

FARGO-MOORHEAD
AREA
FLOOD RISK
MANAGEMENT –
ALTERNATIVES
CONSIDERED

**Presentation to:
Fargo-Moorhead Area Flood Diversion Task Force
October 23, 2017**

SEARCH FOR LOCAL SOLUTIONS

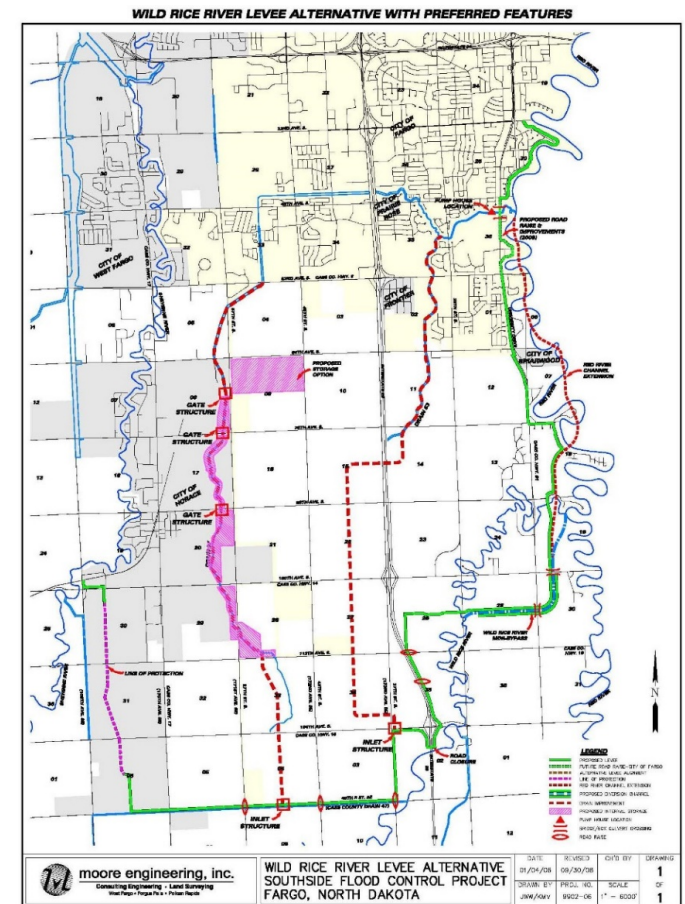
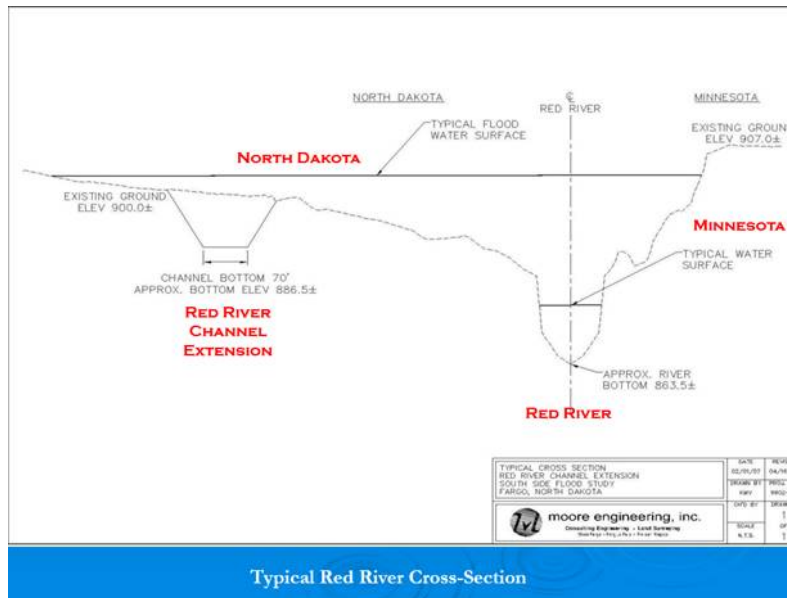
STARTING THE SEARCH LOCALLY

- 1997** Cass County initiates Flood Mitigation Study
- 2001** Study recommends Southside Flood Protection Project
 - Receives \$9.5 Million FEMA Grant
- 2002** Project/Funds transferred to City of Fargo
- 2006** 4 alternatives presented to public
- 2008** 5 alternatives presented to public
 - 60+ small group meetings
- 2009** Flood of Record made clear the need for a comprehensive project in Cass/Clay Counties, Fargo/Moorhead



SOUTHSIDE FLOOD PROTECTION PLAN

- Wild Rice River levee
- Drain extensions
- Internal storage areas
- A small diversion
- Channel extensions (in North Dakota and Minnesota)



FEDERAL PROJECT

SEEKS A REGIONAL SOLUTION FOR FLOOD DAMAGE REDUCTION IN THE FM METROPOLITAN AREA

- 2008-2011: Federal Feasibility Study
- 2012: Post Feasibility Southern Alignment Analysis
- 2013: Supplemental Environmental Assessment
- 2014: Federal Authorization (WRDA)
- 2016: Federal Appropriation for Construction
- 2016: Project Partnership Agreement Executed.

Project Purpose:

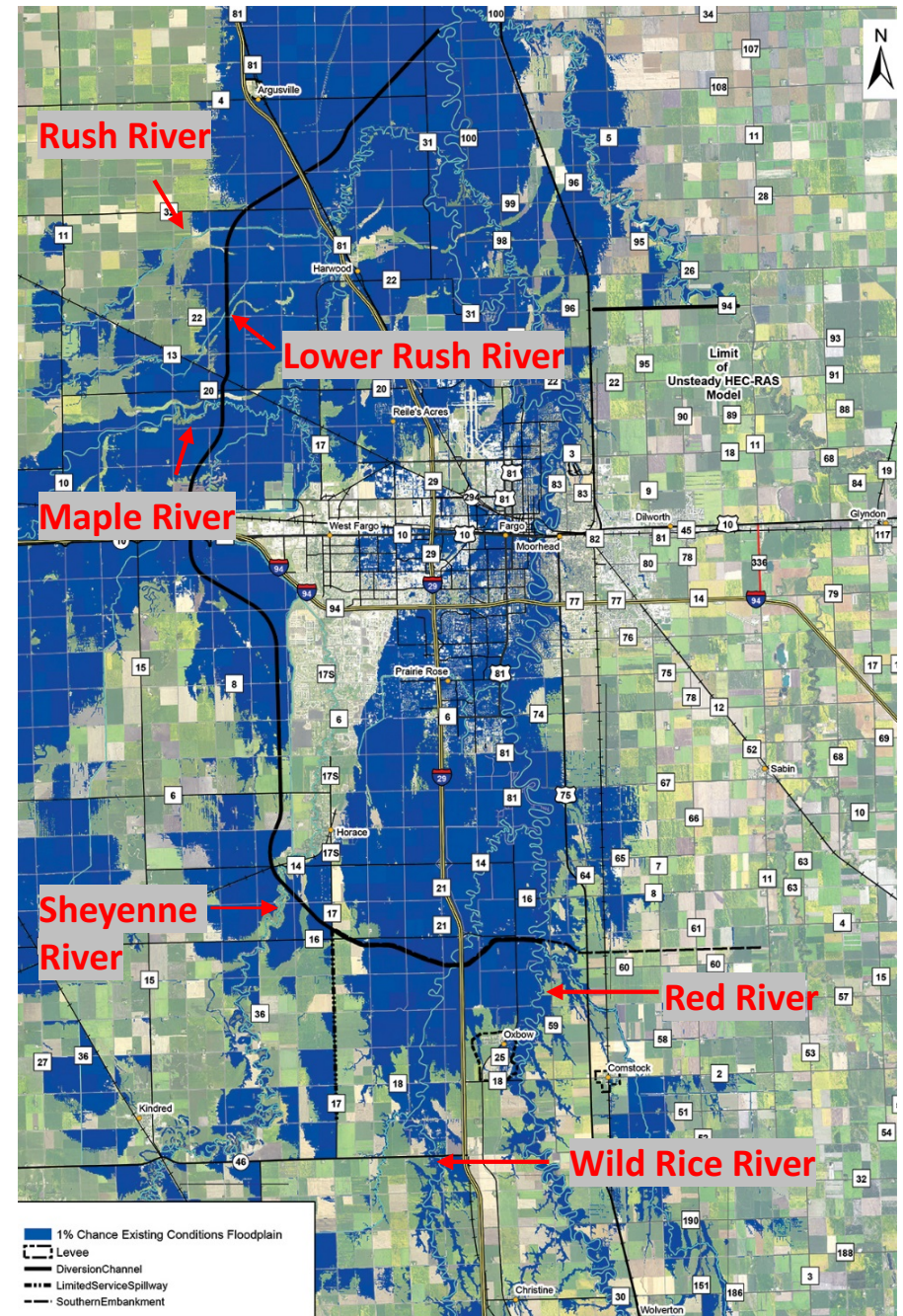
...”Reduce flood risk and flood damages in the Fargo-Moorhead metropolitan area.”

