

FM Diversion – Project Operations Discussion

**Diversion Authority
December 13, 2012**

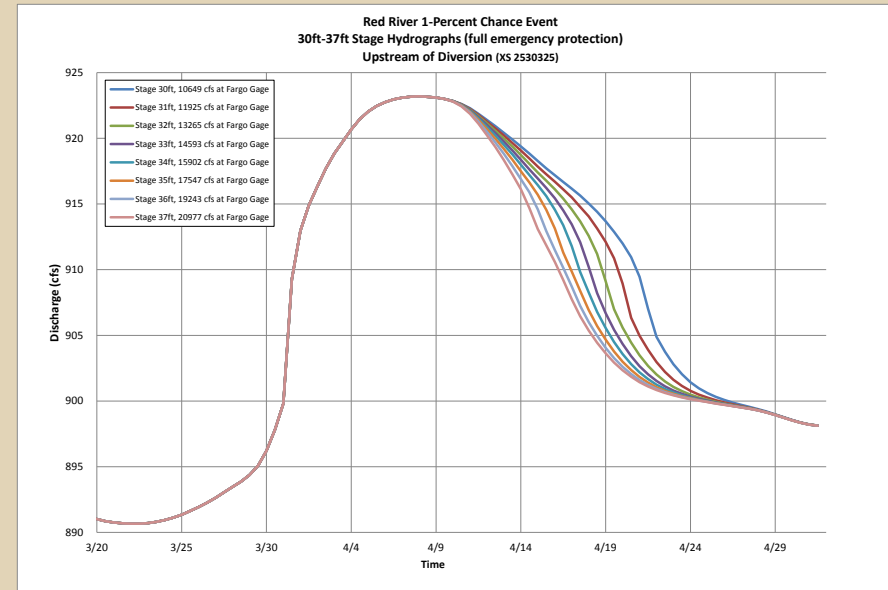
Agenda

- Addition of more Flow Through Town/In Town Levees and Diversion Inlet Gates
- Simulation of Staging Elevation and Duration for 10-, 50-, and 100-year flood events
- Staging area duration comparison

More Flow Through Town/In Town Levees

- Purpose:

- Reduced frequency and duration of project operation
- Eliminates need for Fish Passage on Red and Wild Rice River structures
- Reduces environmental impacts of project
- Significantly reduces the probability of summer operation



More Flow Through Town/In Town Levees

Event	Protection Level Flood Stage at Fargo Gage (13th Ave South)	Projected Protection Level Flood Stage at Fargo Gage Following Completion of ND Diversion Channel - Feasibility Phase
2009 Approx. 50-Year	40.8 feet±	30 feet±
10-Year	34.8 feet±	30-31 feet±
FEMA Preliminary 100-yr	39.4 feet±	
100-Year	42.4 feet±	30.8 feet±
500-Year	46.7 feet±	40 feet±

More Flow Through Town/In Town Levees

Residual Peak 100-yr Flood Stage, Discharge, and Approximate Existing Frequency Conditions

Residual 100-yr Flood Stage	Residual 100-yr Peak Discharge (cfs)	Approximate Existing Condition Frequency (yr)
RS30	10,700	3.6
RS31	11,900	4.8
RS32	13,300	6.0
RS33	14,600	7.1
RS34	15,900	8.4
RS35	17,500	10.2
RS36	19,200	11.4
RS37	21,000	12.9

In Town Levees

- ✓ Allow a Stage of 35-ft
- ✓ Able to pass approximately 17,000 cfs through town (compared to 9,600 cfs w/FRP)
- ✓ Effects on Project operation:
 - ✓ Reduce frequency and duration of operation
 - ✓ Based on history the project would NEVER have operated in the summer

Event (Year)	5-yr event	10-year event	Month	Last date	Last date
	Days >=9600	Days >=17,000		flows above 9,600 cfs	flows above 17,000 cfs
1943	8	--	April	4/11/1943	
1952	11	--	April	4/22/1952	
1965	3	--	April	4/16/1965	
1966	2	--	March	3/22/1966	
1969	13	6	March	4/24/1969	4/18/1969
1975	7	--	July	7/8/1975	
1978	10	1	March/April	4/9/1978	4/3/1978
1979	10	1	April	4/25/1979	4/19/1979
1989	7	3	April	4/13/1989	4/10/1989
1993	2	--	April	4/6/1993	
1994	7	--	March/April	4/6/1994	
1995	4	--	March	3/23/1995	
1995	3	--	March/April	4/2/1995	
1996	2	--	April	4/16/1996	
1997	29	20	April/May	5/5/1997	4/28/1997
2001	15	6	April	4/23/2001	4/17/2001
2005	2	--	June	6/18/2005	
2006	12	5	April	4/12/2006	4/7/2006
2007	7	--	June	6/12/2007	
2009	36	10	March/April	4/28/2009	4/3/2009
2009	5	--	June	6/24/2009	
2010	20	6	March/April	4/4/2010	3/24/2010
2011	30	11	April/May	5/4/2011	4/17/2011
Total	195	69			
Number of Events	23	10			
Avg. days >= event	10.7	6.9			
Median days/evt	7.0	5.5			
Events <= 7 Days	12	3			

