

**Draft Fargo-Moorhead Metro Feasibility Study
Preliminary Downstream Impact Analysis
Supplemental Information**

July 2010

The information presented below provides additional detail regarding the potential stage increases associated with the proposed Fargo-Moorhead Metro Diversion projects from Fargo-Moorhead to the gage near Thompson, ND.

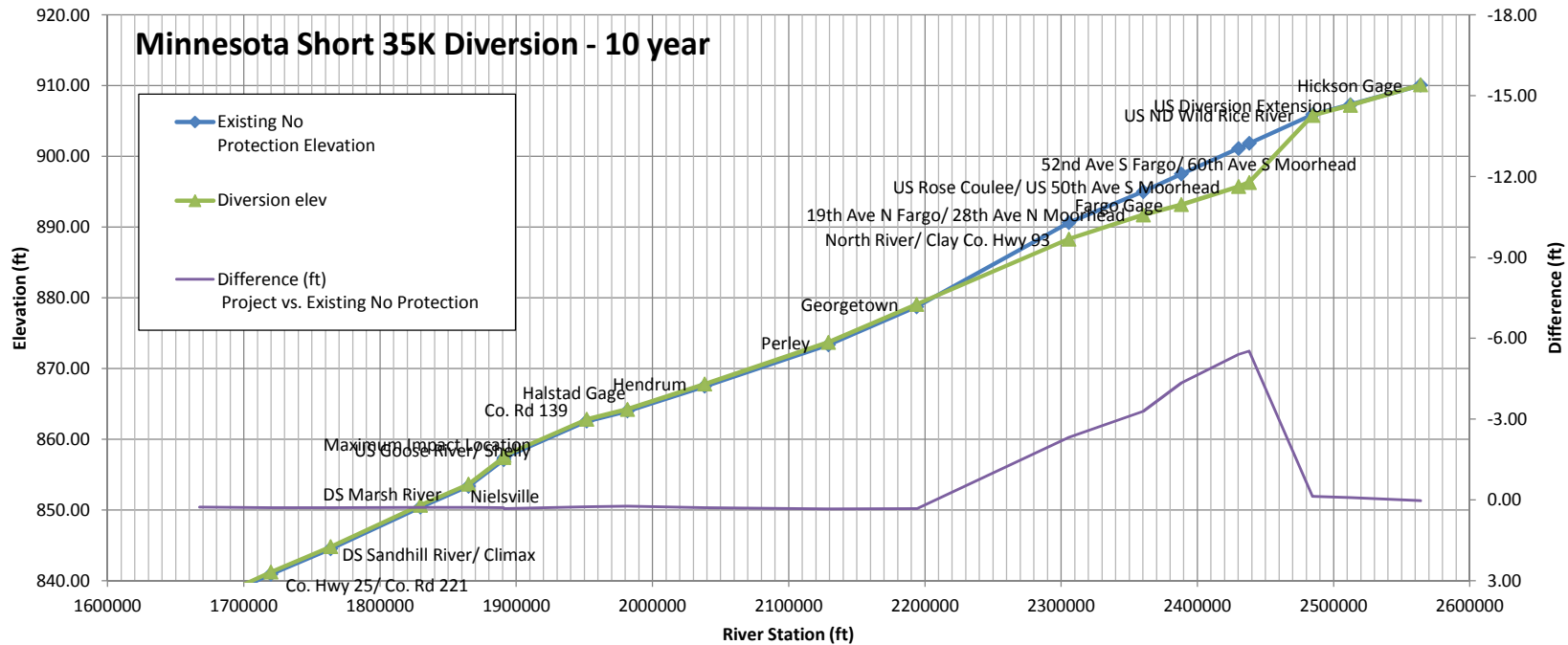
All elevations are presented relative to the North American Vertical Datum of 1988 (NAVD 1988).

Minnesota Short 35K Diversion - 10 year

7-20-10

Location	Station	Existing No Protection Elevation		MN short 35K Diversion Elevation		Difference Project vs. Existing No Protection	
		Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)
Thompson	1667665	836.31	42,496	836.58	43,267	0.27	771
Co. Hwy 25/ Co. Rd 221	1719816	840.92	42,335	841.22	43,110	0.3	775
DS Sandhill River/ Climax	1763746	844.51	42,221	844.81	42,999	0.3	778
Nielsville	1829650	850.4	39,145	850.69	39,952	0.29	807
DS Marsh River	1864960	853.37	38,925	853.65	39,759	0.28	834
US Goose River/ Shelly	1890722	857.11	35,909	857.41	36,803	0.3	894
Maximum Impact Location	1891054	857.39	35,909	857.72	36,804	0.33	895
Co. Rd 139	1951761	862.56	35,068	862.82	36,000	0.26	931
Halstad Gage	1981580	864	34,927	864.24	35,870	0.24	943
Hendrum	2038359	867.51	31,387	867.81	32,467	0.3	1,080
Perley	2129181	873.38	25,625	873.72	26,603	0.34	978
Georgetown	2193941	878.75	24,299	879.08	25,283	0.33	983
North River/ Clay Co. Hwy 93	2305647	890.63	12,912	888.31	9,487	-2.32	-3,425
19th Ave N Fargo/ 28th Ave N Moorhead	2360321	895.02	16,321	891.73	9,661	-3.29	-6,660
Fargo Gage (13th Ave S, 12th Ave S)	2388223	897.52 (34.78*)	16,548	893.18 (30.44*)	9,762	-4.34	-6,785
US Rose Coulee/ US 50th Ave S Moorhead	2430241	901.13	16,310	895.73	9,559	-5.4	-6,751
52nd Ave S Fargo/ 60th Ave S Moorhead	2438085	901.84	16,371	896.32	9,577	-5.52	-6,793
US ND Wild Rice River	2484618	905.92	10,610	905.8	10,709	-0.12	99
US Diversion Extension	2512440	907.31	10,850	907.23	10,965	-0.08	115
Hickson Gage	2563878	910.07	10,130	910.11	10,261	0.04	131

