Appendix K

CLOMR Letters of Determination

Houston Engineering Inc.

Bismarck ND | HEI No. 6680_007
August 29, 2017

BNSF RAILWAY BRIDGE MP 196.6 LS 0038 MISSOURI RIVER CLOMR SUPPORT DOCUMENT

Conditional Letter of Map Revision Application
City of Bismarck and Mandan, ND

BNSF MP 196.6 LS 0038
BRIDGE REPLACEMENT PROJECT

CLOMR SUPPORT DOCUMENT

Conditional Letter of Map Revision Application
City of Bismarck and Mandan, ND

August 29, 2017

HoustonEngineering Inc.

Houston Engineering, Inc.
6901 E Fish Lake Rd., Suite 140
Maple Grove, MN 55369
Phone # 763-493-4522
HEI No. 6680_007

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the state of North Dakota

REGISTERED PROFESSIONAL ENGINEER
ADAM N. NIES
PE-10101
DATE
NORTH DAKOTA

Adam N. Nies
ND Reg. No. 10101

8-29-2017

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INTRODUCTION

This report provides support documentation for the BNSF MP 196.6 LS 0038 bridge replacement project (Project) Conditional Letter of Map Revision (CLOMR) submittal. The MT-2 forms, revised mapping, and supporting information are being submitted as part of the CLOMR package.

PROJECT LOCATION AND DESCRIPTION

The Project spans the Missouri River, connecting the Cities of Bismarck and Mandan, ND. Figure 1 shows the Project location with respect to the greater Bismarck-Mandan area.

The Project includes removal of the existing BNSF bridge over the Missouri River, and placement of the proposed bridge adjacent to, and just upstream of, the existing bridge. The new bridge is located within a FEMA defined Special Flood Hazard Area (SFHA), and is within a FEMA designated floodway. The Bridge is located and mapped on the effective FIRM Map No. 38015C Panel No. 0780D (Burleigh Co.), and on Map No. 38059C Panel No. 0505D (Morton Co.)

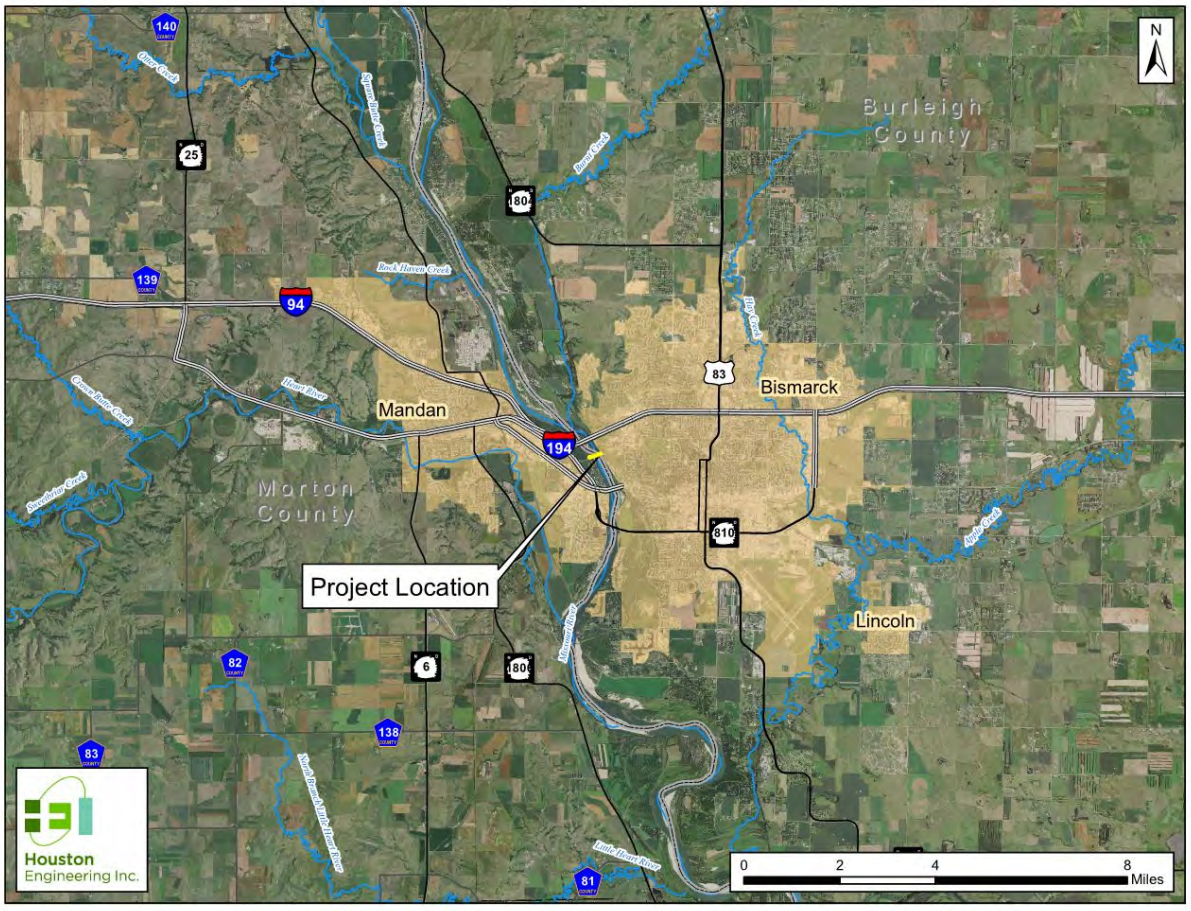

Figure 1: Location Map

SUPPLEMENTAL INFORMATION FOR MT-2 FORMS

The MT-2 forms are supplied in Appendix A – MT-2 Forms of this CLOMR submittal. The MT-2 forms provide the primary documentation, and this report supplies additional supporting information.

HYDROLOGY

Hydrology was not revised from the effective FIS. Table 1 displays an excerpt from the Burleigh County Effective FIS for discharges on the Missouri River. Note that the Project is located upstream of the Heart River Confluence.

Table 1: Missouri River Effective Peak Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharge (cfs)			
		10 - Percent	2 - Percent	1 - Percent	0.2 - Percent
Missouri River					
Below Heart River Confluence	189,710	68,500	104,000	121,500	193,000
Above Heart River Confluence	186,400	57,000	81,500	94,000	148,000

HYDRAULICS

The hydraulic analysis utilized the Hydrologic Engineering Center – River Analysis System hydraulic model developed for the Burleigh and Morton County Flood Insurance Studies. HEC-RAS v5.0.3 was used for this analysis. The model has been truncated so as to represent the river reach that pertains to the project, and is further defined in Table 2, which displays the upstream and downstream limits of this analysis. The model contains cross section data that defines the channel geometry and riverine characteristics. There are several bridge crossings located within the effective modeled reach of the Missouri River, but the traditional bridge routine was not utilized to represent these crossings in the effective FIS hydraulic model. Instead, the channel bathymetry within cross sections located at the river crossings were modified so as to represent the piers and the reduction in conveyance area under each of the bridges. It is thought that this was done because the low member elevations for the bridges is significantly higher than the 500-year water surface elevations. As part of this CLOMR submittal, the BNSF bridge has been modeled through the use of the standard bridge routine within HEC-RAS, while any other bridge in the modeled reach remains consistent with the effective FIS, as cross sections only. In addition to the bridge detail defined for the Project, several additional cross sections were placed in the model adjacent to the BNSF Bridge, utilizing survey data obtained as part of the Project. This additional detail was incorporated into the corrected effective model as well as the post-project model so as to have a justifiable comparison of impacts.

Table 1: Affected River Reach – Modeled Cross Sections

Reach to be Revised	Description	Cross Section	Water Surface Elevation (ft)	
			Effective	Proposed/Revised
Downstream Limit	1,800 feet downstream of BNSF Proposed Bridge	131464 (AH)	1637.79	1637.79
Upstream Limit	13 miles upstream of BNSF Proposed Bridge	132864 (AS)	1644.87	1644.87

The effective model references vertical datum NGVD29. The Burleigh County FIS uses a datum conversion of 1.36 ft. to convert NGVD29 to NAVD88, while the Morton County FIS uses a datum conversion of 1.3 ft. For this analysis, a calculation was completed through the use of Vertcon, and a vertical conversion of 1.34 ft. was obtained, and will be used for reporting purposes. The model will be left consistent with the effective FIS in NGVD29, but all reported elevations in this report reference vertical datum NAVD88 in order to be consistent and transferrable to all design documents.

For verification purposes, the modeling was run through cHECk-RAS, which is a FEMA recommended process prior to model submittal that validates model parameters used in the analysis. The results are provided in Appendix B – Hydraulic Analysis. Also included in the Appendix B submittal package, the HEC-RAS model has been packaged up and includes the plan names and numbers as outlined in Table 3. The Duplicate Effective model is the base model from the Effective FIS, run with four profiles including the 10-, 50-, 100-, and 500-year flood event profiles. The Floodway Encroachment runs (FWE) include just the base 100yr flood, and the encroached 100yr flood event. The Corrected Effective modeling incorporates the bridge modeling updates as previously mentioned, and adds new cross sections based on survey data acquired for the project, essentially creating a revised existing conditions model. The Post-Project Conditions model builds upon the modeling established in the Corrected Effective Model, and incorporates the proposed bridge design.

Table 2: HEC-RAS Models Submitted

Models Submitted	Natural Run		Floodway Run		Datum
	File Name:	Plan Name:	File Name:	Plan Name:	
Duplicate Effective Model	50thAVEs .p01	Duplicate Effective	50thAVEs .p04	Duplicate Effective FWE	NAVD88
Corrected Effective Model	50thAVEs .p02	Corrected Effective	50thAVEs .p05	Corrected Effective FWE	NAVD88
Existing or Pre-Project Conditions Model	50thAVEs .p02	Corrected Effective	50thAVEs .p05	Corrected Effective FWE	NAVD88
Revised or Post-Project Conditions Model	50thAVEs .p03	Post-Project	50thAVEs .p06	Post-Project FWE	NAVD88

The hydraulic analysis showed a maximum impact to the 100yr water surface elevation of 0.02 ft when comparing the Corrected Effective model and the Post-Project Conditions model. Hydraulic results are detailed in Table 4. For reference, the BNSF bridge is located between cross sections 131501 and 131500. As part of the Project, several of the proposed piers will be located inside of the regulatory floodway, therefore a floodway analysis was completed to verify surcharges do not exceed the 1.0 foot allowable surcharge. The Project does increase the profile for the floodway run by approximately 0.02 feet, however the max surcharge still remains below the 1.0 foot allowable. Water surface elevations and corresponding surcharges for the corrected effective, and post-project floodway models are detailed in Tables 5 and 6. In addition to the floodway analysis, the 10-, 50-, 100-, and 500-yr events have been analyzed to determine impacts over a range of events, and the HEC-RAS model output tables are presented at the end of this report.

Certified topographic work maps have been created and are included within Appendix C – Topographic Workmap. The mapping includes the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway. They include the HEC-RAS modeled cross sections and transportation data, as well

as relevant political boundaries. In conjunction with the work maps that were created as part of this submittal, a structure impacts check was conducted to determine if there are newly impacted structures or structures with additional flooding as a result of the change. Through the use of tools accessible within GIS, the effective base floodplain was used as a boundary to highlight any insurable structures within the study reach, specifically the portion that generates the 0.02 feet of impact. A total of 64 structures were identified as impacted by the project and will require notification of the process underway. These are structures that are currently in the effective floodplain. Through this mapping, it was confirmed that there are no new structures impacted as a result of the project. This is not a re-mapping effort by FEMA, and no new maps will be created and the floodplain and floodway boundaries will not be revised.

Table 4: 100-year Water Surface Elevations and Project Impacts (NAVD88)

Cross Section Number	Corrected Effective Water Surface Elevation	Post-Project Conditions Water Surface Elevation	Change in Water Surface Elevation
132864	1644.87	1644.87	0.00
132679	1643.58	1643.58	0.00
132553	1642.91	1642.91	0.00
132368	1642.30	1642.30	0.00
132249	1641.98	1641.97	0.00
131988	1640.89	1640.88	0.00
131742	1639.66	1639.66	0.00
131678	1639.43	1639.44	0.01
131585	1639.02	1639.04	0.02
131549	1638.23	1638.25	0.02
131525	1638.20	1638.22	0.02
131502	1638.09	1638.11	0.02
131501	1638.05	1638.07	0.01
131500	1637.97	1637.97	0.00
131499	1637.92	1637.92	0.00
131475	1637.89	1637.89	0.00
131464	1637.79	1637.79	0.00

Table 5: 100-year Floodway Encroachment Corrected Effective Surcharge (NAVD88)

Cross Section Number	Corrected Effective Water Surface Elevation	Floodway Encroachment Water Surface Elevation	Surcharge
132864	1644.87	1645.13	0.25
132679	1643.58	1643.91	0.33
132553	1642.91	1643.29	0.38
132368	1642.30	1642.76	0.45
132249	1641.98	1642.47	0.49
131988	1640.89	1641.49	0.60
131742	1639.66	1640.44	0.78
131678	1639.43	1640.25	0.82
131585	1639.02	1639.74	0.72
131549	1638.23	1639.05	0.81
131525	1638.20	1639.03	0.83
131502	1638.09	1638.92	0.83
131501	1638.05	1638.88	0.83
131500	1637.97	1638.82	0.85
131499	1637.92	1638.78	0.86
131475	1637.89	1638.76	0.87
131464	1637.79	1638.68	0.88

Table 6: 100-year Floodway Encroachment Post Project Surcharge (NAVD88)

Cross Section Number	Post-Project Water Surface Elevation	Floodway Encroachment Water Surface Elevation	Surcharge
132864	1644.87	1645.13	0.26
132679	1643.58	1643.92	0.34
132553	1642.91	1643.30	0.39
132368	1642.30	1642.76	0.46
132249	1641.97	1642.48	0.50
131988	1640.88	1641.50	0.62
131742	1639.66	1640.45	0.80
131678	1639.44	1640.26	0.82
131585	1639.04	1639.76	0.72
131549	1638.25	1639.07	0.81
131525	1638.22	1639.04	0.83
131502	1638.11	1638.93	0.83
131501	1638.07	1638.90	0.83
131500	1637.97	1638.82	0.85
131499	1637.92	1638.78	0.86
131475	1637.89	1638.76	0.87
131464	1637.79	1638.68	0.88

HEC-RAS MODEL OUTPUT (NGVD 29)

Duplicate Effective Model

HEC-RAS Plan: Duplicate FWE River: Missouri River Reach: Bismarck-Mandan

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Bismarck-Mandan	132864	100-year	94000	1615.8	1643.52		1643.9	0.0	4.65	20203	1327	0
Bismarck-Mandan	132864	Floodway	94000	1615.8	1643.77		1644.1	0.0	4.58	20538	1329	0
Bismarck-Mandan	132679	100-year	94000	1612.8	1642.22	1629.9	1642.4	0.0	3.71	27674	5054	0
Bismarck-Mandan	132679	Floodway	94000	1612.8	1642.55	1629.9	1642.8	0.0	3.63	25882	2050	0
Bismarck-Mandan	132553	100-year	94000	1618.8	1641.55	1629.4	1641.7	0.0	3.38	27796	3788	0
Bismarck-Mandan	132553	Floodway	94000	1618.8	1641.93	1629.4	1642.1	0.0	3.30	28447	1718	0
Bismarck-Mandan	132368	100-year	94000	1609.5	1640.93	1626.2	1641.0	0.0	2.24	42132	7400	0
Bismarck-Mandan	132368	Floodway	94000	1609.5	1641.39	1626.2	1641.5	0.0	2.14	43946	4228	0
Bismarck-Mandan	132249	100-year	94000	1611.5	1640.60	1626.6	1640.7	0.0	2.40	39247	9178	0
Bismarck-Mandan	132249	Floodway	94000	1611.5	1641.10	1626.6	1641.2	0.0	2.30	40845	3404	0
Bismarck-Mandan	131988	100-year	94000	1608.2	1639.50	1625.7	1639.7	0.0	3.36	30209	4938	0
Bismarck-Mandan	131988	Floodway	94000	1608.2	1640.11	1625.7	1640.3	0.0	3.25	28887	1917	0
Bismarck-Mandan	131742	100-year	94000	1611.3	1638.26	1623.6	1638.4	0.0	2.47	38001	7437	0
Bismarck-Mandan	131742	Floodway	94000	1611.3	1639.05	1623.6	1639.1	0.0	2.31	40665	3362	0
Bismarck-Mandan	131678	100-year	94000	1607.8	1638.02	1622.9	1638.1	0.0	2.09	45823	6410	0
Bismarck-Mandan	131678	Floodway	94000	1607.8	1638.86	1622.9	1638.9	0.0	1.96	47906	3764	0
Bismarck-Mandan	131585	100-year	94000	1607.3	1637.61	1623.7	1637.8	0.0	3.23	33792	4550	0
Bismarck-Mandan	131585	Floodway	94000	1607.3	1638.35	1623.7	1638.6	0.0	3.77	24938	1322	0
Bismarck-Mandan	131552	100-year	94000	1596.7	1636.88	1618.6	1637.4	0.0	5.99	16051	3946	0
Bismarck-Mandan	131552	Floodway	94000	1596.7	1637.70	1618.6	1638.2	0.0	5.79	16628	761	0
Bismarck-Mandan	131551	100-year	94000	1596.7	1636.82	1619.7	1637.4	0.0	6.20	15519	2381	0
Bismarck-Mandan	131551	Floodway	94000	1596.7	1637.65	1619.7	1638.2	0.0	5.99	16193	814	0
Bismarck-Mandan	131550	100-year	94000	1596.7	1636.81	1619.3	1637.4	0.0	6.13	15696	2378	0
Bismarck-Mandan	131550	Floodway	94000	1596.7	1637.64	1619.3	1638.2	0.0	5.92	16371	814	0
Bismarck-Mandan	131549	100-year	94000	1596.7	1636.82	1618.6	1637.4	0.0	6.00	16024	2393	0
Bismarck-Mandan	131549	Floodway	94000	1596.7	1637.65	1618.6	1638.2	0.0	5.80	16708	826	0
Bismarck-Mandan	131502	100-year	94000	1600.6	1636.64	1620.1	1637.0	0.0	4.85	19408	5322	0
Bismarck-Mandan	131502	Floodway	94000	1600.6	1637.50	1620.1	1637.8	0.0	4.66	20179	926	0
Bismarck-Mandan	131501	100-year	94000	1600.6	1636.62	1620.3	1637.0	0.0	4.92	19434	4830	0
Bismarck-Mandan	131501	Floodway	94000	1600.6	1637.48	1620.3	1637.8	0.0	4.73	19853	917	0
Bismarck-Mandan	131500	100-year	94000	1600.6	1636.61	1620.3	1637.0	0.0	4.92	19424	4822	0
Bismarck-Mandan	131500	Floodway	94000	1600.6	1637.47	1620.3	1637.8	0.0	4.74	19845	917	0
Bismarck-Mandan	131499	100-year	94000	1600.6	1636.61	1620.1	1637.0	0.0	4.86	19379	5292	0
Bismarck-Mandan	131499	Floodway	94000	1600.6	1637.47	1620.1	1637.8	0.0	4.66	20152	926	0
Bismarck-Mandan	131464	100-year	94000	1610.5	1636.45	1622.0	1636.7	0.0	4.05	23455	5534	0
Bismarck-Mandan	131464	Floodway	94000	1610.5	1637.34	1622.1	1637.6	0.0	3.87	24275	1198	0

Corrected Effective Model

HEC-RAS Plan: Corrected FWE River: Missouri River Reach: Bismarck-Mandan

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Bismarck-Mandan	132864	100-year	94000	1615.8	1643.53		1643.9	0.0	4.65	20222	1327	0
Bismarck-Mandan	132864	Floodway	94000	1615.8	1643.79		1644.1	0.0	4.57	20558	1329	0
Bismarck-Mandan	132679	100-year	94000	1612.8	1642.24	1629.9	1642.5	0.0	3.70	27780	5068	0
Bismarck-Mandan	132679	Floodway	94000	1612.8	1642.57	1629.9	1642.8	0.0	3.63	25924	2050	0
Bismarck-Mandan	132553	100-year	94000	1618.8	1641.57	1629.4	1641.7	0.0	3.38	27838	3839	0
Bismarck-Mandan	132553	Floodway	94000	1618.8	1641.95	1629.4	1642.1	0.0	3.30	28488	1718	0
Bismarck-Mandan	132368	100-year	94000	1609.5	1640.96	1626.2	1641.0	0.0	2.23	42259	7452	0
Bismarck-Mandan	132368	Floodway	94000	1609.5	1641.42	1626.2	1641.5	0.0	2.13	44064	4228	0
Bismarck-Mandan	132249	100-year	94000	1611.5	1640.64	1626.6	1640.7	0.0	2.39	39364	9245	0
Bismarck-Mandan	132249	Floodway	94000	1611.5	1641.13	1626.6	1641.2	0.0	2.30	40948	3404	0
Bismarck-Mandan	131988	100-year	94000	1608.2	1639.55	1625.7	1639.7	0.0	3.35	30342	5037	0
Bismarck-Mandan	131988	Floodway	94000	1608.2	1640.15	1625.7	1640.3	0.0	3.25	28959	1917	0
Bismarck-Mandan	131742	100-year	94000	1611.3	1638.32	1623.6	1638.4	0.0	2.46	38196	7441	0
Bismarck-Mandan	131742	Floodway	94000	1611.3	1639.10	1623.6	1639.2	0.0	2.30	40828	3362	0
Bismarck-Mandan	131678	100-year	94000	1607.8	1638.08	1622.9	1638.2	0.0	2.08	46066	6418	0
Bismarck-Mandan	131678	Floodway	94000	1607.8	1638.91	1622.9	1639.0	0.0	1.95	48098	3764	0
Bismarck-Mandan	131585	100-year	94000	1607.3	1637.68	1623.7	1637.8	0.0	3.22	34002	4639	0
Bismarck-Mandan	131585	Floodway	94000	1607.3	1638.40	1623.7	1638.6	0.0	3.76	25012	1322	0
Bismarck-Mandan	131552	100-year	94000	1596.7	1636.95	1618.6	1637.5	0.0	5.97	16108	3977	0
Bismarck-Mandan	131552	Floodway	94000	1596.7	1637.76	1618.6	1638.3	0.0	5.78	16674	761	0
Bismarck-Mandan	131551	100-year	94000	1596.7	1636.89	1619.7	1637.5	0.0	6.18	15578	2415	0
Bismarck-Mandan	131551	Floodway	94000	1596.7	1637.71	1619.7	1638.3	0.0	5.98	16242	814	0
Bismarck-Mandan	131550	100-year	94000	1596.7	1636.89	1619.3	1637.5	0.0	6.11	15755	2413	0
Bismarck-Mandan	131550	Floodway	94000	1596.7	1637.70	1619.3	1638.2	0.0	5.91	16420	814	0
Bismarck-Mandan	131549	100-year	94000	1596.7	1636.89	1618.6	1637.4	0.0	5.99	16084	2427	0
Bismarck-Mandan	131549	Floodway	94000	1596.7	1637.71	1618.6	1638.2	0.0	5.79	16759	826	0
Bismarck-Mandan	131525	100-year	94000	1606.4	1636.86	1620.8	1637.2	0.0	4.93	19596	5094	0
Bismarck-Mandan	131525	Floodway	94000	1606.4	1637.69	1620.8	1638.0	0.0	4.75	20246	955	0
Bismarck-Mandan	131502	100-year	94000	1602.2	1636.74	1620.6	1637.1	0.0	4.90	20456	4244	0
Bismarck-Mandan	131502	Floodway	94000	1602.2	1637.58	1620.6	1637.9	0.0	4.77	20147	915	0
Bismarck-Mandan	131501	100-year	94000	1602.2	1636.71	1620.6	1637.1	0.0	5.02	19805	4453	0
Bismarck-Mandan	131501	Floodway	94000	1602.2	1637.54	1620.6	1637.9	0.0	4.89	19761	909	0
Bismarck-Mandan	131500.5		Bridge									
Bismarck-Mandan	131500	100-year	94000	1601.5	1636.63	1620.4	1637.0	0.0	5.10	19422	4990	0
Bismarck-Mandan	131500	Floodway	94000	1601.5	1637.48	1620.4	1637.9	0.0	4.94	19407	915	0
Bismarck-Mandan	131499	100-year	94000	1601.5	1636.58	1620.4	1637.0	0.0	5.24	18282	4143	0
Bismarck-Mandan	131499	Floodway	94000	1601.5	1637.44	1620.4	1637.8	0.0	5.04	18973	915	0
Bismarck-Mandan	131475	100-year	94000	1610.4	1636.55	1621.2	1636.8	0.0	4.13	22980	6097	0
Bismarck-Mandan	131475	Floodway	94000	1610.4	1637.42	1621.2	1637.7	0.0	3.96	23863	1160	0
Bismarck-Mandan	131464	100-year	94000	1610.5	1636.45	1622.0	1636.7	0.0	4.05	23455	5534	0
Bismarck-Mandan	131464	Floodway	94000	1610.5	1637.34	1622.1	1637.6	0.0	3.87	24275	1198	0

Post Project Model

HEC-RAS Plan: PostProject FWE River: Missouri River Reach: Bismarck-Mandan

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Bismarck-Mandan	132864	100-year	94000	1615.8	1643.53		1643.9	0.0	4.65	20222	1327	0
Bismarck-Mandan	132864	Floodway	94000	1615.8	1643.79		1644.1	0.0	4.57	20564	1329	0
Bismarck-Mandan	132679	100-year	94000	1612.8	1642.24	1629.9	1642.5	0.0	3.70	27777	5068	0
Bismarck-Mandan	132679	Floodway	94000	1612.8	1642.58	1629.9	1642.8	0.0	3.62	25937	2050	0
Bismarck-Mandan	132553	100-year	94000	1618.8	1641.57	1629.4	1641.7	0.0	3.38	27837	3837	0
Bismarck-Mandan	132553	Floodway	94000	1618.8	1641.96	1629.4	1642.1	0.0	3.30	28499	1718	0
Bismarck-Mandan	132368	100-year	94000	1609.5	1640.96	1626.2	1641.0	0.0	2.23	42256	7451	0
Bismarck-Mandan	132368	Floodway	94000	1609.5	1641.42	1626.2	1641.5	0.0	2.13	44098	4228	0
Bismarck-Mandan	132249	100-year	94000	1611.5	1640.63	1626.6	1640.7	0.0	2.39	39361	9243	0
Bismarck-Mandan	132249	Floodway	94000	1611.5	1641.14	1626.6	1641.2	0.0	2.29	40978	3404	0
Bismarck-Mandan	131988	100-year	94000	1608.2	1639.54	1625.7	1639.7	0.0	3.35	30339	5035	0
Bismarck-Mandan	131988	Floodway	94000	1608.2	1640.16	1625.7	1640.3	0.0	3.24	28980	1917	0
Bismarck-Mandan	131742	100-year	94000	1611.3	1638.32	1623.6	1638.4	0.0	2.46	38192	7441	0
Bismarck-Mandan	131742	Floodway	94000	1611.3	1639.11	1623.6	1639.2	0.0	2.30	40875	3362	0
Bismarck-Mandan	131678	100-year	94000	1607.8	1638.10	1622.9	1638.2	0.0	1.98	56792	6420	0
Bismarck-Mandan	131678	Floodway	94000	1607.8	1638.92	1622.9	1639.0	0.0	1.95	48153	3764	0
Bismarck-Mandan	131585	100-year	94000	1607.3	1637.70	1623.7	1637.8	0.0	3.21	34061	4663	0
Bismarck-Mandan	131585	Floodway	94000	1607.3	1638.42	1623.7	1638.6	0.0	3.76	25033	1322	0
Bismarck-Mandan	131552	100-year	94000	1596.7	1636.97	1618.6	1637.5	0.0	5.97	16124	3985	0
Bismarck-Mandan	131552	Floodway	94000	1596.7	1637.78	1618.6	1638.3	0.0	5.78	16687	761	0
Bismarck-Mandan	131551	100-year	94000	1596.7	1636.91	1619.7	1637.5	0.0	6.18	15594	2424	0
Bismarck-Mandan	131551	Floodway	94000	1596.7	1637.73	1619.7	1638.3	0.0	5.97	16256	814	0
Bismarck-Mandan	131550	100-year	94000	1596.7	1636.91	1619.3	1637.5	0.0	6.11	15772	2422	0
Bismarck-Mandan	131550	Floodway	94000	1596.7	1637.72	1619.3	1638.3	0.0	5.90	16434	814	0
Bismarck-Mandan	131549	100-year	94000	1596.7	1636.91	1618.6	1637.5	0.0	5.98	16101	2437	0
Bismarck-Mandan	131549	Floodway	94000	1596.7	1637.73	1618.6	1638.2	0.0	5.79	16773	826	0
Bismarck-Mandan	131525	100-year	94000	1606.4	1636.88	1620.8	1637.3	0.0	4.93	19618	5124	0
Bismarck-Mandan	131525	Floodway	94000	1606.4	1637.70	1620.8	1638.0	0.0	4.75	20262	955	0
Bismarck-Mandan	131502	100-year	94000	1602.2	1636.77	1620.6	1637.1	0.0	4.89	20481	4253	0
Bismarck-Mandan	131502	Floodway	94000	1602.2	1637.59	1620.6	1637.9	0.0	4.76	20163	915	0
Bismarck-Mandan	131501	100-year	94000	1602.2	1636.73	1620.6	1637.1	0.0	5.02	19827	4467	0
Bismarck-Mandan	131501	Floodway	94000	1602.2	1637.56	1620.6	1637.9	0.0	4.88	19777	909	0
Bismarck-Mandan	131500.5		Bridge									
Bismarck-Mandan	131500	100-year	94000	1601.5	1636.63	1620.4	1637.0	0.0	5.10	19422	4990	0
Bismarck-Mandan	131500	Floodway	94000	1601.5	1637.48	1620.4	1637.9	0.0	4.94	19407	915	0
Bismarck-Mandan	131499	100-year	94000	1601.5	1636.58	1620.4	1637.0	0.0	5.24	18282	4143	0
Bismarck-Mandan	131499	Floodway	94000	1601.5	1637.44	1620.4	1637.8	0.0	5.04	18973	915	0
Bismarck-Mandan	131475	100-year	94000	1610.4	1636.55	1621.2	1636.8	0.0	4.13	22980	6097	0
Bismarck-Mandan	131475	Floodway	94000	1610.4	1637.42	1621.2	1637.7	0.0	3.96	23863	1160	0
Bismarck-Mandan	131464	100-year	94000	1610.5	1636.45	1622.0	1636.7	0.0	4.05	23455	5534	0
Bismarck-Mandan	131464	Floodway	94000	1610.5	1637.34	1622.1	1637.6	0.0	3.87	24275	1198	0

APPENDIX A

MT-2 Forms

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☒ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
380149	City of Bismarck	ND	38015C	0780D	08/04/2014
380072	City of Mandan	ND	38059C	0505D	04/19/2005

2. a. Flooding Source: Missouri River

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: BNSF Railway Bridge MP 196.6 LS0038

4. FEMA zone designations affected: AE (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☒ Physical Change ☐ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☐ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☐ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

   b. The area of revision encompasses the following structures (check all that apply)

Structures:	☐ Channelization	☐ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☐ Fill	☐ Other (Attach Description)

6. ☒ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $6,500

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Adam N. Nies	Company: Houston Engineering, Inc.	
Mailing Address: 6901 E Fish Lake Road, Suite 140 Maple Grove, MN 55369	Daytime Telephone No.: 763-493-4522	Fax No.: 763-493-5572
	E-Mail Address: anies@houstoneng.com	
Signature of Requester (required): Adam N Nies	Date: 8-22-2017	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Brady Blaskowski Building Inspections	Community Name: City of Bismarck, ND	
Mailing Address: P.O. Box 5503 Bismarck, ND 58506	Daytime Telephone No.: 701-355-1467	Fax No.: 701-328-3696
	E-Mail Address: bblaskowski@bismarcknd.gov	
Community Official's Signature (required): Brady Blaskowski	Date: 7/31/17	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Adam N. Nies	License No.: PE - 10101	Expiration Date: 12/31/2018
Company Name: Houston Engineering, Inc.	Telephone No.: 763-493-4522	Fax No.: 763-493-5572
Signature: Adam N Nies	Date: 8-22-2017	E-Mail Address: anies@houstoneng.com

Ensure the forms that are appropriate to your revision request are included in your submittal. Form Name and (Number)

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

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DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☒ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

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380072	City of Mandan	ND	38059C	0505D	04/19/2005

2. a. Flooding Source: Missouri River

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: BNSF Railway Bridge MP 196.6 LS0038

4. FEMA zone designations affected: AE (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☒ Physical Change ☐ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☐ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☐ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

   b. The area of revision encompasses the following structures (check all that apply)

Structures:	☐ Channelization	☐ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☐ Fill	☐ Other (Attach Description)

6. ☒ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $6,500

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Adam N. Nies	Company: Houston Engineering, Inc.	
Mailing Address: 6901 E Fish Lake Road, Suite 140 Maple Grove, MN 55369	Daytime Telephone No.: 763-493-4522	Fax No.: 763-493-5572
	E-Mail Address: anies@houstoneng.com	
Signature of Requester (required):	Date: 8-29-2017	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: John Benz, Building Official	Community Name: City of Mandan, ND	
Mailing Address: 205 2nd Ave. NW, Mandan ND 58554	Daytime Telephone No.: 701-667-3230	Fax No.: 701-328-3696
	E-Mail Address: jbenz@cityofmandan.com	
Community Official's Signature (required):	Date: 8-25-17	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Adam N. Nies	License No.: PE - 10101	Expiration Date: 12/31/2018	
Company Name: Houston Engineering, Inc.	Telephone No.: 763-493-4522	Fax No.: 763-493-5572	
Signature:	Date: 8/29/17	E-Mail Address: anies@houstoneng.com	

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Missouri River

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☒ Not revised (skip to section B) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model → Specify Model: _____
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit*	1,800 feet downstream of BNSF Propose Br	131464 (AH)	1636.45	1636.45
Upstream Limit*	13 miles upstream of BNSF Proposed Br	132864 (AS)	1643.53	1643.53

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: HEC-RAS version 5.0.3

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: BNSF_CLOMR.p01	Plan Name: Duplicate Effective	File Name: BNSF_CLOMR.p02	Plan Name: Duplicate Effective FWE	NGVD 29
Corrected Effective Model*	File Name: BNSF_CLOMR.p03	Plan Name: Corrected Effective	File Name: BNSF_CLOMR.p04	Plan Name: Corrected Effective FWE	NGVD 29
Existing or Pre-Project Conditions Model	File Name: BNSF_CLOMR.p03	Plan Name: Corrected Effective	File Name: BNSF_CLOMR.p04	Plan Name: Corrected Effective FWE	NGVD 29
Revised or Post-Project Conditions Model	File Name: BNSF_CLOMR.p05	Plan Name: Post Project	File Name: BNSF_CLOMR.p06	Plan Name: Post Project FWE	NGVD 29
Other - (attach description)	File Name: N/A	Plan Name: N/A	File Name: N/A	Plan Name: N/A	N/A

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: LiDAR and Survey

Source: Bismarck-Mandan Metropolitan Planning Organization Date: 2016

Accuracy: 3 foot by 3 foot cell size

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☒ Yes ☐ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:

   - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

   a. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☐ No If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. NO. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20598-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program; Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Missouri River

Note**:** Fill out one form for each flooding source studied.

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam.....complete Section D
Levee/Floodwall.....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: BNSF Bridge MP 196.6 LS 0038

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Bismarck-Mandan, North Dakota

   Downstream Limit/Cross Section: 131500

   Upstream Limit/Cross Section: 131501

2. Name of Structure: _____

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

3. Name of Structure: _____

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

B. CHANNELIZATION

Flooding Source: _____

Name of Structure: _____

1. Hydraulic Considerations

The channel was designed to carry _____ (cfs) and/or the _____-year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions

☐ Other locations (specify): _____

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☐ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Missouri River

Name of Structure: BNSF Bridge MP 196.6 LS 0038

1. This revision reflects (check one):

☐ Bridge/culvert not modeled in the FIS

☒ Modified bridge/culvert previously modeled in the FIS

☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS v5.0.3
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☐ Dimensions (height, width, span, radius, length)
☐ Shape (culverts only)
☐ Material
☐ Beveling or Rounding
☐ Wing Wall Angle
☐ Skew Angle
☐ Distances Between Cross Sections
☐ Erosion Protection
☐ Low Chord Elevations – Upstream and Downstream
☐ Top of Road Elevations – Upstream and Downstream
☐ Structure Invert Elevations – Upstream and Downstream
☐ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

D. DAM/BASIN

Flooding Source: _____
Name of Structure: _____

1. This request is for (check one): ☐ Existing dam/basin ☐ New dam/basin ☐ Modification of existing dam/basin

2. The dam/basin was designed by (check one): ☐ Federal agency ☐ State agency ☐ Private organization ☐ Local government agency

   Name of the agency or organization: _____

3. The Dam was permitted as (check one): ☐ Federal Dam ☐ State Dam

   Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

   Permit or ID number _____ Permitting Agency or Organization _____

   a. ☐ Local Government Dam ☐ Private Dam

   Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm? (must account for the maximum volume of runoff)

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why debris/sediment analysis was not considered?

6. Does the Base Flood Elevation behind the dam/basin or downstream of the dam/basin change? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin FIS	REVISED
10-year (10%)	_____	_____
50-year (2%)	_____	_____
100-year (1%)	_____	_____
500-year (0.2%)	_____	_____
Normal Pool Elevation	_____	_____

7. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one): ☐ upgrading of an existing levee/floodwall system ☐ a newly constructed levee/floodwall system ☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc. Station _____ to _____
☐ structural floodwall Station _____ to _____
☐ Other (describe): Station _____ to _____

c. Structural Type (check one): ☐ monolithic cast-in place reinforced concrete ☐ reinforced concrete masonry block ☐ sheet piling ☐ Other (describe): _____

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency? _____

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures. Sheet Numbers: _____
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers: _____
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers: _____
4. A layout detail for the embankment protection measures. Sheet Numbers: _____
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, Floodwall structure, closure structures, and pump stations. Sheet Numbers: _____

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☐ No
3.5 feet or more at the upstream end	☐ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope land side is: _____

b. The maximum levee slope flood side is: _____

c. The range of velocities along the levee during the base flood is: _____ (min.) to _____ (max.)

d. Embankment material is protected by (describe what kind): _____

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D_{100}	D_{50}	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:
_____

☐ Overall height: Sta.: _____, height _____ ft.

☐ Limiting foundation soil strength:

Strength ϕ = _____ degrees, c = _____ psf

Slope: SS = _____ (h) to _____ (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):
_____

c. Summary of stability analysis results:

E. LEVEE/FLOODWALL (CONTINUED)

5. Embankment And Foundation Stability (continued)

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is _____ hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): ☐ UBC (1988) ☐ Other (specify): _____

b. Stability analysis submitted provides for: ☐ Overturning ☐ Sliding If not, explain: _____

c. Loading included in the analyses were: ☐ Lateral earth @ P_A = _____ psf; P_p = _____ psf

☐ Surcharge-Slope @ _____, ☐ surface _____ psf

☐ Wind @ P_w = _____ psf

☐ Seepage (Uplift); _____ ☐ Earthquake @ P_{eq} = _____ %g

☐ 1%-annual-chance significant wave height: _____ ft.

☐ 1%-annual-chance significant wave period: _____ sec.

d. Summary of Stability Analysis Results: Factors of Safety.
Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)
Note: (Extend table on an added sheet as needed and reference)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability (continued)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is _____ ft. to _____ ft.

c. Settlement of the levee crest is determined to be primarily from : ☐ Foundation consolidation ☐ Embankment compression ☐ Other (Describe): _____

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: _____ acres
Draining to ponding area: _____ acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: _____ cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

e. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is _____ cfs

h. The length of levee system used to drive this seepage rate in item g: _____ ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants: _____ For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem

Hydrocompaction ☐ is ☐ is not a problem

Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐ No Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No
If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why sediment transport was not considered.

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
☐ Yes ☐ No If the answer is No to any of the above, please attach supporting documentation.

E. LEVEE/FLOODWALL (CONTINUED)

11. Maintenance Plan

Please attach a copy of the fomal maintenance plan for the levee/floodwall

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

CERTIFICATION OF THE LEVEE DOCUMENTION

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: _____ License No.: _____ Expiration Date: _____

Company Name: _____ Telephone No.: _____ Fax No.: _____

Signature: _____ Date: _____ E-Mail Address: _____

F. SEDIMENT TRANSPORT

Flooding Source: _____

Name of Structure: _____

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume _____ acre-feet

Debris load associated with the base flood discharge: Volume _____ acre-feet

Sediment transport rate _____ (percent concentration by volume)

Method used to estimate sediment transport: _____

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: _____

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport: _____

Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

APPENDIX B

Hydraulic Analysis

Check-RAS Report

Corrected Effective

HEC-RAS Project: *bnsf_clomr.prj*
Plan File: *bnsf_clomr.p03*
Geometry File: *bnsf_clomr.g02*
Flow File: Report *bnsf_clomr.f01*
Date: *5/12/2017*

Message ID	Message	Cross sections affected	Comments
BR LF 01	This is ($strucname$). The selected profile is $profilename$. Type of flow is low flow because, 1. EGEL 3 of $egel3$ is less than or equal to MinTopRd of $minelweirflow$. 2. EGEL 3 of $egel3$ is less than MxLoCdU of $mxlocdu$.	131500.5(Bridge-UP)	Please refer to comment key at the end of this appendix
MP SW 01DK	The name of the stream is ($streamname$). The flow regime is subcritical or mixed flow. Starting water-surface elevations are computed from Known WSELs as the downstream boundary condition. Provide backup information on Known water-surface elevations or use same energy slope for all the profiles as the starting boundary condition and rerun the plan.		Comment #3
NT RC 03C	All of the channel "n" values are equal to or less than 0.025. The "n" value of the channel is usually greater than 0.025. The "n" values or the Channel Bank stations should be re-evaluated. Select the Channel Bank stations to include bank slopes and low flow channel to represent a confined cross section. Channel Bank stations must not be placed at the banks of the low flow channel, at the bottom of the channel, or above the 1%-annual-chance water-surface elevation. Let HEC-RAS compute the composite "n" values by using the Horizontal Variation in "n" Values option within the channel (HEC, 2010, HEC-RAS Reference Manual, page 2-6). Or follow the procedure on pages 9 and 52 of (FHWA, 1984) to compute the total channel "n" value. Please submit supporting information on the evaluation of "n" value.	132249; 132368	Comment #4

NT RS 02BDC	This is the Downstream Bridge Section (BRD). The channel n value of $chldn$ for the downstream internal bridge opening section is equal to or larger than the channel n value of $chl2$ at Section 2. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 2. The "n" value for Section 2 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of the higher "n" value.	131500.5(Bridge-DN)	Comment #4
NT RS 02BUC	This is the Upstream Bridge Section (BRU). The channel n value of $chlup$ for the upstream internal bridge opening section is equal to or larger than the channel n value of $chl3$ at Section 3. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 3. The "n" value for Section 3 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of a higher "n" value.	131500.5(Bridge-UP)	Comment #4
ST DT 01B	This is ($strucname$). 'Upstream Dist' of $distup$ in "Bridge Width Table" is less than the height of the bridge opening of $height$. This indicates that Section 3 may not be placed at the foot of the road embankment or wing walls and may not represent the natural valley cross section. Section 3 should be relocated or provide a statement that it represents the natural valley cross section. The HEC-RAS geometry file may need to be recreated using a GIS program. Lengths at Sections 4, 3 and 2 and 'Upstream Dist' should be adjusted.	131500.5(Bridge-UP)	Comment #5
ST DT 02B	This is ($strucname$). 'Downstream Dist' of $distdn$ in 'Bridge Width Table' is less than the height of the bridge opening of $height$. This indicates that Section 2 may not be placed at the foot of the road embankment or wing walls and may not represent the natural valley cross section. Section 2 should be relocated or provide a statement that it represents the natural valley cross section. A HEC-RAS geometry file may need to be recreated using a GIS program. Lengths at Sections 3 and 2 should be adjusted.	131500.5(Bridge-DN)	Comment #5

ST GD 02BD	This is the Downstream Bridge Section. There is only one bridge. However, the low cord line crosses the ground line at more than two locations. The ground and deck/roadway data should be checked.	131500.5(Bridge)	Comment #6
ST GD 02BU	This is the Upstream Bridge Section. There is only one bridge. However, the low cord line crosses the ground line at more than two locations. The ground and deck/roadway data should be checked.	131500.5(Bridge)	Comment #6
ST IF 01S2L	This is Section 2 of a hydraulic structure. The highest flood frequency that has low or pressure flow is $profilename$. However, the Left Ineffective Flow station was not considered at Section 2. The ineffective flow station and elevation should be inserted. The left ineffective flow elevation should be equal to wsel2 of $wsel$. The placement of the left ineffective flow station is explained on page 5-7 of Hydraulic Reference Manual (HEC, 2010).	131500.5(Bridge)	Comment #7
ST IF 01S3L	This is Section 3. The highest flood frequency that has low or pressure flow is $profilename$. However, the Left Ineffective Flow station was not considered at Section 3. The ineffective flow station and elevation should be inserted. The left ineffective flow elevation should be equal to lmntprdu of $lmntprdu$. The placement of the left ineffective flow station is explained on page 5-7 of Hydraulic Reference Manual (HEC, 2010).	131500.5(Bridge)	Comment #7
ST IF 05S2R	This is Section 2 of a hydraulic structure. The right ineffective flow station is within the opening area of the structure. The right ineffective flow station of $ineffstar$ is less than the upstream right abutment station of $abutstar$ at ($strucname$). The Right ineffective flow station should be adjusted.	131500(Bridge)	Comment #8
ST IF 05S3R	This is Section 3 of a hydraulic structure. The right ineffective flow station is within the opening area of the structure. The right ineffective flow station of $ineffstar$ is less than the upstream right abutment station of $abutstar$ at ($strucname$). The Right ineffective flow station should be adjusted.	131501(Bridge)	Comment #8

ST IF 06S2R	This is Section 2. The selected profile is $profilename$. Low or pressure flow occurs at ($strucname$). The Dn_Dist of $dndist$ at the structure is less than the opening height of $openheight$ of the structure. The cHECk-RAS computed right ineffective flow station of $compineffstar$ is greater than the input right ineffective flow station of $ineffstar$. The right ineffective flow station should be adjusted per the help instructions and the HEC-RAS manual.	131500(Bridge)	Comment #7
ST IF 06S3R	This is Section 3. The selected profile is $profilename$. Low or pressure flow occurs at ($strucname$). The Up_Dist of $updist$ at the structure is less than the opening height of $openheight$ of the structure. The cHECk-RAS computed right ineffective flow station of $compineffstar$ is greater than the input right ineffective flow station of $ineffstar$. The right ineffective flow station should be adjusted per the help instructions and the HEC-RAS manual.	131501(Bridge)	Comment #7
ST IF 07S1R	This is Section 1. Right Ineffective flow option was considered at this section. However, it should be a fully expanded cross section. Ineffective flow stations and elevations should be cleared from this section, unless the areas beyond the ineffective flow stations are not within the flow path of the stream. This message should be ignored if this section is Section 3 of the downstream structure.	131499(Bridge)	Comment #7
ST IF 07S4R	This is Section 4. Right Ineffective flow option was considered at this section. However, it should be a fully expanded cross section. Ineffective flow stations and elevations should be cleared from this section, unless the areas beyond the ineffective flow stations are not within the flow path of the stream. This message should be ignored if this section is Section 2 of the upstream structure.	131502(Bridge)	Comment #7
ST IF 09S2L	This is Section 2. The highest flood frequency that is having low flow or pressure flow is $profilename$. The leftineffective flow elevation, Ineff_El_Left, should be equal to or higher than the WSEL at Section 2. However, the Ineff_El_Left of $ineffell$ at the left ineffective flow station $ineffstal$ is lower than the WSEL of $wsel2$ at Section 2. The Ineff_El_Left should be raised to or above the WSEL at Section 2.	131500(Bridge)	Comment #7

ST IF 09S3L	This is Section 3. The highest flood frequency that is having low flow or pressure flow is $profilename$. The left ineffective flow elevation, Ineff_El_Left, should be equal to or higher than the WSEL at Section 3. However, the Ineff_El_Left of $ineffell$ at the left ineffective flow station $ineffstal$ is lower than the WSEL of $wsel3$ at Section 3. The computed Left Upstream Minimum Top Road elevation, LMnTpRdU of $lmntprdu$ is higher than the WSEL of $wsel3$ at Section 3. The Ineff_El_Left should be raised to the computed LMnTpRdU.	131501(Bridge)	Comment #7
XS CD 02	Critical Depth occurs at $assignedname$ flood. Flow Code will be "C". The smallest channel n-value is less than 0.025. Please investigate whether this selection is appropriate	132249; 132368	Comment #4
XS DC 02	Constant discharge used for the entire profile for $assignedname$ flood. At least two discharges should be selected; one at the mouth and the other at the middle of the watershed or above the confluence of a tributary. Or provide explanation why only one discharge should be used. Other flood frequencies should also be checked.		Comment #3
XS DF 01L	Divided flow. Flow code will be DL. The $assignedname$ flood discharge has a divided flow. The starting and ending stations of the cross section should not extend beyond the watershed boundary of the studied stream. Please review the extent of the cross section. If the cross section extends beyond the watershed boundary then the cross sections need to be trimmed and the HEC-RAS geometry file may need to be recreated using a GIS program. Or use the ineffective flow option, if it has not been considered, to limit the extent of the cross section or to block the divided flow area if it is a local depression.	131550; 131551; 132249; 132368	Comment #2
XS DF 01R	Divided flow. Flow code will be DR. The $assignedname$ flood discharge has a divided flow. The starting and ending stations of the cross section should not extend beyond the watershed boundary of the studied stream. Please review the extent of the cross section. If the cross section extends beyond the watershed boundary then the cross section needs to be trimmed and the HEC-RAS geometry file may need to be recreated using a GIS program. Or use the ineffective flow option, if it has not been considered, to limit the extent of the cross section or to block the divided flow area if it is a local depression.	132368; 132553; 132679	Comment #2

XS DT 01	Both the right overbank distance of rob and the left overbank distance of lob are longer than the channel distance of chl . Please review the creation of left overbank, channel and right overbank distances. The HEC-RAS geometry file may need to be recreated using a GIS program. Please resolve the differences among the distances.	131988	Comment #2
XS IF 01R	Flow code will be IR. The area to the right of the ineffective flow station may be considered effective. The $assignedname$ WSEL of $wsel$ is higher than the ground elevation $grelv$ of the Right Ineffective Flow Station. However, it is equal to or lower than the right ineffective flow elevation of $ineffelr$. The lateral structure was not modeled downstream of this River Station. Lower the ineffective flow elevation to the ground elevation to consider the area right of the ineffective flow station as effective, or model a lateral structure if the overflow will take a different flow path. The ineffective flow elevation could be accepted if the area right of the ineffective flow station is non conveyance.	131464; 131475; 131499; 131502; 131525; 131549; 131552	Comment #7

Check-RAS Report

Corrected Effective Floodway Encroachment

HEC-RAS *bnsf_clomr.prj*
Project: Plan File: *bnsf_clomr.p0*
Geometry File: *4*
Flow File: Report *bnsf_clomr.g0*
Date: *2*
bnsf_clomr.f02
5/12/2017

Message ID	Message	Cross sections affected	Comments
BR LF 01	This is ($strucname$). The selected profile is $profilename$. Type of flow is low flow because, 1. EGEL 3 of $egel3$ is less than or equal to MinTopRd of $minelweirflow$. 2. EGEL 3 of $egel3$ is less than MxLoCdU of $mxlocdu$.	131500.5(Bridge-UP)	Please refer to comment key at the end of this appendix
FW FW 01L	The Left encroachment station is within the channel. The Left encroachment station $encrstal$ is more than left channel bank station $stalob$. The left encroachment station should be the same as the left channel bank station.	131499	Comment #1
FW FW 01R	The Right encroachment station is within the channel. The Right encroachment station $encrstar$ is less than right channel bank station $starob$. The right encroachment station should be the same as the right channel bank station.	131475	Comment #1
FW FW 03L	The left channel bank elevation of $lobelev$ is higher than the 1-percent-annual-chance WSEL of $wsel$. Relocate the left channel bank station at or below the 1-percent-annual-chance WSEL. Do not place the bank stations at the bottom of the channel. Do not place the bank stations at the low flow channel. Use the Horizontal Variation in "n" Values option in HEC-RAS to assign different "n" values to the left bank slope, low flow channel, and the right bank slope. Let HEC-RAS compute the composite "n" value based on the depth of flow.	131742; 132249; 132864	Comment #2
FW FW 03R	The right channel bank elevation of $robelev$ is higher than the 1-percent annual chance WSEL of $wsel$. Relocate the right channel bank station at or below the 1-percent annual chance WSEL. Do not place the bank stations at the bottom of the channel. Do not place the bank stations at the low flow channel. Use the Horizontal Variation in "n" Values option in HEC-RAS to assign different "n" values to the left bank slope, low flow channel, and the right bank slope. Let HEC-RAS compute the composite "n" value based on the depth of flow.	132553; 132679; 132864	Comment #2

FW FW 04L	The 1-percent-annual-chance floodplain is outside of the channel. The left station effective of $ineffstal$ for the 1-percent-annual-chance floodplain is less than the left channel bank station $stalob$. However, the left encroachment station $encstal$ is outside of the 1-percent-annual-chance floodplain. Adjust the left encroachment station so that it will be within the floodplain.	131549; 131550; 131551; 131552	Comment #2
FW FW 04R	The 1-percent-annual-chance floodplain is outside of the channel. The right station effective of $ineffstar$ for the 1-percent-annual-chance floodplain is greater than the right channel bank station $starob$. However, the right encroachment station $encstar$ is outside of the 1-percent-annual-chance floodplain. Adjust the right encroachment station so that it will be within the floodplain.	131549; 131550; 131551	Comment #2
FW ST 04S2L	This is Section 2 of a hydraulic structure. The left encroachment station is within the channel. The left encroachment station of $encstal$ is greater than the left bank station of $stalob$. The left encroachment station should be the same as the left channel bank station.	131500	Comment #1
FW ST 04S3L	This is Section 3 of a hydraulic structure. The Left Channel Bank station is outside the Left Abutment station. The left encroachment station is within the channel. The left encroachment station of $encstal$ is greater than the left bank station of $stalob$. The left encroachment station should be the same as the left channel bank station.	131501	Comment #1
FW SW 01M1	The name of the stream is ($streamname$). Encroachment Method 1 is used. Known WS option is used for both the 1%-annual-chance flood and floodway profiles. The floodway profile starting WSEL of $knownwsfw$ is not equal to the 1%-annual-chance flood starting WSEL of $knownws100yr$ plus the allowable surcharge value of $allowsurchrg$. The Normal Depth option with the energy slope of the 1%-annual-chance flood should be used for both profiles and the plan should be rerun. This message may not be applicable when revising only a portion of a hydraulic model.	131464	Comment #3

MP SW 01DK	The name of the stream is ($streamname$). The flow regime is subcritical or mixed flow. Starting water-surface elevations are computed from Known WSELs as the downstream boundary condition. Provide backup information on Known water-surface elevations or use same energy slope for all the profiles as the starting boundary condition and rerun the plan.		Comment #3
NT RC 03C	All of the channel "n" values are equal to or less than 0.025. The "n" value of the channel is usually greater than 0.025. The "n" values or the Channel Bank stations should be re-evaluated. Select the Channel Bank stations to include bank slopes and low flow channel to represent a confined cross section. Channel Bank stations must not be placed at the banks of the low flow channel, at the bottom of the channel, or above the 1%-annual-chance water-surface elevation. Let HEC-RAS compute the composite "n" values by using the Horizontal Variation in "n" Values option within the channel (HEC, 2010, HEC-RAS Reference Manual, page 2-6). Or follow the procedure on pages 9 and 52 of (FHWA, 1984) to compute the total channel "n" value. Please submit supporting information on the evaluation of "n" value.	132249; 132368	Comment #4
NT RS 02BDC	This is the Downstream Bridge Section (BRD). The channel n value of $chldn$ for the downstream internal bridge opening section is equal to or larger than the channel n value of $chl2$ at Section 2. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 2. The "n" value for Section 2 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of the higher "n" value.	131500.5(Bridge-DN)	Comment #4

NT RS 02BUC	This is the Upstream Bridge Section (BRU). The channel n value of $chlup$ for the upstream internal bridge opening section is equal to or larger than the channel n value of $chl3$ at Section 3. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 3. The "n" value for Section 3 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of a higher "n" value.	131500.5(Bridge-UP)	Comment #4
ST DT 01B	This is ($strucname$). 'Upstream Dist' of $distup$ in "Bridge Width Table" is less than the height of the bridge opening of $height$. This indicates that Section 3 may not be placed at the foot of the road embankment or wing walls and may not represent the natural valley cross section. Section 3 should be relocated or provide a statement that it represents the natural valley cross section. The HEC-RAS geometry file may need to be recreated using a GIS program. Lengths at Sections 4, 3 and 2 and 'Upstream Dist' should be adjusted.	131500.5(Bridge-UP)	Comment #5
ST DT 02B	This is ($strucname$). 'Downstream Dist' of $distdn$ in 'Bridge Width Table' is less than the height of the bridge opening of $height$. This indicates that Section 2 may not be placed at the foot of the road embankment or wing walls and may not represent the natural valley cross section. Section 2 should be relocated or provide a statement that it represents the natural valley cross section. A HEC-RAS geometry file may need to be recreated using a GIS program. Lengths at Sections 3 and 2 should be adjusted.	131500.5(Bridge-DN)	Comment #5
ST GD 02BD	This is the Downstream Bridge Section. There is only one bridge. However, the low cord line crosses the ground line at more than two locations. The ground and deck/roadway data should be checked.	131500.5(Bridge)	Comment #6
ST GD 02BU	This is the Upstream Bridge Section. There is only one bridge. However, the low cord line crosses the ground line at more than two locations. The ground and deck/roadway data should be checked.	131500.5(Bridge)	Comment #6

