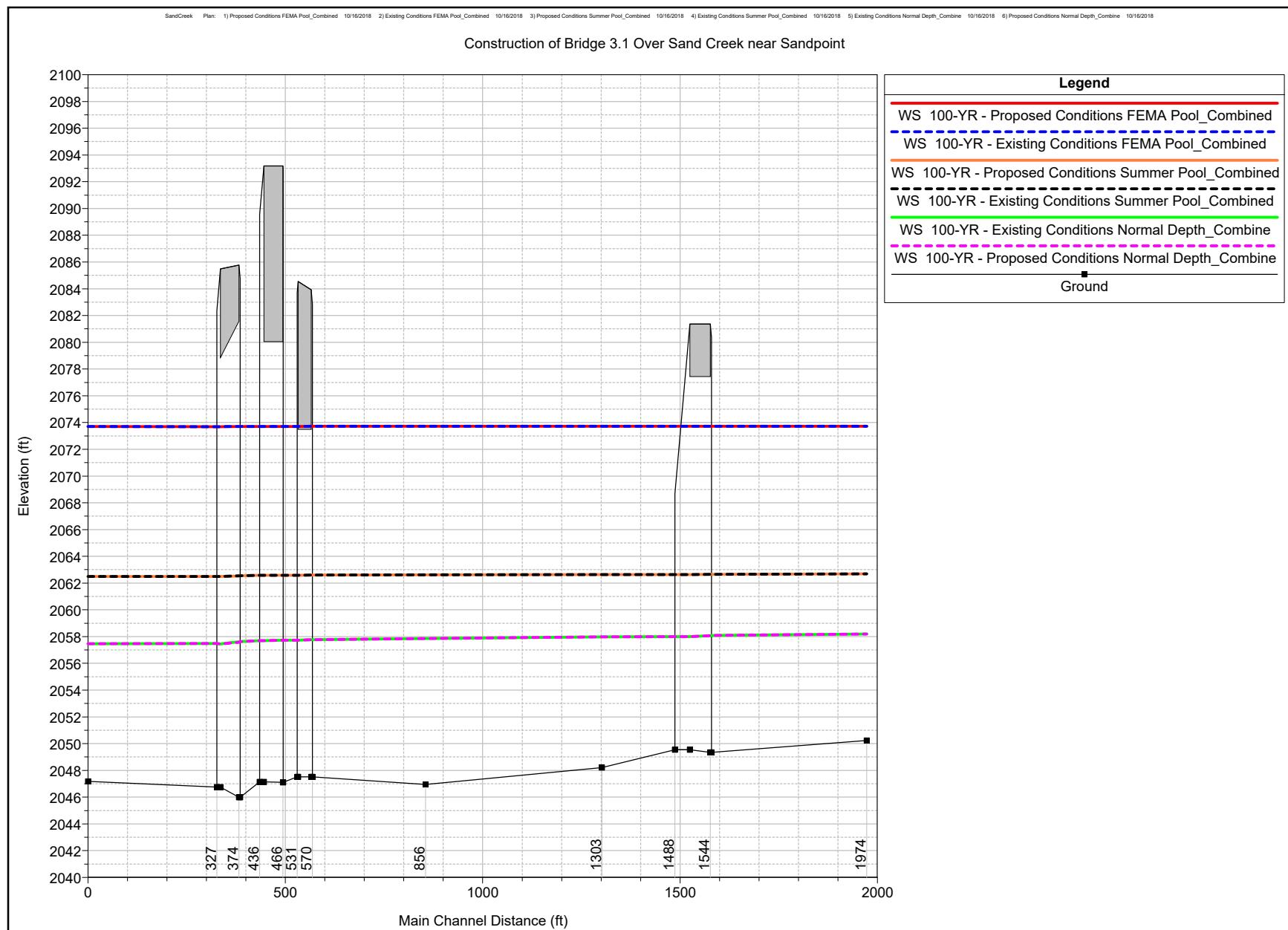
* FOR ELEVATION CHART SEE PLAN NO. 0045-0003.100-010

95% SUBMITTAL
NOT FOR CONSTRUCTION
MAY 15, 2019

DES: JEC
DRAWN: GTJ
CHECK: MAF
DATE: MAY 2019
AUTH: XXX-XXXX
LINE SEG: 0045

Attachment G: HEC-RAS Output





Cross section 3 should be located a short distance upstream from the bridge or culvert. This distance should only reflect the length required for the abrupt acceleration and contraction of the flow that occurs in the immediate area of the opening. Cross section 3 represents the natural ground of the channel and overbank area just upstream of the road embankment. This section is normally located near the toe of the upstream road embankment. This cross section should **Not** be placed immediately upstream of the bridge deck or culvert opening (for example some people wrongly place this cross section 1.0 foot upstream of the bridge deck or culvert opening). The bridge and culvert routines used between cross sections 2 and 3 account for the contraction losses that occur just upstream of the structure (entrance losses for the culvert routines). Therefore, this cross section should be placed just upstream of the area where the abrupt contraction of flow occurs to get into the bridge opening or culvert. This distance will vary with the size of the bridge opening or culvert.

Parallel Bridges

With the construction of divided highways, a common modeling problem involves parallel bridges (Figure 5-12). For new highways, these bridges are often identical structures. The hydraulic loss through the two structures has been shown to be between one and two times the loss for one bridge [Bradley, 1978]. The model results [Bradley, 1978] indicate the loss for two bridges ranging from 1.3 to 1.55 times the loss for one bridge crossing, over the range of bridge spacing's tested. Presumably if the two bridges were far enough apart, the losses for the two bridges would equal twice the loss for one. If the parallel bridges are very close to each other, and the flow will not be able to expand between the bridges, the bridges can be modeled as a single bridge. If there is enough distance between the bridge, in which the flow has room to expand and contract, the bridges should be modeled as two separate bridges. If both bridges are modeled, care should be exercised in depicting the expansion and contraction of flow between the bridges. Expansion and contraction rates should be based on the same procedures as single bridges.