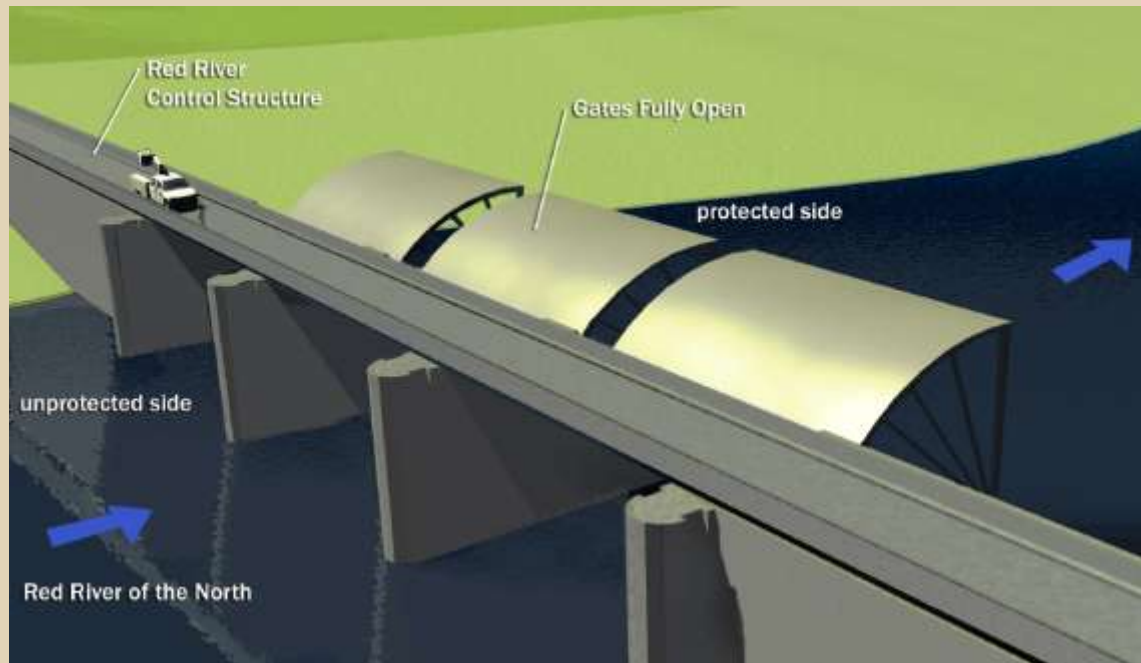
Diversion Inlet Gates

- Feasibility Study Included 90 foot wide fixed weir
- Advantages of adding adjustable gates
 - Reduces upstream staging elevations
 - Adds flexibility in operations
 - Affects timing of flows in diversion
 - Reduces environmental connectivity impacts
 - Provides more control of flow (within design constraints)
 - Variable flows to better match downstream conditions
 - Ability to drawdown staging area faster.



Fixed weir at Breckenridge, MN Diversion

Diversion Inlet Gates



Gates will be similar to gates on the Red River Control Structure

VE13A w/more Flow Through Town and Gates

Upstream Staging Area Elevations, FRP - Inlet Weir vs. VE13 Option A - Bundled Package			
Event Frequency	FRP - Inlet Weir	VE13 Option A - Bundled Package	Difference
10	914.40	909.46	-4.94
2	921.22	921.44*	0.22
1	922.98	922.04	-0.94
0.2	922.99	922.04	-0.95
103k cfs	925.40	923.70	-1.70
PMF	926.11	924.90	-1.21

Note: Elevations obtained upstream from the Red River Control Structure (RRN XS 2531315)

