

Appendix B.4 - TAG Key Criteria and Results Table

FM Diversion Task Force Technical Advisory Group Alternative Evaluation Key Criteria and Results (November 29, 2017)			Phase 8.1		Alt 1 - Flows Through Town				Alt 2 - Levees Only		Alt 3 - Dam Alignments			Alt 4 - Northern Storage		Alt 5 - 6in. Downstream Impacts		Alt 6 - WRR Diversion + Levees					
					1.A	1.B	1.C	1.D	2		3.A	3.B	3.C	4		5		6					
Criteria			Existing Conditions	Current Project 35 ft Through Town (baseline)	Current Diversion, Western Tieback, 35 ft Through Town,	Current Diversion, Western Tieback, 37 ft Through Town,	Current Diversion, Western Tieback, 38 ft Through Town,	Current Diversion, Western Tieback, 39 ft Through Town,	Levees Only		North Wild Rice River, Western Tieback, 35 ft Through Town,	NAA/VE13C, Western Tieback, 35 ft Through Town,	Current Diversion, Storage Area 1, Western Tieback, 35 ft Through Town,	Flows through Tributaries, Western Tieback, 35 ft Through Town	Current Diversion, Western Tieback, 35 ft Through Town, Downstream Impacts < 6in.	WRR Diversion Plus Levees, No Staging, No Red Gate, No Diversion Gate							
Criteria A - Satisfy Task Force Charter																							
	FEMA Accreditation	Y or N	-																				
	Maintain Federal Authorization	Y or N	-																				
Criteria B - Meets Laws and Ordinances																							
	ND Statute and Rules	Y or N	-																				
	MN Statute and Rules	Y or N	-																				
	Local Ordinances	Y or N	-																				
Criteria C - Minimize Residual Risk																							
	Life and Safety - Evacuation	Frequency	-																				
	Length of Levee/Dam	Length (ft)	-																				
	Height of Levee/Dam	Length (ft)	-																				
	Internal Floodplain/Drainage	# of Systems	-																				
	Dam Breach No Build Zone	Area (ac)	-																				
Criteria D - Upstream Floodplain Impacts ⁴				EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP		
	Cass County	Total Area (ac)		10,326	16,290	10,444	17,584	10,331	16,877	10,297	16,629	10,298	16,439	12,883	13,560	16,514	18,776	15,283	19,873	12,659	19,003	10,331	16,829
		Add'l Area (ac)			5,964		7,140		6,546		6,332		6,141		677		2,262		4,590		6,344		6,498
	Richland County	Total Area (ac)		3,263	4,387	3,304	4,357	2,853	3,567	2,719	3,347	2,672	3,245	0	0	1,205	1,279	2,073	2,343	2,692	3,305	3,251	4,088
		Add'l Area (ac)			1,124		1,053		714		628		573		0		74		270		613		837
North Dakota		Total Area (ac)		13,589	20,677	13,748	21,941	13,184	20,444	13,016	19,976	12,970	19,684	12,883	13,560	17,719	20,055	17,356	22,216	15,351	22,308	13,582	20,917
		Add'l Area (ac)			7,088		8,193		7,260		6,960		6,714		677		2,336		4,860		6,957		7,335
	Clay County	Total Area (ac)		1,989	12,229	1,990	11,977	1,988	10,768	1,984	10,351	1,978	10,156	5,689	8,788	5,513	15,894	2,977	12,289	1,949	10,310	1,987	10,974
		Add'l Area (ac)			10,240		9,987		8,780		8,367		8,178		3,099		10,381		9,312		8,361		8,987
	Wilkin County	Total Area (ac)		1,160	2,551	1,163	2,446	1,161	1,996	1,120	1,809	1,078	1,679	0	0	644	673	1,022	1,140	1,123	1,763	1,147	2,104
		Add'l Area (ac)			1,391		1,283		835		689		601		0		29		118		640		957
Minnesota		Total Area (ac)		3,149	14,780	3,153	14,423	3,149	12,764	3,104	12,160	3,056	11,835	5,689	8,788	6,157	16,567	3,999	13,429	3,072	12,073	3,134	13,078