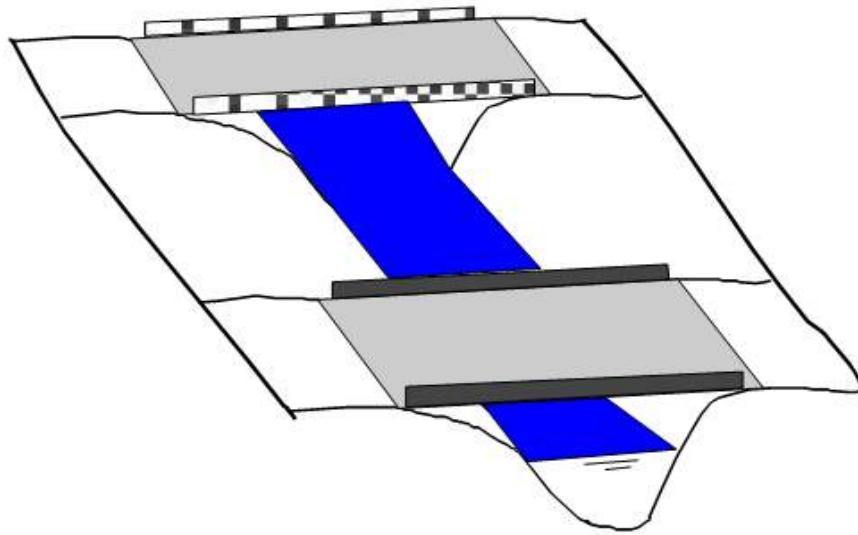


Figure 5-12 Parallel Bridge Example

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 10% Annual Chance Comparison (Existing Conditions - Normal Depth)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	10-YR	1455	2050.23	2055.991	0	2056.07	0.000357	2.25	667.73	169.87	0.18
1581	10-YR	1455	2049.34	2055.877	2052.3	2055.93	0.000301	1.77	832.72	211.4	0.15
1544	10-YR										Bridge Street
1488	10-YR	1455	2049.54	2055.792	2052.53	2055.86	0.000405	2.08	724.33	193.2	0.18
1303	10-YR	1455	2048.2	2055.754	0	2055.79	0.000225	1.62	1035.06	242.33	0.12
856	10-YR	1455	2046.95	2055.655	2050.66	2055.7	0.000158	1.77	870.66	390.43	0.13
570	10-YR	1455	2047.51	2055.574	2051.62	2055.64	0.000275	2.1	744.17	360.65	0.16
551	10-YR										Bypass 95 Off-Ramp
531	10-YR	1455	2047.51	2055.557	2051.62	2055.63	0.000291	2.16	705.47	360.35	0.17
496	10-YR	1455	2047.11	2055.548	2051.19	2055.62	0.000255	2.14	729.11	262.85	0.16
466	10-YR										US 95 Mainline Bridge
436	10-YR	1455	2047.15	2055.523	2051.19	2055.59	0.000295	2.19	707.11	262.54	0.16
387	10-YR	1455	2045.98	2055.503	2049.79	2055.58	0.000207	2.27	679.75	110.67	0.15
337	10-YR										Project Bridge: Bridge 3.1 (Existing)
327	10-YR	1455	2046.75	2055.418	2050.27	2055.52	0.0003	2.51	595.93	105.22	0.17
1	10-YR	1455	2047.18	2055.37	2051.51	2055.41	0.0002	1.53	971.05	250.32	0.13

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 10% Annual Chance Comparison (Existing Conditions - Summer Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	10-YR	1455	2050.23	2062.549	0	2062.56	0.000025	0.83	1932.66	214.98	0.04
1581	10-YR	1455	2049.34	2062.543	2052.3	2062.55	0.000016	0.65	2340.18	238.36	0.03
1544	10-YR										Bridge Street
1488	10-YR	1455	2049.54	2062.537	2052.53	2062.54	0.00002	0.73	2100.62	215.54	0.04
1303	10-YR	1455	2048.2	2062.536	0	2062.54	0.000011	0.59	2772.93	269.04	0.03
856	10-YR	1455	2046.95	2062.531	2050.66	2062.54	0.00001	0.58	2974.81	405.69	0.03
570	10-YR	1455	2047.51	2062.525	2051.62	2062.53	0.000015	0.68	2307.22	447.11	0.03
551	10-YR										Bypass 95 Off-Ramp
531	10-YR	1455	2047.51	2062.523	2051.62	2062.53	0.000017	0.72	2171.49	437.75	0.04
496	10-YR	1455	2047.11	2062.523	2051.19	2062.53	0.000016	0.71	2194.31	294.76	0.04
466	10-YR										US 95 Mainline Bridge
436	10-YR	1455	2047.15	2062.521	2051.19	2062.53	0.000018	0.73	2161.6	292.76	0.04
387	10-YR	1455	2045.98	2062.512	2049.79	2062.53	0.000026	0.99	1670.91	250.67	0.05
337	10-YR										Project Bridge: Bridge 3.1 (Existing)
327	10-YR	1455	2046.75	2062.498	2050.27	2062.52	0.000036	1.11	1410.23	125.07	0.05
1	10-YR	1455	2047.18	2062.5	2051.53	2062.5	0.000009	0.52	2996.85	315.99	0.03

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 10% Annual Chance Comparison (Existing Conditions - FEMA Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	10-YR	1455	2050.23	2073.706	0	2073.71	0.000002	0.36	4685.98	270.15	0.01
1581	10-YR	1455	2049.34	2073.706	2052.3	2073.71	0.000001	0.3	5164.12	268.61	0.01
1544	10-YR										Bridge Street
1488	10-YR	1455	2049.54	2073.705	2052.53	2073.71	0.000002	0.34	4788.55	290.42	0.01
1303	10-YR	1455	2048.2	2073.705	0	2073.71	0.000001	0.27	6067.52	331.54	0.01
856	10-YR	1455	2046.95	2073.705	2050.66	2073.71	0.000001	0.27	6335.8	527.86	0.01
570	10-YR	1455	2047.51	2073.704	2051.62	2073.71	0.000001	0.31	5170.9	587.94	0.01
551	10-YR										Bypass 95 Off-Ramp
531	10-YR	1455	2047.51	2073.703	2051.62	2073.71	0.000002	0.33	4903.03	521.61	0.01
496	10-YR	1455	2047.11	2073.703	2051.19	2073.71	0.000002	0.34	4679.85	498.63	0.01
466	10-YR										US 95 Mainline Bridge
436	10-YR	1455	2047.15	2073.703	2051.19	2073.71	0.000002	0.35	4475.24	501.63	0.01
387	10-YR	1455	2045.98	2073.701	2049.79	2073.7	0.000003	0.46	3520.56	322.96	0.02
337	10-YR										Project Bridge: Bridge 3.1 (Existing)
327	10-YR	1455	2046.75	2073.699	2050.27	2073.7	0.000004	0.54	3009.86	163.91	0.02
1	10-YR	1455	2047.18	2073.7	2051.53	2073.7	0.000001	0.23	6857.8	609.21	0.01

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 10% Annual Chance Comparison (Proposed Conditions - Normal Depth)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	10-YR	1455	2050.23	2055.993	0	2056.07	0.000356	2.25	668.11	169.89	0.18
1581	10-YR	1455	2049.34	2055.879	2052.3	2055.93	0.0003	1.77	833.23	211.41	0.15
1544	10-YR										Bridge Street
1488	10-YR	1455	2049.54	2055.795	2052.53	2055.86	0.000404	2.08	724.85	193.21	0.18
1303	10-YR	1455	2048.2	2055.757	0	2055.79	0.000224	1.62	1035.71	242.34	0.12
856	10-YR	1455	2046.95	2055.658	2050.66	2055.71	0.000158	1.77	871.1	390.44	0.13
570	10-YR	1455	2047.51	2055.577	2051.62	2055.64	0.000274	2.1	744.66	360.69	0.16
551	10-YR										Bypass 95 Off-Ramp
531	10-YR	1455	2047.51	2055.56	2051.62	2055.63	0.000291	2.15	705.92	360.4	0.17
496	10-YR	1455	2047.11	2055.552	2051.19	2055.62	0.000254	2.14	729.59	262.87	0.16
466	10-YR										US 95 Mainline Bridge
436	10-YR	1455	2047.15	2055.526	2051.19	2055.6	0.000294	2.18	707.56	262.56	0.16
387	10-YR	1455	2045.98	2055.506	2049.79	2055.58	0.000206	2.27	680.1	110.68	0.15
374	10-YR										Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)
374	10-YR										Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)
327	10-YR	1455	2046.75	2055.418	2050.27	2055.52	0.0003	2.51	595.93	105.22	0.17
1	10-YR	1455	2047.18	2055.37	2051.51	2055.41	0.0002	1.53	971.08	250.35	0.13

