

# Fargo-Moorhead Metropolitan Area Flood Risk Management Feasibility Study Report and Environmental Impact Statement

## *Civil Works Review Board*

### PROJECT BRIEFING

COL Michael J. Price

District Commander, St. Paul  
District

23 September 2011

Headquarters, US Army Corps of Engineers

Washington, DC



US Army Corps of Engineers  
**BUILDING STRONG**<sup>®</sup>



# Presentation Outline

---

- Purpose
- Project Delivery Process
- Background
- Overview of Study and Selected Plan
- Environmental Operating Principles
- District Policy Compliance
- Agency Technical Review
- Independent External Peer Review
- OWPR Policy Compliance Review
- Public Involvement
- Environmental Compliance
- Assessment of the project delivery process
- USACE Campaign Plan
- Summary
- Recommendation



# Purpose of Briefing

---

- Provide an overview of the Fargo-Moorhead Feasibility Study and the Recommended Plan
- Answer questions and address comments
- Obtain CWRB approval for State & Agency Review
- Discuss the next steps in the approval process toward a Chief's Report



# Project Delivery Team Members

---

- Non-Federal Sponsors
  - ▶ City of Fargo, ND
  - ▶ City of Moorhead, MN
- Non-Federal Partners
  - ▶ Cass County, ND
  - ▶ Clay County, MN
  - ▶ Buffalo-Red River Watershed District
  - ▶ Cass County Joint Water Resource Board
- Project Management
- Planning
  - ▶ Plan Formulation
  - ▶ Economics
  - ▶ Environmental
- Engineering
  - ▶ Design
  - ▶ Hydrology & Hydraulics
- Real Estate
- Office of Counsel
- ATR & IEPR Teams
- Regional Support / 9 Corps Districts
  - ▶ Non-Structural Flood Proofing Committee
  - ▶ Cost DX
  - ▶ HEC
  - ▶ Cold Regions Research and Engineering Laboratory
  - ▶ IWR
- AE Contractors



# Study Authority

---

The *Fargo-Moorhead Metropolitan Area Flood Risk Management Feasibility Report and Environmental Impact Statement* was authorized by a September 30, 1974, Resolution of the Senate Committee on Public Works:

*RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors be, and is hereby, requested to review reports on the Red River of the North Drainage Basin, Minnesota, South Dakota and North Dakota, submitted in House Document Numbered 185, 81st Congress, 1st Session, and prior reports, with a view to determining if the recommendations contained therein should be modified at this time, with particular reference to flood control, water supply, waste water management and allied purposes.*



# Project Location



- Fargo-Moorhead Metropolitan area
  - ▶ 600 square miles
  - ▶ Along the Red River of the North
  - ▶ 150 miles from Emerson, Manitoba
- Red River of the North Basin
  - ▶ Drainage area of 6,800 square miles upstream of Fargo-Moorhead



# Purpose & Objectives

---

## Purpose:

To identify measures to reduce flood risk in the entire Fargo-Moorhead Metropolitan Area.

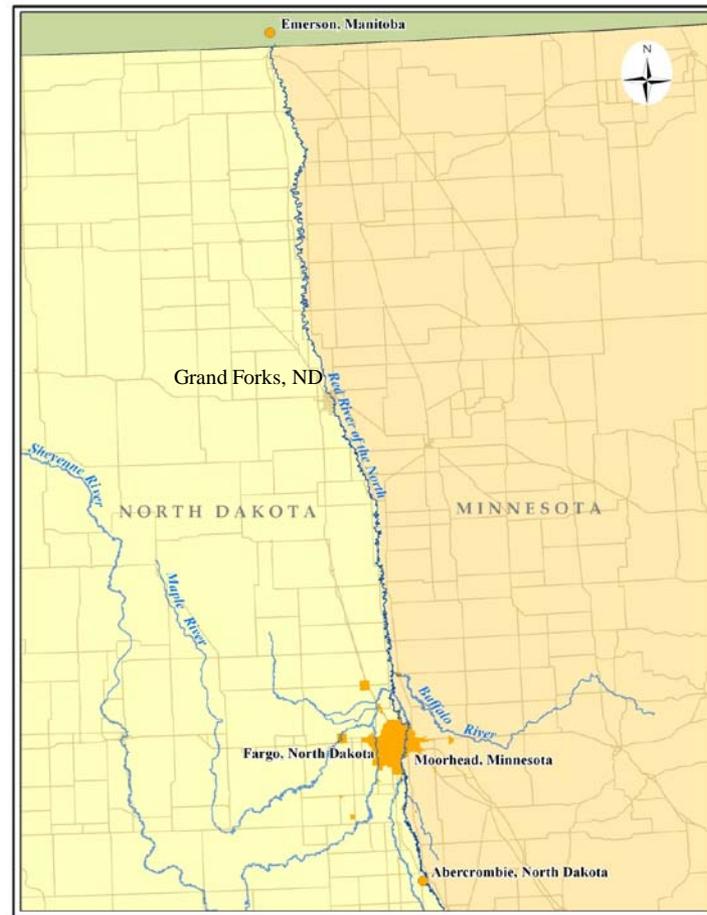
## Objectives:

- Reduce flood risk and flood damages in the Metro area
- Restore or improve degraded riverine and riparian habitat
- Provide additional wetland habitat
- Provide recreational opportunities



# Study Area

- Largest urban area in North Dakota and western Minnesota, principle regional economic center
- 200,000 people in the metropolitan area
- Expected average annual flood damages over \$194.8 million



# Background

---

- Red River Flood Stage = 18 feet on the Fargo gage
  - ▶ Exceeded in 48 of the past 109 years
  - ▶ Exceeded every year from 1993 through 2011
- Catastrophic damages have been prevented by emergency measures
  - ▶ 11 disaster declarations since 1989
- 2009 was the flood of record
  - ▶ Stage of 40.8 feet
  - ▶ 2-percent chance (50 year) event
  - ▶ Emergency measures cost approximately \$70M



# Study Timeline

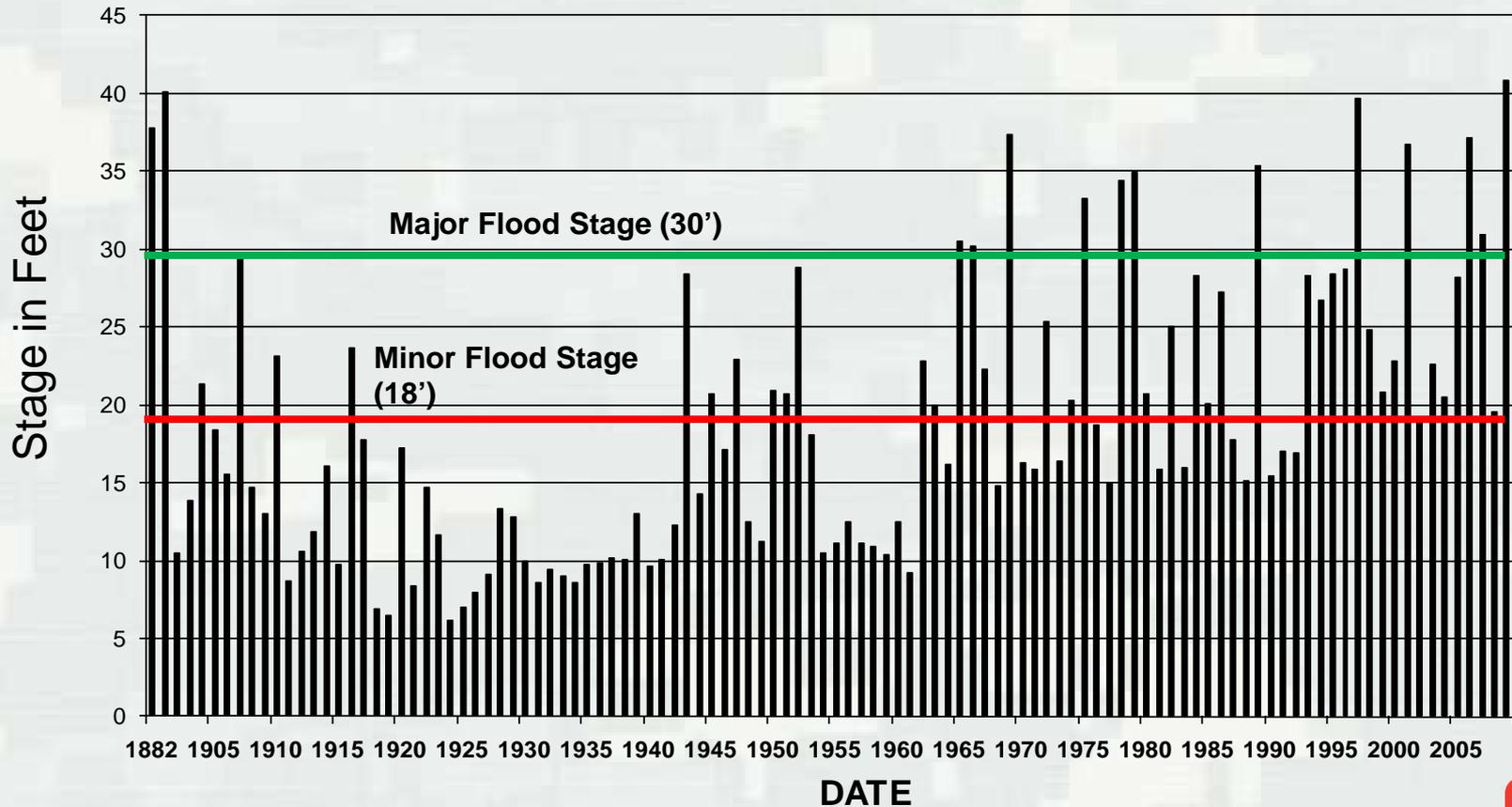
---

<u>Activity</u>	<u>Scheduled Completion Date</u>
Feasibility Cost Share Agreement Signed	Sep 2008
Flood of Record	Spring 2009
Alternative Formulation Briefing	Apr 2010
AFB Guidance Memorandum	May 2010
Public Review of Draft Feasibility Report & EIS	Jun 2010
IEPR on Draft Feasibility Report & EIS	Jul 2010
ATR	Apr 2011
Public Review of Supplemental Feasibility Report & EIS	May 2011
IEPR on Supplemental Draft Feasibility Report & EIS	Jul 2011
Division Commander's Transmittal Letter	August 2011
Civil Works Review Board	Sept 2011
State & Agency Review	Oct 2011
Final Report to Headquarters	Nov 2011
Chief's Report Signed	Dec 2011





# Increasing Trend in Annual Peak Stages



# Array of Alternatives

---

- ▶ Non-structural
- ▶ Structural
- ▶ Combinations



# Non-Structural Measures Considered

---

- ▶ Buy and relocate flood-prone structures
- ▶ Flood proofing
- ▶ Elevate structures
- ▶ Flood warning systems
- ▶ Restore Wetlands
- ▶ Restore Grasslands



Non-structural analysis was conducted by the  
National Non-Structural Flood Proofing Committee



# Structural Measures Considered

---

- Increase conveyance
  - ▶ Diversion channels around the study area
  - ▶ Underground tunnels
  - ▶ Interstate 29 viaduct
  - ▶ Increase conveyance in Oakport Coulee
  - ▶ Cutoff channels (to short-cut existing meanders)
  - ▶ Flattening the slopes on river bank
  - ▶ Dredge river deeper and wider
  - ▶ Replace bridges



# Structural Measures Considered

---

- Flood barriers
  - ▶ Levees
  - ▶ Floodwalls
  - ▶ Invisible floodwalls
  - ▶ Gate closures
  - ▶ Pump stations
- Flood storage
  - ▶ Large dams upstream
  - ▶ Distributed storage
  - ▶ Controlled field runoff
  - ▶ Storage ponds, also used for water conservation