* Flood stage at USGS Gaging Station 05054000, Fargo, ND

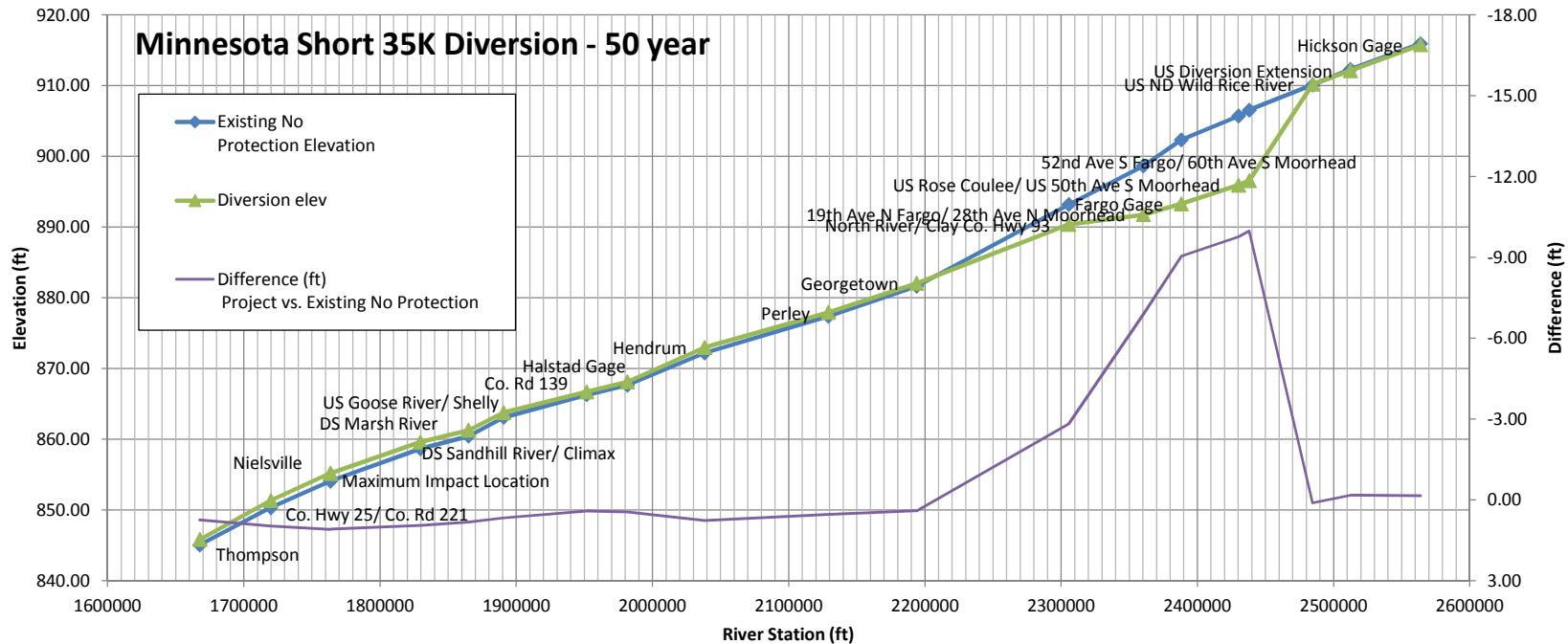


Minnesota Short 35K Diversion - 50 year

7-20-10

Location	Station	Existing No Protection Elevation		MN short 35K Diversion Elevation		Difference Project vs. Existing No Protection	
		Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)
Thompson	1667665	845.05	72,642	845.8	77,652	0.75	5,009
Co. Hwy 25/ Co. Rd 221	1719816	850.34	72,475	851.32	77,498	0.98	5,023
Maximum Impact Location	1763493	854.08	72,344	855.18	77,390	1.1	5,047
DS Sandhill River/ Climax	1763746	854.1	72,346	855.19	77,387	1.09	5,041
Nielsville	1829650	858.65	67,787	859.61	72,949	0.96	5,163
DS Marsh River	1864960	860.44	67,359	861.27	72,633	0.83	5,274
US Goose River/ Shelly	1890722	863.09	61,020	863.76	66,541	0.67	5,521
Co. Rd 139	1951761	866.29	59,647	866.71	65,402	0.42	5,756
Halstad Gage	1981580	867.65	59,148	868.11	65,070	0.46	5,922
Hendrum	2038359	872.2	53,446	872.97	59,823	0.77	6,377
Perley	2129181	877.39	47,491	877.94	53,560	0.55	6,069
Georgetown	2193941	881.65	46,983	882.06	52,187	0.41	5,204
North River/ Clay Co. Hwy 93	2305647	893.19	18,361	890.37	9,371	-2.82	-8,990
19th Ave N Fargo/ 28th Ave N Moorhead	2360321	898.64	26,616	891.76	9,944	-6.88	-16,672
Fargo Gage (13th Ave S, 12th Ave S)	2388223	902.33 (39.59*)	24,168	893.28 (30.54*)	10,048	-9.05	-14,120
US Rose Coulee/ US 50th Ave S Moorhead	2430241	905.7	24,750	895.94	9,874	-9.76	-14,876
52nd Ave S Fargo/ 60th Ave S Moorhead	2438085	906.53	24,811	896.55	9,874	-9.98	-14,937
US ND Wild Rice River	2484618	910.09	20,035	910.2	19,631	0.11	-405
US Diversion Extension	2512440	912.29	22,154	912.12	20,295	-0.17	-1,859
Hickson Gage	2563878	915.94	20,671	915.79	20,635	-0.15	-37