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 10% Annual Chance Comparison (Proposed Conditions - Summer Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	10-YR	1455	2050.23	2062.549	0	2062.56	0.000025	0.83	1932.71	214.99	0.04
1581	10-YR	1455	2049.34	2062.543	2052.3	2062.55	0.000016	0.65	2340.18	238.36	0.03
1544	10-YR										Bridge Street
1488	10-YR	1455	2049.54	2062.537	2052.53	2062.54	0.00002	0.73	2100.62	215.54	0.04
1303	10-YR	1455	2048.2	2062.536	0	2062.54	0.000011	0.59	2772.93	269.04	0.03
856	10-YR	1455	2046.95	2062.531	2050.66	2062.54	0.00001	0.58	2974.81	405.69	0.03
570	10-YR	1455	2047.51	2062.525	2051.62	2062.53	0.000015	0.68	2307.22	447.11	0.03
551	10-YR										Bypass 95 Off-Ramp
531	10-YR	1455	2047.51	2062.523	2051.62	2062.53	0.000017	0.72	2171.49	437.75	0.04
496	10-YR	1455	2047.11	2062.523	2051.19	2062.53	0.000016	0.71	2194.31	294.76	0.04
466	10-YR										US 95 Mainline Bridge
436	10-YR	1455	2047.15	2062.521	2051.19	2062.53	0.000018	0.73	2161.6	292.76	0.04
387	10-YR	1455	2045.98	2062.512	2049.79	2062.53	0.000026	0.99	1670.91	250.67	0.05
374	10-YR										Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)
374	10-YR										Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)
327	10-YR	1455	2046.75	2062.498	2050.27	2062.52	0.000036	1.11	1410.23	125.07	0.05
1	10-YR	1455	2047.18	2062.5	2051.53	2062.5	0.000009	0.52	2996.94	315.99	0.03

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 10% Annual Chance Comparison (Proposed Conditions - FEMA Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	10-YR	1455	2050.23	2073.706	0	2073.71	0.000002	0.36	4686.04	270.15	0.01
1581	10-YR	1455	2049.34	2073.706	2052.3	2073.71	0.000001	0.3	5164.12	268.61	0.01
1544	10-YR						Bridge Street				
1488	10-YR	1455	2049.54	2073.705	2052.53	2073.71	0.000002	0.34	4788.55	290.42	0.01
1303	10-YR	1455	2048.2	2073.705	0	2073.71	0.000001	0.27	6067.52	331.54	0.01
856	10-YR	1455	2046.95	2073.705	2050.66	2073.71	0.000001	0.27	6335.8	527.86	0.01
570	10-YR	1455	2047.51	2073.704	2051.62	2073.71	0.000001	0.31	5170.9	587.94	0.01
551	10-YR						Bypass 95 Off-Ramp				
531	10-YR	1455	2047.51	2073.703	2051.62	2073.71	0.000002	0.33	4903.03	521.61	0.01
496	10-YR	1455	2047.11	2073.703	2051.19	2073.71	0.000002	0.34	4679.85	498.63	0.01
466	10-YR						US 95 Mainline Bridge				
436	10-YR	1455	2047.15	2073.703	2051.19	2073.71	0.000002	0.35	4475.24	501.63	0.01
387	10-YR	1455	2045.98	2073.701	2049.79	2073.7	0.000003	0.46	3520.56	322.96	0.02
374	10-YR						Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)				
374	10-YR						Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)				
327	10-YR	1455	2046.75	2073.699	2050.27	2073.7	0.000004	0.54	3009.86	163.91	0.02
1	10-YR	1455	2047.18	2073.7	2051.53	2073.7	0.000001	0.23	6857.89	609.21	0.01

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 10% Annual Chance Comparison

	Proposed Conditions (Normal Depth)	Proposed Conditions (Summer Pool)	Proposed Conditions (FEMA Regulatory Pool)	Existing Conditions (Normal Depth)	Existing Conditions (Summer Pool)	Existing Conditions (FEMA Regulatory Pool)	Proposed Impacts (Normal Depth)	Proposed Impacts (Summer Pool)	Project Impacts (FEMA Regulatory Pool)
River Sta	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	Δ W.S. Elev Prop -Existing (ft)	Δ W.S. Elev Prop -Existing (ft)	Δ W.S. Elev Prop -Existing (ft)
1974	2056.0	2062.5	2073.7	2056.0	2062.5	2073.7	0.0	0.0	0.0
1581	2055.9	2062.5	2073.7	2055.9	2062.5	2073.7	0.0	0.0	0.0
1544	Bridge Street								
1488	2055.8	2062.5	2073.7	2055.8	2062.5	2073.7	0.0	0.0	0.0
1303	2055.8	2062.5	2073.7	2055.8	2062.5	2073.7	0.0	0.0	0.0
856	2055.7	2062.5	2073.7	2055.7	2062.5	2073.7	0.0	0.0	0.0
570	2055.6	2062.5	2073.7	2055.6	2062.5	2073.7	0.0	0.0	0.0
551	Bypass 95 Off-Ramp								
531	2055.6	2062.5	2073.7	2055.6	2062.5	2073.7	0.0	0.0	0.0
496	2055.6	2062.5	2073.7	2055.5	2062.5	2073.7	0.0	0.0	0.0
466	US 95 Mainline Bridge								
436	2055.5	2062.5	2073.7	2055.5	2062.5	2073.7	0.0	0.0	0.0
387	2055.5	2062.5	2073.7	2055.5	2062.5	2073.7	0.0	0.0	0.0
374	Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)								
374	Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)								
327	2055.4	2062.5	2073.7	2055.4	2062.5	2073.7	0.0	0.0	0.0
1	2055.4	2062.5	2073.7	2055.4	2062.5	2073.7	0.0	0.0	0.0

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 2% Annual Chance Comparison (Existing Conditions - Normal Depth)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	50-YR	2280	2050.23	2057.415	0	2057.52	0.000347	2.65	916.84	179.92	0.19
1581	50-YR	2280	2049.34	2057.316	2053.08	2057.38	0.00027	2.05	1142.5	219.09	0.15
1544	50-YR										Bridge Street
1488	50-YR	2280	2049.54	2057.227	2053.23	2057.31	0.000357	2.38	1004.88	197.78	0.18
1303	50-YR	2280	2048.2	2057.195	0	2057.24	0.000226	1.88	1388.62	248.34	0.12
856	50-YR	2280	2046.95	2057.072	2051.41	2057.15	0.000187	2.22	1102.35	393.77	0.14
570	50-YR	2280	2047.51	2056.983	2052.39	2057.08	0.000286	2.51	981.75	383.63	0.17
551	50-YR										Bypass 95 Off-Ramp
531	50-YR	2280	2047.51	2056.959	2052.39	2057.06	0.00031	2.61	919.18	382.66	0.18
496	50-YR	2280	2047.11	2056.95	2052.06	2057.05	0.000282	2.61	942.16	270.34	0.17
466	50-YR										US 95 Mainline Bridge
436	50-YR	2280	2047.15	2056.915	2052.07	2057.02	0.000333	2.69	908.48	270.06	0.18
387	50-YR	2280	2045.98	2056.871	2050.71	2057	0.000278	2.95	836.74	120.79	0.18
337	50-YR										Project Bridge: Bridge 3.1 (Existing)
327	50-YR	2280	2046.75	2056.743	2051.29	2056.9	0.000386	3.23	737.6	108.7	0.2
1	50-YR	2280	2047.18	2056.71	2052.53	2056.76	0.0002	1.78	1316.9	265.76	0.13