# Evaluating & Screening Alternatives

---

- Phase 1
  - ▶ September 2008 – May 2009
  - ▶ Extension of reconnaissance effort
  - ▶ Diversion alternative and levee/floodwall alternative considered
- Phase 2
  - ▶ May 2009 – March 2010
  - ▶ Full range of alternatives considered
  - ▶ First iteration: no action and diversion channels to be carried forward
  - ▶ Second iteration: developed an array of diversion plans with capacities ranging from 10,000 to 35,000 cfs in North Dakota and Minnesota
  - ▶ Local sponsors requested the ND35K (North Dakota alignment with 35,000 cfs diversion) be pursued as the locally preferred plan (LPP)



# Evaluating & Screening Alternatives

---

- Phase 3
  - ▶ March 2010 – September 2010
  - ▶ Refined plans and identified NED as the MN40K (Minnesota alignment with 40,000 cfs diversion) , LPP as the ND35K and FCP as the MN35K (Minnesota alignment with 35,000 cfs diversion)
  - ▶ Released DEIS in May 2010 for public review
- Phase 4
  - ▶ September 2010 – July 2011
  - ▶ Refined hydraulic models to define downstream and upstream impacts
  - ▶ Optimized LPP channel size—ND20K (North Dakota alignment with 20,000 cfs diversion)
  - ▶ Added upstream staging and storage to reduce downstream impacts
  - ▶ Released SDEIS in April 2011 for public review



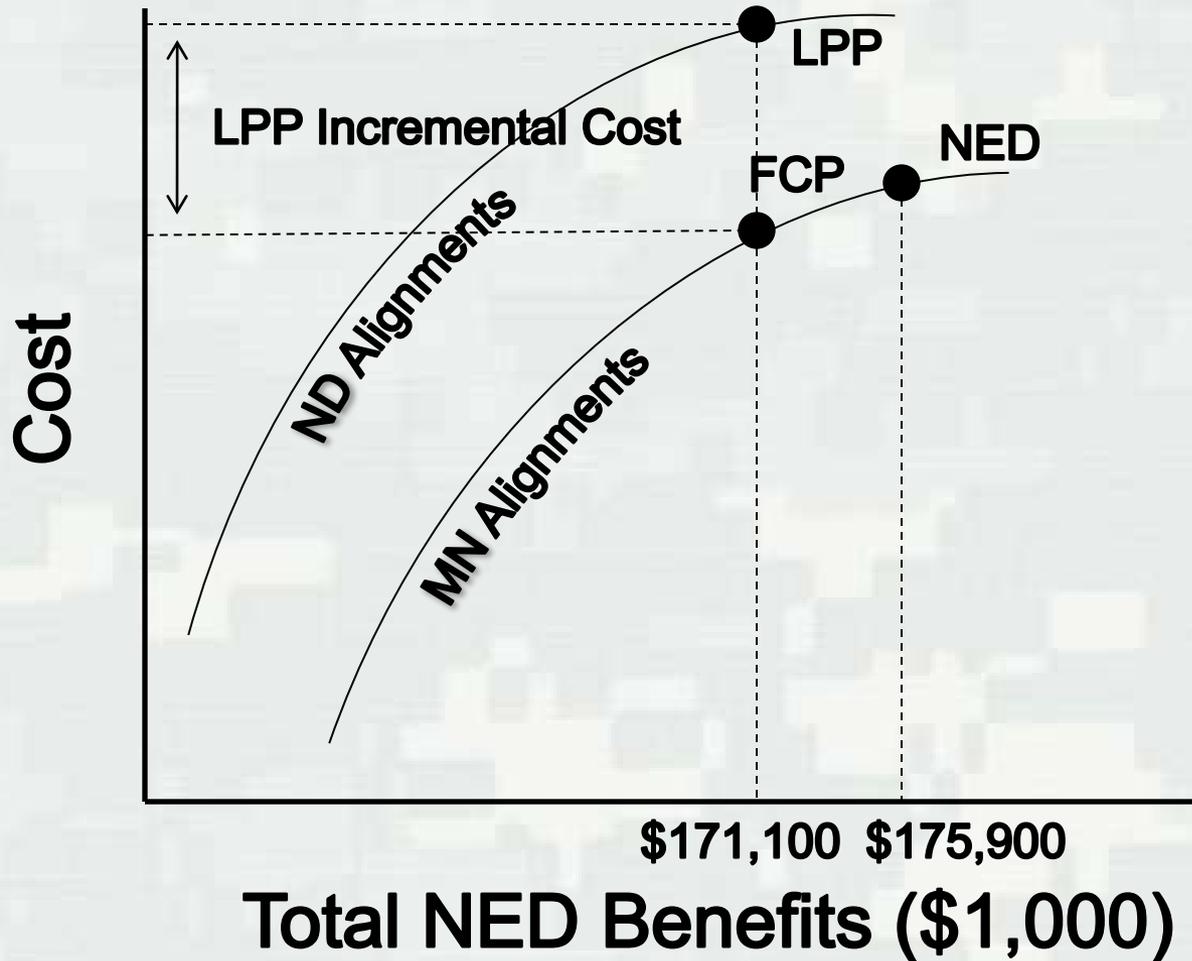
# FCP Defined in Phase 3

---

- OASA(CW) approved the LPP using the FCP as the basis for cost-sharing
- NED maximized net benefits—MN 40K plan
- LPP is the ND20K plan
- FCP is a smaller version of the NED plan that matches the LPP total benefits
- Federal share of the LPP is capped at the Federal share of the FCP



# FCP Defined in Phase 3



\$171,100 \$175,900

Total NED Benefits (\$1,000)



# Phase 4 Array of Alternatives

---

- No Action
- Three Diversion channels:
  - ▶ Federally Comparable Plan (FCP)
    - MN35K diversion with moderate downstream impacts
  - ▶ Locally Preferred Plan (LPP)
    - ND20K diversion with upstream staging and storage and negligible downstream impacts
  - ▶ North Dakota 35,000 cfs (ND35K)
    - Diversion with downstream impacts to Canada



# No Action

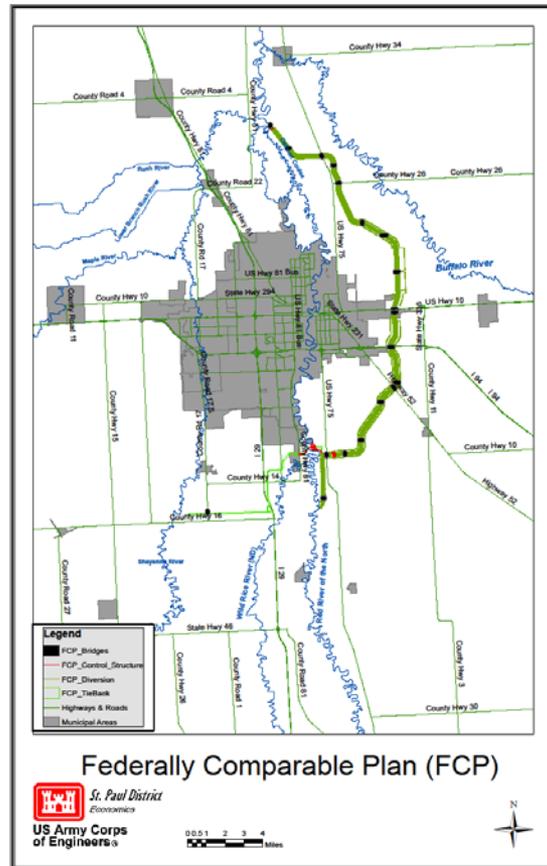
---



- Continue emergency flood fight measures
- Emergency flood fighting measures have low reliability
- Urban areas will expand into the floodplain
- \$194.8 million average annual damages



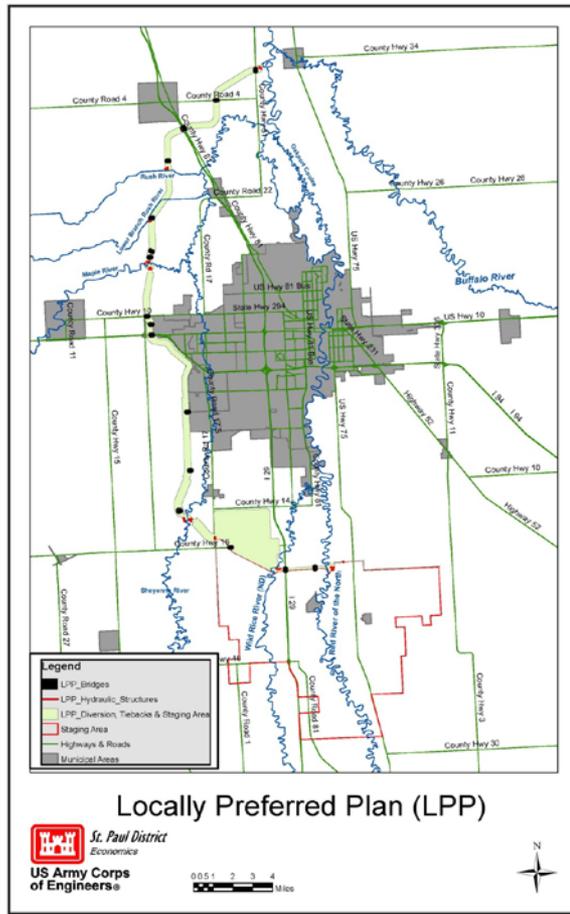
# Federally Comparable Plan (FCP)



- MN35K diversion channel
- 25 miles long with control structure on the Red River
- 9.9 mile tie-back levee
- Mitigation features
- Recreation features
- 2.39 FRM Benefit-Cost ratio
- \$1,205,207,000 FRM first cost
- \$100,433,000 annual net FRM benefit
- Downstream impacts up to 13 inches



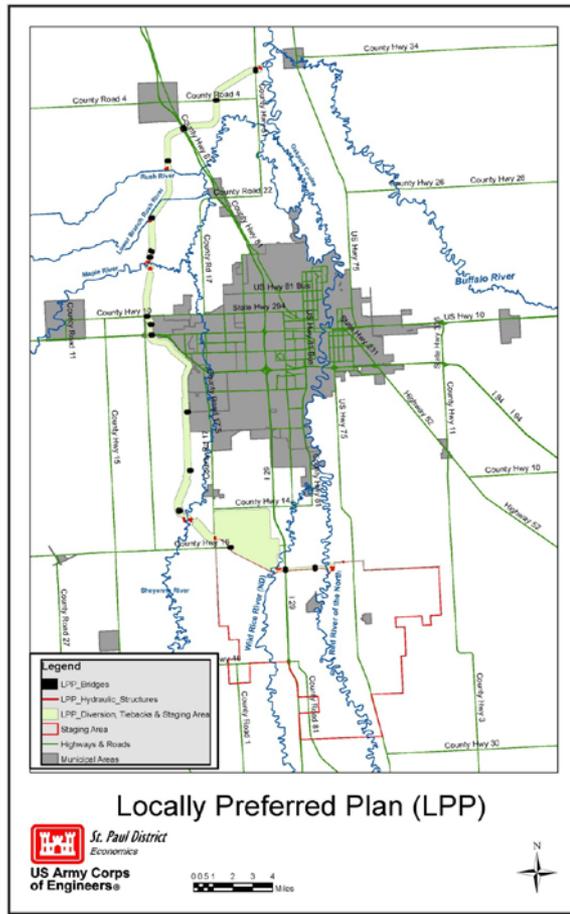
# Locally Preferred Plan (LPP)



- Refined LPP components
  - ▶ 20,000 cfs ND diversion channel
  - ▶ 50,000 acre feet storage area
  - ▶ 150,000 acre feet staging area
  - ▶ 36-mile diversion
  - ▶ 10 miles of tie-back levees
  - ▶ Control structures on the Red & Wild Rice rivers
  - ▶ Aqueduct & spillway structures on the Sheyenne & Maple rivers
  - ▶ Drop structure on the Lower Rush & Rush rivers
  - ▶ Non-structural mitigation for impacts in the storage & staging areas