* Flood stage at USGS Gaging Station 05054000, Fargo, ND

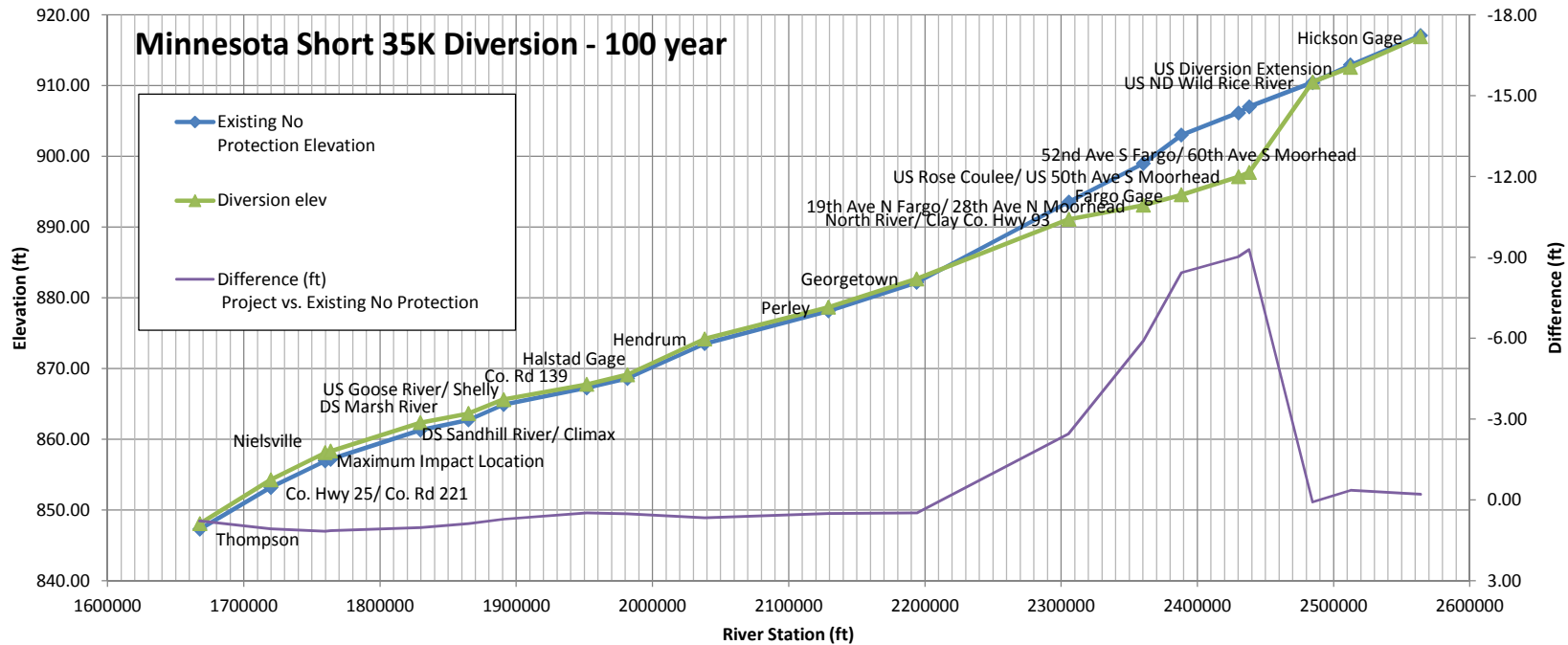


Minnesota Short 35K Diversion - 100 year

7-20-10

Location	Station	Existing No Protection Elevation		MN short 35K Diversion Elevation		Difference Project vs. Existing No Protection	
		Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)
Thompson	1667665	847.29	87,604	848.07	93,743	0.78	6,140
Co. Hwy 25/ Co. Rd 221	1719816	853.2	87,277	854.28	93,420	1.08	6,144
Maximum Impact Location	1759732	856.93	87,047	858.1	93,194	1.17	6,146
DS Sandhill River/ Climax	1763746	857.18	87,019	858.33	93,167	1.15	6,147
Nielsville	1829650	861.31	81,731	862.35	87,900	1.04	6,169
DS Marsh River	1864960	862.75	81,136	863.64	87,415	0.89	6,278
US Goose River/ Shelly	1890722	864.91	72,481	865.63	78,938	0.72	6,458
Co. Rd 139	1951761	867.27	70,573	867.76	77,253	0.49	6,680
Halstad Gage	1981580	868.61	70,172	869.13	77,123	0.52	6,951
Hendrum	2038359	873.53	63,836	874.2	70,564	0.67	6,728
Perley	2129181	878.16	55,909	878.67	62,415	0.51	6,507
Georgetown	2193941	882.18	52,630	882.67	55,911	0.49	3,281
North River/ Clay Co. Hwy 93	2305647	893.55	18,891	891.1	10,650	-2.45	-8,241
19th Ave N Fargo/ 28th Ave N Moorhead	2360321	898.99	28,394	893.1	11,181	-5.89	-17,213
Fargo Gage (13th Ave S, 12th Ave S)	2388223	903.00 (40.26*)	25,009	894.57 (31.83*)	11,174	-8.43	-13,835
US Rose Coulee/ US 50th Ave S Moorhead	2430241	906.15	26,072	897.13	10,811	-9.02	-15,261
52nd Ave S Fargo/ 60th Ave S Moorhead	2438085	907.01	25,914	897.72	10,812	-9.29	-15,102
US ND Wild Rice River	2484618	910.44	22,329	910.52	21,207	0.08	-1,122
US Diversion Extension	2512440	912.92	24,884	912.57	23,305	-0.35	-1,579
Hickson Gage	2563878	917.11	24,586	916.91	24,468	-0.2	-118