ST IF 01S2L	This is Section 2 of a hydraulic structure. The highest flood frequency that has low or pressure flow is $profilename$. However, the Left Ineffective Flow station was not considered at Section 2. The ineffective flow station and elevation should be inserted. The left ineffective flow elevation should be equal to wsel2 of $wsel$. The placement of the left ineffective flow station is explained on page 5-7 of Hydraulic Reference Manual (HEC, 2010).	131500.5(Bridge)	Comment #6
ST IF 01S3L	This is Section 3. The highest flood frequency that has low or pressure flow is $profilename$. However, the Left Ineffective Flow station was not considered at Section 3. The ineffective flow station and elevation should be inserted. The left ineffective flow elevation should be equal to lmntprdu of $lmntprdu$. The placement of the left ineffective flow station is explained on page 5-7 of Hydraulic Reference Manual (HEC, 2010).	131500.5(Bridge)	Comment #7
ST IF 05S2R	This is Section 2 of a hydraulic structure. The right ineffective flow station is within the opening area of the structure. The right ineffective flow station of $ineffstar$ is less than the upstream right abutment station of $abutstar$ at ($strucname$). The Right ineffective flow station should be adjusted.	131500(Bridge)	Comment #8
ST IF 05S3R	This is Section 3 of a hydraulic structure. The right ineffective flow station is within the opening area of the structure. The right ineffective flow station of $ineffstar$ is less than the upstream right abutment station of $abutstar$ at ($strucname$). The Right ineffective flow station should be adjusted.	131501(Bridge)	Comment #8
ST IF 06S2R	This is Section 2. The selected profile is $profilename$. Low or pressure flow occurs at ($strucname$). The Dn_Dist of $dndist$ at the structure is less than the opening height of $openheight$ of the structure. The cHECk-RAS computed right ineffective flow station of $compineffstar$ is greater than the input right ineffective flow station of $ineffstar$. The right ineffective flow station should be adjusted per the help instructions and the HEC-RAS manual.	131500(Bridge)	Comment #7

ST IF 06S3R	This is Section 3. The selected profile is $profilename$. Low or pressure flow occurs at ($strucname$). The Up_Dist of $updist$ at the structure is less than the opening height of $openheight$ of the structure. The cHECk-RAS computed right ineffective flow station of $compineffstar$ is greater than the input right ineffective flow station of $ineffstar$. The right ineffective flow station should be adjusted per the help instructions and the HEC-RAS manual.	131501(Bridge)	Comment #7
ST IF 07S1R	This is Section 1. Right Ineffective flow option was considered at this section. However, it should be a fully expanded cross section. Ineffective flow stations and elevations should be cleared from this section, unless the areas beyond the ineffective flow stations are not within the flow path of the stream. This message should be ignored if this section is Section 3 of the downstream structure.	131499(Bridge)	Comment #7
ST IF 07S4R	This is Section 4. Right Ineffective flow option was considered at this section. However, it should be a fully expanded cross section. Ineffective flow stations and elevations should be cleared from this section, unless the areas beyond the ineffective flow stations are not within the flow path of the stream. This message should be ignored if this section is Section 2 of the upstream structure.	131502(Bridge)	Comment #7
ST IF 09S2L	This is Section 2. The highest flood frequency that is having low flow or pressure flow is $profilename$. The leftineffective flow elevation, Ineff_El_Left, should be equal to or higher than the WSEL at Section 2. However, the Ineff_El_Left of $ineffell$ at the left ineffective flow station $ineffstal$ is lower than the WSEL of $wsel2$ at Section 2. The Ineff_El_Left should be raised to or above the WSEL at Section 2.	131500(Bridge)	Comment #7

ST IF 09S3L	This is Section 3. The highest flood frequency that is having low flow or pressure flow is $profilename$. The left ineffective flow elevation, Ineff_El_Left, should be equal to or higher than the WSEL at Section 3. However, the Ineff_El_Left of $ineffell$ at the left ineffective flow station $ineffstal$ is lower than the WSEL of $wsel3$ at Section 3. The computed Left Upstream Minimum Top Road elevation, LMnTpRdU of $lmntprdu$ is higher than the WSEL of $wsel3$ at Section 3. The Ineff_El_Left should be raised to the computed LMnTpRdU.	131501(Bridge)	Comment #7
XS CD 02	Critical Depth occurs at $assignedname$ flood. Flow Code will be "C". The smallest channel n-value is less than 0.025. Please investigate whether this selection is appropriate	132249; 132368	Comment #4
XS DC 02	Constant discharge used for the entire profile for $assignedname$ flood. At least two discharges should be selected; one at the mouth and the other at the middle of the watershed or above the confluence of a tributary. Or provide explanation why only one discharge should be used. Other flood frequencies should also be checked.		Comment #3
XS DF 01L	Divided flow. Flow code will be DL. The $assignedname$ flood discharge has a divided flow. The starting and ending stations of the cross section should not extend beyond the watershed boundary of the studied stream. Please review the extent of the cross section. If the cross section extends beyond the watershed boundary then the cross sections need to be trimmed and the HEC-RAS geometry file may need to be recreated using a GIS program. Or use the ineffective flow option, if it has not been considered, to limit the extent of the cross section or to block the divided flow area if it is a local depression.	131585	Comment #2
XS DF 01R	Divided flow. Flow code will be DR. The $assignedname$ flood discharge has a divided flow. The starting and ending stations of the cross section should not extend beyond the watershed boundary of the studied stream. Please review the extent of the cross section. If the cross section extends beyond the watershed boundary then the cross section needs to be trimmed and the HEC-RAS geometry file may need to be recreated using a GIS program. Or use the ineffective flow option, if it has not been considered, to limit the extent of the cross section or to block the divided flow area if it is a local depression.	132679	Comment #2

XS DT 01	Both the right overbank distance of rob and the left overbank distance of lob are longer than the channel distance of chl . Please review the creation of left overbank, channel and right overbank distances. The HEC-RAS geometry file may need to be recreated using a GIS program. Please resolve the differences among the distances.	131988	Comment #2
XS IF 01R	Flow code will be IR. The area to the right of the ineffective flow station may be considered effective. The $assignedname$ WSEL of $wsel$ is higher than the ground elevation $grelv$ of the Right Ineffective Flow Station. However, it is equal to or lower than the right ineffective flow elevation of $ineffelr$. The lateral structure was not modeled downstream of this River Station. Lower the ineffective flow elevation to the ground elevation to consider the area right of the ineffective flow station as effective, or model a lateral structure if the overflow will take a different flow path. The ineffective flow elevation could be accepted if the area right of the ineffective flow station is non conveyance.	131475; 131502	Comment #7
XS SW 01DK	The name of the stream is $streamname$. The flow regime is subcritical or mixed flow. Starting WSEL is computed from Known WSEL as the downstream boundary for $Assigned_Name$ flood. Provide backup information on Known WSEL or use energy slope as the downstream boundary.	131464	Comment #3

Check-RAS Report

Post Project

HEC-RAS Project: *bnsf_clomr.prj*
Plan File: *bnsf_clomr.p05*
Geometry File: *bnsf_clomr.g03*
Flow File: Report *bnsf_clomr.f01*
Date: *5/12/2017*

Message ID	Message	Cross sections affected	Comments
BR LF 01	This is ($strucname$). The selected profile is $profilename$. Type of flow is low flow because, 1. EGEL 3 of $egel3$ is less than or equal to MinTopRd of $minelweirflow$. 2. EGEL 3 of $egel3$ is less than MxLoCdU of $mxlocdu$.	131500.5(Bridge-UP)	Please refer to comment key at the end of this appendix
MP SW 01DK	The name of the stream is ($streamname$). The flow regime is subcritical or mixed flow. Starting water-surface elevations are computed from Known WSELs as the downstream boundary condition. Provide backup information on Known water-surface elevations or use same energy slope for all the profiles as the starting boundary condition and rerun the plan.		Comment #3
NT RC 03C	All of the channel "n" values are equal to or less than 0.025. The "n" value of the channel is usually greater than 0.025. The "n" values or the Channel Bank stations should be re-evaluated. Select the Channel Bank stations to include bank slopes and low flow channel to represent a confined cross section. Channel Bank stations must not be placed at the banks of the low flow channel, at the bottom of the channel, or above the 1%-annual-chance water-surface elevation. Let HEC-RAS compute the composite "n" values by using the Horizontal Variation in "n" Values option within the channel (HEC, 2010, HEC-RAS Reference Manual, page 2-6). Or follow the procedure on pages 9 and 52 of (FHWA, 1984) to compute the total channel "n" value. Please submit supporting information on the evaluation of "n" value.	132249; 132368	Comment #4

NT RS 02BDC	This is the Downstream Bridge Section (BRD). The channel n value of $chldn$ for the downstream internal bridge opening section is equal to or larger than the channel n value of $chl2$ at Section 2. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 2. The "n" value for Section 2 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of the higher "n" value.	131500.5(Bridge-DN)	Comment #4
NT RS 02BUC	This is the Upstream Bridge Section (BRU). The channel n value of $chlup$ for the upstream internal bridge opening section is equal to or larger than the channel n value of $chl3$ at Section 3. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 3. The "n" value for Section 3 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of a higher "n" value.	131500.5(Bridge-UP)	Comment #4
ST DT 01B	This is ($strucname$). 'Upstream Dist' of $distup$ in "Bridge Width Table" is less than the height of the bridge opening of $height$. This indicates that Section 3 may not be placed at the foot of the road embankment or wing walls and may not represent the natural valley cross section. Section 3 should be relocated or provide a statement that it represents the natural valley cross section. The HEC-RAS geometry file may need to be recreated using a GIS program. Lengths at Sections 4, 3 and 2 and 'Upstream Dist' should be adjusted.	131500.5(Bridge-UP)	Comment #5
ST DT 02B	This is ($strucname$). 'Downstream Dist' of $distdn$ in 'Bridge Width Table' is less than the height of the bridge opening of $height$. This indicates that Section 2 may not be placed at the foot of the road embankment or wing walls and may not represent the natural valley cross section. Section 2 should be relocated or provide a statement that it represents the natural valley cross section. A HEC-RAS geometry file may need to be recreated using a GIS program. Lengths at Sections 3 and 2 should be adjusted.	131500.5(Bridge-DN)	Comment #5

ST GD 02BD	This is the Downstream Bridge Section. There is only one bridge. However, the low cord line crosses the ground line at more than two locations. The ground and deck/roadway data should be checked.	131500.5(Bridge)	Comment #5
ST GD 02BU	This is the Upstream Bridge Section. There is only one bridge. However, the low cord line crosses the ground line at more than two locations. The ground and deck/roadway data should be checked.	131500.5(Bridge)	Comment #5
ST IF 01S2L	This is Section 2 of a hydraulic structure. The highest flood frequency that has low or pressure flow is $profilename$. However, the Left Ineffective Flow station was not considered at Section 2. The ineffective flow station and elevation should be inserted. The left ineffective flow elevation should be equal to wsel2 of $wsel$. The placement of the left ineffective flow station is explained on page 5-7 of Hydraulic Reference Manual (HEC, 2010).	131500.5(Bridge)	Comment #5
ST IF 01S3L	This is Section 3. The highest flood frequency that has low or pressure flow is $profilename$. However, the Left Ineffective Flow station was not considered at Section 3. The ineffective flow station and elevation should be inserted. The left ineffective flow elevation should be equal to lmntprdu of $lmntprdu$. The placement of the left ineffective flow station is explained on page 5-7 of Hydraulic Reference Manual (HEC, 2010).	131500.5(Bridge)	Comment #7
ST IF 06S2R	This is Section 2. The selected profile is $profilename$. Low or pressure flow occurs at ($strucname$). The Dn_Dist of $dndist$ at the structure is less than the opening height of $openheight$ of the structure. The cHECk-RAS computed right ineffective flow station of $compineffstar$ is greater than the input right ineffective flow station of $ineffstar$. The right ineffective flow station should be adjusted per the help instructions and the HEC-RAS manual.	131500(Bridge)	Comment #8

ST IF 06S3R	This is Section 3. The selected profile is $profilename$. Low or pressure flow occurs at ($strucname$). The Up_Dist of $updist$ at the structure is less than the opening height of $openheight$ of the structure. The cHECk-RAS computed right ineffective flow station of $compineffstar$ is greater than the input right ineffective flow station of $ineffstar$. The right ineffective flow station should be adjusted per the help instructions and the HEC-RAS manual.	131501(Bridge)	Comment #7
ST IF 07S1R	This is Section 1. Right Ineffective flow option was considered at this section. However, it should be a fully expanded cross section. Ineffective flow stations and elevations should be cleared from this section, unless the areas beyond the ineffective flow stations are not within the flow path of the stream. This message should be ignored if this section is Section 3 of the downstream structure.	131499(Bridge)	Comment #7
ST IF 07S4R	This is Section 4. Right Ineffective flow option was considered at this section. However, it should be a fully expanded cross section. Ineffective flow stations and elevations should be cleared from this section, unless the areas beyond the ineffective flow stations are not within the flow path of the stream. This message should be ignored if this section is Section 2 of the upstream structure.	131502(Bridge)	Comment #7
ST IF 09S2L	This is Section 2. The highest flood frequency that is having low flow or pressure flow is $profilename$. The leftineffective flow elevation, Ineff_El_Left, should be equal to or higher than the WSEL at Section 2. However, the Ineff_El_Left of $ineffell$ at the left ineffective flow station $ineffstal$ is lower than the WSEL of $wsel2$ at Section 2. The Ineff_El_Left should be raised to or above the WSEL at Section 2.	131500(Bridge)	Comment #7

ST IF 09S3L	This is Section 3. The highest flood frequency that is having low flow or pressure flow is $profilename$. The left ineffective flow elevation, Ineff_El_Left, should be equal to or higher than the WSEL at Section 3. However, the Ineff_El_Left of $ineffell$ at the left ineffective flow station $ineffstal$ is lower than the WSEL of $wsel3$ at Section 3. The computed Left Upstream Minimum Top Road elevation, LMnTpRdU of $lmntprdu$ is higher than the WSEL of $wsel3$ at Section 3. The Ineff_El_Left should be raised to the computed LMnTpRdU.	131501(Bridge)	Comment #7
XS CD 02	Critical Depth occurs at $assignedname$ flood. Flow Code will be "C". The smallest channel n-value is less than 0.025. Please investigate whether this selection is appropriate	132249; 132368	Comment #4
XS DC 02	Constant discharge used for the entire profile for $assignedname$ flood. At least two discharges should be selected; one at the mouth and the other at the middle of the watershed or above the confluence of a tributary. Or provide explanation why only one discharge should be used. Other flood frequencies should also be checked.		Comment #3
XS DF 01L	Divided flow. Flow code will be DL. The $assignedname$ flood discharge has a divided flow. The starting and ending stations of the cross section should not extend beyond the watershed boundary of the studied stream. Please review the extent of the cross section. If the cross section extends beyond the watershed boundary then the cross sections need to be trimmed and the HEC-RAS geometry file may need to be recreated using a GIS program. Or use the ineffective flow option, if it has not been considered, to limit the extent of the cross section or to block the divided flow area if it is a local depression.	131550; 131551; 132249; 132368	Comment #2
XS DF 01R	Divided flow. Flow code will be DR. The $assignedname$ flood discharge has a divided flow. The starting and ending stations of the cross section should not extend beyond the watershed boundary of the studied stream. Please review the extent of the cross section. If the cross section extends beyond the watershed boundary then the cross section needs to be trimmed and the HEC-RAS geometry file may need to be recreated using a GIS program. Or use the ineffective flow option, if it has not been considered, to limit the extent of the cross section or to block the divided flow area if it is a local depression.	132368; 132553; 132679	Comment #2

XS DT 01	Both the right overbank distance of rob and the left overbank distance of lob are longer than the channel distance of chl . Please review the creation of left overbank, channel and right overbank distances. The HEC-RAS geometry file may need to be recreated using a GIS program. Please resolve the differences among the distances.	131988	Comment #2
XS IF 01R	Flow code will be IR. The area to the right of the ineffective flow station may be considered effective. The $assignedname$ WSEL of $wsel$ is higher than the ground elevation $grelv$ of the Right Ineffective Flow Station. However, it is equal to or lower than the right ineffective flow elevation of $ineffelr$. The lateral structure was not modeled downstream of this River Station. Lower the ineffective flow elevation to the ground elevation to consider the area right of the ineffective flow station as effective, or model a lateral structure if the overflow will take a different flow path. The ineffective flow elevation could be accepted if the area right of the ineffective flow station is non conveyance.	131464; 131475; 131499; 131502; 131525; 131549; 131552	Comment #7

Check-RAS Report

Post Project Floodway Encroachment

HEC-RAS Project: *bnsf_clomr.prj*
Plan File: *bnsf_clomr.p06*
Geometry File: *bnsf_clomr.g03*
Flow File: *bnsf_clomr.f02*
Report Date: *5/12/2017*

Message ID	Message	Cross sections affected	Comments
BR LF 01	This is ($strucname$). The selected profile is $profilename$. Type of flow is low flow because, 1. EGEL 3 of $egel3$ is less than or equal to MinTopRd of $minelweirflow$. 2. EGEL 3 of $egel3$ is less than MxLoCdU of $mxlocdu$.	131500.5(Bridge-UP)	Please refer to comment key at the end of this appendix
FW FW 01L	The Left encroachment station is within the channel. The Left encroachment station $encrstal$ is more than left channel bank station $stalob$. The left encroachment station should be the same as the left channel bank station.	131499	Comment #1
FW FW 01R	The Right encroachment station is within the channel. The Right encroachment station $encrstar$ is less than right channel bank station $starob$. The right encroachment station should be the same as the right channel bank station.	131475	Comment #1
FW FW 03L	The left channel bank elevation of $lobelev$ is higher than the 1-percent-annual-chance WSEL of $wsel$. Relocate the left channel bank station at or below the 1-percent-annual-chance WSEL. Do not place the bank stations at the bottom of the channel. Do not place the bank stations at the low flow channel. Use the Horizontal Variation in "n" Values option in HEC-RAS to assign different "n" values to the left bank slope, low flow channel, and the right bank slope. Let HEC-RAS compute the composite "n" value based on the depth of flow.	131742; 132249; 132864	Comment #2
FW FW 03R	The right channel bank elevation of $robelev$ is higher than the 1-percent annual chance WSEL of $wsel$. Relocate the right channel bank station at or below the 1-percent annual chance WSEL. Do not place the bank stations at the bottom of the channel. Do not place the bank stations at the low flow channel. Use the Horizontal Variation in "n" Values option in HEC-RAS to assign different "n" values to the left bank slope, low flow channel, and the right bank slope. Let HEC-RAS compute the composite "n" value based on the depth of flow.	132553; 132679; 132864	Comment #2

FW FW 04L	The 1-percent-annual-chance floodplain is outside of the channel. The left station effective of $ineffstal$ for the 1-percent-annual-chance floodplain is less than the left channel bank station $stalob$. However, the left encroachment station $encstal$ is outside of the 1-percent-annual-chance floodplain. Adjust the left encroachment station so that it will be within the floodplain.	131550; 131551; 131552	Comment #2
FW FW 04R	The 1-percent-annual-chance floodplain is outside of the channel. The right station effective of $ineffstar$ for the 1-percent-annual-chance floodplain is greater than the right channel bank station $starob$. However, the right encroachment station $encstar$ is outside of the 1-percent-annual-chance floodplain. Adjust the right encroachment station so that it will be within the floodplain.	131549; 131550; 131551	Comment #2
FW ST 04S2L	This is Section 2 of a hydraulic structure. The left encroachment station is within the channel. The left encroachment station of $encstal$ is greater than the left bank station of $stalob$. The left encroachment station should be the same as the left channel bank station.	131500	Comment #1
FW ST 04S3L	This is Section 3 of a hydraulic structure. The Left Channel Bank station is outside the Left Abutment station. The left encroachment station is within the channel. The left encroachment station of $encstal$ is greater than the left bank station of $stalob$. The left encroachment station should be the same as the left channel bank station.	131501	Comment #1
FW SW 01M1	The name of the stream is ($streamname$). Encroachment Method 1 is used. Known WS option is used for both the 1%-annual-chance flood and floodway profiles. The floodway profile starting WSEL of $knownwsfw$ is not equal to the 1%-annual-chance flood starting WSEL of $knownws100yr$ plus the allowable surcharge value of $allowsurchrg$. The Normal Depth option with the energy slope of the 1%-annual-chance flood should be used for both profiles and the plan should be rerun. This message may not be applicable when revising only a portion of a hydraulic model.	131464	Comment #3

MP SW 01DK	The name of the stream is ($streamname$). The flow regime is subcritical or mixed flow. Starting water-surface elevations are computed from Known WSELs as the downstream boundary condition. Provide backup information on Known water-surface elevations or use same energy slope for all the profiles as the starting boundary condition and rerun the plan.		Comment #3
NT RC 03C	All of the channel "n" values are equal to or less than 0.025. The "n" value of the channel is usually greater than 0.025. The "n" values or the Channel Bank stations should be re-evaluated. Select the Channel Bank stations to include bank slopes and low flow channel to represent a confined cross section. Channel Bank stations must not be placed at the banks of the low flow channel, at the bottom of the channel, or above the 1%-annual-chance water-surface elevation. Let HEC-RAS compute the composite "n" values by using the Horizontal Variation in "n" Values option within the channel (HEC, 2010, HEC-RAS Reference Manual, page 2-6). Or follow the procedure on pages 9 and 52 of (FHWA, 1984) to compute the total channel "n" value. Please submit supporting information on the evaluation of "n" value.	132249; 132368	Comment #4
NT RS 02BDC	This is the Downstream Bridge Section (BRD). The channel n value of $chldn$ for the downstream internal bridge opening section is equal to or larger than the channel n value of $chl2$ at Section 2. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 2. The "n" value for Section 2 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of the higher "n" value.	131500.5(Bridge-DN)	Comment #4

NT RS 02BUC	This is the Upstream Bridge Section (BRU). The channel n value of $chlup$ for the upstream internal bridge opening section is equal to or larger than the channel n value of $chl3$ at Section 3. Usually, the channel "n" value of the bridge opening section represents the area below the bridge deck and is less than the channel "n" value of Section 3. The "n" value for Section 3 represents the natural valley channel section roughness for the reach between Section 3 and Section 4. Please change the "n" value of the internal bridge opening section or provide supporting information for the use of a higher "n" value.	131500.5(Bridge-UP)	Comment #4
ST DT 01B	This is ($strucname$). 'Upstream Dist' of $distup$ in "Bridge Width Table" is less than the height of the bridge opening of $height$. This indicates that Section 3 may not be placed at the foot of the road embankment or wing walls and may not represent the natural valley cross section. Section 3 should be relocated or provide a statement that it represents the natural valley cross section. The HEC-RAS geometry file may need to be recreated using a GIS program. Lengths at Sections 4, 3 and 2 and 'Upstream Dist' should be adjusted.	131500.5(Bridge-UP)	Comment #5
ST DT 02B	This is ($strucname$). 'Downstream Dist' of $distdn$ in 'Bridge Width Table' is less than the height of the bridge opening of $height$. This indicates that Section 2 may not be placed at the foot of the road embankment or wing walls and may not represent the natural valley cross section. Section 2 should be relocated or provide a statement that it represents the natural valley cross section. A HEC-RAS geometry file may need to be recreated using a GIS program. Lengths at Sections 3 and 2 should be adjusted.	131500.5(Bridge-DN)	Comment #5
ST GD 02BD	This is the Downstream Bridge Section. There is only one bridge. However, the low cord line crosses the ground line at more than two locations. The ground and deck/roadway data should be checked.	131500.5(Bridge)	Comment #6
ST GD 02BU	This is the Upstream Bridge Section. There is only one bridge. However, the low cord line crosses the ground line at more than two locations. The ground and deck/roadway data should be checked.	131500.5(Bridge)	Comment #6

ST IF 01S2L	This is Section 2 of a hydraulic structure. The highest flood frequency that has low or pressure flow is $profilename$. However, the Left Ineffective Flow station was not considered at Section 2. The ineffective flow station and elevation should be inserted. The left ineffective flow elevation should be equal to wsel2 of $wsel$. The placement of the left ineffective flow station is explained on page 5-7 of Hydraulic Reference Manual (HEC, 2010).	131500.5(Bridge)	Comment #6
ST IF 01S3L	This is Section 3. The highest flood frequency that has low or pressure flow is $profilename$. However, the Left Ineffective Flow station was not considered at Section 3. The ineffective flow station and elevation should be inserted. The left ineffective flow elevation should be equal to lmntprdu of $lmntprdu$. The placement of the left ineffective flow station is explained on page 5-7 of Hydraulic Reference Manual (HEC, 2010).	131500.5(Bridge)	Comment #7
ST IF 06S2R	This is Section 2. The selected profile is $profilename$. Low or pressure flow occurs at ($strucname$). The Dn_Dist of $dndist$ at the structure is less than the opening height of $openheight$ of the structure. The cHECk-RAS computed right ineffective flow station of $compineffstar$ is greater than the input right ineffective flow station of $ineffstar$. The right ineffective flow station should be adjusted per the help instructions and the HEC-RAS manual.	131500(Bridge)	Comment #8
ST IF 06S3R	This is Section 3. The selected profile is $profilename$. Low or pressure flow occurs at ($strucname$). The Up_Dist of $updist$ at the structure is less than the opening height of $openheight$ of the structure. The cHECk-RAS computed right ineffective flow station of $compineffstar$ is greater than the input right ineffective flow station of $ineffstar$. The right ineffective flow station should be adjusted per the help instructions and the HEC-RAS manual.	131501(Bridge)	Comment #7

ST IF 07S1R	This is Section 1. Right Ineffective flow option was considered at this section. However, it should be a fully expanded cross section. Ineffective flow stations and elevations should be cleared from this section, unless the areas beyond the ineffective flow stations are not within the flow path of the stream. This message should be ignored if this section is Section 3 of the downstream structure.	131499(Bridge)	Comment #7
ST IF 07S4R	This is Section 4. Right Ineffective flow option was considered at this section. However, it should be a fully expanded cross section. Ineffective flow stations and elevations should be cleared from this section, unless the areas beyond the ineffective flow stations are not within the flow path of the stream. This message should be ignored if this section is Section 2 of the upstream structure.	131502(Bridge)	Comment #7
ST IF 09S2L	This is Section 2. The highest flood frequency that is having low flow or pressure flow is $profilename$. The leftineffective flow elevation, Ineff_El_Left, should be equal to or higher than the WSEL at Section 2. However, the Ineff_El_Left of $ineffell$ at the left ineffective flow station $ineffstal$ is lower than the WSEL of $wsel2$ at Section 2. The Ineff_El_Left should be raised to or above the WSEL at Section 2.	131500(Bridge)	Comment #7
ST IF 09S3L	This is Section 3. The highest flood frequency that is having low flow or pressure flow is $profilename$. The left ineffective flow elevation, Ineff_El_Left, should be equal to or higher than the WSEL at Section 3. However, the Ineff_El_Left of $ineffell$ at the left ineffective flow station $ineffstal$ is lower than the WSEL of $wsel3$ at Section 3. The computed Left Upstream Minimum Top Road elevation, LMnTpRdU of $lmntprdu$ is higher than the WSEL of $wsel3$ at Section 3. The Ineff_El_Left should be raised to the computed LMnTpRdU.	131501(Bridge)	Comment #7
XS CD 02	Critical Depth occurs at $assignedname$ flood. Flow Code will be "C". The smallest channel n-value is less than 0.025. Please investigate whether this selection is appropriate	132249; 132368	Comment #4

XS DC 02	Constant discharge used for the entire profile for $assignedname$ flood. At least two discharges should be selected; one at the mouth and the other at the middle of the watershed or above the confluence of a tributary. Or provide explanation why only one discharge should be used. Other flood frequencies should also be checked.		Comment #3
XS DF 01R	Divided flow. Flow code will be DR. The $assignedname$ flood discharge has a divided flow. The starting and ending stations of the cross section should not extend beyond the watershed boundary of the studied stream. Please review the extent of the cross section. If the cross section extends beyond the watershed boundary then the cross section needs to be trimmed and the HEC-RAS geometry file may need to be recreated using a GIS program. Or use the ineffective flow option, if it has not been considered, to limit the extent of the cross section or to block the divided flow area if it is a local depression.	132679	Comment #2
XS DT 01	Both the right overbank distance of rob and the left overbank distance of lob are longer than the channel distance of chl . Please review the creation of left overbank, channel and right overbank distances. The HEC-RAS geometry file may need to be recreated using a GIS program. Please resolve the differences among the distances.	131988	Comment #2
XS IF 01R	Flow code will be IR. The area to the right of the ineffective flow station may be considered effective. The $assignedname$ WSEL of $wsel$ is higher than the ground elevation $grelv$ of the Right Ineffective Flow Station. However, it is equal to or lower than the right ineffective flow elevation of $ineffelr$. The lateral structure was not modeled downstream of this River Station. Lower the ineffective flow elevation to the ground elevation to consider the area right of the ineffective flow station as effective, or model a lateral structure if the overflow will take a different flow path. The ineffective flow elevation could be accepted if the area right of the ineffective flow station is non conveyance.	131502	Comment #7
XS SW 01DK	The name of the stream is $streamname$. The flow regime is subcritical or mixed flow. Starting WSEL is computed from Known WSEL as the downstream boundary for $Assigned_Name$ flood. Provide backup information on Known WSEL or use energy slope as the downstream boundary.	131464	Comment #3

CHECK-RAS COMMENT KEY

For verification purposes, the modeling was run through the cHECk-RAS program. The warnings and errors generated by the program are documented herein. Due to the repetitive nature of the warnings and errors, several duplicate responses have been generated and are numbered below. These correspond to the comment numbers in the cHECk-RAS model output.

1. Channel bank station has been adjusted appropriately
2. This is an unrevised portion of the effective FIS model and will not be changed
3. This model was truncated, and boundary conditions and inflow locations were set to tie in to the effective FIS at this location
4. Manning's 'n' values from the effective FIS model have been utilized in this analysis and will remain as is.
5. Cross sections were supplemented with survey data where available and have been created in a consistent manner as the effective FIS.
6. Bridge data was set based on survey and has been verified
7. Ineffective flow areas have been reviewed and are consistent with the effective FIS
8. Ineffective area has been adjusted appropriately

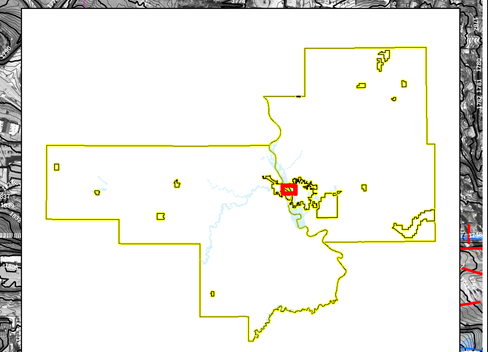
APPENDIX C

Topographic Workmaps

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.

Adam N. Nies
ND Reg. No. 10101

Date:



Legend

- Line of Protection
- Proposed Bridge
- Water Features
- BFE
- Lettered Cross Section
- Modeled Cross Sections
- 1 ft Contours
- 5 ft Contours
- PLSS Area
- Political Area
- FIRM Panels
- 0.2 Pct Annual Chance Flood Hazard
- AE Effective
- AE Post Project
- AE, Floodway Effective/Post-Project

0 500 1,000 Feet

N W E S

All elevations reference:
-Vertical Datum NAVD88.
-Horizontal Datum NAD 1983 UTM Zone 14N

Topographic Work Map
BNSF Bridge, Bismarck/Mandan, ND

Scale:	Drawn by:	Checked by:	Project No.:	Date:	Sheet:
1" = 500'	SMO	ANN	6680-007	6/22/2017	1

HoustonEngineering Inc.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.

Adam N. Nies
ND Reg. No. 10101

Date:

Annotated FIRM
BNSF Bridge, Bismarck/Mandan, ND

Scale:	Drawn by:	Checked by:	Project No.:	Date:	Sheet:
1" = 500'	SMO	ANN	6680-007	6/22/2017	1


N
Legend
FEMA 100-Year Floodplain
Impacted Structures
Cross Sections
Proposed Bridge
Heart River
WILDERNESS COVE RD
RIVER RD NW
0
1,050
2,100
4,200
Feet
Impacted Structures
BNSF Bridge, Mandan, ND
Scale: AS SHOWN
Drawn by: SMO
Checked by: CGT
Project No.: 6680-007
Date: 5/30/2017
Sheet: 1
HoustonEngineering Inc.

APPENDIX D

Certified Plan Set

Please see Appendix C for the current plan sets.

Federal Emergency Management Agency

Washington, D.C. 20472

July 16, 2018

RECEIVED
JUL 23 2018
Houston Engineering Inc
Minneapolis MN

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 17-08-1412R

Community Name: City of Bismarck, ND
Community No.: 380149

The Honorable Mike Seminary
Mayor, City of Bismarck
P. O. Box 665
Bismarck, ND 58506

Dear Mayor Seminary:

We are providing our comments with the enclosed Conditional Letter of Map Revision (CLOMR) on a proposed project within your community that, if constructed as proposed, could revise the effective Flood Insurance Study report and Flood Insurance Rate Map for your community.

If you have any questions regarding the floodplain management regulations for your community, the National Flood Insurance Program (NFIP) in general, or technical questions regarding this CLOMR, please contact the Director, Mitigation Division of the Federal Emergency Management Agency (FEMA) Regional Office in Denver, at (303) 235-4830, or the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at https://www.fema.gov/national-flood-insurance-program.

Sincerely,

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Enclosure:
Conditional Letter of Map Revision Comment Document

cc: The Honorable Tim Helbling
Mayor, City of Mandan

Mr. Brady Blaskowski, CBCO, CFM
Building Inspections
City of Bismarck

Mr. Shawn Ouradnik
Building Official
City of Mandan

Mr. Adam Nies, P.E., CFM
Civil Engineer
Houston Engineering, Inc.

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT

COMMUNITY INFORMATION		PROPOSED PROJECT DESCRIPTION	BASIS OF CONDITIONAL REQUEST
COMMUNITY	City of Bismarck Burleigh County North Dakota	BRIDGE	FLOODWAY HYDRAULIC ANALYSIS UPDATED TOPOGRAPHIC DATA
	COMMUNITY NO.: 380149		
IDENTIFIER	BNSF Bridge Replacement Missouri River MP196.6 LS0038	APPROXIMATE LATITUDE & LONGITUDE: 46.821, -100.843 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

AFFECTED MAP PANELS			
TYPE: FIRM*	NO.: 38015C0780D	DATE: August 4, 2014	* FIRM - Flood Insurance Rate Map
TYPE: FIRM	NO.: 38015C0790D	DATE: August 4, 2014	

FLOODING SOURCE AND REACH DESCRIPTION

Missouri River – from approximately 3,100 feet downstream to approximately 1,060 feet downstream of Interstate-94

PROPOSED PROJECT DESCRIPTION

Flooding Source	Proposed Project	Location of Proposed Project
Missouri River	New Bridge	Approximately 2,000 feet downstream of Interstate-94
	Bridge Removal	Approximately 2,040 feet downstream of Interstate-94

SUMMARY OF IMPACTS TO FLOOD HAZARD DATA

Flooding Source	Effective Flooding	Proposed Flooding	Increases	Decreases
Missouri River	BFEs *	BFEs	Yes	Yes

* BFEs - Base (1-percent-annual-chance) Flood Elevations

COMMENT

This document provides the Federal Emergency Management Agency's (FEMA's) comment regarding a request for a CLOMR for the project described above. This document is not a final determination; it only provides our comment on the proposed project in relation to the flood hazard information shown on the effective National Flood Insurance Program (NFIP) map. We reviewed the submitted data and the data used to prepare the effective flood hazard information for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. Your community is responsible for approving all floodplain development and for ensuring that all permits required by Federal or State/Commonwealth law have been received. State/Commonwealth, county, and community officials, based on their knowledge of local conditions and in the interest of safety, may set higher standards for construction in the Special Flood Hazard Area (SFHA), the area subject to inundation by the base flood). If the State/Commonwealth, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

OTHER COMMUNITIES AFFECTED BY THIS CONDITIONAL REQUEST

CID Number: 380072 **Name:** City of Mandan, North Dakota

AFFECTED MAP PANELS

TYPE: FIRM	NO.: 38059C0505D	DATE: April 19, 2005
TYPE: FIRM	NO.: 38059C0515D	DATE: April 19, 2005

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

To determine the changes in flood hazards that will be caused by the proposed project, we compared the hydraulic modeling reflecting the proposed project (referred to as the proposed conditions model) to the hydraulic modeling used to prepare the Flood Insurance Study (FIS) (referred to as the effective model). If the effective model does not provide enough detail to evaluate the effects of the proposed project, an existing conditions model must be developed to provide this detail. This existing conditions model is then compared to the effective model and the proposed conditions model to differentiate the increases or decreases in flood hazards caused by more detailed modeling from the increases or decreases in flood hazards that will be caused by the proposed project.

The table below shows the changes in the BFEs:

BFE Comparison Table

Flooding Source: Missouri River		BFE Change (feet)	Location of maximum change
Existing vs. Effective	Maximum increase	0.01	Approximately 1,910 feet downstream of Interstate-94
	Maximum decrease	0.1	Approximately 2,260 feet downstrean of Interstate-94
Proposed vs. Existing	Maximum increase	None	Not applicable
	Maximum decrease	None	Not applicable
Proposed vs. Effective	Maximum increase	0.01	Approximately 1,910 feet downstream of Interstate-94
	Maximum decrease	0.1	Approximately 2,260 feet downstrean of Interstate-94

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

DATA REQUIRED FOR FOLLOW-UP LOMR

Upon completion of the project, your community must submit the data listed below and request that we make a final determination on revising the effective FIRM and FIS report. If the project is built as proposed and the data below are received, a revision to the FIRM and FIS report would be warranted.

• Detailed application and certification forms must be used for requesting final revisions to the maps. Therefore, when the map revision request for the area covered by this letter is submitted, Form 1, entitled "Overview and Concurrence Form," must be included. A copy of this form may be accessed at https://www.fema.gov/media-library/assets/documents/1343.

• The detailed application and certification forms listed below may be required if as-built conditions differ from the proposed plans. If required, please submit new forms, which may be accessed at https://www.fema.gov/media-library/assets/documents/1343, or annotated copies of the previously submitted forms showing the revised information.

Form 2, entitled "Riverine Hydrology and Hydraulics Form." Hydraulic analyses for as-built conditions of the base flood, the 10-percent, 2-percent, and 0.2-percent-annual-chance floods, and the regulatory floodway, must be submitted with Form 2.

Form 3, entitled "Riverine Structures Form."

• A certified topographic work map showing the revised and effective base and 0.2-percent-annua-chance floodplain and floodway boundaries. Please ensure that the revised information ties in with the current effective information at the downstream and upstream ends of the revised reach.

• An annotated copy of the FIRM, at the scale of the effective FIRM, that shows the revised base and 0.2-percent-annual-chance floodplain and floodway boundary delineations shown on the submitted work map and how they tie-in to the base and 0.2-percent-annual-chance floodplain and floodway boundary delineations shown on the current effective FIRM at the downstream and upstream ends of the revised reach.

• As-built plans, certified by a registered Professional Engineer, of all proposed project elements.

• Documentation of the individual legal notices sent to property owners who will be affected by any widening or shifting of the base floodplain and/or any BFE increases along Missouri River.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

DATA REQUIRED FOR FOLLOW-UP LOMR (continued)

• FEMA's fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps may be accessed at https://www.fema.gov/forms-documents-and-software/flood-map-related-fees. The fee at the time of the map revision submittal must be received before we can begin processing the request. Payment of this fee can be made through a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or by credit card (Visa or MasterCard only). Please either forward the payment, along with the revision application, to the following address:

LOMC Clearinghouse
Attention: LOMR Manager
3601 Eisenhower Avenue, Suite 500
Alexandria, Virginia 22304-6426

or submit the LOMR using the Online LOMC portal at: https://hazards.fema.gov/femaportal/onlinelomc/signin

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM and FIS report. Because the flood hazard information (i.e., base flood elevations, base flood depths, SFHAs, zone designations, and/or regulatory floodways) will change as a result of the project, a 90-day appeal period will be initiated for the revision, during which community officials and interested persons may appeal the revised flood hazard information based on scientific or technical data.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

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Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

COMMUNITY REMINDERS

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Jeanine P. Petterson
Director, Mitigation Division
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267
(303) 235-4830

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

July 16, 2018

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 17-08-1412R

The Honorable Tim Helbling
Mayor, City of Mandan
205 2nd Avenue NW
Mandan, ND 58554

Community Name: City of Mandan, ND
Community No.: 380072

Dear Mayor Helbling:

We are providing our comments with the enclosed Conditional Letter of Map Revision (CLOMR) on a proposed project within your community that, if constructed as proposed, could revise the effective Flood Insurance Study report and Flood Insurance Rate Map for your community.

If you have any questions regarding the floodplain management regulations for your community, the National Flood Insurance Program (NFIP) in general, or technical questions regarding this CLOMR, please contact the Director, Mitigation Division of the Federal Emergency Management Agency (FEMA) Regional Office in Denver, at (303) 235-4830, or the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at https://www.fema.gov/national-flood-insurance-program.

Sincerely,

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Enclosure:
Conditional Letter of Map Revision Comment Document

cc: The Honorable Mike Seminary
Mayor, City of Bismarck

Mr. Shawn Ouradnik
Building Official
City of Mandan

Mr. Brady Blaskowski, CBCO, CFM
Building Inspections
City of Bismarck

Mr. Adam Nies, P.E., CFM
Civil Engineer
Houston Engineering, Inc.

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT

COMMUNITY INFORMATION		PROPOSED PROJECT DESCRIPTION	BASIS OF CONDITIONAL REQUEST
COMMUNITY	City of Mandan Morton County North Dakota	BRIDGE	FLOODWAY HYDRAULIC ANALYSIS UPDATED TOPOGRAPHIC DATA
	COMMUNITY NO.: 380072		
IDENTIFIER	BNSF Bridge Replacement Missouri River MP196.6 LS0038	APPROXIMATE LATITUDE & LONGITUDE: 46.821, -100.843 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

AFFECTED MAP PANELS			
TYPE: FIRM*	NO.: 38059C0505D	DATE: April 19, 2005	* FIRM - Flood Insurance Rate Map
TYPE: FIRM	NO.: 38059C0515D	DATE: April 19, 2005	

FLOODING SOURCE AND REACH DESCRIPTION

Missouri River – from approximately 3,100 feet downstream to approximately 1,060 feet downstream of Interstate-94

PROPOSED PROJECT DESCRIPTION

Flooding Source	Proposed Project	Location of Proposed Project
Missouri River	New Bridge	Approximately 2,000 feet downstream of Interstate-94
	Bridge Removal	Approximately 2,040 feet downstream of Interstate-94

SUMMARY OF IMPACTS TO FLOOD HAZARD DATA

Flooding Source	Effective Flooding	Proposed Flooding	Increases	Decreases
Missouri River	BFEs*	BFEs	Yes	Yes

* BFEs - Base (1-percent-annual-chance) Flood Elevations

COMMENT

This document provides the Federal Emergency Management Agency's (FEMA's) comment regarding a request for a CLOMR for the project described above. This document is not a final determination; it only provides our comment on the proposed project in relation to the flood hazard information shown on the effective National Flood Insurance Program (NFIP) map. We reviewed the submitted data and the data used to prepare the effective flood hazard information for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. Your community is responsible for approving all floodplain development and for ensuring that all permits required by Federal or State/Commonwealth law have been received. State/Commonwealth, county, and community officials, based on their knowledge of local conditions and in the interest of safety, may set higher standards for construction in the Special Flood Hazard Area (SFHA), the area subject to inundation by the base flood). If the State/Commonwealth, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

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Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

OTHER COMMUNITIES AFFECTED BY THIS CONDITIONAL REQUEST

CID Number: 380149 **Name:** City of Bismarck, North Dakota

AFFECTED MAP PANELS

TYPE: FIRM	NO.: 38015C0780D	DATE: August 4, 2014
TYPE: FIRM	NO.: 38015C0790D	DATE: August 4, 2014

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/national-flood-insurance-program.

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Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

To determine the changes in flood hazards that will be caused by the proposed project, we compared the hydraulic modeling reflecting the proposed project (referred to as the proposed conditions model) to the hydraulic modeling used to prepare the Flood Insurance Study (FIS) (referred to as the effective model). If the effective model does not provide enough detail to evaluate the effects of the proposed project, an existing conditions model must be developed to provide this detail. This existing conditions model is then compared to the effective model and the proposed conditions model to differentiate the increases or decreases in flood hazards caused by more detailed modeling from the increases or decreases in flood hazards that will be caused by the proposed project.

The table below shows the changes in the BFEs:

BFE Comparison Table

Flooding Source: Missouri River		BFE Change (feet)	Location of maximum change
Existing vs. Effective	Maximum increase	0.01	Approximately 1,910 feet downstream of Interstate-94
	Maximum decrease	0.1	Approximately 2,260 feet downstrean of Interstate-94
Proposed vs. Existing	Maximum increase	None	Not applicable
	Maximum decrease	None	Not applicable
Proposed vs. Effective	Maximum increase	0.01	Approximately 1,910 feet downstream of Interstate-94
	Maximum decrease	0.1	Approximately 2,260 feet downstrean of Interstate-94

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

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Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

DATA REQUIRED FOR FOLLOW-UP LOMR

Upon completion of the project, your community must submit the data listed below and request that we make a final determination on revising the effective FIRM and FIS report. If the project is built as proposed and the data below are received, a revision to the FIRM and FIS report would be warranted.

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Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

DATA REQUIRED FOR FOLLOW-UP LOMR (continued)

• FEMA's fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps may be accessed at https://www.fema.gov/forms-documents-and-software/flood-map-related-fees. The fee at the time of the map revision submittal must be received before we can begin processing the request. Payment of this fee can be made through a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or by credit card (Visa or MasterCard only). Please either forward the payment, along with the revision application, to the following address:

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Attention: LOMR Manager
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Alexandria, Virginia 22304-6426

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Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

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COMMUNITY REMINDERS

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Jeanine P. Petterson
Director, Mitigation Division
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267
(303) 235-4830

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Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

State of North Dakota
Office of the State Engineer

Regulatory Division

900 EAST BOULEVARD AVE. • BISMARCK, ND 58505-0850
Regulatory Division (701) 328-2752 • FAX (701) 328-3696 • http://swc.nd.gov

August 9, 2018

City of Bismarck
Attn: Brady Blaskowski
PO Box 5503
Bismarck, ND 58506

Re: BNSF Bridge – Floodway Review

Dear Mr. Blaskowski,

On behalf of the State Engineer, and as directed in North Dakota Century Code § 61-16.2-14, the Office of the State Engineer (OSE) staff has reviewed a proposed project located within the mapped floodway of the Missouri River as requested by the City of Bismarck, ND (City). The proposed project (Project) consist of removing the existing BNSF railroad bridge and constructing a new bridge adjacent to and upstream of the current bridge.

The Floodway Review application was received by the OSE on July 26, 2018. Included with the submission was a copy of the Federal Emergency Management Agency's (FEMA) approved Conditional Letter of Map Revision (CLOMR), dated July 16, 2018, with case number 17-08-1412R. As the Project was presented to FEMA, the State will accept the CLOMR and consider the Project to be in compliance with state and federal regulations as it pertains to floodplain management and the National Flood Insurance Program. As stated in the CLOMR, upon completion of the Project, a Letter of Map Revision (LOMR) is required. An approved LOMR would officially change the effective map.

The City is the regulatory authority for floodplain purposes through the National Flood Insurance Program. If the City wishes to allow this project, a permit must be issued and associated documentation must be kept for proper record keeping. Any changes to the Project must be submitted to the OSE for further review.

Sincerely,

Dionne Haynes

Dionne Haynes, CFM
State NFIP Coordinator

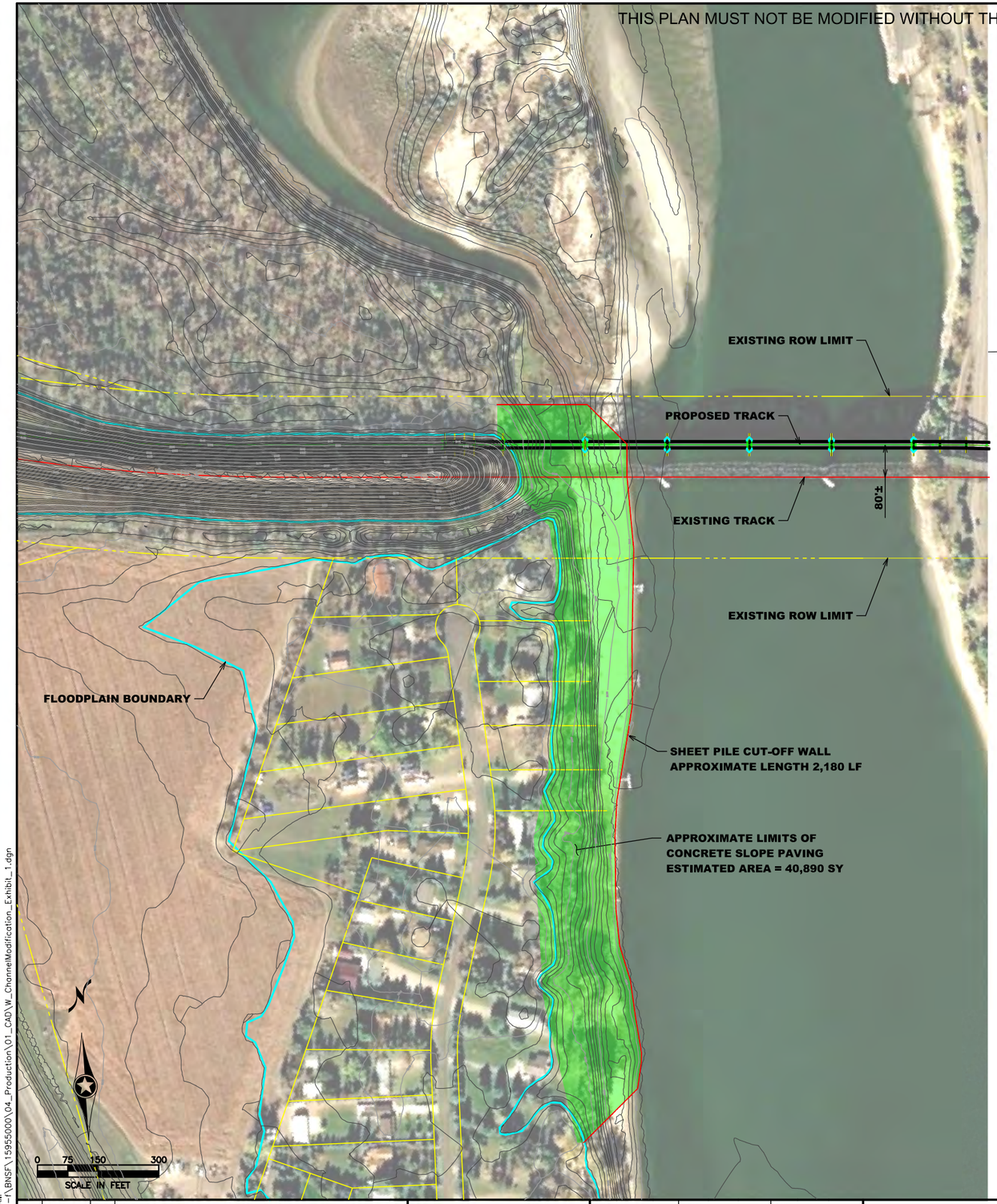
AC: DH/1721-05

cc: Tom Birney, FEMA (email)

Appendix L

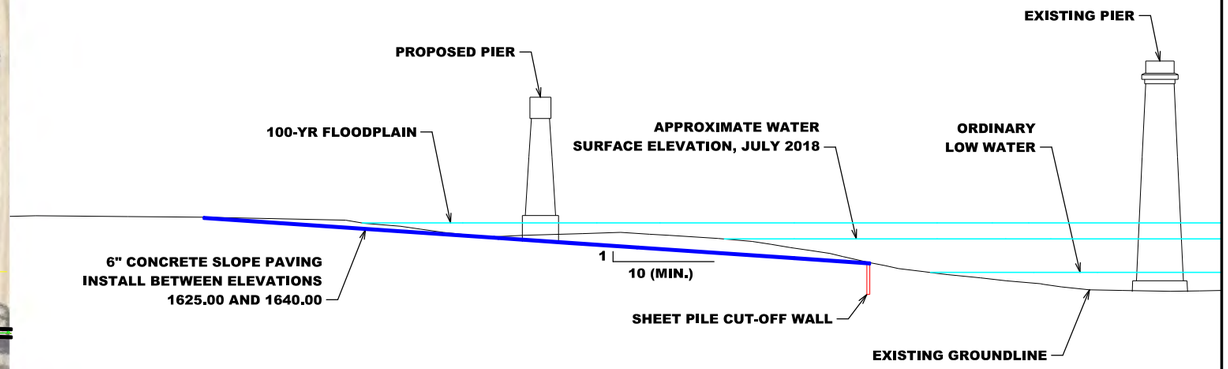
Proposed Floodplain Mitigation

THIS PLAN MUST NOT BE MODIFIED WITHOUT THE APPROVAL OF BNSF SYSTEM ENGINEERING



NOTES:

CHANNEL MODIFICATIONS MUST OCCUR AT THE WEST APPROACH DUE TO THE POTENTIAL FOR EAST APPROACH SLOPE INSTABILITY.



WEST APPROACH PARTIAL ELEVATION @ SOUTH ROW

(IN-PLACE & PROPOSED SUPERSTRUCTURES NOT SHOWN FOR CLARITY.)

0 25 50
SCALE IN FEET

CONSTRUCTION COST ESTIMATE:

DETERMINE ESTIMATED CONSTRUCTION COST USING NDDOT STANDARD PAY ITEMS FROM 2014 WHERE POSSIBLE. AMPLIFY BY 3% PER YEAR TO ACCOUNT FOR INFLATION. ASSUME 2020 CONSTRUCTION DATE.

ADD 10% FOR MOBILIZATION / DEMOBILIZATION COSTS.

DOES NOT INCLUDE COSTS ASSOCIATED WITH PERMITTING, ROW ACQUISITION, DEWATERING, PROFESSIONAL SERVICES, UTILITY RELOCATIONS OR UNKNOWN CONTINGENCIES.

ESTIMATE OF PROBABLE CONSTRUCTION COST

ITEM NUMBER	PAY ITEM	UNIT	QUANTITY	NDDOT 2014 UNIT PRICE	ANTICIPATED 2020 UNIT PRICE	TOTAL
1	MOBILIZATION (10%)	EACH	1	-	$751,700.00	$751,700.00
2	COMMON EXCAVATION	CY	26,963	$4.30	$5.13	$138,439.31
3	STEEL SHEET PILING (10' EMBEDMENT)	SF	21,800	$44.00	$52.54	$1,145,334.96
4	SLOPE PROTECTION CONCRETE	SY	40,890	$130.50	$155.82	$6,371,636.19
					TOTAL ANTICIPATED CONSTRUCTION COSTS (2020 - ROUNDED)	$ 8,407,100.00

DATE: 7/18/2018
TIME: 6:44:57 AM
FILENAME: K:\a-f\BNSF\15955000\04_Production\01_CAD\W_ChannelModification_Exhibit_1.dgn

NO.	DATE	BY	DESCRIPTION OF REVISIONS

TKDA
444 Cedar Street, Suite 1500
Saint Paul, MN 55101
651.292.4400
tkda.com

DES:	DRW:	CHK:
DATE:	AFE NO.:	

VERIFY SCALES 0 1
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS DRAWING
ADJUST SCALES ACCORDINGLY

BNSF RAILWAY

BNSF RAILWAY COMPANY
BRIDGE NO 196.6A GRADING PLAN
BISMARCK, ND (MP 196.38 - MP 197.20)

ALTERNATE 2
WEST APPROACH CHANNEL MODIFICATION GRADING

COMM. NO. 15955.000
DRAWING NO.

Appendix M

U.S. Fish and Wildlife Service, and North Dakota Game and Fish Department Coordination

BIOLOGICAL ASSESSMENT

BNSF Bridge 196.6

Prepared for

Houston Engineering, Inc.
1401 21st Ave N
Fargo, ND 58102

On behalf of

Burlington Northern Santa Fe Railway
2500 Lou Menk Dr. AOB-3
Fort Worth, TX 76131

Prepared by

DLW Natural Resource, LLC
Kevin K. Sedivec, Ph.D., Range Scientist/Botanist/Wildlife Biologist
6188 168TH AVE SE
WALCOTT, ND 58077-9749

Date: August 14, 2017

Table of Contents

List of Tables

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Executive Summary

Houston Engineering Inc. is submitting this Biological Assessment (BA) to the Omaha District Engineer, US Army of Engineers, Omaha, Nebraska as part of a consultation process pursuant to Section 7(a)(2) of the Endangered Species Act (ESA). This BA was prepared by DLW Natural Resource, LLC in accordance with legal requirements set forth in Section 7 of the ESA (16 U.S.C. 1536; see also 50 CFR Part 402). This BA defines and evaluates the potential effects of constructing a new, independent single-track bridge across the Missouri River upstream of the in-place structure, and removal of existing bridge.

This specific activity constitutes of the Proposed Action for purposes of this consultation and evaluated for potential effects to listed and candidate species or critical habitat. This activity on the Missouri River and associated land impacted by this project relates to: building a new single-track bridge across the river (approximately 1550' in length), constructing track work at each approach to generate the proposed geometry within the bridge limits (approximately 2800' on the eastern side and 5200' on the western side). This BA defines the Proposed Action on the Missouri River, and evaluates potential effects on listed and candidate species and their designated critical habitats attributed to the Proposed Action.

The Missouri River is designated critical habitat for piping plovers (*Charadrius melodus*), a bird classified as a threatened species by the US Department of Interior Fish and Wildlife Service (1985). The Missouri River also provides habitat for other threatened and endangered (T&E) species that include the interior least tern (*Sterna antillarum*), red knot rufa (*Calidris canutrus*), pallid sturgeon (*Scaphirhynchus albus*), and northern long-eared bat (*Myotis septentrionalis*). This report assesses the impacts of this project on these T&E species and critical habitat, as well as all plants and animals designated as threatened and endangered (and any candidate species) by the US Fish and Wildlife Service that fall within Morton and Burleigh counties.

Although this project has a "may affect" on the piping plover, northern long-eared bat, and pallid sturgeon, a ***"not likely to adversely affect"*** was determined. Suitable habitat was not present to attract nesting female piping plover or spawning for female pallid sturgeon. To mitigate any

disturbance on the northern long-eared bat, trees will be removed after this species has migrated south for the winter.

Introduction

This biological assessment (BA) analyzes the potential effects of the proposed bank stabilization on a selected section of the Missouri River. The Endangered Species Act (ESA) of 1973 (16 U.S.C. 153 et seq.), as amended (ESA or Act) requires the need for a permit from a federal agency under federal jurisdiction to conserve and recover listed species and use their authorities to further the purposes of the Act by carrying out programs for the conservation on threatened and endangered species, and critical habitat, and determine impacts (50 CFR § 402). The ESA directs all federal agencies to consult (referred to as section 7 consultation) with the US Fish and Wildlife Service (USFWS) when activities "may affect" a listed species or designated critical habitat. The Act also mandates that federal agencies contribute to the conservation of federally listed species by utilizing their authorities to conserve (recover) federally listed species so that listing is no longer necessary. Federally, state, or locally listed threatened and endangered animal and plant species and critical habitat meeting the following criteria are addressed in this assessment:

1. Known to occur in the US Army Corps of Engineers (USACE) land, based on confirmed sightings;
2. May occur in the US Army Corps of Engineers land, based on unconfirmed sightings;
3. Potential habitat exists for the species in the US Army Corps of Engineers land; or
4. Potential effects may occur to these species.