Source: USACE Final Feasibility Report and Environmental Impact Statement – July, 2011

STUDY AREA

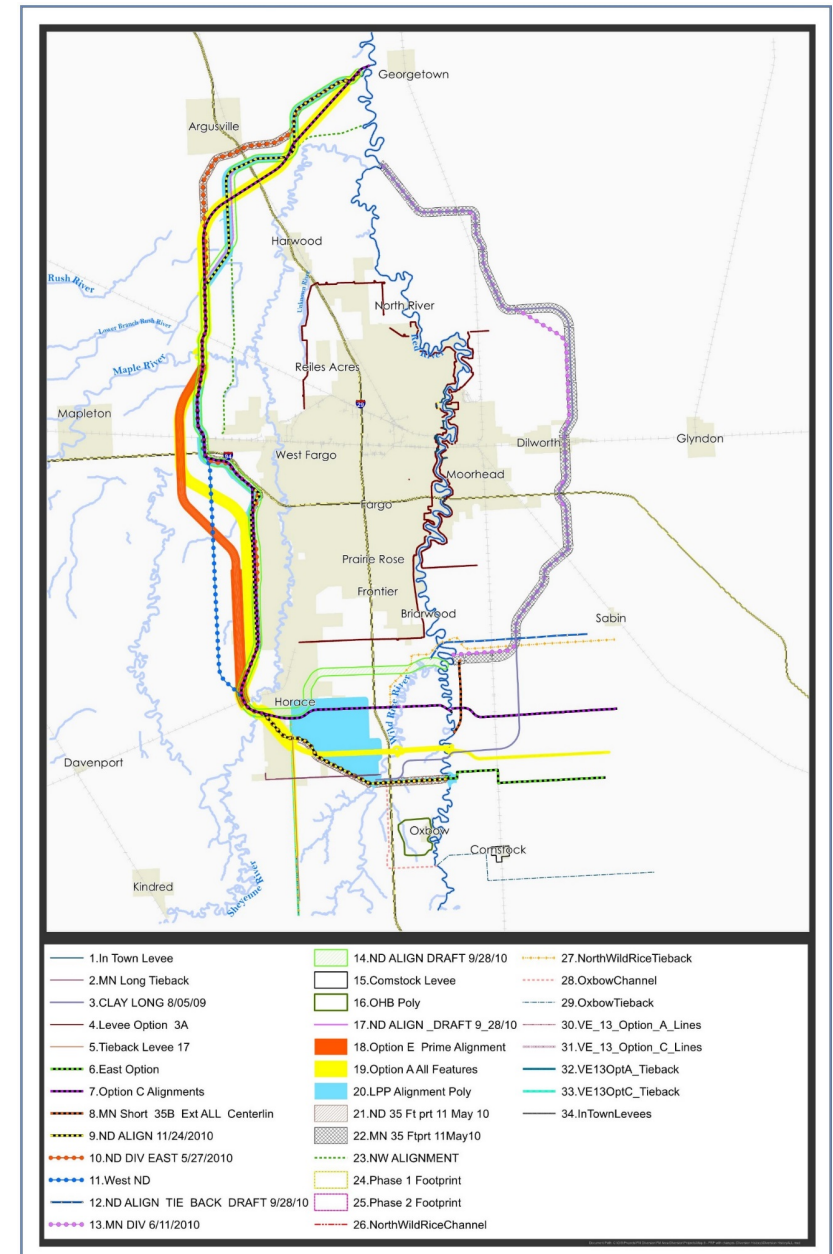
- Fargo-Moorhead metropolitan & surrounding area

- North: Harwood, ND & Kragens, MN
- South: Oxbow, ND
- East: Dilworth, MN
- West: West Fargo, ND



USACE PLANNING PROCESS

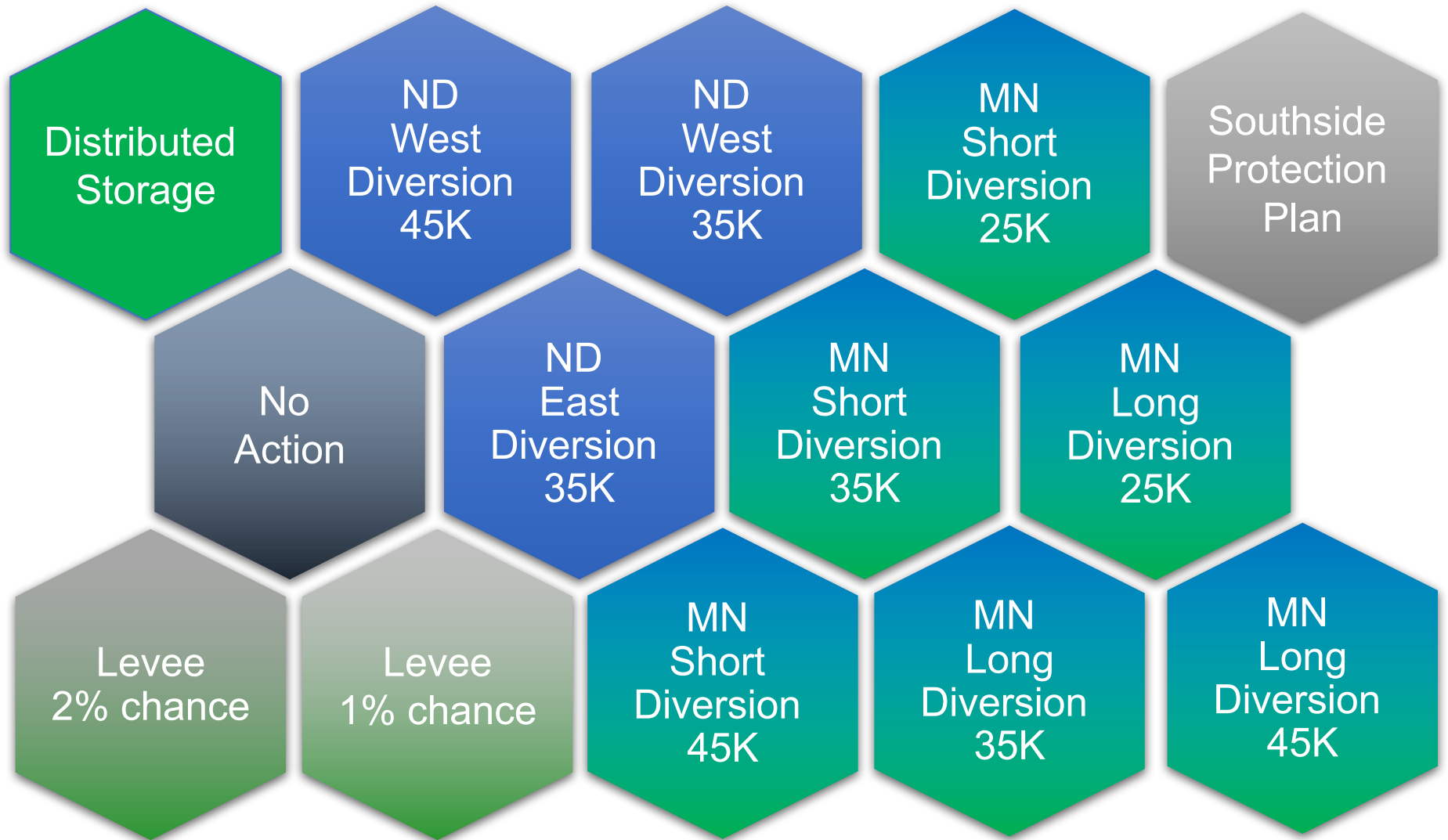
1. Specify problems and opportunities.
2. Inventory and forecast conditions.
3. Formulate alternative plans.
 - Over 70 alternatives and combinations of alternatives were considered during Feasibility and post-Feasibility studies
4. Evaluate effects of alternative plans.
5. Compare alternative plans.
6. Select recommended plan.