		Add'l Area (ac)			11,631		11,270		9,615		9,056		8,779		3,099		10,410		9,430		9,001		9,944
Total (ND/MN)		Total Area (ac)		16,738	35,457	16,901	36,364	16,333	33,208	16,120	32,136	16,026	31,519	18,572	22,348	23,876	36,622	21,355	35,645	18,423	34,381	16,716	33,995
		Add'l Area (ac)			18,719		19,463		16,875		16,016		15,493		3,776		12,746		14,290		15,958		17,279
Criteria D - Protected Area Floodplain Impacts ⁵				EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP		
	Cass County	Total Area (ac)		61,335	14,190	61,335	14,207	61,335	18,368	61,335	21,759	61,335	24,394	61,335	45,138	53,781	13,164	55,956	13,891	58,838	14,878	61,335	21,670
		Add'l Area (ac)			0		0		0		0		0		0		0		0		0		0
	Clay County	Total Area (ac)		17,853	6,861	17,853	6,861	17,853	8,368	17,853	9,450	17,853	10,844	17,853	19,797	14,188	6,447	16,837	6,871	17,853	6,841	17,853	7,116
		Add'l Area (ac)			0		0		0		0		0		1,944		0		0		0		0
Total (ND/MN)		Total Area (ac)		79,188	21,051	79,188	21,068	79,188	26,736	79,188	31,209	79,188	35,239	79,188	64,935	67,969	19,611	72,794	20,762	76,690	21,719	79,187	28,786
		Add'l Area (ac)			0		0		0		0		0		1,944		0		0		0		0
Criteria E - Reduce Environmental Effects																							
		Similar, Better, Worse																					
Criteria F - Upstream Impacted Structures ⁴				EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP		
	Cass County	# of Res Structures			41		42		40		39		38		244		151		90		49		41
		# of Non-Res Structures			258		266		252		241		237		420		499		457		312		248
		Total # of Structures		139	299	139	308	139	292	139	280	139	275	527	664	430	650	319	547	182	361	139	289
		# of Additional Structures			160		169		153		141		136		137		220		228		179		150
	Richland County	# of Res Structures			3		3		3		2		2		0		0		1		2		3
		# of Non-Res Structures			61		58		44		39		36		0		13		20		37		54
		Total # of Structures		32	64	32	61	28	47	25	41	25	38	0	0	11	13	15	21	25	39	32	57
		# of Additional Structures			32		29		19		16		13		0		2		6		14		25
North Dakota		# of Res Structures			44		45		43		41		40		244		151		91		51		44
		# of Non-Res Structures			319		324		296		280		273		420		512		477		349		302
		Total # of Structures		171	363	171	369	167	339	164	321	164	313	527	664	441	663	334	568	207	400	171	346
		# of Additional Structures			192		198		172		157		149		137		222		234		193		175
	Clay County	# of Res Structures			20		20		19		17		17		15		45		24		17		19
		# of Non-Res Structures			211		209		185		178		172		117		306		198		174		189
		Total # of Structures		30	231	30	229	30	204	30	195	30	189	88	132	90	351	53	222	26	191	30	208
		# of Additional Structures			201		199		174		165		159		44		261		169		165		178
	Wilkin County	# of Res Structures			5		5		3		2		2		0		0		2		2		5
		# of Non-Res Structures			37		35		32		30		29		0		16		26		30		32
		Total # of Structures		23	42	23	40	23	35	23	32	23	31	0	0	15	16	23	28	23	32	23	37
		# of Additional Structures			19		17		12		9		8		0		1		5		9		14
Minnesota		# of Res Structures			25		25		22		19		19		15		45		26		19		24
		# of Non-Res Structures			248		244		217		208		201		117		322		224		204		221
		Total # of Structures		53	273	53	269	53	239	53	227	53	220	88	132	105	367	76	250	49	223	53	245
		# of Additional Structures			220		216		186		174		167		44		262		174		174		192