Consultation History

This section presents a brief summary of consultation history with a description of proposed actions identified. Consultation between Kevin Sedivec, Range Scientist/Botanist/Wildlife Biologist; US Fish and Wildlife Service staff; and USACE include the following correspondences (**Table 1**).

Table 1. Consultation History of Sedivec with agencies

DATE	MEETING ATTENDEES	DISCUSSION
June 8, 2016	Steven Krentz (USFWS, Fisheries Biologist)	Early ESA coordination meeting and discussions regarding the biological assessment and threatened and endangered species.
June 15, 2016	Toni Erhardt (USACE, Project Manager)	Post-field survey meeting to discussion USACE issues and concerns with the project, river status clarification, issues of concern, and guidelines for BA.
June 27, 2017	Kevin Shelley (USFWS, Region Director)	Post-field survey meeting and discussions regarding the biological assessment and threatened and endangered species.
June 30, 2017	Jessica Johnson (USFWS, Biologist)	Post-field survey meeting on use of project area by piping plover and interior least terns.

Project Location

The proposed construction (Action Area) includes construction of a new, independent, single-track bridge across the Missouri River upstream of the in-place structure.
The project is located in Township 139N Range 80W Section 31 (general latitude: 46.817883, longitude: -100.827597). This part of the Jamestown Subdivision runs from Mandan in Morton County, ND to Bismarck in Burleigh County, ND. The project lies between I-94 bridge and I-194 bridge.

Figure 1. Vicinity map of project area showing Bismarck (right side) and Mandan (left side), ND (Google 2017).

Project Description

BNSF Railway currently owns and operates a single-track structure across the Missouri River in Bismarck, North Dakota. Located on the Jamestown subdivision of Line Segment 0038, the current structure is approximately 1470’ in length and consists of three primary river spans and six approach spans. Totaling approximately 1200’ of the overall bridge length, the three primary river spans consist of three independent steel through-truss structures, each approximately 400’ in length. A single-deck truss span is utilized to transition between the primary spans and the west approach embankment, while five spans of precast box girders are used at the east approach. The primary river truss spans were installed in 1905 and are replacement structures for the steel truss spans dating from the original construction in 1883. The trusses are supported on masonry piers, numbered one to four from east to west, and are the only bridge elements remaining from the original bridge. Each river span pier is supported on a shallow foundation, with the exception of pier four, which is supported on a mat of timber piling.

With in-service components over 130 years old, the in-place structure is approaching the end of its useful service life. Therefore, the intent of the project is to construct a new, independent single-track bridge across the Missouri River upstream of the in-place structure (**Table 2**).

The new structure is to be constructed on a parallel alignment offset roughly 30’ from the existing bridge’s centerline. The new structure is anticipated to be approximately 1550’ in length and consist of seven ballasted deck prestressed concrete beam approach spans with span lengths of approximately 70’ and 80’, and five steel deck plate girder river spans, each approximately 200’ in length. The approach spans will be split between the east and west approaches, with four allocated for the west and three allocated for the east. The superstructure spans will be supported on reinforced concrete substructures that, in turn, are supported by deep foundations.

The proposed superstructure type selected places all of the primary load carrying elements below the top of rail elevation. As such, the structure will have a significantly reduced susceptibility to damage caused by over-dimension or wayward loadings and derailments when compared to the existing structure. Furthermore, inspection and maintenance practices will be possible with limited disruptions to rail service and reduced risk to BNSF employees as walkway access will be provided between the primary river span beam lines. Finally, each span will consist of multiple beam lines between adjacent supports, thus providing a level of redundancy that is not provided by the in-place structure.

Supporting the proposed superstructure will be pier and abutment substructure units constructed from cast-in-place concrete. Each unit will, in turn, be supported on a deep foundation mat of driven steel piling. Spacing of the substructures will be developed such that construction is compatible with the in-place bridge and the configuration of each substructure will be dependent on the loading demands generated by the railroad and environmental forces applicable to the specific location.

Since the configuration of the proposed structure places additional piers within the limits of the Missouri River, the river hydraulics will be affected by the proposed work with a slight increase to the water surface profile anticipated. In order to minimize the impact to river hydraulics and to

provide an open corridor for future work, the existing bridge will be completely removed once the new structure is in-service.

Track work will also be required at each approach to generate the proposed geometry within the bridge limits. The scope of track work will differ significantly between the two approaches, with limited civil works required at the east approach and significant railroad embankment construction required at the west. The overall project limits will extend from a point at RR Sta. 55+40, approximately 370’ east of the in-place bridge, to RR Sta. 135+40, approximately 6,600’ west of the in-place bridge. The primary civil works and bridge construction will occur within the eastern 2800’ of the project between RR Sta. 55+40 to 83+40. The western 5200’ of the project between RR Sta. 83+40 and 135+40 will consist of track realignment on the in-place embankment (**Appendix A**).

Table 2. Project proposer and location information of Action Area.

ITEM	DETAIL
Project proposer	BNSF Railway Company
Project name	BNSF Bridge 196.6
Project implementation/timeline	Construction commencing in October/November 2017, pending final approvals, to late-March, early-April 2019
Project duration	Contractor Dependent
Project type	Survey of shoreline, railroad right-of-way, adjacent private land associated with project area
County/State	Morton and Burleigh Counties, North Dakota
Survey location	S36, T139N, R81W – Morton County; S31, T139N, R80W – Burleigh County 5,138 linear feet, 71.3 acres Analysis Area

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Impact Avoidance and Minimization Measures

Impact avoidance and minimization measures are discussed for threatened and endangered species that may be impacted during the construction phase of this project, or habitat impacted by the project. Although seven species may occur (gray wolf, interior least tern, whooping crane, red knot rufa, pallid sturgeon, piping plover, and northern long-eared bat) within the Action Area, results of the analysis showed only three species (pallid sturgeon, piping plover, northern long-eared bat) had an impact that "may affect."

Noise and human activity would more than likely deter those species listed as could occur, thus precluding the "may affect" status (gray wolf, interior least tern, whooping crane, red knot rufa). It will be impossible to reduce noise and human activity (minimization measure) to construct this project. Because the project involves replacing an old bridge with a new bridge, impact avoidance would also be impossible. In fact, due to the current high impact of boat recreation on this area, use by these species would be already classified as unlikely. This area does not provide required nesting and fledging habitat for the interior least tern. Whooping cranes and red knot rufa do not nest in North Dakota, and there are no known reproducing gray wolves in North Dakota. Better foraging and resting habitat occurs both north and south of the Action Area, providing superior locations for these species to use.

Avoidance and minimization measures should be incorporated to eliminate or reduce the impact on the pallid sturgeon, piping plover, and northern long-eared bat. These avoidance and minimization measures include:

1. Construction activities occurring 50 feet or more away from the river should be minimized to avoid disturbing the shorelines. These shorelines are classified as designated critical habitat for the piping plover. This avoidance would minimize any impacts to the interior least tern and red knot rufa if they are present. Confine movement of heavy equipment to existing roadways (approximately 50 feet from river edge in Burleigh County) to minimize habitat disturbance. No roadways exist on the Morton County side.

2. Construction activity within habitat (shorelines) should be conducted between September 1 and May 15, if possible, to avoid the presence of the piping plover. This time frame may be difficult to achieve with North Dakota's short construction season.
3. Removal of old bridge material should be conducted without explosives to minimize impact to adult pallid sturgeon.
4. Removal of trees should occur between October 1 and May 1. The active period of the northern long-eared bat occurs from mid-May to mid-September in North Dakota. These trees could provide roosting and nursery habitat, thus should be avoided by all construction activities and personnel while bats are present in North Dakota.
5. After the project is completed, disturbed areas should be restored to pre-project conditions. Reclamation following the completion of the project should include shoreline reconstructed to pre-construction condition, trees planted to replace removed trees, and grasslands planted to match pre-project plant community.

Action Area

The proposed location of the project spans the Missouri River between Bismarck and Mandan, ND (Burleigh and Morton Counties). The Action Area includes all areas directly or indirectly impacted by the proposed project. The Action area includes both the Permit Area and the Analysis Area, **Figure 2**. The Permit Area refers to the vicinity of the proposed project disturbances. The Permit Area includes the locations of the expected construction activities and a reasonable buffer.

The Analysis Area (0.5-mile radius of the proposed project) for conducting this BA encompassed a larger area and was reviewed to provide documentation of the existing conditions to aid in the evaluation of cumulative effects. The Analysis Area comprised of Missouri River shoreline, sandbars found within and along the Missouri River, tillable land, cottonwood tree wood lots, and riparian corridors. The Analysis Area also included designated critical habitat for the piping plover.

Figure 2. Location of Permit Area and Analysis Area boundaries for the BNSF bridge 196.6 near Bismarck, ND.

Figure 2 shows the Permit Area (yellow boundary) and added Analysis Area (red boundary). The area north of the Permit Area and south of Interstate 94 on the Morton County side was surveyed specific to the piping plover and interior least terns to determine if any individual birds occupied the area or if nests were present. Land uses, habitat, weeds, wildlife, and wildlife locations were identified and described. Structural features were identified with aerial photography and existing GIS data (GIS Hub, 2016). Their existence was verified in the field when reasonably accessible.

The vegetation in the immediate shoreline (0-1 m) graded from sparse to no plants on the Morton County side and sparse vegetation on the Burleigh County side. Much of the shoreline on the Morton

County side is owned by private homeowners and used as a recreational beach. The shoreline on the Burleigh County side is narrow (less than 0.5 m) and runs parallel to a walking path used by local residents and tourists. Both shorelines are disturbed heavily by human activities associated with river recreation. Historically, both shorelines would have provided foraging habitat for piping plover and interior least terns (shorelines to narrow, sparsely vegetative at 0.3-1 m, then heavily vegetated after 1-3 m away from immediate shoreline for nesting and brood-rearing habitat). Both species are listed as threatened and endangered species by the US Fish and Wildlife Service. These shorelines also are listed as critical habitat for the piping plover.

The Permit Area in Burleigh County is an existing railroad track that was cut through the land when the railway was built. The railroad right-of-way is grasslands that were reseeded to a crested wheatgrass and/or smooth bromegrass plant community (**Figure 3**).

The Permit Area in Morton County is elevated and built up to match the Burleigh County side. The railroad right-of-way is forested, dominated by green ash, boxelder, and cottonwood trees (**Figure 4**).

The current bridge and projected new bridge span the Missouri River. The Missouri River contains the pallid sturgeon, a listed threatened and endangered species by the US Fish and Wildlife Service (**Figure 2**).

The equipment and materials used in this project will be operated and stored on the land directly south of the railroad right-of-way in Morton County (**Figure 2**). This area is classified as a flood plain and currently managed using an annual cropping rotation (corn, soybeans, spring wheat). This area is bordered by I-94 interstate and residential housing.

Figure 3. View of railroad right-of-way in Burleigh County on June 30, 2017. Vegetation is reseeded crested wheatgrass to the north (right) and reseeded smooth bromegrass to the south (left).

Figure 4. View of railroad right-of-way in Morton County on June 30, 2017 (far side of river). Vegetation is forest dominated by green ash, box elder, and eastern cottonwood trees on both sides of the railroad tracks.

Species and Habitat Information

Species and Critical Habitat Addressed in BA

Federally Listed and Proposed Threatened and Endangered Species

Assessments for federally listed Threatened and Endangered Species (see **Appendix B** for biology of listed species) were conducted by evaluating historic and current occurrences and determining if potential habitat exists within the Project Area and Analysis Area. A determination was made concerning direct, indirect, and cumulative effects of the proposed activities on each species. Determinations made for federally listed species are:

"No effect"

"May affect, not likely to adversely affect"

"Beneficial impact"

"May affect, likely to adversely affect"

"Likely to jeopardize/adversely modify proposed species/critical habitat"

"Not likely to jeopardize the continued existence or adversely modify proposed critical habitat"

Potential impacts, avoidance, and mitigation practices are provided under the species discussion unless a ***"no effect"*** determination is made. If a determination of ***"no effect"*** is made, avoidance or mitigation practices are not necessary.

Excluded Species

Species were excluded from further evaluation and discussion if habitat requirements and known range do not exist within the Project or Analysis Areas, and lack of confirmed sightings of the species have been made within in the designated area or near vicinity. Species excluded from further evaluation are listed in **Table 3**.

The black-footed ferret, until recently, has been extirpated from North Dakota for decades. Although two individuals have been recently (2014) found along the North and South Dakota border near McLaughlin, South Dakota; no occurrences have been found in Morton or Burleigh counties for decades. The black-footed ferret also depends exclusively on prairie dog burrows for shelter (Black-footed Ferret Recovery Team, 2009; USDI Fish and Wildlife Service 2015b), with no known prairie dog colonies found within the surveyed area.

Historically, the rusty patched bumble bee was broadly distributed across the eastern United States and Upper Midwest, from Maine in the U.S. and southern Quebec and Ontario in Canada, south to the northeast corner of Georgia, reaching west to the eastern edges of North and South Dakota. Since 2000, this bumble bee has been reported from only 13 states and 1 Canadian province: Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin – and Ontario, Canada. Based on this bumble bee's most westerly historic range being Stutsman County, ND, this bee has never been recorded as far west as Burleigh County (our easterly most county in this project; US Fish and Wildlife Service 2017a).

The western prairie fringed orchid and Poweshiek skipperling are not found in Morton or Burleigh counties (USDI Fish and Wildlife Service, 2017b). The Poweshiek skipperling is classified as extirpated from North Dakota. No preferred habitat exists for either species within the Project or Analysis Area.

Although the Dakota skipper has been recorded in the adjacent county, McLean County, habitat within the Project and Analysis Areas is not preferred habitat (USDI Fish and Wildlife Service, 2017a). And in fact, would be considered unsuitable to attract adult Dakota skipper. There are no Dakota skipper Designated Critical Habitats found in either county (USDI Fish and Wildlife Service, 2017b).

Table 3. Threatened, endangered, candidate/proposed species with the potential to occur within the Action and Analysis area. The USDI Fish and Wildlife Service (2017a) species list was obtained and reviewed, and species not having the potential to occur were excluded from further review with no effect determination.

SPECIES COMMON AND SCIENTIFIC NAME	STATUS[1]	POTENTIAL TO OCCUR	RATIONALE FOR EXCLUSION[2]	HABITAT DESCRIPTION AND RANGE IN NORTH DAKOTA
ENDANGERED SPECIES				
Black-footed ferret (*Mustela nigripes*)	E	No	(HAB)	Requires expansive black-tailed prairie dog (*Cynomys ludovicianus*) colonies for food and habitat. 80 acres is the typical minimum black-tailed prairie dog colony size that can support the black-footed ferret. Black-footed ferrets were historically found in SW North Dakota; current occurrence is unlikely to questionable and no reintroduction sites have occurred in ND at this time.
Gray wolf (*Canis lupus*)	E	Yes	--	Has been documented in North Dakota since 1990s. Habitat varies from woodland to grassland, typically avoiding populated areas with high road densities.
Interior least tern (*Sterna antillarum*)	E	Yes	--	Sandbars along Yellowstone and Missouri River systems; nest in barren sands, in colonies.
Pallid sturgeon (*Scaphirhynchus albus*)	E	Yes	--	The Missouri River does support pallid sturgeon. Current range is from the confluence of the Yellowstone and Missouri River as the eastern most range in North Dakota with the exception of the tailrace below the Garrison dam. Preferred habitat is at the bottom of large, turbid, relatively warm, free-flowing rivers.
Poweshiek skipperling (*Oarisma poweshiek*)	E	No	(ODR/HAB)	Adult butterflies feed on nectar from prairie flowers; purple coneflower (*Echinacea angustifolia*), blackeyed susan (*Rudbeckia hirta*), and lobelia (*Lobelia spicata*). For larvae, native, fine-stemmed grasses and sedges (little bluestem (*Schizachyrium scoparium*) and prairie dropseed (*Sporobolus heterolepis*).

SPECIES COMMON AND SCIENTIFIC NAME	STATUS[1]	POTENTIAL TO OCCUR	RATIONALE FOR EXCLUSION[2]	HABITAT DESCRIPTION AND RANGE IN NORTH DAKOTA
Whooping crane (*Grus Americana*)	E	Yes		Only migrate through North Dakota in spring and fall, using large, shallow marshes for roosting and loafing while feeding on harvested grain fields.
Rusty patched bumble bee (*Bombus affinis*)	E	No	(ODR/HAB)	Rusty patched bumble bees once occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, but most grasslands and prairies have been lost, degraded, or fragmented by conversion to other uses. Bumble bees need areas that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil).
THREATENED SPECIES				
Western fringed prairie orchid (*Platanthera praeclara*)	T	No	(ODR/HAB)	Mesic to wet unplowed tallgrass prairies and meadows; also found in old fields and road-ditches. This plant is known not to be found in North Dakota outside the southeast corner of the state.
Piping plover (*Charadrius melodus*)	T	Yes	--	Prefer sparsely vegetated sandbars and shorelines and large alkaline wetlands with shoreline. Breeding pairs exist; though have slightly decreased in past decades.
Dakota skipper (*Hesperia dacotae*)	T	No	(ODR/HAB)	Preferred habitat includes moist bluestem prairie with blooming wildflower species (wood lily (*Lilium philadelphicum*), harebell (*Campanula rotundifolia*) and smooth camas (*Zygadenus elegans*)); other preferred habitat is relatively dry upland prairie found on ridges and hillsides. In North Dakota, Dakota skippers are found in scattered, mostly isolated sites that are lightly grazed, favoring little bluestem with flowering native forbs.
Northern long-eared bat (*Myotis septentrionalis*)	T	Yes	-	Habitat varies by season; winter habitat requires caves or mines, summer habitat requires large trees for roosting, occasionally roost in barns or structures. This bat occurs in North Dakota from May through September. Cottonwood and green ash trees are found in the Project Area and Analysis Area. These trees provide suitable roosting and nursery habitat as some of these large trees contain holes and caverns. The current bridge can also

SPECIES COMMON AND SCIENTIFIC NAME	STATUS[1]	POTENTIAL TO OCCUR	RATIONALE FOR EXCLUSION[2]	HABITAT DESCRIPTION AND RANGE IN NORTH DAKOTA
				provide roosting habitat. This project is found within their summer territory and the Missouri River is considered primary habitat in North Dakota.
Red knot rufa (*Calidris canutrus*)	T	Yes	-	Shorelines during migration with a few occasional inland migrants. Four known locations with sightings found in North Dakota (NatureServe, 2016).
CRITICAL HABITAT				
Piping plover (Charadrius melodus) Unit 11 North Dakota Missouri River and Reservoirs	T	Yes	--	Designated riverine and reservoir habitat in North Dakota includes Burleigh, Dunn, Emmons, McKenzie, McLean, Mercer, Morton, Mountrail, Oliver, Sioux, and Williams counties (USDI Fish and Wildlife Service, 2002a).
Dakota skipper (*Hesperia dacotae*)	T	No	(ODR/HAB)	Prefer lightly grazed grasslands with little bluestem (*Schizachyrium scoparium*) with diverse flowering forbs. Flowering forb species include purple prairie coneflower (*Echinacea angustifolia*), tiger lily (*Lilium lancifolium*), and death camas (*Toxicoscordion venenosum*). There are 14 proposed designated critical habitat units within Ransom (2 units) Richland (1), Rolette (1), McHenry (6), McKenzie (3), and Wells (1) counties in North Dakota. None in Burleigh or Morton counties.
Poweshiek skipperling (*Oarisma poweshiek*)	T	No	(ODR/HAB)	Classified as extirpated from North Dakota.

[1]**STATUS CODES**: **E**= federal listed endangered; **T**= federally listed threatened; **P**= federally proposed for listing; **C**= federal candidate for listing; **CH**= designated critical habitat

[2]**EXCLUSION RATIONALE CODES**: **ODR**= outside known distributional range of the species; **HAB**= no habitat present in analysis area; **ELE**= outside of elevational range of species; and **SEA**= species not expected to occur during the season of use/impact

Gray Wolf *(Canis lupus)*

Gray wolves historically ranged throughout North America. With the exception of Minnesota, Wisconsin, Michigan, Montana, Idaho, and Washington, the gray wolf is absent from the lower 48 states. Although the gray wolf has been documented in North Dakota since 1990, their presence is sporadic and consisted of occasional dispersing animals from Minnesota and Manitoba, Canada (USDI Fish and Wildlife Service, 2008a). The gray wolf's habitat varies from woodland to grasslands, but they generally avoid populated areas and areas with high road densities (Johnson, 1999). The area that would be impacted by the project is already heavily impacted by humans through recreational activities on and along the Missouri River. Also, residential housing occurs along this area.

Interior Least Tern *(Sterna antillarum)*

Approximately 100 pairs of interior least tern breed and nest on sandbars along the Yellowstone and Missouri River systems in North Dakota (USDI Fish and Wildlife Service, 2015c). The interior least tern nest is a small, bowl-shaped depression on barren sands. They nest in colonies, with nesting period between mid-May and mid-August. Least terns nest on barren to sparsely vegetated sandbars along rivers, sand and gravel pits, lake and reservoir shorelines, and occasionally gravel rooftops (USDI Fish and Wildlife Service, 2015c). They hover over and dive into standing or flowing water to catch small fish.

Sidle and Harrison (1990) reported the least tern is a shorebird that prefers to nest in colonies on unvegetated to sparsely vegetated sandbars. They feed primarily on small fish, which are gathered from shallow areas along sandbars or shores. The least tern prefers sandbars that are toward the center of the river, with sparse vegetation and a sandy/gravelly substrate. Adults and juveniles will head for the wintering grounds after fledging (when chicks learn to fly), with most terns departing by the end of August. Much of the habitat historically utilized by these birds has been lost due to reservoir inundation, vegetative encroachment, erosion, and high summer releases of water.

There were 706 least tern adults counted on the Missouri River in 2009, dropping below the threshold recognized as the recovery goal for the first time in four years (800 adults, as set in the 1990 Interior Least Tern Recovery Plan). Much of the drop-in populations may be attributable to higher storage levels in the reservoirs, particularly Lake Oahe and Lake Sakakawea (US Army Corps of Engineers, 2010).

Pallid Sturgeon (*Scaphirhynchus albus*)

The pallid sturgeon is found in the Mississippi, Missouri, and Yellowstone River systems. Although the pallid sturgeon has been historically found in the Missouri River, the current recovery plan shows present day range from the confluence of the Yellowstone and Missouri River as the eastern most range in North Dakota, with the exception of the tailrace below the Garrison dam (Dryer and Sandvol, 1993; USDI Fish and Wildlife Service, 2014a). Secondly, preferred habitat is the bottom of large, turbid, relatively warm, free-flowing rivers (Dryer and Sandvol, 1993; Montana Fish, Wildlife and Parks, 2014).

Although the location of this project on the Missouri River is known not to contain habitat for reproduction or depository area for egg laying (Krentz, 2016 personal communication), it does contain adult sturgeon. An adult, 72-inch pallid sturgeon was caught just south of this bridge in 2017 (Rohde, 2017 personal communication).

Whooping Crane *(Grus americana)*

At one time during the 19th century, whooping cranes nested in North Dakota. Currently, whooping cranes only migrate through North Dakota in the spring and fall. Along their migration route, whooping crane use large, shallow marshes for roosting and loafing while feeding in harvested grain fields. Pearse et al. (2015) identified 1,095 20-square-kilometer grid cells that contained stopover sites for whooping cranes and categorized occupied grid cells based on density of stopover sites and the amount of time cranes spent in the area. This assessment resulted in four categories of stopover site use: unoccupied, low intensity, core intensity, and extended-use core intensity. The Project and Analysis Areas lie within the unoccupied cells for whooping crane stopover use.

Piping Plover *(Charadrius melodus)*

North Dakota's piping plover population was 496 breeding pairs in 1991, reducing to 399 breeding pairs by 1996; and 897 adults on Missouri River in 2009 (US Army Corps of Engineers, 2010). The USDI Fish and Wildlife Service (2011b) reported approximately 75% of piping plovers in North Dakota nest on prairie alkali lakes and 25% use the Missouri River. However, Wiltermuth et al. (2015) showed piping plovers also use mainland and island shorelines of reservoirs that were created when large hydroelectric dams were constructed between 1940 and 1964. By 2005, 64 % of plovers counted along Missouri River used reservoir habitat, while 43 % of Missouri River plovers were observed at Lake Sakakawea (Wiltermuth et al, 2015).

Northern Long-eared Bat (*Myotis septentrionalis*)

During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns, sheds, and bridge decks (USDI Fish and Wildlife Service, 2014b). The Missouri River lies within this bat's primary range in North Dakota (USDI Fish and Wildlife Service, 2014b). Eastern cottonwood and green ash will provide roosting and nursery habitat for the northern long-eared bat.

Red knot rufa *(Calidris canutrus)*

Red knot rufas winter and migrate in large flocks containing hundreds of birds. While we can guess at some of the benefits of traveling in large flocks, such as protection from predators, we can also see the downside - susceptibility to habitat change and loss, oil spills, diseases, collisions with wind turbines, storms, and hunting. The red knot's life history depends on

suitable habitat, food, and weather conditions from across the Western Hemisphere, from the extreme south of Tierra del Fuego to the far north of the central Canadian Arctic. Further, red knots need to encounter these favorable habitats, food, and weather conditions within narrow seasonal windows as the birds hopscotch along migration stopovers between wintering and breeding areas. For example, the red knot population decline that occurred in the 2000s was caused primarily by reduced food availability from increased harvests of horseshoe crabs, exacerbated by small changes in the timing that red knots arrived at the Delaware Bay. Red knots may also be particularly vulnerable to global climate change, which is likely to affect the arctic tundra ecosystem where the knots breed; the quality and quantity of coastal habitats due to rising sea levels; the quantity and timing of invertebrate food resources throughout the bird's range; and the severity, timing, and location of storm and weather patterns (USDI Fish and Wildlife Service, 2013b).

Although recognized as a coastal bird, the red knot rufa has been sighted at four locations in North Dakota (NatureServe, 2016). The closest location would be south of Bismarck along the Missouri River. Since the red knot rufa breeds in the tundra and the Arctic Cordillera in the far north of Canada, Europe, and Russia (Baker et al., 2013); these sightings would be classified as migratory sightings.

Critical Habitat

Piping Plover (*Charadrius melodus)* Designated Critical Habitat

The USDI Fish and Wildlife Service (2002a, 2013a) proposed areas of critical habitat to include prairie alkali wetlands and surrounding shoreline; river channels and associated sandbars and islands; and reservoirs and inland lakes and their sparsely vegetated shorelines, peninsulas, and islands. These areas provide primary courtship, nesting, foraging, sheltering, and brood-rearing and dispersal habitat for piping plovers. Both Morton and Burleigh Counties have designated critical habitat associated with the Missouri River.

Nest locations on barren river sandbars are most likely selected due to their sparse vegetation and relatively narrow beaches (100 – 400 m wide). Adults and juveniles will head for the wintering

grounds after fledging (when chicks learn to fly), with most piping plovers departing by the end of August.

□

As defined under the ESA, the environmental baseline includes past and present impacts of all federal, state, and private actions in the Action Area; the anticipated impacts of all proposed federal actions in the area that have undergone formal or early section 7 consultation; and the impact of state and private actions which are contemporaneous with the section 7 consultation process. Future actions and their potential effects are not included in the environmental baseline. This section in combination with the previous section defines the current status of the species and its habitat in the action area and provides a platform to assess the effects of the proposed action under consultation with the USDI Fish and Wildlife Service.

General Setting

A species list from the USDI Fish and Wildlife Service (2017a) with all federally listed and candidate species within Morton and Burleigh Counties in North Dakota was reviewed for this analysis. Using this list, we determined which of those species had a potential to occur within the Analysis Area. Species not known or with no potential of occurring in the Analysis Area are documented with rationale in **Table 3** and excluded. Excluded species have been dropped from further analysis by meeting one or more of the following conditions:

1. Species does not occur nor is expected in the project area during the time period activities would occur;
2. Occurs in habitats that are not present; and/or
3. Is outside of the geographical or elevation range of the species.

Work within the Project and Analysis Areas included an intensive survey for all Threatened and Endangered Species (TES), an evaluation of habitat components necessary to support these species, and documentation of land uses. Kevin Sedivec and Dennis Whitted conducted a floristic- and faunal

based complete search using a belt type transect survey (150 ft belt) and systematic survey of known habitat types. Search efforts were intensified in areas where threatened and endangered species were likely to occur. Intuitive directed searches were conducted in areas with homogenous habitats and vegetation. A complete observed species list of the surveyed areas was compiled during the field survey as required by the survey protocol (**Appendix C**). Plant and wildlife species were identified in the field. Any unknown species were collected and later identified in the laboratory.

Environmental Baseline

The discussion of environmental baseline conditions will focus on habitat elements that are biological requirements of the species under consultation. Only those subsections that relate to this proposed project will be included. In general, the Environmental Baseline section of the BA should include:

State, tribal, local, and private actions already affecting the species or that will occur contemporaneously with the consultation. Unrelated Federal actions affecting the same species or critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are federal and other actions within the action area that may benefit listed species or critical habitat. We provide:

1. A description of habitat for listed or proposed species in the action area and the amount of degradation that has occurred to date.
2. As much specific data as are reasonably available. This includes information from habitat inventories and surveys completed in the action area and the methods used.
3. A description of critical habitat and its condition if the action area includes designated or proposed critical habitat.
4. Maps and figures of specific relevant biological features relative to the proposed action (i.e., Permit and Action Areas).

5. Photographs when they can aid in describing environmental baseline conditions within the Permit and Action Areas.

Terrestrial Species and Habitat

The permit and action area has been impacted by human activity and disturbance for decades, but recent use of the Missouri River and adjacent shoreline has been exaggerated in the past 30 years. Since the permit area lies between Bismarck and Mandan, ND – the second largest populated metro area of the state – a high volume of disturbance has occurred.

Grasslands

The grassland portions of the Permit Area are found on the east side of the Action Area in Burleigh County. This area was heavily disturbed by railroad companies in the late 1800s and early 20th Century. The grasslands were reseeded to crested wheatgrass and smooth bromegrass, eliminating most native plant species diversity. These grasslands would have been historically inhabited by the Dakota skipper. With the past actions of the federal, state, local government, and the private sector, no preferred habitat exists for the Dakota skipper.

Forest Community

The forested community is found on the west side of the Action Area in Morton County. With the exception of the railroad bed and direct right-of-way, this area remains an intact forest region and has been disturbed the least by human development since at least 1991 (Google Earth, 2017). The forested area would provide habitat for the gray wolf and northern long-eared bat.

Due to this area being heavily populated, the woodland comprising less than 30 acres, these woodland areas would not provide preferred habitat for the gray wolf. North Dakota Game and Fish Department states gray wolf sightings in North Dakota are rare with breeding populations known not to occur in North Dakota (North Dakota Game and Fish Department 2016).

The forest community found within the Action Area can provide habitat for the northern long-eared bat. Habitat varies by season; but the summer habitat – when this species is found in North Dakota - requires large trees for roosting, occasionally roost in barns or structures, including

bridges. Both large trees (eastern cottonwood, green ash) and structures (railroad bridge) are found in the Action Area.

Shoreline

The shoreline of the Missouri River and a peninsula shaped sandbar lie within the Action Area. Historically, this habitat would be used by the piping plover and red knot rufa, and possibly the interior least tern – depending on the location of the sandbars. This area also lies within the piping plover's designated critical habitat.

Past actions of the federal, state, local government, and the private sector has dramatically altered the ecological function and physical properties of this habitat type. Today, these shorelines are disturbed with so much regularity, the likelihood of either of these species using this habitat would be rare.

The piping plover require sandbars and shorelines that are sparsely vegetative, or large alkaline wetlands that contain a shoreline. The present-day shorelines within the Action Area are narrow, sparsely vegetative along the immediate shoreline, and heavily vegetated from 1 to 3 m away from the immediate shoreline, or barren due to human intervention and recreation use. Wiltermuth et al. (2015) clearly showed piping plover live and nest on the Missouri River; however, they prefer sparse vegetation on long shorelines or sandbars. USDI Fish and Wildlife Service (2002a, 2013a) also stated they will not in-habitat areas heavily disturbed by human activity.

The present state of these shorelines and sandbars (heavily vegetated), and location of sandbar (a peninsula attached to the shore) do not meet the requirements of interior least tern. The interior least tern requires sandbars that are sparsely vegetated and on sandy shorelines, preferable to sandbars located toward the center of the river (Sidle and Harrison 1990).

Aquatic Species and Habitat

The Missouri River does provide habitat for the pallid sturgeon. Pallid sturgeon are found on the bottom of large, silty rivers with a natural diversity of depths and velocities formed by channels, sand bars and flats, and gravel bars. Adult pallid sturgeon may be present within the Action Area at any given time. However, the stretch of the river the Action Area lies within is known not to contain habitat for reproduction or depository area for egg laying (Krentz, 2016 personal communication). The current recovery plan shows present day range from the confluence of the Yellowstone and Missouri River as the eastern most range in North Dakota, with the exception of the tailrace below the Garrison dam (Dryer and Sandvol, 1993; USDI Fish and Wildlife Service, 2014a).

Analysis of Effects

In this section, a review of the impacts to species that have the potential to occur within the permit area is provided. Effect determinations will be given for the federally listed species and critical habitat.

This project may affect (directly or indirectly) northern long-eared bat, piping plover, interior least tern, red knot rufa, and pallid sturgeon. Although required nesting and brood-rearing habitat does not exist for either bird species, or depository habitat for pallid sturgeon spawning, all of these species may be effected during foraging, migrating, or day-to-day movement patterns. The forested community and bridge structure may provide habitat for roost and nursey sites of the northern long-eared bat.

Direct Effects

Piping Plover, Interior Least Tern, Red Knot Rufa

Construction activities will have a direct effect on these shore birds. Although no suitable nesting and brood-rearing habitat occurs within the Action Area, the construction of the new bridge and removing old bridge can impact foraging habitat of the piping plover, interior least

tern, and red knot rufa. This activity will disturb the shorelines for a short period of time, reducing foraging locations and resting habitat for non-nesting piping plover and interior least tern adults. The increased noise and human activities will also deter adults from using the Action Area temporarily. Since the red knot rufa does not nest on the Missouri River, these construction activities will impact this bird only if they migrate through in the spring and fall.

These shorelines provide limited suitable foraging and resting habitat for these birds (due to highly vegetative sandy shorelines), so noise and human activities will have the greatest direct effect on these birds. This direct effect should not cause a take of either species, but deter the adults from using the area.

There really are no measures within the scope of this project to minimize these direct effects. Because this project involves the replacement of an existing bridge with a new bridge, the construction activities will not have any long-term impacts of the limited foraging and resting habitat of these shore birds. There is sufficient habitat for foraging and resting directly north of the Action Area for adult birds to use when disturbed by noise and human activities.

When considering the recovery and management plans that are currently in place by the US Fish and Wildlife Service for the piping plover and interior least tern, this project will have no direct impact on these plans. These plans are designed to protect and enhance nesting and brood-rearing habitat for these species. Since required habitat is known not to occur within the Action Area, this project should not impact these recovery and management plans.

Pallid Sturgeon

Although no suitable depository habitat is found within the Action Area for spawning pallid sturgeon, this project could have a direct effect on adults that live within this area. The development of the new bridge sub-structures and removal of old bridge sub-structure can directly affect adults at the time of these activities. These construction activities will not remove habitat, but create exposure when work takes place in the water. The increased noise and human activity can impact the movement patterns, but should not create any situations that lead to a take

of an individual. To minimize any take situations of passing adults, the sub-structures from the old bridge should be removed without explosions.

When considering the recovery and management plan currently in place by the US Fish and Wildlife Service for the pallid sturgeon, this project will have no direct impact on these plans. These plans are designed to protect and enhance spawning habitat for this species. Since required habitat is known not to occur within the Action Area, this project should not impact the recovery and management plan.

Northern Long-eared Bat

Suitable roosting and nursery habitat is found within the Action Area for the northern long-eared bat. A forested area is located on the Morton County side of the project. Some of the large eastern cottonwood and green ash trees have holes or crevices, mainly created by squirrels. These holes can provide habitat for roosting and possibly nurseries when these bats are found in North Dakota. This bat is found in North Dakota during the late spring and summer months, and pregnant females will give birth to one pup from late May through July.

If trees are disturbed while the northern long-eared bat are present, both roosting and nursery habitat can be destroyed, possibly causing a take of an individual. Construction that involves removal of trees during this period will have a direct effect on individuals, colonies, and habitat. Noise and human activities that will occur with this project can directly impact movement, especially during the early and late evening time periods.

US Fish and Wildlife found critical habitat not prudent and developed no recovery plan for the northern long-eared bat. Minimization measures can be implemented to eliminate any direct effect on the northern long-eared bat. Tree removal will be involved in this project. Removal of trees can be performed outside this bat's presence in North Dakota.

Piping Plover Critical Habitat

The Missouri River is classified as critical habitat for the piping plover. During the construction period of this project, a small area directly under the existing bridge and alongside of the existing

bridge where the new bridge will be placed will be impacted and likely disturbed. However, this area of disturbance is heavily vegetated and not classified as meeting the requirements of required habitat. Although individual adult birds may be directly affected as stated earlier, critical habitat for nesting and brood-rearing does not exist within the Action Area.

Indirect effects

The indirect effects will be addressed by first answering the ten indirect effect questions in the guidance document. If any question results in a "yes" for a threatened and endangered species, we will follow the same exposure/response framework as the direct effects.

1. Will the project create a new facility? Although a new bridge will be installed, it will replace an existing bridge within the same location. So, I would answer "No".
2. Will the project improve a level of service of an existing facility as established in local GMA plans? Although the new bridge will improve the safety for the trains that use this site, local residential housing, and recreational uses of the river; it will not change the level of service of the existing area. So, I would answer "No"
3. Determine if the transportation project has a causal relationship to a land use change by answering the following questions.
    a. Is there a building moratorium in place that is contingent on the proposed improvement? "No"
    b. Are there any land use changes tied by permit condition to the proposed improvement? "No"
    c. Do the project's NEPA documents identify other actions or land use changes caused by or resulting from the project that are reasonably certain to occur? I would assume "No". I am not privy to the NEPA document if one was written.

d. Do development plans include scenarios for the planning area where land use differs based on a "build" and "no build" outcome related to the proposed project? "No"

e. Is there land use change that is likely to occur at a different rate as a result of the project? "No"

Since there is a "No" to the first 3 questions, the analysis using the Indirect Effect Guidance flow chart (template provided by USACE in June 2017) shows "No Effect" as it relates to the indirect effect question. However, since trees will need to be removed to tie the existing railroad tracks to the new bridge, there will be an indirect effect on some northern long-eared bat habitat that lies within the floodplain of the Missouri River.

Cumulative Effects

Conclusions and Effect Determinations

Gray Wolf *(Canis lupus)*

The project will have ***"no effect"*** on the gray wolf. No gray wolves were observed during the field survey. Although limited suitable habitat occurs within the Action Area, no known population exist in North Dakota. Due to the close vicinity to the cities of Bismarck and Mandan (less than 30 m from residential housing), close vicinity to highways and vehicle traffic, and lack of desired habitat, if a transient gray wolf appears, they will likely be diverted away from these populated areas.

Interior Least Tern *(Sterna antillarum)*

The project will have ***"no effect"*** on the interior least tern. No interior least terns were observed during the field survey. No suitable habitat occurs in the Action Area. Shoreline along this section of the Missouri River was narrow (0.3 – 1m) with sparse vegetation, but the adjacent bank heavily

vegetated. Sidle and Harrison (1990) reported the least tern prefers to nest in colonies on un-vegetated to sparsely vegetated sandbars with a sandy/gravelly substrate and that are toward the center of the river.. The shoreline affected by this project would not be classified as required nesting habitat for the interior least tern, thus unlikely to encounter a nest or even an adult foraging bird.

Whooping Crane *(Grus Americana)*

The project will have ***"no effect"*** on the whooping crane. No whooping cranes were observed during the field survey; however, this was expected due to timing of survey. No suitable roosting habitat exists within the Action Area, and no small fields of harvested grain occur within Analysis Area. Although the whooping crane may fly over for temporary feeding, they will not stay for any extended time period. Although six wetlands were classified within the Action Area, none of these wetlands were large shallow marshes (the preferred wetland type for foraging). Furthermore, based on a map showing likelihood of whooping crane stopping areas (Pearse et al., 2015) the polygon that represents the Permit and Analysis Areas shows no cranes.

If a whooping crane does land within the Analysis Area, all construction must cease and US Fish and Wildlife Service must be notified. Construction may resume once the whooping crane has permanently left the area during that migration season.

Red knot rufa (*Calidris canutrus*)

The project will have ***"no effect"*** on the red knot rufa. No red knot rufa were found during the survey period. This area is not within the breeding range of this species and rarely used within the migratory route. Only one sighting of a red knot rufa has occurred along the Missouri River.

Piping Plover *(Charadrius melodus)*

The project ***"may affect"*** the piping plover. No piping plovers or nests were found within the Action Area; however, piping plover Designated Critical Habitat occurs within the Missouri River shorelines. Known populations of piping plover adults and fledglings, and nests occur on the Missouri River; however, none within the Analysis Area. The shoreline type within the Action Area and Analysis Area is not habitat required by piping plover to nest and rear fledglings, based on numerous

publications conducted on the Missouri River (Powell and Cuthbert, 1992; Anteau et al. 2012, 2014a, 2014b; Shaffer et al., 2013). Because piping plover prefer sparse to no vegetation on long stretches of sandy beaches (100 to 400 m wide), these shorelines would not meet the required habitat to attract nesting females. The current shorelines are narrow (0.3 to 1 m) has sparse vegetation; however, adjacent bank heavily vegetated and only 1 to 3mt wide.

Due to the heavy use of this region of the Missouri River (in which the Action Area lies) by recreational activities (boating, jet skiing, fishing, hiking on the trails that run parallel to the Burleigh County shoreline, bike riding on the trial that lies along the Morton County shoreline), and residential houses on the Morton County shoreline, actual use by a piping plover adult is unlikely, but still possible. Since adult males and unsuccessful breeding females may feed on the shoreline, a "may affect" was determined. However, due to the high traffic area and disturbance, heavily vegetated and narrow shoreline, this project is ***"not likely to adversely affect"*** the piping plover.

Northern Long-eared Bat *(Myotis septentrionalis)*

The project will have a ***"may affect"*** determination on the northern long-eared bat. No northern long-eared bats were found during the survey period, and no bat guano was found under any sub-structures, including bridge sub-structures. However, the Missouri River is classified by the US Fish and Wildlife Service as primary range for this bat, specifically forested areas along the river. Suitable habitat in the form of large eastern cottonwood and green ash trees were found within the Action Area and Analysis Area based on this classification. The live and dead trees would provide primary roosting and nursery habitat for the northern long-eared bat.

The project proposal states all trees removed during the construction of this project will occur when the bats are not present in North Dakota. This timing of tree removal will eliminate any chances of destroying an individual bat, thus this project is ***"not likely to adversely affect"*** the northern long-eared bat.

Pallid Sturgeon (*Scaphirhynchus albus*)

The project ***"may affect"*** the pallid sturgeon. Although no pallid sturgeon were found during the survey, the Missouri River has a population of adult fish (a 72-inch adult –identified just south of Bismarck in 2017, Rohde, 2017 personal communication). With construction activity involved in this project on and in the river, an individual may be impacted from human activity and noise.

The Missouri River within the Action Area is known not to contain habitat for reproduction or depository area for egg laying (Krentz, 2016 personal communication). The current recovery plan shows present day range from the confluence of the Yellowstone and Missouri River as the eastern-most range in North Dakota, with the exception of the tailrace below the Garrison dam (Dryer and Sandvol, 1993; USDI Fish and Wildlife Service, 2014a). Although this project may affect individual adults, based on these findings of the literature and personal communication from Kentz, this project is ***"not likely to adversely affect"*** the population of pallid sturgeon.

Piping Plover Critical Habitat

This project "***will not destroy or adversely modify***" piping plover designated critical habitat. Although the shoreline of the Missouri River is classified as piping plover critical habitat, the sections that lie within the Action Area and Analysis Area do not contain habitat required to attract egg laying females. Piping plover prefer sparse to no vegetation on long stretches of sandy beaches (100 to 400 feet wide; Powell and Cuthbert, 1992; Anteau et al. 2012, 2014; Shaffer et al., 2013). The shoreline region that will be impacted will be small and does not meet the required habitat, as this area is heavily vegetated and only 1 to 3 m wide.

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Appendices

Appendix A. Detailed Project Construction Description

0038-196.6 ANTICIPATED CONSTRUCTION METHODS

BNSF Railway is currently planning a replacement structure for their crossing of the Missouri River in Bismarck, North Dakota. Located on the Jamestown subdivision of Line Segment 0038, the proposed structure is to be constructed on a parallel alignment offset roughly 30’ from the existing bridge’s centerline, as shown in Figure 5.

Figure 5. Proposed New Bridge Structure Location (green line)

The new bridge is approximately 1554’ in length and will consist of seven ballasted deck prestressed concrete beam approach spans with span lengths of approximately 70’ and 80’, and five steel deck plate girder river spans, each approximately 200’ in length. The approach spans will be split between the east and west approaches, with four allocated for the west and three allocated for the east. The superstructure spans will be supported on reinforced concrete substructures that, in turn, are supported by deep driven pile foundations.

Additional civil works will be required at both approaches to accommodate the proposed alignment shift. The civil works will be minimized to limit the overall project footprint and consist primarily of grading operations at both approaches. Construction of an earthen embankment will be the predominate feature of the west approach; whereas, embankment removals will be the primary task at the east approach.

Once the new bridge is completed and in-service for rail traffic, the existing bridge will be removed. Removal operations will be completed by mechanical means only and removal by demolition will not be allowed.

To complete construction of the proposed structure and corresponding civil works, access to the site and temporary features will be required. Primarily, these temporary works will be required for construction of the proposed substructure units.

All construction activities will be completed in accordance with regulations intended to protect sensitive biological resources. For example, tree clearing within the approaches will be done within the winter months and installation of steel sheet piling for cofferdams and dock walls will not be done between April 15 and June 1.

Since the bridge crosses the Missouri River, site access and construction methods will differ depending on the segment of the project under consideration. As such, the bridge will be separated into three distinct regions for examination: west approach, river spans, and east approach.

West Approach:

The project elements contained within the west approach are Piers 9-12, Abutment 13, Spans 9-12, and expansion of the earthen approach embankment, as shown in Figure 6.

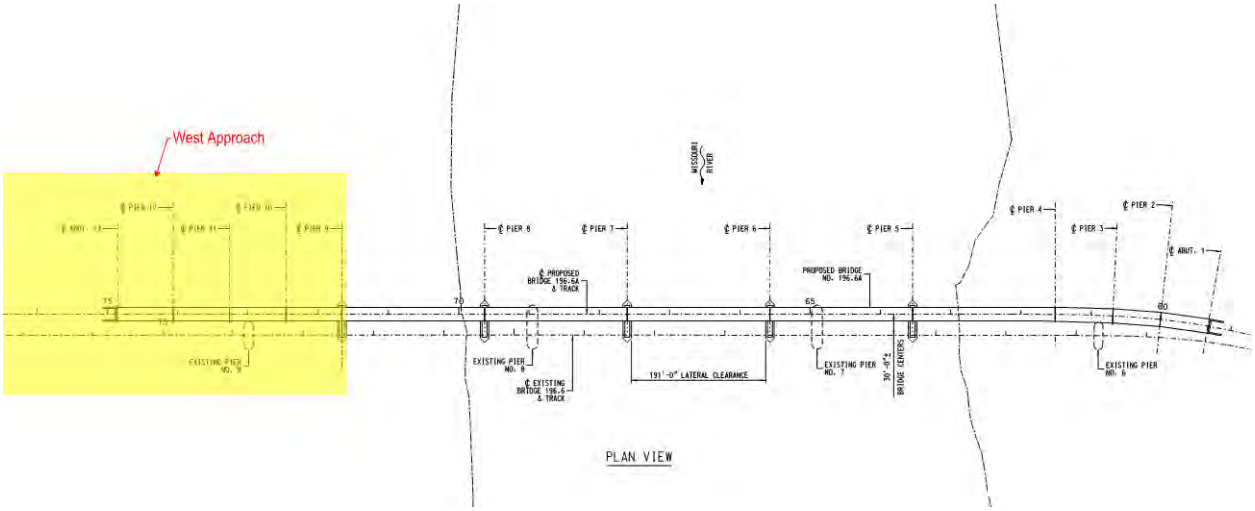

Figure 6. West Approach

It is anticipated that construction of the civil works and bridge elements within the west approach will be completed in the following fashion. The primary site access for construction operations will be made off of the West Bismarck Expressway at the far west end of the project. Temporary access will be provided to the two embankment benches located adjacent to the highway underpass structure, as shown in Figure 7.

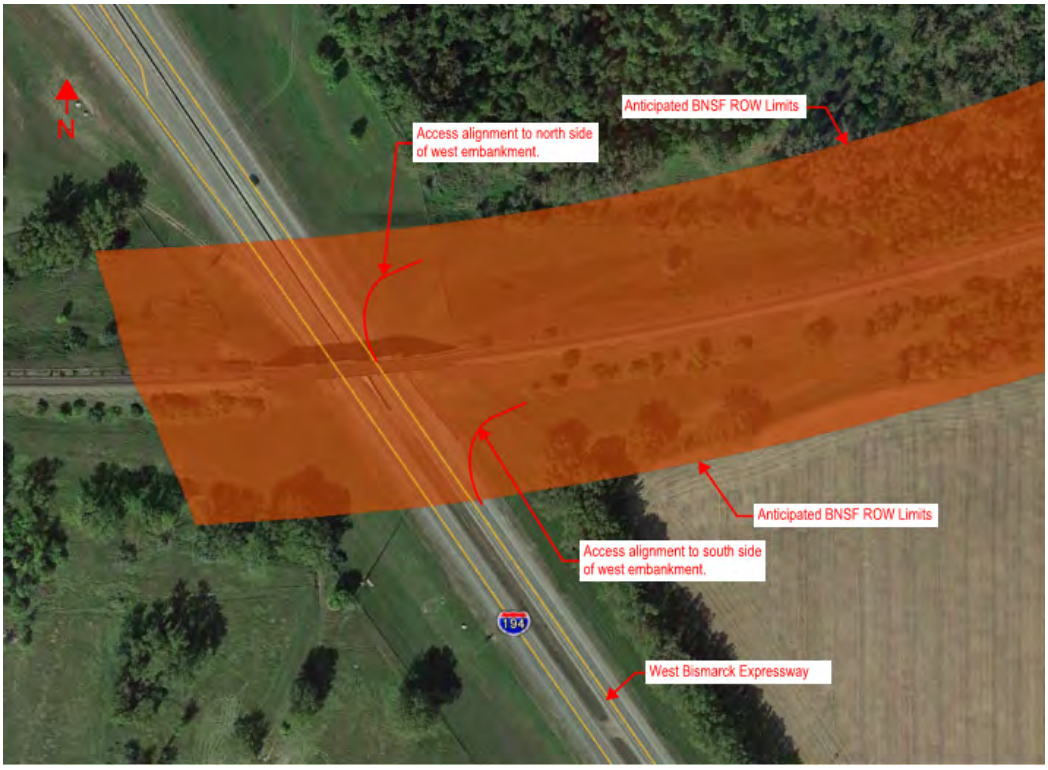

Figure 7. West Approach Access

The access points will be configured to avoid the in-place guardrail protecting the underpass bridge pier from northbound expressway traffic, as shown in Figure 8.

Delivery of construction equipment and material will be made via these access points. Temporary traffic control measures will be required with deliveries proposed during off-peak (i.e. mid-day and overnight) traffic hours only. Access for construction staff will originate off of Captain Leach Drive south of the project site and traverse along the east side of the agricultural field to the edge of BNSF ROW. A parking area approximately 200’ x 200’ will be created in the field’s northeast corner and also contain construction offices.

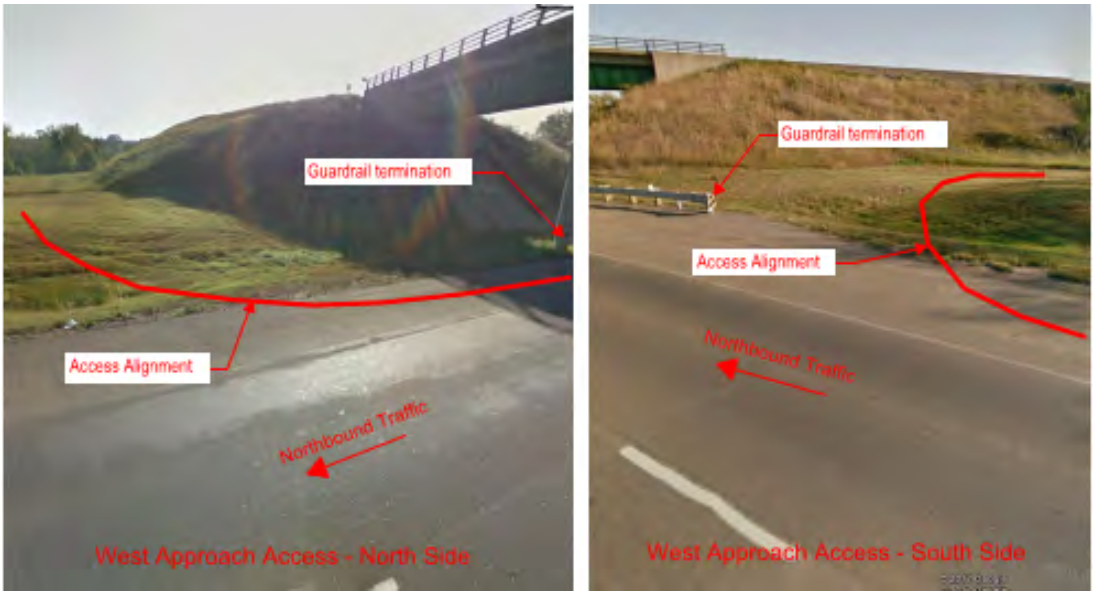

Figure 8. West Approach Access

Other than access for construction personnel and vehicle and construction office parking, construction of the west approach work will be contained entirely within current BNSF ROW. To this end, staging/lay-down areas will be required for completion of the work. The two embankment benches at the west end of the embankment as well as the bank area near the Missouri River are anticipated for this use. These areas are identified in Figure 9.

Using the identified site access and staging/lay-down areas, construction of the west approach civil works are anticipated to begin at the west project end and progress back toward the River. Embankment material will be deposited in the staging/lay-down area and pushed east and compacted in a systematic fashion. As the embankment is constructed to its finished configuration, a small retaining wall and additional fill will be placed along the toe of slope to create a construction access road to the River. The access road will be approximately 30’ wide and will be contained entirely within BNSF ROW.

Figure 9. West Approach Staging/Lay-Down Areas

Construction of the west approach span bridge substructures will be initiated by localized grading to the proposed bottom of footing elevation within the plan limits of the individual substructure unit. Within this area, a mat of steel H-piling will be driven with a diesel-powered hammer. The anticipated pile lengths range from approximately 170’ at the west abutment to approximately 70’ at Pier 9. An HP 14x102 steel pile will be utilized throughout and either welded or prefabricated pile splices will be necessary to achieve the anticipate pile lengths. Pile point reinforcement will be used at all substructure locations.

On top of the pile mats will be placed cast-in-place concrete footings and cast-in-place concrete stems. The concrete elements will be formed by conventional means and strengthened with mild

steel reinforcement. Concrete will be delivered to the site via the construction access road and a concrete pump may be used for placement if necessary.

Upon completion of the substructure units, construction of the superstructure elements will begin. The approach spans are configured with precast-prestressed concrete beam elements that will be fabricated off-site and delivered to the project. Delivery to the site will be made via the construction access road and placement of the individual beams on the substructures will be completed with cranes positioned within BNSF ROW. A cast-in-place concrete deck with cast-in-place concrete ballast curbs will be placed on the beams. Concrete placement operations for these elements will be supplied to the site via the construction access road and pumped to the deck elevation.

River Spans:

The project elements contained within the river spans are Piers 5-8, and Spans 4-8, as shown in

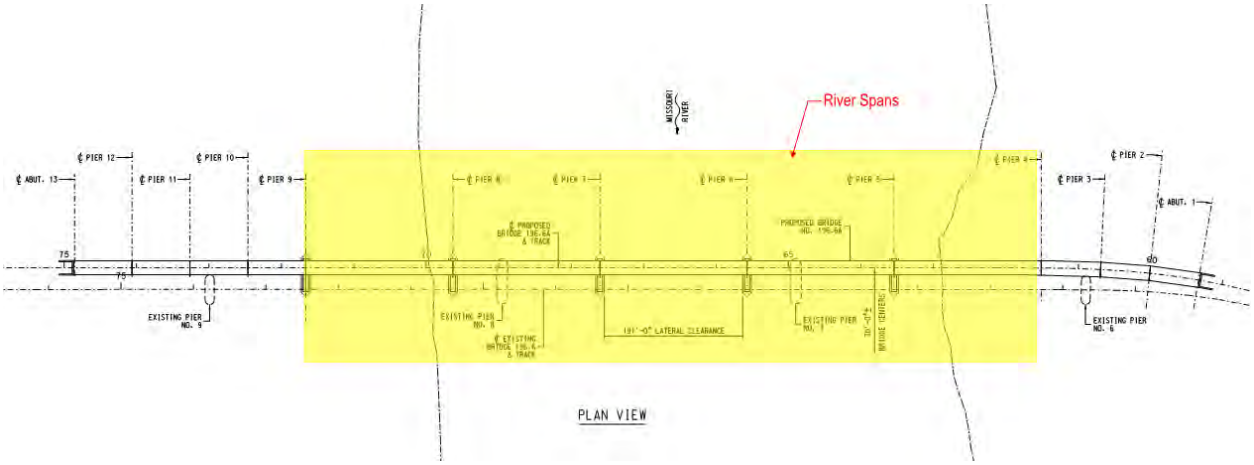

Figure 10. River Spans

One of the primary challenges associated with development of the new structure will be construction of the river span foundations, Piers 5-8, as access for construction will be largely dictated by water depths within the Missouri River. With the exception of Pier 8, the intended construction access will be via barges. Equipment and material will be supplied to the barges via

the west approach construction access road constructed along the north side of the proposed embankment. To provide the necessary water depths to allow the transition from land-based to water-based construction operations, a temporary dock wall will be constructed along the west bank of the River, as shown in Figure 11. Configured as such, the dock wall will allow for construction of Pier 8 without the need for barge access. The dock wall will be constructed utilizing steel sheet piling with aggregate fill material placed behind the wall. Individual steel sheets will be installed using vibratory techniques and a geotextile will be placed to separate the aggregate fill from the in-situ soils. To be feasible, the minimum water depth adjacent to the dock wall and throughout the working area of the Missouri River must be 6.0 feet. As such, some degree of dredging may be needed to maintain construction operations. Dredged materials will be stockpiled within the Staging/Lay-down area and will either be reused as embankment fill material or transported off-site for disposal.