INITIAL SCREENING CRITERIA

- **Effectiveness:** Ability to provide acceptable level of flood risk management
- **Environmental Effects:** Effects on natural and cultural resources
- **Social Effects:** Effects on socio-economic resources
- **Acceptability:** Controversy and potential effects on community
- **Implementability:** Technical, social, legal or institutional issues
- **Cost:** The first cost of the project and operations and maintenance
- **Risk:** The uncertainties surrounding the project
- **Separable Mitigation:** Is separable mitigation required and what is the cost
- **Cost Effectiveness:** Comparison of benefits and costs

Numerous Alternatives Considered



NON- STRUCTURAL FLOOD PROOFING

- Relocation of Structures in Flood Plain
- Buyout and Demolition of Structures
- Raising of Structures



Home Relocation in Grand Forks, ND



Building Demolition in Grand Forks, ND

FLOOD BARRIERS / LEVEES / FLOODWALLS

- Earthen Levees
- Flood Walls
- Pump Stations
- Gated Closures



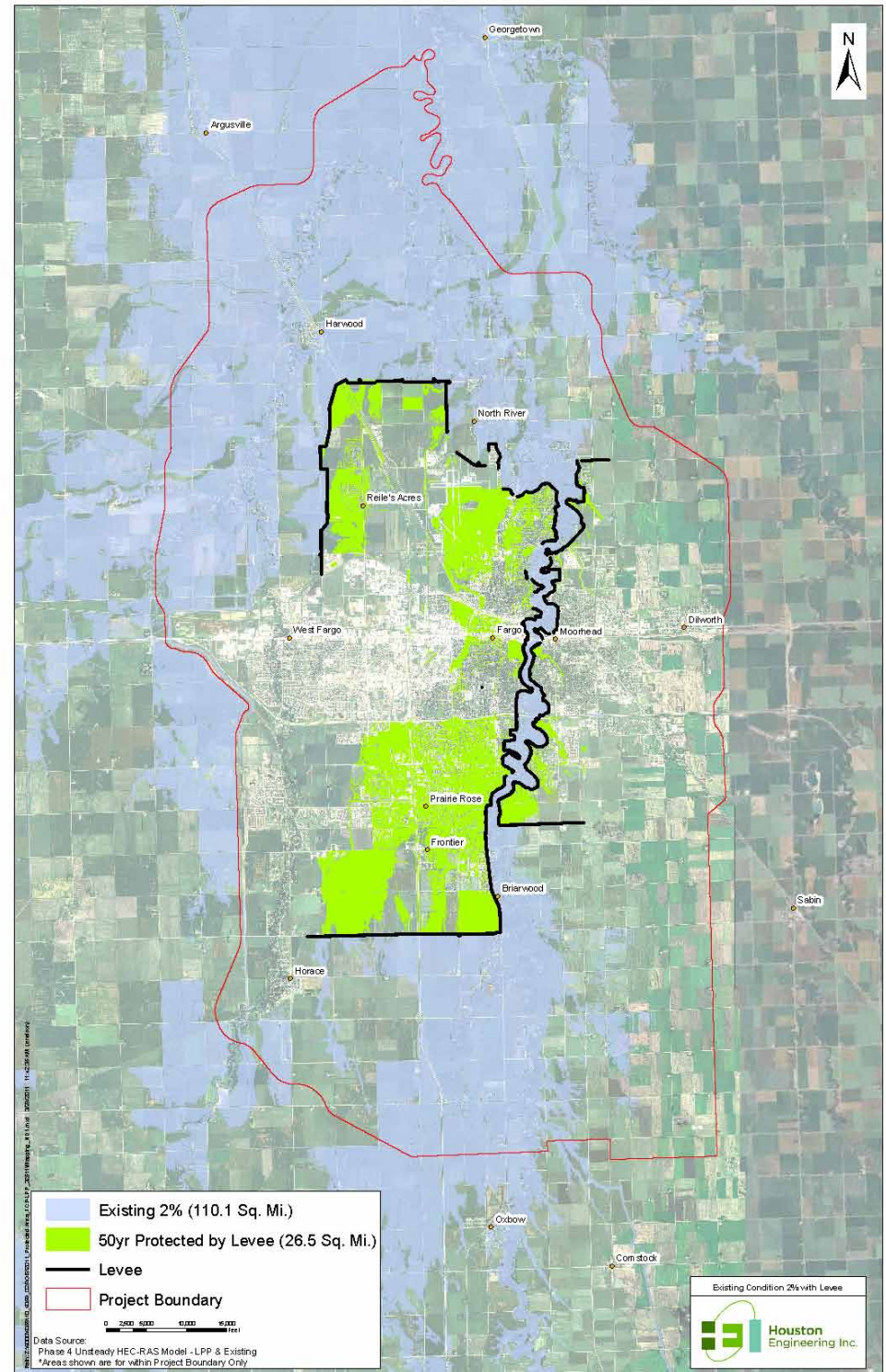
Levee and Pump Station in Grand Forks



Invisible Floodwall at St. Anne's, Grand Forks

Levee Only Alternative

- Max. level of protection of approx. a 50-year flood (USACE).
- Flood insurance will still be required.
- Potential upstream and downstream impacts – mitigation will increase cost.



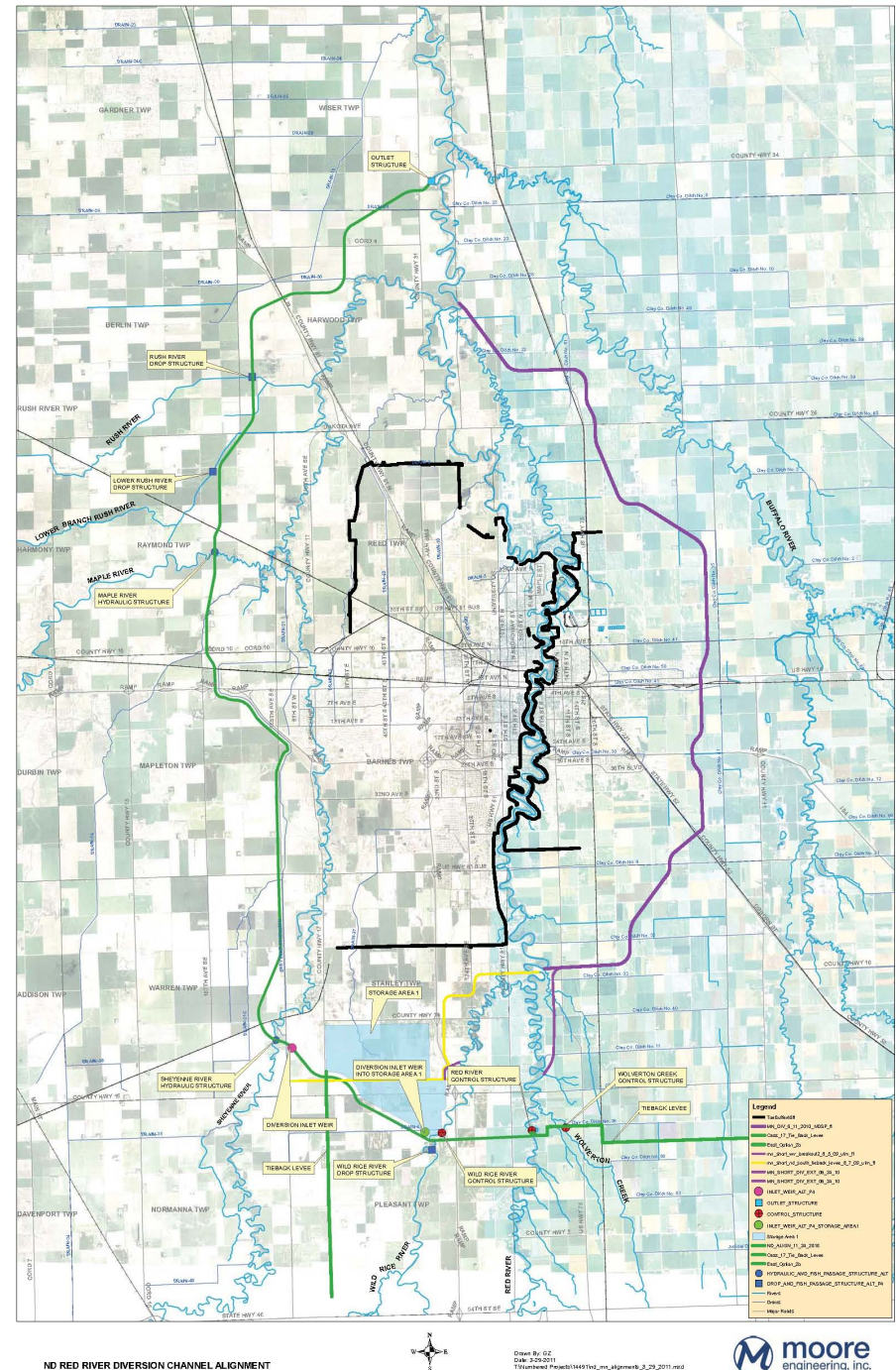
DIVERSION CHANNEL

- Would re-route a portion of the flood water around Fargo – Moorhead.
- Considered alternative alignments in both ND and MN.