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Criteria			Existing Conditions		Current Project 35 ft Through Town (baseline)		1.A		1.B		1.C		1.D		2		3.A		3.B		3.C		4		5		6			
					Current Diversion, Western Tieback, 35 ft Through Town,		Current Diversion, Western Tieback, 37 ft Through Town,		Current Diversion, Western Tieback, 38 ft Through Town,		Current Diversion, Western Tieback, 39 ft Through Town,		Levees Only		North Wild Rice River, Western Tieback, 35 ft Through Town,		NAA/VE13C, Western Tieback, 35 ft Through Town,		Current Diversion, Storage Area 1, Western Tieback, 35 ft Through Town,		Flows through Tributaries, Western Tieback, 35 ft Through Town		Current Diversion, Western Tieback, 35 ft Through Town, Downstream Impacts < 6in.		WRR Diversion Plus Levees, No Staging, No Red Gate, No Diversion Gate					
Total (ND/MN)	# of Res Structures				69	70	65	60	59	259	196	117	70	68																
	# of Non-Res Structures				567	568	513	488	474	537	834	701	553	523																
	Total # of Structures		224	636	224	638	220	578	217	548	217	533	615	796	546	1,030	410	818	256	623	224	591								
	# of Additional Structures				412	414	358	331	316	181	484	408	367	367																
Criteria F - Protected Area Impacted Structures ⁵			EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP	EX	WP						
Cass County	# of Res Structures		15,536	20	15,536	20	15,536	71	15,536	115	15,536	194	15,536	901	15,287	27	15,355	31	15,397	43	15,536	116								
	# of Non-Res Structures		8,854	93	8,854	93	8,854	183	8,854	246	8,854	331	8,854	1,306	8,607	91	8,689	103	8,798	156	8,854	289								
	Total # of Structures		24,390	113	24,390	113	24,390	254	24,390	361	24,390	525	24,390	2,207	23,894	118	24,044	134	24,347	199	24,390	405								
	# of Additional Structures			0		0		0		0		0		0		0		0		0		0								
Clay County	# of Res Structures		637	9	637	9	637	30	637	41	637	63	637	170	618	9	622	10	623	9	637	10								
	# of Non-Res Structures		554	33	554	33	554	90	554	132	554	175	554	309	505	31	534	46	546	32	554	45								
	Total # of Structures		1,191	42	1,191	42	1,191	120	1,191	173	1,191	238	1,191	479	1,123	40	1,156	56	1,169	41	1,191	55								
	# of Additional Structures			0		0		0		0		0		0		0		0		0		0								
Total (ND/MN)			16,173	29	16,173	29	16,173	101	16,173	156	16,173	257	16,173	1,071	15,905	36	15,977	41	16,020	52	16,173	126								
			9,408	126	9,408	126	9,408	273	9,408	378	9,408	506	9,408	1,615	9,112	122	9,223	149	9,344	188	9,408	334								
			25,581	155	25,581	155	25,581	374	25,581	534	25,581	763	25,581	2,686	25,017	158	25,200	190	25,516	240	25,581	460								
				0		0		0		0		0		0		0		0		0		0								
Criteria G - Resilience/Robustness of Design																														
	Maintain FEMA Accreditation if future hydrology changes		Similar, Better, Worse																											
	Capability to Fight Floods larger than 100-year		Similar, Better, Worse																											
Criteria H - Cost and Engineering Feasibility																														
	Engineering Feasibility		Similar, Better, Worse																											
	Cost		Similar, Better, Worse																											
Criteria I / J - Upstream and Downstream Impacts																														
Downstream	Drayton, ND (30 mi. to Canada) ³	Elevation, (Impact, ft)	802.03	802.06 (0.03)	802.06 (0.03)	802.07 (0.04)	802.07 (0.04)	802.07 (0.04)	802.06 (0.03)	802.01 (-0.02)	802.07 (0.04)	802.06 (0.03)	802.06 (0.03)	802.07 (0.04)	802.06 (0.03)	802.07 (0.04)	802.12 (0.09)	802.42 (0.39)												
	Oslo, MN	Elevation, (Impact, ft)	813.42	813.44 (0.02)	813.44 (0.02)	813.44 (0.02)	813.44 (0.02)	813.44 (0.02)	813.44 (0.02)	813.41 (-0.01)	813.44 (0.02)	813.44 (0.02)	813.44 (0.02)	813.44 (0.02)	813.44 (0.02)	813.44 (0.02)	813.47 (0.05)	813.62 (0.2)												