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 2% Annual Chance Comparison (Existing Conditions - Summer Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	50-YR	2280	2050.23	2062.619	0	2062.64	0.00006	1.29	1947.79	215.33	0.07
1581	50-YR	2280	2049.34	2062.605	2053.08	2062.62	0.000039	1.01	2354.96	238.54	0.05
1544	50-YR					Bridge Street					
1488	50-YR	2280	2049.54	2062.59	2053.23	2062.61	0.000049	1.14	2112.04	215.78	0.06
1303	50-YR	2280	2048.2	2062.587	0	2062.6	0.000026	0.91	2786.79	269.28	0.05
856	50-YR	2280	2046.95	2062.577	2051.41	2062.59	0.000025	0.9	2987.23	405.78	0.04
570	50-YR	2280	2047.51	2062.562	2052.39	2062.58	0.000037	1.06	2315.4	447.25	0.05
551	50-YR					Bypass 95 Off-Ramp					
531	50-YR	2280	2047.51	2062.557	2052.39	2062.58	0.000042	1.12	2178.57	437.85	0.06
496	50-YR	2280	2047.11	2062.556	2052.06	2062.57	0.000039	1.12	2201.06	294.85	0.06
466	50-YR					US 95 Mainline Bridge					
436	50-YR	2280	2047.15	2062.551	2052.07	2062.57	0.000044	1.14	2167.67	292.84	0.06
387	50-YR	2280	2045.98	2062.53	2050.71	2062.56	0.000065	1.54	1673.9	250.92	0.07
337	50-YR					Project Bridge: Bridge 3.1 (Existing)					
327	50-YR	2280	2046.75	2062.496	2051.29	2062.54	0.000089	1.74	1409.96	125.06	0.08
1	50-YR	2280	2047.18	2062.5	2052.54	2062.51	0.000023	0.81	2996.85	315.99	0.04

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 2% Annual Chance Comparison (Existing Conditions - FEMA Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	50-YR	2280	2050.23	2073.715	0	2073.72	0.000005	0.57	4688.49	270.18	0.02
1581	50-YR	2280	2049.34	2073.714	2053.08	2073.72	0.000003	0.47	5166.41	268.63	0.02
1544	50-YR					Bridge Street					
1488	50-YR	2280	2049.54	2073.712	2053.23	2073.72	0.000004	0.53	4790.6	290.66	0.02
1303	50-YR	2280	2048.2	2073.712	0	2073.72	0.000002	0.42	6069.95	331.55	0.02
856	50-YR	2280	2046.95	2073.712	2051.41	2073.71	0.000002	0.43	6338.31	528.23	0.02
570	50-YR	2280	2047.51	2073.709	2052.39	2073.71	0.000003	0.49	5172.6	588.09	0.02
551	50-YR					Bypass 95 Off-Ramp					
531	50-YR	2280	2047.51	2073.708	2052.39	2073.71	0.000004	0.52	4904.48	521.62	0.02
496	50-YR	2280	2047.11	2073.708	2052.06	2073.71	0.000004	0.53	4681.07	498.73	0.02
466	50-YR					US 95 Mainline Bridge					
436	50-YR	2280	2047.15	2073.707	2052.07	2073.71	0.000004	0.55	4476.07	501.64	0.02
387	50-YR	2280	2045.98	2073.703	2050.71	2073.71	0.000007	0.73	3520.88	322.96	0.03
337	50-YR					Project Bridge: Bridge 3.1 (Existing)					
327	50-YR	2280	2046.75	2073.697	2051.29	2073.71	0.000009	0.85	3009.55	163.91	0.03
1	50-YR	2280	2047.18	2073.7	2052.54	2073.7	0.000002	0.36	6857.8	609.21	0.01

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 2% Annual Chance Comparison (Proposed Conditions - Normal Depth)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	50-YR	2280	2050.23	2057.416	0	2057.52	0.000347	2.64	917.08	179.94	0.19
1581	50-YR	2280	2049.34	2057.317	2053.08	2057.38	0.00027	2.05	1142.77	219.1	0.15
1544	50-YR										Bridge Street
1488	50-YR	2280	2049.54	2057.228	2053.23	2057.31	0.000357	2.38	1005.12	197.78	0.18
1303	50-YR	2280	2048.2	2057.197	0	2057.24	0.000226	1.88	1388.92	248.34	0.12
856	50-YR	2280	2046.95	2057.073	2051.41	2057.15	0.000187	2.22	1102.55	393.77	0.14
570	50-YR	2280	2047.51	2056.984	2052.39	2057.08	0.000286	2.51	981.95	383.65	0.17
551	50-YR										Bypass 95 Off-Ramp
531	50-YR	2280	2047.51	2056.96	2052.39	2057.06	0.00031	2.61	919.37	382.68	0.18
496	50-YR	2280	2047.11	2056.951	2052.06	2057.05	0.000282	2.61	942.35	270.35	0.17
466	50-YR										US 95 Mainline Bridge
436	50-YR	2280	2047.15	2056.917	2052.07	2057.02	0.000333	2.69	908.65	270.06	0.18
387	50-YR	2280	2045.98	2056.872	2050.71	2057	0.000278	2.95	836.92	120.81	0.18
374	50-YR										Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)
374	50-YR										Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)
327	50-YR	2280	2046.75	2056.743	2051.29	2056.9	0.000386	3.23	737.6	108.7	0.2
1	50-YR	2280	2047.18	2056.71	2052.53	2056.76	0.0002	1.78	1316.98	265.78	0.13

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 2% Annual Chance Comparison (Proposed Conditions - Summer Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	50-YR	2280	2050.23	2062.619	0	2062.64	0.00006	1.29	1947.84	215.33	0.07
1581	50-YR	2280	2049.34	2062.605	2053.08	2062.62	0.000039	1.01	2354.96	238.54	0.05
1544	50-YR										Bridge Street
1488	50-YR	2280	2049.54	2062.59	2053.23	2062.61	0.000049	1.14	2112.04	215.78	0.06
1303	50-YR	2280	2048.2	2062.587	0	2062.6	0.000026	0.91	2786.79	269.28	0.05
856	50-YR	2280	2046.95	2062.577	2051.41	2062.59	0.000025	0.9	2987.23	405.78	0.04
570	50-YR	2280	2047.51	2062.562	2052.39	2062.58	0.000037	1.06	2315.4	447.25	0.05
551	50-YR										Bypass 95 Off-Ramp
531	50-YR	2280	2047.51	2062.557	2052.39	2062.58	0.000042	1.12	2178.57	437.85	0.06
496	50-YR	2280	2047.11	2062.556	2052.06	2062.57	0.000039	1.12	2201.06	294.85	0.06
466	50-YR										US 95 Mainline Bridge
436	50-YR	2280	2047.15	2062.551	2052.07	2062.57	0.000044	1.14	2167.67	292.84	0.06
387	50-YR	2280	2045.98	2062.53	2050.71	2062.56	0.000065	1.54	1673.9	250.92	0.07
374	50-YR										Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)
374	50-YR										Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)
327	50-YR	2280	2046.75	2062.496	2051.29	2062.54	0.000089	1.74	1409.96	125.06	0.08
1	50-YR	2280	2047.18	2062.5	2052.54	2062.51	0.000023	0.81	2996.94	315.99	0.04

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 2% Annual Chance Comparison (Proposed Conditions - FEMA Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	50-YR	2280	2050.23	2073.715	0	2073.72	0.000005	0.57	4688.55	270.18	0.02
1581	50-YR	2280	2049.34	2073.714	2053.08	2073.72	0.000003	0.47	5166.41	268.63	0.02
1544	50-YR						Bridge Street				
1488	50-YR	2280	2049.54	2073.712	2053.23	2073.72	0.000004	0.53	4790.6	290.66	0.02
1303	50-YR	2280	2048.2	2073.712	0	2073.72	0.000002	0.42	6069.95	331.55	0.02
856	50-YR	2280	2046.95	2073.712	2051.41	2073.71	0.000002	0.43	6338.31	528.23	0.02
570	50-YR	2280	2047.51	2073.709	2052.39	2073.71	0.000003	0.49	5172.6	588.09	0.02
551	50-YR						Bypass 95 Off-Ramp				
531	50-YR	2280	2047.51	2073.708	2052.39	2073.71	0.000004	0.52	4904.48	521.62	0.02
496	50-YR	2280	2047.11	2073.708	2052.06	2073.71	0.000004	0.53	4681.07	498.73	0.02
466	50-YR						US 95 Mainline Bridge				
436	50-YR	2280	2047.15	2073.707	2052.07	2073.71	0.000004	0.55	4476.07	501.64	0.02
387	50-YR	2280	2045.98	2073.703	2050.71	2073.71	0.000007	0.73	3520.88	322.96	0.03
374	50-YR						Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)				
374	50-YR						Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)				
327	50-YR	2280	2046.75	2073.697	2051.29	2073.71	0.000009	0.85	3009.55	163.91	0.03
1	50-YR	2280	2047.18	2073.7	2052.54	2073.7	0.000002	0.36	6857.89	609.21	0.01