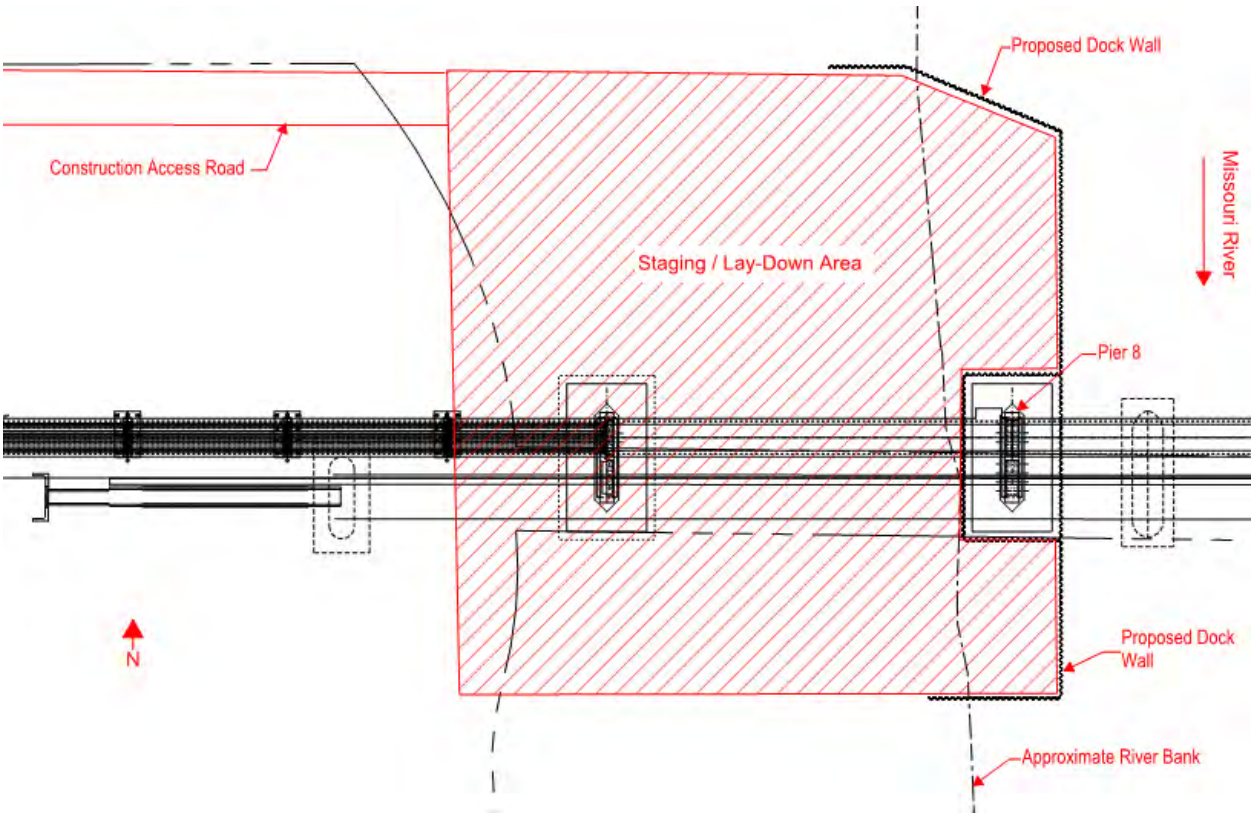

Figure 11. West Dock Wall

Construction of the river piers will begin with installation of the cofferdams. Cofferdams will be constructed with steel sheet piling installed with vibratory methods and will be configured to accommodate the proposed pier footing and supporting pile mat. To minimize impacts to the Missouri River hydraulics, no more than two river pier cofferdams will be installed at any one time.

Following cofferdam installation, the material contained within the cofferdams will be removed to the proposed bottom of footing seal elevation with clam-shell type excavation equipment. Excavated materials will be transported to the Staging/Lay-down area and will either be reused as embankment fill material or transported off-site for disposal.

Within the excavated cofferdams, a mat of steel H-piling will be driven with a diesel-powered hammer. The anticipated pile lengths range from approximately 40’ at the Pier 8 to approximately 60’ at Pier 5. An HP 14x102 steel pile will be utilized throughout and either welded or prefabricated pile splices will be necessary to achieve the anticipate pile lengths. Pile point reinforcement will be used at all substructure locations.

Once all of the piles are installed, a cast-in-place concrete footing seal will be placed at the bottom of the cofferdam excavation. Concrete for the footing seal will be delivered to the site via the construction access road and transported to the individual foundation via barge where necessary. Strengthening of the footing seal with mild steel reinforcement will not be required.

Upon sufficient cure of the footing seal concrete, water contained within the cofferdam will be pumped out and additional steel reinforcement added to the cofferdam interior as the hydrostatic pressures from the differing water surface elevations are generated. Pumped water from the cofferdam interior will be deposited directly back into the Missouri River if it does not contain dredged sediments; otherwise, it will be collected and transported to the Staging/Lay-down area for disposal.

Construction of the river pier footings and stems may be initiated once the tops of the cofferdams seals are exposed. Footings and stems will be constructed from cast-in-place concrete and strengthened with mild steel reinforcement. Similar to the cofferdam seals, concrete will be

delivered to the site via the construction access road and transported to the individual foundations via barge where necessary.

When stem construction has progressed to an elevation above the river's water surface, the cofferdam is no longer needed and may be removed. Removal operations will progress in reverse order to cofferdam construction beginning with staged filling and removal of internal steel strengthening elements. Cofferdam filling operations will be completed by pumping water directly from the Missouri River. Once the water surface elevation between the interior and exterior of the cofferdam has converged, the steel sheets will either be removed by vibratory methods or cut-off at the lowest possible elevation.

Upon completion of the substructure units, construction of the superstructure elements will begin. The river spans are configured with welded steel plate girder elements that will be fabricated off-site and delivered in segments to the project. Delivery to the site will be made via the construction access road and assembly of the individual girders will be completed within the Staging/Lay-down area. Installation of the girders on the substructures will be completed with cranes positioned on barges or in the Staging/Lay-down area. A cast-in-place concrete deck with cast-in-place concrete ballast curbs will be placed on the girders. Concrete placement operations for these elements will be supplied to the site via the construction access road and pumped to the deck elevation.

The anticipated access for construction of the river spans is via barges. This access method requires at least 6.0 feet of water depth for the duration of construction to be feasible. Since the actual water depth at the time of construction is unpredictable, it may be necessary to complete a portion of the river span work via earthen causeway. Causeways may be pursued should the water depths decrease significantly below the 6.0 foot minimum threshold requirement and localized dredging proves ineffective or offensive. Causeways, if utilized would be constructed as earthen embankments utilizing imported fill material with rip rap used to armor the causeways to protect against erosion. A geotextile fabric would be used to separate the proposed temporary fills from the in-situ soils. All temporary causeway material would be removed once no longer needed for construction.

East Approach:

The project elements contained within the east approach are Piers 2-4, Abutment 1, Spans 1-3, and grading work necessary to modify the east approach, as shown in Figure 12.

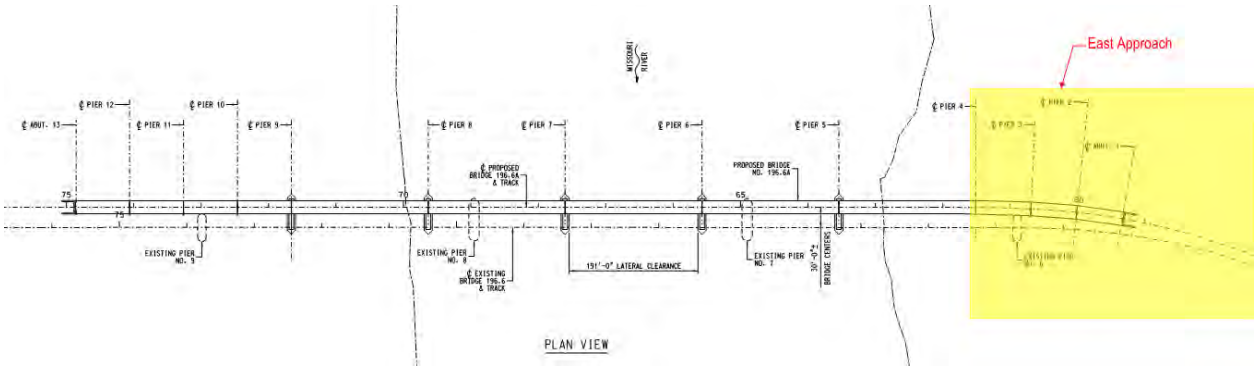

Figure 12. East Approach

It is anticipated that construction of the civil works and bridge elements within the east approach will be completed in the following fashion. The primary site access for construction operations will be made off of River Road at the east end of the project. Temporary access will be provided to the north side of the current alignment, as shown in Figure 13.

In addition, access to the river bank will be necessary for installation of the Span 4 superstructure and assistance with construction of Pier 5. Access to this location will be provided via a temporary access road adjacent to the river bank, as shown in Figure 14. The temporary shoring indicated will be steel sheeting piling installed via vibratory methods. Additional fill needed to generate the proposed working surfaces will be imported granular material and a geotextile fabric will be placed to separate new fills from the in-situ soils. Tree clearing within this region will be necessary to complete the proposed works as well as temporary closures to both River Road and the Riverfront Trail.

Figure 13. East Approach Access

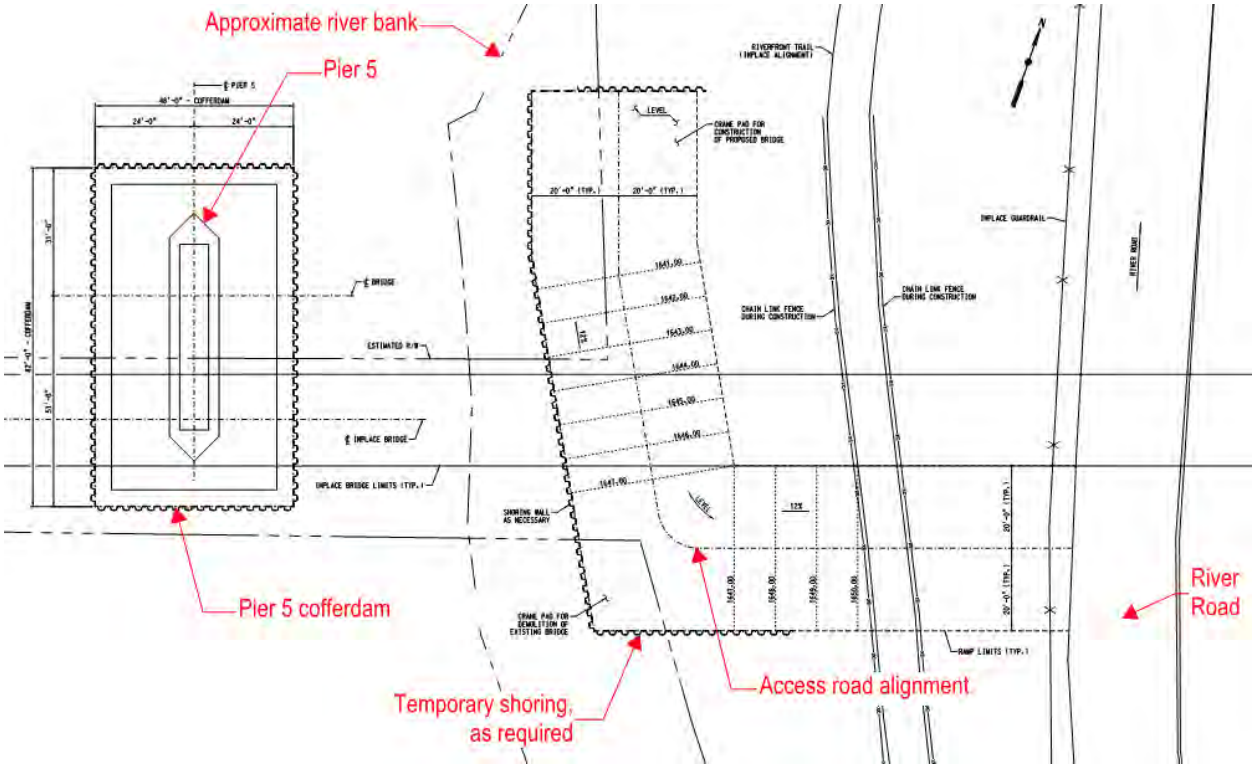

Figure 14. East Approach Access

Access for construction personnel and vehicle and construction office parking, and the staging/lay-down area required for completion of the work will be located on the south side of the existing alignment within BNSF ROW, as shown in Figure 15. An additional staging/lay-down area is available on the north side as well.

Figure 15. East Approach Staging / Lay-Down Areas

Construction of the east approach span bridge substructures will be initiated by localized grading to the proposed bottom of footing elevation within the plan limits of the individual substructure unit. A temporary shoring system will be required for construction of Pier 4 given its proximity to River Road, and for Pier 3 given its proximity to the in-place pier. Within these excavated areas, a mat of steel H-piling will be driven with a diesel-powered hammer. The anticipated pile lengths range from approximately 80’ at Pier 3 to approximately 100’ at Pier 4 and the east abutment. An HP 14x102 steel pile will be utilized throughout and either welded or prefabricated pile splices will be necessary to achieve the anticipate pile lengths. Pile point reinforcement will be used at all substructure locations.

On top of the pile mats will be placed cast-in-place concrete footings and cast-in-place concrete stems. The concrete elements will be formed by conventional means and strengthened with mild steel reinforcement. Concrete will be delivered to the site via River Road and a concrete pump may be used for placement if necessary.

Upon completion of the substructure units, construction of the superstructure elements will begin. The approach spans are configured with precast-prestressed concrete beam elements that will be fabricated off-site and delivered to the project. Delivery to the site will be made via River Road and placement of the individual beams on the substructures will be completed with cranes positioned within BNSF ROW. A cast-in-place concrete deck with cast-in-place concrete ballast curbs will be placed on the beams. Concrete placement operations for these elements will be supplied to the site via the construction access road and pumped to the deck elevation.

Appendix B. Biology of Listed Species as Referenced by USDI Fish and Wildlife Service published Fact Sheets

Species Name: Black-footed ferret (*Mustela nigripes*)

Status of Species: Endangered

Listing History: March 11, 1967

Suitable habitat parameters/characteristics for life stages and proximity related to project area: No suitable habitat found within Action Area

Life History Information:

Black-footed ferrets (BFF) depend exclusively on prairie dog burrows for shelter. Historically, BFF habitat coincided with habitats of black-tailed prairie dog (*C. ludovicianus*), Gunnison's prairie dog (*C. gunnisoni*), and white-tailed prairie dog (*C. leucurus*). The BFF is the only ferret species native to the Americas. Its historical range spanned much of western North America's intermountain and prairie grasslands, extending from Canada to Mexico. As of 2015, BFFs have been reintroduced in the wild at 24 sites across 8 states, Canada, and Mexico.

The mating season for BFFs is March-April. Gestation time is 41 to 43 days, and kits are born May through June. Litter sizes are typically three to five kits. Kits are born blind and helpless, staying below ground until they are about two months old. At this age BFF mothers move their litters to various burrows within their home range and begin to take them on hunting forays. At approximately 90 days of age, kits reach 90% of their adult size, and are adept at killing prairie dogs.

Status of Critical Habitat: No critical habitat identified by US Fish and Wildlife.

Species Name: Gray Wolf (*Canis lupus*)

Status of Species: Endangered

Listing History: March 9, 1978

Suitable habitat parameters/characteristics for life stages and proximity related to project area: No reproducing wolf packs are found in North Dakota

Life History Information:

Gray wolves were once common throughout all of North America, but were exterminated in most areas of the United States by the mid-1930s. Today, their range has been reduced to Canada, Alaska, the Great Lakes, northern Rockies and Pacific Northwest. Thanks to the reintroduction of wolves in 1995, Yellowstone National Park is one of the most favored places to see and hear wolves in their native habitat. Wolves require large areas of contiguous habitat that can include forests and mountainous terrain, and Mexican gray wolves can thrive in desert and brush in the southwest. Suitable habitat must have sufficient access to prey, protection from excessive persecution, and areas for denning and taking shelter.

Wolves live, travel and hunt in packs of 7 to 8 animals on average. Packs include the mother and father wolves (called the alphas), their pups and older offspring. The alpha female and male are typically the pack leaders that track and hunt prey, choose den sites and establish the pack's territory. Wolves develop strong social bonds within their packs.

Wolves have a complex communication system ranging from barks and whines to growls and howls. While they don't actually howl at the moon, they are more active at dawn and dusk, and they do howl more when it's lighter at night, which occurs more often when the moon is full.

Breeding season occurs once a year late January through March. Pups are born blind and defenseless. The pack cares for the pups until they fully mature at about 10 months of age when they can hunt on their own. Once grown, young wolves may disperse. Dispersing wolves have been known to travel 50 to 500 miles.

Status of Critical Habitat: No critical habitat identified in North Dakota by US Fish and Wildlife.

Species Name: Interior least tern (*Sterna antillarum*)

Status of Species: Endangered

Listing History: May 28, 1985

Suitable habitat parameters/characteristics for life stages and proximity related to project area: Sandbars within the Missouri River provide suitable habitat. No suitable habitat found within Action Area

Life History Information:

Historically, the least tern was found on the Atlantic, Gulf of Mexico, and California coasts and on the Mississippi, Missouri, and Rio Grande River systems. It was found throughout the Missouri River system in North Dakota.

The interior population of the least tern presently breeds in the Mississippi, Missouri, and Rio Grande river systems. The birds usually stay in close proximity to the rivers. Census data indicates over 8,000 least terns in the interior population. Birds from the interior population winter along the Gulf of Mexico and on Caribbean Islands. In North Dakota, the least tern is found mainly on the Missouri River from Garrison Dam south to Lake Oahe, and on the Missouri and Yellowstone Rivers upstream of Lake Sakakawea. Approximately 100 pairs breed in North Dakota.

In North Dakota, the least tern utilizes sparsely vegetated sandbars on the Missouri and Yellowstone Rivers. Birds nest, raise young, and relax on barren river sandbars.

The breeding season for the interior population of the least tern lasts from May through August. The peak of the nesting season occurs from mid-June to mid-July. Nests are bowl-shaped depressions, about 4" across, on barren, sandy areas. Least terns nest in colonies where the nests can be as close as a few feet apart. A typical clutch contains 2 to 3 eggs and takes about 24 days to hatch. Both parents incubate the eggs and feed the young. Young are able to fly in about 21 days. Least terns typically live 1 to 5 years. Terns forage for small fish in the river and nearby wetlands.

Status of Critical Habitat: No critical habitat identified by US Fish and Wildlife.

Species Name: Pallid sturgeon (*Scaphirhynchus albus*)

Status of Species: Endangered

Listing History: September 6, 1990

Suitable habitat parameters/characteristics for life stages and proximity related to project area: The Missouri River provides suitable habitat, including within the Action Area, for adults; however, all of the Missouri River below the tailrace does not provide required habitat for reproduction.

Life History Information:

Pallid sturgeon are a bottom-oriented, large river obligate fish inhabiting the Missouri and Mississippi rivers and some tributaries from Montana to Louisiana (Kallemeyn 1983). Pallid sturgeon evolved in the diverse environments of the Missouri and Mississippi river systems. Floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters formed the large-river ecosystem that met the habitat and life history requirements of pallid sturgeon and other native large-river fishes. Substrate Pallid sturgeon have been documented over a variety of available substrates, but are often associated with sandy and fine bottom materials (Bramblett and White 2001; Elliott et al. 2004; Gerrity 2005; Snook et al. 2002; Swigle 2003; Peters and Parham 2008; Spindler 2008). Substrate association appears to be seasonal (Kochet al. 2006a; Koch et al. 2012). During winter and spring, a mixture of sand, gravel and rock substrates are used and during the summer and fall, sand substrate is most often used (Koch et al. 2006a). In the middle Mississippi River, pallid sturgeon transition from predominantly sandy substrates to gravel during May which may be associated with spawning (Koch et al. 2012). In these river systems and others, pallid sturgeon appear to use underwater sand dunes (Bramblett 1996; Constant et al. 1997; Snook et al. 2002; Elliott et al. 2004; Jordan et al. 2006). Depths and Velocity Across their range, pallid sturgeon have been documented in waters of varying depths and velocities. Depths at collection sites range from 0.58 meter (m) to > 20 m (1.9 to > 65 feet (ft)), though there may be selection for areas at least 0.8 m (2.6 ft) deep (Bramblett and White 2001; Carlson and Pflieger 1981; Constant et al. 1997; Erickson 1992; Gerrity 2005; Jordan et al. 2006; Peters and Parham 2008; Wanner et al. 2007). Despite the wide range of depths associated

with capture locations, one commonality is apparent: this species is typically found in areas where relative depths (the depth at the fish location divided by the maximum channel cross section depth expressed as a percent) exceed 75% (Constant et al. 1997; Gerrity 2005; Jordan et al. 2006; Wanner et al. 2007). Bottom water velocities associated with collection locations are generally < 1.5 m/s (4.9 ft/s) with reported averages ranging from 0.58 m/s to 0.88 m/s (1.9 ft/s to 2.9 ft/s) (Carlson and Pflieger 1981; Elliott et al. 2004; Erickson 1992; Jordan et al. 2006; Swigle 2003; Snook et al. 2002).

Data on food habits of age-0 pallid sturgeon are limited. In a hatchery environment, exogenously feeding fry (fry that have absorbed their yolk and are actively feeding) will readily consume brine shrimp suggesting zooplankton and/or small invertebrates are likely the food base for this age group. Data available for age-0 Scaphirhynchus indicate mayflies (*Ephemeroptera*) and midge (*Chironomidae*) larvae are important (Sechler et al. 2012). Juvenile and adult pallid sturgeon diets are generally composed of fish and aquatic insect larvae with a trend toward piscivory as they increase in size (Carlson and Pflieger 1981; Hoover et al. 2007; Gerrity et al. 2006; Grohs et al. 2009; Wanner 2006; French 2010). Based on the above diet data and habitat utilization by prey items, it appears that pallid sturgeon will feed over a variety of substrates (Hoover et al. 2007; Keevin et al. 2007). However, the abundance of Trichoptera in the diet suggests that harder substrates like gravel and rock material may be important feeding areas (Hoover et al. 2007).

Pallid sturgeon can be long-lived, with females reaching sexual maturity later than males (Keenlyne and Jenkins 1993). Based on wild fish, estimated age at first reproduction was 15 to 20 years for females and approximately 5 years for males (Keenlyne and Jenkins 1993). Like most fish species, water temperatures influence growth and maturity. Female hatchery-reared pallid sturgeon maintained in an artificially controlled environment (i.e., near constant 16 to 20oC temperatures) can attain sexual maturity at age 6, whereas female pallid sturgeon subject to colder winter water temperatures reached maturity around age 9 (Webb in litt., 2011). Thus, age at first reproduction likely is variable and dependent on local conditions. Females do not spawn each year (Kallemeyn 1983). Observations of wild pallid sturgeon collected as part of the conservation stocking program in the northern part of the range indicates that female spawning

periodicity is 2-3 years (Rob Holm, USFWS Garrison Dam Hatchery, unpublished data). Fecundity is related to body size. The largest upper Missouri River fish can produce as many as 150,000-170,000 eggs (Keenlyne et al. 1992; Rob Holm, USFWS Garrison Dam Hatchery, unpublished data), whereas smaller bodied females in the southern extent of the range may only produce 43,000-58,000 eggs (George et al. 2012). Spawning appears to occur between March and July, with lower latitude fish spawning earlier than those in the northern portion of the range. Adult pallid sturgeon can move long distances upstream prior to spawning, and females likely are spawning at or near the apex of these movements (Bramblett and White 2001; DeLonay et al. 2009). This behavior can be associated with spawning migrations (U.S. Geological Survey (USGS) 2007; DeLonay et al. 2009). Spawning appears to occur over firm substrates, in deeper water, with relatively fast, turbulent flows, and is driven by several environmental stimuli including flow, water temperature, and day length (USGS 2007; DeLonay et al. 2009). Incubation rates are governed by and depend upon water temperature. In a hatchery environment, fertilized eggs hatch in approximately 5-7 days (Keenlyne 1995). Incubation rates may deviate slightly from this in the wild. Newly hatched larvae are predominantly pelagic, drifting in the currents for 11 to 13 days and dispersing several hundred km downstream from spawn and hatch locations (Kynard et al. 2002, 2007; Braaten et al. 2008, 2010, 2012a).

Status of Critical Habitat: No critical habitat identified by US Fish and Wildlife.

Species Name: Poweshiek skipperling (*Oarisma Poweshiek*)

Status of Species: Endangered

Listing History: November 24, 2014

Suitable habitat parameters/characteristics for life stages and proximity related to project area: Extirpated from North Dakota

Life History Information:

The Poweshiek skipperling is a small butterfly with a wing-span of about 1 inch. It is dark brown above with some light orange along the wing margins and a lighter orange head. The underside of the wings, which can be seen when it's at rest, are dark to light brown with very prominent white veins that may make the wing look striped.

Poweshiek skipperling live in high quality tallgrass prairie in both upland, dry areas as well as low, moist areas. In Michigan they are found mainly in prairie fens, a type of wet prairie.

Poweshiek skipperling larvae (caterpillars) hibernate during winter on the ground; they resume activity in spring and continue developing until they pupate and emerge as adult butterflies. Adults have a short lifespan of only one to two weeks and can be seen between mid-June and mid-July. During that time they mate and lay eggs. Larvae hatch during late summer; they feed and develop through early fall and then overwinter to continue development the following spring.

Adult butterflies feed on nectar from prairie flowers such as purple coneflower (*Echinacea* angustifolia), blackeyed susan (*Rudbeckia hirta*) and palespike lobelia (*Lobelia spicata*). Because limited research has been done on the Poweshiek skipperling, we are not certain which plant species are necessary for the larvae to develop although we know they select native, fine-stemmed grasses and sedges such as little bluestem (*Schizachyrium scoparium*) and prairie dropseeed (*Sporobolus heterolepis*).

Historically, Poweshiek skipperlings were found in tallgrass prairie and prairie fens from Manitoba to Iowa, with populations also found in Michigan and Wisconsin. Unfortunately, the range is now much less and has been declining for some time. The Poweshiek skipperling may

have been extirpated from the Dakotas, Minnesota and Iowa within the last 10 years – an area that, until recently, contained the vast majority of the surviving populations. It is now known only from Wisconsin, Michigan and Manitoba. During surveys in 2014, the species could be found only at a few sites in a single Michigan county, in very limited numbers at one site in Wisconsin, and in Canada at the single Manitoba site.

Status of Critical Habitat: Designated critical habitat was listed October 1, 2015.

Species Name: Whooping crane (*Grus Americana*)

Status of Species: Endangered

Listing History: March 11, 1967

Suitable habitat parameters/characteristics for life stages and proximity related to project area: No suitable habitat found within Action Area

Life History Information:

The whooping crane breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. Whooping cranes breed and nest in wetland habitat in Wood-Buffalo National Park, Canada. Bulrush is the dominant vegetation type in the potholes used for nesting, although cattail, sedge, musk-grass, and other aquatic plants are common. Nest sites are primarily located in shallow diatom ponds that contain bulrush. During migration, whooping cranes use a variety of habitats; however wetland mosaics appear to be the most suitable. For feeding, whooping cranes primarily use shallow, seasonally and semi permanently flooded palustrine wetlands for roosting, and various cropland and emergent wetlands. In Nebraska, whooping cranes also often use riverine habitats. Wintering habitat in the Aransas National Wildlife Refuge, Texas, includes salt marshes and tidal flats on the mainland and barrier islands, dominated by salt grass, saltwort, smooth cordgrass, glasswort, and sea ox-eye.

Whooping cranes are omnivorous, probing the soil subsurface with their bills and taking foods from the soil surface or vegetation. Young chicks are fed by their parents. Summer foods include large nymphal or larval forms of insects, frogs, rodents, small birds, minnows, and berries. Foods utilized during migration are poorly documented but include frogs, fish, plant tubers, crayfish, insects, and agricultural grains. The largest amount of time is spent feeding in harvested grain fields. In the winter, whooping cranes forage for blue crabs, clams and the plant wolfberry in the brackish bays, marshes, and salt flats on the edge of the Texas mainland and on barrier islands. Occasionally, cranes fly to upland sites when attracted by fresh water to drink or by foods such as acorns, snails, crayfish and insects, and then return to the marshes to roost. Uplands are

particularly attractive when partially flooded by rainfall, burned to reduce plant cover or when food is less available in the salt flats and marshes.

The whooping crane is a bi-annual migrant, traveling between its summer habitat in central Canada, and its wintering grounds on the Texas coast, across the Great Plains of the U.S. in the spring and fall of each year. The migratory corridor runs in an approximately straight line from the Canadian Prairie Provinces of Alberta and Saskatchewan through the Great Plains states of eastern Montana, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. The complete corridor is approximately 2,400 miles (3,862 km) long by 220 miles (354 km) wide, a zone that encompasses 95% of known sightings of whooping cranes. Autumn migration normally begins in mid-September, with most birds arriving on the Texas wintering grounds between late October and mid-November. Whooping cranes migrate south as singles, pairs, in family groups, or as small flocks of 3 to 5 birds. They are diurnal migrants and stop daily to feed and rest. Local weather conditions influence distance and direction of travel, but whooping cranes generally are capable of reaching the autumn staging grounds in the north central portion of the Saskatchewan agricultural area on the second day of migration, where they remain for 2 – 4 weeks. The remainder of the migration from Saskatchewan to the wintering grounds is usually rapid, probably weather-induced, and may be completed in a week. Whooping cranes occupy winter areas for almost half a year. Although close association with other whooping cranes is tolerated at times on the wintering grounds, pairs and family groups typically occupy and defend relatively discrete territories. As spring approaches, “dancing” behavior (running, leaping and bowing, unison calling, and flying) increases in frequency, and is indicative of pre-migratory restlessness. Spring migration departure dates are normally between March 25 and April 15, with the last birds usually leaving by May 1.

Whooping cranes are monogamous, forming pairs and laying eggs as early as 3 years of age, although the average age of first egg production is 5 years. They show considerable fidelity to their breeding territories, and normally nest in the same general vicinity each year. These nesting territories, termed "composite nesting areas", vary considerably in size, ranging from about 1.3 to 47.1 km2 (0.8 to 29 mi2) but averaging 4.1 km2 (2.5 mi2). Adjoining pairs usually nest at least 1 km (0.6 mi) apart. From the initiation of egg laying, until chicks are a few months of age, the

activities of pairs and family groups are restricted to the breeding territory. Eggs are normally laid in late April to mid-May, and hatching occurs about 1 month later. The incubation period is from 29 to 31 days. Whooping cranes usually produce clutches of 2 eggs laid 48-60 hours apart. Incubation begins with the first egg laid, resulting in asynchronous hatching of the eggs. This asynchrony may follow the "insurance" hypothesis, where parents add marginal offspring to their clutch/brood as a hedge against early failure of core brood members. Whooping crane parents share incubation and brood-rearing duties. Except for brief intervals, one member of the pair remains on the nest at all times.

Status of Critical Habitat: No critical habitat identified in North Dakota by US Fish and Wildlife.

Species Name: Rusty patched bumble bee (*Bombus affinis*)

Status of Species: Endangered

Listing History: February 10, 2017

Suitable habitat parameters/characteristics for life stages and proximity related to project area: No suitable habitat found within Action Area

Life History Information:

Historically, the rusty patched bumble bee was broadly distributed across the eastern United States, Upper Midwest, and southern Quebec and Ontario in Canada. Since 2000, this bumble bee has been reported from only 13 states and 1 Canadian province: Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin and Ontario, Canada.

Rusty patched bumble bees live in colonies that include a single queen and female workers. The colony produces males and new queens in late summer. Queens are the largest bees in the colony, and workers are the smallest. All rusty patched bumble bees have entirely black heads, but only workers and males have a rusty reddish patch centrally located on the back.

Rusty patched bumble bees once occupied grasslands and tallgrass prairies of the Upper Midwest and Northeast, but most grasslands and prairies have been lost, degraded, or fragmented by conversion to other uses. Bumble bees need areas that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil).

Bumble bees gather pollen and nectar from a variety of flowering plants. The rusty patched emerges early in spring and is one of the last species to go into hibernation. It needs a constant supply and diversity of flowers blooming throughout the colony's long life, April through September.

Rusty patched bumble bee colonies have an annual cycle. In spring, solitary queens emerge and find nest sites, collect nectar and pollen from flowers and begin laying eggs, which are fertilized by sperm stored since mating the previous fall. Workers hatch from these first eggs and colonies

grow as workers collect food, defend the colony, and care for young. Queens remain within the nests and continue laying eggs. In late summer, new queens and males also hatch from eggs. Males disperse to mate with new queens from other colonies. In fall, founding queens, workers and males die. Only new queens go into diapause (a form of hibernation) over winter - and the cycle begins again in spring.

Status of Critical Habitat: No critical habitat identified by US Fish and Wildlife.

Species Name: Western fringed prairie orchid (*Platanthera praeclara*)

Status of Species: Threatened

Listing History: September 28, 1989

Suitable habitat parameters/characteristics for life stages and proximity related to project area: No suitable habitat found within Action Area

Life History Information:

The western prairie fringed orchid is a terrestrial member of the orchid family. This smooth, erect, perennial herb grows to 1.2 meters 4 feet (ft)] tall. Plants have two to five fairly thick, elongate, hairless leaves each. The open, spike-like flowering stalk bears up to 24 showy, 2.5 centimeters (cm) [1-inch (in)] wide, white flowers. The lower petal of each flower is deeply 3-lobed and fringed, hence the common name.

The western prairie fringed orchid, is a perennial orchid of the North American tall grass prairie and is found most often on unplowed, calcareous prairies and sedge meadows. Soil moisture is a critical determinant of growth, flowering, and distribution of western prairie fringed orchid (USFWS 2009). This species is dependent on mycorrhizal fungi, especially for seed germination and for nutritional support before plants are capable of photosynthesis. The persistence of western prairie fringed orchid is dependent on periodic disturbance by fire, mowing, or grazing, but these practices may also cause adverse effects and must be carefully implemented. The species occurs in Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and Oklahoma. Upstream depletions to the Platte River system in Colorado and Wyoming may affect the species in Nebraska.

Although Western prairie fringed orchid forms tubers and vegetative shoots from existing plants, pollination is required for seed production. Western prairie fringed orchid is pollinated by a few species of sphinx moths (USFWS 2009). Seeds are wind-dispersed and may also be adapted for dissemination through the soil profile by water.

In its recovery plan (USFWS 1996) the Service mostly reiterated the threats it described in the final listing rule, but emphasized that conversion of habitat to cropland was the greatest

remaining threat to southern populations. It also emphasized that little was known about how to ensure that burning, grazing, and mowing are conducted in a manner not adverse to western prairie fringed orchid populations and pointed out that actions that directly or indirectly lower water levels in the rooting zone of plants “have the potential of serious adverse impacts.” In addition, it implied that potential impacts of pesticides to western prairie fringed orchid and its pollinators was also a threat. As with the conservation of other rare prairie species that exist in fragments of a once vast ecosystem, successful management consists of careful application of practices that are essential for conserving the habitat, while ensuring that associated adverse effects are avoided or minimized.

Status of Critical Habitat: No critical habitat identified by US Fish and Wildlife.

Species Name: Piping plover (*Charadrius melodus*)

Status of Species: Threatened

Listing History: December 11, 1985

Suitable habitat parameters/characteristics for life stages and proximity related to project area: The Missouri River is recognized as an area in North America that provides suitable habitat for piping plovers. Although no required habitat is found within the Action Area, the shorelines are designated at critical habitat.

Life History Information:

The piping plover is a small, stocky shorebird, with a sandy-colored plumage on its back and crown and a white underside. Breeding birds have a single black breast band, a black bar across the forehead, bright orange legs and bill, and a black tip on the bill. During the winter, the birds lose their breeding plumage; the black bands are lost, the legs fade to pale yellow, and the bill becomes mostly black.

The piping plover begins arriving on the breeding ground as early as mid-March and remain there for three to four months. Plovers lay 3 to 4 eggs in shallow scraped depressions lined with light colored pebbles and shell fragments. The eggs are camouflaged and blend extremely well with their surroundings. Both sexes incubate the eggs which hatch within 30 days, and both sexes feed the young until they can fly, about 30 days after hatching.

Piping plovers begin arriving on the wintering grounds in early July, with some late nesting birds arriving through late October. A few individuals can be found on the wintering grounds throughout the year, but sightings are rare in late May, June, and early July. Migration is poorly understood, but a recent study suggests that plovers use inland and coastal stopover sites when migrating from breeding areas to their wintering grounds. In late February, piping plovers begin leaving the wintering grounds to migrate back to their breeding sites. Northward migration peaks in late March, and by late May most birds have left the wintering grounds. North Carolina is uniquely positioned in the species' range, being the only State where the piping plover's breeding and wintering ranges overlap and the birds are present year-round.

Breeding and wintering piping plovers feed on exposed wet sand in wash zones; intertidal ocean beach; wrack lines; washover passes; mud, sand, and algal flats; and shorelines of ephemeral ponds, lagoons, and salt marshes by probing for invertebrates at or just below the surface. Plovers use upland beaches adjacent to foraging areas for roosting and preening. Small sand dunes, debris, and sparse vegetation within adjacent beaches provide shelter from wind and extreme temperatures.

Threats to the piping plover on the breeding and wintering grounds are similar. Habitat loss and degradation due to coastal development, recreation, navigation, dredging, and shoreline stabilization and replenishment projects have been major contributors to this species' decline. Human activity on beaches, such as walking, jogging, walking pets off leash, and operating vehicles may prevent birds from feeding, flush birds from roost sites, alter habitat conditions, and destroy camouflaged eggs and young. Human activities have aided range expansions and population increases of predators such as gulls and raccoons, and introduced non-native predators such as feral cats and Norway rats; these factors have resulted in increased predation pressure.

Status of Critical Habitat: Designated critical habitat was listed September 11, 2002.

Species Name: Dakota skipper (*Hesperia dacotae*)

Status of Species: Threatened

Listing History: October 23, 2014

Suitable habitat parameters/characteristics for life stages and proximity related to project area: No suitable habitat exists within Action Area

Life History Information:

Dakota skippers have four basic life stages: egg, larva, pupa and adult. During the brief adult period in June and July, females lay eggs on the underside of leaves. Eggs take about 10 days to hatch into larvae (caterpillar). After hatching, larvae build shelters at or below the ground surface and emerge at night to feed on grass leaves. This continues until fall when larvae become dormant. They overwinter in shelters at or just below ground level, usually in the base of native bunchgrasses. The following spring, larvae emerge to continue developing. Pupation takes about 10 days and usually happens in June.

Adult males emerge from pupae about five days before females, and the adults live for three weeks, at most. This brief period is the only time that Dakota skippers can reproduce. If a female Dakota skipper lives for the full three weeks and adequate flowers for nectar are available, she may lay up to 250 eggs. Nectar, providing both water and food, is crucial for survival of both sexes during the adult flight period, which often occurs during the hottest part of summer.

Dakota skipper populations declined historically because of widespread conversion of native prairie to farms, ranches and other land uses. They may persist on ranches where grazing is not too intense but are lost from sites where native vegetation is plowed or killed with herbicides. States and Canadian provinces in the historical range of Dakota skipper have lost 85 percent to 99 percent of their original tallgrass prairie. Small, isolated patches of native prairie are often what remain of this once-vast ecosystem; Dakota skippers survive on only some of these prairie remnants.

Dakota skippers are almost always absent from overgrazed or otherwise degraded prairies. Because of this sensitivity, historical survival of Dakota skippers probably depended on the

vastness of the prairie, with immigrants available to repopulate areas if the butterfly was eliminated by intense disturbance, such as wildfire or heavy bison grazing. Today, many remaining Dakota skipper populations are isolated and are too far from each other to be recolonized if a local extinction occurs.

Although some native prairie plants and animals have adaptations that allow them to survive in modern agricultural landscapes, the Dakota skipper does not. Dakota skippers need high-quality prairie that has retained a large part of its original plant diversity. The future of many prairies where this butterfly persists is not secure because of threats from conversion to row crops, herbicide use, woody and non-native plant invasion, road construction, over-grazing and gravel mining. In addition, insecticide drift from nearby agricultural areas could harm Dakota skippers. Prescribed fire, which may improve the quality of native prairie, must be used carefully because it may kill a significant number of Dakota skippers in burned areas.

Although threats are numerous, there are opportunities to address them and effectively conserve the skipper. Dakota skippers and their native prairie habitat depend on periodic disturbance, without which the prairie would become shrubby or forested. Therefore, grazing, fire or mowing (haying) is necessary for the skipper. At the same time, these practices may eliminate populations, depending on how they are carried out, so they must be managed carefully to ensure skipper survival.

Status of Critical Habitat: Designated critical habitat was listed October 1, 2015.

Species Name: Northern long-eared bat (*Myotis septentrionalis*)

Status of Species: Threatened

Listing History: May 4, 2015

Suitable habitat parameters/characteristics for life stages and proximity related to project area: Suitable habitat and primary range located within the riparian and forested areas of Missouri River. This area is used as summer range, and birthing and raising of pups.

Life History Information:

During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds. Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. Specific areas where they hibernate have very high humidity, so much so that droplets of water are often seen on their fur. Within hibernacula, surveyors find them in small crevices or cracks, often with only the nose and ears visible.

Northern long-eared bats emerge at dusk to fly through the understory of forested hillsides and ridges feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation. This bat also feeds by gleaning motionless insects from vegetation and water surfaces.

Breeding begins in late summer or early fall when males begin swarming near hibernacula. After copulation, females store sperm during hibernation until spring, when they emerge from their hibernacula, ovulate, and the stored sperm fertilizes an egg. This strategy is called delayed fertilization. After fertilization, pregnant females migrate to summer areas where they roost in small colonies and give birth to a single pup. Maternity colonies, with young, generally have 30 to 60 bats, although larger maternity colonies have been observed. Most females within a maternity colony give birth around the same time, which may occur from late May or early June

to late July, depending where the colony is located within the species' range. Young bats start flying by 18 to 21 days after birth. Adult northern long-eared bats can live up to 19 years.

Status of Critical Habitat: No critical habitat identified by US Fish and Wildlife.

Species Name: Red knot rufa (*Calidris canutrus*)

Status of Species: Threatened

Listing History: January 12, 2015

Suitable habitat parameters/characteristics for life stages and proximity related to project area: Suitable habitat is found with the Missouri River when migrating through North Dakota to the Arctic Circle.

Life History Information:

Length: 25-28 cm. Adults in spring: Above finely mottled with grays, black and light ochre, running into stripes on crown; throat, breast and sides of head cinnamon-brown; dark gray line through eye; abdomen and undertail coverts white; uppertail coverts white, barred with black. Adults in winter: Pale ashy gray above, from crown to rump, with feathers on back narrowly edged with white; underparts white, the breast lightly streaked and speckled, and the flanks narrowly barred with gray. Adults in autumn: Underparts of some individuals show traces of the "red" of spring.

The red knot's unique and impressive life history depends on suitable habitat, food, and weather conditions at far-flung sites across the Western Hemisphere, from the extreme south of Tierra del Fuego to the far north of the central Canadian Arctic. Further, red knots need to encounter these favorable habitat, food, and weather conditions within narrow seasonal windows as the birds hopscotch along migration stopovers between wintering and breeding areas. For example, the red knot population decline that occurred in the 2000s was caused primarily by reduced food availability from increased harvests of horseshoe crabs, exacerbated by small changes in the timing that red knots arrived at the Delaware Bay. Red knots may also be particularly vulnerable to global climate change, which is likely to affect the arctic tundra ecosystem where the knots breed; the quality and quantity of coastal habitats due to rising sea levels; the quantity and timing of invertebrate food resources throughout the bird's range; and the severity, timing, and location of storm and weather patterns.

Horseshoe crab harvests are now managed with explicit goals to stabilize and recover red knot populations; red knot number appear to have stabilized in the past few years, but at low levels

relative to earlier decades. Red knots fascinate biologists, bird watchers and people who appreciate the complex beauty of the natural world. Together with these partners, the U.S. Fish and Wildlife Service is dedicated to working to conserve this extraordinary bird.

Status of Critical Habitat: No critical habitat identified by US Fish and Wildlife.

Appendix C. Official Species List

FLORAL SURVEY FORM	
Area Surveyed (acres): 71.3 acres within Analysis Area.	Survey Type: Belt transect and full area; systematic and focused

Scientific Name[1]	Common Name	Date	Project Site
ACERACEAE - Elm Family		30-Jun-2017	Missouri River
Acer negundo	Box-elder		
ANACARDIACEAE – Sumac Family	Posion ivy		
Toxicodendron rydbergii			
APOPCYNACEAE - Dogbane Family			
Apocynum sibiricum	Indian hemp dogbane		
ARALIACEAE – Ginseng Family			
Aralia nudicaulis	Wild sarsaparilla		
ASCLEPIADACEAE- Milkweed Family			
Asclepias syriaca	Common milkweed		
Asclepias ovalifolia	Oval-leaf milkweed		
ASTERACEAE - Sunflower Family			
Achillea millefolium	Common yarrow		
Ambrosia artemisiifolia	Annual ragweed		
Artemisia absinthium	Absinth wormwood		
Artemisia dracunculus	Silky wormwood		
Artemisia frigida	Prairie sagewort		
Artemisia ludoviciana	Cudweed sagewort		
Carduus nutans	Musk thistle		
Cirsium arvense	Canada thistle		
Cirsium flodmanii	Flodmans thistle		
Cirsium undulatum	Wavyleaf thistle		
Conyza canadensis	Canadian horseweed		

Erigeron philadelphicus	Philadelphia fleabane
Erigeron strigosus	Prairie fleabane
Grindelia squarrosa	Curly-cup gumweed
Helianthus annuus	Common sunflower
Helianthus maximiliani	Maximilian sunflower
Helianthus parciflorus	Stiff sunflower
Heterotheca villosa	Hairy goldaster
Lactuca tatarica	Blue lettuce
Lygodesmia juncea	Rush skeletonplant
Matricaria discoidea	Pineapple weed
Oligoneuron rigidum	Stiff goldenrod
Solidago canadensis	Canada goldenrod
Solidago gigantea	Giant goldenrod
Sonchus arvensis	Field sowthistle
Symphyotrichum ericoides	White heath aster
Symphyotrichum lanceolatum	White panicle aster
Taraxacum officinale	Dandelion
Tragopogon dubius	Goatsbeard
Xanthium strumarium	Cocklebur
BORAGINACEAE - Borage Family	
Lappula occidentalis	Flatspine stickseed
BRASSICACEAE - Mustard Family	
Arabis glabra	Tower rockcress
Hesperis matronalis	Dame’s rocket
Lepidium densiflorum	Peppergrass
Thlaspi arvense	Field pennycress
CAPRIFOLIACEAE - Honeysuckle Family	
Lonicera tatarica	Tatarian honeysuckle
Symphoricarpos occidentalis	Western snowberry
CARYOPHYLLACEAE – Carnation Family	
Silene antirrhina	Sleepy silene
CHENOPODIACEAE - Goosefoot Family	
Bassia scoparia	Burningbush
Chenopodium album	Lamb's quarters

Salsola kali	Russian thistle
CONVOLVULACEAE – Morning glory Family	
Convolvulus arvensis	Field bindweed
CORNACEAE – Dogwood Family	
Cornus sericea	Redosier dogwood
CUCURBITACEAE – Gourd Family	
Echinocystis lobata	Wild cucumber
CYPERACEAE – Sedge Family	
Carex filifolia	Threadleaf sedge
Carex pellita	Woolly sedge
Carex praegracilis	Clustered field sedge
Eleocharis compressa	Flatstem spikerush
Schoenoplectus acutus	Hardstem bulrush
Schoenoplectus pungens	Common threesquare
Schoenoplectus tabernaemontani	Softstem bulrush
ELAEGANACEAE – Oleaster Family	
Elaeagnus angustifolia	Russian olive
Shepherdia argentea	Silver buffaloberry
EQUISETACEAE - Horsetail Family	
Equisetum arvense	Field horsetail
Equisetum laevigatum	Smooth horsetail
EUPHORBIACEAE - Spurge Family	
Euphorbia esula	Leafy spurge
FABACEAE - Legume Family	
Amphicarpeae bracteata	American hogpeanut
Amorpha fruticosa	False indigo brush
Astragalus canadensis	Canada milkvetch
Astragalus crassicarpus	Groundplum milkvetch
Glycyrrhiza lepidota	Wild licorice
Medicago lupulina	Black medic
Melilotus officinalis	Yellow sweet clover
Medicago sativa	Alfalfa

Pediomelum argophyllum	Silver-leaf scurfpea
Psoralidium tenuiflorum	Slimflower scurfpea
Vicia americana	American vetch
JUNCACEAE – Rush Family	
Juncus balticus	*Baltic rush*
LAMIACEAE - Mint Family	
Nepeta cataria	Catnip
Mentha arvensis	Wild mint
MALVACEAE - Mallow Family	
Sphaeralcea coccinea	Scarlet globemallow
OLEACEAE - Olive Family	
Fraxinus pennsylvanica	Green ash
ONAGRACEAE - Evening Primrose Family	
Chamerion angustifolium	Fireweed
Oenothera biennis	Common evening primrose
PLANTAGINACEAE - Plantain Family	
Plantago major	Common plantain
POACEAE - Grass Family	
Agropyron cristatum	Crested wheatgrass
Andropogon hallii	Sand bluestem
Bouteloua gracilis	Blue grama
Bromus inermis	Smooth brome
Calamovilfa longifolia	Prairie sandreed
Distichlis spicata	Inland saltgrass
Elymus canadensis	Canada wildrye
Elymus repens	Quackgrass
Glyceria striata	Fowl mannagrass
Hesperostipa comata	Needle-and-thread
Hordeum jubatum	Foxtail barley
Panicum virgatum	Switchgrass
Pascopyron smithii	Western wheatgrass
Phalaris arundinacea	Reed canarygrass

Phragmites australis	Common reed
Poa pratensis	Kentucky bluegrass
Puccinellia nuttalliana	Nuttall's alkaligrass
Setaria glauca	Yellow foxtail
Spartina pectinata	Prairie cordgrass
Sporobolus cryptandrus	Sand dropseed
Thinopyrum intermedium	Intermediate wheatgrass
POLYGONACEAE - Buckwheat Family	
Polygonum achoreum	Leathery knotweed
Polygonum lapathifolium	Curlytop knotweed
Polygonum ramosissimum	Bushy knotweed
RANUNCULACEAE – Buttercup Family	
Anemone canadensis	Canadian anemone
Anemone cylindrica	Candle anemone
Thalictrum dasycarpum	Purple meadow-rue
ROSACEAE - Rose Family	
Potentilla norvegica	Norwegian cinquefoil
Prunus virginiana	Chokecherry
Rosa arkansana	Prairie rose
Rosa woodsii	Wood's rose
SALICACEAE - Willow Family	
Populus deltoides	Eastern cottonwood
Salix alba	White willow
Salix exigua	Sandbar willow
Salix lutea	Yellow willow
SCROPHULARIACEAE – Figwort Family	
Verbascum thapsus	Common mullein
SMILACEAE – Greenbrier Family	
Smilax herbacea	Smooth carrionflower
SOLANACEAE – Nightshade Family	
Solanum dulcamara	Climbing nightshade

TYPHACEAE – Cattail Family	
Typha latifolia	*Broadleaf cattail*
ULMACEAE - Elm Family	
Ulmus pumila	*Siberian elm*
URTICACEAE - Nettle Family	
Urtica dioica	Stinging nettle
VERBENACEAE - Vervain Family	
Verbena bracteata	Bigbract verbena
VITACEAE - Grape Family	
Parthenocissus inserta	Virginia creeper
Vitis riparia	Riverbank grape

[1] Plant nomenclature was determined using the USDA Plants Database (USDA Natural Resources Conservation Service 2016).

BIRD SURVEY FORM		
Area Surveyed (acres): 71.3 acres within Analysis Area.		Survey Type: Belt transect and full area; systematic and focused
Scientific Name[1]	Common Name	
Actitis macularius	Spotted sandpiper	9 (1 nest; 1 brood)
Agelaius phoeniceus	Red-winged blackbird	14
Aix sponsa	Wood duck	11
Ammodramus savannarum	Grasshopper sparrow	7
Anas platyrhynchos	Mallard	4
Anas strepera	Gadwall	2
Bombycilla cedrorum	Cedar waxwing	9
Branta Canadensis	Canada goose	67
Cathartes aura	Turkey vulture	2 (Flying)
Charadrius vociferus	Killdeer	13
Chondestes grammacus	Lark sparrow	3
Colaptes auratus	Northern flicker	2
Dumetella carolinensis	Gray catbird	2
Euphagus cyanocephalus	Brewer's blackbird	1

Falco mexicanus	Prairie falcon	1
Junco hyemalis	Dark eyed junco	2
Larus californicus	California gull	3 (Flying)
Molathrus ater	Brown-headed cowbird	1
Petrochelidan pyrrhonata	Cliff Swallow	24
Phasianus colchicus	Ring-necked pheasant	1
Pheucticus melanocephalus	Black-headed grosbeak	1
Poecile atricapillus	Black-capped chickadee	3
Setophaga petechia	Yellow warbler	11
Sialia currucoides	Mountain bluebird	1
Spinus tristis	American gold finch	7
Spizella pusilla	Field sparrow	5
Spizelloides arborea	American tree sparrow	5
Troglodytes aedon	House wren	2
Turdus migratorius	American robin	14
Zenaida macroupa	Mourning dove	27

[1] Bird species nomenclature was determined using The Auk: Ornithological Advances (2016).

United States Department of the Interior

FISH AND WILDLIFE SERVICE
North Dakota Ecological Services Field Office
3425 Miriam Avenue
Bismarck, North Dakota 58501
(701) 250-4481, ndfieldoffice@fws.gov

In Reply Refer To:
06E15000-I-0293

Dr. Donna Jacob
Environmental Scientist
Houston Engineering, Inc.
1420 21st Avenue North
Fargo, North Dakota 58102

Dear Dr. Jacob:

This letter is in response to your request for informal consultation for the BNSF Railway Company (BNSF) proposal to build a new bridge on the upstream (north) side of an existing railroad bridge over the Missouri River in Bismarck, ND (Project). The U. S. Coast Guard (USCG) designated Houston Engineering, Inc. as their non-federal representative for informal Section 7 consultation on May 30, 2017, in regards to the proposed action. This designation is in accordance with 50 CFR Section 402.08 which states that a federal agency may designate a non-federal representative to conduct informal consultation or prepare a biological assessment (BA) by giving written notice of such designation. Therefore, the U. S. Fish and Wildlife Service (Service) is responding to Houston Engineering as the designated non-federal representative for the purposes of the Endangered Species Act of 1973 (Act) as amended (16 U.S.C 1531 *et seq.*). The BA was received on December 5, 2017, and amended via email January 7, 2018.

In accordance with Section 7 consultation under the Act, Houston Engineering has requested Service concurrence with the determinations that the Project "may affect, but is not likely to adversely affect" the endangered pallid sturgeon (*Scaphirhynchus alba*), the threatened Northern long-eared bat (*Myotis septentrionalis*), piping plover (*Charadrius melodus*) and piping plover designated critical habitat.

Pallid Sturgeon
The BA indicates the action area may contain foraging and migrating adults and juvenile pallid sturgeon, but the action area has been determined to be unsuitable for reproduction and spawning. Thus, there is a potential for the construction of the new bridge sub-structures and removal of the existing bridge structure to directly affect pallid sturgeon via an increase in hydroacoustic (industrial equipment) sound and/or the direct exposure to in-water demolition or construction activity. To ameliorate exposure risk, removal of the existing bridge piers is proposed to be conducted without explosives, a practice that will greatly reduce the potential for

exposure to injurious effects to individual pallid sturgeon from debris or concussive sound. Furthermore, the species occurs at such a low density within the affected Missouri River segment that the likelihood of direct exposure to the Project activities is extremely low. Based upon these Project conservation measures, coupled with the species' very low density in this reach of the Missouri River, effects to pallid sturgeon are expected to be either insignificant or discountable.

Northern Long-Eared Bat

Suitable roosting and nursery forest habitat is present within the action area for the Northern long-eared bat, but no known hibernacula are present. Suitable winter habitat (hibernacula) for the species includes underground caves and cave-like structures (e.g. abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (32-48°F/0-9°C) and with high humidity and minimal air currents.

The Project has been designed to conduct tree removal activities at a time when the species will be hibernating (November 1 through April 1). Accordingly, individuals are not expected to be exposed to the tree removal activities. Therefore, the effects to the species are considered to be either insignificant or discountable.

Piping Plover

The action area contains habitat that may be suitable for use by migrating or foraging piping plovers. However, the action area generally does not harbor nesting piping plovers and there are no known records of piping plovers nesting within one mile of the action area in the past ten years. This may be due to a limited abundance of suitable habitat or that the piping plovers tend to avoid nesting in areas prone to frequent disturbance, such as exists on sandbars within the Project area (Bismarck/Mandan, North Dakota).

When nesting habitat is scarce, adult piping plovers have been documented to nest virtually anywhere suitable habitat occurs. Although the June 30, 2017 habitat survey reported in the BA concluded no suitable nesting habitat occurred within the Project area, the Missouri River is a highly dynamic riverine environment. Depending on climatic, flow and river channel morphological variables at the Project location, it is reasonable to assume, for the purposes of planning the Project, that the environmental conditions may be change such that piping plovers nest within the Project area.

In order to reduce the likelihood of disturbing nesting piping plovers during construction and demolition, the applicant proposes to implement a survey effort to determine the species' presence if construction occurs during breeding season (April 1 to August 31). As proposed, a qualified wildlife biologist will survey all sandbars and shoreline within a 250 meter radius from the Project area.

The Service recommends surveys be performed during daylight hours, i.e. from one half-hour prior to sunrise to one half-hour after sunset. If construction commences between April 1 and July 15, surveys should ideally be performed daily in the week prior to construction and if no piping plovers are detected, the frequency may be reduced to once a week and may cease after the end of the nest initiating period in this stretch of the river (July 15). If construction begins

between July 15 and August 31, surveys should similarly be performed daily in the week prior to construction. If no piping plovers are detected, no further survey are needed. No surveys are recommended for Project construction/demolition activities during the period of August 31 to April 1, or if sandbars and shoreline are inundated by high flows in the Missouri River.