* Flood stage at USGS Gaging Station 05054000, Fargo, ND

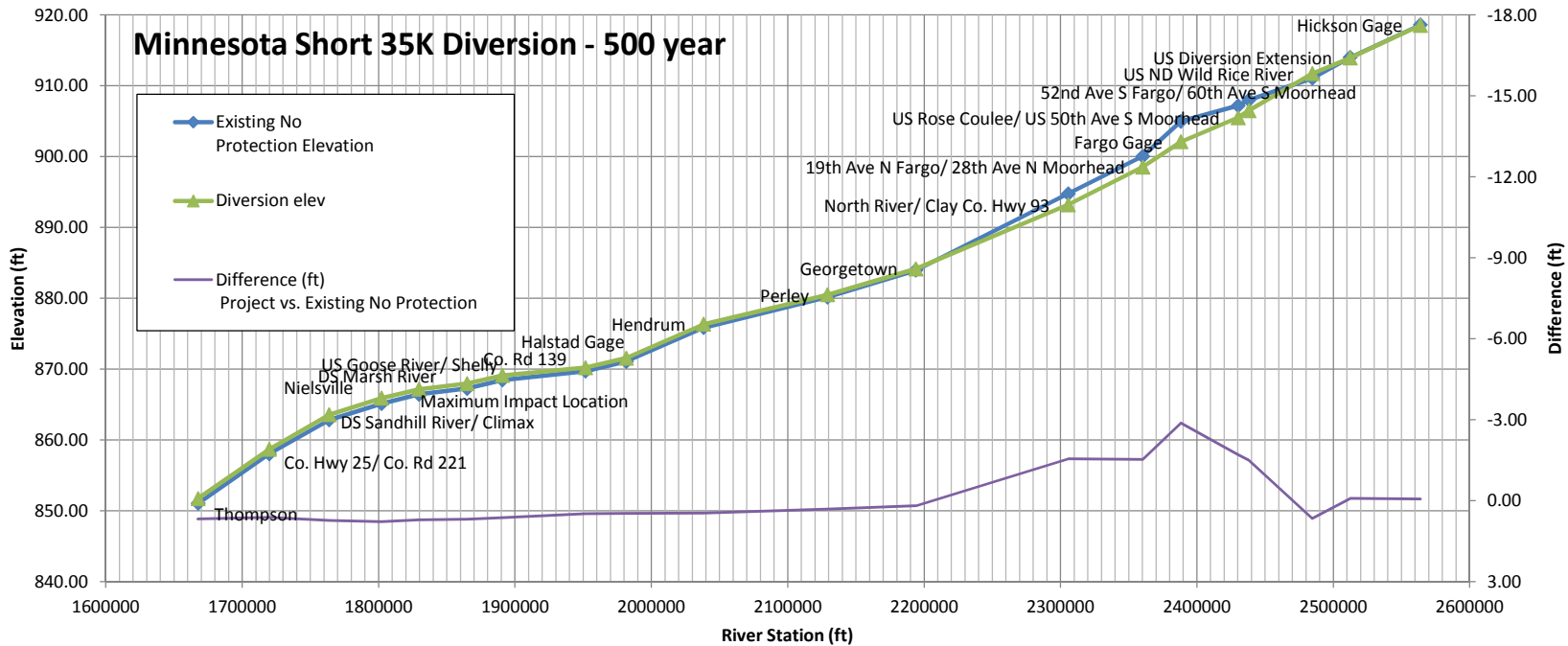


Minnesota Short 35K Diversion - 500 year

7-20-10

Location	Station	Existing No Protection Elevation		MN short 35K Diversion Elevation		Difference Project vs. Existing No Protection	
		Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)
Thompson	1667665	851.04	122,285	851.72	128,775	0.68	6,491
Co. Hwy 25/ Co. Rd 221	1719816	858.05	122,068	858.67	128,932	0.62	6,864
DS Sandhill River/ Climax	1763746	862.83	122,050	863.57	129,111	0.74	7,061
Maximum Impact Location	1802119	865.12	115,996	865.9	122,928	0.78	6,932
Nielsenville	1829650	866.44	115,351	867.16	122,366	0.72	7,015
DS Marsh River	1864960	867.27	114,841	867.96	121,869	0.69	7,028
US Goose River/ Shelly	1890722	868.46	99,780	869.1	105,825	0.64	6,044
Co. Rd 139	1951761	869.72	97,673	870.21	103,553	0.49	5,880
Halstad Gage	1981580	871.07	97,651	871.55	104,501	0.48	6,850
Hendrum	2038359	875.86	89,641	876.33	96,286	0.47	6,645
Perley	2129181	880.17	87,236	880.49	91,924	0.32	4,688
Georgetown	2193941	883.96	60,077	884.15	60,518	0.19	441
North River/ Clay Co. Hwy 93	2305647	894.76	18,200	893.21	17,927	-1.55	-273
19th Ave N Fargo/ 28th Ave N Moorhead	2360321	900.05	33,217	898.53	26,023	-1.52	-7,194
Fargo Gage (13th Ave S, 12th Ave S)	2388223	904.97 (42.23*)	22,903	902.1 (39.36*)	23,876	-2.87	973
US Rose Coulee/ US 50th Ave S Moorhead	2430241	907.19	27,834	905.49	26,615	-1.7	-1,219
52nd Ave S Fargo/ 60th Ave S Moorhead	2438085	907.99	26,823	906.49	26,557	-1.5	-266
US ND Wild Rice River	2484618	911.06	28,091	911.72	29,278	0.66	1,187
US Diversion Extension	2512440	914.01	32,593	913.93	37,117	-0.08	4,525
Hickson Gage	2563878	918.59	31,648	918.53	31,491	-0.06	-157