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 2% Annual Chance Comparison

	Proposed Conditions (Normal Depth)	Proposed Conditions (Summer Pool)	Proposed Conditions (FEMA Regulatory Pool)	Existing Conditions (Normal Depth)	Existing Conditions (Summer Pool)	Existing Conditions (FEMA Regulatory Pool)	Proposed Impacts (Normal Depth)	Proposed Impacts (Summer Pool)	Project Impacts (FEMA Regulatory Pool)
River Sta	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	Δ W.S. Elev Prop -Existing (ft)	Δ W.S. Elev Prop -Existing (ft)	Δ W.S. Elev Prop -Existing (ft)
1974	2057.4	2062.6	2073.7	2057.4	2062.6	2073.7	0.0	0.0	0.0
1581	2057.3	2062.6	2073.7	2057.3	2062.6	2073.7	0.0	0.0	0.0
1544	Bridge Street								
1488	2057.2	2062.6	2073.7	2057.2	2062.6	2073.7	0.0	0.0	0.0
1303	2057.2	2062.6	2073.7	2057.2	2062.6	2073.7	0.0	0.0	0.0
856	2057.1	2062.6	2073.7	2057.1	2062.6	2073.7	0.0	0.0	0.0
570	2057.0	2062.6	2073.7	2057.0	2062.6	2073.7	0.0	0.0	0.0
551	Bypass 95 Off-Ramp								
531	2057.0	2062.6	2073.7	2057.0	2062.6	2073.7	0.0	0.0	0.0
496	2057.0	2062.6	2073.7	2057.0	2062.6	2073.7	0.0	0.0	0.0
466	US 95 Mainline Bridge								
436	2056.9	2062.6	2073.7	2056.9	2062.6	2073.7	0.0	0.0	0.0
387	2056.9	2062.5	2073.7	2056.9	2062.5	2073.7	0.0	0.0	0.0
374	Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)								
374	Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)								
327	2056.7	2062.5	2073.7	2056.7	2062.5	2073.7	0.0	0.0	0.0
1	2056.7	2062.5	2073.7	2056.7	2062.5	2073.7	0.0	0.0	0.0

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 1% Annual Chance Comparison (Existing Conditions - Normal Depth)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	100-YR	2820	2050.23	2058.222	0	2058.34	0.000343	2.85	1064.27	185.62	0.19
1581	100-YR	2820	2049.34	2058.129	2053.41	2058.2	0.000261	2.2	1322.39	223.44	0.15
1544	100-YR										Bridge Street
1488	100-YR	2820	2049.54	2058.035	2053.62	2058.13	0.000343	2.55	1165.77	200.26	0.18
1303	100-YR	2820	2048.2	2058.007	0	2058.06	0.000227	2.01	1591.61	251.94	0.12
856	100-YR	2820	2046.95	2057.869	2051.82	2057.96	0.000201	2.46	1233.51	395.65	0.15
570	100-YR	2820	2047.51	2057.778	2052.8	2057.89	0.000291	2.73	1118.64	398.5	0.18
551	100-YR										Bypass 95 Off-Ramp
531	100-YR	2820	2047.51	2057.748	2052.8	2057.87	0.00032	2.86	1041.61	396.22	0.19
496	100-YR	2820	2047.11	2057.739	2052.54	2057.86	0.000295	2.86	1063.57	274.89	0.18
466	100-YR										US 95 Mainline Bridge
436	100-YR	2820	2047.15	2057.698	2052.54	2057.83	0.000352	2.97	1023.19	274.68	0.19
387	100-YR	2820	2045.98	2057.638	2051.22	2057.8	0.000316	3.32	932.57	128.99	0.19
337	100-YR										Project Bridge: Bridge 3.1 (Existing)
327	100-YR	2820	2046.75	2057.481	2051.85	2057.68	0.000431	3.63	818.55	110.8	0.22
1	100-YR	2820	2047.18	2057.46	2052.82	2057.52	0.0002	1.92	1519.47	274.34	0.13

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 1% Annual Chance Comparison (Existing Conditions - Summer Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	100-YR	2820	2050.23	2062.683	0	2062.72	0.000091	1.59	1961.57	215.65	0.08
1581	100-YR	2820	2049.34	2062.662	2053.41	2062.69	0.000058	1.24	2368.48	238.7	0.07
1544	100-YR										Bridge Street
1488	100-YR	2820	2049.54	2062.638	2053.62	2062.67	0.000074	1.4	2122.53	216	0.07
1303	100-YR	2820	2048.2	2062.635	0	2062.65	0.000039	1.13	2799.55	269.49	0.06
856	100-YR	2820	2046.95	2062.619	2051.82	2062.63	0.000037	1.11	2998.7	405.86	0.05
570	100-YR	2820	2047.51	2062.596	2052.8	2062.62	0.000056	1.31	2322.99	447.38	0.07
551	100-YR										Bypass 95 Off-Ramp
531	100-YR	2820	2047.51	2062.589	2052.8	2062.62	0.000063	1.38	2185.18	437.94	0.07
496	100-YR	2820	2047.11	2062.587	2052.54	2062.61	0.000059	1.38	2207.31	294.93	0.07
466	100-YR										US 95 Mainline Bridge
436	100-YR	2820	2047.15	2062.58	2052.54	2062.61	0.000066	1.41	2173.36	292.92	0.07
387	100-YR	2820	2045.98	2062.547	2051.22	2062.6	0.000098	1.91	1676.68	251.15	0.09
337	100-YR										Project Bridge: Bridge 3.1 (Existing)
327	100-YR	2820	2046.75	2062.494	2051.85	2062.56	0.000136	2.15	1409.68	125.06	0.1
1	100-YR	2820	2047.18	2062.5	2052.84	2062.52	0.000036	1	2996.85	315.99	0.05

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 1% Annual Chance Comparison (Existing Conditions - FEMA Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	100-YR	2820	2050.23	2073.724	0	2073.73	0.000007	0.7	4690.73	270.2	0.03
1581	100-YR	2820	2049.34	2073.722	2053.41	2073.73	0.000005	0.58	5168.51	268.66	0.02
1544	100-YR					Bridge Street					
1488	100-YR	2820	2049.54	2073.719	2053.62	2073.73	0.000006	0.65	4792.66	290.91	0.02
1303	100-YR	2820	2048.2	2073.719	0	2073.72	0.000004	0.52	6072.3	331.57	0.02
856	100-YR	2820	2046.95	2073.718	2051.82	2073.72	0.000004	0.53	6340.56	528.56	0.02
570	100-YR	2820	2047.51	2073.715	2052.8	2073.72	0.000005	0.6	5174.08	588.22	0.02
551	100-YR					Bypass 95 Off-Ramp					
531	100-YR	2820	2047.51	2073.713	2052.8	2073.72	0.000006	0.64	4905.73	521.62	0.02
496	100-YR	2820	2047.11	2073.712	2052.54	2073.72	0.000006	0.65	4682.11	498.81	0.02
466	100-YR					US 95 Mainline Bridge					
436	100-YR	2820	2047.15	2073.71	2052.54	2073.72	0.000007	0.69	4476.84	501.65	0.02
387	100-YR	2820	2045.98	2073.705	2051.22	2073.72	0.00001	0.9	3521.17	322.96	0.03
337	100-YR					Project Bridge: Bridge 3.1 (Existing)					
327	100-YR	2820	2046.75	2073.696	2051.85	2073.71	0.000014	1.05	3009.36	163.9	0.04
1	100-YR	2820	2047.18	2073.7	2052.84	2073.7	0.000003	0.45	6857.8	609.21	0.02