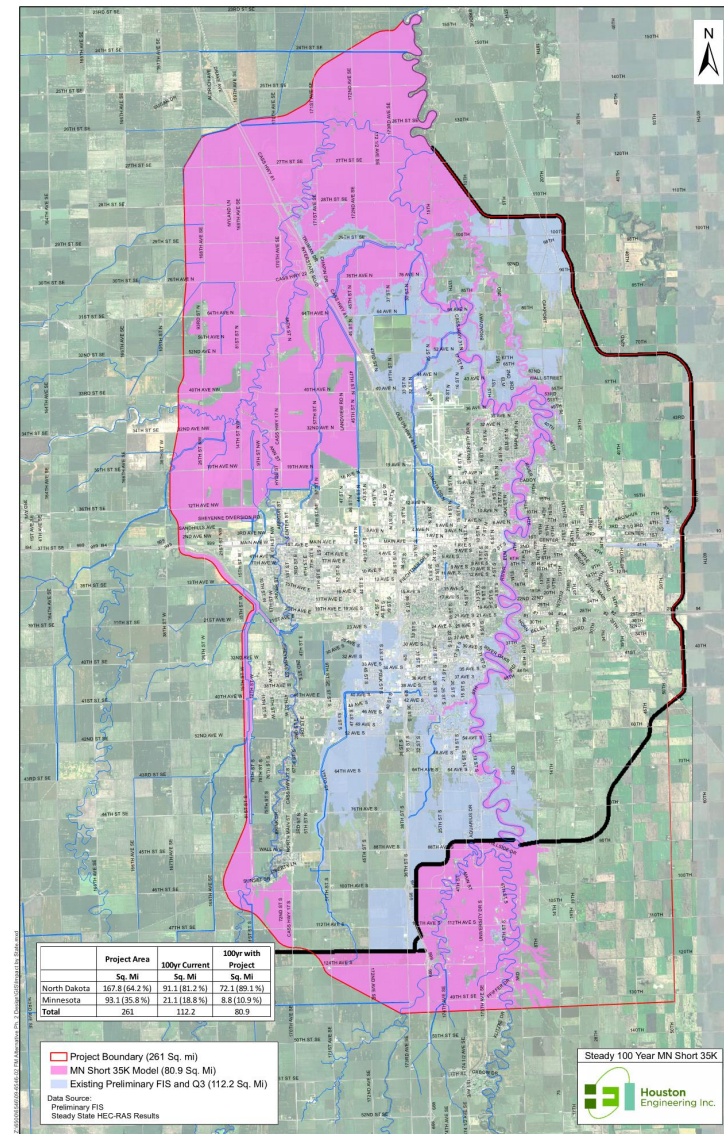
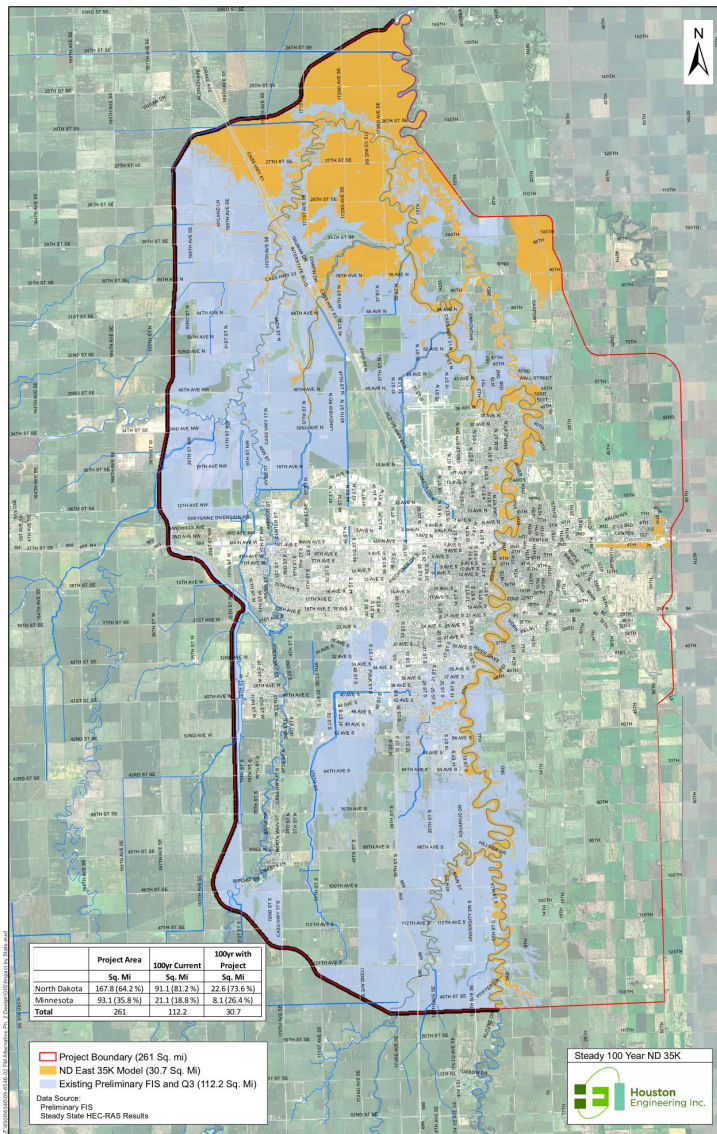


DIVERSION CHANNEL

- Diversion Project in Winnipeg in place since 1969
- Sheyenne Diversion continues to succeed in West Fargo, North Dakota
- Wahpeton/Breckenridge Diversion protected community during the 2009 flood and has paid for itself multiple times already



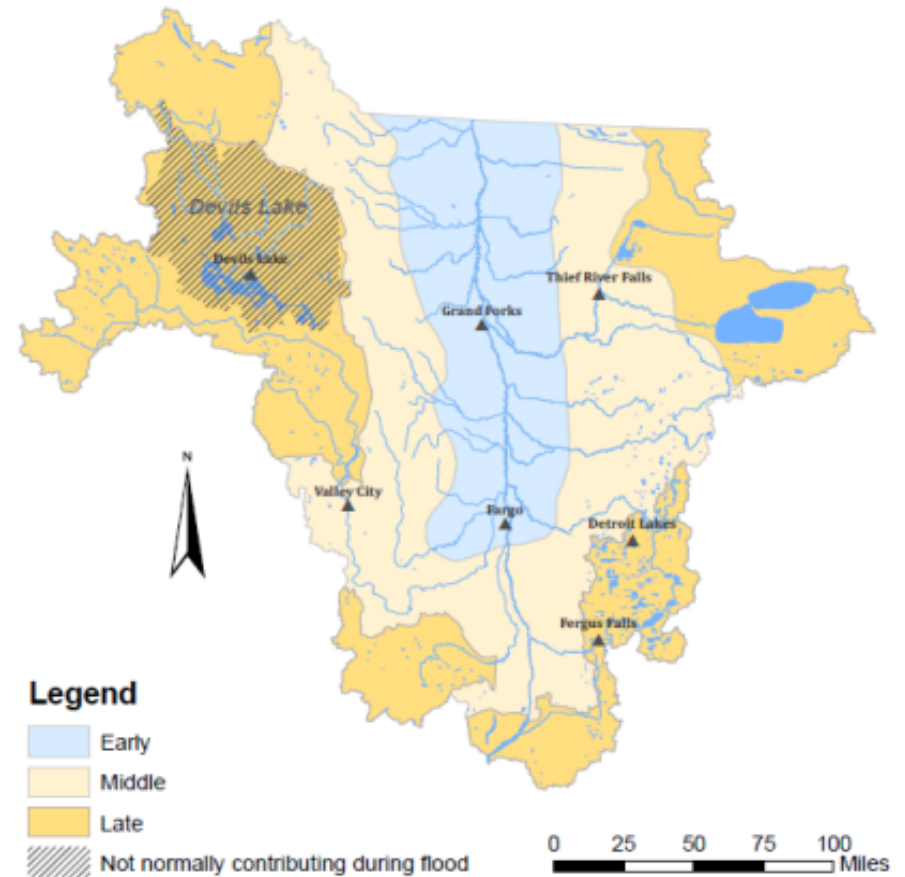
ND AND MN DIVERSION OPTIONS



- MN Diversion does not protect from Western Tributaries
- Concerns with Buffalo Aquifer, BNSF Rail Yard and City of Dilworth – MN Diversion
- 6500 acres under diversion footprint for MN Diversion

DISTRIBUTED STORAGE/UPSTREAM RETENTION

- 400,000 acre-feet of storage needed for 1.6 ft stage reduction during 100 Year flood (USACE)
- 270,000 acre-feet of storage needed to provide 2 ft reduction during 1997 flood (<50-year) (RRBC)
- Location of runoff could limit effectiveness
- Also considered alternatives such as waffle plan, controlled field runoff (drain tile), water redistribution that were screened out
- Water retention is an Important long-term water management strategy



OTHER ALTERNATIVES CONSIDERED

- Flattening the slopes of the riverbank
- Underground Tunnels
- Interstate 29 viaduct
- Dredge river deeper and wider