* Flood stage at USGS Gaging Station 05054000, Fargo, ND

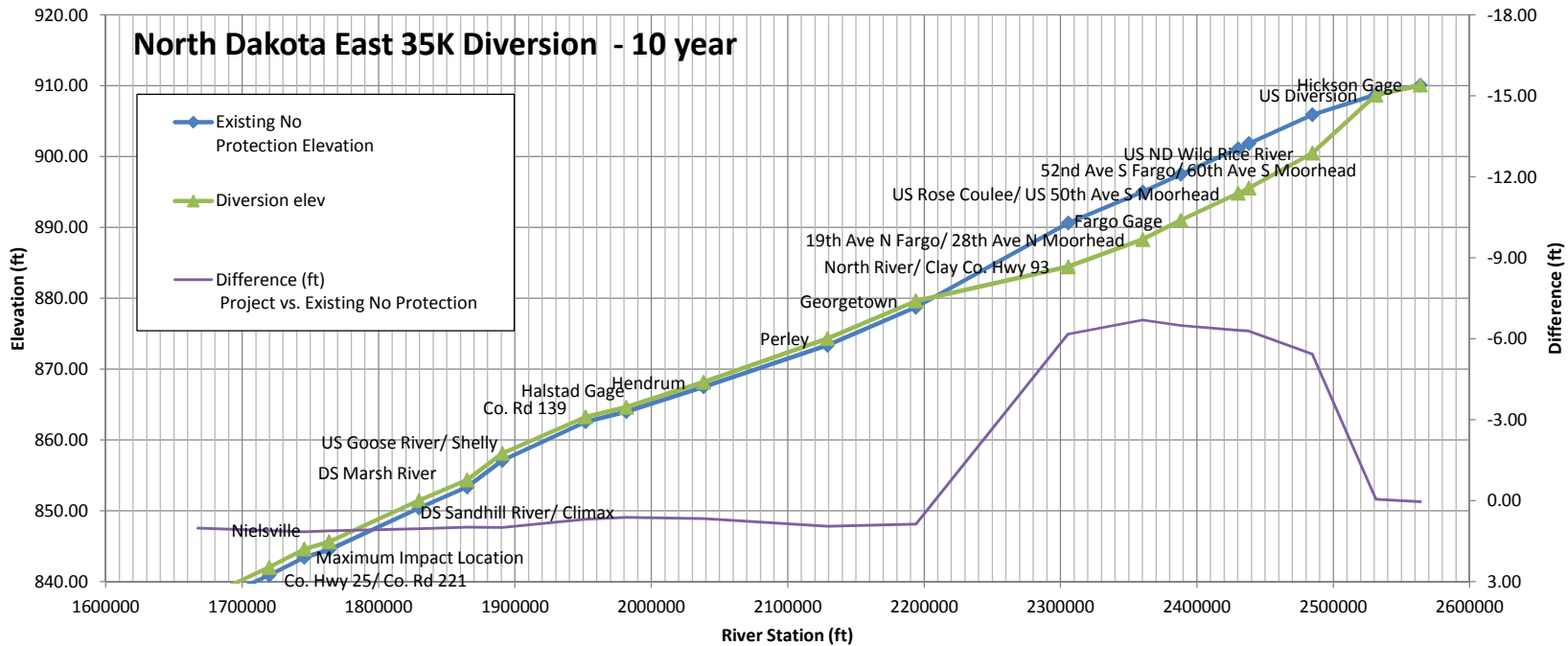


North Dakota East 35K Diversion - 10 year

7-20-10

Location	Station	Existing No Protection Elevation		ND East 35K Diversion Elevation		Difference Project vs. Existing No Protection	
		Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)
Thompson	1667665	836.31	42,496	837.33	45,422	1.02	2,925
Co. Hwy 25/ Co. Rd 221	1719816	840.92	42,335	842.03	45,243	1.11	2,908
Maximum Impact Location	1745606	843.43	42,258	844.59	45,150	1.16	2,892
DS Sandhill River/ Climax	1763746	844.51	42,221	845.64	45,106	1.13	2,886
Nielsville	1829650	850.4	39,145	851.45	42,049	1.05	2,904
DS Marsh River	1864960	853.37	38,925	854.36	41,806	0.99	2,881
US Goose River/ Shelly	1890722	857.11	35,909	858.11	38,600	1	2,691
Co. Rd 139	1951761	862.56	35,068	863.25	37,721	0.69	2,652
Halstad Gage	1981580	864	34,927	864.63	37,461	0.63	2,535
Hendrum	2038359	867.51	31,387	868.18	33,247	0.67	1,859
Perley	2129181	873.38	25,625	874.33	29,218	0.95	3,593
Georgetown	2193941	878.75	24,299	879.63	29,329	0.88	5,029
North River/ Clay Co. Hwy 93	2305647	890.63	12,912	884.46	10,025	-6.17	-2,887
19th Ave N Fargo/ 28th Ave N Moorhead	2360321	895.02	16,321	888.32	10,065	-6.7	-6,256
Fargo Gage (13th Ave S, 12th Ave S)	2388223	897.52 (34.78*)	16,548	891.03 (28.29*)	10,142	-6.49	-6,405
US Rose Coulee/ US 50th Ave S Moorhead	2430241	901.13	16,310	894.82	9,866	-6.31	-6,444
52nd Ave S Fargo/ 60th Ave S Moorhead	2438085	901.84	16,371	895.56	9,885	-6.28	-6,486
US ND Wild Rice River	2484618	905.92	10,610	900.49	7,331	-5.43	-3,279
US Diversion	2531338	908.76	9,995	908.71	10,417	-0.05	423
Hickson Gage	2563878	910.07	10,130	910.12	10,403	0.05	273