# Locally Preferred Plan (LPP)



- 1.74 FRM Benefit-Cost ratio
- \$1,745,033,000 FRM first costs
- \$74,219,000 annual net FRM benefit
- Negligible downstream impacts
- \$32 million average annual residual damages

# Comparison of Alternatives

---

- All three alternatives are effective in meeting the primary planning objectives
- LPP & ND35K reduce flood risk from Red and Wild Rice rivers plus four tributaries
- FCP addresses only the Red and Wild Rice rivers
- Maximum downstream stage increases for 1% chance event:
  - ▶ LPP = Less than 4 inches
  - ▶ FCP = 13 inches
  - ▶ ND35K = 25 inches
- LPP has upstream impacts
- LPP is the most robust alternative: project features could withstand floods larger than a 0.2 percent chance event without overtopping



# Comparison of Alternatives

	<b>LPP</b>	<b>FCP</b>
Total FRM First cost	\$1,745,033	\$1,205,207
Average Annual FRM Benefit	\$174,817	\$172,454
Net FRM Benefits of plan (NED)	\$74,219	\$100,433
Residual FRM Damages	\$32,000	\$30,000

Costs are given in \$1,000  
Based on October 2011 price levels  
and 4.125 percent interest rate

No Action Residual Damages \$194.8 million

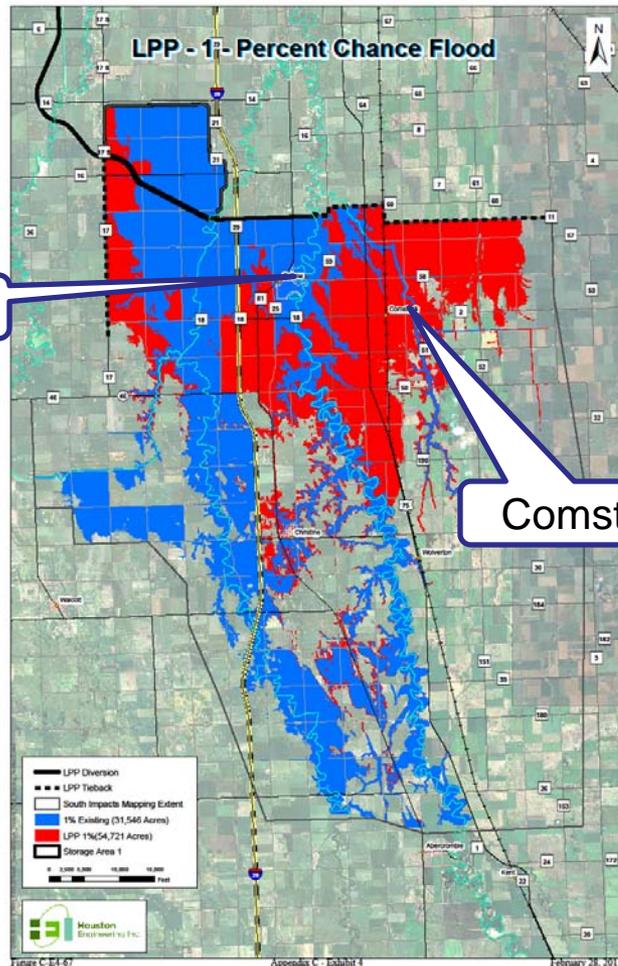
Federal share of the FCP and LPP is 65% of the FCP cost = \$783.4 million

OMRR&R Costs = \$3,631,000





# Selected Plan - LPP

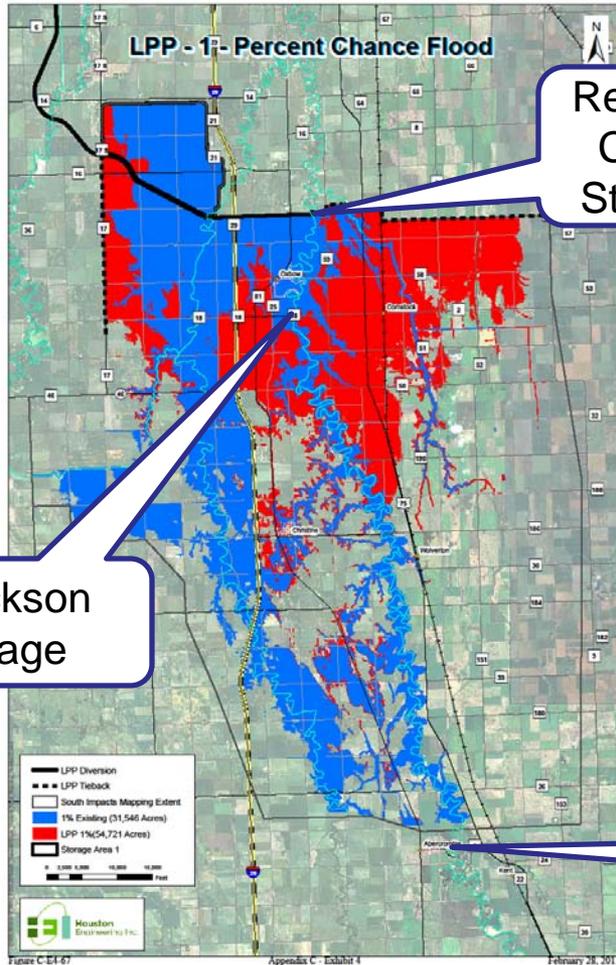


## Upstream Storage and Staging

- Blue = existing 100-yr flood plain
- Red = 100-yr flood plain with project
- 33,390 Acres affected
- Number of structures
  - ▶ 387 Residences
  - ▶ 421 Non-residences
- Oxbow, Bakke, Hickson buyouts
- Comstock levee



# Selected Plan - LPP



## 100-Year Upstream Impacts

	Difference (ft) vs. Existing No Protection
US LPP Diversion (at RR Control Structure)	8.23
Hickson Gage	5.38
Abercrombie	0.11



# Selected Plan - LPP

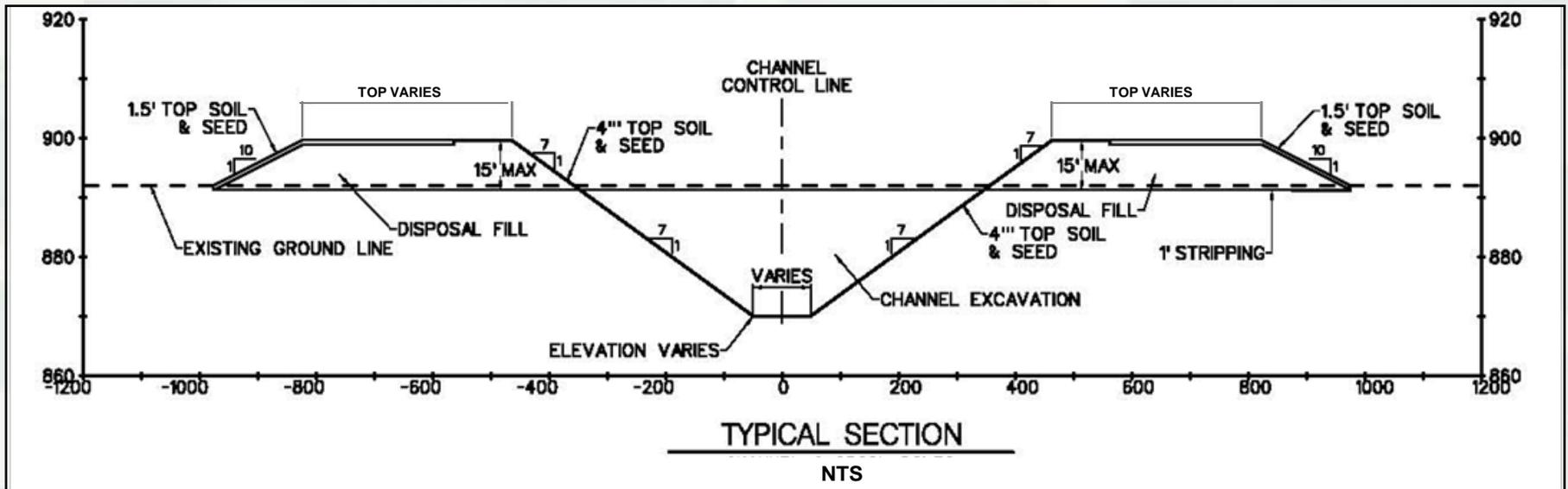
---

Stage Increase for 100-year Flood  
Project vs. Existing, No Protection

<b>Location</b>	<b>Difference (inches)</b>
Drayton Gage	1.0
Oslo Gage	0.7
Grand Forks Gage	2.9
Maximum Impact Location	3.5
Thompson Gage	0.5
Halstad Gage	-0.7
Hendrum	-0.7
Perley	-3.4
Georgetown	-3.0



# Diversion Cross Section



# Red River and Wild Rice Control Structures

---



# Control Structure

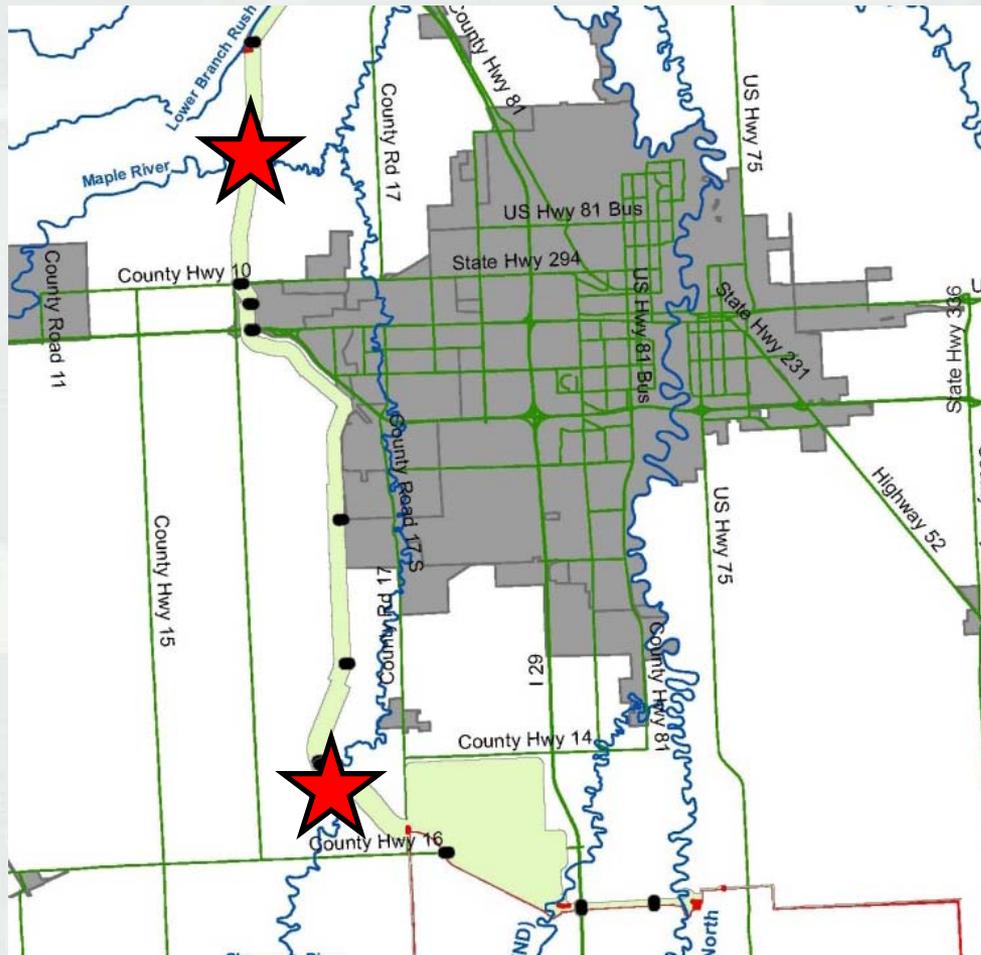
---



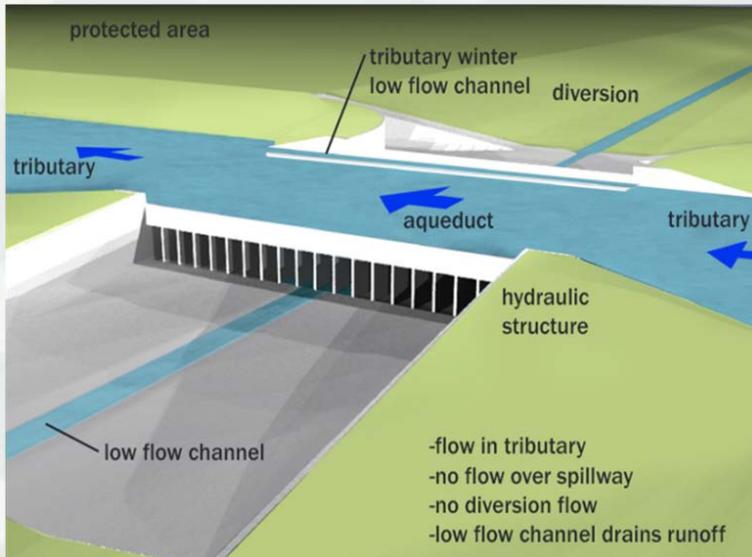
Red River Control Structure visualization (gates open - no flooding)