If piping plovers are observed during the surveys and within 250 meters of the Project construction/demolition activities, we recommend the Project be temporarily delayed, contact made with the Service, and a risk assessment performed. In some instances, construction activities may not be able to resume until individual piping plovers leave the site or it is determined there is a low risk for disturbance. Project management performed in this manner provides the assurance that adverse effects to piping plovers would be highly unlikely during Project construction activities. Based on the use of piping plover surveys, the direct and indirect effects are expected to be either insignificant or discountable to the species.

Piping Plover Critical Habitat

The BA indicates designated piping plover critical habitat occurs within the action area. When the Service designated critical habitat for the piping plover (September 11, 2002, 50 CFR 67:57638-57717), primary constituent elements (PCE) were also defined. Primary constituent elements are defined as the physical and biological features of the habitat that are considered essential to the conservation of the species (50 CFR 67:57643). For the Northern Great Plains population of piping plovers, the one overriding PCE is the dynamic ecological processes that create and maintain piping plover nesting, foraging, and rearing habitat (e.g., sparsely vegetated channel sandbars, sand and gravel beaches on islands, temporary pools on sandbars and islands, and the interface with the river (50 CFR 67:57643).

Based upon our review of the construction and operation of the Project, the Service agrees that no PCEs would be removed or significantly (adversely) affected. We base this conclusion upon our determination that the dynamic processes that produce and maintain critical habitat are not likely to be adversely affected by the Project. Thus, the riverine processes that create and maintain nesting, foraging, and rearing habitat are not expected to be adversely affected. The physical disturbance to potential foraging habitat (wetted river margins that interface with the Missouri River) is expected to be temporary and not likely to be biologically detrimental to the function of any PCEs given the low amount and quality of the habitat. Therefore, the Service concludes the direct and indirect effects of the Project are not biologically measurable and are either insignificant or discountable to conservation purposes for which this critical habitat was designated.

Summary

The Service has concluded the effects are discountable or insignificant. Accordingly, the Service **concurs** with your determinations.

Houston Engineering, on behalf of the USCG, has also determined that there will be "no effect" to the rufa red knot (*Calidris canutus rufa*), interior least tern (*Sternula antillarum*), whooping crane (*Grus Americana*) and gray wolf (*Canis lupus*). There is no requirement under the implementing regulations of the Act (50 CFR Part 402) for action agencies to receive Service concurrence with "no effect" determinations, therefore the responsibility for "no effect"

determinations remains with the USCG. We recommend you document your "no effect" determination and retain the documentation in your decisional record.

The Service's concurrence is based on the information contained within the BA. Pursuant to the implementing regulations of the Act (50 CFR 402.13), this letter concludes informal consultation on the Project. This action should be re-analyzed if (1) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation; (2) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this consultation; or (3) a new species is listed or critical habitat is designated that may be affected by this Project.

We appreciate your efforts to ensure the conservation of listed species as part of our joint responsibilities under the Act. For further information, please have your staff contact Jessica Johnson of my staff at (701) 355-8507, or contact me at (701) 355-8512 or at the letterhead address.

Sincerely,

Kevin J. Shelley, Supervisor
North Dakota Field Office

Cc: Erik Washburn, Bridge Administrator, USCG
Terry Steinwand, Director, NDGF
Patricia McQueary, Regulatory Program Manager, ACOE

HoustonEngineering Inc.
Fargo Office | P 701.237.5065 | F 701.237.5101
1401 21st Avenue North | Fargo ND 58102

June 9, 2017

Early Coordination Meeting - ESA discussion for BNSF Bismarck Bridge Project (Bridge 196.6) Meeting notes

Location:
Houston Engineering Bismarck Office
3712 Lockport St #A, Bismarck, ND 58503
Office phone 701-323-0200

Date and Time:
June 8, 2017
2:00 pm central time, duration approximately two hours

Attended:
Steve Dyke – ND Game and Fish, sdyke@nd.gov
Toni Erhardt – USACE, Toni.R.Erhardt@usace.army.mil
Hans Erickson – TKDA, hans.erickson@tkda.com
Dionne Haynes - State Water Commission
Gerald Heiser – OSE/State Water Commission, gheiser@nd.gov
Patricia McQueary – USACE, Patricia.L.Mcqueary@usace.army.mil
Kevin Shelly – USFWS, kevin_shelley@fws.gov
Kris Swanson – BNSF, Kristopher.Swanson@BNSF.com (conference call, one hour)
Pete Wax – ND Department of Health, pwax@nd.gov

Mark D. Aanenson – HEI, maanenson@houstoneng.com (organizing)
Donna Jacob – HEI, djacob@houstoneng.com (organizing)

Detailed Notes from meeting:

- CLOMAR/LOMAR: will show assessment of impacts associated with more riprap along the banks, this will widen the range of the area involved in the NEPA documentation (upstream and downstream impacts)

- For construction methods: think long-term when writing these for applications, need to consider unforeseen things like e.g. coffer dams being difficult to remove and could introduce additional impacts
- For the BA,
    - Kevin Shelley wants on ONE, FEMA will wait for BA to permit the CLOMAR. Format for BA discussed (USACE format, USFWS format – they will coordinate with each other).
    - McQueary provided several examples of bridge BA and a template which is acceptable to USFWS.
    - Shelley suggested we should hold another meeting with USACE and USFWS once a BA template is selected – Shelley wants to go over how to write an acceptable BA.
    - ESA inventory:
        - Shelley requested a bird inventory (for all including terns, plover, swallows), and for bats a tree inventory where removal is designated (all trees 3" DBH should be flagged) and a bat survey (acoustics). The Missouri River is a known bat habitat corridor. The bat pup season is June 1-July 31, so no tree removal during that period. Better to remove trees in winter before March 15. USACE recommended following ESA guidance documents.
        - Surveys should be done this season. USACE indicated the water is above the OHW and thus we may get false positives for plover nesting. We must recheck all construction sites within 15 days before work (at end of March when work begins in April) each year
        - Info for BA: this is what we know (elevations, open sand or veg, aerial photos), this is what we will do in future (rechecking sites), and how are we going to reduce potential effects (streamers, construction measures, etc.)
        - We need to describe the effects of three years of construction/demolition on the plover and critical habitat of plover. Describe the effects construction and future operation of the bridge will have on the critical habitat, how will construction and new piers affects sand movement?
        - Eagles: for data contact Sandy Johnson at Game and Fish
- 408 permitting: USACE is checking on potential secondary impacts on other Corps structures. If there are any present, we may need 408 permit before we can proceed with 404 permitting. HEI predicts low potential for 408 permit being required.
- Because coffer dams will be used: this will result in water transfer and dredged sediments. For dewatering, need dewatering permit and it is ok to pump the water back into the river. Once the sediments are reached, these can be disposed of properly if tested (?), can be used as fill somewhere else above the Sovereign Lands OHW.
- 401 permits: we'll need two, one for USACE, one for USCG

- ESA: timing of work: Game and Fish indicated between April 15 and June 1 (spawning period for assumed presence of sturgeon), no work to be done in the river, but can get a variance. Shelley discussed hydroacoustics and said although the sturgeon density is low, the Missouri River is year-round habitat. Construction should employ vibration method for installation of coffer dams and then pile driving can use hammers. We need to specify the hammer size, number of strikes per minute, etc. Because we may not know these details when writing the constructions methods, we should provide a range of typical values, overshoot a bit to be safe, and give maximum values for high estimate scenario. This way, if design or methods change but stay within the range, the effects will not be greater and we don't have to amend the permits. We will stipulate that the known effect cannot be greater than out stated threshold, and then the contractors can determine how to proceed with the work within those constraints.
- Sovereign Lands application – we need two, one for construction and one for demolition.
- Additional meetings with this group: schedule another after the contractors have been selected to discuss construction methods and define how and why. Also, schedule a few more at intervals to discuss progress of permits etc.
- Spill management plan required
- Barge inspections required
- Alternative analysis: need hydraulics for different number of piers including flow/turbulence, sediment movement/scouring, and ice accumulation. McQueary asked for alternatives analysis to show balance between initial construction costs versus long-term maintenance costs (e.g. when ice causes damage to close interval piers versus less maintenance required for wider-interval piers). Also, asked about changes in the stability of the channel over time with different numbers of piers. See the CLOMAR application as a source for some of this information.
- Shelley indicated the ESA clearance is needed for the FEMA permit approval, but FEMA outcome is necessary for the ESA clearance. He said we can submit the 70% design as preliminary permit to FEMA and ESA will make a decision so we can move forward.
- Permitting sequence:
    - USCG bridge permit, then
    - 408 permit if necessary, then
    - USACE permit

Meeting outcomes and next steps:

- USCG requires a CatEx, USACE requires an EA
- USACE predicts Individual Permit requirement
- USFWS requires BA, entails document preparation and surveys

- Need language for avoidance and minimization, alternatives analysis of pier numbers (hydrological impacts, ESA effects, impacts to upstream properties)

Appendix N

Cultural Resource Inventory Reports

BNSF Bridge 0038-196.6A Of The Jamestown Subdivision Over The Missouri River

A Class III Cultural Resource Inventory, Burleigh and Morton Counties, North Dakota

Prepared For:
Houston Engineering, Inc
Fargo, North Dakota

Principal Investigator:
John G. Morrison

Prepared By:
John G. Morrison
Juniper, LLC
and
Aaron L. Barth, M.A.
Architecture and History
Bismarck, North Dakota

Report of Investigation: 451 **August 2017**

315 East Broadway Ave., Bismarck, ND 58501 | O: (701) 223-6306 | C: (701) 400-3575 | Juniper, LLC

Manuscript Data Record Form

1. Manuscript Number:
2. SHPO Reference #:
3. Author(s): John G. Morrison and Aaron L. Barth
4. Title: BNSF Bridge 0038-196.6A of the Jamestown Subdivision Over The Missouri River A Class III Cultural Resource Inventory, Burleigh And Morton Counties, North Dakota
5. Report Date: August 2017
6. Number of Pages: 45
7. Type I, T, E, O: I
8. Acres: 58
9. Legal Location(s) with Historic Context Study Unit(s):

County	TWP	R	SEC	SU
BL	139	80	31 and 32	SMR
MO	139	80	31	SMR

BNSF BRIDGE 0038-196.6A OF THE JAMESTOWN SUBDIVISION OVER THE MISSOURI RIVER

A CLASS III CULTURAL RESOURCE INVENTORY, BURLEIGH AND MORTON COUNTIES, NORTH DAKOTA

Prepared For:
Houston Engineering, Inc.
Fargo, North Dakota

Principal Investigator:
John G. Morrison

Prepared By:
John G. Morrison
Juniper, LLC
and
Aaron L. Barth, M.A.
Architecture and History
Bismarck, North Dakota

August 2017

ABSTRACT

Houston Engineering on behalf of BNSF Railroad contacted Juniper, LLC, to conduct a Class III Cultural Resource Inventory of the area of development for a new bridge to replace the historic BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) crossing the Missouri River in Bismarck, North Dakota. The proposed project also entails dismantling the historic bridge. A total of 58 acres were inventoried to Class III Intensive Pedestrian Inventory standards.

John G. Morrison, Principal Investigator, conducted the cultural resource inventory of the project area on July 27, 2017. During the inventory, no new cultural resources were recorded. The BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) was reviewed but no significant changes were noted to the site since it was recorded in 2016 by Aaron L. Barth of Architecture and History. Mr. Barth recorded the historic structure, conducted the historical research, and wrote the history of the bridge and bridge engineer.

The Class I Literature Review of the project area noted 49 previously recorded cultural resources lie within one mile of the proposed development. The majority of the previously recorded resources lie within Fraine Barracks, the headquarters of the North Dakota National Guard, which lies to the southeast, outside of the project area.

Site 32BL801/32MO1459, the BNSF Bridge 0038-196.6A, was previously recorded by Barth in 2016. The site was recommended *eligible* for listing in the National Register of Historic Places. Site Lead 32MOx626, an irrigation or drainage ditch, lies within the western portion of the project area and was recorded by Yates earlier this year (2017). Site Lead 32MOx626 was previously recommended *not eligible* for the National Register of Historic Places nor does it meet the 50 year guideline to be considered for the Register. No significant changes were noted to the resource during the inventory. Juniper concurs with Yate's previous recommendation of *not eligible* for Site Lead 32MOx626. None of the other previously recorded cultural resources lie within the inventoried project area.

Because the proposed undertaking includes dismantling the National Register of Historic Places-*eligible* BNSF Bridge 0038-196.6A, a finding of *Adverse Effect To Historic Properties* is anticipated. Because the proposed undertaking will have an *adverse effect* on an historic property, the project proponents, lead federal agency (United States Coast Guard), North Dakota State Historic Preservation Office, and other consulting parties as appropriate should enter into consultation on ways to avoid, minimize, or mitigate the adverse effect. Juniper also recommends that monitoring of the ground disturbing construction activities by a qualified archaeologist be part of the mitigation plan.

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INTRODUCTION

Houston Engineering, Inc., (Houston) on behalf of BNSF Railroad contacted Juniper, LLC, (Juniper) to conduct a Class III Intensive Pedestrian Cultural Resource Inventory of the area of development for a new bridge to replace the historic BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) crossing the Missouri River in Bismarck, North Dakota (Figure 1). Juniper inventoried a total of 58 acres to State Historical Society of North Dakota (SHSND) Class III Intensive Pedestrian Inventory standards (SHSND 2015). The United States Coast Guard (USCG) serves as the lead federal agency for Section 106 compliance.

BNSF currently owns and operates a single-track structure, BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459,) across the Missouri River in Bismarck, North Dakota. The bridge is part of the Jamestown subdivision of Line Segment 0038. The proposed undertaking consists of the construction of a new structure on a parallel alignment, offset approximate 30' upstream of the existing bridge's centerline. The proposed structure is anticipated to be approximately 1550' in length and consist of seven ballasted deck prestressed concrete beam approach spans with span lengths of approximately 70' and 80', and five steel deck plate girder river spans, each approximately 200' in length. The approach spans will be split between the east and west approaches, with four allocated for the west and three allocated for the east. Supporting the proposed superstructure will be pier and abutment substructure units constructed from cast-in-place concrete. Each unit will, in turn, be supported on a deep foundation mat of driven steel pilings. Spacing of the substructures will be developed such that construction is compatible with the in-place bridge and the configuration of each substructure will be dependent on the loading demands generated by the railroad and environmental forces applicable to the specific location.

Because of the configuration of the proposed structure, additional piers will be placed within the limits of the Missouri River. The river hydraulics are anticipated to be affected by the proposed work with a slight increase to the water surface profile. Therefore, to minimize the impact to river hydraulics, to eliminate fracture-critical spans from the bridge inventory, and to provide an open corridor for future work, the existing bridge will be completely removed once the new structure is in service. Additional workspace will be needed on the eastern and western sides of the bridge to accommodate the anticipated construction activities.

John G. Morrison, Principal Investigator, conducted the cultural resource inventory of the project area on July 27, 2017. Aaron L. Barth of Architecture and History recorded the historic structure BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459), conducted the historical research, and wrote the history of the bridge and bridge engineer in 2016.

The Class I Literature Review of the project area noted 49 previously recorded cultural resources lie within one mile of the proposed development. The majority of the previously recorded resources are located within the North Dakota National Guard headquarters to the southeast of the project area. BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) had been previously recorded by Barth in 2016. Barth recommended the bridge *eligible* for listing in the National Register of Historic Places (NRHP). Site Lead 32MOx626, an irrigation or drainage ditch, lies within the western portion of the project area. Site Lead 32MOx626 was previously recommended *not eligible* for listing the NRHP (Yates 2016). Site Lead 32MOx626 also does not meet the 50 year guideline to be considered for the NRHP. None of the other previously recorded cultural resources lie within the inventoried project area. A discussion and historic background of the bridge are included in the RESULTS section, while the other previously recorded properties are listed in the LITERATURE REVIEW section of the document. The entirety of the site forms, illustrations, maps, field notes, and photographic records relevant to the undertakings are on file at the Juniper office in Bismarck, North Dakota.

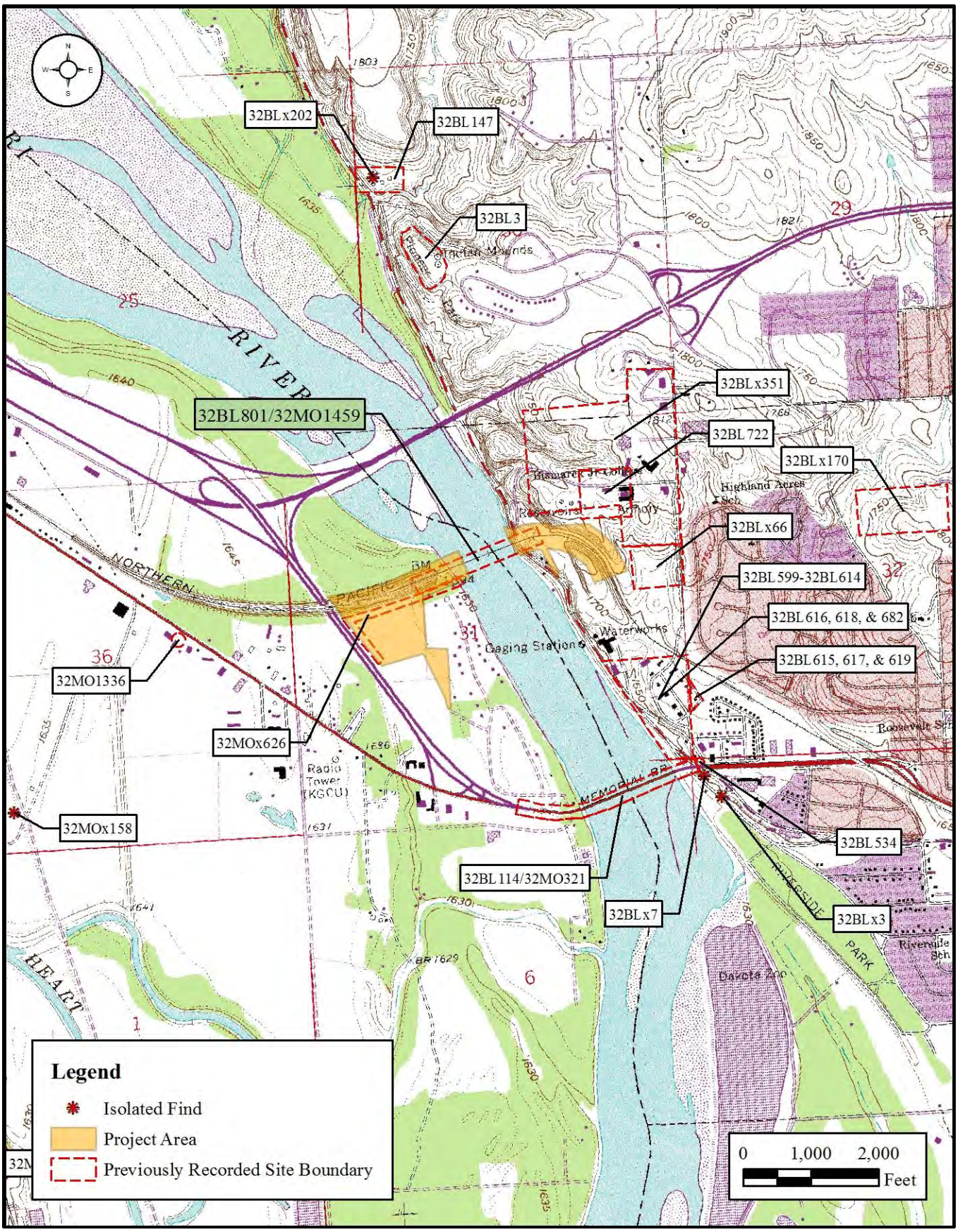

Figure 1: Location of the proposed undertaking and previously recorded cultural resources as depicted upon USGS 7.5' Bismarck (1976) quadrangle map.

ENVIRONMENTAL SETTING

The area of the proposed undertaking lies on either side of the Missouri River in Bismarck, North Dakota, to the south of Interstate 94 (Figure 1). The project is located within the Southern Missouri Study Unit (SMR) (#5). The cultural study unit is defined and delineated in the *North Dakota Comprehensive Plan for Historic Preservation: Archaeological Component* (SHSND 2008: 5.1-5.89). The SHSND (2008) document presents a generalized description/overview of the physiographic and cultural setting for the study unit, along with information on the previous research within the study unit. A project specific description of the environmental setting is presented below based on the review of aerial photographs of the project area, our knowledge of the area, and our field observations.

Topography

The project area lies on the floodplains and terraces of the Missouri River. On the eastern side of the river, the railroad corridor is cut down through the higher terraces, creating a steeply sided valley with flat tops. The tracks remain elevated on piers on the east side, passing high above the floodplain. On the western side of the Missouri River, on the Mandan side, the project area lies on the floodplain and the ground surface has been built up to meet the bridge. To the north and south of the project area, on the western side are flat bottomlands that border the river. The entire project area has been extensively disturbed by historic and modern development.

Flora

The vegetation regimes present today are not necessarily the ones that would have been present in the prehistoric past: agriculture, the introduction of non-native species, and modern development have altered the flora present within the landscape.

On the eastern side of the river, the project area on the higher terraces lies mostly within fields of tall grasses and sagebrush with several tree species, including but not limited to Green Ash, Russian Olive, and Cottonwood. Bushes of buffalo berry as well as numerous invasive species are present, the most notable of which is thistle (Figure 2 - Figure 5). The flora in the project area, on the eastern side, below the bridge, in the floodplain, consists of modern grasses and city park vegetation. On the western side of the river, the project area nearest to the river abuts a residential development (Captain's Landing) on the south, and a densely wooded area to the north. The westernmost area, to the south, consists of an active agricultural field. Ground surface visibility (GSV) within all areas averaged 30%. Special attention was given to areas of increased ground surface visibility within areas of lower ground surface visibility, and exposures of subsurface sediments, including but not limited to cut banks, rodent burrows, and erosional features found within and directly adjacent to the project area.

Figure 2: Overview of eastern portion of the project area, view to the west with Site 32BL801/32MO1459 or BNSF Bridge 0038-196.6A in background.

Figure 3: Overview of eastern portion of the project area, view to the east. Note the new Liberty Memorial Bridge and the Bismarck Expressway bridges in the background.

Figure 4: Overview of a typical cutbank, view to south.

Figure 5: Overview of the western extent of the project view to the southeast.

Fauna

It can also be said that the types and distributions of faunal species present in the project area today do not reflect those of the past. While the following list is not exhaustive of the fauna present, it represents the species most likely to have been encountered during historic or prehistoric times. The region would have been home to diverse large and small mammals as well as some birds, amphibians, and reptiles. In the past, people would have commonly encountered bison (*Bison bison*), elk (*Cervus canadensis*), antelope (*Antilocapra americana*), as well as mule and white tail deer (*Odocoileus* sp.). In addition, wolf (*Canis lupus*), coyote (*Canis latrans*), jack rabbits (*Lepus* sp.), badger (*Taxidea taxus*), beaver (*Castor canadensis*), and prairie dogs (*Cynomys ludovicianus*) would have been present, as well as raptors, songbirds, and game birds. The Missouri River would have provided homes to various species of fish (walleye, northern pike, perch, and suckers), different types of waterfowl, (ducks, geese, etc.,) amphibians, and reptiles and would have also served to draw in and concentrate the faunal resources.

Research Goals and Evaluation of Research

Following the mandated policies implementing the National Historic Preservation Act (NHPA [54 U.S.C. 300101 et seq]), as amended, the project area was inventoried to locate and identify cultural resources. An additional goal of the survey was to allow Houston, BNSF, and ultimately the USCG to plan the proposed development to avoid or minimize the effects of the proposed project on any NRHP *eligible* or *listed* cultural resources within the project area.

The only NRHP *eligible* resource within the project area is BNSF Bridge 0038-196.6A or Site 32BL801/32MO1459. Because no other NRHP *eligible* or *listed* cultural resources were encountered, the inventory achieved its goals.

Literature Review

A literature review of the SHSND's site and manuscript files was conducted by Solli Frank of Juniper. The literature review was conducted for a one mile radius (study area) around the project area. The search noted 49 previously recorded cultural resources within the study area. The majority of the previously recorded resources are architectural properties that lie within Fraine Barracks to the southeast of the project area. Site Lead 32MOx626, a drainage or irrigation ditch, and the BNSF Bridge 0038-196.6A, (Site 32BL801/32MO1459) are located within the project area. Site Lead 32MOx626 was recorded in 2017 as an irrigation ditch likely built in 1982 during the development of the Interstate 94 interchange (Yates 2017). Site Lead 32MOx626 has been previously recommended *not eligible* for the NRHP nor does it meet the 50 year guideline to be considered for the Register (Yates 2017). No significant changes were noted to the resource during the inventory. Juniper concurs with Yate's previous *not eligible* recommendation for Site Lead 32MOx626. Site 32BL801/32MO1459 (BNSF Bridge 0038-196.6A) was recorded by Barth in 2016, recommended *eligible* for the NRHP, and is described in the Results section. The results of the literature review are provided in tabular format in Appendix A (Table 1and Table 2 in Appendix A).

Field Methods

Juniper archaeologist John G. Morrison (Principal Investigator) conducted the Class III Intensive Pedestrian Cultural Resource Inventory on July 27, 2017. The Class III Inventory was conducted by walking parallel pedestrian transects spaced no more than 15 meters apart to cover the project area (SHSND 2015). The railroad bed and tracks themselves were not walked on as part of the inventory. These areas have been extensively disturbed by the development and maintenance of the railway.

Special attention was given to areas of increased ground surface visibility within areas of lower ground surface visibility, and exposures of subsurface sediments, including but not limited to cut banks, rodent burrows, ant mounds, and erosional features found within or directly adjacent to the project area.

Results

No new cultural resources were recorded during the inventory. BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) and Site Lead 32MOx626 lie within the project area and were revisited. Site Lead 32MOx626, the irrigation or drainage ditch, lies within the western portion of the project area. Site Lead 32MOx626 has been previously recommended *not eligible* for the NRHP nor does it meet the 50 year guideline to be considered for listing in the NRHP (Yates 2017). No significant changes were noted to the resource during the inventory. Juniper concurs with Yate's previous *not eligible* recommendation for Site Lead 32MOx626. None of the other previously recorded cultural resources lie within the inventoried project area. The information provided for BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) was originally included in an unpublished 2016 report by Aaron L. Barth.

32BL801/32MO1459 or BNSF Bridge 0038-196.6A

Current Setting and Condition

BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) is one of four bridges visible from the project area (Figure 7 and Figure 8). BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) is the first bridge built within the Bismarck-Mandan Area, between 1880 - 1883, crossing the Missouri River. The second bridge built was the Liberty Memorial Bridge located approximately 4,200' downriver to the south-southeast. The Liberty Memorial Bridge was the first automobile bridge to be built across the upper Missouri River in 1920, and represented the rise of the automobile in American history. The Liberty Memorial Bridge was listed in the NRHP in 1997, and in 2009 the bridge was destroyed and removed from the NRHP, and replaced with the modern bridge that is used today (Figure 3) (Hufstetler 1996). The third bridge, the "Captain Grant Marsh" Bridge, was built in 1965 to carry Interstate 94 across the Missouri River (NPS 2015). This bridge is approximately 2,000' upriver to the north-northwest. In 1985, the Expressway Bridge was built 8,000' downriver to the south.

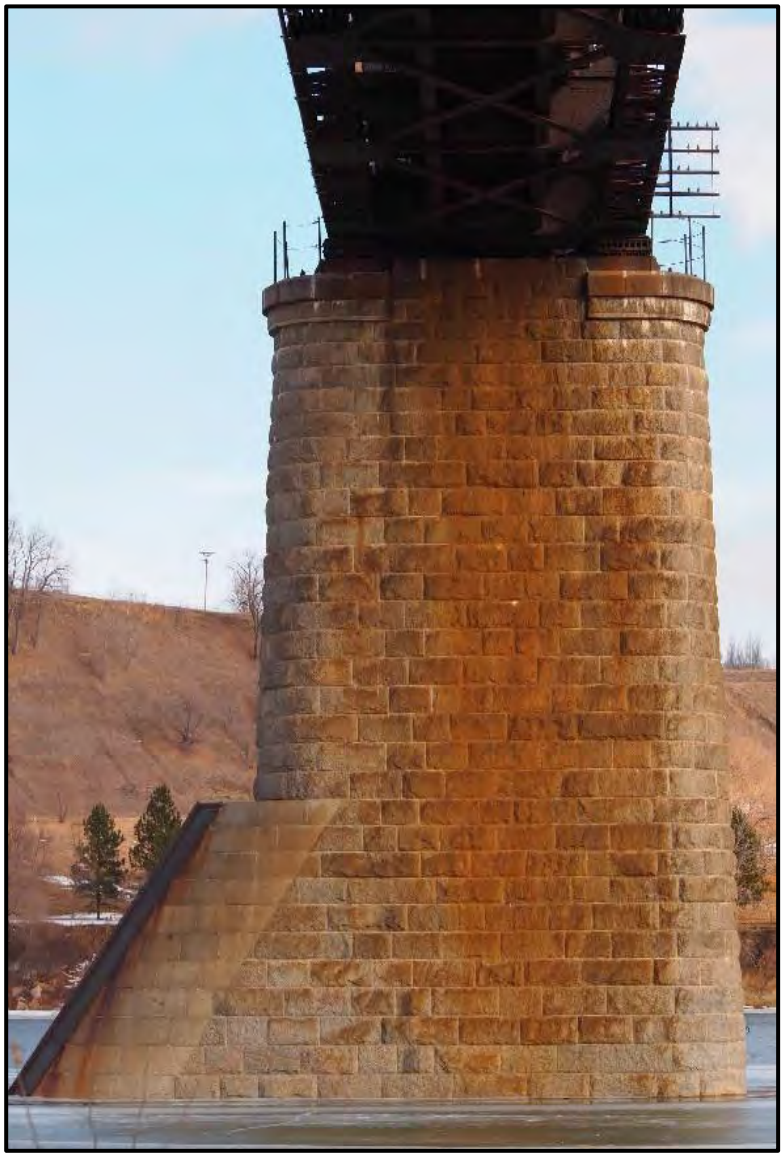

Figure 6: Overview of Pier 2. Icebreaker visible on left.

The BNSF Bridge 0038-196.6A is reflective of bridge construction techniques from the late 1800s. George Shattuck Morison (1842-1903) designed and oversaw construction of this bridge. Four granite piers support the bridge's steel superstructure. Morison numbered the piers east to west 1, 2, 3 and 4. On each bridge pier, immediately below the superstructure, are decades worth of rust that has stained the granite block. The original drill and chisel marks are visible on the granite stones.

Over the course of the bridge history, bridge Pier 1 has received the most alterations, as shortly after bridge completion the pier began slowly sliding toward the river. This was addressed in the 1880s, and again in the 20th century. Today the eastern elevation of bridge Pier 1 has a vertical concrete support, and a scattering of graffiti. Bridge Pier 1 is immediately east of River Road.

Bridge Piers 2 and 3 are in the main channel of the Missouri River. Icebreakers made of steel and granite cap the north sides of bridge Piers 2 and 3 at and above the waterline (Figure 6). These icebreakers cut through the current, and also allow ice flows to break themselves up during seasonal thaws. The icebreaker on the eastern elevation of bridge Pier 2 has one visible tree branch protruding from a seam. The seams were originally sealed with a petroleum-based product. Bridge Pier 4, the western most pier, lies on the floodplain.

The bridge superstructure is a Parker truss design and remains original to when it replaced the Warren truss design in 1905-1906. Wood creosote railroad ties carry the railroad tracks across the bridge. There is a personnel metal walking grate on the northern side of the tracks. On the south elevation are supports that carried electrical wire and phone lines across the river. The electrical and phone lines have been removed, but remnants of this system remain, including steel and wood supports, and glass insulators.

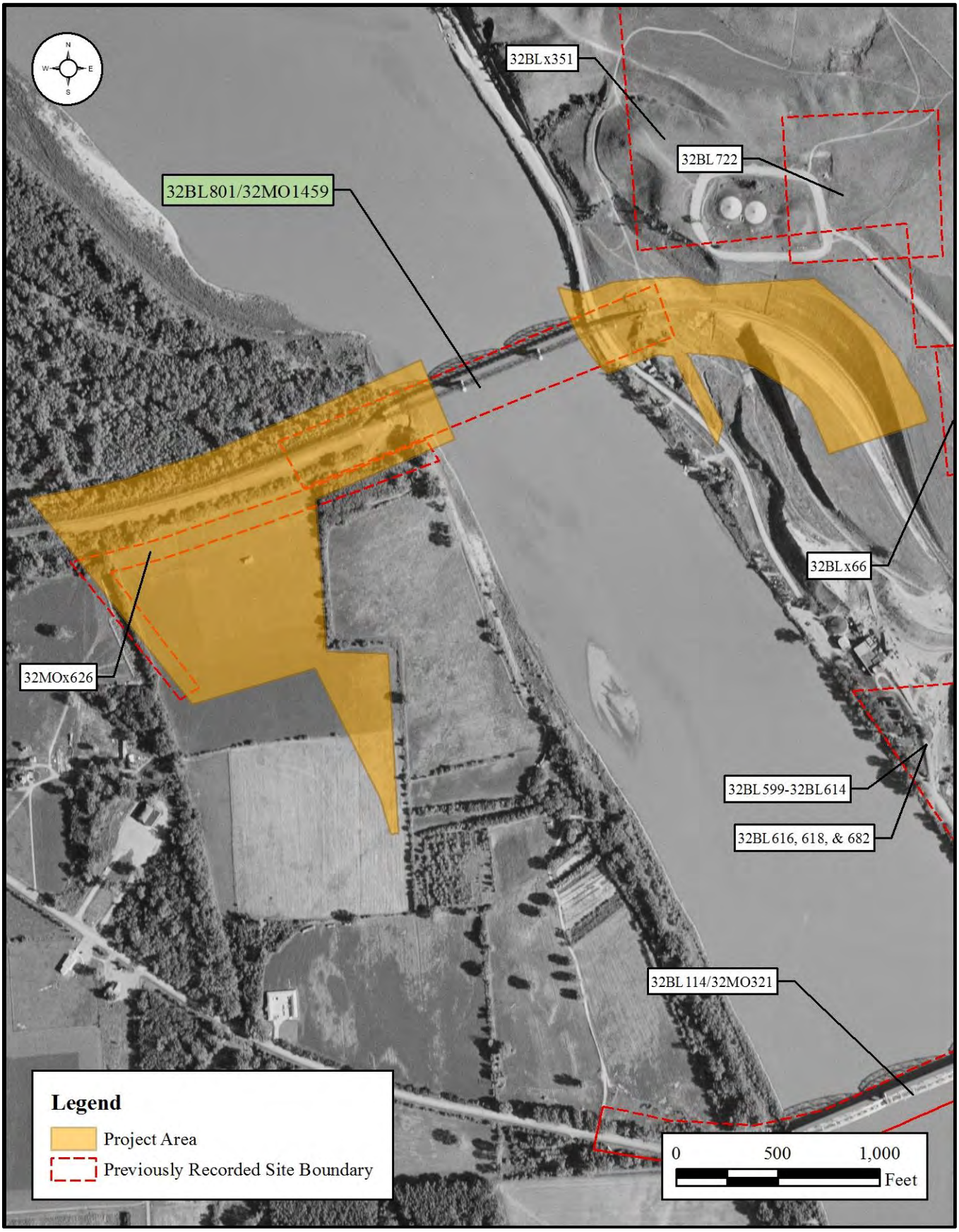

Figure 7: The proposed undertaking and BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) (green label), as depicted upon NAIP 1957-1962 aerial photograph.

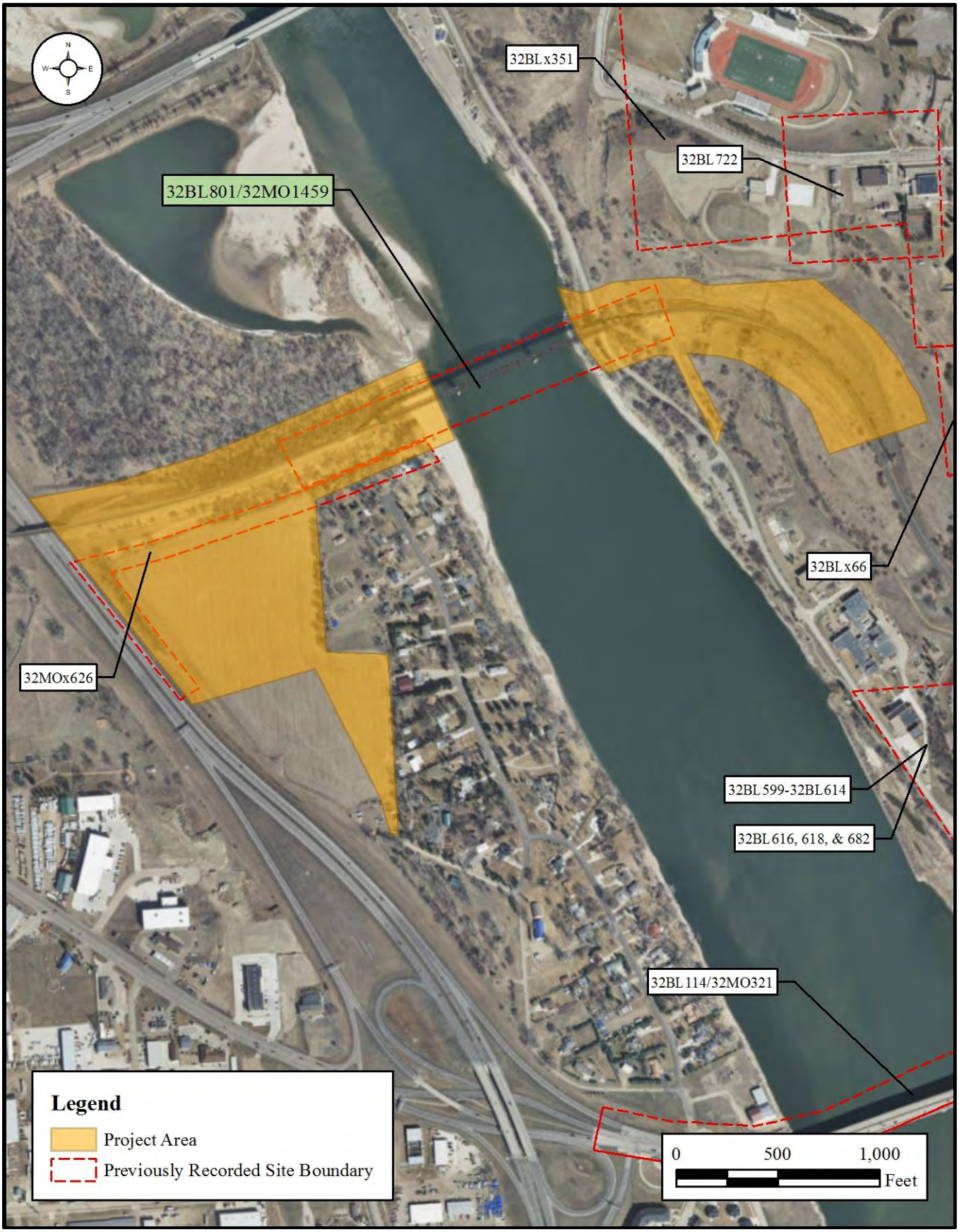

Figure 8: The proposed undertaking and BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) (green label), as depicted upon NAIP 2016 aerial photograph.

Historic Disturbance Within the Project Location

The area of the proposed undertaking has been extensively disturbed by historic and modern developments. Disturbance had occurred at the time of the original construction of the BNSF Bridge 0038-196.6A in the 1880s (Figure 7 - Figure 10). The areas to the north and south of the footings, along the eastern extent of the bridge have undergone many changes, resulting from the use of the area as a ferry and steamboat landing and as an early commercial/industrial zone associated with port side activities (staging, loading, and unloading of steamboats and other river traffic). Its current use is as a road corridor (River Road), and city park and greenspace with a pedestrian/bike trail between Keelboat (north) and Steamboat (south) Parks.

The western extent of the bridge appears a little less disturbed than the eastern side. Based on the 1957-1962 aerial photos, the area to the north of BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459), on the western side of the Missouri River has not been extensively disturbed, while the area to the south has been impacted by the development of the Captain's Landing residential subdivision and the business loop of Interstate 94 (Figure 7 and Figure 8).

Figure 9: Overview of the southern side of the bridge. Photographer unknown, September 1881, Reproduction Number: HAER ND, 8-BISMA, 3-2, Repository: Library of Congress Prints and Photographs Division Washington, D.C. 20540 USA.

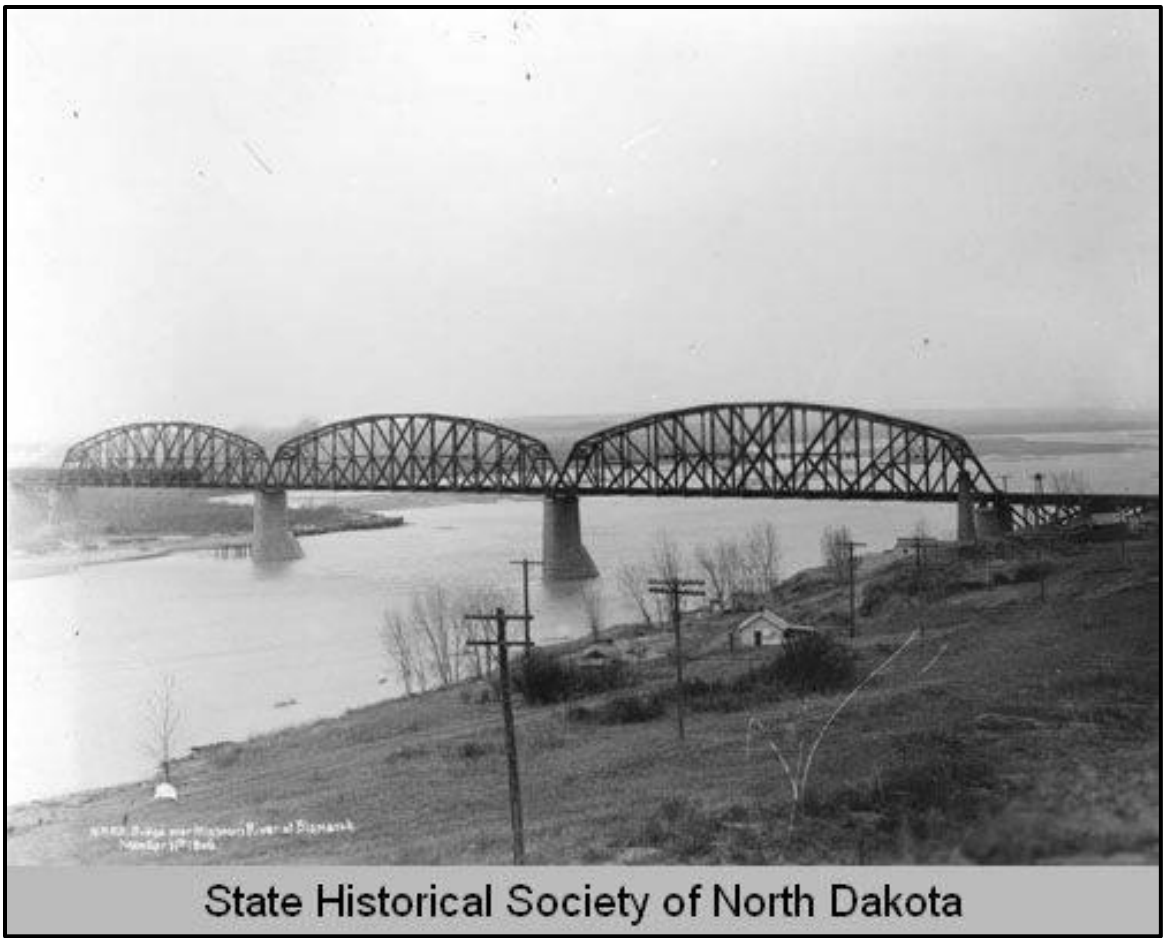

Figure 10: Overview of southern side bridge between 1905-1909 (no date SHSND, Item Number 1952-0221).

History Of The Location

Figure 11: The official Burleigh County (est. 1873) seal on the south elevation of the Burleigh County Courthouse, City of Bismarck.

Before construction of the railroad bridge and prior to the arrival of the Euro-American settler colonizers, this area was occupied by the larger confederacy of Mandan villages. Some of the latest scholarship covering this period includes Elizabeth Fenn's Pulitzer prize- winning history, *Encounters at the Heart of the World: A History of the Mandan People* (2015); Mark D. Mitchell, *Crafting History in the Northern Plains: A Political Economy of the Heart River* (2013); and Tracy Potter, *Shehekeh, Mandan Indian Diplomat: The Story of White Coyote, Thomas Jefferson, and Lewis & Clark* (2003).

Prior to the Eruo-American settlement of the area, indigenous populations crafted bullboats to cross the Missouri River. By the 18th and early 19th centuries, Euro-American fur traders pulled and poled keelboats up and down the Missouri River. By the third decade of the 19th century, the first

steamboats provided the industrial power to transport personnel and supplies upriver to Fort Union and back downriver to St. Louis and other ports. Prior to the arrival of the railroad, the river and tributaries served as highways. Steamboats took advantage of this from 1831 to 1867, as there were 146 steamboats active on this section of the Missouri River (Casler 1999). Of this, 144 had known ports of construction, and two had unknown ports of construction. Steamboats figured so largely in this region's history that the steamboat became the official seal of Burleigh County in 1873 (Figure 11).

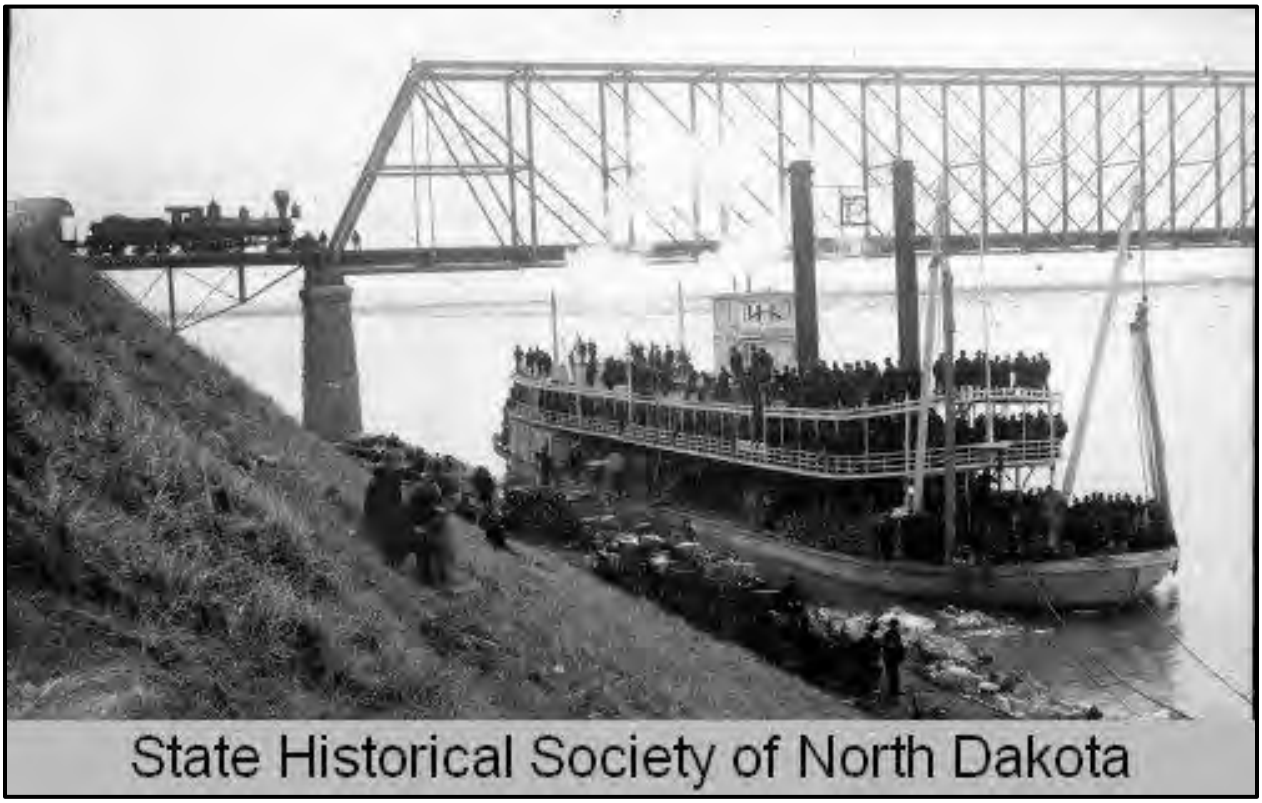

Figure 12: Overview of the Steamboat Helena at Bismarck Landing, Bismarck, N.D, State Historical Society of North Dakota (Photo ID: B0190).

Harvard historian Maya Jasanoff has noted that, throughout the 19th century, steamboat captains faced "Stones, sandbanks, widely varying soundings, sticky heat, banks a monotonous screen of jungle, and the menacing possibility of attack" from indigenous populations. Jasanoff also mentioned that steamboats "were to nineteenth-century empire-builders what caravels had been to conquistadores, and what satellites and drones are to us: they extended political and economic power into hitherto inaccessible regions." (Jasanoff 2013). This was also the case with railroad construction.

In the decade leading up to the BNSF Bridge 0038-196.6A construction, the United States Government ordered Lt. Col. Custer and the 7th Cavalry to Fort Abraham Lincoln to protect continued construction of the railroad after it arrived to Bismarck, Dakota Territory, in 1873. Jay Cooke and Associates, one of the largest financial institutions in the nation, financed this Northern Pacific Railroad (NPRR) construction. This fusion of military and business provided the model

by which Anglo- and Euro-America extended political and economic influence across the continent.

One contemporary of BNSF Bridge 0038-196.6A Engineer George Morison was steamboat Captain Grant Prince Marsh. From 1873 to 1876, Marsh captained the *Far West* and supplied Lt. Col. Custer and his 7th cavalry at Fort Abraham Lincoln. After the actions at Little Bighorn, Marsh set a never-to-be-broken record, rushing dead and wounded soldiers through the waterways of the Little Bighorn River, the Bighorn River, the Yellowstone River, and then the Missouri River, arriving to Bismarck 54 hours later on July 5, 1876. That day, news reached Colonel Clement Lounsberry, founder of *The Bismarck Tribune*, who in turned wired news to the *New York Herald.*

Memorials of these individuals and this event are scattered throughout Bismarck-Mandan. On April 10, 1953, Sigma Delta Chi Foundation and the North Dakota Newspaper Association placed a commemorative marker near the location where Lounsberry wired the telegraph, which today is immediately north of the BNSF tracks on the west side of 5th Street in the Bismarck Historic District. A large headstone marks Marsh's gravesite at St. Mary's Cemetery in the City of Bismarck. Marsh fell ill in early January of 1916 and he died at Saint Alexius Hospital that year.

Immediately north of the BNSF/BNSF Bridge 0038-196.6A is the Grant Marsh boat landing, and "Keelboat Park," complete with a replica keelboat from Lewis & Clark's expedition. Also in this location is the Port of Bismarck, and the *Lewis & Clark* riverboat, a leisure heritage tourism boat adorned with 19th century steamboat elements. South of the BNSF/BNSF Bridge 0038-196.6A is the historic steamboat landing, identified on the 1899 Sanborn Fire Insurance map as the "N.P.R.R. Co's River Landing Ware House." The Bismarck Parks & Recreation District operates and maintains Steamboat Park, complete with a scale model section of the *Yellowstone*, a side wheeler steamboat built in Louisville, Kentucky, for the American Fur Company for service on the Missouri River.

History of the BNSF Bridge 0038-196.6A

At the time it was built, from 1880-1883, the BNSF Bridge 0038-196.6A was the first bridge span on the upper Missouri River and the 10th bridge to span the Missouri River in the history of the United States (Murphy 1995). The Northern Pacific Railroad Company (NPRR) built the bridge. The NPRR recruited and assigned George Shattuck Morison (1842-1903) as the lead engineer to oversee and design the bridge. This bridge project came at the mid-point in his profession. Morison's career would begin after the Civil War, and he would end his career as one of the most nationally respected and recognized bridge engineers in American history.

Although not discussed by Morison, the BNSF Bridge location resulted from the industrial, nation-making ambitions of Anglo-America, and the larger goal of Manifest Destiny. This goal was articulated first by John L. O'Sullivan in 1839 (Coleman 2012). After the American Civil War, these ambitions became realized with the standardized construction of several east-west railroads across the continent. The financier of the NPRR, Jay Cooke, made a fortune during the American Civil War, and he became one of the chief railroad industrialists in the post-Civil War era. This industry, though, required military protection from indigenous populations throughout the American West.

The military would protect railroad survey and labor crews, and the railroad, in turn, would bring settlers and New Americans to fill the continent. These Civil War veterans and New American homesteaders would privatize and fence the land, and bring it into agricultural and ranching production (Fite 1966). They shipped the farming and ranching commodities to urban and world markets, giving rise to urban metropolises in world history. Regionally, this took the form of, for example, Bismarck, Fargo, Minneapolis-St. Paul and Chicago (Belich 2011; Cronon 1992). The railroads provided an overland highway for bringing to market renewable and non-renewable commodities, including grain and cattle, coal, gold, silver, timber, copper and petroleum.

Figure 13: Prior to the construction of the NPRR Bridge, steamboats would load and ferry trains and cargo across the Missouri River (no date, SHSND, Item Number C0649).

Prior to the railroad construction, the Great Plains was perceived of as a great American desert. It was a place to get through rather than settle. The American military established a greater presence on the northern Plains during and after the Civil War. Before the U.S.-Dakota Wars of 1862-1865, American companies and world empires established forts that catered to mercantile and commercial interests. European demands for pelts and hides induced fur trappers to hunt, trap and trade throughout the northern Plains, Rocky Mountains, and American West. As the nation edged closer to the 1860s, though, the United States increasingly realized the nation-state benefits of protecting commercial fur trading and mining interests.

Early overland military and gold mining wagon routes helped define early NPRR routes. By 1871, the railroad pushed up from St. Paul, Minnesota to Fargo, North Dakota. NPRR survey

crews under protection of the U.S. Army also pushed into eastern Montana. Lieutenant Colonel Custer was a part of the officer corps, and this and his Civil War experiences and renown would help lead to his appointment in Dakota Territory.

In 1873, the NPRR tracks reached Edwinton on the east banks of the upper Missouri River. It was then that the NPRR held a meeting and agreed to change the name of Edwinton to Bismarck, the surname of Otto von, Prussia's Iron Chancellor. The NPRR hoped this deliberate namesake change would attract more German and European immigrants. The railroad remained viable with the shipment of commodities, and commodity production required homesteaders.

In 1873, the U.S. Government ordered Custer and the 7th Cavalry to Bismarck, Dakota Territory. This military detachment protected railroad land survey crews west of the Missouri River, and the headquarters at Fort Abraham Lincoln would become a launching point for the overland expeditions with railroad land surveyors. Forts were located along the Missouri River so steamboats could easily resupply them.

In September of 1873, though, an economic depression - The Panic - swept through the nation. Historian M. John Lubetkin (2006) said it started,

> "…shortly before 11 A.M. on Thursday, September 18, when the Wall Street branch of the nation's most prestigious private banking house, Jay Cooke & Associates, the financiers of the Northern Pacific Railroad, unexpectedly ushered its customers out and then literally closed its doors, thereby signaling that it was bankrupt."

Before the day ended, scores of private banking firms in large cities and an untold number of medium-sized and smaller communities had shut their doors for lack of cash. The Panic lasted some five years, and its economic damage was second only to the past century's Great Depression. The Panic resulted in the halting of NPRR construction. Custer remained at Fort Abraham Lincoln, stationed in a remote province of the continental interior and insulated from The Panic. From 1873 to 1876, he and the 7th Cavalry led survey and expedition crews throughout Dakota Territory, even igniting the Black Hills gold rush in 1875. In May of 1876, Custer led several columns of cavalry and infantry out of Fort Abraham Lincoln for the last time. Military expeditions and campaigns against indigenes throughout Dakota Territory, Montana, and Wyoming came and went from Fort Abraham Lincoln for another four years. In 1880, the NPRR recruited their chief railroad bridge engineer, George Shattuck Morison, to move from New York City to Bismarck, Dakota Territory. He would begin work on designing and building the BNSF Bridge 0038-196.6A at a site that remained, as Morison pointed out, "50 miles beyond any settled agricultural country, and more than 400 miles from the nearest labor market." (Morison 1884). Morison engineered and designed this bridge, and oversaw its construction. In modern terms, he was all at once a structural engineer, civil engineer, soil scientist, hydrologist, landscape architect, and construction manager.

Iconic Nature of the BNSF Bridge 0038-196.6A

BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) remains the oldest standing bridge in North Dakota and one of the most iconic structures within the Bismarck Mandan metropolitan area. The bridge dominates the southern viewshed of the heavily traveled Interstate 94 Bridge. In 2015, the North Dakota Department of Transportation (NDDOT) recorded between 36,450 and 45,770 vehicles/day that entered or exited the Interstate 94 Missouri River crossing. Over the course of a year, this means that anywhere from 13,304,250 to 16,706,050 vehicles traveled across the Interstate 94 bridge and viewed the north elevation of the bridge. Also in 2015, NDDOT recorded 20,930 vehicles that crossed the Memorial Bridge immediately south of the BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459). Over the course of a year, this means that 7,639,450 vehicles could have viewed the south elevation of the bridge. That same year the NDDOT also counted 3,185 vehicles/day traveling on River Road, the north-south road that passes under the BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) on the eastern side of the Missouri River. Over the course of a year, 1,162,525 vehicles traveled underneath the bridge at this location. The pedestrian and bicycle trails of the Bismarck Parks & Recreation District and the Mandan Parks & Recreation District also travel north-south underneath this east-west running bridge, carrying many more daily observers.

Beyond this daily visibility, the BNSF Bridge remains a regional and statewide icon. Numerous public and private groups use it as a symbol that unifies the eastern and western banks of the Missouri River. The City of Bismarck uses an aerial photo of this bridge on the city website, and the BNSF Bridge 0038-196.6A is an icon in the Morton County logo. The Bismarck Mandan Food Cooperative uses a silhouette of this bridge within its official logo. In 1995, state geologist Edward Murphy published an article on the bridge in *North Dakota History: Journal of the Northern Plains*. Today the heritage passenger boat, *Lewis & Clark*, incorporates information about this bridge in its historical monologue. The Bismarck Mandan Convention and Visitors Bureau and North Dakota's Department of Tourism use this bridge in marketing materials. This is a non-exhaustive cross section of how the bridge is and has been an iconic image in the Bismarck-Mandan area and the state.