* Flood stage at USGS Gaging Station 05054000, Fargo, ND

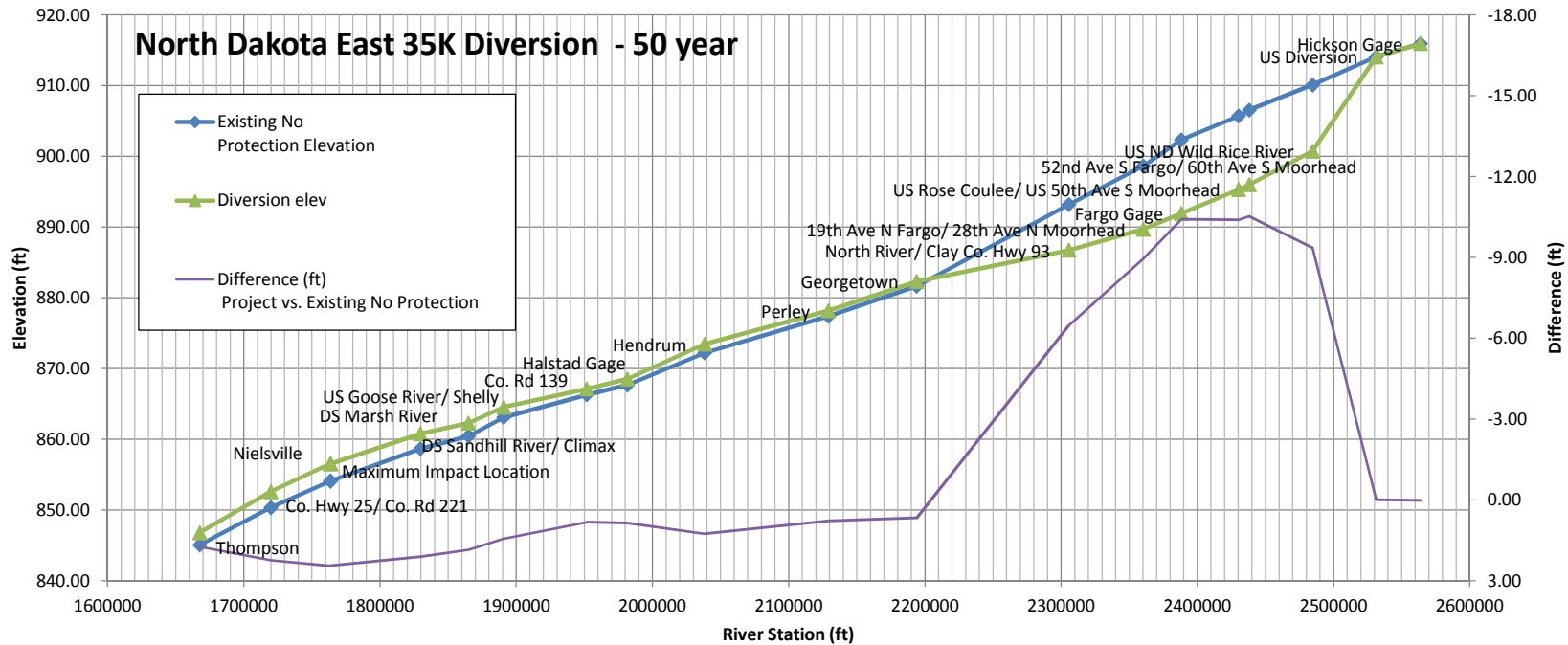


North Dakota East 35K Diversion - 50 year

7-20-10

Location	Station	Existing No Protection Elevation		ND East 35K Diversion Elevation		Difference Project vs. Existing No Protection	
		Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)
Thompson	1667665	845.05	72,642	846.79	84,264	1.74	11,622
Co. Hwy 25/ Co. Rd 221	1719816	850.34	72,475	852.58	84,052	2.24	11,576
Maximum Impact Location	1763493	854.08	72,344	856.53	83,895	2.45	11,551
DS Sandhill River/ Climax	1763746	854.1	72,346	856.54	83,893	2.44	11,547
Nielsville	1829650	858.65	67,787	860.76	78,975	2.11	11,188
DS Marsh River	1864960	860.44	67,359	862.29	78,561	1.85	11,203
US Goose River/ Shelly	1890722	863.09	61,020	864.53	71,563	1.44	10,543
Co. Rd 139	1951761	866.29	59,647	867.12	70,247	0.83	10,600
Halstad Gage	1981580	867.65	59,148	868.51	69,986	0.86	10,839
Hendrum	2038359	872.2	53,446	873.46	63,400	1.26	9,954
Perley	2129181	877.39	47,491	878.17	56,776	0.78	9,285
Georgetown	2193941	881.65	46,983	882.32	57,532	0.67	10,549
North River/ Clay Co. Hwy 93	2305647	893.19	18,361	886.72	10,248	-6.47	-8,113
19th Ave N Fargo/ 28th Ave N Moorhead	2360321	898.64	26,616	889.7	10,282	-8.94	-16,334
Fargo Gage (13th Ave S, 12th Ave S)	2388223	902.33 (39.59*)	24,168	891.92 (29.18*)	10,273	-10.41	-13,895
US Rose Coulee/ US 50th Ave S Moorhead	2430241	905.7	24,750	895.31	9,977	-10.39	-14,773
52nd Ave S Fargo/ 60th Ave S Moorhead	2438085	906.53	24,811	896	9,981	-10.53	-14,830
US ND Wild Rice River	2484618	910.09	20,035	900.74	7,492	-9.35	-12,543
US Diversion	2531338	914.08	20,369	914.08	20,552	0	183
Hickson Gage	2563878	915.94	20,671	915.96	20,732	0.02	61