*2-percent chance event increase is due to lower downstream impacts for VE13A

Upstream Staging Area Simulation – VE13A w/ more Flow Through Town and Gates

- 10-PERCENT CHANCE (10-YEAR) VISUALIZATION

Upstream Staging Area Simulation – VE13A w/ more Flow Through Town and Gates

- 2-PERCENT CHANCE (50-YEAR) VISUALIZATION

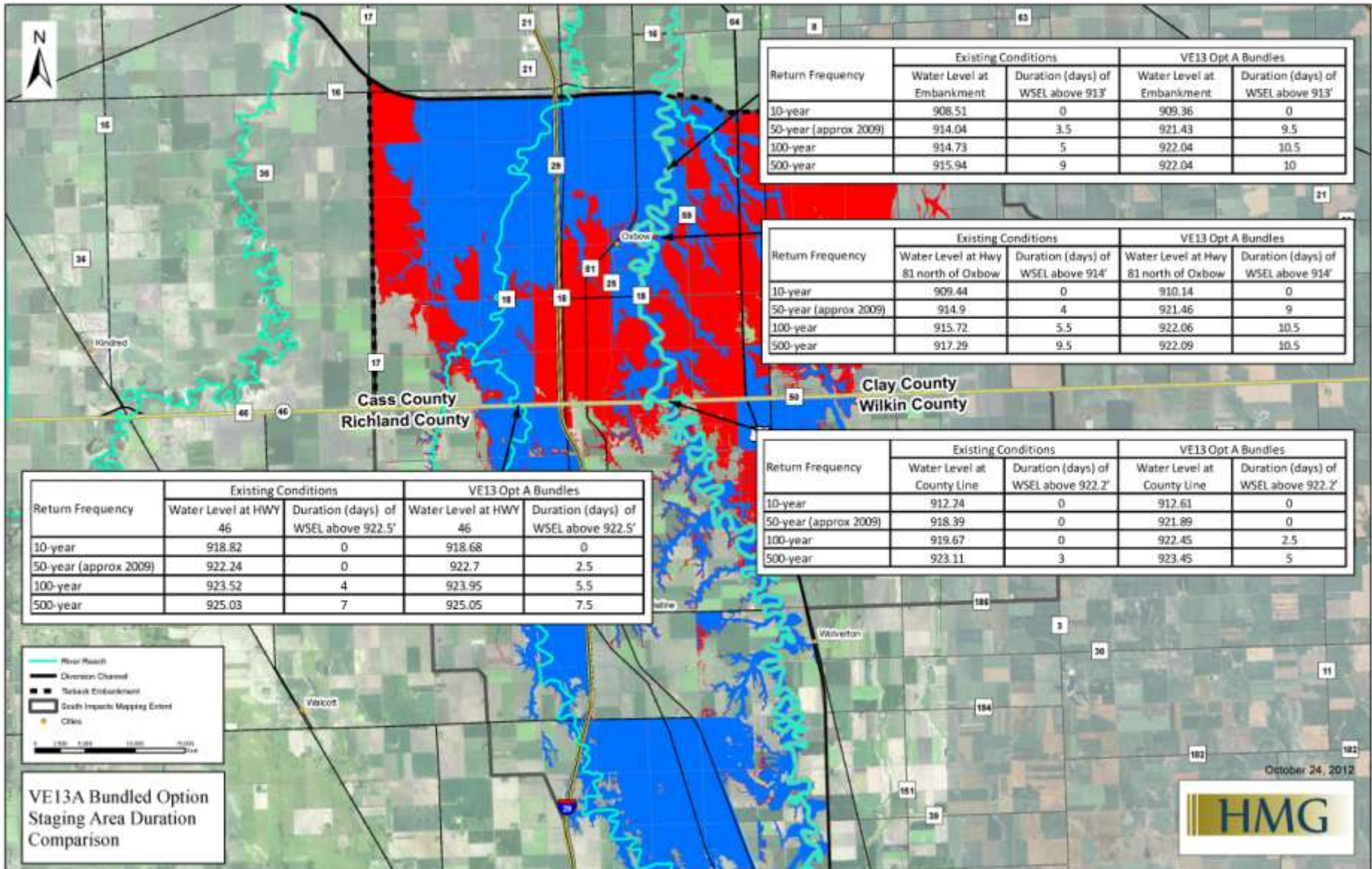
Upstream Staging Area Simulation – VE13A w/ more Flow Through Town and Gates

- 1-PERCENT CHANCE (100-YEAR) VISUALIZATION

Upstream Staging Area Simulation – VE13A w/ more Flow Through Town and Gates

- 1-PERCENT CHANCE (100-YEAR) DEPTH VISUALIZATION

Upstream Staging Area Duration Comparison



VE13A Bundled Option Staging Area Duration Comparison

October 24, 2012

