

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																					
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																			
					EX		WP		EX		WP		EX		WP		EX		WP		EX		WP		EX		WP																			
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 <sup>4</sup>					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			
			Addnl 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			
			Addnl 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			
			Addnl 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			
			Addnl Area (ac)				10,240		9,987		8,780		8,779		8,178		3,099		9,312		9,312		9,312		9,312		9,312		9,312		9,312		9,312		9,312		9,312		9,312		9,312		9,312			
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			
			Addnl 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			
			Addnl Area (ac)				11,631		11,270		9,615		9,615		9,615		9,056		3,099		3,099		3,099		3,099		3,099		3,099		3,099		3,099		3,099		3,099		3,099		3,099		3,099		3,099	
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			
			Addnl 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 <sup>5</sup>					EX		WP		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			
			Addnl Area (ac)				0		0		0		0		0		0		0		0		0		0		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			
			Addnl Area (ac)				0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		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			
Addnl Area (ac)					0		0		0		0		0		0		0		1,944		0		0		1,944		0		0		0		0		0		0		0		0					
Criteria E - Reduce Environmental Effects																																														
			Similar, Better, Worse																																											
Criteria F - Upstream Impacted Structures <sup>4</sup>					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				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				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				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				137				222				234				193				175			
Clay County			# of Res Structures				20		20		19				17				15				45				151				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		22									

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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																	
								1.A		1.B		1.C		1.D		2		3.A		3.B		3.C		4		5		6																	
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 <sup>5</sup>						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	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	0	0	0	0	0	0	0	0	0	0																						
Total (ND/MN)						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		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		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) <sup>3</sup>	Elevation, (Impact, ft)		802.03	802.06 (0.03)	802.06 (0.03)	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)	802.06 (0.03)	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)	813.41 (-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)	813.44 (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) <sup>2</sup>	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)	922.02 (-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.

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

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

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

<sup>4</sup> The Impacted Acres 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.

<sup>5</sup> The Protected Area Acres 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.