* Flood stage at USGS Gaging Station 05054000, Fargo, ND

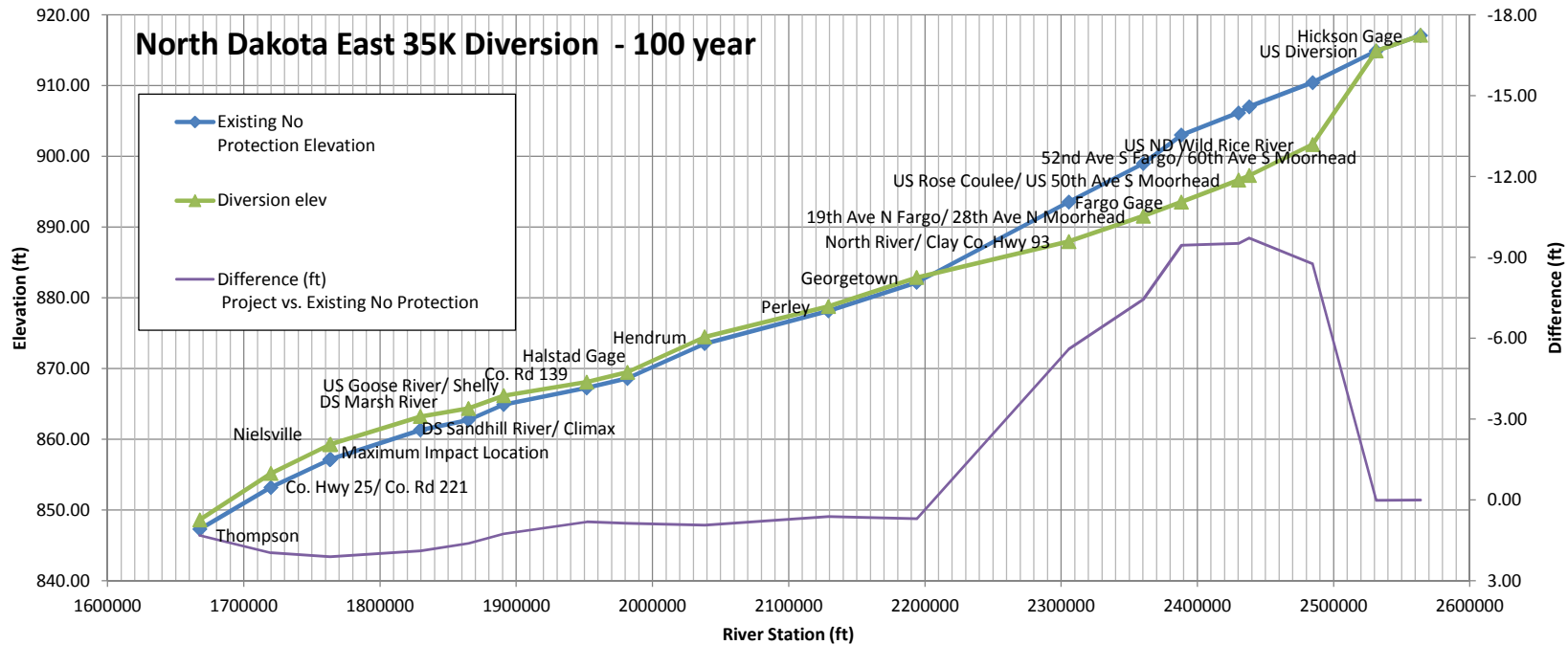


North Dakota East 35K Diversion - 100 year

7-20-10

Location	Station	Existing No Protection Elevation		ND East 35K Diversion Elevation		Difference Project vs. Existing No Protection	
		Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)
Thompson	1667665	847.29	87,604	848.61	98,882	1.32	11,279
Co. Hwy 25/ Co. Rd 221	1719816	853.2	87,277	855.17	98,553	1.97	11,276
Maximum Impact Location	1762993	857.12	87,017	859.24	98,312	2.12	11,294
DS Sandhill River/ Climax	1763746	857.18	87,019	859.29	98,321	2.11	11,301
Nielsville	1829650	861.31	81,731	863.21	92,837	1.9	11,105
DS Marsh River	1864960	862.75	81,136	864.37	92,348	1.62	11,212
US Goose River/ Shelly	1890722	864.91	72,481	866.17	82,449	1.26	9,969
Co. Rd 139	1951761	867.27	70,573	868.09	80,834	0.82	10,261
Halstad Gage	1981580	868.61	70,172	869.48	81,005	0.87	10,833
Hendrum	2038359	873.53	63,836	874.47	72,805	0.94	8,970
Perley	2129181	878.16	55,909	878.79	64,836	0.63	8,927
Georgetown	2193941	882.18	52,630	882.88	60,598	0.7	7,968
North River/ Clay Co. Hwy 93	2305647	893.55	18,891	887.96	11,352	-5.59	-7,539
19th Ave N Fargo/ 28th Ave N Moorhead	2360321	898.99	28,394	891.56	11,474	-7.43	-16,920
Fargo Gage (13th Ave S, 12th Ave S)	2388223	903.00 (40.26*)	25,009	893.55 (30.81*)	11,492	-9.45	-13,517
US Rose Coulee/ US 50th Ave S Moorhead	2430241	906.15	26,072	896.64	10,922	-9.51	-15,150
52nd Ave S Fargo/ 60th Ave S Moorhead	2438085	907.01	25,914	897.29	10,932	-9.72	-14,982
US ND Wild Rice River	2484618	910.44	22,329	901.68	8,149	-8.76	-14,180
US Diversion	2531338	914.89	24,161	914.91	24,236	0.02	74
Hickson Gage	2563878	917.11	24,586	917.12	24,527	0.01	-59