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 1% Annual Chance Comparison (Proposed Conditions - Normal Depth)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	100-YR	2820	2050.23	2058.219	0	2058.34	0.000343	2.86	1063.84	185.61	0.19
1581	100-YR	2820	2049.34	2058.126	2053.41	2058.2	0.000261	2.2	1321.73	223.43	0.15
1544	100-YR										Bridge Street
1488	100-YR	2820	2049.54	2058.032	2053.62	2058.13	0.000343	2.55	1165.23	200.26	0.18
1303	100-YR	2820	2048.2	2058.004	0	2058.06	0.000227	2.01	1590.94	251.93	0.12
856	100-YR	2820	2046.95	2057.866	2051.82	2057.96	0.000201	2.46	1233.06	395.65	0.15
570	100-YR	2820	2047.51	2057.775	2052.8	2057.88	0.000291	2.73	1118.12	398.43	0.18
551	100-YR										Bypass 95 Off-Ramp
531	100-YR	2820	2047.51	2057.745	2052.8	2057.87	0.000321	2.86	1041.12	396.15	0.19
496	100-YR	2820	2047.11	2057.736	2052.54	2057.85	0.000295	2.86	1063.12	274.87	0.18
466	100-YR										US 95 Mainline Bridge
436	100-YR	2820	2047.15	2057.695	2052.54	2057.83	0.000352	2.97	1022.76	274.66	0.19
387	100-YR	2820	2045.98	2057.635	2051.22	2057.8	0.000316	3.32	932.16	128.96	0.19
374	100-YR										Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)
374	100-YR										Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)
327	100-YR	2820	2046.75	2057.481	2051.85	2057.68	0.000431	3.63	818.52	110.8	0.22
1	100-YR	2820	2047.18	2057.46	2052.81	2057.52	0.0002	1.92	1519.49	274.34	0.13

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 1% Annual Chance Comparison (Proposed Conditions - Summer Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	100-YR	2820	2050.23	2062.683	0	2062.72	0.000091	1.59	1961.52	215.65	0.08
1581	100-YR	2820	2049.34	2062.661	2053.41	2062.68	0.000058	1.24	2368.36	238.7	0.07
1544	100-YR										Bridge Street
1488	100-YR	2820	2049.54	2062.638	2053.62	2062.67	0.000074	1.4	2122.43	216	0.07
1303	100-YR	2820	2048.2	2062.634	0	2062.65	0.000039	1.13	2799.42	269.49	0.06
856	100-YR	2820	2046.95	2062.618	2051.82	2062.63	0.000037	1.11	2998.57	405.86	0.05
570	100-YR	2820	2047.51	2062.595	2052.8	2062.62	0.000056	1.31	2322.88	447.37	0.07
551	100-YR										Bypass 95 Off-Ramp
531	100-YR	2820	2047.51	2062.588	2052.8	2062.62	0.000063	1.38	2185.08	437.94	0.07
496	100-YR	2820	2047.11	2062.586	2052.54	2062.61	0.000059	1.38	2207.21	294.92	0.07
466	100-YR										US 95 Mainline Bridge
436	100-YR	2820	2047.15	2062.579	2052.54	2062.61	0.000066	1.41	2173.26	292.92	0.07
387	100-YR	2820	2045.98	2062.547	2051.22	2062.6	0.000098	1.91	1676.6	251.14	0.09
374	100-YR										Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)
374	100-YR										Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)
327	100-YR	2820	2046.75	2062.494	2051.85	2062.56	0.000136	2.15	1409.68	125.06	0.1
1	100-YR	2820	2047.18	2062.5	2052.84	2062.52	0.000036	1	2996.94	315.99	0.05

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 1% Annual Chance Comparison (Proposed Conditions - FEMA Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	100-YR	2820	2050.23	2073.724	0	2073.73	0.000007	0.7	4690.86	270.2	0.03
1581	100-YR	2820	2049.34	2073.722	2053.41	2073.73	0.000005	0.58	5168.57	268.66	0.02
1544	100-YR						Bridge Street				
1488	100-YR	2820	2049.54	2073.719	2053.62	2073.73	0.000006	0.65	4792.73	290.92	0.02
1303	100-YR	2820	2048.2	2073.72	0	2073.72	0.000004	0.52	6072.38	331.57	0.02
856	100-YR	2820	2046.95	2073.718	2051.82	2073.72	0.000004	0.53	6340.64	528.57	0.02
570	100-YR	2820	2047.51	2073.715	2052.8	2073.72	0.000005	0.6	5174.16	588.23	0.02
551	100-YR						Bypass 95 Off-Ramp				
531	100-YR	2820	2047.51	2073.713	2052.8	2073.72	0.000006	0.64	4905.8	521.62	0.02
496	100-YR	2820	2047.11	2073.712	2052.54	2073.72	0.000006	0.65	4682.17	498.82	0.02
466	100-YR						US 95 Mainline Bridge				
436	100-YR	2820	2047.15	2073.711	2052.54	2073.72	0.000007	0.69	4476.89	501.65	0.02
387	100-YR	2820	2045.98	2073.705	2051.22	2073.72	0.00001	0.9	3521.21	322.96	0.03
374	100-YR						Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)				
374	100-YR						Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)				
327	100-YR	2820	2046.75	2073.696	2051.85	2073.71	0.000014	1.05	3009.36	163.9	0.04
1	100-YR	2820	2047.18	2073.7	2052.84	2073.7	0.000003	0.45	6857.89	609.21	0.02

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 1% Annual Chance Comparison

	Proposed Conditions (Normal Depth)	Proposed Conditions (Summer Pool)	Proposed Conditions (FEMA Regulatory Pool)	Existing Conditions (Normal Depth)	Existing Conditions (Summer Pool)	Existing Conditions (FEMA Regulatory Pool)	Proposed Impacts (Normal Depth)	Proposed Impacts (Summer Pool)	Project Impacts (FEMA Regulatory Pool)
River Sta	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	Δ W.S. Elev Prop -Existing (ft)	Δ W.S. Elev Prop -Existing (ft)	Δ W.S. Elev Prop -Existing (ft)
1974	2058.2	2062.7	2073.7	2058.2	2062.7	2073.7	0.0	0.0	0.0
1581	2058.1	2062.7	2073.7	2058.1	2062.7	2073.7	0.0	0.0	0.0
1544	Bridge Street								
1488	2058.0	2062.6	2073.7	2058.0	2062.6	2073.7	0.0	0.0	0.0
1303	2058.0	2062.6	2073.7	2058.0	2062.6	2073.7	0.0	0.0	0.0
856	2057.9	2062.6	2073.7	2057.9	2062.6	2073.7	0.0	0.0	0.0
570	2057.8	2062.6	2073.7	2057.8	2062.6	2073.7	0.0	0.0	0.0
551	Bypass 95 Off-Ramp								
531	2057.7	2062.6	2073.7	2057.7	2062.6	2073.7	0.0	0.0	0.0
496	2057.7	2062.6	2073.7	2057.7	2062.6	2073.7	0.0	0.0	0.0
466	US 95 Mainline Bridge								
436	2057.7	2062.6	2073.7	2057.7	2062.6	2073.7	0.0	0.0	0.0
387	2057.6	2062.5	2073.7	2057.6	2062.5	2073.7	0.0	0.0	0.0
374	Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)								
374	Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)								
327	2057.5	2062.5	2073.7	2057.5	2062.5	2073.7	0.0	0.0	0.0
1	2057.5	2062.5	2073.7	2057.5	2062.5	2073.7	0.0	0.0	0.0