MINNESOTA EIS

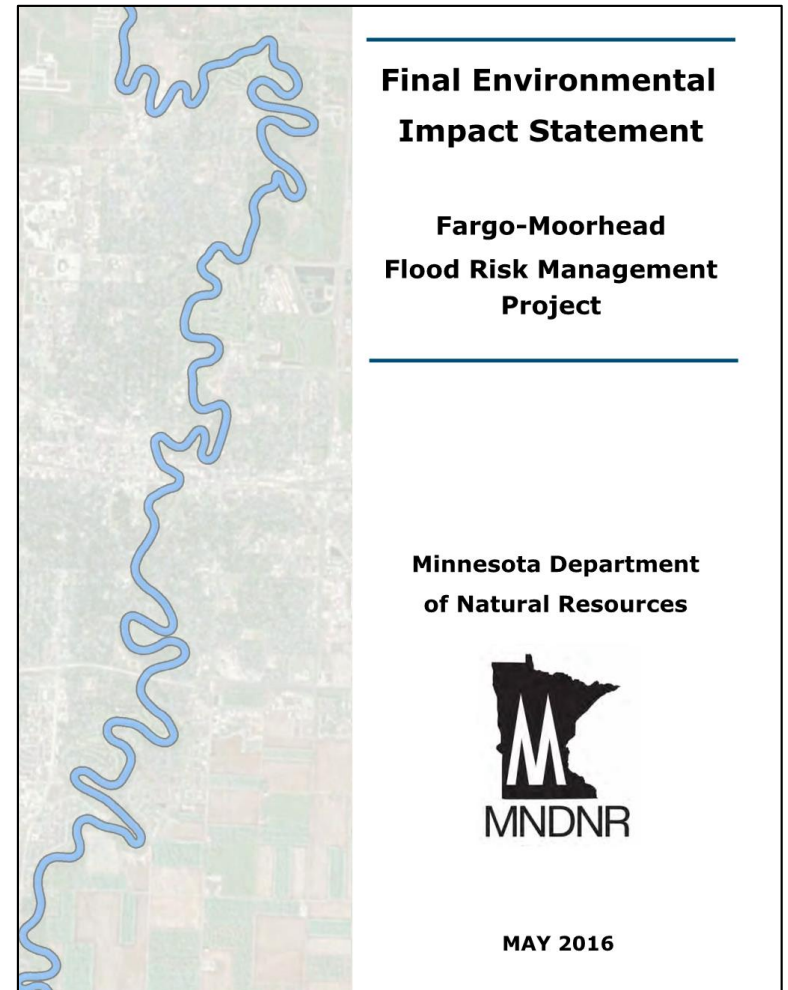
MINNESOTA EIS

- Initiated Scoping Process in February, 2012 ; Final EIS published in May, 2016
- Project Team:
...comprised of the MNDNR, Diversion Authority, and USACE. The MNDNR served as the lead agency in preparing the EIS and facilitating the state EIS process
- Project Purpose:
 1. *Reduce flood risk potential associated with a long history of frequent flooding on local streams including the Red River, Sheyenne, Wild Rice (North Dakota), Maple, Rush, and Lower Rush Rivers passing through or into the F-M metropolitan area,*
 2. *Qualify substantial portions of the F-M metropolitan area for 1-percent chance flood (i.e. 100-year flood) accreditation (i.e., meets the standard to be shown on Flood Insurance Rate Maps as providing protection) by the Federal Emergency Management Agency (FEMA) under the National Flood Insurance Program; and*
 3. *Reduce flood risk for floods exceeding the 100-year flood or greater, given the importance of the F-M metropolitan area to the region and the recent frequencies of potentially catastrophic flood events.*

Source: Minnesota Department of Natural Resources - Final Environmental Impact Statement – Fargo-Moorhead Flood Risk Management Project, May, 2016.

MINNESOTA EIS ALTERNATIVE SCREENING

- In Addition to the Proposed Project, Alternatives Carried Forward for Evaluation in the EIS included:
 - Northern Alignment Alternative
 - Base No Action Alternative
 - No Action Alternative (with Emergency Measures)
- Alternatives Carried Forward but Dismissed during the EIS:
 - Distributed Storage Alternative
 - More Flows Through Town Alternative



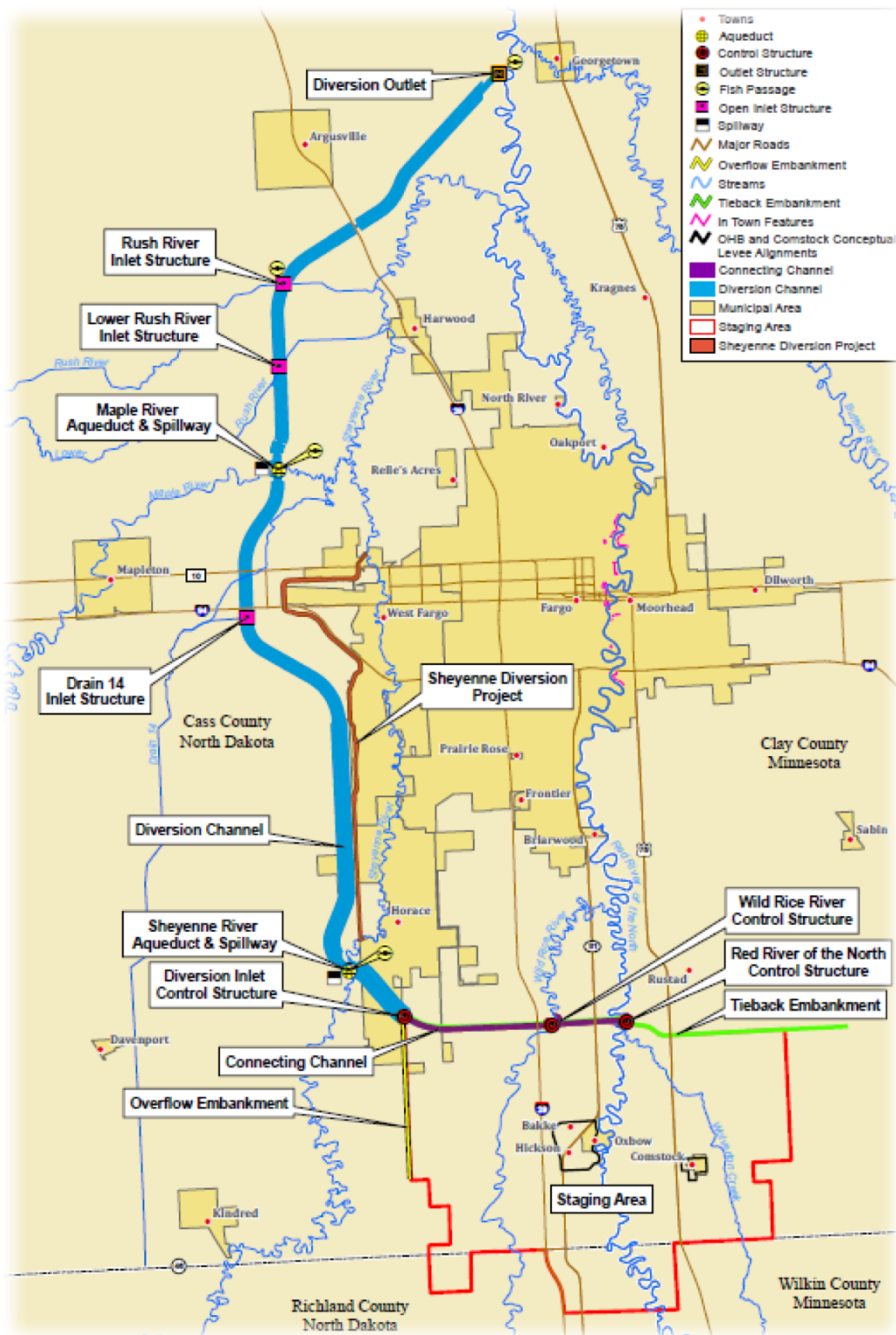
MN EIS Alternative Re-Screening

Table 1. Fargo-Moorhead EIS – Summary of Purpose & Need and Alternative Rescreen

ID	Alternative Name	Step 1. Was the alternative screened out in Scoping based on DEIS Purpose & Need?	Step 2. Do we believe it can get FEMA accreditation?	Step 3. Is the proposal a reasonable alternative to the proposed project (i.e., not challenged by physical limitations, factors of time, cost, land acquisition, or political or regulatory issues?) (Minn. Rules 4410.2300, item G)?	Step 4. a. Does the alternative have significant environmental benefit compared to the project as proposed? b. If no, is it similar? (Minn. Rules 4410.2300, item G). "Yes" or "similar" answers proceed. "No" responses stop here.	Step 5. Does it have substantially less adverse socioeconomic impact over Proposed Project? (Minn. Rules 4410.2300, item G)
10	Flood Storage + Control Structure + Staging (no diversion, 100-year flows)	Y	Y	Y	a. NO. b. YES, similar.	N
14	Project + Reduced staging	Y	Y	Y	a. NO. b. YES, similar.	N
19	NWRR	n/a	Y	Y	a. NO. b. YES, similar.	N
26	Shared Upstream/Downstream Burden	n/a	Y	Y	a. NO. b. YES, similar.	N
4	Diversion in MN/ND	Y	Y	Y	N	
3	MN 35K	Y	Y	N		
12	DSA	N	Y	N		
15	DSA + More	n/a	Y	N		
16	Project + DSA	n/a	Y	N		
18	MN 35K + More	n/a	Y	N		
29	NWRR + DSA + Existing floodplain storage	n/a	Y	N		
5	Nonstructural Measures	Y	N			
7	Flood Barriers	Y	N			
9	Flood Storage	Y	N			
11	ND Diversion, no dam	Y	N			
17	ND/SD Retention	n/a	N			
20	Restoration	n/a	N			
21	Fargo FDR	n/a	N			
22	Dredge the River/Dynamite	n/a	N			
23	Internal Storage	n/a	N			
24	Increase Northern Flows, no Project	n/a	N			
25	Outlet into MN River	n/a	Unavailable info			
27	Divert Wild Rice into Sheyenne	n/a	N			
28	Change Wild Rice Peak	n/a	N			
8	I-29 Viaduct	N				
6	Tunneling	N				
2a&b	No Action Alternatives	N				
1&13	Proposed Project	N				