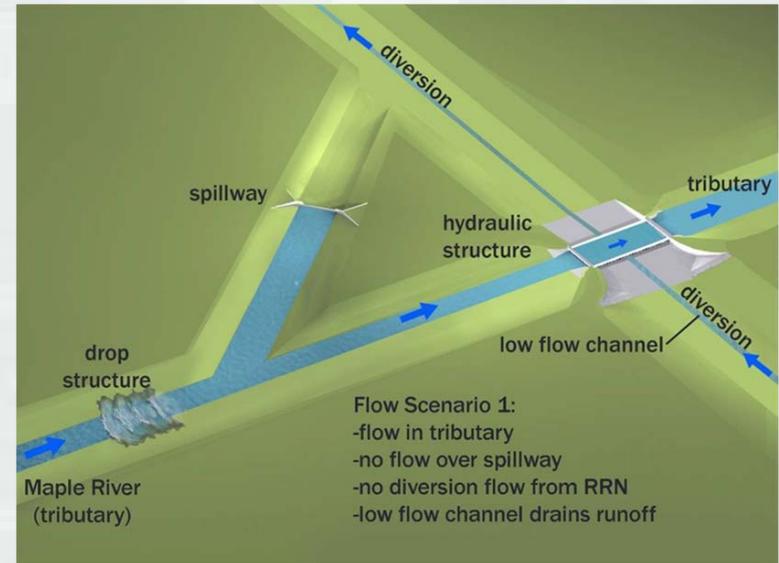
# Tributary Aqueducts



# Tributary Aqueducts



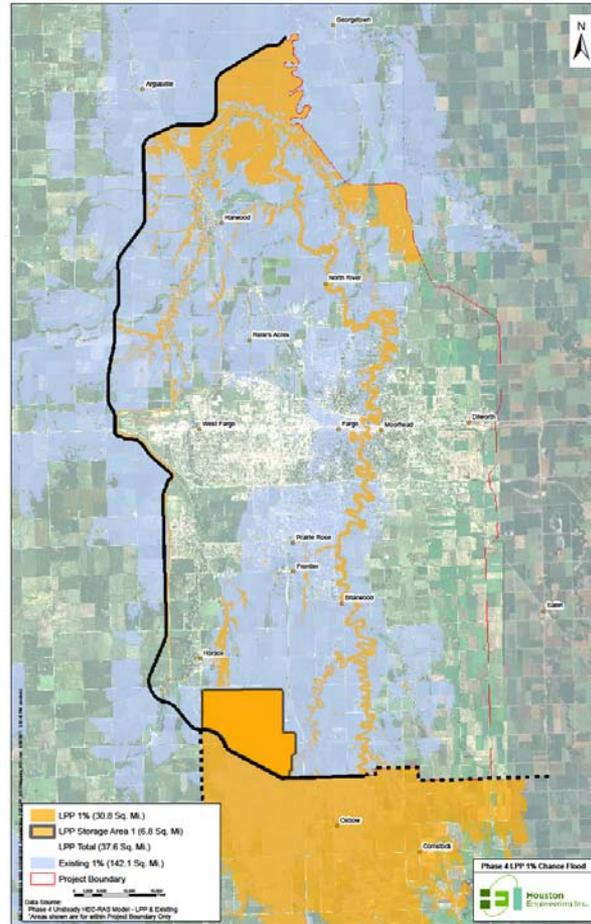
Flow in Sheyenne River, no flow over spillway or in diversion looking at structure.



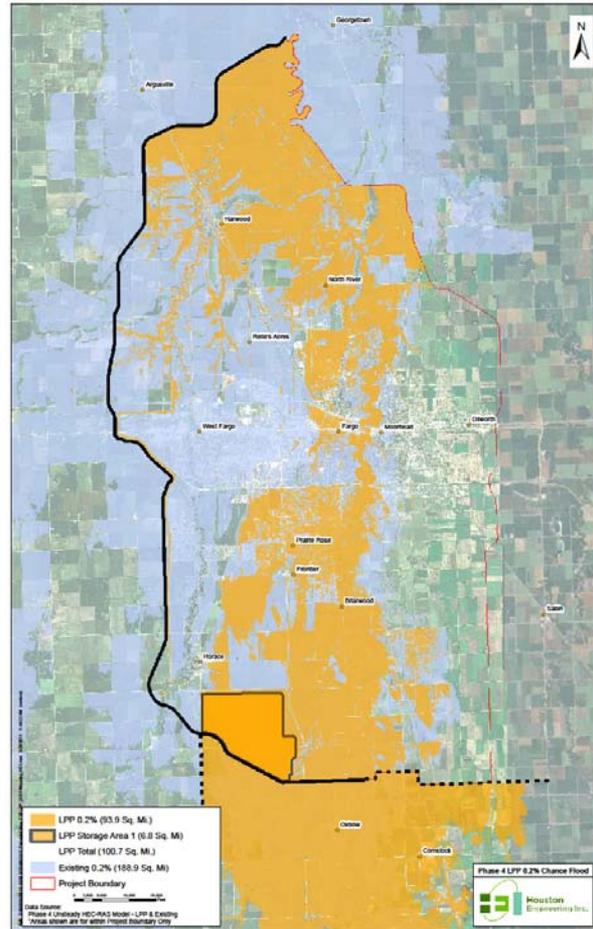
Flow in Maple River, no flow over spillway or in diversion.



# With LPP Conditions: 1% Chance



# With LPP Conditions: 0.2% Chance



# Selected Plan FRM Costs

---

<b>Item</b>	<b>FRM</b>
FRM Investment Cost	\$2,041,947
Annual FRM Cost	\$100,598
Annual FRM Benefits	\$174,817
Net Annual FRM Benefits	\$74,219
Benefit-Cost Ratio (4.125% interest)	1.74
Benefit-Cost Ratio (7% interest)	1.49*

Costs are given in \$1,000

Based on October 2011 price levels

\*Based on Federal Investment



# Selected Plan Recreation Costs

---

<b>Item</b>	<b>Recreation</b>
Recreation Investment Cost	\$37,106
Annual Recreation Cost	\$1,894
Annual Recreation Benefits	\$5,130
Net Annual Recreation Benefits	\$3,236
Benefit-Cost Ratio (4.125% interest)	2.71
Benefit-Cost Ratio (7% interest)	1.88

Costs are given in \$1,000  
Based on October 2011 price levels



# Selected Plan Total Costs

---

<b>Item</b>	<b>Total</b>
Total Investment Cost	\$2,079,053
Total Annual Cost	\$102,492
Total Annual Benefits	\$179,947
Net Annual Benefits	\$77,455
Benefit-Cost Ratio (4.125% interest)	1.76
Benefit-Cost Ratio (7% interest)	1.49*

Costs are given in \$1,000  
Based on October 2011 price levels  
\*Based on Federal Investment



# Selected Plan Cost Share

---

<b>Item</b>	<b>Federal</b>	<b>Non-Federal</b>	<b>Total</b>
FRM <sup>1</sup>	\$783,384	\$961,649	\$1,745,033
Recreation	\$18,158	\$18,158	\$36,315
<b>Total Project</b>	<b>\$801,542</b>	<b>\$979,806</b>	<b>\$1,781,348</b>

Costs are given in \$1,000  
Based on October 2011 price levels

OMRR&R Costs = \$3,631,000

<sup>1</sup> Federal FRM cost for the LPP is capped at the Federal share of the FCP



# Public Involvement

---



51 Public meetings held to inform and gather input from Nov 2008 to Jun 2011

- (4) Scoping meetings
- (3) Metro Flood Management Committee
- (5) Public information
- (11) NEPA public review
- (1) 404(b) hearing
- (27) Metro Flood Work Group



# Resource Agency Coordination

---

20 meetings held with Resource Agency Team:

- Federal
  - ▶ USFWS
  - ▶ FEMA
  - ▶ EPA
  - ▶ FAA
  - ▶ NRCS
- State
  - ▶ MPCA
  - ▶ MNDNR
  - ▶ MNBWSR
  - ▶ MNDOT
  - ▶ ND G&F
  - ▶ NDSWC
  - ▶ NDDOH
  - ▶ NDDOT
- Local
  - ▶ Fargo
  - ▶ Moorhead
  - ▶ Cass Co., ND
  - ▶ Clay Co., MN
  - ▶ SE Cass WRD
  - ▶ BRRWD



# Environmental Operating Principles

---

Strives to achieve environmental sustainability (EOP 1)

- ▶ Facilitate fish passage and minimize impacts to geomorphology

Consider environmental consequences (EOP 2)

- ▶ Extensive coordination with other environmental agencies

Balance & synergy among human development activities and natural systems (EOP 3)

- ▶ Reducing flood risk thereby avoiding environmental and economic damage from repeated flood fighting actions

Accept corporate responsibility and accountability (EOP 4)

- ▶ Plan is consistent with all applicable laws and policies

Assess and mitigate cumulative impacts to the environment (EOP 5)

- ▶ Use of engineering models & environmental surveys

Increase the integrated scientific knowledge base (EOP 6)

- ▶ Numerous types of survey work

Seeks public input and involvement (EOP 7)

- ▶ Numerous public meetings, public notices and comment periods



# District Policy Compliance

---

- District Quality Control (DQC)
  - ▶ Assistance from Rock Island, St. Louis and Vicksburg Districts & Institute for Water Resources and the Hydraulic Engineering Center
  - ▶ Non-structural measures and alternatives developed by Non-Structural Flood Proofing Committee staff in Omaha District
  - ▶ Cost and schedule risk analysis by Walla Walla District
  
- Legal Certification  
15 July 2011 – signed by Chief, MVP-OC



# Agency Technical Review (ATR)

---

- ATR led by FRM – PCX
- 617 comments were generated from multiple reviews:
  - ▶ 104 Hydraulics
  - ▶ 84 Hydrology
  - ▶ 220 Economics
  - ▶ 59 Geotechnical
  - ▶ 13 Environmental
  - ▶ 26 Plan Formulation
  - ▶ 9 Structural engineering
  - ▶ 87 Cost engineering
  - ▶ 1 Non-structural
  - ▶ 8 Real Estate
  - ▶ 5 Project Management
  - ▶ 1 Sedimentation
- One significant comment (now resolved):
  - ▶ Design criteria for Storage Area 1 embankments—levee or dam?
  - ▶ MVP response: Levee; current feasibility design is appropriate
  - ▶ Risk-based analyses confirmed reliable performance beyond 500-yr event