* Flood stage at USGS Gaging Station 05054000, Fargo, ND

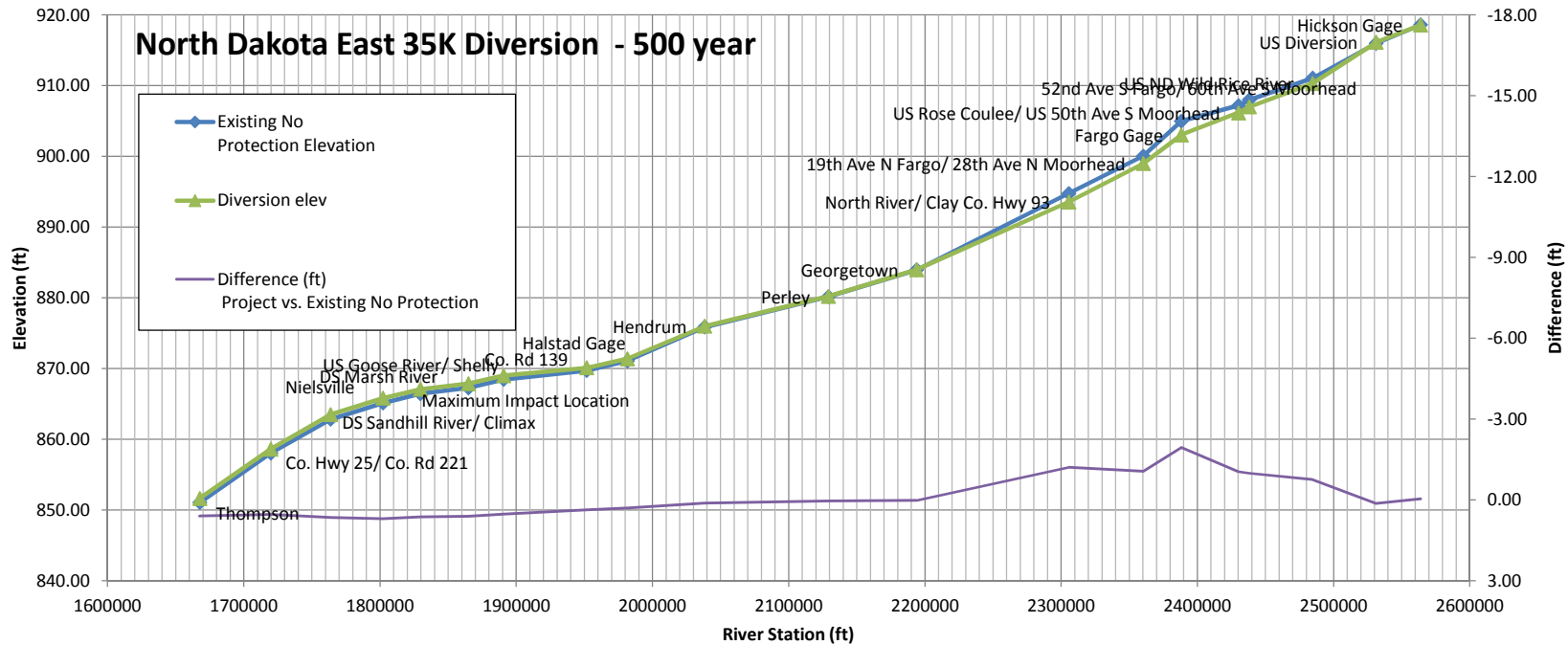


North Dakota East 35K Diversion - 500 year

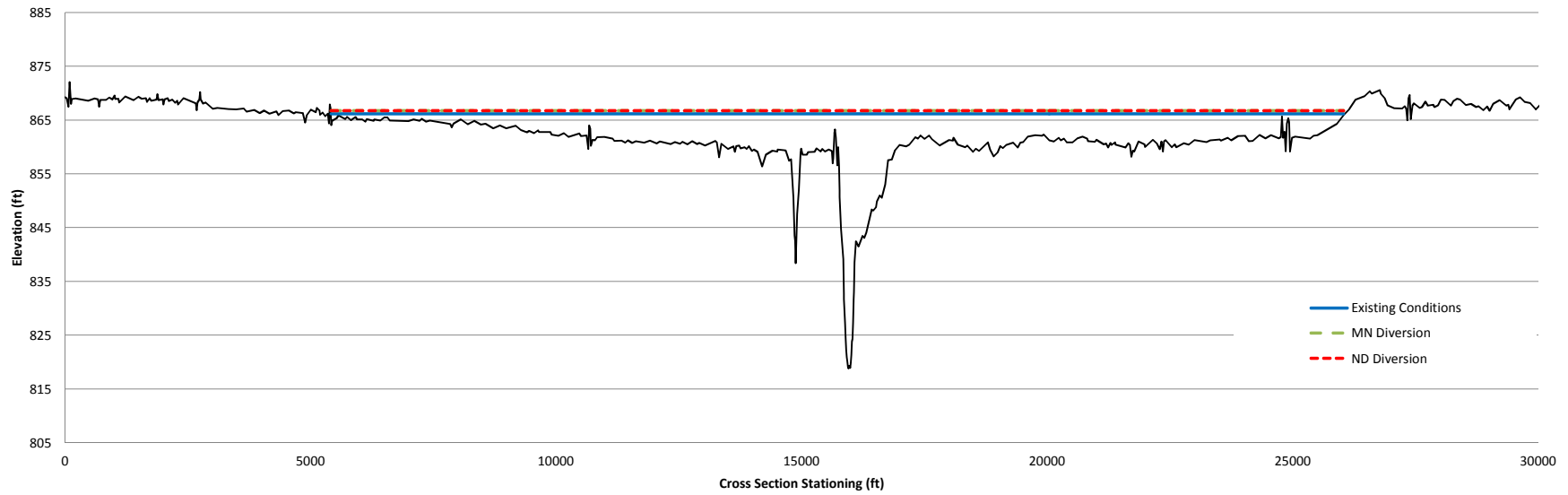
7-20-10

Location	Station	Existing No Protection Elevation		ND East 35K Diversion Elevation		Difference Project vs. Existing No Protection	
		Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)	Elevation (ft)	Discharge (cfs)
Thompson	1667665	851.04	122,285	851.64	127,989	0.6	5,704
Co. Hwy 25/ Co. Rd 221	1719816	858.05	122,068	858.6	128,296	0.55	6,229
DS Sandhill River/ Climax	1763746	862.83	122,050	863.49	128,342	0.66	6,292
Maximum Impact Location	1802119	865.12	115,996	865.82	122,170	0.7	6,174
Nielsenville	1829650	866.44	115,351	867.08	121,379	0.64	6,029
DS Marsh River	1864960	867.27	114,841	867.88	120,484	0.61	5,643
US Goose River/ Shelly	1890722	868.46	99,780	869	102,932	0.54	3,151
Co. Rd 139	1951761	869.72	97,673	870.1	99,651	0.38	1,977
Halstad Gage	1981580	871.07	97,651	871.38	99,970	0.31	2,319
Hendrum	2038359	875.86	89,641	875.98	90,459	0.12	818
Perley	2129181	880.17	87,236	880.22	87,279	0.05	43
Georgetown	2193941	883.96	60,077	883.98	64,712	0.02	4,635
North River/ Clay Co. Hwy 93	2305647	894.76	18,200	893.55	19,018	-1.21	818
19th Ave N Fargo/ 28th Ave N Moorhead	2360321	900.05	33,217	898.99	28,450	-1.06	-4,767
Fargo Gage (13th Ave S, 12th Ave S)	2388223	904.97 (42.23*)	22,903	903.03 (40.29*)	25,154	-1.94	2,251
US Rose Coulee/ US 50th Ave S Moorhead	2430241	907.19	27,834	906.14	26,137	-1.05	-1,697
52nd Ave S Fargo/ 60th Ave S Moorhead	2438085	907.99	26,823	907	25,853	-0.99	-970
US ND Wild Rice River	2484618	911.06	28,091	910.31	20,496	-0.75	-7,595
US Diversion	2531338	915.98	27,283	916.12	35,780	0.14	8,496
Hickson Gage	2563878	918.59	31,648	918.56	31,002	-0.03	-646

* Flood stage at USGS Gaging Station 05054000, Fargo, ND



100 Year - Red River Cross Section 1922451 (between Halstad and Shelly)



1

100 Year - Red River Cross Section 1759732 (between Climax and Thompson)