George Shattuck Morison

Throughout the course of his life, George Shattuck Morison helped design and build five bridges across the Mississippi River and 10 bridges across the Missouri River. He was born in New Bedford, Massachusetts on December 19, 1842. He received his Bachelor of Arts degree from Harvard College in 1863 at 20 years of age. After this he studied law. He earned his Bachelors of Laws degree and was admitted to the New York City bar. In 1867, Morison began pursuing a career in civil engineering with an emphasis in bridge design and construction. From 1867 to 1869 he apprenticed under Octave Chanute, the principal engineer of the Kansas City bridge crossing, the "First Hannibal Bridge," on the Missouri River (Chanute and Morison 1870).

In 1871, Morison left Kansas City for Detroit City to take a job as chief engineer of the Detroit, Eel River and Illinois Railroad. He was appointed first assistant engineer of the Erie Railroad from April 1873 to November 1875, building the viaduct span across the Genesee River.

In 1875, he returned to New York City, and became associates with S.C. Ward & G.T. Ward. The Wards were American associates for Baring Brothers & Company, a London-based company that owned several railroads in the United States. From 1875 to 1880, he was a partner of Morison, Fields & Company Bridge Builders (New York Times 1903). In 1880, the NPRR recruited and appointed Morison to relocate to Bismarck, Dakota Territory, to engineer and construct the BNSF Bridge 0038-196.6A. After finishing the bridge at Bismarck, he went on to Chicago and became partner with Elmer L. Corthell. By the 1880s he had achieved national and international bridge building renown (Murphy 1995).

In 1894, President Grover Cleveland appointed him to the Hudson River Bridge Board of Engineers. Four years later, in 1898, President Alexander McKinley appointed him to the Isthmus Canal Commission, where he argued heavily for the Panama route. He eventually returned to New York City. He fell ill in 1903 and never recovered. *The New York Times* noted in his obituary that prior to his death he suffered "from a complication of disorders which had caused him to be confined to his bed" for six weeks.

Bridge Building Area Assessment

By the time Morison arrived in Bismarck in 1880, he had professional liberal arts training, a law degree, and 13 years of high profile civil engineering and bridge building experience. He also apprenticed to and studied under one of the leading bridge engineers in the world. His liberal arts and legal training provided him with the ability to effectively narrate and communicate complex engineering ideas throughout his professional career. The report he produced in 1884 summarizing the BNSF Bridge 0038-196.6A construction is still, today, a highly accessible narrative, complete with detailed engineering and architectural illustrations and drawings of bridge substructure and superstructure construction methods and techniques.

Morison identified three areas for potential bridge construction (Murphy 1995). During the winters of 1878-1880 the Missouri River froze hard and thick enough to support temporary, winter railroad tracks across the ice, the utility of which confirmed the need for a year round crossing (Nolan 1983). For a brief period, a railroad tunnel was also considered. In the May 28, 1880, issue of *The Bismarck Tribune,* an unmentioned reporter wrote that "A tunnel or a bridge is an immediate necessity, and can but be an economical move on the part of the railroad company." The idea of the tunnel was abandoned, though, as it would be completely overwhelmed by spring floods.

The three possible bridge locations Morison considered consisted of the (1) location of Fort Abraham Lincoln, (2) the Old Highway 10/Old Red Trail location, and the (3) current location where the bridge was built. With the southernmost location at Fort Abraham Lincoln, the Missouri River was the narrowest, but the most amount of additional railroad track would have to be laid. Boring tests indicated that the sight around Old Highway 10 would require excessively deep foundations to reach bedrock. Thus, the current location was chosen (Morison 1884).

Bridge Subcontractors

Substructure construction was contracted to Saulpaugh & Company, a "firm consisting of Thomas Saulpaugh, George W. Saulpaugh and John Crubaugh." (Morison 1884). The subcontractor of Rust & Coolidge (Chicago) was hired for the pneumatic work, the support system that would provide laborers in the caisson tunnels with air and air pressure and the construction of the caissons for Piers 2 and 3 (Morison 1884).

Bridge Design and Construction Needs

With the location chosen, Morison identified two complexities inherent in bridge construction on the upper Missouri River. The first was the lack of immediate bedrock, or bedrock close to the surface. The second was how to design the piers to deal with the heavy ice build-up in the winter and rapid ice break-up in the spring. In Morison's words, he said the "peculiarities of this portion of the Missouri valley are of two kinds: the first is due to the entire absence of any proper rock in the formation of this country, and the second is due to the ice, which is always very heavy in the long winters of this high latitude." Morison would address this at length in his narrative (Morison 1884).

Upstream, the Yellowstone and Little Missouri rivers, tributaries of the Missouri River, break up and thaw prior to the area where Morison located the BNSF Bridge 0038-196.6A. This is due to the tributaries running south to north: the southern sections of the rivers are warmed by the sun and melt before the northern section of the upper Missouri River thaws. This causes a buildup of ice and water from November to March and the ice "attains a thickness of from 2 to 4 feet, the latter being uncommon, except in the most severe winters." In the spring, water and ice release within the span of days and weeks at the BNSF Bridge 0038-196.6A site crossing. The river carried massive chunks of thick ice. Morison accounted for this in his bridge design, and called for the construction of a dike to narrow the Missouri River at the site of bridge construction (Morison 1884).

Supporting an industrial superstructure on the upper Missouri River required thoughtful, heavy substructure support. Morison said, "three special provisions must be made in any bridge constructed across this portion of the Missouri" River. The first was pier construction that would resist the most intense springtime ice flows. The second was pier spacing. They must be "placed at such distances, that they will offer the least possible impediment to the mass of moving, broken ice which comes from the river above." Morison's final provision called for a secondary "discharge of the river through a side overflow at a distance from the main channel, in case that channel should be completely dammed by an ice gorge." (Morison 1884).

Ideally, substructure footings would reach down and connect with a solid base of bedrock. In the case of the BNSF Bridge 0038-196.6A site, Morison drilled hundreds of boreholes to sample sediment deposits and locate bedrock depths. He decided on a total construction of four piers. Structural placement of Piers 1, 2, 3, and 4 were organized east to west. Piers 1, 2, and 3 would reach bedrock. The bedrock depth below Pier 4 on the western bank of the Missouri River was too deep, so a series of wood pilings were systemically pounded into the ground. The pier foundation would rest on these pilings (Figure 14). During Barth's review of the BNSF Bridge in January 31, 2016, he noted remnants of wood pilings were observed immediately east of Pier 4. The pilings measure approximately 14-15" (36-37cm), are spaced approximately 4' from one another, and may be from the 1880-1883 bridge construction period (Figure 15) (Morison 1884).

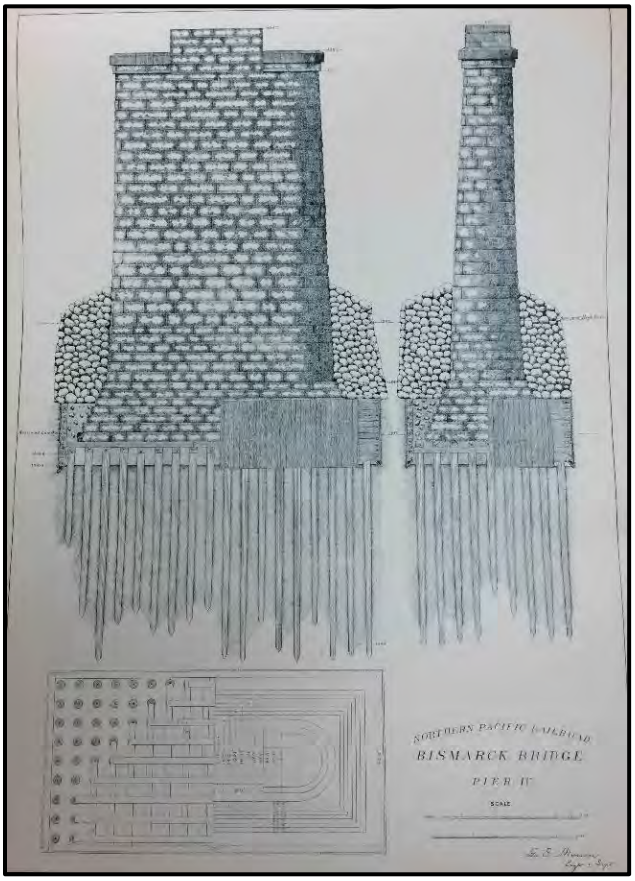

Figure 14: Illustration of the wood pilings driven into the ground supporting Pier 4 (Morison 1884).

Figure 15: Overview of the possible pilings from the original BNSF Bridge construction.

Caisson Construction

Piers 2 and 3, the central piers within the Missouri River channel, required pneumatic caisson foundations. Caisson construction consisted of prefabricating a hollow box or cylinder, floating it into place, and slowly sinking it to the river bottom. Once at the river bottom, laborers worked in an air chamber at the river bottom, removing river bottom soils and clay so the caisson slowly sank (Figure 16). Masonry rows of granite were added to the top of the caisson before it sank below the water line.

With the BNSF Bridge 0038-196.6A, Morison said the caissons were "built of pine timber," and "sheathed on the outside with two thicknesses of 3 inch oak plank." Within, the "working chamber" was "lined with one thickness of 3 inch pine plank calked to render it air tight." On the outside, the caissons measured "74 feet long by 26 feet wide and 17 feet high." Morison described the working chamber at length. He said the walls, "…inclined at an angle of 45º, thus making a V shaped space between the inner and outer walls of the caisson, and the space above the roof of the working chamber is formed of an open crib work of pine timber. The timbers are bolted through at all points of intersection, and the side walls are well drift bolted besides.

The "V" shaped spaces between the two walls, and the spaces in the crib work above the roof of the working chamber, were filled with Portland cement concrete, which was generally made of sand and cement in the proportions of two parts sand to one of cement, rubble stone being working into the upper portion of this filling in the same manner as at Pier 1."

Morison's design also called for a double air chamber lock "specific for this work." Two working chambers, "seven feet high, each of which was in plan a half circle 6' in diameter, separated by two spaces 3' square: one of these intermediate spaces connected with the shaft leading into the working chamber, and the other with the shaft leading to the top of the masonry, the two semicircular chambers forming really two independent air locks. The air lock was placed on top of the caisson and buried in the masonry, the shell being left there when the work was completed, the doors and all the fittings being removed."

Morison said this design "proved exceedingly convenient, especially when it was necessary to take out clay through the lock," suggesting that Morison worked closely with the foremen and laborers in the caisson, or traveled into the locks himself. Air was supplied to the air chambers through a 4" pipe, and water was supplied with a 5" pipe. The cutting edge of the caisson - the edge that pushed its way down through the Missouri River bottom - "was made of wrought iron."

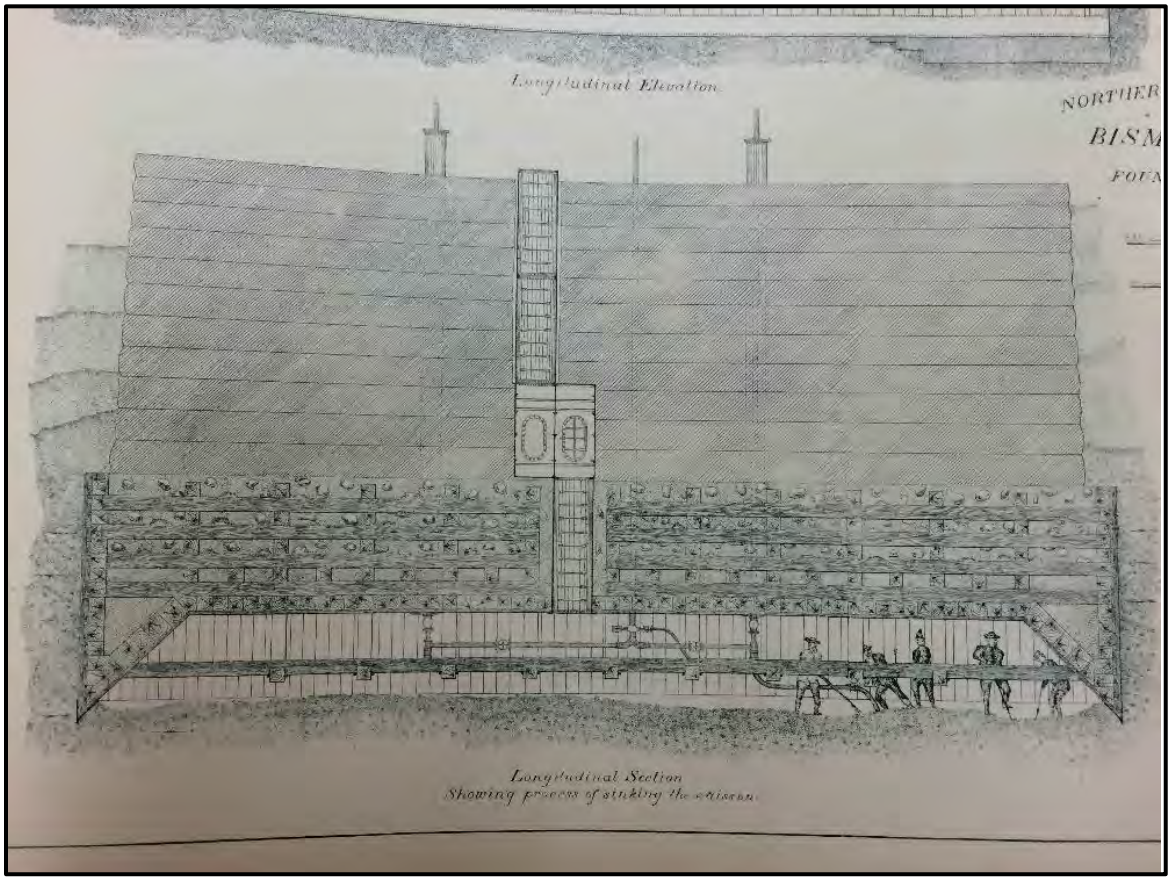

Figure 16: Architectural and engineering illustrations from 1884 of the caisson construction method of the BNSF-NPRR bridge piers.

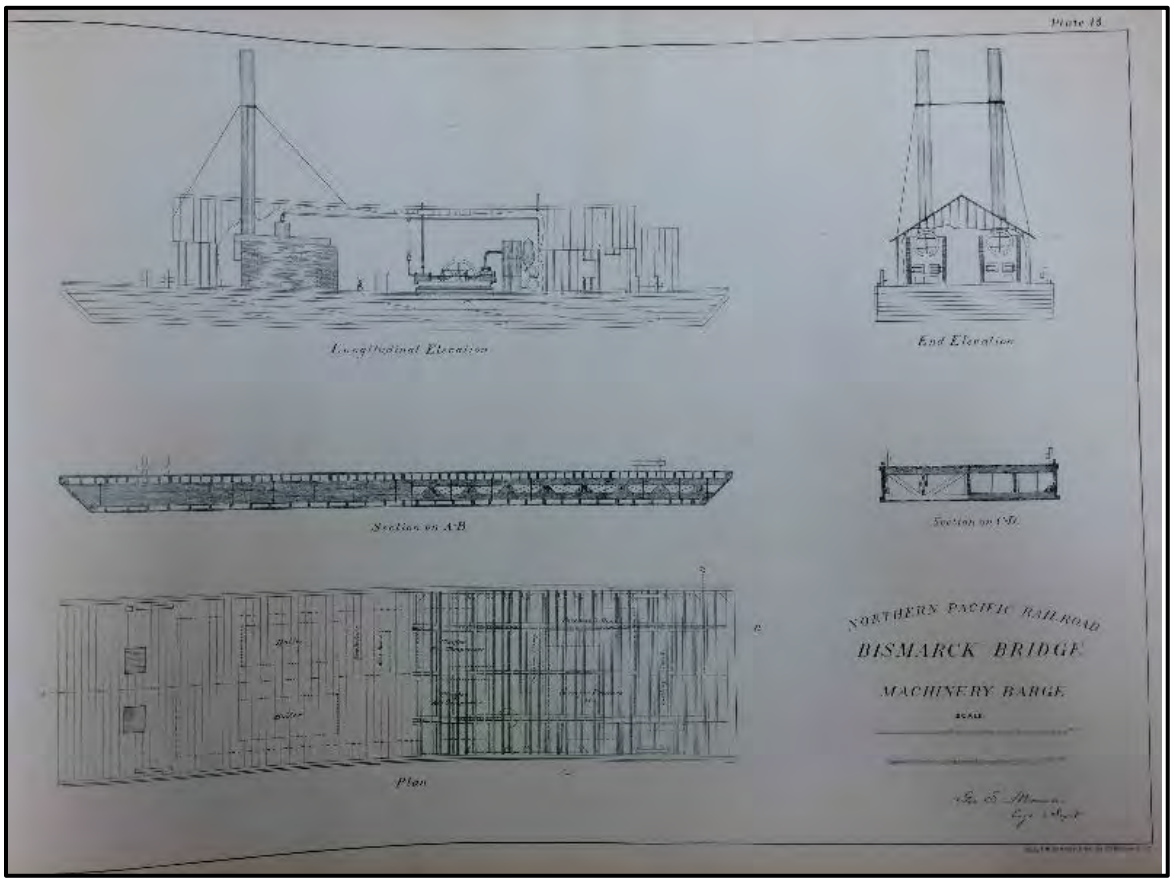

Figure 17: An 1884 illustration of the NPRR machinery (Caisson) barge which supported the air compressors and pumps to support the caisson laborers.

Caisson Barges

Two river barges were required for the caisson construction of Piers 2 and 3 (Figure 17). One barge supplied the pneumatics, including compressors to pressurize the air chambers for the workers, and compressors to power the sand pumps. The barge for the pneumatic machinery was 100' long, 26' wide, and 5' 4" deep. Machinery on the barge "consisted of two No. 4 Clayton air compressors, each with two air cylinders 14 by 15 inches, and two steam cylinders 14 by 15 inches, and a No. 12 long stroke Cameron pump (old No. 8), to drive the Eads sand pumps." Two 60 horse power steam boilers powered the air compressors and sand pumps (Morison 1884). Morison noted that these steam boilers "did the work satisfactorily, but had no power to spare, though one of them was ample to drive the air pumps when the Cameron was not in use." (Morison 1884).

Bridge Laborers

In his 1884 report, Morison noted that the bridge construction location was remote, approximately 190 miles from the Red River Valley agricultural fields, and 440 miles from the steady labor supply of Minneapolis-St. Paul. As the geologist Edward C. Murphy pointed out in his 1995 article on the history of this bridge, Morison complained about bridge laborers. Morison said,

> "…the labor in this country was of an inferior character, and very difficult to control, the men generally being indifferent as to whether they worked or not, and entirely ready to be discharged. It frequently happened that gangs of men sent out from St. Paul to work on the bridge disappeared as soon as they arrived."

From the perspective of laborers, though, this makes sense: 1883 was regarded as an agricultural "Boom" year for northern Dakota Territory. Cattle ranching exploded along the Little Missouri River in western Dakota Territory, and Bonanza farming resulted in unprecedented wheat yields in the Red River Valley. If a laborer arrived at the bridge construction site they were offered, on average, $2/day. With new homesteads opening up throughout northern Dakota Territory the same workers might have been lured to the safer prospect of putting plows in the soil or working as a ranch hand rather than continue at the heavy industrial construction site.

It is important to note that Morison does not note injuries or fatalities in his 1884 report. Industrial bridge construction was dangerous work, as noted with the caisson construction of the Brooklyn Bridge from 1869 to 1883. During construction of the Brooklyn Bridge, approximately 20 laborers died. Morison does not mention worker injuries or fatalities in his report. If approximately 20 laborers died in caisson bridge construction over the course of 14 years in New York, it would suggest that at least four laborers perished during the construction of the BNSF Bridge, although these numbers remain speculative.

At least one worker fatality can be confirmed through a November 19, 1880, front page article in *The Bismarck Tribune.* In "A Watery Grave," *The Bismarck Tribune* reported that,

> "Fred Starr, one of Mr. Fuller's pile-driving crew, met a sudden death Monday. He was on board the N.P. transfer and stationed at the wheel looking up stream while the boat was gliding down. Suddenly the boat struck one of the piles driven in the river to protect the approaches, catching [t]he head of Mr. Starr between the boat guard and pile. The unfortunate man's head was crushed flat and the lifeless form dropped into the river among the floating cakes of ice. As the Missouri never gives up its dead, nothing has since been seen of the body."

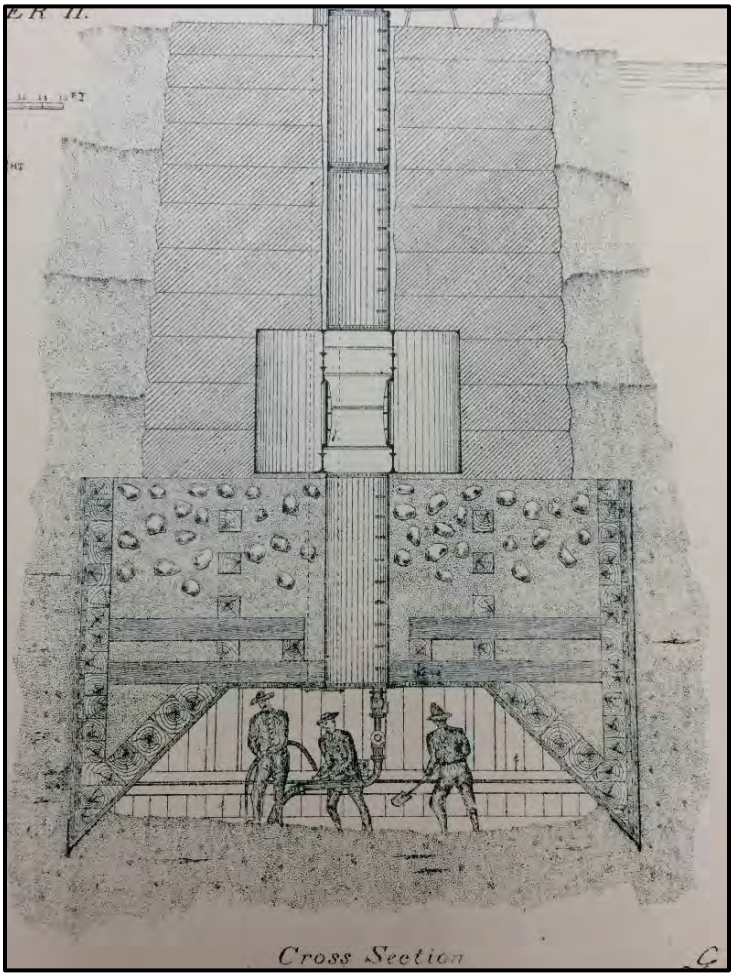

Figure 18: Cross section of caisson displayed in Figure 13.

Within the bridge caissons, Morison noted one problem that bridge laborers had to deal with. He said the "weight of the caisson and masonry was not sufficient to sink the caisson without relieving the air pressure," with "the men remaining in the caisson all the time." When air pressure was relieved, the caisson would settle "about two feet" in the span of "about five minutes." This meant that in the span of 5 minutes, workers within the caisson, through lantern light, would watch their working space decrease from a maximum vertical height of 7' to 5' (Figure 16 and Figure 18).

Outside of the caisson and above the water line, Murphy also recounted the recollections of bridge laborer James Melarvie, a pioneer who worked for four days as a concrete mixer. Melarvie said,

> "I was wheeling cement on a wheel-barrow out to the mixer about seventy-five or one hundred feet. The wind was blowing a gale up the river and the planks we were wheeling over had so much spring they would go up and down. That was too much for me as it made me dizzy. I saw if I tried to keep on I would be taking a bath in the river so I let go of the wheel-barrow and over it went into the water. I walked back to shore and went to the boarding house and gave the man my time sheet and quit. That was the last I heard of it. I didn't go back after my pay for fear they would ask me what I did with that wheel-barrow load of cement."

Morison Addresses the Slide of Bridge Pier 1

From 1880-1883, Morison engineered, guided, and oversaw bridge substructure and superstructure construction. Two years later, in July 1885, he returned to examine Pier 1, as it had moved several inches due to the eastern slope slumping toward the Missouri River.

Three years later, in October 1888, Morison returned again to engineer a solution to relieve Pier 1 from eastern slope pressure. Morison called for the excavation of a pit northeast of Pier 1 to isolate the pier from slide, and for relocating the sediment fill to the west side of the pier for additional stabilization. He then attached two concrete slabs to the base of the pier to fuse it with sediments above and below the slide, speculating that this would impede or prevent the pier from sliding any further. By 1890, a year after North Dakota statehood, Morison concluded that pier had been stabilized.

Figure 19: West elevation of BNSF Bridge Pier 1, photo from January 2016.

As geologist Edward Murphy recounted in his 1995 article on the history of the BNSF Bridge 0038-196.6A, in "1897 Chief Engineer E.H. McHenry sent Morison a plan which called for attaching an 8' thick vertical slab or column of concrete to Pier 1 and deepening the foundation below the sliding zone." Citing that it would adversely impact the aesthetics of the entire bridge, Morison objected and pushed for the disassembly and reassembly of the pier at the original location. "After several letters," said Murphy, "Morison agreed to McHenry's proposal to slide the pier back into position." This required 8 months of preparation, and included steel rails, "a bed of two-inch steel rollers," and "[h]uge screws attached to large wooden levers run through capstan heads" that supplied the power. "Finally," said Murphy, "on May 29, 1898, the pier was moved back into position onto an enlarged and deepened foundation."

Murphy (1995) also tracked the socio-political tension that existed between Morison's ownership of the Bismarck Water Company's reservoirs and his reluctance to immediately address the reservoirs as contributing to the movement of Pier 1. By 1898 Morison had sold his interests in the Bismarck Water Company. In 1902, railroad engineers started blaming water reservoir leakage as a cause for pier movement. The water reservoirs were constructed in 1886 approximately 750' to the northeast of Pier 1. There was speculation that the reservoirs leaked 50,000-60,000 gallons per day. By 1903, Alexander "Boss" McKenzie acquired title to the Bismarck Water Company. Murphy stated that,

> "The story of how McKenzie and a few close friends acquired title to the Bismarck Water Company is surrounded by mystery and intrigue. It reportedly involved the mysterious disappearance of an official record book from the office of the Burleigh County Register of Deeds and the return of the title with names other than the originals."

There are several reasons the NPRR Company was reluctant to take legal action against McKenzie for the water leakage. McKenzie was an old NPRR agent, and he provided free water to "his old cronies at the Northern Pacific Railway." (Murphy 1995).

He was also the known political machine; McKenzie never entered politics himself, but he had the political connections to make politicians. Before anyone ran for politics, it was customary for them to visit with McKenzie. This kind of indirect political influence in local, state, and national elections also likely contributed to the NPRR Company not taking action against McKenzie.

Superstructure Replacement in 1905-1906

Morison designed the substructure and bridge superstructure to account for increased engine and car capacity in 1880. Twenty-five years later, though, the bridge superstructure had to be upgraded, as the original cage was not large enough to accommodate the modern trains. The railroad hired Ralph Modjeski, a consulting engineer from Chicago. The work lasted 8 months, and resulted in the bridge superstructure used today.

For a time, bridge engineers considered but dismissed bridge expansion that required additional bridge piers. Additional piers "would increase the danger of ice jams forming beneath the bridge." (Murphy 1995). In a March 5, 1906 front page article, *The Bismarck Tribune* reported that the

> "…famous bridge was rebuilt last summer, the work being considered a great engineering feat because an entirely new, large and heavier bridge [superstructure] was built in place of the old one without for a moment interfering with the traffic of the road."

National Register Eligibility Recommendations

BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) is recommended *eligible* for listing in the NRHP under to criteria A, B, and C. This recommendation speaks to the 2009 eligibility recommendations for criteria A and C as set forth in the historic statewide railroad context. BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459), though, also has significant people directly associated with its construction, and is therefore also recommended *eligible* under criterion B.

According to NHRP Criteria for Evaluation, a site can be *eligible* if the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
B. That are associated with the lives of significant persons in our past; or
C. That embody distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) is recommended *eligible* under Criterion A: Event. BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) is recommended *eligible*, as it makes a significant contribution to the broad pattern of railroad, commercial and military history in the United States. Railroads remain one of the, if not the, largest infrastructure projects in American history. Railroads signaled unprecedented industrial infrastructure in national and world history. Railroad construction in North Dakota, among other states, allowed settlers and New Americans to arrive, en masse, to the continental interior to take up homesteading and bring the land into industrial agricultural production. In North Dakota, railroads and NPRR bridge construction triggered an economic boom in northern Plains history. This was the same time period where Bonanza farms took root in the Red River Valley of the North, and the open range cattle ranching industry boomed in the Little Missouri River valley in western Dakota Territory. This helped meet national and global demands for wheat and beef protein. Indeed, the NPRR bridge, once built and open, allowed for the free flow of these commodities, contributing to a broad pattern in American history.

BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) is recommended *eligible* under Criterion B: Person. NPRR engineer George Shattuck Morison (1842-1903) designed and oversaw construction of this bridge. *The New York Times* ran Morison's obituary in July 1903 with the title, "George S. Morison Dead: Distinguished Engineer and Bridge Builder Succumbs to Long Illness." Morison was the chief engineer of NPRR bridge construction between Bismarck-Mandan from 1880-1884. He helped design and build five bridges across the Mississippi River and 10 bridges across the Missouri River. He received his Bachelor of Arts degree and Bachelors of Laws degree from Harvard College. In 1867, he began pursuing a career in civil engineering with an emphasis in bridge design and construction. Beyond this, he was chief engineer or a part of bridge building teams throughout the United States.

His success caught the attention of two U.S. presidents. In 1894, President Grover Cleveland appointed him to the Hudson River Bridge Board of Engineers, and in 1898 President Alexander McKinley appointed him to the Isthmus Canal Commission, where he argued heavily for the Panama route. While there has yet to be a comprehensive, balanced biography of Morison, his significance in American history has been noted in regional scholarly articles, historic newspaper articles, and documents he created throughout his life. These documents figure significantly in the historical records within the State Historical Society of North Dakota (Bismarck) and the Minnesota State Historical Society (St. Paul).

BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) is recommended *eligible* under Criterion C: Design/Construction. Morison used state-of-the-art bridge construction methods - the caisson method, for example - appropriated from methods of the bridge crossing at Hannibal, Missouri, and the ongoing construction of the Brooklyn Bridge (1869-1883). The caisson method called for the construction of a type of air chamber for the system of permanent piers. With concrete, aggregate, and wood, this air chamber was floated into vertical position of the pier placement. One layer after another of granite stone were cut and placed atop the caisson, causing it to slowly lower to the river floor. Once on the river floor, the air chamber was pumped dry and workers accessed it through air locks and a portal centered vertically from the river floor to the surface in the caisson. Powered by pumping barges above, workers in the air chamber used a vacuum to remove the river bottom sand. As layers of sand were removed, air pressure was relieved from the air chamber allowing the caisson to gradually sink with the aid of an iron cutting edge at its perimeter. This eventually allowed the caisson to reach bedrock.

Site 32BL801/32MO1459 also has particular engineering qualities that allow it to cope and manage the violent seasonal ice break up on the upper Missouri River. Large cutting wedges of granite and steel are centered on the northern elevation of Piers 2 and 3 (Figure 6). Morison designed the bridge this way specifically for this upper Missouri River crossing. The south-north flowing tributaries to the Missouri River further upstream also power the thaws. Since the Yellowstone River and the Little Missouri River flow south to north, they thaw more rapidly than the Missouri River. This creates a large buildup of ice and water in a short time. Morison documented these design/construction techniques in great detail in an 1884 report he prepared and submitted to the Northern Pacific Railroad Company. An original copy of this report is on file with the SHSND.

SUMMARY AND MITIGATIVE/MANAGEMENT RECOMMENDATIONS

Houston on behalf of BNSF contacted Juniper to conduct a Class III Cultural Resource Inventory of the area of development for a new bridge to replace the historic BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) crossing the Missouri River in Bismarck, North Dakota. The proposed project also entails the dismantling of the historic bridge. A total of 58 acres were inventoried to Class III Intensive Pedestrian Inventory standards.

John G. Morrison, Principal Investigator, conducted the cultural resource inventory of the project area on July 27, 2017. During the inventory, no new cultural resources were recorded. The BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) was reviewed but no significant changes were noted to the site since it had been recorded in 2016. Aaron L. Barth of Architecture and History recorded the historic structure, conducted the historical research, and wrote the history of the bridge and bridge engineer.

Because Site 32BL801/32MO1459 or BNSF Bridge 0038-196.6A is recommended *eligible* for the NRHP, the proposed dismantling of the bridge should be considered an *Adverse Effect* on the historic property. Based in part on Advisory Council on Historic Preservation (ACHP)guidelines, the following mitigative solutions are suggested:

1) Developing interpretive panels of the BNSF Bridge 0038-196.6A along the pedestrian trail system of the Bismarck Parks & Recreation District and the Mandan Parks & Recreation District that incorporate Morison's original 1884 illustrations;
2) Repurposing or relocation all or part of the BNSF Bridge 0038-196.6A (Site 32BL801/32MO1459) to another setting open to the public;
3) Documenting the structure using photography equipment and other methods similar to Historic American Engineering Record (HAER) guidelines.

Juniper also recommends that an archaeologist be present to monitor construction in the project area. Based on historic photographs of the area and the extensive use of the area by prehistoric peoples, there is a high likelihood that buried historic and prehistoric cultural resources that do not have a surface expression could be encountered during the construction effort. Archaeological monitoring is recommended during any ground disturbing bridge construction activities on the east and west banks of the Missouri River, and during any disturbance of railroad approaches to the bridge.

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Downtown Bismarck Historic District. October 28, 2001
E.G. Patterson Building. 1982. 32BL105
L.J. Anderson Building. 32BL150
McKenzie Hotel. 1976. 32BL20
Northern Pacific Railway Depot. 1976. 32BL16
Soo Hotel. 1983. 32BL58
Webb Brothers Block. 1983. 32BL56

APPENDIX A
RESULTS OF THE LITERATURE REVIEW

Table 1: Results of the Site, Site Lead, and Isolated Find Files Search					
Sec-Twp/Rng	**SITS#**	**Type**	**Recorder Date**	**NRHP Status**	**MS #**
5-138/80	32BL63	Architectural - Residence	Schweigert/ Persinger 1988	E	108, 4554, 8462, 10128, 11555, 17256
	32BL64	Architectural - Residence	Schweigert/ Persinger 1988	E	
	32BL65	Architectural - Residence	Schweigert/ Persinger 1988	E	
	32BL66	Architectural - Residence	Schweigert/ Persinger 1988	NE	
	32BL85	Architectural/Historic - Park, Masonry, Metal	Schweigert/ Persinger 1988	E	
	32BL114	Architectural - Liberty Memorial Bridge	Meidinger 2011; Renewable Technologies, Inc./Hess, Roise, & Co. 1991	E	
	32BL287	Architectural - Calvary Free Lutheran Church	Ford-Dunker 1999	UN	
	32BL381	Architectural - Residence	Meidinger 2013; Wegscheid 1991	UN	
	32BL382	Architectural - Residence	Wegscheid 1991	UN	
	32BL383	Architectural - Residence	Wegscheid 1991	UN	
	32BL534	Archaeological - CMS, Faunal Remains, Chipped Stone	Pratt 2003	NE	
	32BL551	Architectural - Lundquist House	Ryan 2006	L	
	32BLx3	Isolated Find - Projectile Point	Borchert 2006	NE	
	32BLx7	Isolated Find - Fire Cracked Rock, Chipped Stone	Zachmann 2006	NE	
	32BLx63	Site Lead - Residence	BAM 1996	UN	
	32BLx191	Site Lead - Residence	BAM 1996	UN	
6-138/80	32BL114	Architectural - Liberty Memorial Bridge	Meidinger 2011; Renewable Technologies, Inc./Hess, Roise, & Co. 1991	E	87, 3992, 8462, 8772, 8838, 8901, 10128, 15166
	32MO321	Architectural - Liberty Memorial Bridge	Renewable Technologies, Inc./Hess, Roise, & Co. 1991	E	
	32MO1318	Architectural -Bethel Assembly of God	Christopher 2002	UN	
1-138/81	32MO28	Archaeological - CMS, Earthlodge Village, Mound	Simonson 1997; Purcell 1979; Metcalf 1950	NE	80, 94, 2094, 2999, 3992, 6088, 6138, 6708, 6919, 8044, 8838, 8901
29-139/80	32BL315	Architectural - Church of Christ	Ford-Dunker 1999	UN	4554, 5506, 5968, 8172, 16299
30-139/80	32BL3	Archaeological - Chief Looking's Village	Bleier, SHSND 2010; Volk 2010; Metcalf 1950	E	80, 94, 109, 5410, 5506, 6886, 7133,

Table 1: Results of the Site, Site Lead, and Isolated Find Files Search					
Sec-Twp/Rng	**SITS#**	**Type**	**Recorder Date**	**NRHP Status**	**MS #**
	32BL147	Architectural - Homestead	Good 1998	NE	8812, 11030, 12124, 15171, 15377, 16299
	32BLx202	Isolated Find - Faunal Remains, Chipped Stone	Good 1998	NE	
	32BKx351	Site Lead - Bismarck State College	Meidinger 2015	UN	
31-139/80	32BL599-32BL614	Architectural - (16 Sites) - Fraine Barracks/ND National Guard	McCormick/ Renewable Technologies, Inc. 2006		80, 109, 2011, 5920, 6354, 8772, 10861, 15171, 16299
	32BL616	Architectural - Fraine Barracks/ND National Guard	McCormick/ Renewable Technologies, Inc. 2006	UN	
	32BL618	Architectural - Fraine Barracks/ND National Guard	McCormick/ Renewable Technologies, Inc. 2006	UN	
	32BL682	Architectural - Fraine Barracks/ND National Guard/Motor Vehicle Storage	Rossillon 2009	NE	
	32BL722	Architectural - Barrack Building	Meidinger 2011	UN	
	32BL801	Architectural - Northern Pacific RR Bridge	Barth 2016; Meidinger 2011; Benson 1980	E	
	32BLx66	Site Lead - Steamboat Warehouse	Benson 1980	UN	
	32BLx351	Site Lead - Bismarck State College	Meidinger 2015	UN	
	32MO321	Architectural - Liberty Memorial Bridge	Renewable Technologies, Inc./Hess, Roise, & Co. 1991	E	
	32MO1459	Architectural - Northern Pacific RR Bridge	Barth 2016; Meidinger 2011; Benson 1980	E	
	32MOx626	Site Lead - Water Diversion Ditch	Yates 2017	NE	
32-139/80	32BL27	Architectural - Cathedral of the Holy Spirit	Ford-Dunker 1999	L	108, 4554, 10861, 15495
	32BL75-32BL80	Architectural - (7 Sites) - Residential			
	32BL103	Architectural - Ralph S. Thompson House	Fukuda 1978	UN	
	32BL316	Architectural - Church of the Cross	Ford-Dunker 1999	UN	
	32BL317	Architectural - United Church of Christ	Ford-Dunker 1999	UN	
	32BL410 - 32BL412	Architectural - (3 Sites) - Residential			
	32BL428 - 32BL433	Architectural - (6 Sites) - Residential			

Table 1: Results of the Site, Site Lead, and Isolated Find Files Search					
Sec-Twp/Rng	**SITS#**	**Type**	**Recorder Date**	**NRHP Status**	**MS #**
32-139/80	32BL454 - 32BL461	Architectural - (8 Sites) - Residential			108, 4554, 10861, 15495
	32BL510 - 32BL518	Architectural - (9 Sites) - Residential			
	32BL520	Architectural - Cathedral Convent	Mertz 2000	L	
	32BL522-32BL523	Architectural - (2 Sites) - Residential			
	32BL530	Architectural - Residence	Mertz 2000	L	
	32BL615	Architectural - Fraine Barracks/ND National Guard	McCormick/ Renewable Technologies, Inc. 2006	UN	
	32BL617	Architectural - Fraine Barracks/ND National Guard	McCormick/ Renewable Technologies, Inc. 2006	NE	
	32BL619	Architectural - Fraine Barracks/ND National Guard	McCormick/ Renewable Technologies, Inc. 2006	UN	
	32BLx159	Site Lead - Bone, Glass, Metal	Ritterbush 1982	UN	
	32BLx170	Site Lead - Mound/Isolated Find	LCT 1990	UN	
25-139/81	32MO1060	Archaeological - CMS, Charcoal, Faunal Remains, Fire Cracked Rock, Chipped Stone	Stine/Kulevsky 2002	UN	87, 6779, 6886, 7753, 8351, 8812, 8897
36-139/81	32MO1336	Architectural - International Cornerstone Church & Academy	Mertz 2002	UN	2054, 2999, 3992, 8351
	32MOx158	Isolated Find - Chipped Stone, TRSS Biface Fragment	Gnabasik 1988	NE	

SITS=Smithsonian Institute Trinomial System, CMS=Cultural Material Scatter, NRHP=National Register of Historic Places, E=Eligible, UN=Unevaluated, NE=Not Eligible, L=Listed, MS=Manuscript

Table 2: Results of the Manuscript Review	
Manuscript #	**Reference**
80	Adamczyk, T. 1975 *Archaeological Inventory Missouri River Reach Between Fort Benton, Montana, and Sioux City, Iowa.*
87	Zimmerman, L., J. Buechler, and S. Symes 1977 *A Cultural Resources Reconnaissance of Eight Proposed Bank Stabilization Sites in Central North Dakota.*
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2999	Montgomery, S. 1982 *A Class III Cultural Resource Inventory for the Proposed Mandan Sewer Improvements, Morton County, ND.*
3992	Gnabasik, V. 1985 *Flood Protection, Levee Raise-Upgrade, Heart River at Mandan Area, Morton County, North Dakota.*
4554	Schweigert, K. 1988 *A Cultural Resources Inventory of the Proposed Washington Street Project, Bismarck, Burleigh Co., ND Vol I.*
5410	Good, K. 1990 *Interstate 94-Ward Road Interchange, Burleigh Co., A Cultural Resources Inventory Report.*
5506	Good, K. 1991 *Grant Marsh Bridge to East Interchange Project, Burleigh Co., (Divide Avenue to Pinto Place and Hay Creek Surveys).*
5920	Johnson, L., M. Hufstetler, F. Quivik, and C. Roise 1992 *Historic Bridges in North Dakota.*
5968	Good, K. 1992 *Century Avenue Reroute Project Century Avenue (Century to Tyler Parkway) Burleigh County, North Dakota (City of Bismarck).*
6088	Christensen, R. 1993 *ND Highway 1806 Archaeology: Class III Inventory & Evaluative Testing at 32MO141, 32MO291 & 32MO292 Project No. DPC-1-806(018)062.*
6138	Good, K. 1993 *Project No. F-1-806()064 Improvement and Widening Project Highway of Fort McKeen to Mandan, Morton Co., ND.*
6354	Borchert, J. and G. Wermers 1994 *Missouri West MR&I Water System Cultural Resources Inventory of Selected Segments in Morton County, North Dakota.*
6708	Stine, E. 1996 *Master Monitor: Monitoring of a Telecommunication Installation Along the Ft. Lincoln By-Pass, Morton County, North Dakota.*
6779	Stine, E. 1996 *Country West Marina: A Class III Cultural Resource Inventory in Burleigh County, North Dakota.*

Table 2: Results of the Manuscript Review	
Manuscript #	**Reference**
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6919	Rothwell, S., T. Larson, and D. Penny 1997 *Results of a Cultural Resource Inventory for the Missouri West Water System, Phase II and Report 1 for the 1998 Field Season.*
7130	Kinney, W. 1998 *The Casselton, Cass Co., North Dakota Dike Improvement, Flood Control District 98-1. A Class III Cultural Resource Inventory Report.*
7753	Bluemle, W. 2000 *Wilderness Cove 2nd Subdivison: A Class III Cultural Resource Inventory, Burleigh Co., ND.*
8044	Ahler, S. 2001 *Analysis of Curated Plains Village Artifact Collections from the Heart, Knife and Cannonball Regions, Burleigh, Morton, Oliver Co., ND.*
8172	Olson, B. 2002 *Braun Intertec Job, No. BGXX-02-524B A Class III Cultural Resources Inventory, Burleigh Co., ND.*
8351	Stine, E. 2002 *Class III Cultural Resource Inventory, Interstate 94 From Highway 25 to Grant Marsh Bridge: Morton County, ND.*
8462	Pratt, D., E. Palmer, and A. Ollendorf 2003 *Class III Cultural Resource Inventory: Archaeological Investigations and Standing Structure Reconnaissance Survey for the Proposed Liberty Memorial Bridge Rehabilitation/Construction, Bismarck (Burleigh Co) & Mandan (Morton Co) ND.*
8772	Stine, E. 2004 *46th Avenue SE: A Class III Cultural Resource Inventory in Mandan, Morton Co., ND.*
8812	Stine, E. 2004 *Pioneer Park to Double Ditch: A Class III Cultural Resource Inventory, Burleigh Co., ND.*
8838	Bluemle, W. 2004 *Lakewood Development Proposed Wetlands: A Class III Cultural Resources Inventory in Morton Co., ND.*
8897	Morrison, J. 2004 *Alternate Routes for Pioneer Park to Double Ditch: A Class III Cultural Resource Inventory, Burleigh Co., ND.*
8901	Bleier, A. 2004 *Lakewook Borrow: A Class III Cultural Resource Inventory, Morton Co., ND.*
10128	Hufstetler, M. and J. Goff 2005 *Historic Bridges in North Dakota 2004 Revision.*
10861	McCormick, M. 2008 *North Dakota Army National Guard's 2006 Inventory of Selected Buildings at Three National Guard Facilities in Ramsey, Burleigh, and Williams Counties, North Dakota.*
11030	Kvamme, K. 2009 *Magnetic Gradiometry Investigations at Chief Looking's Village (32BL3), Burleigh Co. ND.*
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15166	Holven, A. 2014 *Class I: File Search, Pirate Captain - New Build, 40th Avenue SE, Mandan, Morton County, North Dakota.*

Table 2: Results of the Manuscript Review	
Manuscript #	**Reference**
15171	Rohrer, M. 2014 *Gateway to Science Construction Project: A Class III Intensive Cultural Resource Inventory in Burleigh County, North Dakota.*
15377	Mitchell, M. 2008 *Archaeological, Geoarchaeological, and Geophysical Investigations During 2008 at Chief Looking's Village, Burleigh County, North Dakota.*
15495	Baldwin, V. and R. Weston 2014 *Cultural Resources Inventory and Documentation for the Telecommunications Tower BIS Memorial, Burleigh County, North Dakota.*
16299	Brooks, B. 2015 *Interstate 94 Right-of-Way Survey: A Class III Intensive Cultural Resource Inventory in Burleigh County, North Dakota.*
17256	Boos, S. 2017 *Historic Properties Inventory and Documentation for the Mobilitie 9NDXR00359A Communications Pole, Burleigh County, North Dakota.*

BNSF Bridge 0038-196.6A, Western Approach:
A Class III Cultural Resource Inventory, Morton County, North Dakota

Prepared For:
Houston Engineering, Inc.
Fargo, North Dakota

Principal Investigator:
John G. Morrison

Prepared By:
John G. Morrison
Juniper, LLC
Bismarck, North Dakota

Report of Investigation: 574 **November 2019**

315 East Broadway Ave., Bismarck, ND 58501 | O: (701) 223-6306 | C: (701) 400-3575 | Juniper, LLC

MANUSCRIPT DATA RECORD FORM

1. Manuscript Number:
2. SHPO Reference #:
3. Author(s): John G. Morrison
4. Title: BNSF Bridge 0038-196.6A, Western Approach: A Class III Cultural Resource Inventory, Morton County, North Dakota
5. Report Date: November 2019
6. Number of Pages: 14
7. Type I, T, E, O: I
8. Acres: 27
9. Legal Location(s) with Historic Context Study Unit(s):

COUNTY	TWP	R	SEC	SU
MO	138	80	6	SM
MO	139	80	31	SM

Small Survey Report
Submitted by Juniper, LLC
315 East Broadway Ave., Bismarck, ND 58501
Phone: (701) 400-3575, Email: j.morrison@juniperenvironmental.com

Report Title: BNSF Bridge 0038-196.6A, Western Approach: A Class III Cultural Resource Inventory, Morton County, North Dakota

Author: John G. Morrison

SHPO Reference #:

Report Date: November 2019

Acreage: 27

Survey Date: October 24, 2019

Consultant: Houston Engineering, Inc., Fargo, North Dakota

Historic Context: Missouri River Study Unit (#)

Legal Description/Location of Project Area: The project lies along the eastern side of the Interstate 94 Business Loop running southeast of Bismarck, ND on the Mandan side of the Missouri River. The legal location for the project is the E½ of Section 6, in Township (T.) 138 North (N.), Range (R.) 80 West (W.), and the S½ and W½ of Section 31, T. 139 N., R. 80 W., Morton County ND (Figure 1 - Figure 2).

Description of Proposed Project: The project consists of irregularly shaped block running from McKenzie Drive on the southern end, along the eastern side of the I-94 Business Loop (or Bismarck Expressway) for approximately 1.1 miles north to the Burlington Northern Santa Fe (BNSF) railroad right-of-way (Figure 1 - Figure 2). The proposed project will allow BNSF to develop a temporary access road (the *Western Approach*) for the construction activities related to proposed work on the BNSF Bridge 0038-196.6A project (Morrison and Barth 2017). The proposed approach would allow BNSF to move heavy equipment and have daily access to their staging area on the western side of the Missouri River from the I-94 highway and avoid travel through the residential neighborhoods.

A total of 26.9 acres were inventoried to State Historical Society of North Dakota (SHSND) Class III Intensive Pedestrian Inventory guidelines (SHSND 2018).

The project corridor is heavily disturbed by modern development related to both the I-94 Business Loop and the adjacent residential neighborhoods.

Results of Literature Review: A Class I Literature Review of the State Historical Society of North Dakota's site and manuscript files was conducted for a one mile radius study area around the proposed undertaking by Michael Knopik and William Christensen of Juniper, LLC, on September 10, 2018. A total of 144 previously recorded cultural resources have been recorded and 58 previous inventories have been conducted within the study area (Table 1 and Table 2).

Two cultural resources lie within the inventory corridor Site 32BL114/32MO321, the Liberty Memorial Bridge, and Site Lead 32MOx626, an irrigation ditch. Site 32BL114/32MO321 was a three span Warren-Turner Truss bridge that was demolished and replaced in 2008-2009 with a modern concrete bridge. The proposed undertaking will have no effect on Site

32BL114/32MO321 as it has been destroyed. Site Lead 32MOx626 is an irrigation ditch which has been previously recommended *not eligible* for the NRHP and does not meet the 50 year guideline to be considered for the Register (Yates 2017 and Figure 6). No significant changes were noted to the resource during the inventory. Juniper concurs with Yate's previous recommendation of *not eligible* for Site Lead 32MOx626. None of the other 142 cultural resources will be impacted by the proposed undertaking.

Field Personnel: The Class III Intensive Pedestrian Inventory was conducted on October 23, 2019, by Juniper archaeologists Matthew Radermacher (Principal Investigator) and William Christensen (Archaeological Technician).

Field Methods and Conditions: The irregularly shaped inventory block lies primarily within the modern highway right-of-way of the I-94 Business Loop as well as the disturbed right-of-way related to the interchange with McKenzie Drive. The inventory was conducted using parallel pedestrian transects spaced no more than 15 meters apart to cover the inventory block. Ground surface visibility (GSV) within the inventory block averaged 20%. Rodent burrows, road cutbanks, and any other areas of increased visibility were intensively investigated for evidence of buried cultural materials that may not have a surface expression. Shovel investigation probes were not excavated due the low probability setting for finding intact cultural deposits that would not have a surface expression.

Results and Recommendations: No new cultural resources were identified during the inventory. Two previously recorded cultural resources lie within the inventory block. Site 32BL114/32MO321, the Liberty Memorial Bridge, has been destroyed and replaced and will, therefore, not be impacted by the proposed development. Site Lead 32MOx626 has been previously recommended *not eligible* for the NRHP and no further work or avoidance measures are recommended as part of this project.

Because none of the previously recorded cultural resources will be adversely impacted by the proposed development, and no new cultural resources were identified during the inventory, Juniper recommends a finding of *No Historic Properties Affected* for the proposed undertaking.

References Cited:

State Historical Society of North Dakota
2018 *NDSHPO Manual for Cultural Resource Investigations Revised Edition.* Produced by and available at the Division of Archaeology and Historic Preservation, State Historical Society of North Dakota, Bismarck.

Morrison, John G. and Arron L. Barth
2017 *BNSF Bridge 0038-196.6A of the Jamestown Subdivision Over The Missouri River A Class III Cultural Resource Inventory, Burleigh And Morton Counties, North Dakota*. Produced by Juniper, LLC and available at the Division of Archaeology and Historic Preservation, State Historical Society of North Dakota, Bismarck.

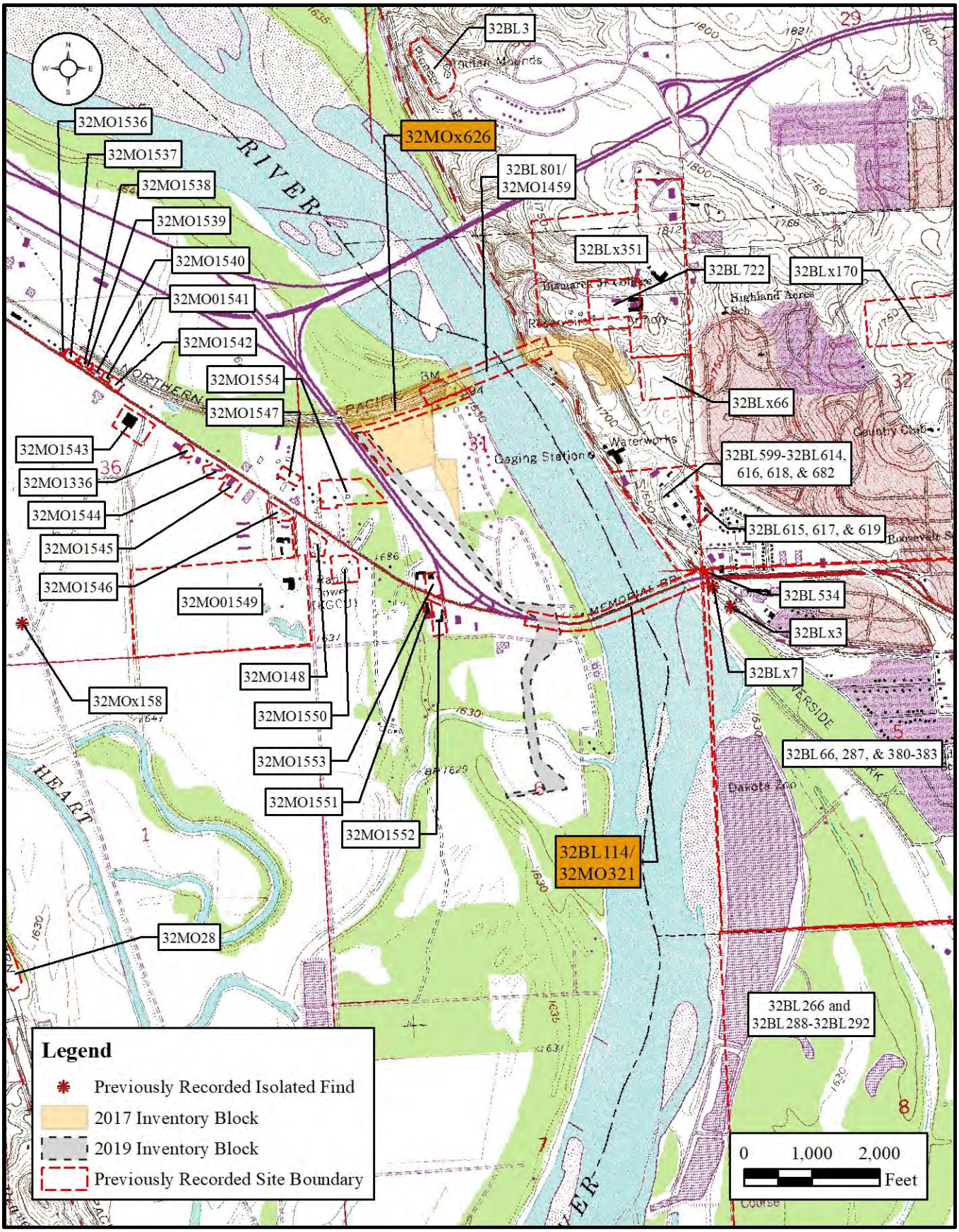

Figure 1: Location of the proposed undertaking, the 2017 and 2019 Juniper inventories, and previously recorded cultural resources as depicted on USGS 7.5' Bismarck (1976) quadrangle map.