# Independent External Peer Review (IEPR)

---

- Managed by FRM-PCX
- Battelle Memorial Institute subcontracted panel of five experts in economics, environmental, and geotechnical, cost and H&H engineering
- Two phases—Draft report and Supplemental Draft report
- First Phase:
  - ▶ 23 comments: 7 high, 13 medium, 3 low
  - ▶ All 23 comments have been resolved
- Second Phase:
  - ▶ 16 comments: 1 high, 11 medium, 4 low
  - ▶ All 16 comments have been resolved



# OWPR Policy Compliance Review

---

- Alternatives Formulation Briefing (AFB)
  - ▶ 26 April 2010 – AFB Meeting
  - ▶ 5 May 2010 – AFB follow-on teleconference
  - ▶ 20 May 2010 – 61 HQUSACE Policy Review Comments:
    - 1 general; 2 problems and opportunities; 4 without project conditions; 6 formulation of alternative plans; 7 evaluation and comparison of plans; 7 mitigation; 6 environmental and environmental compliance; 5 legal; 8 cost engineering; 7 real estate; 8 miscellaneous.
  - ▶ 28 May 2010 – PGM Compliance
  
- HQ Comments on Supplemental Draft EIS
  - ▶ 6 May 2011 Public Review Supplemental EIS to MVD & HQ
    - Received 28 comments from HQ
  - ▶ 15 July 2011 Responses addressed



# Environmental Compliance

---

- 15 July 2011 – District Engineer signed the 404(b)1
- Water Quality Certification from the State of North Dakota and Minnesota still required



# USACE Campaign Plan

---

2. Deliver enduring and essential water resource solutions through collaboration with partners and stakeholders
  - ▶ 2a –Integrated, sustainable flood risk management
  - ▶ 2b –Implemented collaborative approaches with sponsor, stakeholders, and the public to build consensus and trust
  - ▶ 2c – Implemented streamlined and transparent regulatory process
  
4. Build and cultivate a competent, disciplined, and resilient team equipped to deliver high quality solutions
  - ▶ 4a –Multidisciplinary PDT enhanced technical competencies to model hydraulics and conduct economic inventories & analyses
  - ▶ 4b -Communicating with teams, stakeholders, and the public strategically and transparently, including use of a project website



# Project Summary

---

- 20,000 cfs diversion channel in North Dakota with upstream staging and storage
- Provide in excess of 1-percent chance level of risk reduction
- 1.76 Benefit-Cost ratio
- \$1,781,348,000 total cost
  - \$801,542,000 Federal share
  - \$979,806,000 non-Federal share



# Project Schedule

---

- 28 Sept 11 Final EIS to EPA for publication in *Federal Register*
- 30 Sept 11 Initiate S&A review
- 07 Oct 11 Initiate public review
- Dec 2011 Sign Chief's Report
- Dec 2011 Submit Chief's Report to ASA(CW) for administrative review
- Apr 2012 ASA(CW) submit report to Congress
- TBD Sign Project Partnership Agreement\*
- TBD Begin Construction\*
- TBD Project Operable\*

\* *Requires authorization and funding from Congress*



# Recommendation

---

Approval to initiate State and Agency Review for the *Fargo-Moorhead Metropolitan Area, Flood Risk Management Project Feasibility Study Report with Integrated Environmental Impact Statement*, dated July, 2011.



**Fargo Moorhead Metro**

**A Community at Risk**

**September 23, 2011**





**CBS Video**  
**2009 Flood -50 year event**

# Red River Basin

Total Drainage Area:  
45,000 square miles

$Q_{100}$  year = 34,700 cfs  
 $Q_{500}$  year = 61,700 cfs  
 $Q_{max}$  2009 = 29,500 cfs

**Baldhill Dam**  
**Maple River Dam**  
**Orwell Dam**  
**White Rock Dam**

North  
Dakota

North Dakota

South  
Dakota

Manitoba

Minnesota

Minnesota

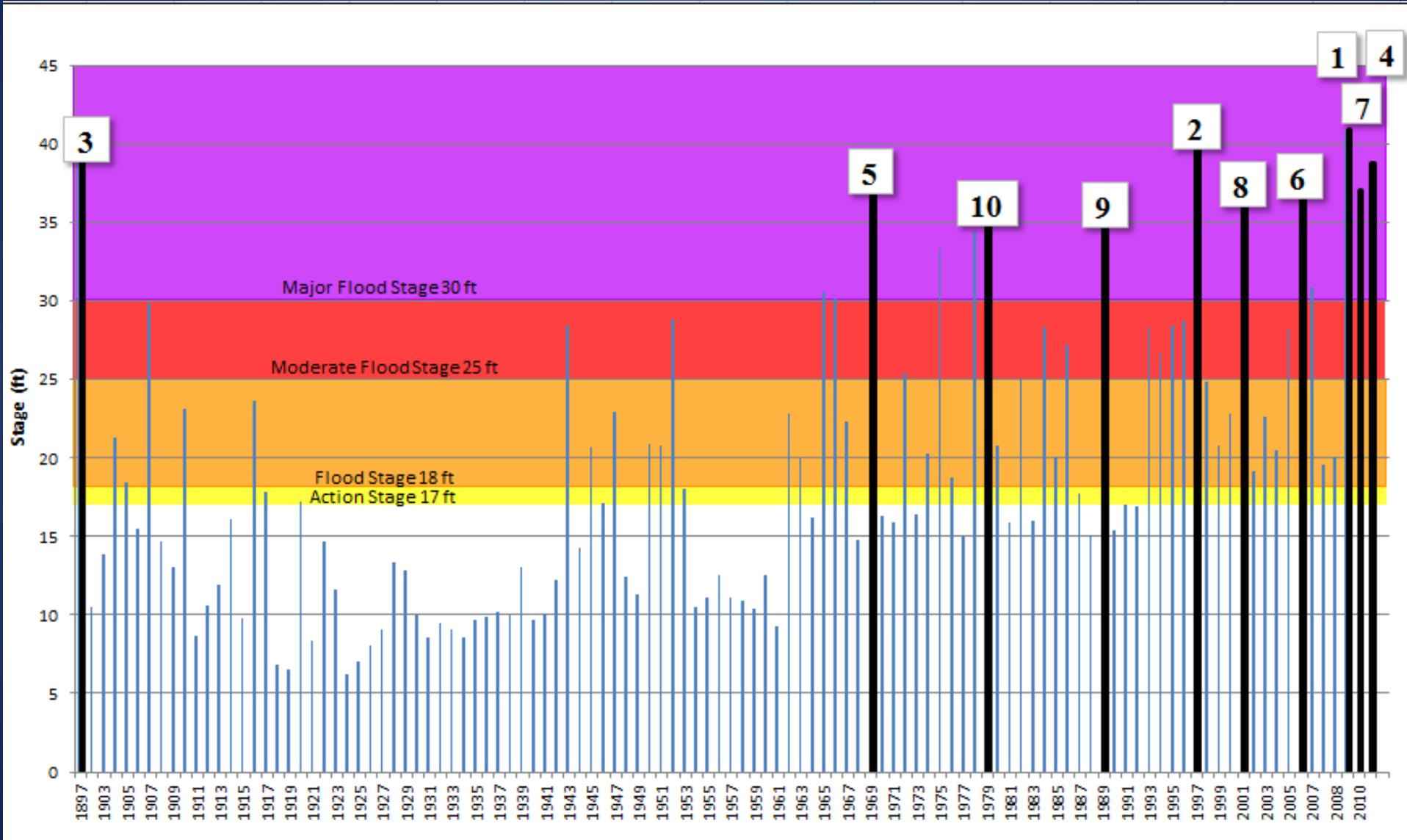
Minnesota

# Metro Area

	Fargo	Moorhead	Metro
<b>Population</b>	105,549	38,065	208,777
<b>Households</b>	46,791	15,274	86,178
<b>Jobs</b>	90,010	14,846	120,467

Regional center for Economy, Education, & Health Care  
With over 70 Square miles of Infrastructure

# Red River Flood History



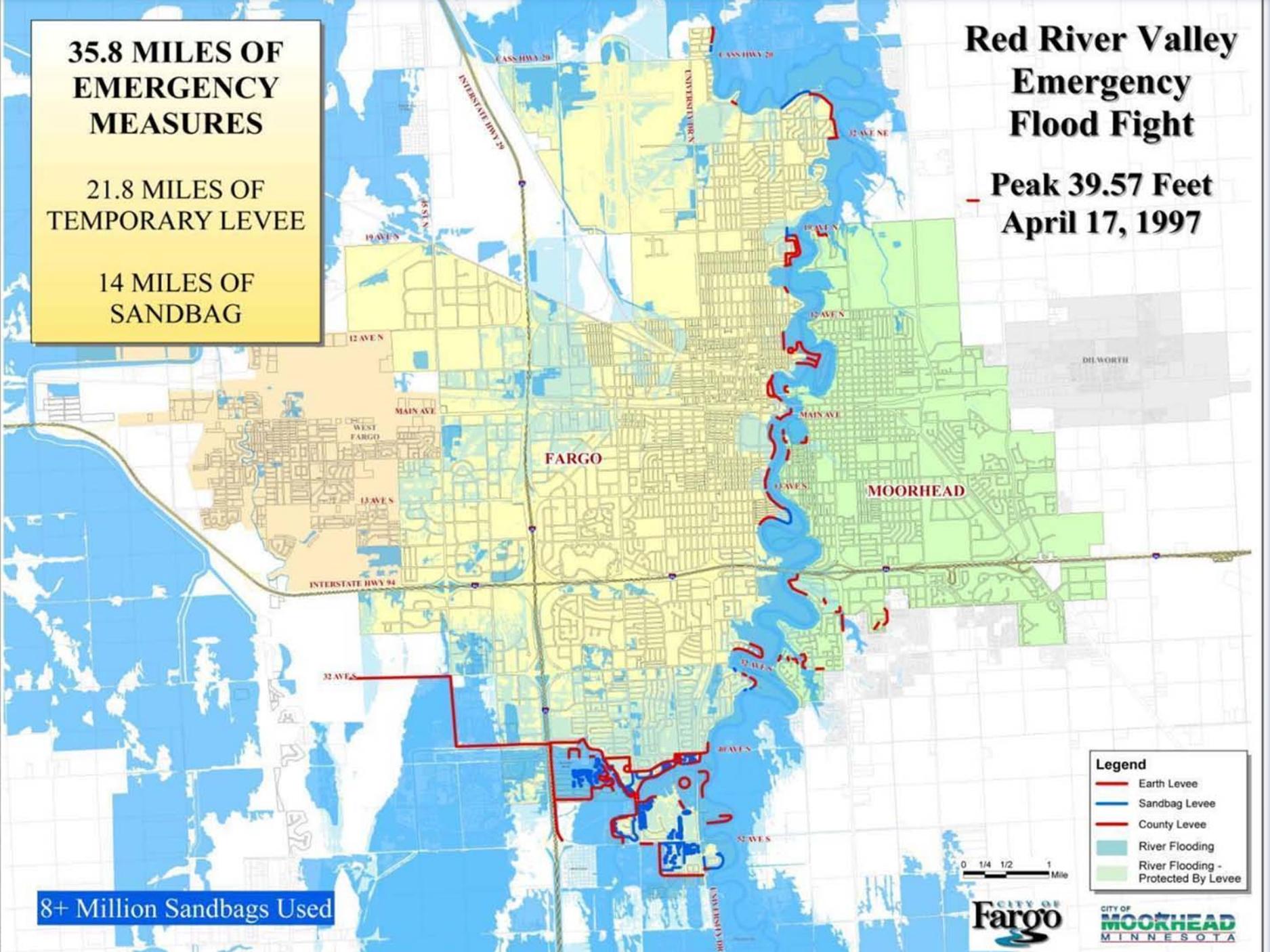
# 35.8 MILES OF EMERGENCY MEASURES

21.8 MILES OF TEMPORARY LEVEE

14 MILES OF SANDBAG

# Red River Valley Emergency Flood Fight

Peak 39.57 Feet  
April 17, 1997



8+ Million Sandbags Used

0 1/4 1/2 1 Mile



**Legend**

- Earth Levee
- Sandbag Levee
- County Levee
- River Flooding
- River Flooding - Protected By Levee