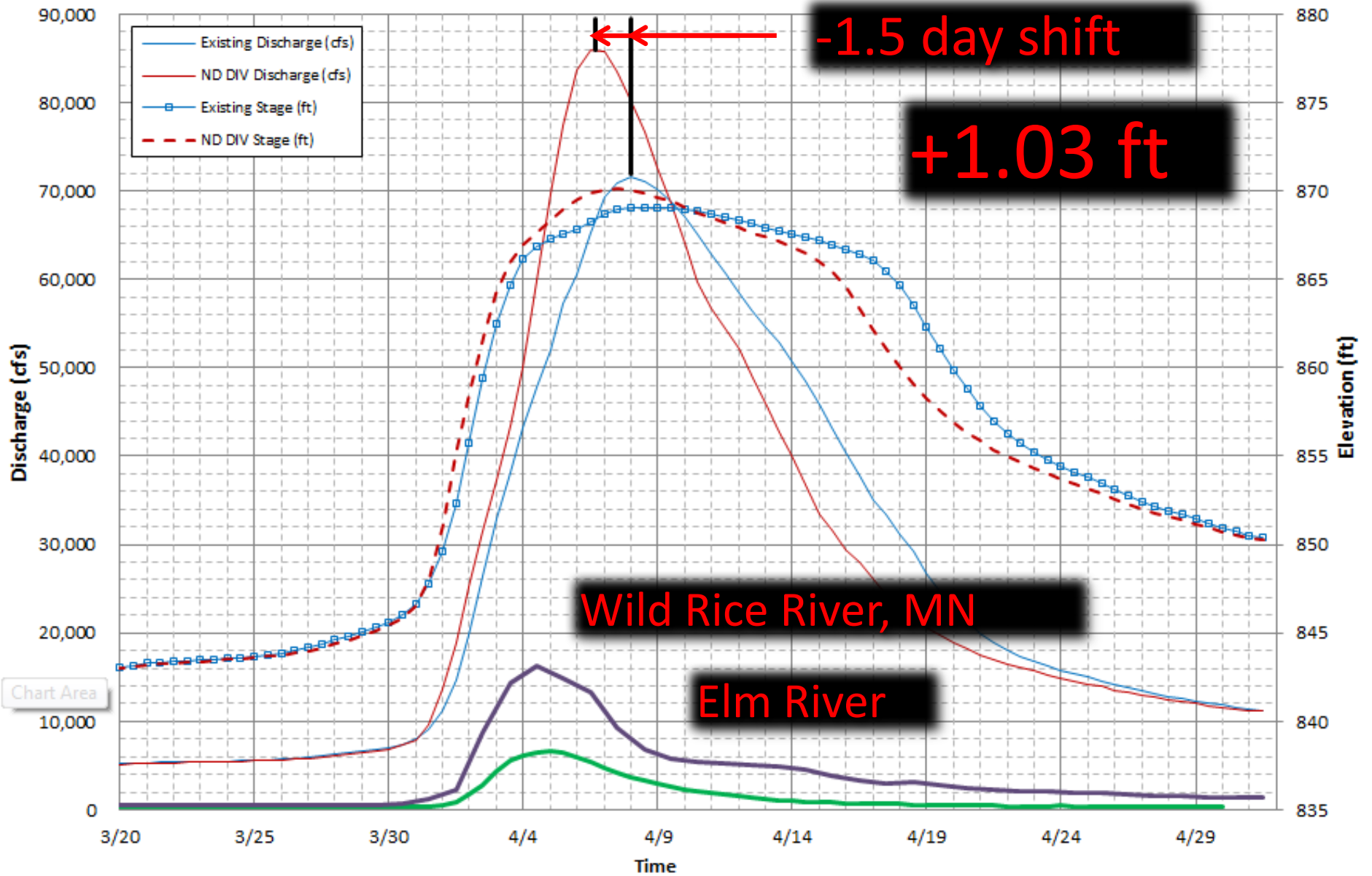


**PROJECT
IMPACTS AND
CHANGES**

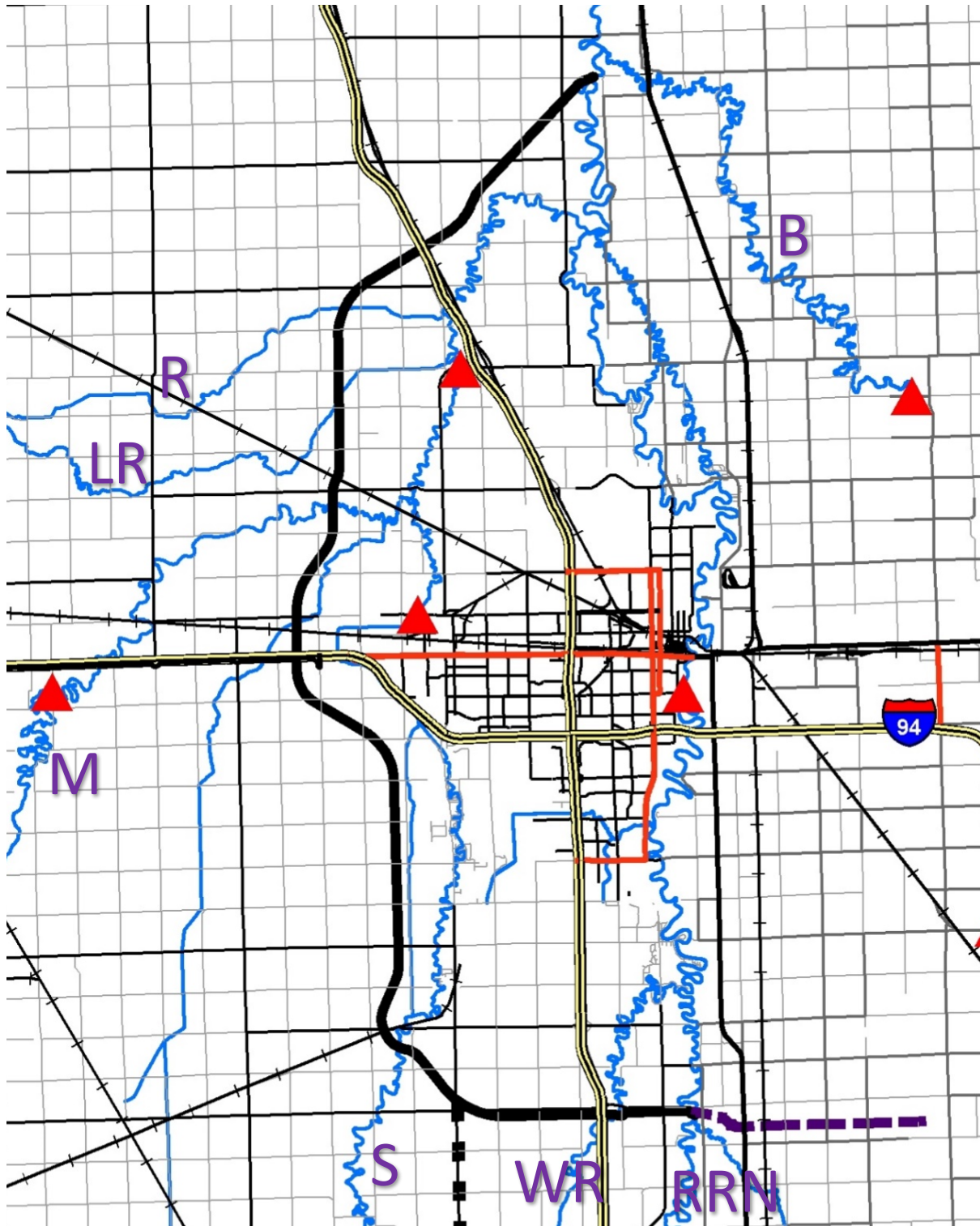


Downstream Impacts

Red River 1-Percent Chance Event, Stage and Discharge Comparison
North Dakota Diversion (LPP) vs. Existing Conditions (no emergency protection)
Halstad, MN



River Station 1981580



Impacts

1. Travel Time
2. Floodplain Storage

Diversion
(35 mi.)