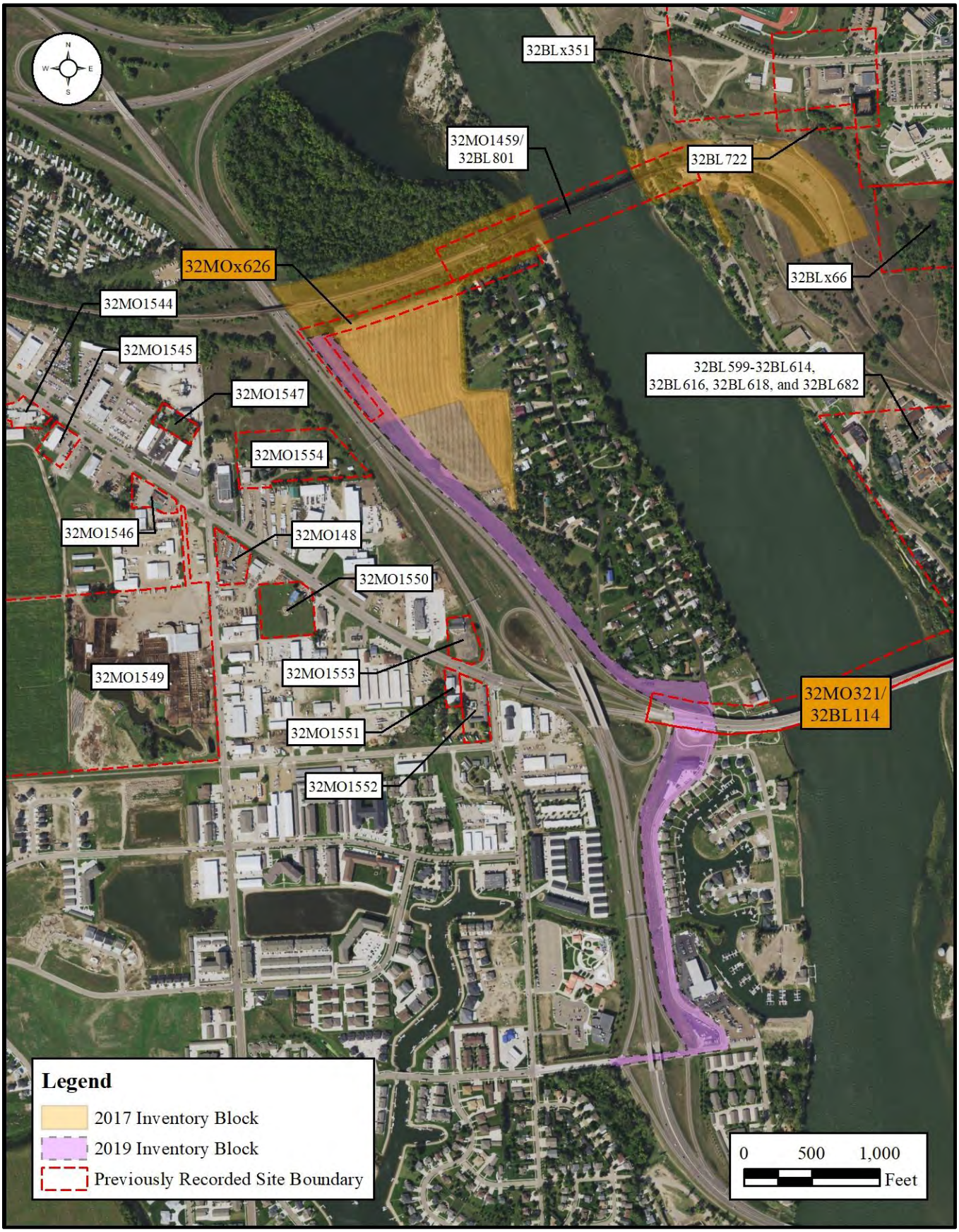

Figure 2: Overview of the proposed undertaking, the 2017 and 2019 Juniper inventories, and previously recorded cultural resources as depicted on 2018 NAIP Morton and Burleigh Counties aerial photographs.

Figure 3: Overview of McKenzie Drive and southern end of the inventory corridor, view to the east.

Figure 4: Overview of the southern end of the inventory corridor as it runs along the eastern side of the I-94 Business Loop, view to the north.

Figure 5: Overview near the middle of the corridor, view to the north..

Figure 6: Overview the northern end of the corridor and Site Lead 32MOx626, view to the southeast. The agricultural field in background was inventoried as part of the 2017 Juniper inventory.

Table 1: Results of the Site, Site Lead, and Isolated Find Files Search					
Sec-Twp/Rng	**SITS#**	**Type**	**Recorder Date**	**NRHP Status**	**MS #**
5-138/80	32BL63	Architectural - Residence	Schweigert/ Persinger 1988	E	108, 4554, 8462, 10128, 11555, 17256
	32BL64	Architectural - Residence	Schweigert/ Persinger 1988	E	
	32BL65	Architectural - Residence	Schweigert/ Persinger 1988	E	
	32BL66	Architectural - Residence	Schweigert/ Persinger 1988	NE	
	32BL85	Architectural/Historic - Park, Masonry, Metal	Schweigert/ Persinger 1988	E	
	32BL114	Architectural - Liberty Memorial Bridge	Meidinger 2011; RTI/Hess, Roise, & Co. 1991	E	
	32BL287	Architectural - Calvary Free Lutheran Church	Ford-Dunker 1999	UN	
	32BL381	Architectural - Residence	Meidinger 2013; Wegscheid 1991	UN	
	32BL382	Architectural - Residence	Wegscheid 1991	UN	
	32BL383	Architectural - Residence	Wegscheid 1991	UN	
	32BL534	Archaeological - CMS, Faunal Remains, Chipped Stone	Pratt 2003	NE	
	32BL551	Architectural - Lundquist House	Ryan 2006	L	
	32BLx3	Isolated Find - Projectile Point	Borchert 2006	NE	
	32BLx7	Isolated Find - Fire Cracked Rock, Chipped Stone	Zachmann 2006	NE	
	32BLx63	Site Lead - Residence	BAM 1996	UN	
	32BLx191	Site Lead - Residence	BAM 1996	UN	
6-138/80	32BL114	Architectural - Liberty Memorial Bridge	Meidinger 2011; RTI/Hess, Roise, & Co. 1991	E	87, 3992, 8462, 8772, 8838, 8901, 10128, 15166
	32MO321	Architectural - Liberty Memorial Bridge	RTI/Hess, Roise, & Co. 1991	E	
	32MO1318	Architectural - Bethel Assembly of God	Christopher 2002	UN	
7-138/80	32MOx57	Historic - Lewis and Clark Camp	Benson 1980	NE	108, 3992, 13475
8-138/80	32BL266	Architectural	McCormick/ Hufstedler 2000	E	13745
	32BL288	Architectural - House of Prayer	Christopher 2001	NE	
1-138/81	32MO28	Archaeological - CMS, Earthlodge Village, Mound	Simonson 1997; Purcell 1979; Metcalf 1950	NE	80, 94, 2094, 2999, 3992, 6088, 6138, 6708, 6919, 8044, 8838, 8901
12-138/81	32MO27	Archaeological - CMS	Larson 1997	UN	80, 94, 130, 2054, 3992, 4837, 6088, 6138, 6310, 6708, 6710,
	32MO292	Historical - Beaver Bridge	Christensen 1993	UN	
	32MO1508	Archaeological - CMS	Stine/Meens 2017	UN	
	32MOx50	Archaeological - CMS	Benson 1980	UN	
	32MOx61	Archaeological - CMS	Benson 1980	UN	

Table 1: Results of the Site, Site Lead, and Isolated Find Files Search					
Sec-Twp/Rng	**SITS#**	**Type**	**Recorder Date**	**NRHP Status**	**MS #**
	32MOx218	Archaeological - CMS	Bauxar 1947	UN	6870, 7617, 8044, 8901, 11065, 11616, 17556
	32MOx431	Archaeological - CMS	Bluemle 2009	UN	
25-139/80	32MO1060	Archaeological - CMS	Stine 2002	UN	87, 6779, 6886, 7753, 8351, 8812, 8897
	32MO1531	Architectural - 2522 Memorial HWY True North Steel	Garnett 2019	NE	
	32MO1532	Architectural - 2517 Memorial Highway	Garnett 2019	NE	
29-139/80	32BL315	Architectural - Church of Christ	Ford-Dunker 1999	UN	4554, 5506, 5968, 8172, 16299
30-139/80	32BL3	Archaeological - Chief Looking's Village	Bleier 2010; Volk 2010; Metcalf 1950	E	80, 94, 109, 5410, 5506, 6886, 7133, 8812, 11030, 12124, 15171, 15377, 16299
	32BL147	Architectural - Homestead	Good 1998	NE	
	32BLx202	Isolated Find - Faunal Remains, Chipped Stone	Good 1998	NE	
	32BLx351	Site Lead - Bismarck State College	Meidinger 2015	UN	
31-139/80	32BL599-32BL614	Architectural - (16 Sites) - Fraine Barracks/ND National Guard	McCormick/ RTI 2006	Various	80, 109, 2011, 5920, 6354, 8772, 10861, 15171, 16299
	32BL616	Architectural - Fraine Barracks/ND National Guard	McCormick/ RTI 2006	UN	
	32BL618	Architectural - Fraine Barracks/ND National Guard	McCormick/ RTI 2006	UN	
	32BL682	Architectural - Fraine Barracks/ND National Guard/Motor Vehicle Storage	Rossillon 2009	NE	
	32BL722	Architectural - Barrack Building	Meidinger 2011	UN	
	32BL801	Architectural - Northern Pacific RR Bridge	Barth 2016; Meidinger 2011; Benson 1980	E	
	32BLx66	Site Lead - Steamboat Warehouse	Benson 1980	UN	
	32BLx351	Site Lead - Bismarck State College	Meidinger 2015	UN	
	32MO321	Architectural - Liberty Memorial Bridge	RTI/Hess, Roise, & Co. 1991	E	
	32MO1459	Architectural - Northern Pacific RR Bridge	Barth 2016; Meidinger 2011; Benson 1980	E	
	32MOx626	Site Lead - Water Diversion Ditch	Yates 2017	NE	
32-139/80	32BL27	Architectural - Cathedral of the Holy Spirit	Ford-Dunker 1999	L	108, 4554, 10861, 15495
	32BL75-32BL80	Architectural - (7 Sites) - Residential	Various	Various	
	32BL103	Architectural - Ralph S. Thompson House	Fukuda 1978	UN	

Table 1: Results of the Site, Site Lead, and Isolated Find Files Search					
Sec-Twp/Rng	**SITS#**	**Type**	**Recorder Date**	**NRHP Status**	**MS #**
	32BL316	Architectural - Church of the Cross	Ford-Dunker 1999	UN	
	32BL317	Architectural - United Church of Christ	Ford-Dunker 1999	UN	
	32BL410 - 32BL412	Architectural - (3 Sites) - Residential	Various	Various	
	32BL428 - 32BL433	Architectural - (6 Sites) - Residential	Various	Various	
	32BL454 - 32BL461	Architectural - (8 Sites) - Residential	Various	Various	
	32BL510 - 32BL518	Architectural - (9 Sites) - Residential	Various	Various	
	32BL520	Architectural - Cathedral Convent	Mertz 2000	L	
	32BL522-32BL523	Architectural - (2 Sites) - Residential	Various	Various	
	32BL530	Architectural - Residence	Mertz 2000	L	
	32BL615	Architectural - Fraine Barracks/ND National Guard	McCormick/ RTI 2006	UN	
	32BL617	Architectural - Fraine Barracks/ND National Guard	McCormick/ RTI 2006	NE	
	32BL619	Architectural - Fraine Barracks/ND National Guard	McCormick/ RTI 2006	UN	
	32BLx159	Site Lead - Bone, Glass, Metal	Ritterbusch 1982	UN	
	32BLx170	Site Lead - Mound/Isolated Find	LCT 1990	UN	
25-139/81	32MO1060	Archaeological - CMS, Charcoal, Faunal Remains, Fire Cracked Rock, Chipped Stone	Stine/Kulevsky 2002	UN	87, 6779, 6886, 7753, 8351, 8812, 8897
36-139/81	32MO1336	Architectural - International Cornerstone Church & Academy	Mertz 2002	UN	2054, 2999, 3992, 8351
	32MOx158	Isolated Find - Chipped Stone, TRSS Biface Fragment	Gnabasik 1988	NE	

CMS=Cultural Material Scatter, Tongue River Silicified Sediment=TRSS

Table 2: Results of the Manuscript Review	
MS #	**Reference**
80	Adamczyk, T. 1975 *Archaeological Inventory Missouri River Reach Between Fort Benton, Montana, and Sioux City, Iowa.*
87	Zimmerman, L., J. Buechler, and S. Symes 1977 *A Cultural Resources Reconnaissance of Eight Proposed Bank Stabilization Sites in Central North Dakota.*
94	Hecker, T. nd *List of Known Earth Lodge Village Sites Above the Grand River.*
108	Mattison, R. 1953 *Report on Historic Sites of the Oahe Reservoir Area, Missouri River.*
109	Mattison, R. 1951 *Report on Historical Aspects of the Garrison Reservoir Area, Missouri River.*
130	Jensen, R. 1965 *An Archeological Survey of the Oahe Reservoir Area, North Dakota.*
2011	Anonymous 1965 *Historic Sites Under the Authority of the State Historical Society of North Dakota as Established by The Thirty-Ninth Legislative Assembly.*
2054	Robson, L. 1980 *Class III Intensive Inventory For All Cultural Resources, Mandan, North Dakota, Flood Control Levee, Morton County, North Dakota.*
2999	Montgomery, S. 1982 *A Class III Cultural Resource Inventory for the Proposed Mandan Sewer Improvements, Morton County, ND.*
3955	Woolworth, A. 1956 *Report Submitted to the National Park Service in 1956 on Archeological Sites Along the Missouri River in North Dakota Which Should Be Preserved, Sioux, Morton, Oliver, Mercer, Emmons, Burleigh, McLean & Williams Counties.*
3992	Gnabasik, V. 1985 *Flood Protection, Levee Raise-Upgrade, Heart River at Mandan Area, Morton County, North Dakota.*
4554	Schweigert, K. 1988 *A Cultural Resources Inventory of the Proposed Washington Street Project, Bismarck, Burleigh Co., ND Vol I.*
4837	Good, K. and G. Anderson 1989 *Class III Cultural Resource Survey Fort Abraham Lincoln State Park, Morton County, North Dakota.*
5410	Good, K. 1990 *Interstate 94-Ward Road Interchange, Burleigh Co., A Cultural Resources Inventory Report.*
5506	Good, K. 1991 *Grant Marsh Bridge to East Interchange Project, Burleigh Co., (Divide Avenue to Pinto Place and Hay Creek Surveys).*
5920	Johnson, L., M. Hufstedler, F. Quivik, and C. Roise 1992 *Historic Bridges in North Dakota.*
5968	Good, K. 1992 *Century Avenue Reroute Project Century Avenue (Century to Tyler Parkway) Burleigh County, North Dakota (City of Bismarck).*
6088	Christensen, R. 1993 *ND Highway 1806 Archaeology: Class III Inventory & Evaluative Testing at 32MO141, 32MO291 & 32MO292 Project No. DPC-1-806(018)062.*

Table 2: Results of the Manuscript Review	
MS #	**Reference**
6138	Good, K. 1993 *Project No. F-1-806()064 Improvement and Widening Project Highway of Fort McKeen to Mandan, Morton Co., ND.*
6310	Kulevsky, A. 1994 *Mor-Gran-Sou Electric Cooperatives McKeen Electric Line: A Class III Cultural Resource Inventory in Morton County, North Dakota.*
6354	Borchert, J. and G. Wermers 1994 *Missouri West MR&I Water System Cultural Resources Inventory of Selected Segments in Morton County, North Dakota.*
6708	Stine, E. 1996 *Master Monitor: Monitoring of a Telecommunication Installation Along the Ft. Lincoln By-Pass, Morton County, North Dakota.*
6710	Metcalf, M. 1996 *Fort Lincoln Bike Trail: A Class III Inventory in Morton County, North Dakota*
6779	Stine, E. 1996 *Country West Marina: A Class III Cultural Resource Inventory in Burleigh County, North Dakota.*
6870	Kulevsky, A. and E. Stine 1997 *32MO27 Evaluative Testing, Morton County, North Dakota.*
6886	Good, K. 1996 *Burnt Boat Drive Improvements and Channel Change City of Bismarck, Burleigh Co., ND Class III Cultural Resource Inventory.*
6919	Rothwell, S., T. Larson, and D. Penny 1997 *Results of a Cultural Resource Inventory for the Missouri West Water System, Phase II and Report 1 for the 1998 Field Season.*
7133	Good, K. 1998 *Ducks Unlimited, Inc., Great Plains Regional Office Headquarters Project Class III Cultural Resource Inventory, Burleigh Co., ND.*
7617	Ahler, S., C. Graham, and M. Metcalf 2000 *Report of Archaeological Investigations Along Highway 1806 Morton County, North Dakota.*
7753	Bluemle, W. 2000 *Wilderness Cove 2nd Subdivision: A Class III Cultural Resource Inventory, Burleigh Co., ND.*
8044	Ahler, S. 2001 *Analysis of Curated Plains Village Artifact Collections from the Heart, Knife and Cannonball Regions, Burleigh, Morton, Oliver Co., ND.*
8172	Olson, B. 2002 *Braun Intertec Job, No. BGXX-02-524B A Class III Cultural Resources Inventory, Burleigh Co., ND.*
8351	Stine, E. 2002 *Class III Cultural Resource Inventory, Interstate 94 From Highway 25 to Grant Marsh Bridge: Morton County, ND.*
8462	Pratt, D., E. Palmer, and A. Ollendorf 2003 *Class III Cultural Resource Inventory: Archaeological Investigations and Standing Structure Reconnaissance Survey for the Proposed Liberty Memorial Bridge Rehabilitation/Construction, Bismarck (Burleigh Co) & Mandan (Morton Co) ND.*
8772	Stine, E. 2004 *46th Avenue SE: A Class III Cultural Resource Inventory in Mandan, Morton Co., ND.*
8812	Stine, E. 2004 *Pioneer Park to Double Ditch: A Class III Cultural Resource Inventory, Burleigh Co., ND.*

Table 2: Results of the Manuscript Review	
MS #	**Reference**
8838	Bluemle, W. 2004 *Lakewood Development Proposed Wetlands: A Class III Cultural Resources Inventory in Morton Co., ND.*
8897	Morrison, J. 2004 *Alternate Routes for Pioneer Park to Double Ditch: A Class III Cultural Resource Inventory, Burleigh Co., ND.*
8901	Bleier, A. 2004 *Lakewook Borrow: A Class III Cultural Resource Inventory, Morton Co., ND.*
10128	Hufstedler, M., and J. Goff 2005 *Historic Bridges in North Dakota 2004 Revision.*
10861	McCormick, M. 2008 *North Dakota Army National Guard's 2006 Inventory of Selected Buildings at Three National Guard Facilities in Ramsey, Burleigh, and Williams Counties, North Dakota.*
11030	Kvamme, K. 2009 *Magnetic Gradiometry Investigations at Chief Looking's Village (32BL3), Burleigh Co. ND.*
11065	Banks, Kimball 2009 *Goetzfridt Property Survey: A Class III Cultural Resource Inventory of a Proposed Home Site in Morton County, North Dakota.*
11555	Banks, K. 2010 *Bismarck Main Memorial Bridge and Bismarck Cottonwood Park SW Projects: A Class III Cultural Resource Inventory in Burleigh Co., ND.*
11616	Geo-Recovery-Systems 1996 *Report of Geophysical Surveys: Archaeological Investigation of North Dakota State Highway 1806 Bypass, Mandan, Morton County, North Dakota.*
12124	Shropshire, M. 2011 *KL&J Building Site: A Class III Cultural Resource Inventory in Burleigh Co., ND.*
13475	Morrison, J. 2012 *Riverwood Drive and Mills Avenue Road Improvement Projects: Class III Cultural Resource Inventory, Burleigh County, North Dakota.*
15166	Holven, A. 2014 *Class I: File Search, Pirate Captain - New Build, 40th Avenue SE, Mandan, Morton County, North Dakota.*
15171	Rohrer, M. 2014 *Gateway to Science Construction Project: A Class III Intensive Cultural Resource Inventory in Burleigh County, North Dakota.*
15377	Mitchell, M. 2008 *Archaeological, Geoarchaeological, and Geophysical Investigations During 2008 at Chief Looking's Village, Burleigh County, North Dakota.*
15495	Baldwin, V. and R. Weston 2014 *Cultural Resources Inventory and Documentation for the Telecommunications Tower BIS Memorial, Burleigh County, North Dakota.*
16299	Brooks, B. 2015 *Interstate 94 Right-of-Way Survey: A Class III Intensive Cultural Resource Inventory in Burleigh County, North Dakota.*
17256	Boos, S. 2017 *Historic Properties Inventory and Documentation for the Mobilitie 9NDXR00359A Communications Pole, Burleigh County, North Dakota.*
17554	Yates, C. 2017 *Sprint Crossing Bore Locations: A Class III Cultural Resource Inventory in Burleigh and Morton Counties, North Dakota.*

Table 2: Results of the Manuscript Review	
MS #	**Reference**
17556	Meens, D. 2017 *Nick Thomas Trackside Subdivision Waterline: A Class III Cultural Resource Inventory in Morton County, North Dakota.*
17578	Morrison, J. and A. Barth 2017 *BNSF Bridge 0038-196.6A of the Jamestown Subdivision over the Missouri River: A Class III Cultural Resource Inventory, Burleigh and Morton Counties, North Dakota*.
17752	Yates, C. 2018 *Addendum to DCN Small Cell Installations: Bismarck State College, Burleigh County, North Dakota.*
18395	Kulevsky, A. 2019 *AT&T's Memorial Highway & Hwy 22 & 40th Ave SE (NDL02919) Telecommunications Facility: A Class III Cultural Resource Inventory and Visual Impact Assessment in Morton County, North Dakota.*

Appendix O

Visual Impact Assessment

Jacobs

BNSF Railway Bridge 196.6 Project
Burleigh and Morton Counties, North Dakota

Visual Impact Assessment

Draft

April 9, 2021

BNSF Railway Company

Contents

Appendixes

Tables

Figures

Acronyms and Abbreviations

Acronym	Abbreviations
AVE	area of visual effect
BAC	Bridge Advisory Committee
BNSF	BNSF Railway Company
CFR	*Code of Federal Regulations*
DEIS	Draft Environmental Impact Statement
FHWA	Federal Highway Administration
I	Interstate
MRNA	Missouri River Natural Area
Project	BNSF Railway Bridge 196.6 Project
ROW	right-of-way
VIA	Visual Impact Assessment

This document contains acronyms that are longer than four letters. Please confirm acronym settings if using assistive technology.

Table notes are denoted with [].

1. Introduction

This Visual Impact Assessment (VIA) analyzes expected visual impacts from implementation of the BNSF Railway Bridge 196.6 Project (Project), which proposes alternatives to replace the aging BNSF Railway Company (BNSF) freight railway bridge (hereafter referred to as Bridge 196.6). Bridge 196.6 is approaching the end of its useful life and needs to be replaced to safely move future rail traffic along the BNSF northern corridor. This VIA is part of an analysis that is being prepared under the National Environmental Policy Act by the U.S. Coast Guard. This VIA is intended to provide decision makers with information about, and recommendations for minimizing, any impacts on visual quality.

Bridge 196.6 is a truss bridge that crosses the Missouri River between the cities of Mandan and Bismarck, North Dakota (Figure 1). Truss bridges are characterized by a triangular framework of structural members that function as a large beam (North Carolina Department of Transportation n.d.). Completed in 1882, Bridge 196.6 consists of three independent steel through truss structures, a single-deck truss on the west approach, and precast box girders on the eastern approach (Figure 2). The tallest elevation of the Bridge 196.6 is 1,758.0 feet (NAVD88). The original design of Bridge 196.6 included Warren truss features that were replaced with Parker trusses between 1905, and 1906. A Parker truss has a polygonal top chord that places the greatest depth of the truss at the center of the span. The riveted Parker truss design was suited for relatively long spans and remained popular throughout the early 20th century (North Carolina Department of Transportation n.d.).

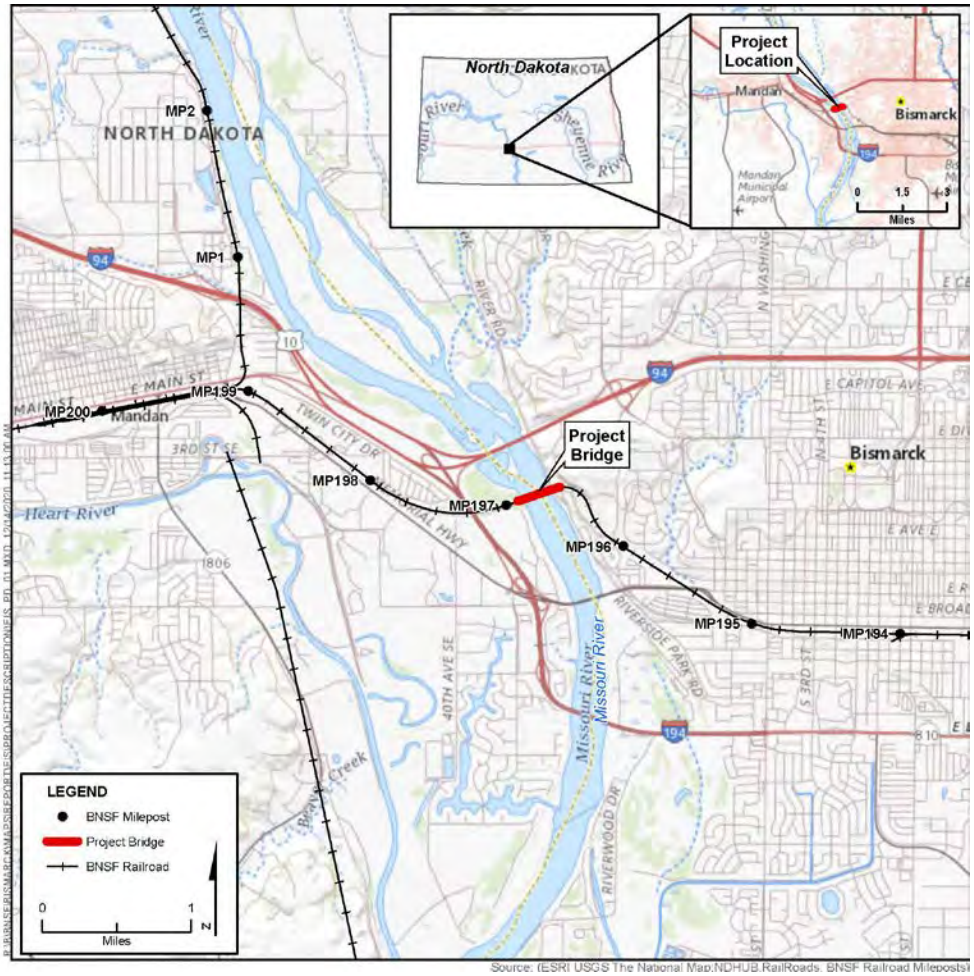

Figure 1. Project Location

Figure 2. Looking South Toward Bridge 196.6 from Interstate 94 Grant Marsh Bridge

Bridge 196.6 includes components that are over 130 years old, and has a history of exposure to ice jams. The shallow foundation piers of the bridge render it "scour critical," meaning that the abutment or pier foundations are rated as unstable (FHWA 2001). In addition, each truss contains fracture-critical members that are subject to tensile loads, failure of which would result in partial or total collapse. Furthermore, failure of any of the steel pins used to assemble the bottom chord members would also result in a catastrophic bridge collapse.

2. Regulatory Context

The National Environmental Policy Act requires that an environmental analysis be performed during project development to minimize harm to the human, physical, or biological environment. Section 101(b)(2) (*United States Code* Title 42, Section 4321) states that it is the "continuous responsibility" of the federal government to "use all practicable means" to "assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings." Federal implementing regulations are Title 23, Part 771 of the *Code of Federal Regulations* (CFR) (23 CFR 771; Federal Highway Administration [FHWA]) and 40 CFR 1500–1508.

According to the Council on Environmental Quality that implements regulations, environmental analysis is to consider impacts on "Urban quality, historic and cultural resources, and the design of the built environment" (40 CFR 1502.16[g]). Agencies will "Identify methods and procedures… to ensure that presently unquantified environmental amenities and values may be given appropriate consideration" (40 CFR 1507.2[b]).

Implementing regulations for Section 106 of the National Historic Preservation Act of 1966 (40 CFR 456.02), adopted in 1976, define criteria of adverse effects (36 CFR 800.5) to include the "Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features."

The *Comprehensive Plan for Burleigh County* (Burleigh County 2014), which encompasses the City of Bismarck, does not identify any scenic views or related protections. The *City of Bismarck's Infill and Redevelopment Plan* (City of Bismarck 2017) includes a goal to "promote efforts to beautify, preserve and enhance our aesthetically pleasing community." The *Morton County 2014 Comprehensive Plan* (Morton County 2018), which encompasses the City of Mandan, identifies "Viewshed Restricted Areas." The plan includes an objective to preserve the viewshed of the natural landscape from Fort Abraham Lincoln State Park to "ensure the integrity of the viewshed… is not diminished by incompatible development" (Morton County 2018). No planning documents were identified for the City of Mandan.

3. Visual Assessment Methodology

This VIA incorporates elements of the *Visual Impact Assessment for Highway Projects* (FHWA 1988) and the subsequent update, *Guidelines for the Visual Impact Assessment of Highway Projects* (FHWA 2015), which define recommendations for conducting a VIA. These FHWA methodologies provide definitions and procedures for evaluating existing and proposed changes to the landscape. While this Project is not subject to FHWA guidelines, they provide a useful and widely accepted framework and industry standard for analyzing visual impacts of linear corridors that results in a focused yet comprehensive analysis process. Applying this process helps to mitigate the inherent subjective nature of visual resources and establishes procedures that are repeatable by other experts. The process that has been used in this VIA follows these seven steps:

1) Determine the Project elements and their extent, including all actions that may result from the Project, such as conversion of farm fields to suburban uses or stormwater treatment areas.
2) Determine the visual extent of the Project, which may extend far beyond construction limits.
3) Describe the visual character of the affected environment and representative key views of the existing landscape.
4) Determine who has views toward and from Project elements and evaluate their sensitivity.
5) Describe and evaluate the same representative views toward the Project after construction, based on changes to visual quality. Incorporate computer simulations to demonstrate proposed changes.
6) Identify minimization and mitigation measures to help offset any anticipated adverse impacts.
7) Analyze cumulative impacts.

Changes to visual quality have been determined by comparing existing conditions of the landscape to changes expected under each proposed alternative. Landscapes can be characterized by a suite of variables that include landform, water, vegetation, and humanmade elements. Landscapes can be analyzed for visual quality according to three independent criteria: vividness, intactness, and unity, defined as follows (FHWA 1988):

- Vividness: The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.
- Intactness: The integrity of visual order in the natural and humanmade landscape, and the extent to which the landscape is free from visual encroachment.
- Unity: The degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Refers to the compositional harmony or intercompatibility between landscape elements.

This VIA incorporates a numerical rating system used in the methodology for the *Visual Impact Assessment for Highway Projects* (FHWA 1988) to define the visual quality of specific views. This system helps remove subjectivity and demonstrates how and why changes in visual quality would occur. Each of these dimensions of visual quality is documented using an FHWA rating sheet, and for each of these dimensions, a numerical rating score on a scale from 1 to 7 is assigned. A score of 1 indicates very low visual quality, a score of 4 indicates moderate or average visual quality, and a score of 7 indicates very high visual quality. The scores for each of these three dimensions are added and then averaged to generate an overall visual quality score.

4. Project Description

The following alternatives have been analyzed in this VIA; Appendix C of the Draft Environmental Impact Statement (DEIS) includes maps and detailed designs.

- No Action Alternative: Maintain the existing bridge; no new construction.
- Proposed Action Alternative: New bridge with 200-foot spans and piers, 20 feet upstream of the existing bridge, and remove the existing bridge.
- Offset Alternative 1: Build a new girder bridge with 200-foot spans and piers, 92.5 feet upstream of existing bridge, and retain the existing bridge.
- Offset Alternative 2: Build a new truss bridge with 400-foot spans and piers, 92.5 feet upstream of existing bridge, and retain the existing bridge.
- Offset Alternative 3: Build a new girder bridge with 200-foot spans and piers, 42.5 feet upstream of existing bridge, and retain the existing bridge.

In addition to constructing a new bridge, the tracks approaching the bridge may need to be aligned, which would require additional right-of-way (ROW) and/or retaining walls under some of the Proposed Action Alternatives. All offset alternatives also call for replacing the railroad bridge over Interstate (I) 194 on the west side of the river. Bridge 196.6 would not be lit under any of the alternatives, but navigation lighting may be placed on piers to assist boaters. Table 1 describes the visual components of each action alternative.

5. Area of Visual Effect

This section describes the visual extent of the Project by determining the area of visual effect (AVE), or viewshed. The AVE is as an area with a line-of-sight (exclusive of vegetation) that looks toward and away from the Project. The viewshed is larger than the Project area because built and natural features determine what can and cannot be seen. The Project viewshed has been determined by visiting the site and reviewing plans, aerial mapping, and topographical and Project information.

Bridge 196.6 crosses the Missouri River in roughly central North Dakota, with Mandan to the west and Bismarck to the east. I-94, the only east-west interstate in North Dakota, crosses the river via the Grant Marsh Bridge, approximately 0.4 mile north of Bridge 196.6, and Memorial Highway crosses the river via Memorial Bridge, approximately 0.8 mile south of Bridge 196.6. The river curves north of the Grant Marsh Bridge and south of Memorial Bridge, thereby impeding most views of Bridge 196.6 beyond these bends. Most public views past the highway bridges are further impeded by the highway bridge structures, vegetation, and buildings. However, Bridge 196.6 is slightly visible from Crying Hill in Mandan and Fort Abraham Lincoln, south of Mandan on the west side of the river. Most, if not all, views of Bridge 196.6 from Sertoma Park, which is south of Memorial Bridge on the east side of the river, are impeded by vegetation, topography, distance, and Memorial Bridge. Public views of Bridge 196.6 from the east are also primarily bound to 0.5 mile from the river centerline due to topography. Most public views of Bridge 196.6 on the west side of the Missouri River are generally bound by I-194, approximately 0.5 west of the river centerline.

The farthest Project construction limits are from 3rd Street and Memorial Highway in Mandan to the intersection of the railroad and Schaefer Street in Bismarck; therefore, the AVE includes the farthest discernable views and Project construction limits (Figure 3).

Table 1. Visual Components of Action Alternatives

Component	Proposed Action Alternative	Offset Alternative 1	Offset Alternative 2	Offset Alternative 3
Type	One new, single-track, welded steel-plate girder bridge.	Same as the Proposed Action Alternative.	One new, double-track steel truss bridge.	Same as the Proposed Action Alternative.
Spans	Five 200-foot river spans.	Same as the Proposed Action Alternative.	Three 400-foot spans.	Same as the Proposed Action Alternative.
Distance from Bridge 196.6	▪ A single track that is 30 feet from the centerline of the current bridge with space for a future second track that is 10 feet from the centerline of current bridge; 20 feet between the new and future tracks. ▪ The centerline of proposed bridge is halfway between the single and future tracks, 20 feet from the center of Bridge 196.6.	▪ A single track that is 80 feet from the centerline of the current bridge with space for future second track that is 105 feet from the centerline of current bridge; 25 feet between the new and future tracks. ▪ The centerline of the proposed bridge is halfway between the single and future tracks, 92.5 feet upstream from the center of Bridge 196.6.	▪ The same distance from Bridge 196.6 at Alternative 1 (92.5 feet) ▪ The future track is included.	▪ A single track that is 30 feet from the centerline of the current bridge with space for future second track that is 55 feet from the centerline of current bridge; 25 feet between the new and future tracks. ▪ The centerline of the proposed bridge is halfway between the single and future tracks, 42.5 feet upstream from the center of Bridge 196.6.
Material	▪ Reinforced concrete piers. ▪ Steel girders.	Same as the Proposed Action Alternative.	▪ Reinforced concrete piers. ▪ Steel trusses.	Same as the Proposed Action Alternative.
Pier alignment	▪ Five new in-water piers. ▪ Existing piers removed.	▪ Five new in-water piers.[a] ▪ Two new in-water piers aligned with two in-water existing piers. ▪ Existing piers remain.	▪ Two new in-water piers; one new on-land (approach) pier.[a] ▪ New in-water piers aligned with existing in-water piers. ▪ Existing piers remain.	▪ Five new in-water piers; one new on-land (approach) pier.[a] ▪ All new piers offset from existing piers. ▪ Existing piers remain.
Bridge 196.6 retention	Bridge 196.6 removed.	Bridge 196.6 remains.	Same as Offset Alternative 1.	Same as Offset Alternative 1.
Future second track requirements	Future second track requires additional or expanded piers on land.	Same as the Proposed Action Alternative.	Future track included.	Same as the Proposed Action Alternative.
I-194 rail bridge	Retain rail bridge over I-194.	Replace rail bridge over I-194.	Same as Offset Alternative 1.	Same as Offset Alternative 1.
Construction limits	▪ East side of I-194 to halfway between River Road and Schaefer Street. ▪ 0.8-mile new rail.	▪ Intersection of 3rd Street and Memorial Highway to Schaefer Street ▪ 1.6-mile rail replacement.	Same as Offset Alternative 1.	Same as the Proposed Action Alternative.
Approach track realignment	▪ Shift slightly north on the western side. ▪ Within the existing ROW. ▪ No retaining walls.	▪ Shift north on the eastern and western sides. ▪ Construction limits extend beyond the ROW in several locations.	Same as Offset Alternative 1.	▪ Shift north on the eastern and western sides. ▪ Within the existing ROW.

Component	Proposed Action Alternative	Offset Alternative 1	Offset Alternative 2	Offset Alternative 3
Retaining walls	None.	▪ West: 35-foot-high retaining wall, or acquire an 80-foot-wide property in the MRNA to construct an earthen embankment. ▪ East: 48-foot-high retaining wall north of track using soldier-pile lagging (earth retention system). ▪ Remove approximately 28,900 cubic yards of material.	Same as Offset Alternative 1.	▪ West: Same as Alternative 1. ▪ East: 23-foot-high retaining wall north of the track using soldier-pile lagging. ▪ Remove approximately 3,700 cubic yards of material.

[a] Bridge 196.6 has two in-water piers and one approach pier on the eastern side.

Note:

MRNA = Missouri River Natural Area

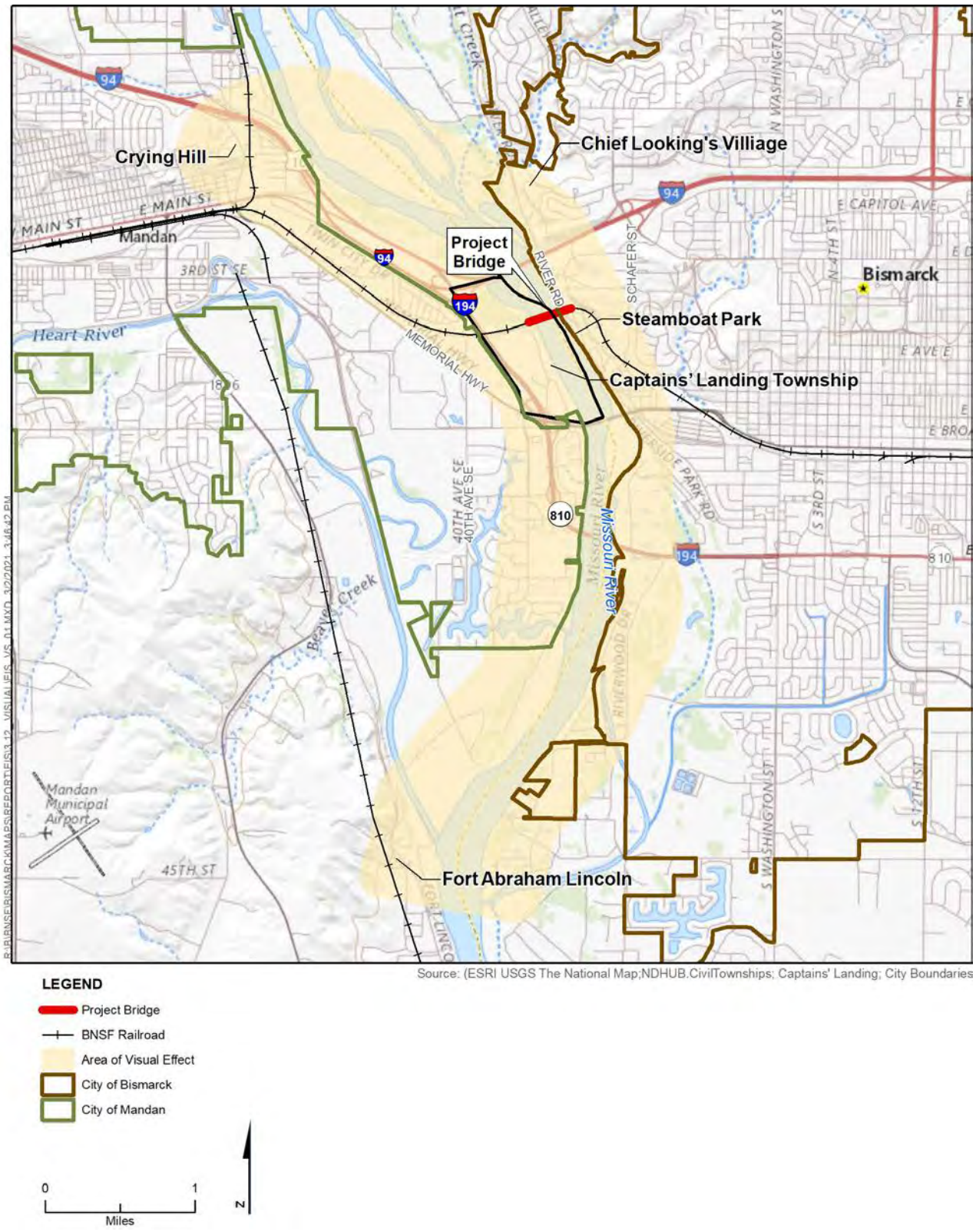

Figure 3: Area of Visual Effect

6. Affected Environment

This section describes the general landscape of the AVE and includes photos of views in the area that establish the landscape context of the Project area, as well as photos of the key views that were used as the basis for assessing Project visual effects. The key views are views that can be seen from publicly accessible locations that are seen by large numbers of viewers and that represent Project-related visual changes that have the potential to be readily evident.

6.1 Landscape Character

The landscape of the AVE is primarily urban, with Mandan on the west side, and Bismarck on the east side of the Missouri River. Captains' Landing Township is a "rural residential and agricultural area" between Mandan and the river, and between I-94 and Memorial Highway (Bismarck-Mandan Metropolitan Planning Organization 2010). The township is "completely within the extraterritorial area of the City of Mandan" (Morton County 2018). The river is generally flat and approximately 1,000 feet wide, depending on the season and the water level, and is a prominent natural feature. Although some development is visible adjacent to the river, the riverbanks are primarily tree-lined or occupied by riparian shrubs, which obscures many structures (such as residential dwellings) and creates an overall natural appearance. During leaf-on seasons, the vegetation interjects a bright green color of various textures that contrasts with the broad and generally smooth waterway. The color of the river varies depending on light conditions, sometimes appearing as a dark slate gray or a mirror reflecting the sun and colors of the sky. During leaf-off conditions, the trees display a brown, spindly texture that provides more open views (Figure 4). In winter, trees can be covered in frost or snow, and the river can be covered with an expansive coating of bright, choppy snow and/or ice, which creates an entirely different scene with vivid whites of varied textures. Without snow cover, the winter backdrop tends to be shades of beige and brown.

Figure 4: Looking South Toward Bridge 196.6 from Interstate 94 Approaching Grant Marsh Bridge from the West

The river is crossed by two major highways that are located north and south of Bridge 196.6: I-94 via the Grant Marsh Bridge, approximately 0.4 mile north of Bridge 196.6, and Memorial Highway via the Memorial Bridge, approximately 0.8 mile south. Where directly over water, these highway bridges provide unobstructed views of Bridge 196.6. Vegetation obstructs views on the eastbound approach to the Grant Marsh Bridge (Figure 4), and a tall hill blocks westbound views of Bridge 196.6 until travelers are over water (Figure 5). Both highway bridges consist of beams with simple deck slabs that create a smooth, continuous horizontal line over the river. The sides of the Grant Marsh Bridge deck are painted a vivid sky blue that stands out from a distance. The sides of the Memorial Bridge deck are an unpainted pale gray color.

Figure 5: Looking South Toward Bridge 196.6 from Interstate 94 Approaching Grant Marsh Bridge from the East

I-194 roughly parallels the river approximately 0.5 mile from the centerline of the river. Only intermittent views of Bridge 196.6 are visible from I-194 due to dense vegetation, particularly directly north of Bridge 196.6 at the MRNA, which is undeveloped and only accessible by boat in this area. In addition, views of Bridge 196.6 from I-194 are primarily restricted to northbound travelers. Captains' Landing, a low-density residential area, occupies the riverbank between Bridge 196.6 and Memorial Bridge. Farther north, on the west side of the river in Mandan, Bridge 196.6 is visible from Crying Hill in the distance just below the horizon line, but is mostly absorbed by background hills and distance, thereby lacking vividness or memorability. The bridge also appears to be disconnected from the other landscape components; therefore, this view forms the northern boundary of the AVE as the farthest distance north from which the bridge can be reliably seen (Figure 6).

Figure 6. Looking South from Crying Hill Toward Bridge 196.6

Bridge 196.6 is sporadically visible from Fort Abraham Lincoln, south of Memorial Bridge, on the west side of the river. Most northern views are blocked by vegetation, which is more pronounced during leaf-on seasons. Views of the bridge that are provided by openings in the vegetation are absorbed by background topography. The three arched shapes, formed by the bridge, that mimic the curves of the background hills, further help to absorb the bridge into the landscape (Figure 7). Similar to Crying Hill, the bridge in this view lacks vividness or memorability and appears to be disconnected from the other landscape components. Fort Abraham Lincoln therefore defines the southern boundary of the AVE as the farthest distance south from which the bridge can be reliably seen.

Figure 7. Looking North from Fort Abraham Lincoln Toward Bridge 196.6

Riverfront Trail (Key View 4 in Section 6.2), a paved multi-use path, and River Road, a local two-lane paved road, parallel the eastern shoreline between Grant Marsh Bridge and Memorial Bridge. Both the trail and the road provide views of Bridge 196.6 that are intermittently interrupted by mature vegetation that occasionally blocks views to the river and forms an overhead canopy that screens views closer to the bridge, which is more prominent during leaf-on seasons. Two riverfront parks, Keelboat Park (Key View 1 in Section 6.2) and Steamboat Park, are accessible from River Road, immediately north and south of Bridge 196.6, and afford views of the bridge. Some views from Steamboat Park, the smaller of the two parks, are partially obscured by riverside vegetation (Figure 8).

Figure 8. Looking North from Steamboat Park Toward Bridge 196.6

The topography rises considerably directly east of River Road, and gains elevation as the road travels north. Beyond this rise, directly east of Bridge 196.6, is an expansive tract of undeveloped land that is associated with Bismarck State College. A small amount of visually unobtrusive commercial development is located to the south along Riverfront Road near Memorial Bridge. Pioneer Park and Pioneer Outlook Park are located north of I-94, on the east side of the river, and provide access to Riverfront Trail. Dense, mature vegetation prevents views from these parks, but Bridge 196.6 is intermittently visible from some areas of the trail.

Bridge 196.6 is also visible from Chief Looking's Village on a hill, just east of Pioneer Overlook Park and River Road, approximately 0.8 mile from Bridge 196.6 (Figure 9). From this view, the west (right) side of the bridge is more visually absorbed against the background than the west (left) side, which stands out against the bright water. Grant Marsh Bridge, with its blue deck walls, is another striking, but unmemorable, element in the foreground that creates a bold horizontal line against the river that parallels Bridge 196.6.

Figure 9. Looking South from Chief Looking's Village Toward Bridge 196.6

The railroad bridge that crosses I-194 is a simple steel-deck girder bridge with three concrete supports (Figure 10). The unobtrusive bridge deck is a subdued green, similar to surrounding vegetation, with a repeating vertical pattern and a horizontal rail pattern. The bridge lacks vividness, but is intact and its symmetry provides unity.

Figure 10. Looking North Toward Railroad Bridge over Interstate 194
Source: 2019 © Google Maps.

6.2 Key Views

Four key views have been selected for use in analyzing Project visual effects. These key views are representative of views toward the Project that are seen by large numbers of viewers and demonstrate potential for substantial Project-related visual changes. The viewpoints from which these views can be seen are all publicly accessible, and have been identified based on review of the AVE, aerial maps, public input, and field photos. Figure 11 indicates the locations of these viewpoints, which focuses on the portion of the AVE closest to the bridge, where Project visual changes would be most prominent. The photos used to represent these views have been selected from a set of photos that were taken during the week of February 15, 2021, during leaf-off conditions and clear days, which provide for the most unimpeded views and best conditions for assessing impacts. This photo set is also the source of the photos that have been used for Figures 4 through 9, which represent existing views toward the Project area from a range of viewpoints in the Project AVE. The photographs were taken with a digital, single-lens-reflex camera and stitched into panoramas to best approximate the field of human vision. The location of each viewpoint was recorded using a Global Positioning System device. Appendix B includes the key view photographs, as well as a simulation that was prepared for Key View 1. The following subsections provide short descriptions of the key views that have been selected for analysis.

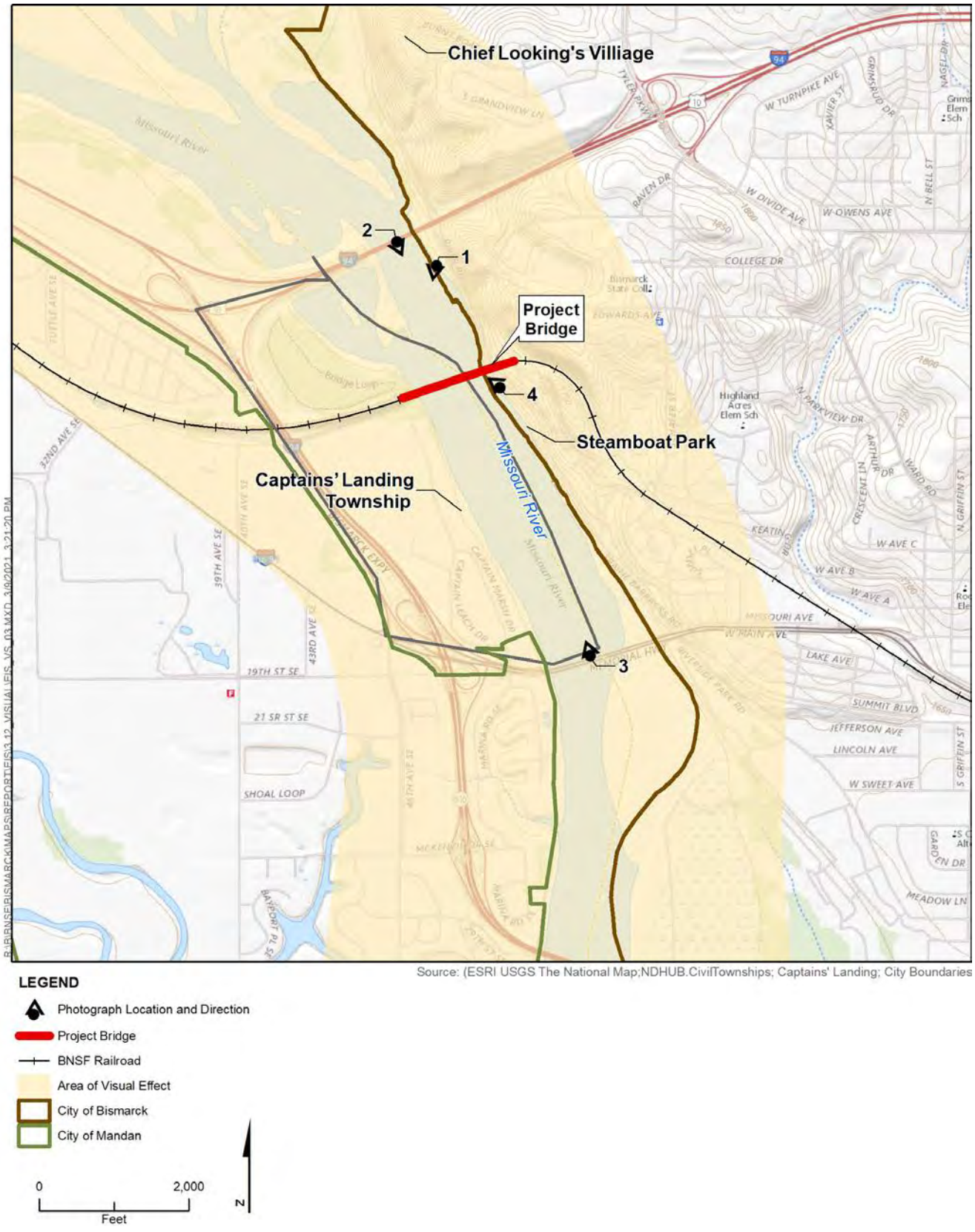

Figure 11. Key Views Map

6.2.1 Key View 1: Keelboat Park

Key View 1 is located at the south end of Keelboat Park, looking south. Keelboat Park is a long, narrow park of approximately 6.4 acres between River Road and the Missouri River, and extends approximately halfway from Grant Marsh Bridge to Bridge 196.6. A panorama was created to depict this view, looking south from the south end of the park (Figure 1, Appendix B). Views to Bridge 196.6 in this view are primarily unobscured. The railroad bridge is a prominent visual feature, given its close proximity, which heightens its scale and dominance. The lines created by the trusses combine to form a distinctive pattern in three symmetrically shaped arcing forms that introduces diversity into the landscape. The dark-colored trusses stand out against the pale blue sky. The Missouri River is a dominant feature and occupies most of the scene. In this winter view, the water is covered in brilliant white, choppy snow that adds texture. Other than the bridge, humanmade development is not readily evident. For these reasons, the view is vivid, as the pattern elements and dark color combine to form a striking and distinctive visual pattern that is memorable. The view also has a high degree of intactness, as it is free from visual encroachment. In addition, the visual elements of the landscape join together to form a coherent, harmonious pattern that results in a high degree of unity; therefore, this view has a moderately high level of visual quality.

Keelboat Park includes a boat ramp for public use (Bismarck Parks and Recreation District 2021), and the Lewis and Clark Riverboat operates traditional steamboat cruises from the park from May through September that pass under Bridge 196.6 (Lewis & Clark Riverboat 2019). Section 3.11 of the DEIS notes that the highest use period is typically summer weekends and holidays. The park includes a replica keelboat of the kind used by Lewis and Clark, as well as interpretive and historic information, a self-guided walking tour, and large sculptures (Bismarck Parks and Recreation District 2021; North Dakota Tourism Division 2021b). Plans are underway to develop the Heritage River Landing at the north end of the park, a community event space and visitor center with a bar and restaurant, a gift shop, an interactive kiosk, and ticket sales for the Lewis and Clark Riverboat. The Heritage River Landing would serve as the interpretive headquarters for the Northern Plains National Heritage Area, which would be overseen by the National Park Service (Bismarck Parks and Recreation District 2018).

6.2.2 Key View 2: Grant Marsh Bridge

Key View 2 is located in the approximate center of Grant Marsh Bridge (Figure 2, Appendix B), which carries I-94 over the Missouri River, approximately 0.4 mile north of Bridge 196.6. The landform in this view is primarily flat and occupies the foreground on the west side of the bridge, where it crosses a spit of land that juts into the river. Deciduous trees that line the riverbank are visible beyond the bridge and follow the curve of the river on the western (right) side, and in front of the bridge on the eastern and western sides. Leafless brown trees have a slightly spindly texture that forms an overall mass of brown in the distance, with more texture in the foreground. The Missouri River fills the lower third of the view from east to west and is covered in bright white snow that is broken and crumbly, creating noticeable texture and shadows.

As in Key View 1, Bridge 196.6 is a dominant feature that crosses a wide body of water amidst minimal humanmade development. Located in the foreground, the proximity of the bridge makes it a prominent visual element. The horizontal line formed by the bridge deck parallels the distant horizontal horizon line. Similar to Key View 1, Bridge 196.6 is backdropped against the uninterrupted sky, which makes the dark trusses a clearly visible and striking visual element. Because the railroad bridge is seen at relatively close range (indicate 0.4 mile) by viewers on this bridge, the railroad bridge creates a vivid impression. The trusses appear aligned and as one at outer edges and slightly more horizontally offset and duplicated in the center. Keelboat Park, Riverfront Trail, and River Road are in the foreground to the east (left). A handful of cars stand out against the snow-covered parking lot, which blends in with the water. Little to no development is visible in this view aside from the bridge. The view is also free from visual encroachment and forms a coherent, harmonious visual pattern that results in a high level of intactness and unity; therefore, this view has a moderately high level of visual quality.

Travelers consist of commuters, tourists, and truck drivers, all of whom have unobstructed views of Bridge 196.6 for approximately 0.2 mile while crossing the river at approximately 60 miles per hour (posted speed limit). Views are mostly restricted to drivers, who would be facing straight ahead and away from the river. The view is memorable, but fleeting.

6.2.3 Key View 3: Memorial Bridge

Key View 3 is located in the approximate center of Memorial Bridge (Figure 3, Appendix B). Memorial Bridge carries Memorial Highway over the Missouri River, approximately 0.8 mile south of Bridge 196.6. The landform is flat on the west (left) side of the bridge. A hill occupies the eastern (right) side, the height of which rises to the top of the bridge trusses. Deciduous trees that line the riverbank are visible in front of the bridge on both sides. Leafless trees are brown and have a slightly spindly texture, but are otherwise unremarkable. The Missouri River fills the lower one-quarter of the foreground and the middleground view from east to west, and is covered in bright white snow that is slightly broken and textured.

The bridge is in the middleground and is less prominent than in Key View 2 because it is located at a greater distance (0.8 mile versus 0.4 mile). The horizontal line formed by the railroad bridge deck parallels the horizontal horizon line. The bridge is slightly obscured at the east and west approaches by vegetation or topography. The vivid blue paint on the side of the Grant Marsh Bridge deck is visible under Bridge 196.6, which further underscores the presence of the rail bridge and the strong horizontal line of the bridge deck. Similar to Key View 2, Bridge 196.6 is backdropped against the uninterrupted sky, which makes the dark trusses a clearly visible and striking visual element. As in Key View 2, Bridge 196.6 is a dominant feature with distinctive pattern elements that crosses a wide body of water, free from encroachment, which creates a high degree of intactness. Landmasses that flank the bridge create a near-symmetrical view that results in compositional harmony and, thus, high unity. Given these conditions, the level of visual quality of this view is moderately high.

Travelers consist of commuters, tourists, and truck drivers, all of whom have unobstructed views of Bridge 196.6 for approximately 0.25 mile while crossing the river at approximately 40 miles per hour (posted speed limit). The view is memorable and because of the lower travel speeds on this bridge, the views from it are of longer duration than the views seen from the Grant Marsh Bridge; however, the views are still fleeting.

6.2.4 Key View 4: Riverfront Trail

Key View 4 is located on the Riverfront Trail, just south of Bridge 196.6 (Figure 4, Appendix B). Riverfront Trail is a 2.1-mile-long multi-use trail that connects Pioneer Park to Sertoma Park in Bismarck. The landform is mostly flat with slight undulations in the middleground beyond the bridge. Dense vegetation that consists of deciduous trees reaches the height of the bridge deck on the western (left) side. Fewer trees and more shrubs are visible in the farther distance. Deciduous trees are a prominent feature on the east (right) side of the riverbank due to proximity. Leafless trees have dark brown trunks and lighter branches with a spindly texture and a color that is similar to the bridge. During leaf-off seasons, there is less contrast between the bridge and the background trees, which slightly diminishes vividness. However, during winter, the finer brown lines created by the truss pattern somewhat mimic the brown texture of the tree branches, which enhances intactness of the natural setting. Yellow grasses interject some vivid color and spiky texture on eastern bank. The Missouri River fills the lower half of the foreground and is covered in bright white, broken snow that interjects crumbly texture.