# 69 MILES OF EMERGENCY MEASURES

42 MILES OF TEMPORARY LEVEE

8 MILES OF HESCO

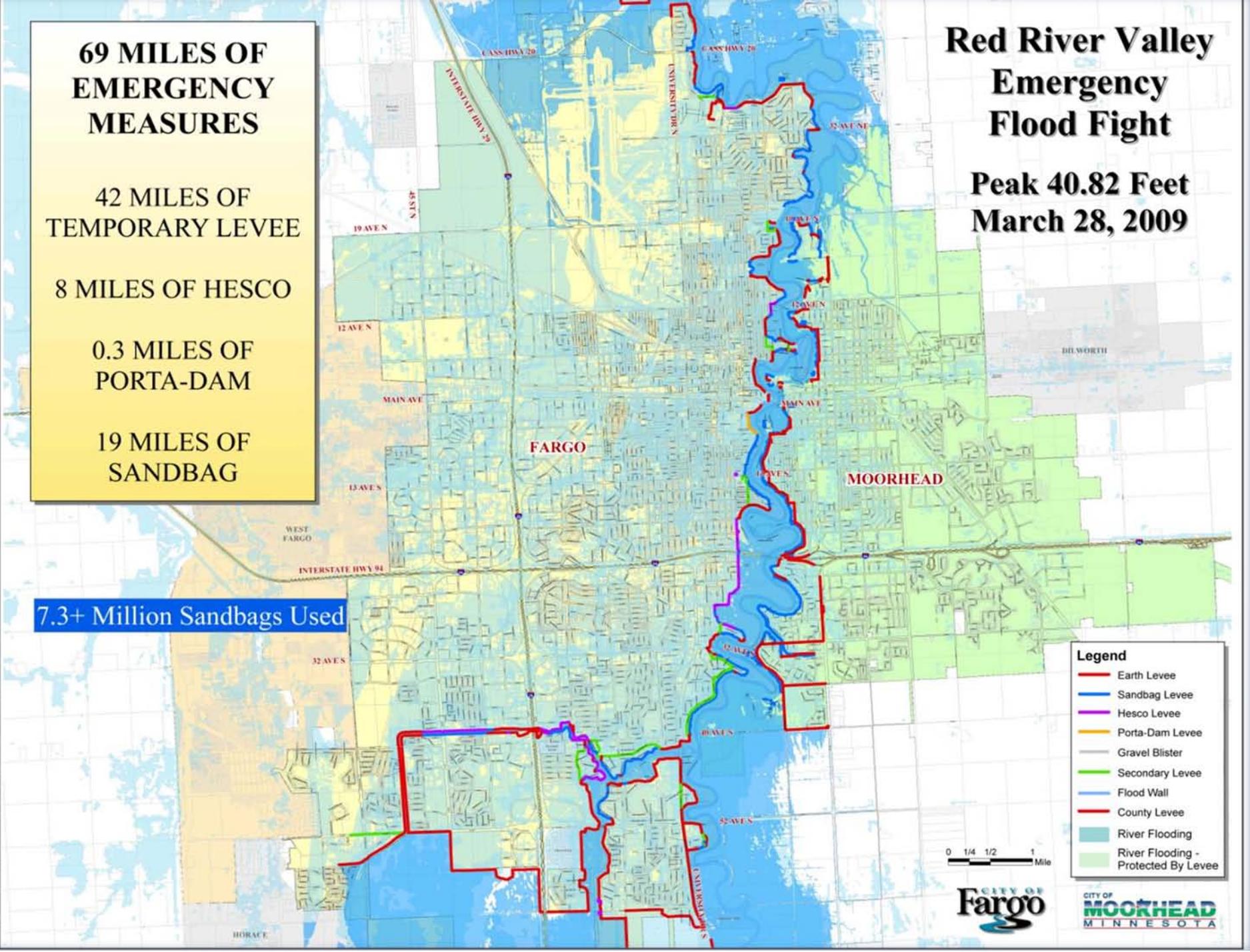
0.3 MILES OF PORTA-DAM

19 MILES OF SANDBAG

# Red River Valley Emergency Flood Fight

Peak 40.82 Feet  
March 28, 2009

7.3+ Million Sandbags Used



- Legend**
- Earth Levee
  - Sandbag Levee
  - Hesco Levee
  - Porta-Dam Levee
  - Gravel Blister
  - Secondary Levee
  - Flood Wall
  - County Levee
  - River Flooding
  - River Flooding - Protected By Levee





**A willing workforce heeds the call 2009**





# Volunteers fill the Fargodome 2009



Building is 466,000 SF.



# Lines of Defense Take Shape 2009



# Cass County 2009



**This is what it looks like when we win!?**



2009



**This is what it looks like when we win!?**

# Red River Valley Emergency Flood Fight

Peak 36.99 Feet  
March 21, 2010

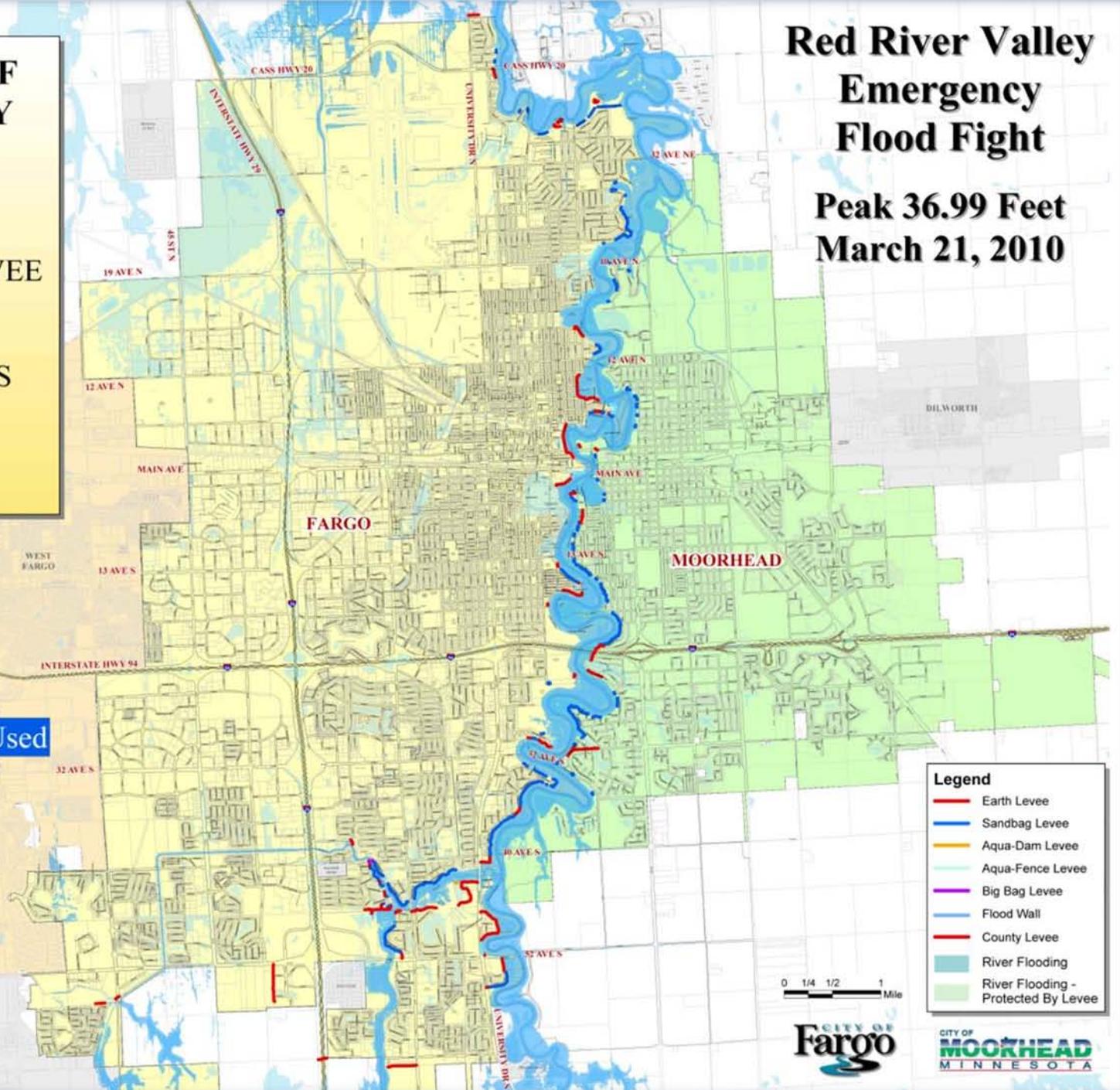
**15.2 MILES OF  
EMERGENCY  
MEASURES**

7.1 MILES OF  
TEMPORARY LEVEE

.1 MILES OF  
ALT. PRODUCTS

8 MILES OF  
SANDBAG

2+ Million Sandbags Used



- Legend**
- Earth Levee
  - Sandbag Levee
  - Aqua-Dam Levee
  - Aqua-Fence Levee
  - Big Bag Levee
  - Flood Wall
  - County Levee
  - River Flooding
  - River Flooding - Protected By Levee