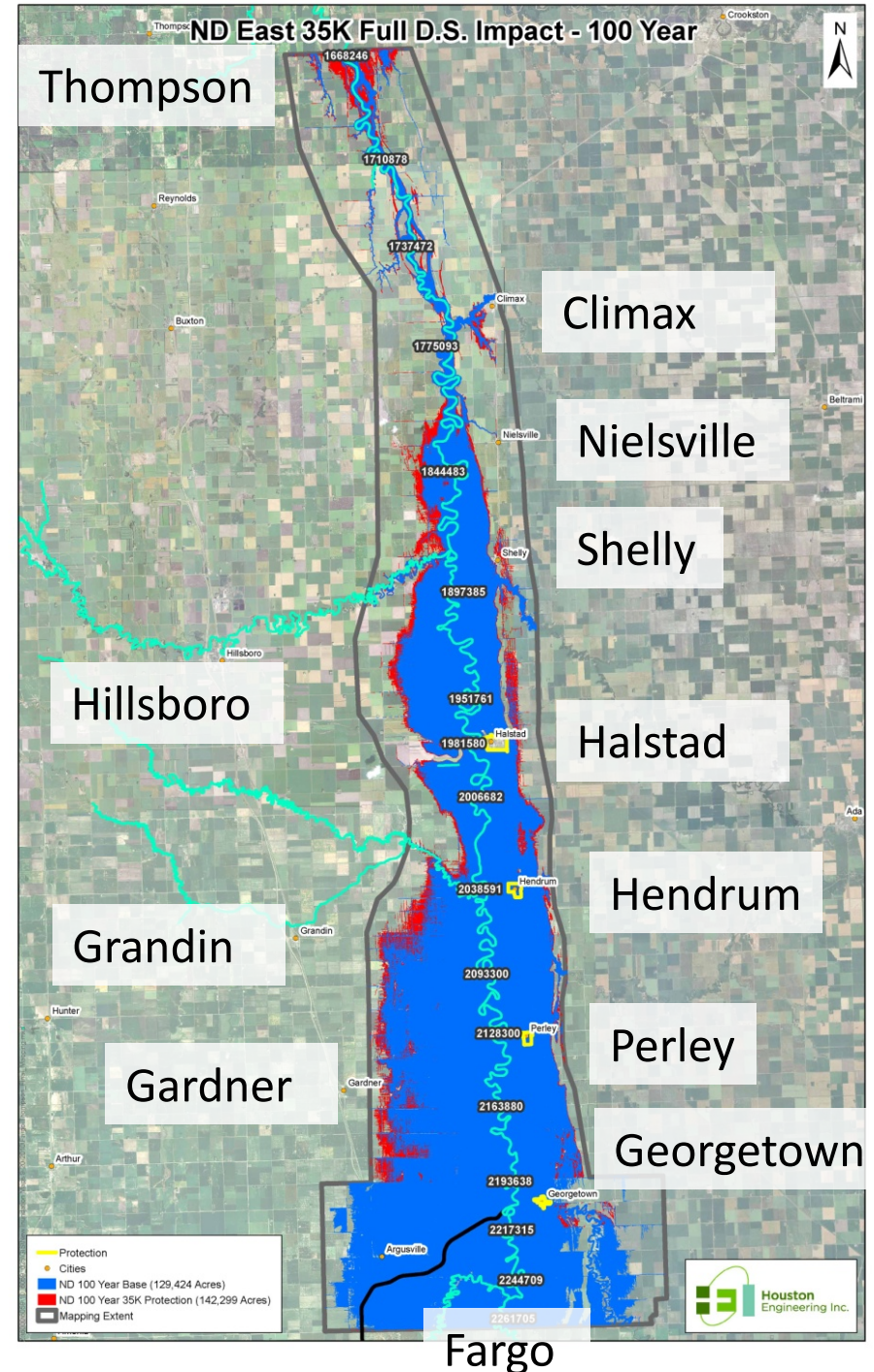
Red River
(60 mi.)



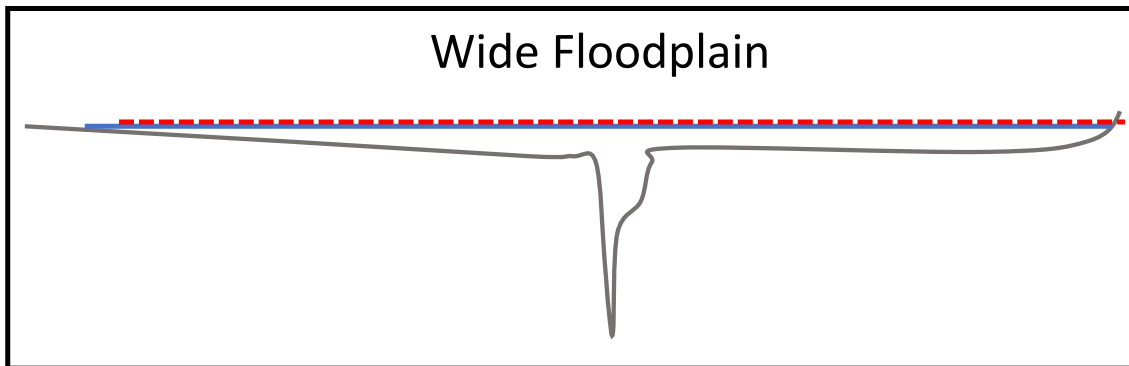
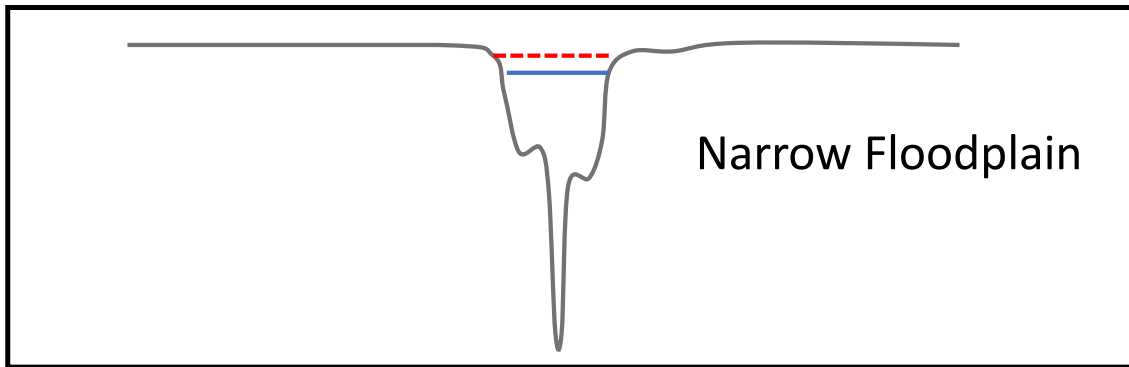
Length
Time

Downstream Impacts (Phase 3)

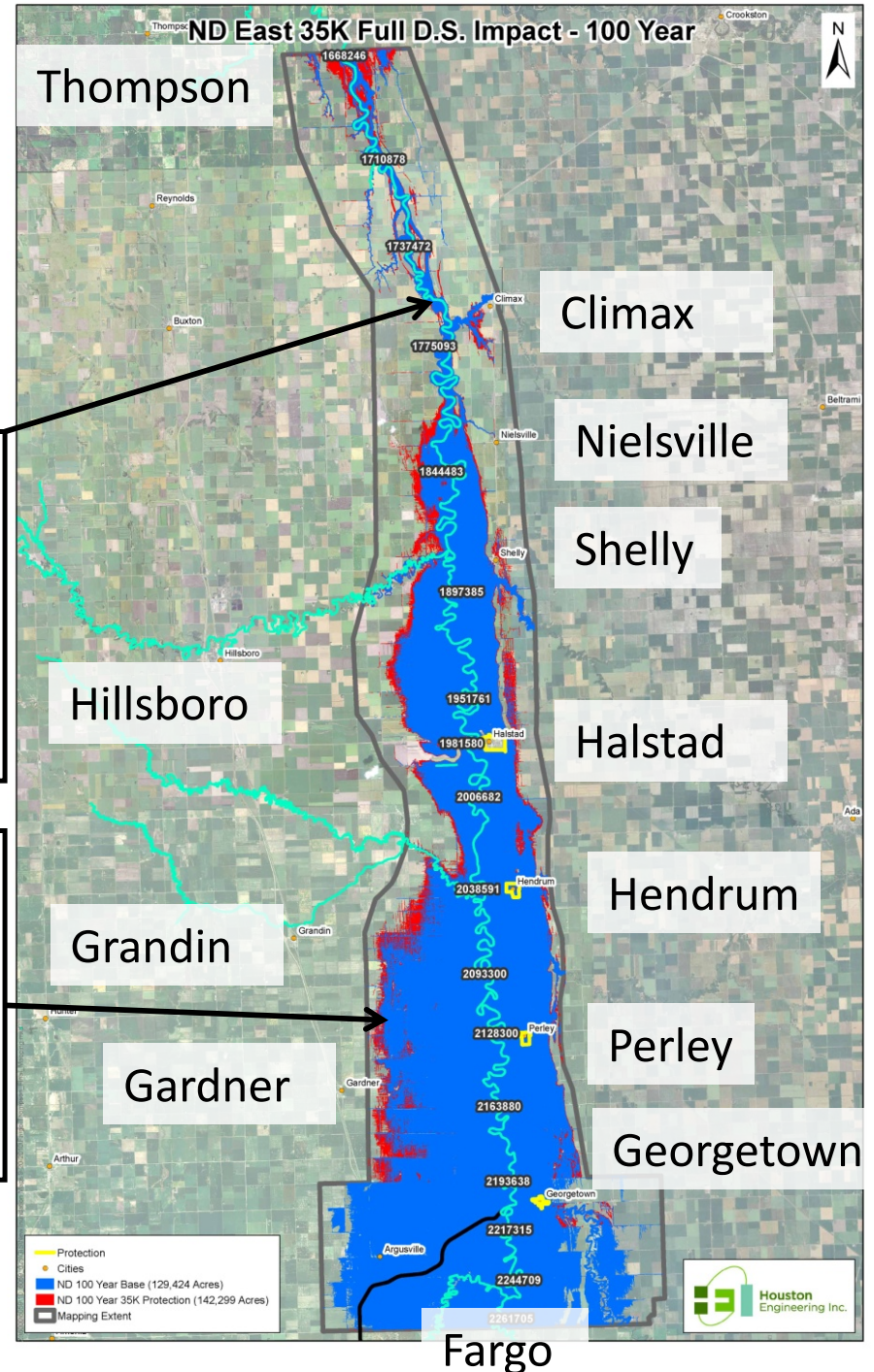
Location	Stage Increase (inches)
Minnesota Short 35K - 100 Year	
Climax	12.5
Halstad Gage	6.7
Hendrum	6.8
Perley	4.8
Georgetown	4.7
North Dakota 35K - 100 Year	
Climax	25.4
Halstad Gage	10.7
Hendrum	10.7
Perley	6.6
Georgetown	7.1