The tall, triangular-shaped elements of the truss bridge form a striking and memorable component of the landscape, with its dark spans and tall masonry piers. The close proximity of the bridge heightens its mass and scale, and the intricacy of the truss patterns is more evident than in farther views. This particular view also includes bright orange rail cars that interject vivid color onto the scene, particularly against the backdrop of the blue sky and the white snow in the foreground. Repeating triangular patterns formed by trusses and the resulting three repeated curved shapes create high visual order. Lines created by trusses slightly mimic the lines of

background trees and colors are similar. The scene is slightly off balance due to the proximity of the trees and the riverbank on the eastern (right) side. However, the bridge provides a balanced focal point. Repetition of the horizon line and vertical piers is harmonious, as is repetition of the truss patterns and the three curved shapes they form. For these reasons, visual quality is moderately high.

Viewers include pedestrians, runners, and cyclists whose view varies based on duration (speed).

7. Viewers Types and Sensitivity

Viewer types include neighbors (for example, local residents and recreationists) and travelers (commuters, tourists, and truck drivers) with views of Bridge 19.6. The sensitivity of viewers to changes in the landscape is the consequence viewer exposure and viewer awareness. Viewer exposure is based on:

- Proximity (distance): The farther a viewer is from a scene or object, the less exposure that viewer has; the closer the viewer is to an object or scene, the more exposure the viewer has. Proximity is defined by distance zones:
  - Foreground: 0.25 to 0.5 mile from the viewer
  - Middleground: Extends from the foreground zone to 3 to 5 miles from the viewer
  - Background: Extends from the middleground zone to the limit of visibility
- Extent: Extent refers to the number of people that would view the scene or object. Fewer viewers means less exposure; many viewers means greater exposure.
- Duration: Duration measures how long viewers view a scene or object. The narrower the view and the faster one travels, the shorter the duration. The wider the view and the more one lingers, the longer the duration. Duration is defined by whether views are static or dynamic. Static viewsheds are those viewers seen from a stationary location. Dynamic viewsheds are those travelers seen as they move through the landscape.

Viewer awareness is based on attention, focus, and protection.

- Attention correlates with routine. The more routine the scene is to a viewer, the less sensitive the viewer is to it; conversely, the more unique a scene is to a viewer, the more sensitive the viewer is to it.
- Focus refers to apprehending details. If a view has no specific visual element or focal point on which the viewer is focused, the less sensitive the viewer would be to the details of that scene. The greater the focus on a single or limited number of visual elements, the greater the sensitivity to details.
- Protection is provided by restrictions placed on changes to a particular view or object being viewed.

No public views are available from Bridge 196.6 as it is only used for freight transport. Many public views of the bridge, particularly those selected as key views, are within the foreground, thereby putting viewers in close proximity to the bridge. More distant public views, such as from Memorial Bridge and Chief Looking's Village, which are in the middleground, are fewer. Background views, such as from Crying Hill and Fort Abraham Lincoln, are least common and in these views, the bridge is often obscured.

The number of viewers of the bridge is fairly high given the two highway bridges that bracket the AVE, the proximity of River Road and I-194, and the recreational use of the river and riverfront.

Static viewers of the Project include people viewing the bridge from homes, businesses, and parks, such as Keelboat Park, Steamboat Park, and the southern extent of the MRNA. Static viewers would experience long-duration views and are likely to be local residents with high sensitivity to visual change due to their expectations of the view. However, if the view becomes routine, awareness would be reduced. Although views of the bridge are more routine to these viewers, they likely focus on it given its prominent and unique presence in the landscape; therefore, static viewers of the Project are expected to be sensitive to visual change.

Dynamic viewers include boaters on the Missouri River, motorists on I-94, Grant Marsh Bridge, Memorial Highway, and Memorial Bridge (including pedestrians on Memorial Bridge), motorists and pedestrians using adjacent city streets, and, to a lesser extent, motorists on I-194 within view of the Project. Motor vehicle travelers include local residents who live within the viewshed or who frequent it, recreationalists, truck drivers, and commuters. Drivers are presumed to be less sensitive than dynamic recreational users who view the bridge from

nearby trails and the river due to their activity, as their attention and focus is on their surroundings. These viewers are presumed to be highly sensitive to changes in the view. Truck drivers, tourists, and travelers who pass once through the AVE would have limited exposure and expectations of the view, which would result in low visual sensitivity.

No known protections or restrictions have been placed on views of Bridge 196.6.

To further understand viewer types and their sensitivity to proposed changes, public comments, meeting notes, news articles, and local plans have been reviewed to identify any relevant issues or constraints. Several public meetings were held to present the Project to the public and to solicit feedback (Section 5 of the DEIS). Many comments referred to the bridge as "scenic," a "beautiful structure," "our identity," a "masterpiece," a "historical work of art," and a "visual landmark." Some comments referred to the specific design and its "significance" and the "experience" of it, noting that it is "the iconic image for this community." Some commenters stated that the bridge was a reason for moving to the area; one said that "it's in every family picture" and another said that it represents the city and community (U.S. Department of Homeland Security 2017). Similarly, the North Dakota Tourism Division lists Bridge 196.6 as one of *9 Iconic Bridges in North Dakota* (North Dakota Tourism Division 2021b).

The Friends of the Rail Bridge group was formed to preserve Bridge 196.6, and refer to it as a "cultural landmark of both architectural and historical significance" (Friends of the Rail Bridge n.d.) The bridge has been named one of the 11 Most Endangered Historic Places by the National Trust for Historic Preservation in America, which also identifies it as "iconic" (National Trust for Historic Preservation 2021). The Bridge Advisory Committee (BAC) has been established for this Project to consider how the new bridge could be visually compatible with Bridge 196.6 and its landscape, setting, and viewshed. The role of BAC is limited to advice and comment on aesthetic issues and does not involve input on engineering. BAC may include representatives from the State Historic Preservation Office, Friends of the Rail Bridge, the North Dakota State Water Commission, BNSF, the Bismarck Historic Preservation Commission, and tribes. The first BAC meeting took place February 18, 2021, in Bismarck. The 10 attendees included two BNSF representatives and one BNSF consultant. Attendees reviewed the proposed designs, asked questions about aesthetics, and offered suggestions. Two more meetings are planned for March 2021.

8. Impact Analysis

This section evaluates impacts of views toward the Project after construction and is based on changes to visual quality as determined by changes to vividness, intactness, and unity. A visual impact is "the degree of change in visual resources and viewer response to those resources caused by" a proposed project (FHWA 1988). The analysis includes a brief overall summary of impacts by each alternative. Appendix C includes details about each key view in worksheets that have been used to assign a numerical rating to evaluate changes to these criteria.

To provide a basis for evaluating Project impacts on these views, visual simulations have been produced to illustrate the after visual conditions for Key View 1. Computer modeling and rendering techniques have been used to produce the simulated images of the view as it would appear after development of the Project. Existing topographic and site data provided the basis for developing an initial digital model. The Project engineers provided site plans and digital data for the proposed bridge designs, which were used to create three-dimensional digital models of them. These models were combined with the digital site model to produce a complete computer model of the proposed alternatives. These simulations provide the viewer with a clear image of the location, the scale, and the visual appearance of the Project. The images are accurate within the constraints of the available site and Project data. Appendix B includes the before site photographs along with the after visual simulations.

Based on review of the simulated Project views from Key View 1, the visual quality of each key view was re-evaluated using the FHWA visual quality evaluative system. The FHWA worksheets document the results of the evaluations of the existing and Project views from each key view (Appendix C). The evaluations of the existing and Project views have been compared to determine the degree of visual change. Based on the assessment of the degree of visual change expected and an evaluation of the sensitivity of the view, overall determinations of visual impact have been made and are expressed in terms of the impact level (very low to very high).

Table 2 summarizes the visual impacts expected under each alternative, followed by more explanatory text. The analysis that follows is a summation of the changes to visual quality based on the key views. Appendix C contains details about each key view, including viewer sensitivity.

Table 2. Impact Summary

Alternative	Physical Changes Proposed	Impacts to Visual Resources Compared to Existing Conditions
No Action	Bridge 196.6 would remain in place; no new bridge would be immediately constructed.	No immediately visual change would occur. Eventually, the bridge would show signs of continued wear and could potentially fail. In such an event, views would be temporarily replaced with wreckage of the partially or completely collapsed structures. A new, modern-design bridge would likely be constructed in its place.
Proposed Action Alternative	Removal of the existing truss bridge and replacement with a box girder bridge with five 200-foot river spans.	Moderately high, adverse visual effects related to the removal of the existing truss bridge that is the major contributor to the vividness and visual unity of the existing view, and replacement of it with a simple box girder structure that does not have the striking visual attributes of Bridge 196.6. Overall visual impact: Moderately high, adverse visual impact.
Offset Alternative 1	Retention of the existing truss bridge and construction of a box girder bridge with five 200-foot river spans, 92.5 feet upstream from Bridge 196.6.	Mostly neutral visual effect because the existing truss bridge would remain in place and the new box girder bridge built adjacent to it would mostly blend into the truss bridge in views from the north and have limited visibility in views from the south. Slight adverse impacts from additional piers and new retaining walls, as well as a slight disconnect of two side-by-side bridges from some viewpoints. Overall visual impact: Neutral to minor, adverse visual impact.
Offset Alternative 2	Retention of the existing truss bridge and construction of a new truss bridge with 400-foot spans, 92.5 feet upstream from Bridge 196.6.	Moderately high level of adverse visual effect because the offset alignment of the two bridges together would reduce vividness, unity, and intactness of the existing view with a single bridge with a truss design. Overall visual impact: Moderately high, adverse visual impact.

Alternative	Physical Changes Proposed	Impacts to Visual Resources Compared to Existing Conditions
Offset Alternative 3	Retention of the existing truss bridge and construction of a box girder bridge with five 200-foot river spans, 42.5 feet upstream from Bridge 196.6.	Mostly neutral visual effect because the existing truss bridge would remain in place and the new box girder bridge built adjacent to it would mostly blend into the truss bridge in views from the north and have limited visibility in views from the south. Slight adverse impacts from additional nonaligned piers and new retaining walls, as well as a slight disconnect of two side-by-side bridges from some viewpoints. Overall Visual Impact: Neutral to minor, adverse visual impact.

8.1 Alternative 1: No Action Alternative

Under the No Action Alternative, Bridge 196.6 would remain in place; no new bridge would be immediately constructed. Views of Bridge 196.6 would remain, but eventually, the bridge would show signs of continued wear. Given the age of the bridge and ongoing issues with scour and possible pin failure, it is expected that Bridge 196.6 could eventually fail, despite ongoing maintenance. In such an event, views of the bridge would be temporarily replaced with wreckage of the partially or completely collapsed structure and any remaining freestanding piers or other support elements, as well as ensuing debris removal activities in the river. A new, modern-design bridge would likely be constructed in its place if Bridge 196.6 collapsed.

8.2 Proposed Action Alternative

Under the Proposed Action Alternative, Bridge 196.6 would be removed and a new 200-foot span, single-track, welded steel-plate girder bridge would be built approximately 20 feet from the center of Bridge 196.6. No change to the rail bridge over I-194 would occur. Figure 1b (Appendix B) is a photo simulation of the view from Key View 1 in Keelboat Park that depicts the appearance of the new railroad bridge that would be constructed under this alternative. As this simulation indicates, the new railroad bridge would have a similar appearance to the existing Grant Marsh Bridge 0.4 mile to the north (although in a neutral color), consisting of a long, horizontal deck atop broad, concrete piers. The new bridge would introduce more vertical structures (piers) than Bridge 196.6 (five compared to two), and the deck sides would be slightly higher, creating a heavier horizontal line. Removing Bridge 196.6, with its distinctive repeating pattern created by the dark trusses, would substantially reduce vividness and memorability of the views evaluated in Appendix B.

The new bridge would not demonstrate repeating patterns or shapes, and additional piers would slightly break up the visual flow under the bridge. The new piers would be wider to accommodate a second future track, making them appear offset when viewed from a superior viewing angle. However, the new bridge would retain a high degree of visual order and completeness. Overall, most views would remain symmetrical and balanced, but the new bridge would be less of a focal point without pattern elements and shapes formed by trusses, thereby diminishing unity.

The approach track would be shifted slightly to the north, but within the existing ROW, with no impacts to landform or vegetation. Replacing approximately 0.8 mile of new rail would have no noticeable visual impacts.

Long-term adverse impacts are expected to affect a high number of viewers, including travelers and recreational viewers, most of whom are considered to be sensitive due to recreational use of the park, close proximity, and long view duration. Affected viewers include boaters using the public boat ramp, clients of the Lewis and Clark Riverboat, visitors taking the self-guided tour, and, to a lesser extent, visitors to the future Heritage River Landing, whose focus would be more concentrated on activities provided there. Viewers relaxing at the park and on leisurely boat rides would have views of longest duration and impact, with static viewers being most impacted. Viewers focused on the bridge, including tourists, would also be most affected. Although views of the bridge may be routine for locals, the view is highly unique and iconic, and therefore, sensitive.

This alternative would somewhat support the goal of the *City of Bismarck's Infill and Redevelopment Plan* (City of Bismarck 2017) to "promote efforts to beautify, preserve and enhance our aesthetically pleasing community," and would not "diminish" the viewshed of the natural landscape from Fort Abraham Lincoln State Park "by incompatible development" (Morton County 2018).

The vividness and memorability of Bridge 196.6 function as a visual "icon" (U.S. Department of Homeland Security 2017) of the area (a feature repeatedly noted by the public), the removal of which would result in substantial long-term adverse impacts to sensitive viewers. These impacts would affect a high number of viewers and would be felt by both static and dynamic viewers. For these reasons, overall long-term, moderately high, adverse visual impacts would result from this alternative.

8.3 Offset Alternative 1

Under Offset Alternative 1, Bridge 196.6 would remain and a new 200-foot span, single-track, welded steel-plate girder bridge would be built approximately 92.5 feet from the center of Bridge 196.6. The new bridge would add a bolder horizontal deck line and five additional piers, some of which would be aligned with existing piers. As with the Proposed Action Alternative, the new piers would appear offset when viewed from a superior viewing angle. Because Bridge 196.6 would be retained, the distinctive repeating pattern created by the dark trusses would remain, thereby retaining the existing vividness and memorability.

Although the additional piers would slightly break up the visual flow under the bridge, retaining the repeating patterns, shapes, and lines of original bridge would retain intactness of most views. From views directly toward the Project, such as Grant Marsh Bridge (Key View 2), the two bridges would appear as one, heightening intactness; from others, the two tracks would be noticeably separate. Similarly, from some views, some of the new piers would be aligned with existing piers, aiding intactness. The darker, heavier feel of the new bridge deck would help to visually anchor views of the trusses on Bridge 196.6 from most views, making them appear as one bridge.

The addition of the new bridge would very slightly diminish views of background trees, and the additional piers would intrude on views of the river. However, these effects would likely be noticeable to only the most sensitive viewers, and the overall level of impact would be small.

A 35-foot-high retaining wall would be constructed west of the bridge, generally between I-194 and the Missouri River, on the north side of the tracks. A 48-foot-high soldier-pile lagging wall would be built on the east side of the river in the hill just north of the curve in the railroad tracks. Construction of these walls would result in the removal of a total of 28,900 cubic yards of material. The retaining wall on the western side would not be visible to most viewers, as it would generally parallel the tracks adjacent to the MRNA. The retaining wall on the eastern side would be visible from distant public views from the south and the east. Sensitive viewers using River Road, Riverfront Trail, and Steamboat Park are not expected to have views of this wall because steep topography and vegetation block views of the tracks, beyond which the wall would be constructed.; therefore, the closest publicly available view of this wall would likely be Memorial Bridge, approximately 0.8 mile south. Views of this wall would vary based on viewpoint, topography, vegetation, and season. For these reasons, the new walls would result in minimal degradation of intactness.

The railroad bridge over I-194 (Figure 10) would be replaced. The new bridge over the highway would be visually similar to Bridge 196.6, resulting in neutral impacts. Replacing approximately 1.6 miles of new rail would have no noticeable visual impacts.

This alternative would support the *City of Bismarck's Infill and Redevelopment Plan* (City of Bismarck 2017) goal to "promote efforts to beautify, preserve and enhance our aesthetically pleasing community," and would not "diminish" the viewshed of the natural landscape from Fort Abraham Lincoln State Park "by incompatible development" (Morton County 2018).

The existing vividness and memorability of the bridge would be retained, affecting a high number of both static and dynamic viewers (as described in the Proposed Action Alternative [Section 8.2]), particularly recreationists with long-duration views. For these reasons, overall long-term, neutral to minor, adverse visual impacts would result from this alternative compared to existing conditions.

8.4 Offset Alternative 2

Under Offset Alternative 2, Bridge 196.6 would remain and a new 400-foot span, double-track steel truss bridge would be built approximately 92.5 feet from the center of Bridge 196.6. The result would be two side-by-side truss bridges. The new bridge would add the same number of piers as Bridge 196.6, and the piers would be aligned in most views. Additional trusses, when viewed directly ahead, would be aligned with existing trusses, and would result in high levels of vividness, intactness, and unity. However, the alignment would become greatly skewed from any other perspective or viewing angle (above or below). In such cases, the dual truss patterns would create a visual jumble of lines that are vivid, but highly discordant. The confusing patterns would disrupt and encroach upon visual order, and the openness of the trusses would degrade where the overlapping patterns become densest, diminishing intactness. The resulting incoherent, unbalanced, and disharmonious visual patterns would conflict with each other and adversely affect visual unity.

Unlike the other Proposed Action Alternatives, the piers would be occupied by tracks on both sides, which would eliminate the slightly off-balance appearance, when viewed from above. No change to landform would occur as no retaining walls would be required.

The new approach track would be located slightly to the north of the existing track, but within the existing ROW. In addition, the railroad bridge over I-194 and the track replacement would be the same as Offset Alternative 1.

This alternative would support local plans, as described for Offset Alternative 1 (Section 8.3).

Long-term impacts are expected to effect a high number of sensitive viewers (as described in the Proposed Action Alternative [Section 8.2]) who would retain views of Bridge 196.6 in conjunction with the new truss bridge. Moderate adverse impacts would result from the discordant, disharmonious effect of conflicting truss patterns compared to existing conditions.

8.5 Offset Alternative 3

Offset Alternative 3 would have the same impacts as Offset Alternative 1, with some minor differences. The new and existing bridges would be closer (92.5 feet apart for Offset Alternative 1 versus 42.5 feet apart for Offset Alternative 3), resulting in a higher likelihood of the two bridges appearing as one from many views, thereby enhancing intactness and unity. Although the number of piers would be the same for both alternatives, they would not be aligned with Bridge 196.6 under Offset Alternative 3, which would slightly degrade intactness and unity. Offset Alternative 3 would also include retaining walls on both sides of the river, but the height of the walls on the eastern side would be about half that proposed under Offset Alternative 1, making them less visible and less detrimental to intactness. In addition, should BNSF acquire an 80-foot-wide property in the MRNA to construct an earthen embankment, the impact on the west side of the river would be lessened.

The railroad bridge over I-194 would be replaced, as described for Offset Alternative 2 (Section 8.4). The new bridge over the highway would be visually similar to Bridge 196.6, resulting in neutral impacts. As under the Proposed Action Alternative, 0.8 mile of new track would be replaced, with no noticeable visual impact.

This alternative would support local plans, as described for Offset Alternative 1 (Section 8.3).

Impacts to sensitive viewers would be the same as Offset Alternative 1, but with a very slightly heightened impact from misaligned piers. As with Offset Alternative 1, overall long-term, neutral to minor, adverse visual impacts would result from this alternative compared to existing conditions.

8.6 Construction Impacts

Construction activities are estimated to take approximately 5.5 to 6.5 years and would be completed in multiple stages. Temporary visual impacts would result from views of construction equipment and work crews on land in the river (Appendix J). Construction activities would occur on both sides of the river, but would be concentrated in the undeveloped agricultural area between I-194 and the river on the south side of the bridge. Construction staging on the eastern side would be more limited due to topographical constraints. A temporary construction access road would be built directly east of I-194, with equipment continuously using access roads for the duration of construction activities. Temporary earthworks, including grading for a construction parking area on the western side, an embankment for connection to the river, and a temporary retaining wall, would also potentially affect views.

Construction equipment would include a dock, barges, cranes, coffer dams, and associated equipment, which would temporality affect views. The use of pile mats, concrete footings, and stems, as well as the construction of temporary falsework towers, would also impact certain views of the riverbanks. Cranes used within the BNSF ROW to assemble girders and trusses in the staging area and on the bridge could impede views and introduce prominent visual elements. Active and moored barges would remain in use in the river for the duration of construction on superstructure elements. Removal of Bridge 196.6 would occur in systematic steps and involve the use of temporary supports and equipment that would affect views of the river, riverbanks, and staging areas. Active construction equipment would also be visible throughout the final cleanup process, both in the staging areas and work areas of the river corridor. All construction supplies and equipment would be removed from the staging areas, which would then be restored to BNSF standards.

Construction limits would vary beyond replacement of Bridge 196.6. Under the Proposed Action Alternative and Offset Alternative 3, 0.8 mile of new rail would be replaced approaching Bridge 196.6 from the west. For these alternatives, construction activities would be visible from the east side of I-194 to halfway between River Road and Schaefer Street. Under Offset Alternatives 1 and 2, 1.6 miles of new rail would be replaced approaching Bridge 196.6 from the west. For these alternatives, construction activities would be visible from the intersection of 3rd Street and Memorial Highway to Schaefer Street. All offset alternatives would also include views related to reconstructing the railroad bridge over I-194. In addition, Offset Alternatives 1 and 3 would include views related to constructing retaining walls on both sides of the river, with more extensive work expected under Offset Alternative 1 due to a near doubling of wall height.

Some trees would be removed during site preparation construction. When working on the east side of the river, BNSF would coordinate with the City of Bismarck to would avoid the two memorial trees planted directly north of Bridge 196.6 between River Road and the riverbank during construction (City of Bismarck n.d.).

9. Minimization and Mitigation Measures

9.1 Construction-related Mitigation

During construction, the contractor would minimize fugitive light from light sources and direct it only on the work zone. Where feasible, construction activities would be limited to daylight hours or would only focus light on the work zone.

9.2 Design-related Mitigation

After receiving the BNSF bridge design information, BAC will present their initial recommendations to the U.S. Coast Guard no later than 60 days prior to the U.S. Coast Guard publishing the DEIS for public comment, so their recommendations can be included in the DEIS. BNSF presented engineering drawings for the new bridge, including architectural renderings, to BAC on February 18, 2021, and have committed to work in collaboration with BAC to develop design considerations.

Pending completion of collaboration between BNSF and BAC, additional design-related mitigation measures will be presented in the Final Environmental Impact Statement.

10. Cumulative Impacts

A cumulative impact is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Bridge 196.6 was the first bridge constructed across the Missouri River in the Bismarck-Mandan area. Construction of the bridge began in 1880, and took approximately 3 years to complete. The original design included Warren truss features that were representative of construction techniques used in the late-1800s. Between 1905, and 1906, the Warren trusses were replaced with Parker trusses.

The Liberty Memorial Bridge was the first vehicular bridge to connect Bismarck and Mandan across the Missouri River, when it was constructed in 1922 (Figure 12), and was also the only Warren-Turner truss bridge constructed in North Dakota. The bridge was placed on the National Register of Historic Places in 1997, and was replaced in 2008, by the new Liberty Memorial Bridge. It was demolished shortly thereafter (Bismarck Tribune 2016; Library of Congress n.d.). Destruction of the original truss bridge removed an iconic truss design similar to that of Bridge 196.6. Destruction of the original Liberty Memorial Bridge, when combined with the adverse impacts under the Proposed Action Alternative, would result in an adverse cumulative impact to visual resources.

No known existing or planned projects, including planned highway improvements, have been identified that would change the visual quality within the viewshed.

Figure 12. Original Liberty Memorial Bridge

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Appendix A
Alternatives Designs and Maps

Appendix A. Alternatives Designs and Maps

Appendix C of the Draft Environmental Impact Statement provides the BNSF Railway Bridge Replacement 196.6 Project Plans.

Appendix B
Key View Photographs and Simulations

Figure 1a: Key View 1, Keelboat Park existing view looking south

Figure 1b: Key View 1, Keelboat Park simulated view looking south with Proposed Action

Figure 1c: Key View 1, Keelboat Park simulated view looking south with Offset Alternative 1

Figure 1d: Key View 1, Keelboat Park simulated view looking south with Offset Alternative 2

Figure 1d: Key View 1, Keelboat Park simulated view looking south with Offset Alternative 3

Figure 2: Key View 2, Grant Marsh Bridge existing view looking south

Figure 3: Key View 3, Memorial Bridge existing view looking north

Figure 4: Key View 4, Riverfront Trail existing view looking northwest

Appendix C
Visual Quality Ratings Worksheets

FHWA Visual Quality Evaluation

Project :	BNSF Bismarck Bridge Replacement Project			
Key View:	1			
Location:	46.82225833270 / -100.82798055600: Keelboat Park			
Orientation:	South			
Date:	February 17, 2021			
Viewers:	Activity:	☑ Recreational	☐ Residential	☐ Business/Commuter
	Number:	Several (>6)	Duration of View:	Long-Term (>1 hr)
	High number of viewers (neighbors and travelers) considered sensitive due to recreational use of the park, close proximity, and long view duration. Affected viewers include boaters using the public boat ramp, clients of the Lewis and Clark Riverboat, visitors taking the self-guided tour, and, to a lesser extent, visitors to the future Heritage River Landing, whose focus would be more concentrated on activities provided there. Viewers relaxing at the park and on leisurely boat rides would have views of longest duration and impact, with static viewers being most impacted. Viewers focused on the bridge, including tourists, would also be most affected. Although views of the bridge may be routine for locals, the view is highly unique and iconic, and therefore, sensitive.			

Visual Quality

Vividness

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Landform	Flat and mostly inconspicuous except for small rise to the east (left) in closer proximity to viewer. Landform is indicated primarily by the presence of trees.	1.00	No change.	1.00	No change.	1.00	No change.	1.00	No change.	1.00
Vegetation	Deciduous trees and riparian shrubs line the river banks and are visible in the foreground in distance beyond the bridge. In this winter view, the trees are leafless and brown with a spindly texture.	3.75	Minimal change; trees are slightly more visible without trusses.	3.80	Minimal change; trees are slightly less visible with additional piers.	3.70	Additional truss patterns, which increase to the west (right) side of the view due to perspective shift, further block views of background trees.	3.60	Minimal change; trees are slightly less visible with additional piers.	3.80
Water	Missouri River is a dominant feature and occupies most of the scene. In this winter view, the water is covered in brilliant white, choppy snow that adds texture.	5.00	Additional piers result in minimal change to vividness by adding new shapes that slightly detract from views of the water.	4.80	Additional piers result in minimal change to vividness by adding new shapes that slightly detract from views of the water, although the piers are aligned.	4.90	The number of new piers match the number of existing piers and are aligned, with minimal change to views of the water.	4.90	Additional piers result in minimal change to vividness by adding new shapes that slightly detract from views of the water, particularly as the piers are not aligned.	4.75
Man-Made	Dark-colored trusses stand out against the light-colored sky and are dominant features, particularly given close proximity. Open truss design creates a "light," open appearance. Patterns made by the trusses create a repeated, symmetrical form that is highly memorable.	6.00	New bridge forms a strong, bold horizontal line that parallels the horizon line and is wider and darker than existing deck, creating a heavier appearance. Piers introduce additional vertical structures, whose girth varies with change in perspective. The new bridge is unremarkable and not memorable.	1.00	New bridge adds a bolder horizontal deck line. Additional piers add new, hefty vertical elements, whose girth varies with change in perspective, some of which are aligned with existing piers. Alignment changes slightly with change in perspective, where both sets of piers are more visible. Additional bridge deck adds heft to existing bridge, making it more visibly substantial and slightly more memorable.	5.90	Additional trusses, when viewed directly ahead (east/left side) are aligned horizontally with existing trusses but not vertically, with original bridge trusses somewhat visible. However, horizontal alignment is greatly skewed and the sizes of the bridges appear to change with increasing change in perspective (center and west/right side), where dual truss patterns create a visual jumble of lines that are vivid but highly discordant.	5.00	New bridge adds a strong, bold horizontal deck line, and the additional piers add new, hefty vertical elements whose girth varies with change in perspective and are not aligned with existing piers. Bridge piers are more visible as they are not aligned, making them more vivid but not memorable. Additional bridge deck adds heft to the original, making it more visibly substantial and slightly more memorable.	5.80
Total		3.94		2.65		3.88		3.63		3.84

Intactness

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Development	Repeating triangular patterns formed by trusses and the resulting three repeated curved shapes create high visual order. Bridge components are intact, i.e., none are missing or damaged. Lines created by trusses slightly mimic lines of background trees. Bridge and vegetation color are similar.	6.00	Bridge does not demonstrate repeating patterns or shapes, but retains a high degree of visual order and is complete (intact). Additional piers slightly break up the visual flow under the bridge.	5.80	Retains repeating patterns, shapes, and lines of original bridge. Additional piers slightly break up the visual flow under the bridge.	5.90	The additional trusses create confusing patterns where views are angled that disrupt and encroach upon visual order.	4.00	Retains repeating patterns, shapes, and lines of original bridge. Additional piers slightly break up the visual flow under the bridge, which is more noticeable due to misalignment.	5.80
Encroachment	Openness provided by the trusses and minimal number of piers allow views beyond and under the bridge, minimizing encroachment. Other manmade development consists of inconspicuous residential houses barely visible through the trees on the western bank.	6.00	The darker, heavier feel of the bridge deck encroaches slightly on the scene.	5.80	The darker, heavier feel of the bridge deck helps visually anchor views of the trusses on the existing bridge beyond, making them appear as one bridge. The wide horizontal line of the bridge deck provides additional visual heft for, and relationship to, the trusses.	6.00	Openness of the trusses degrades where they are unaligned in angled views.	4.00	The darker, heavier feel of the bridge deck helps visually anchor views of the trusses on the existing bridge beyond, making them appear as one bridge. The wide horizontal line of the bridge deck provides additional visual heft for, and relationship to, the trusses.	5.90
Total		6.00		5.80		5.95		4.00		5.85

Unity

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Unity	Bridge provides balanced focal point in a near-symmetrical view. Horizontal line created by bridge deck mimics that of river and horizon line. Repetition of vertical piers is harmonious, as is repetition of the truss patterns and the three curved shapes they form.	6.00	Scene remains symmetrical and balanced but bridge is less of a focal point without pattern elements and shapes formed by trusses.	5.00	Retains unity as described for existing bridge. Deck of the new bridge is on same horizontal plane as existing and appears to be part of it.	6.00	The dual truss patterns create an incoherent, unbalanced, and disharmonious visual pattern where the lines formed by the trusses of each bridge "fight" with each other.	4.00	Retains unity as described for existing bridge. Deck of the new bridge is on same horizontal plane as existing and appears to be part of it.	6.00
Total		6.00		5.00		6.00		4.00		6.00

Overall Visual Quality Score

Overall Existing Visual Quality Score	Proposed Action Score	Alternative 1 Score	Alternative 2 Score	Alternative 3 Score
5.31	4.48	5.28	3.88	5.23

***Scores/Rating is based on the following scale:**
7 = Very High, 6 = Moderately High, 5 = High , 4 = Medium, 3 = Moderately Low, 2 = Low, 1 =Very Low, 0 = None

****Distance Zones are described as:** Foreground (0 to 0.25 mile), Middleground (0.25 mile to 0.75), and Background (0.75 mile and beyond)

FHWA Visual Quality Evaluation

Project :	BNSF Bismarck Bridge Replacement Project			
Key View:	2			
Location:	46.80797759100 / -100.81970387100: Grant Marsh Bridge			
Orientation:	South			
Date:	February 17, 2021			
Viewers:	Activity:	☐ Recreational ☐ Residential ☑ Business/Commuter		
	Number:	Several (>6)	Duration of View:	Short-term (<10 mins)
	High number of viewers (travelers) considered sensitive due to proximity and very high number of viewers. View duration would be fleeting, as travelers have unobstructed views of the bridge for approximately one-fifth of a mile while crossing the river at approximately 75 miles per hour (posted speed limit). Attention and focus would vary. Although views of the bridge may be routine for locals, the view is an iconic focal point, and therefore, sensitive. Views would be mostly restricted to passengers, as drivers' views would be primarily straight ahead. Truckers more focused on reaching destinations would be less sensitive, and tourists with no previous awareness of the bridge would not previous visual context.			

Visual Quality

Vividness

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Landform	Mostly flat landscape occupies the foreground on the west side of the bridge where it crosses a spit of land that juts into the river.	1.00	No change.	1.00	No change.	1.00	No change.	1.00	No change.	1.00
Vegetation	Deciduous trees lining the riverbank are visible beyond the bridge following the curve of the river on the west (right) side, and in front of the bridge on the east and west side. Leafless brown trees have slightly spindly texture forming an overall mass of brown in the distance, with more texture in the foreground.	3.00	Minimal change; trees would be slightly more visible without trusses.	3.05	Minimal change; trees would be slightly less visible with additional piers.	2.95	Additional truss patterns would slightly block views of background trees.	2.95	Minimal change; trees would be slightly less visible with additional piers.	2.95
Water	Missouri River fills the lower third of the view from east to west and is covered in bright white snow that is broken and crumbly, creating noticeable texture and shadows.	4.80	Additional piers would result in minimal change to vividness by adding new shapes that slightly detract from views of the water.	4.70	Additional piers would result in minimal change to vividness by adding new shapes that slightly detract from views of the water, although existing piers would be aligned.	4.75	The number of new piers would match the number of existing piers and are aligned, with no change to views of the water.	4.80	Additional piers would result in minimal change to vividness by adding new shapes that slightly detract from views of the water, especially as the piers would not be aligned.	4.60
Man-Made	The horizontal line formed by the bridge deck parallels the horizontal horizon line. Bridge is backdropped against the uninterrupted sky, making the dark trusses a clearly visible and striking visual element. Proximity of bridge to viewer creates vivid impression. The trusses appear aligned and as one at outer edges and slightly more horizontally offset and duplicated in the center. Keelboat Park, Riverfront Trail, and River Road in the foreground to the east (left). A handful of cars stand out against the snow-covered parking lot, which blends in with the water.	6.00	New bridge would form a strong, bold horizontal line that parallels the horizon line and is wider and darker than existing deck, creating a heavier appearance. Piers would introduce additional vertical structures. The new bridge would be unremarkable and not memorable.	1.00	New bridge would add a bolder horizontal deck line, and the additional piers add new, hefty vertical elements, some of which would be aligned with existing piers. Additional bridge deck would add heft to existing bridge, making it more visibly substantial and slightly more memorable.	6.00	Additional trusses, when viewed straight ahead, would appear nearly aligned with trusses on existing bridge. This near-alignment would degrade slightly to the east and west, as trusses would appear somewhat doubled. The result would be vivid but slightly degrade memorability.	5.60	New bridge would add a bolder horizontal deck line, and the additional piers add new, hefty vertical elements that would not be aligned with existing piers. Additional bridge deck would add heft to existing bridge, making it more visibly substantial and slightly more memorable.	5.90
Total		3.70		2.44		3.68		3.59		3.61

Intactness

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Development	Repeating triangular patterns formed by trusses and the resulting three repeated curved shapes create high visual order. Bridge components are intact, i.e., none are missing or damaged. Bridge and vegetation color are similar.	6.00	Bridge would not demonstrate repeating patterns or shapes, but would retain a high degree of visual order and completeness. Additional piers would slightly break up the visual flow under the bridge.	5.80	Would retain repeating patterns, shapes, and lines of original bridge. Additional piers would slightly break up the visual flow under the bridge.	5.90	Where the additional trusses appear duplicated, patterns would become slightly confusing and visual order would degrade.	5.70	Retains repeating patterns, shapes, and lines of original bridge. Additional piers slightly break up the visual flow under the bridge, which is more noticeable due to misalignment.	5.80
Encroachment	Openness provided by the trusses and minimal number of piers allow views beyond and under the bridge, minimizing encroachment. Other manmade development consists of the distant piers of the Memorial Bridge, which are barely discernable, and Keelboat Park, Riverfront Trail, and River Road in the foreground to the east (left). These manmade elements are minimal intrusions onto the landscape.	5.90	The darker, heavier feel of the bridge deck would encroach slightly on the scene.	5.80	The darker, heavier feel of the bridge deck would help visually anchor views of the trusses on the existing bridge beyond, making them appear as one bridge. The wide horizontal line of the bridge deck would provide additional visual heft for, and relationship to, the trusses.	5.90	Openness of the trusses would remain mostly intact except where trusses are visible duplicated.	5.70	The darker, heavier feel of the bridge deck helps visually anchor views of the trusses on the existing bridge beyond, making them appear as one bridge. The wide horizontal line of the bridge deck provides additional visual heft for, and relationship to, the trusses.	5.90
Total		5.95		5.80		5.90		5.70		5.85

Unity

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Unity	Bridge provides slightly offset focal point in a near-symmetrical view. Curving lines of the riverbanks provide balance on both sides. Horizontal line created by bridge deck mimics that of river and horizon line. Repetition of vertical piers is harmonious, as is repetition of the truss patterns and the three curved shapes they form.	6.50	Scene would remain somewhat symmetrical and balanced but bridge would be less of a focal point without pattern elements and shapes formed by trusses.	5.70	Would retain unity as described for existing bridge. Deck of the new bridge would be on same horizontal plane, or close to it, as existing bridge and appear to be part of it.	6.50	The dual truss patterns would create a slightly disharmonious visual pattern to the east and west where they become misaligned.	6.00	Would retains unity as described for existing bridge. Deck of the new bridge would be on same horizontal plane, or close to it, as existing bridge and appear to be part of it.	6.50
Total		6.50		5.70		6.50		6.00		6.50

Overall Visual Quality Score

Overall Existing Visual Quality Score	Proposed Action Score	Alternative 1 Score	Alternative 2 Score	Alternative 3 Score
5.38	4.65	5.36	5.10	5.32

***Scores/Rating is based on the following scale:**
7 = Very High, 6 = Moderately High, 5 = High , 4 = Medium, 3 = Moderately Low, 2 = Low, 1 =Very Low, 0 = None

****Distance Zones are described as:** Foreground (0 to 0.25 mile), Middleground (0.25 mile to 0.75), and Background (0.75 mile and beyond)

FHWA Visual Quality Evaluation

Project :	BNSF Bismarck Bridge Replacement Project			
Key View:	3			
Location:	46.80797759100 / -100.81970387100: Memorial Bridge			
Orientation:	North			
Date:	February 17, 2021			
Viewers:	Activity:	☐ Recreational ☐ Residential ☑ Business/Commuter		
	Number:	Several (>6)	Duration of View:	Short-term (<10 mins)
	Sensitive viewers similar to Key View 2 but of slightly longer duration, as travelers would have unobstructed views of the bridge for approximately one-quarter of a mile while crossing the river at approximately 40 miles per hour (posted speed limit).			

Visual Quality
Vividness

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Landform	Flat landscape occupies the foreground on the west (left) side of the bridge. A slightly undulating hill occupies the east (right) side, the height exceeding the top of the bridge trusses.	1.25	No change.	1.25	48-foot high retaining wall on east side of river would result in removal of earthen material and introduction of soldier-pile lagging wall, which would be partially visible in this view, particularly depending on leaf-on or -off conditions.	1.00	48-foot high retaining wall on east side of river would result in removal of earthen material and introduction of soldier-pile lagging wall, which would be partially visible in this view, particularly depending on leaf-on or -off conditions.	1.00	23-foot high retaining wall on east side of river would result in removal of earthen material and introduction of soldier-pile lagging wall, which would be partially visible in this view, particularly depending on leaf-on or -off condition, but to a lesser extent than Alternative 2 as it would be roughly half as tall.	1.15
Vegetation	Deciduous vegetation lining the riverbank is visible in front of the bridge on both sides. Leafless trees are brown and have slightly spindly texture that is sharper and more discernible in the foreground on the west (left) side. Vegetation on the east (right) side forms smaller, more rounded shapes.	3.00	No change.	3.00	No change.	3.00	No change.	3.00	No change.	3.00
Water	Missouri River fills the lower one-quarter of the view from east to west and is covered in bright white snow that is slightly broken and textural. The piers of the railroad bridge and Grant Marsh Bridge slightly disrupt the expanse of water.	5.00	Additional piers would result in minimal change to vividness by adding new shapes that slightly detract from views of the water.	4.90	Additional piers would result in minimal change to vividness by adding new shapes that slightly detract from views of the water, although existing piers would be aligned.	4.95	Additional piers would align with existing piers. No noticeable change.	5.00	Additional piers would result in minimal change to vividness by adding new shapes that slightly detract from views of the water, particularly as existing piers would not be aligned.	4.90
Man-Made	The horizontal line formed by the bridge deck parallels the horizontal horizon line. The bridge is mostly backdropped against the uninterrupted sky, making the dark trusses a clearly visible and striking visual element. The bridge is slightly obscured at the east and west approaches by vegetation or topography. The blue painted deck sides of Grant Marsh Bridge create a bright, signature "underline" beneath Bridge 196.6 that echoes the blue sky.	5.75	New bridge would form a strong, bold horizontal line that parallels the horizon line and is wider and darker than existing deck, creating a heavier appearance. The new bridge would be unremarkable and could potentially obscure the signature blue underline created in the distance by the Grant Marsh Bridge. Piers would introduce additional vertical structures.	1.00	New bridge would add a bolder horizontal deck line. Additional piers would add new vertical elements, some of which would be aligned with existing piers. Additional bridge deck would add heft to existing bridge, making it more visibly substantial and slightly more memorable. The new bridge deck could potentially obscure the signature blue underline created in the distance by the Grant Marsh Bridge.	5.75	Additional trusses, when viewed straight ahead, would appear nearly aligned with trusses on existing bridge. This near-alignment could degrade slightly due to slight change in perspective, but partially absorbed by distance (0.8 mile). The result would be vivid but slightly degrade memorability.	5.50	New bridge would add a bolder horizontal deck line. Additional piers would add new vertical elements, but would not be aligned with existing piers. Additional bridge deck would add heft to existing bridge, making it more visibly substantial and slightly more memorable. The new bridge deck could potentially obscure the signature blue underline created in the distance by the Grant Marsh Bridge.	5.65
Total		3.75		2.54		3.68		3.63		3.68

Intactness

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Development	Repeating triangular patterns formed by trusses and the resulting three repeated curved shapes create high visual order. Bridge components are intact, i.e., none are missing or damaged. Distant piers of Grant Marsh Bridge slight disrupt intactness of the view. Bridge and vegetation color are similar.	5.75	Bridge would not demonstrate repeating patterns or shapes, but would retain a high degree of visual order and completeness. Additional piers would slightly break up the visual flow under the bridge.	5.50	Would retain repeating patterns, shapes, and lines of original bridge. Additional piers would break up the visual flow under the bridge with a very slight effect due to distance and piers for the Grant Marsh Bridge.	5.70	Where the additional trusses appear duplicated, patterns would become slightly confusing and visual order would degrade. This effect is expected to be minimal from this distance.	5.60	Would retain repeating patterns, shapes, and lines of original bridge. Additional, unaligned piers would break up the visual flow under the bridge with a slight effect due to distance and piers for the Grant Marsh Bridge.	5.65
Encroachment	White steam from a smokestack is visible against the sky to the west (left), and some small, unobtrusive buildings are visible against through the trees, particularly below the hillside to the east (right).	6.00	The darker, heavier feel of the bridge deck would encroach slightly on the scene but would be somewhat absorbed by distance (0.8 mile) and the Grant Marsh bridge behind.	5.90	The darker, heavier feel of the bridge deck would help visually anchor views of the trusses on the existing bridge beyond, making them appear as one bridge. The wide horizontal line of the bridge deck would provide additional visual heft for, and relationship to, the trusses.	6.00	Openness of the trusses would remain mostly intact except where trusses are visible duplicated.	5.90	The darker, heavier feel of the bridge deck would help visually anchor views of the trusses on the existing bridge beyond, making them appear as one bridge. The wide horizontal line of the bridge deck would provide additional visual heft for, and relationship to, the trusses.	6.00
Total		5.88		5.70		5.85		5.75		5.83

Unity

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Unity	Bridge provides balanced focal point in a near-symmetrical view tying together the two riverbanks. Horizontal line created by bridge deck mimics that of river and horizon line. The curved bridge truss shapes slightly echo the curves in the adjacent hillside. Repetition of vertical piers is harmonious, as is repetition of the truss patterns and the three curved shapes they form.	5.75	Scene would remain mostly symmetrical and balanced but bridge would be less of a focal point without pattern elements and shapes formed by trusses.	4.75	Would retain unity as described for existing bridge. Deck of the new bridge would be on same horizontal plane, or close to it, as existing bridge and appear to be part of it.	5.75	The dual truss patterns would create a slightly disharmonious visual pattern where they become misaligned with minimal effect due to distance.	5.60	Would retain unity as described for existing bridge. Deck of the new bridge would be on same horizontal plane, or close to it, as existing bridge and appear to be part of it.	5.75
Total		5.75		4.75		5.75		5.60		5.75

Overall Visual Quality Score

Overall Existing Visual Quality Score	Proposed Action Score	Alternative 1 Score	Alternative 2 Score	Alternative 3 Score
5.13	4.33	5.09	4.99	5.08

***Scores/Rating is based on the following scale:**
7 = Very High, 6 = Moderately High, 5 = High , 4 = Medium, 3 = Moderately Low, 2 = Low, 1 =Very Low, 0 = None

****Distance Zones are described as:** Foreground (0 to 0.25 mile), Middleground (0.25 mile to 0.75), and Background (0.75 mile and beyond)

FHWA Visual Quality Evaluation

Project :	BNSF Bismarck Bridge Replacement Project			
Key View:	4			
Location:	46.81780000000 / -100.82455833300: Riverview Trail			
Orientation:	Northwest			
Date:	February 17, 2021			
Viewers:	Activity:	☑ Recreational	☐ Residential	☐ Business/Commuter
	Number:	Several (>6)	Duration of View:	Medium-Term (10 mins-1 hr)
	High number of viewers considered sensitive due to recreational use of the trail, close proximity, and variable view duration, as viewers are expected to be dynamic, either walking, running, or cycling. Although views of the bridge may be routine for locals, the view is highly unique and iconic, and therefore, sensitive. As with duration, focus would vary based on activity.			

Visual Quality

Vividness

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Proposed Action (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Landform	Mostly flat with slight undulations.	1.25	No change.	1.25	No change.	1.25	No change.	1.25	No change.	1.25
Vegetation	Dense vegetation consisting of deciduous reaches the height of the bridge deck on the west (left) side. Fewer trees and more shrubs are visible farther distant. Deciduous trees are prominent feature on east (right) side of river bank due to proximity. Leafless trees have dark brown trunks and lighter branches with spindly texture. Color is similar to the bridge. Yellow grasses interject some vivid color and spiky texture on eastern bank.	4.30	Wider bridge deck rails would slightly obscure trees on east (left) side of view.	4.28	Wider bridge deck rails would slightly obscure trees on east (left) side of view.	4.28	No change.	4.28	Wider bridge deck rails would slightly obscure trees on east (left) side of view.	4.28
Water	Missouri River fills the lower half of the foreground view and is covered in bright white, broken snow that interjects crumbly texture. Water line is almost level with piers.	5.00	No change as new piers would be viewed at top of water line and would not interfere with views of the water.	5.00	No change as new piers would be viewed at top of water line and would not interfere with views of the water.	5.00	No change as new piers would be viewed at top of water line and would not interfere with views of the water.	5.00	No change as new piers would be viewed at top of water line and would not interfere with views of the water.	5.00
Man-Made	Tall, triangular-shaped elements of the truss bridge form a striking and memorable element, with dark spans and tall masonry piers. The close proximity of the bridge heightens its mass and scale, and the intricacy of the truss patterns is more evident than in farther views. Bright orange rail cars interject vivid color, particularly against the of blue sky and the white snow. Vivid blue, signature "underline" of Grant Marsh Bridge creates noticeable horizontal line in distance. Bright white steam plumes of varying heights and girths are visible in center background against the blue sky and creates billowy vertical shapes.	6.00	New bridge would form a strong, bold horizontal line that parallels the horizon and water line. Bridge deck would be wider and darker than existing deck, creating a heavier appearance. Piers would introduce additional vertical structures, whose girth would vary with change in perspective. The new bridge would be unremarkable and not memorable.	1.00	New bridge would add a bolder horizontal deck line. Additional piers would add new, hefty vertical elements, whose girth would vary with change in perspective. Some piers would be aligned with existing piers, but the alignment would change with change in perspective, where both sets of piers are more visible. Additional bridge deck would add heft to existing bridge, making it more visibly substantial and slightly more memorable.	6.00	Due to the angled view of this scene, additional trusses, would be unaligned and the sizes of the two bridges would like appear to change with change in perspective (center and west/right side). Dual truss patterns would create a discordant visual jumble of lines that are vivid but highly discordant.	4.00	New bridge would add a bolder horizontal deck line. Additional piers would add new, hefty vertical elements, whose girth would vary with change in perspective, but piers would not be aligned with existing piers. Additional bridge deck would add heft to existing bridge, making it more visibly substantial and slightly more memorable.	5.90
Total		4.14		2.88		4.13		3.63		4.11

Intactness

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Alternative (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Development	Repeating triangular patterns formed by trusses and the resulting three repeated curved shapes create high visual order. Bridge components are intact, i.e., none are missing or damaged. Lines created by trusses slightly mimic lines of background trees. Bridge and vegetation color are similar. Tall slender light poles associated with I-94 are barely visible. Rising steam implies the presence of smokestacks.	6.00	Bridge would not demonstrate repeating patterns or shapes, but would retain a high degree of visual order and is completeness. Additional piers would slightly break up the visual flow under the bridge.	5.80	Would retain repeating patterns, shapes, and lines of original bridge. Piers of the new bridge would slightly break up the visual flow under the bridge, although they would be aligned with existing bridge. Alignment would shift with change in perspective.	5.90	The additional trusses would create confusing patterns where views are angled that disrupt and encroach upon visual order.	4.00	Would retain repeating patterns, shapes, and lines of original bridge. Additional piers would slightly break up the visual flow under the bridge, particularly as they would not be aligned with existing piers.	5.80
Encroachment	The bridge is the only discernable element in the landscape, which is therefore free from encroachment.	6.00	The darker, heavier feel of the bridge deck would encroach slightly on the scene.	5.80	The darker, heavier feel of the bridge deck would help visually anchor views of the trusses on the existing bridge. The wide horizontal line of the bridge deck would provide additional visual heft for, and relationship to, the trusses. In this angled view, the two bridges may appear more visual separated due to the 92.5-foot distance between them.	6.00	Openness of the trusses would degrade due to misalignment.	4.00	The darker, heavier feel of the bridge deck would help visually anchor views of the trusses on the existing bridge. The wide horizontal line of the bridge deck would provide additional visual heft for, and relationship to, the trusses. In this angled view, the two bridges may appear as one as they would be separated by 42.5 feet.	6.00
Total		6.00		5.80		5.95		4.00		5.90

Unity

Component	Existing Description (form, line, color, and texture)	Existing Score*	Description with Alternative (form, line, color, and texture)	Score with Alt*	Description with Alternative 1 (form, line, color, and texture)	Score with Alt*	Description with Alternative 2 (form, line, color, and texture)	Score with Alt*	Description with Alternative 3 (form, line, color, and texture)	Score with Alt*
Unity	The scene is slightly off-balance due to the proximity of the trees and riverbank on the eastern (right) side. However, bridge provides balanced focal point. Horizontal line created by bridge deck parallels that of river and horizon line. Repetition of vertical piers is harmonious, as is repetition of the truss patterns and the three curved shapes they form.	5.90	Scene would remain slightly unbalanced and bridge would be less of a focal point without pattern elements and shapes formed by trusses.	4.80	Would retain unity similar to existing bridge. In this angled view, the two bridges may appear more visually separated due to the 92.5-foot distance between them.	5.80	The dual truss patterns would create an incoherent, unbalanced, and disharmonious visual pattern where the lines formed by the trusses of each bridge "fight" with each other.	4.00	Would retain unity similar to existing bridge. In this angled view, the two bridges may appear as one due to the 42.5-foot distance between them.	5.90
Total		5.90		4.80		5.80		4.00		5.90

Overall Visual Quality Score

Overall Existing Visual Quality Score	Proposed Action Score	Alternative 1 Score	Alternative 2 Score	Alternative 3 Score
5.35	4.49	5.29	3.88	5.30

***Scores/Rating is based on the following scale:**
7 = Very High, 6 = Moderately High, 5 = High , 4 = Medium, 3 = Moderately Low, 2 = Low, 1 =Very Low, 0 = None

****Distance Zones are described as:** Foreground (0 to 0.25 mile), Middleground (0.25 mile to 0.75), and Background (0.75 mile and beyond)

Appendix P

Agency Correspondence

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
1616 CAPITOL AVENUE
OMAHA NE 68102-4901

REPLY TO
ATTENTION OF

Adam Nies
Houston Engineering, Inc
6901 East Fish Lake Road
Maple Grove, MN 55369

Dear Mr. Nies:

The US Army Corps of Engineers, Omaha District is in receipt of your proposal for the BNSF Bridge Replacement project. Our preliminary determination for Section 408 indicates that the proposed bridge replacement project is well removed from the federal bank stabilization structures, thereby not likely to cause any negative effects such as structural degradation or altered performance. This proposed project appears to fall outside requirements of the Section 408 program.

If you have any further questions please feel free to contact Brent Cossette, Omaha District Section 408 Coordinator at brent.j.cossette@usace.army.mil or by phone at (402) 995-2712.

Sincerely,

Brent J. Cossette
Section 408 Coordinator, Omaha District

Printed on Recycled Paper

May 11, 2021

Mr. Rob McCaskey
US Coast Guard- Western Rivers
8th District Bridge Branch
1222 Spruce Street
St Louis, MO 63103-2832

ND SHPO Ref.: 16-0636, Section 106 Consultation for the Proposed Bridge Replacement at Mile 1315.0 on the Missouri River near Bismarck/Mandan, North Dakota

Dear Mr. McCaskey,

We reviewed your request for comments on the revised direct effect APE for ND SHPO Ref.: 16-0636, Section 106 Consultation for the Proposed Bridge Replacement at Mile 1315.0 on the Missouri River near Bismarck/Mandan, North Dakota and concur with the APE as defined in the documentation with the understanding that we would like to see any additional areas to be used for disposal, borrow or staging as those areas are identified.

Thank you for the opportunity to review this project. Please include the ND SHPO Reference number listed above in further correspondence for this specific project. If you have any questions, please contact Lorna Meidinger, Historic Preservation Specialist at (701) 328-2089 or lbmeidinger@nd.gov

Sincerely,

for William D. Peterson PhD
State Historic Preservation Officer
(North Dakota)

16-0636

Bismarck **Engineering Department**

July 23, 2020

Abby M. Korte ---email only abby.korte@jacobs.com ---
Jacobs Engineering Group Inc.
7300 Metro Blvd Stu 400
Minneapolis, MN 55439

Re: BNSF Bismarck Bridge Alternatives

Dear Ms. Korte,

On behalf of the City of Bismarck, thank you for the opportunity to comment on the proposed alternatives associated with the BNSF Bridge replacement project across the Missouri River between Bismarck and Mandan, North Dakota. The City of Bismarck operates three 1 MG buried water storage tanks and associated piping known as the West End Reservoirs north of the existing BNSF line on the Bismarck side of the Missouri River. The City's infrastructure is vitally important to our water distribution network and all alternatives under consideration by BNSF should avoid impacting this facility.

The City would not define impact as acquisition of right of way or slope easement within the boundary of the City's parcel necessarily but rather as placing or removing fill from the hillside between the BNSF track and the City's facility in a way that creates an unsafe or unstable slope by common geotechnical standards. The City would request BNSF perform appropriate geotechnical analyses to confirm that the combination of any proposed sloping and/or retaining walls between the West End Reservoirs and the BNSF track would result in a safe and stable slope able to support the facility using a standard of care and safety factor requisite to the vital importance of this facility to our community.

The exhibits provided to the City dated 6/24/20 of the APE and proposed construction limits of the 20', 42.5' and 92.5' offset alignments using only grading on the backfill and without the usage of any retaining walls show grading within City's property. The limits of the 42.5' and 92.5' offset alignments would need to be revised as discussed in the previous paragraph to limit the APE and pull the construction limits closer to the BNSF track. The City cannot provide any guidance as to a distance from the BNSF track that we can support or specific recommendations on the type or size of retaining walls or

Gabriel J. Schell, PE, City Engineer
Phone: 701-355-1505 ● TDD: 711 ● Fax: 701-222-6593 ● 221 N. Fifth St. ● PO Box 5503 ● Bismarck, ND 58506-5503
Email: bisengd@bismarcknd.gov ● www.bismarcknd.gov

slope treatments as that would be governed by the geotechnical analysis recommended to be performed.

Please note also that the 20’ offset alignment shows the construction limits in this area as tying down close to the existing BNSF track without any work proposed on the existing backslope between the track and the West End Reservoir. There is a documented erosion occurring within the BNSF right of way that has been previously disclosed to BNSF. This is shown below in the 2020 aerial photo with the area circled in red. BNSF had previously indicated that remediation of this issue would be incorporated into any of the alternatives including the no build alternative. Please confirm this is still the case and if so, the construction limits of the 20’ offset alignment should include this area as being disturbed in some manner.

Source: City of Bismarck GIS

Thank you again for the opportunity to comment and please contact me if you have any additional questions or seek clarification or collaboration on any of the previously mentioned items above.

Sincerely,

Gabe Schell, PE
City Engineer

United States Department of the Interior

FISH AND WILDLIFE SERVICE
North Dakota Ecological Services
3425 Miriam Avenue
Bismarck, North Dakota 58501

IN REPLY REFER TO:
06E15000-

May 17, 2021

Ms. Bec Gawtry
Biologist
Jacobs Engineering Group
1295 Northland Drive Suite 200
Mendota Heights, MN 55120

Dear Ms. Gawtry:

Thank you for the opportunity to provide comments on the proposed additional alternatives for the Bismarck Railway Bridge Project. As stated in your letter, previously Houston Engineering submitted a Biological Assessment (BA) on December 5, 2017. After US Fish and Wildlife Service (FWS) concurrence, additional alternatives were proposed for the project. Under the authority of and in according with the Endangered Species Act (ESA) (16 U.S.C. 1531 *et seq*.), we have reviewed the alternatives and have concluded that the proposed modifications to the action will not cause an effect to the listed species or critical habitat that was not considered in the previous consultation.

The FWS appreciates the opportunity to work with the Jacobs Engineering Group and the US Coast Guard on our shared conservation goals. Should you have any questions regarding these comments, please have your staff contact Jessica Johnson of my staff at (701) 355-8507 or at the letterhead address, or contact me at (701) 355-8512.

Sincerely,

DREW BECKER Digitally signed by DREW BECKER
Date: 2021.05.20 13:53:58 -05'00'

Drew Becker
ND Ecological Services Office Supervisor