# Sheyenne River Flooding 2010



# 28.87 MILES OF EMERGENCY MEASURES

19.07 MILES OF TEMPORARY LEVEE

5.46 MILES OF SANDBAG

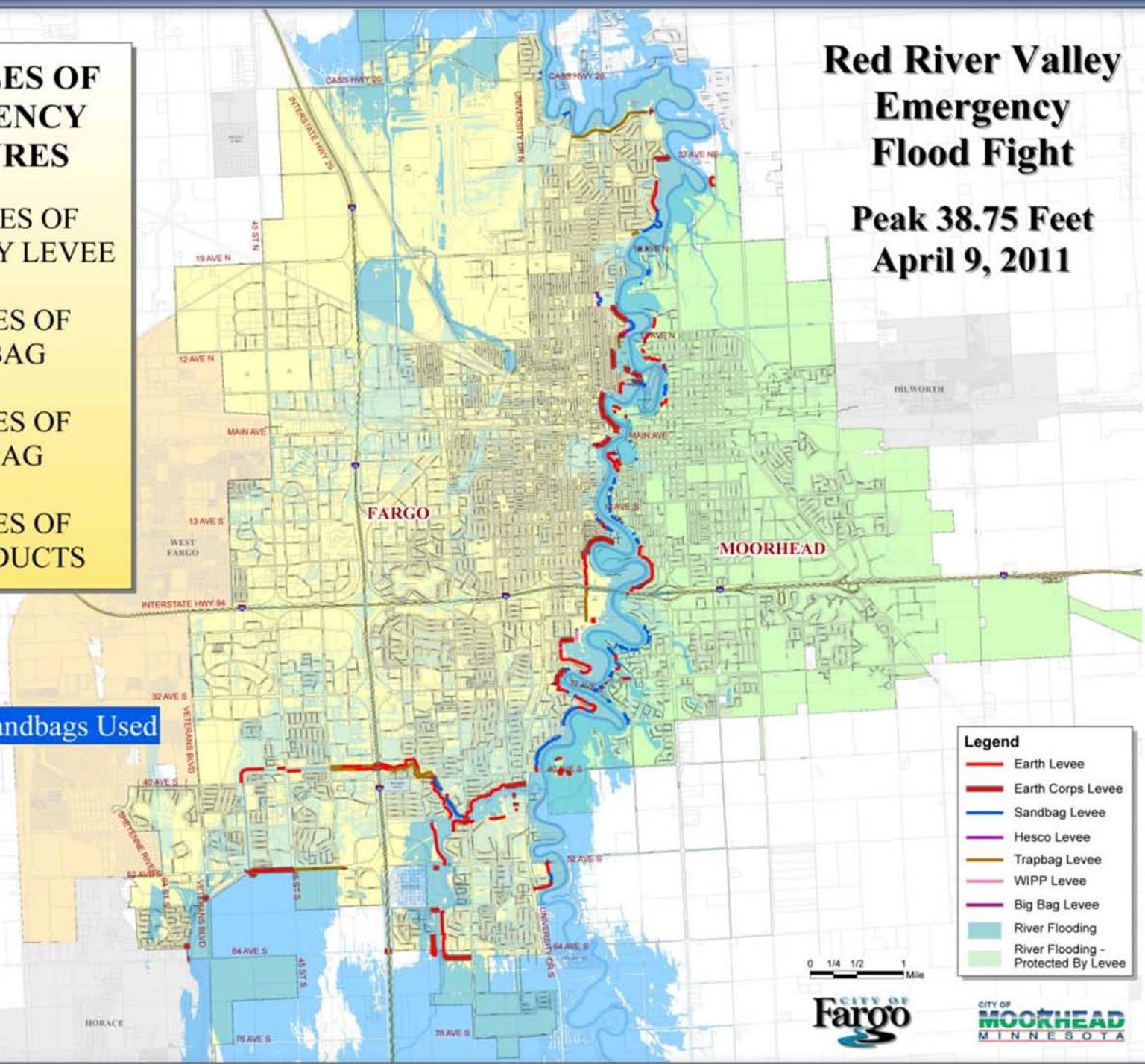
3.61 MILES OF TRAPBAG

0.73 MILES OF ALT. PRODUCTS

# Red River Valley Emergency Flood Fight

Peak 38.75 Feet  
April 9, 2011

1.9+ Million Sandbags Used



**Legend**

- Earth Levee
- Earth Corps Levee
- Sandbag Levee
- Hesco Levee
- Trapbag Levee
- WIPP Levee
- Big Bag Levee
- River Flooding
- River Flooding - Protected By Levee

0 1/4 1/2 1 Mile





# A willing workforce heeds the call 2011



# Cass County 2011



**This is what it looks like when we win!?**



# Cass County 2011



**Interstate 29 NB & SB**  
**Closed April 10- Reopened April 15**  
**Detour added 22.8 miles**

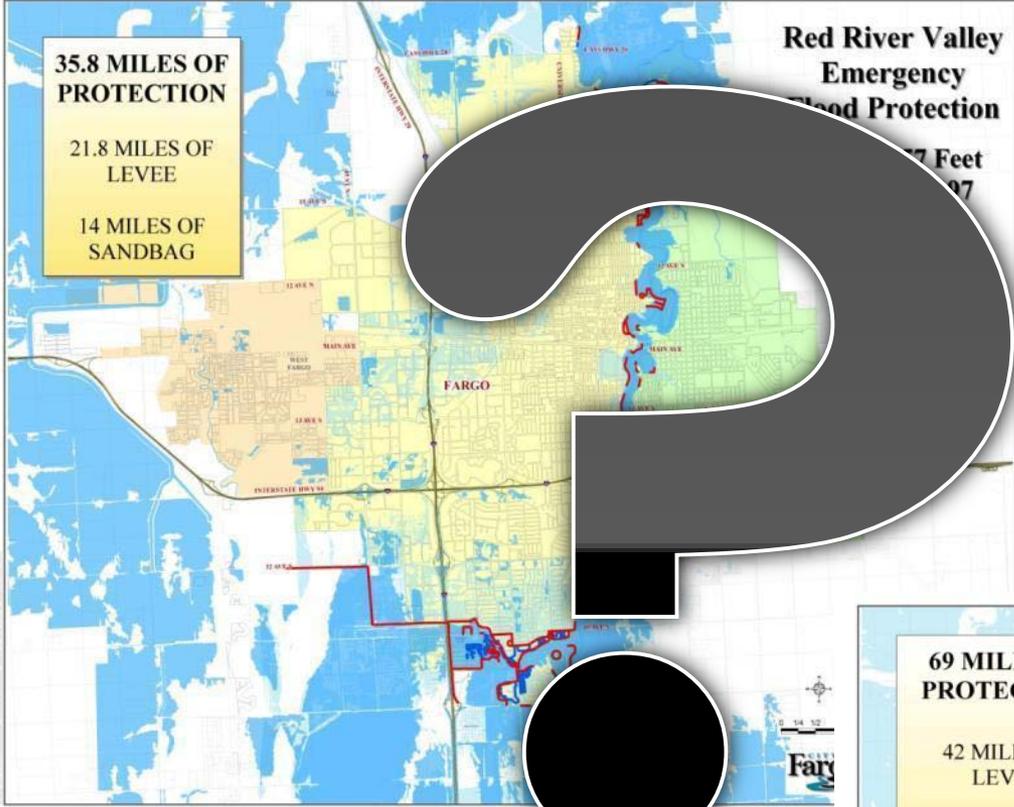
# Search & Rescue

## Rescues in Cass County

- 2009 140 People
- 2010 11 People
- 2011 15 People



# Future Flood Fight Strategy



**We will continue to wage emergency flood fights but we may not always win!**

- Legend**
- Earth Levee
  - Sandbag Levee
  - Hesco Levee
  - Porta-Dam Levee
  - Gravel Blaster
  - Secondary Levee
  - Flood Wall
  - County Levee
  - River Flooding - Protected By Levee

# Future Flood Fight Strategy

- **Pursue Permanent Flood Risk Reduction**
- **Continue Localized Risk Reduction Measures**
  - Acquire & Remove Flood Prone Houses
  - Construct Permanent Infrastructure Improvements
  - Construct Emergency Levees



Emergency  
Repair Fill  
Source

Failing Emergency  
Levee

Fargo 2009

# A Community Comes Together to Hold Off Disaster

## Diversion Authority Board

9 member governance board has been established from the local agencies involved in this project

- **Cities**

- Fargo-ND & Moorhead-MN

- **Counties**

- Cass-ND & Clay-MN

- **Water Boards**

- Cass County Joint Board-ND
- Buffalo-Red Board-MN



Other units of government have & will participate as there is a need.

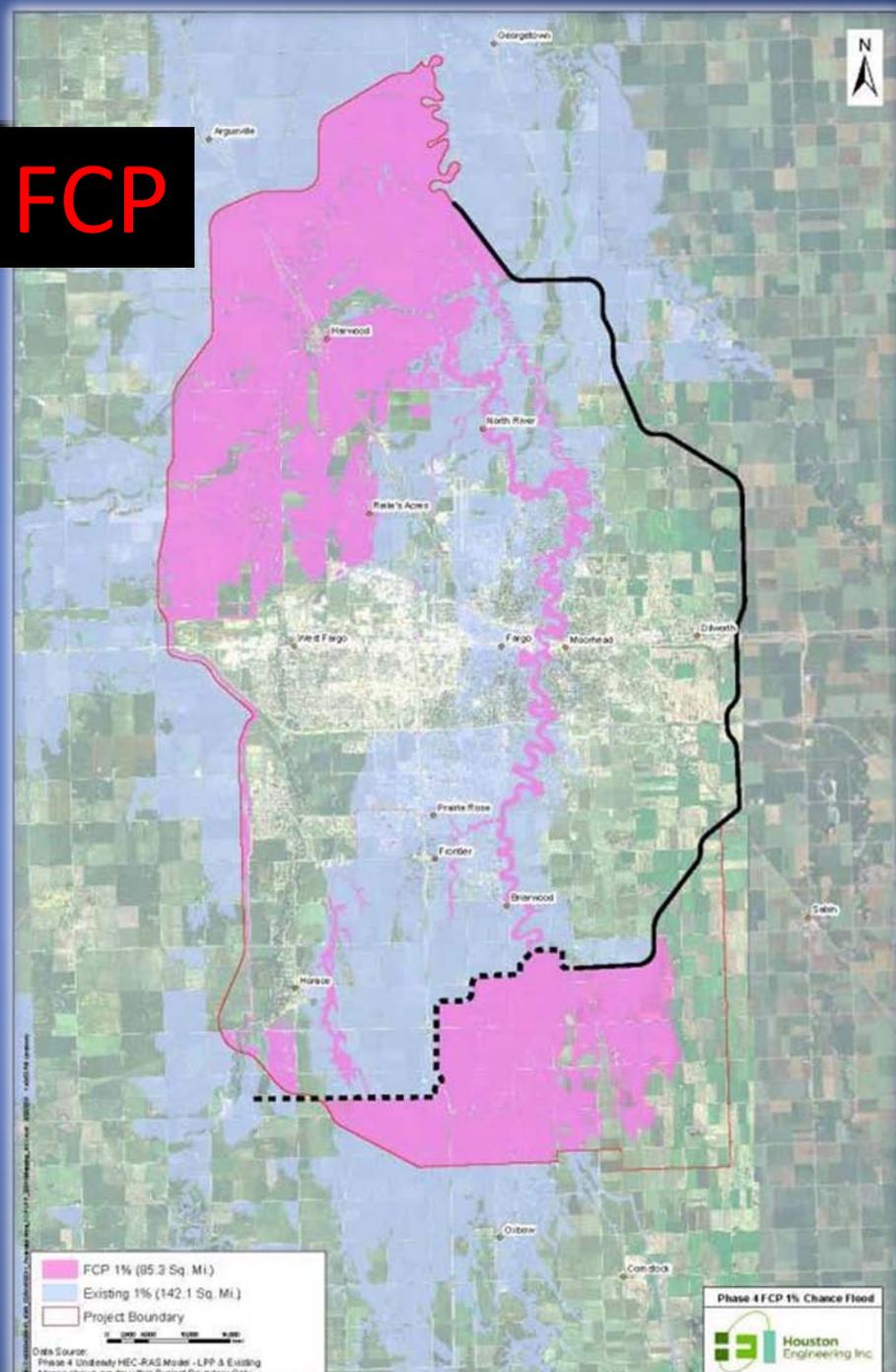
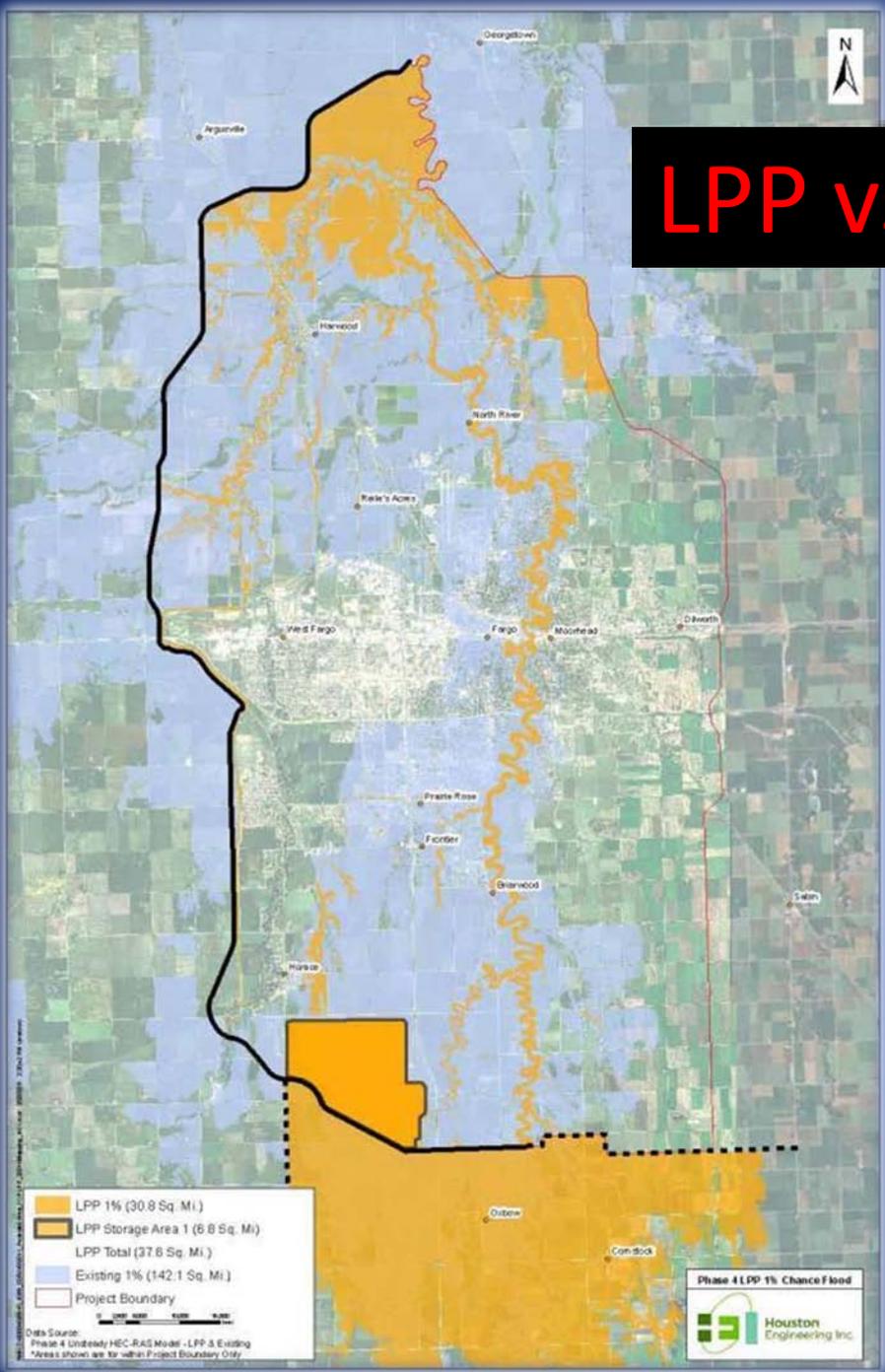
# Locally Preferred Plan