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 0.2% Annual Chance Comparison (Existing Conditions - Normal Depth)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	500-YR	4015	2050.23	2059.794	0	2059.95	0.000336	3.24	1364.83	196.71	0.2
1581	500-YR	4015	2049.34	2059.711	2054.06	2059.81	0.000248	2.48	1679.69	227.5	0.15
1544	500-YR										Bridge Street
1488	500-YR	4015	2049.54	2059.606	2054.27	2059.73	0.000325	2.87	1484.23	205.27	0.18
1303	500-YR	4015	2048.2	2059.584	0	2059.65	0.000228	2.27	1994.6	258.56	0.13
856	500-YR	4015	2046.95	2059.417	2052.6	2059.54	0.000225	2.91	1489.97	399.32	0.16
570	500-YR	4015	2047.51	2059.324	2053.64	2059.47	0.000299	3.14	1393.24	413.54	0.18
551	500-YR										Bypass 95 Off-Ramp
531	500-YR	4015	2047.51	2059.283	2053.6	2059.44	0.000334	3.31	1286.97	412.09	0.2
496	500-YR	4015	2047.11	2059.272	2053.42	2059.43	0.000316	3.34	1303.2	281.6	0.19
466	500-YR										US 95 Mainline Bridge
436	500-YR	4015	2047.15	2059.219	2053.38	2059.4	0.000383	3.48	1249.65	281.26	0.2
387	500-YR	4015	2045.98	2059.129	2052.23	2059.36	0.000377	4	1136.49	145.51	0.21
337	500-YR										Project Bridge: Bridge 3.1 (Existing)
327	500-YR	4015	2046.75	2058.907	2052.9	2059.19	0.000509	4.37	979.44	114.85	0.24
1	500-YR	4015	2047.18	2058.916	2053.3	2058.99	0.0002	2.18	1924.47	283.56	0.14

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 0.2% Annual Chance Comparison (Existing Conditions - Summer Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	500-YR	4015	2050.23	2062.865	0	2062.94	0.000173	2.22	2000.93	216.54	0.11
1581	500-YR	4015	2049.34	2062.824	2054.06	2062.87	0.000112	1.74	2407.21	239.17	0.09
1544	500-YR					Bridge Street					
1488	500-YR	4015	2049.54	2062.777	2054.28	2062.83	0.000144	1.97	2152.63	216.63	0.1
1303	500-YR	4015	2048.2	2062.771	0	2062.8	0.000076	1.58	2836.24	270.11	0.08
856	500-YR	4015	2046.95	2062.74	2052.6	2062.77	0.000073	1.56	3031.74	406.09	0.08
570	500-YR	4015	2047.51	2062.694	2053.78	2062.74	0.000111	1.84	2345.01	447.76	0.09
551	500-YR					Bypass 95 Off-Ramp					
531	500-YR	4015	2047.51	2062.68	2053.74	2062.73	0.000124	1.95	2204.43	438.2	0.1
496	500-YR	4015	2047.11	2062.677	2053.58	2062.73	0.000117	1.94	2225.59	295.16	0.1
466	500-YR					US 95 Mainline Bridge					
436	500-YR	4015	2047.15	2062.662	2053.56	2062.72	0.000131	1.99	2189.87	293.15	0.1
387	500-YR	4015	2045.98	2062.596	2052.23	2062.7	0.000197	2.7	1684.84	251.83	0.13
337	500-YR					Project Bridge: Bridge 3.1 (Existing)					
327	500-YR	4015	2046.75	2062.488	2052.9	2062.63	0.000275	3.07	1408.89	125.04	0.15
1	500-YR	4015	2047.18	2062.5	2053.29	2062.53	0.000072	1.42	2996.85	315.99	0.07

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 0.2% Annual Chance Comparison (Existing Conditions - FEMA Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	500-YR	4015	2050.23	2073.748	0	2073.76	0.000014	1	4697.19	270.26	0.04
1581	500-YR	4015	2049.34	2073.745	2054.06	2073.76	0.00001	0.83	5174.54	268.72	0.03
1544	500-YR					Bridge Street					
1488	500-YR	4015	2049.54	2073.739	2054.28	2073.75	0.000013	0.92	4798.35	291.52	0.03
1303	500-YR	4015	2048.2	2073.739	0	2073.75	0.000007	0.74	6078.86	331.61	0.03
856	500-YR	4015	2046.95	2073.736	2052.6	2073.74	0.000008	0.76	6347.04	529.5	0.03
570	500-YR	4015	2047.51	2073.73	2053.78	2073.74	0.00001	0.86	5178.54	588.61	0.03
551	500-YR					Bypass 95 Off-Ramp					
531	500-YR	4015	2047.51	2073.727	2053.74	2073.74	0.000012	0.91	4909.6	521.65	0.03
496	500-YR	4015	2047.11	2073.725	2053.58	2073.74	0.000012	0.93	4685.4	499.07	0.03
466	500-YR					US 95 Mainline Bridge					
436	500-YR	4015	2047.15	2073.722	2053.56	2073.74	0.000014	0.98	4479.27	501.67	0.04
387	500-YR	4015	2045.98	2073.711	2052.23	2073.73	0.000021	1.28	3522.13	322.96	0.04
337	500-YR					Project Bridge: Bridge 3.1 (Existing)					
327	500-YR	4015	2046.75	2073.691	2052.9	2073.72	0.000029	1.5	3008.67	163.88	0.05
1	500-YR	4015	2047.18	2073.7	2053.29	2073.71	0.000006	0.64	6857.8	609.21	0.02

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 0.2% Annual Chance Comparison (Proposed Conditions - Normal Depth)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	500-YR	4015	2050.23	2059.782	0	2059.94	0.000338	3.24	1362.52	196.63	0.2
1581	500-YR	4015	2049.34	2059.699	2054.06	2059.79	0.000249	2.49	1676.86	227.45	0.16
1544	500-YR										Bridge Street
1488	500-YR	4015	2049.54	2059.593	2054.27	2059.72	0.000327	2.88	1481.57	205.23	0.18
1303	500-YR	4015	2048.2	2059.572	0	2059.64	0.000229	2.27	1991.25	258.51	0.13
856	500-YR	4015	2046.95	2059.404	2052.6	2059.53	0.000226	2.92	1487.7	399.28	0.16
570	500-YR	4015	2047.51	2059.31	2053.64	2059.45	0.0003	3.14	1390.73	413.43	0.19
551	500-YR										Bypass 95 Off-Ramp
531	500-YR	4015	2047.51	2059.269	2053.6	2059.43	0.000336	3.31	1284.67	411.97	0.2
496	500-YR	4015	2047.11	2059.259	2053.42	2059.42	0.000317	3.34	1301	281.54	0.19
466	500-YR										US 95 Mainline Bridge
436	500-YR	4015	2047.15	2059.205	2053.38	2059.38	0.000385	3.49	1247.52	281.2	0.2
387	500-YR	4015	2045.98	2059.115	2052.23	2059.35	0.000378	4.01	1134.4	145.32	0.21
374	500-YR										Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)
374	500-YR										Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)
327	500-YR	4015	2046.75	2058.907	2052.9	2059.19	0.000509	4.37	979.41	114.85	0.24
1	500-YR	4015	2047.18	2058.916	2053.3	2058.99	0.0002	2.18	1924.48	283.55	0.14