	Grand Forks Gage	Elevation, (Impact, ft)	832.38	832.43 (0.05)	832.44 (0.06)	832.45 (0.07)	832.45 (0.07)	832.43 (0.05)	832.34 (-0.04)	832.46 (0.08)	832.43 (0.05)	832.44 (0.06)	832.49 (0.11)	832.63 (0.25)	833.45 (1.07)															
	Thompson, ND (Gage)	Elevation, (Impact, ft)	846.85	846.84 (-0.01)	846.84 (-0.01)	846.86 (0.01)	846.83 (-0.02)	846.79 (-0.06)	846.75 (-0.1)	846.88 (0.03)	846.84 (-0.01)	846.87 (0.02)	846.99 (0.14)	847.16 (0.31)	847.99 (1.14)															
	Climax, MN	Elevation, (Impact, ft)	857.08	857.05 (-0.03)	857.06 (-0.02)	857.09 (0.01)	857.04 (-0.04)	856.96 (-0.12)	856.93 (-0.15)	857.12 (0.04)	857.06 (-0.02)	857.12 (0.04)	857.31 (0.23)	857.56 (0.48)	858.90 (1.82)															
	Nielsenville, MN	Elevation, (Impact, ft)	861.16	861.12 (-0.04)	861.13 (-0.03)	861.15 (-0.01)	861.10 (-0.06)	861.02 (-0.14)	861.00 (-0.16)	861.18 (0.02)	861.13 (-0.03)	861.18 (0.02)	861.38 (0.22)	861.63 (0.47)	862.89 (1.73)															
	Shelly, MN	Elevation, (Impact, ft)	865.16	865.12 (-0.04)	865.13 (-0.03)	865.14 (-0.02)	865.11 (-0.05)	865.06 (-0.1)	865.06 (-0.1)	865.16 (0)	865.13 (-0.03)	865.16 (0)	865.29 (0.13)	865.44 (0.28)	866.17 (1.01)															
	Halstad, MN	Elevation, (Impact, ft)	868.27	868.22 (-0.05)	868.23 (-0.04)	868.23 (-0.04)	868.21 (-0.06)	868.17 (-0.1)	868.21 (-0.06)	868.24 (-0.03)	868.23 (-0.04)	868.26 (-0.01)	868.34 (0.07)	868.44 (0.17)	868.90 (0.63)															
	Hendrum, MN	Elevation, (Impact, ft)	872.61	872.49 (-0.12)	872.50 (-0.11)	872.51 (-0.1)	872.47 (-0.14)	872.41 (-0.2)	872.52 (-0.09)	872.53 (-0.08)	872.50 (-0.11)	872.55 (-0.06)	872.65 (0.04)	872.83 (0.22)	873.34 (0.73)															
	Perley, MN	Elevation, (Impact, ft)	877.31	877.26 (-0.05)	877.26 (-0.05)	877.27 (-0.04)	877.26 (-0.05)	877.24 (-0.07)	877.26 (-0.05)	877.27 (-0.04)	877.26 (-0.05)	877.29 (-0.02)	877.34 (0.03)	877.42 (0.11)	877.59 (0.28)															
	Georgetown, MN	Elevation, (Impact, ft)	881.83	881.93 (0.1)	881.93 (0.1)	881.96 (0.13)	881.95 (0.12)	881.94 (0.11)	881.77 (-0.06)	881.94 (0.11)	881.93 (0.1)	881.96 (0.13)	882.01 (0.18)	882.07 (0.24)	882.20 (0.37)															
	In-Town	Fargo/Moorhead (Fargo Gage ²)	Elevation, (Impact, ft)	903.22	897.56 (-5.66)	897.56 (-5.66)	899.71 (-3.51)	900.69 (-2.53)	901.71 (-1.51)	904.11 (0.89)	897.43 (-5.79)	897.57 (-5.65)	897.56 (-5.66)	897.60 (-5.62)	897.56 (-5.66)	899.10 (-4.12)														
				RS 40.5	RS 34.8	RS 34.8	RS 37	RS 38	RS 39	RS 41.4	RS 34.7	RS 34.8	RS 34.8	RS 34.9	RS 34.8	RS 36.4														
	Upstream	Upstream of Dam	Elevation, (Impact, ft)	Varies	921.66 (7.4)	921.54 (7.28)	920.87 (6.61)	920.64 (6.38)	920.51 (6.25)	909.85 (1.36)	916.79 (5.37)	918.83 (6.8)	920.64 (6.38)	921.01 (6.75)	921.24 (6.98)	913.20 (-1.06)														
Upstream	County Line @ Wild Rice River (xs 109018)	Elevation, (Impact, ft)	922.04	922.6 (0.56)	922.55 (0.51)	922.35 (0.31)	922.30 (0.26)	922.25 (0.21)	922.04 (0)	922.04 (0)	922.07 (0.03)	922.23 (0.19)	922.36 (0.32)	922.54 (0.5)	922.02 (-0.02)															
Upstream	County Line @ Red River (xs 2578502)	Elevation, (Impact, ft)	918.76	922.49 (3.73)	922.40 (3.64)	921.94 (3.18)	921.80 (3.04)	921.71 (2.95)	918.77 (0.01)	919.61 (0.85)	920.70 (1.94)	921.76 (3)	922.02 (3.26)	922.25 (3.49)	918.32 (-0.44)															

Criteria J - Included in Criteria I.

¹ POR = All Models Utilize Full Period of Record Hydrology (1882 and 1902-2009); 100-year discharge = 33,000 cfs

² USGS Gage 05054000 - Red River of the North at Fargo, ND (Gage Zero= 862.74 ft, NAVD88)

³ Impacts of 0.04 ft or less at Drayton indicate zero impacts at US/Canadian Border.

⁴ The Impacted Acreages and Structure totals are based on a takings analysis boundary that is defined based on an area where the depth difference between with-project and existing conditions is 0.1 foot or greater.

⁵ The Protected Area Acreages and Structure totals are based on a boundary that is defined based on an area between the line of protection on the south and any project features on the north, east and west sides.