Downstream Impacts (Phase 3)

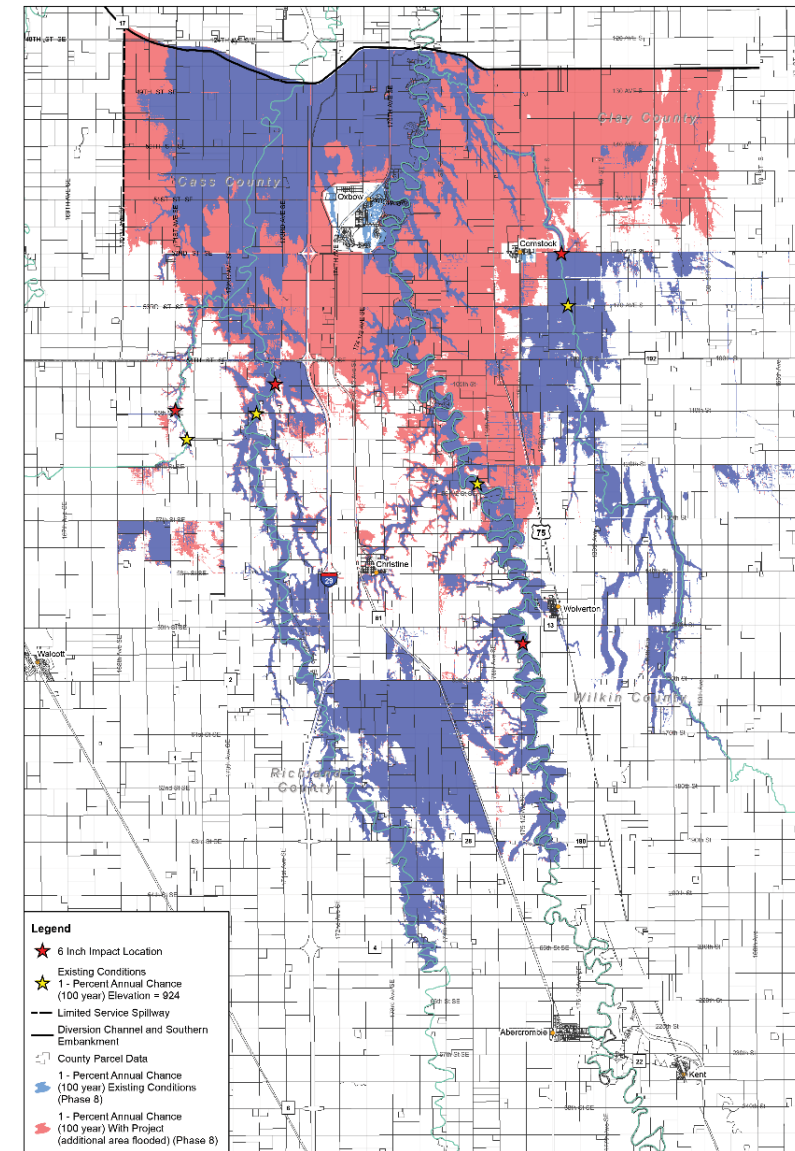


Control Structure Gate Operation



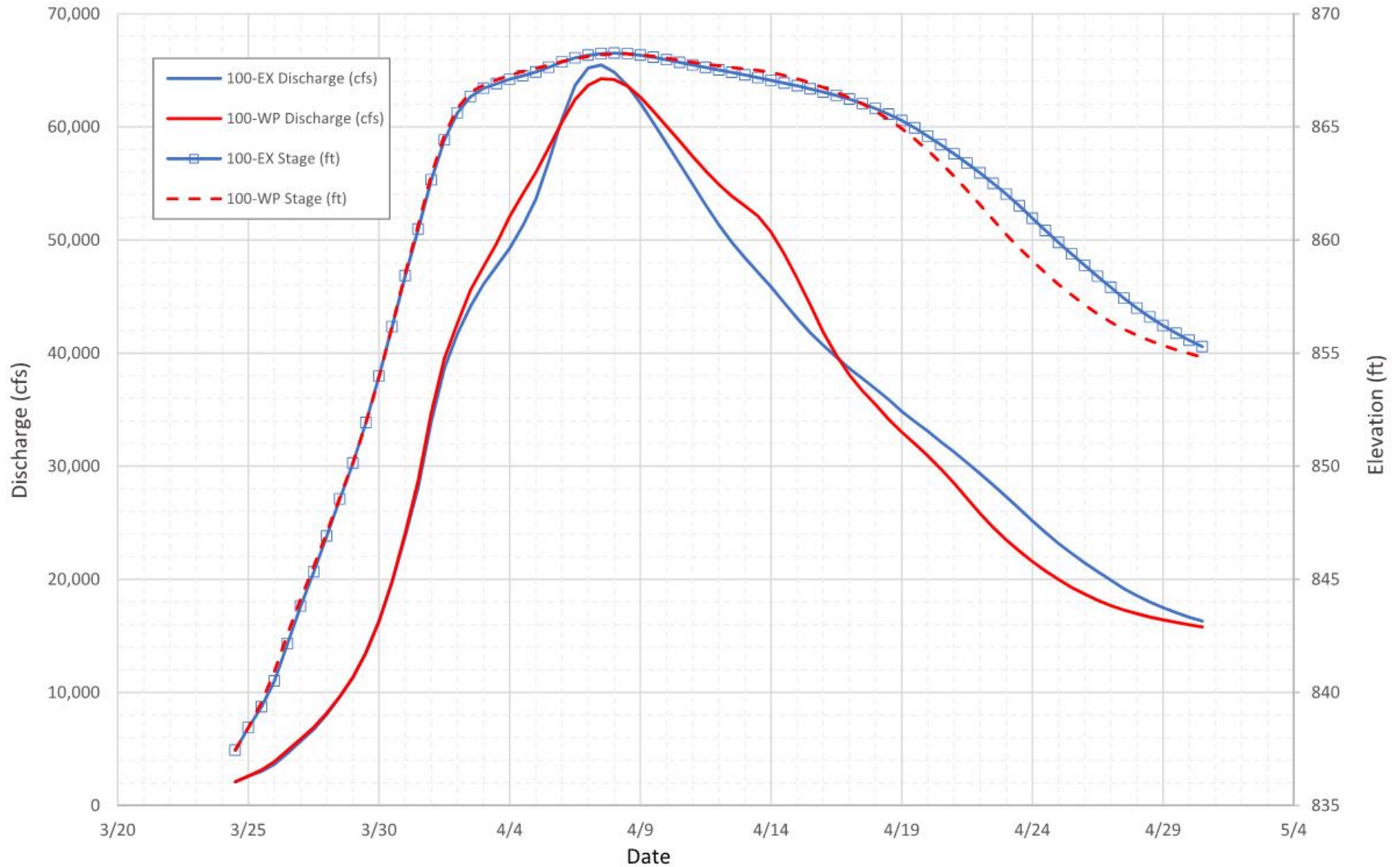
CHANGE TO UPSTREAM STORAGE RESULTED IN NO NEGATIVE IMPACTS DOWNSTREAM

- Downstream impacts were eliminated through use of a staging area immediately upstream of the Project
- Reduced original design's impacts by over 2-feet
- Original downstream impacts on 4,500 structures
- Minnesota diversion alternative had downstream impacts of 1', impacts would go to Canada



Downstream Impacts (Phase 8.1)

Red River 1-Percent Chance Event, Stage and Discharge Comparison
North Dakota Diversion vs. Existing Conditions
Halstad, MN



Federal Project

Federally Authorized Project

- Completed Environmental Impact Statement of all alternatives

Diversion Channel in ND

- 1,600 ft wide
- Outlet near Georgetown, MN
- Inlet SE of Horace, ND

Upstream Mitigation Area

- 150,000 acre-feet of staging area

In-Town Levees

Provides 100-year Flood Risk Reduction

Extreme Events are Flood-Fightable