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 0.2% Annual Chance Comparison (Proposed Conditions - Summer Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	500-YR	4015	2050.23	2062.865	0	2062.94	0.000173	2.22	2000.82	216.54	0.11
1581	500-YR	4015	2049.34	2062.823	2054.06	2062.87	0.000112	1.74	2407.04	239.17	0.09
1544	500-YR										Bridge Street
1488	500-YR	4015	2049.54	2062.777	2054.28	2062.83	0.000144	1.97	2152.48	216.63	0.1
1303	500-YR	4015	2048.2	2062.77	0	2062.8	0.000076	1.58	2836.04	270.11	0.08
856	500-YR	4015	2046.95	2062.739	2052.6	2062.77	0.000073	1.56	3031.54	406.09	0.08
570	500-YR	4015	2047.51	2062.694	2053.78	2062.74	0.000111	1.84	2344.85	447.75	0.09
551	500-YR										Bypass 95 Off-Ramp
531	500-YR	4015	2047.51	2062.679	2053.74	2062.73	0.000124	1.95	2204.28	438.2	0.1
496	500-YR	4015	2047.11	2062.676	2053.58	2062.73	0.000117	1.94	2225.44	295.15	0.1
466	500-YR										US 95 Mainline Bridge
436	500-YR	4015	2047.15	2062.661	2053.56	2062.72	0.000131	1.99	2189.72	293.14	0.1
387	500-YR	4015	2045.98	2062.596	2052.23	2062.7	0.000197	2.7	1684.72	251.82	0.13
374	500-YR										Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)
374	500-YR										Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)
327	500-YR	4015	2046.75	2062.488	2052.9	2062.63	0.000275	3.07	1408.89	125.04	0.15
1	500-YR	4015	2047.18	2062.5	2053.29	2062.53	0.000072	1.42	2996.94	315.99	0.07

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 0.2% Annual Chance Comparison (Proposed Conditions - FEMA Pool)

River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1974	500-YR	4015	2050.23	2073.747	0	2073.76	0.000014	1	4697.12	270.26	0.04
1581	500-YR	4015	2049.34	2073.744	2054.06	2073.75	0.00001	0.83	5174.41	268.72	0.03
1544	500-YR										Bridge Street
1488	500-YR	4015	2049.54	2073.738	2054.28	2073.75	0.000013	0.92	4798.21	291.51	0.03
1303	500-YR	4015	2048.2	2073.739	0	2073.75	0.000007	0.74	6078.69	331.61	0.03
856	500-YR	4015	2046.95	2073.736	2052.6	2073.74	0.000008	0.76	6346.87	529.48	0.03
570	500-YR	4015	2047.51	2073.729	2053.78	2073.74	0.00001	0.86	5178.4	588.6	0.03
551	500-YR										Bypass 95 Off-Ramp
531	500-YR	4015	2047.51	2073.726	2053.74	2073.74	0.000012	0.91	4909.46	521.65	0.03
496	500-YR	4015	2047.11	2073.725	2053.58	2073.74	0.000012	0.93	4685.28	499.06	0.03
466	500-YR										US 95 Mainline Bridge
436	500-YR	4015	2047.15	2073.721	2053.56	2073.74	0.000014	0.98	4479.17	501.67	0.04
387	500-YR	4015	2045.98	2073.71	2052.23	2073.73	0.000021	1.28	3522.05	322.96	0.04
374	500-YR										Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)
374	500-YR										Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)
327	500-YR	4015	2046.75	2073.691	2052.9	2073.72	0.000029	1.5	3008.67	163.88	0.05
1	500-YR	4015	2047.18	2073.7	2053.29	2073.71	0.000006	0.64	6857.89	609.21	0.02

Construction of Bridge 3.1 Over Sand Creek near Sandpoint, ID - 0.2% Annual Chance Comparison

	Proposed Conditions (Normal Depth)	Proposed Conditions (Summer Pool)	Proposed Conditions (FEMA Regulatory Pool)	Existing Conditions (Normal Depth)	Existing Conditions (Summer Pool)	Existing Conditions (FEMA Regulatory Pool)	Proposed Impacts (Normal Depth)	Proposed Impacts (Summer Pool)	Project Impacts (FEMA Regulatory Pool)
River Sta	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	W.S. Elev (ft, NAVD88)	Δ W.S. Elev Prop -Existing (ft)	Δ W.S. Elev Prop -Existing (ft)	Δ W.S. Elev Prop -Existing (ft)
1974	2059.8	2062.9	2073.7	2059.8	2062.9	2073.7	0.0	0.0	0.0
1581	2059.7	2062.8	2073.7	2059.7	2062.8	2073.7	0.0	0.0	0.0
1544	Bridge Street								
1488	2059.6	2062.8	2073.7	2059.6	2062.8	2073.7	0.0	0.0	0.0
1303	2059.6	2062.8	2073.7	2059.6	2062.8	2073.7	0.0	0.0	0.0
856	2059.4	2062.7	2073.7	2059.4	2062.7	2073.7	0.0	0.0	0.0
570	2059.3	2062.7	2073.7	2059.3	2062.7	2073.7	0.0	0.0	0.0
551	Bypass 95 Off-Ramp								
531	2059.3	2062.7	2073.7	2059.3	2062.7	2073.7	0.0	0.0	0.0
496	2059.3	2062.7	2073.7	2059.3	2062.7	2073.7	0.0	0.0	0.0
466	US 95 Mainline Bridge								
436	2059.2	2062.7	2073.7	2059.2	2062.7	2073.7	0.0	0.0	0.0
387	2059.1	2062.6	2073.7	2059.1	2062.6	2073.7	0.0	0.0	0.0
374	Upstream Bridge Face - Project Bridge: Bridge 3.1 (Proposed)								
374	Downstream Bridge Face - Project Bridge: Bridge 3.1 (Existing)								
327	2058.9	2062.5	2073.7	2058.9	2062.5	2073.7	0.0	0.0	0.0
1	2058.9	2062.5	2073.7	2058.9	2062.5	2073.7	0.0	0.0	0.0

**Attachment H: No-rise Certification
Design Certification**

"NO-RISE" Certification

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Idaho.

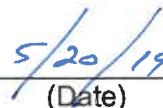
It is further to certify that the attached technical document supports the determination that the proposed construction of BNSF Bridge 3.1 over Sand Creek near its confluence with Lake Pend Oreille near Sandpoint, Idaho will not impact the 100-year flood elevations, floodway elevations, or floodway widths on Sand Creek at published cross-sections in the Flood Insurance Study for Bonner County, Idaho and incorporated areas dated July 7, 2014 and will not impact the 100-year flood elevations, floodway elevations, or floodway widths at unpublished cross-sections in the vicinity of the proposed development.

Attached are the following documents that support my findings:

- 14R0057 –Bridge 3.1 over Sand Creek H&H Technical Summary Memorandum



(Signature)



(Date)

Name: Anthony K. Comerio, P.E., CFM

Title: Chief Water Resources Engineer

License Number: 18024

P.E Seal



Design Certification

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Idaho.

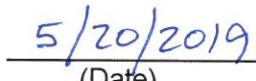
It is further to certify that the project has been designed in accordance with the General Standards of Bonner County Revised Code Section 14-501.

Attached are the following preliminary documents that further describe the proposed construction.

- BNSF Bridge 3.1 over Sand Creek – 95% Preliminary dated May 15, 2019, sheets 3-4 and 9-13



(Signature)



(Date)

Name: Mathew A. Fletcher, P.E.

Title: Structural Engineer

License Number: 15947

P.E Seal



Exp. Date: 2/28/2021