Providing risk reduction...  
to the greatest amount of infrastructure  
for the greatest number of Citizens  
from multiple river systems

- Red River
- Wild Rice River
- Sheyenne River
- Maple River
- Rush River
- Lower Rush River



# LPP vs. FCP



# LPP Makes Sense

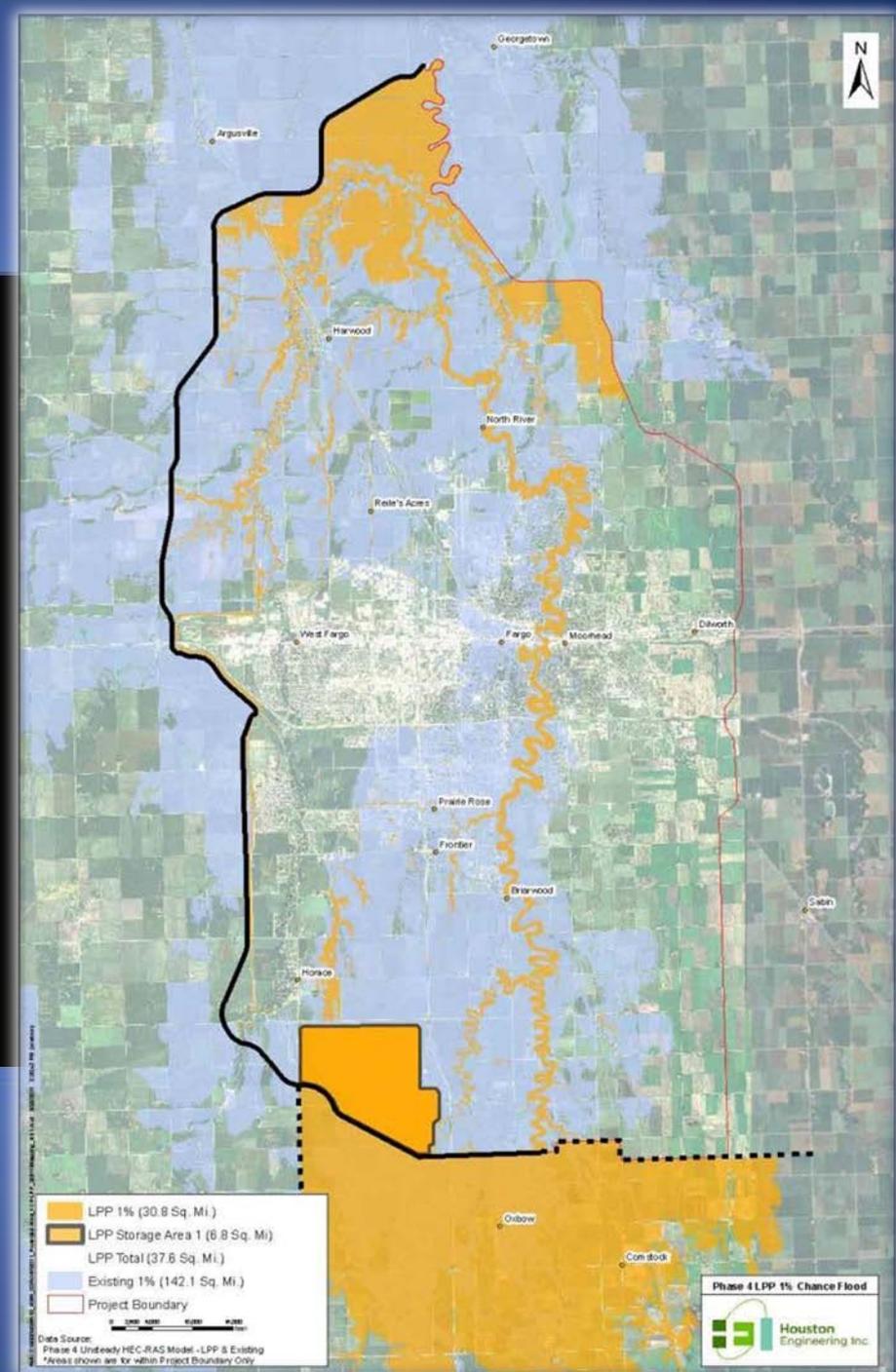
- negative impacts are **contained within a 10 to 12 mile distance**- Previously extended to Canadian Border
- **Reduced potentially impacted properties** from approximately 3,400 to approximately 800



# LPP Makes Sense

For a 1% event:

- 10'-12' stage reduction at Fargo Water Treatment Plant
- Maximum DS impact of 3.5"
- Risk reduction of 105 sq mi
- Max. staging of 8'-10'



# LPP Makes Sense

- **1 in 5** of all North Dakotans will benefit from flood risk reduction. Total citizens to receive risk reduction is estimated to be over 135,000 people.
- Value of property receiving flood risk reduction benefits totals **\$14 Billion dollars**
- The wages in the metro area are **\$4.3 Billion annually**
- The Fargo-Moorhead gross domestic product (GDP) is **\$10 Billion annually**



# LPP Makes Sense

- FM Metro generates **\$200 M** per year for the State of **ND** in income taxes & sales taxes.
- FM Metro generates **\$71 M** per year for the State of **MN** in income taxes & sales taxes.





# LPP Makes Sense

## How will we pay for this locally?

- **Two 20 year ½ cent** sales taxes passed in ND will generate an estimated **\$400 M**
  - 92% of the voters passed a City of Fargo sales tax for flood protection
  - 63% of the voters passed a Cass County sales tax
- State of ND committed to ½ the Non Federal-Non Minnesota Share last estimated at **\$350 M**
- City of Moorhead Minnesota would receive a Flood Damage Reduction Grant from the MN DNR
- Additional funds would be generated from special assessments, taxes or other means as required



# Without Permanent Flood Risk Reduction

- Potential for an estimated loss of life for **200 people** in a **100-year flood!!!**
- Potential for an estimated loss of life for **600 people** in a **500-year flood !!!**
- **\$195 million** a year in estimated damages!!!



# Improvements Since 1990

	\$ Millions
Moorhead	48.5
Cass County	75.0
Clay County	35.2
Fargo	184
<b>*Total</b>	<b>342.7</b>



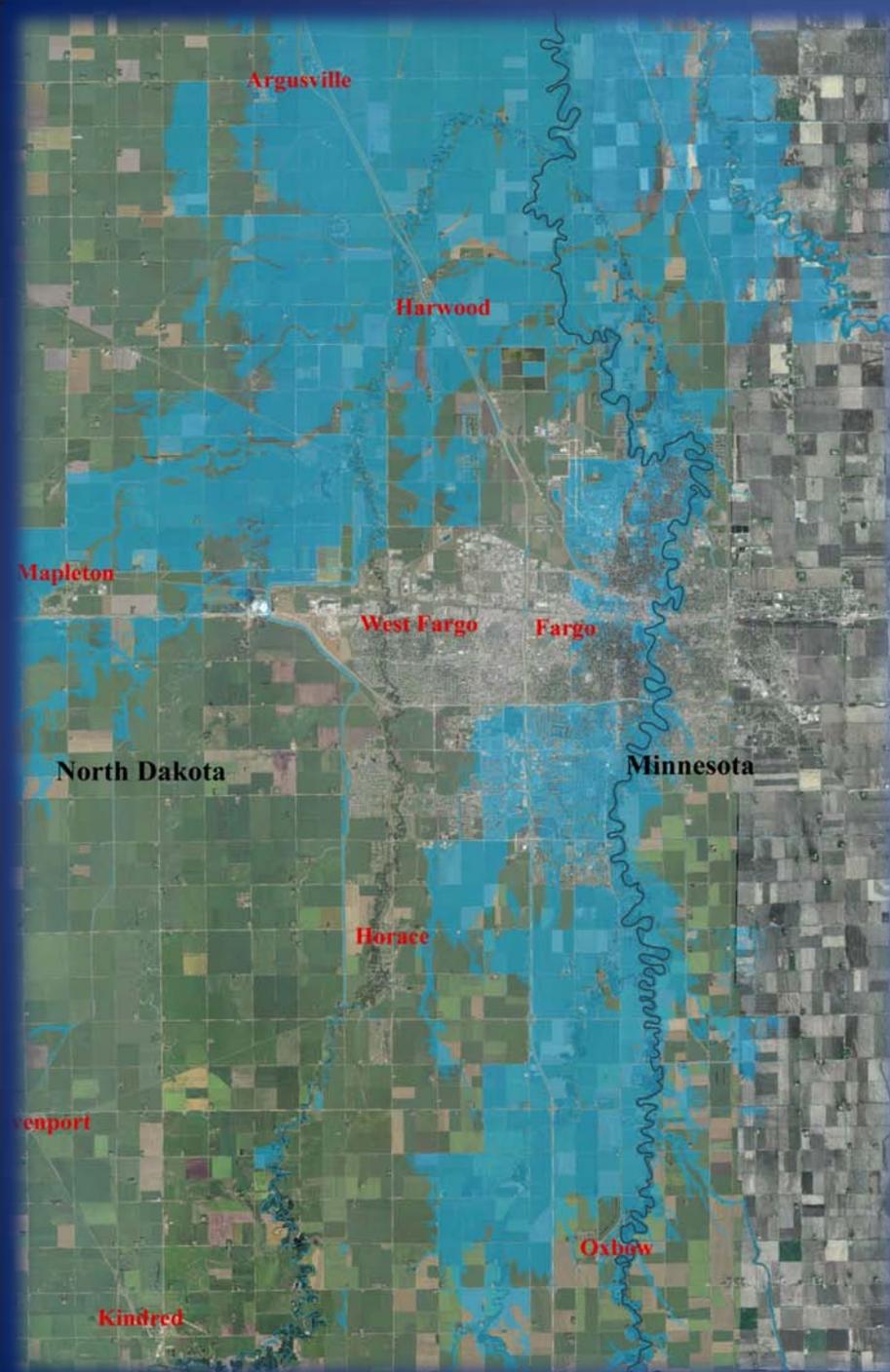
\*Includes Acquisitions (over 500), and Infrastructure Improvements related to reducing flood risk

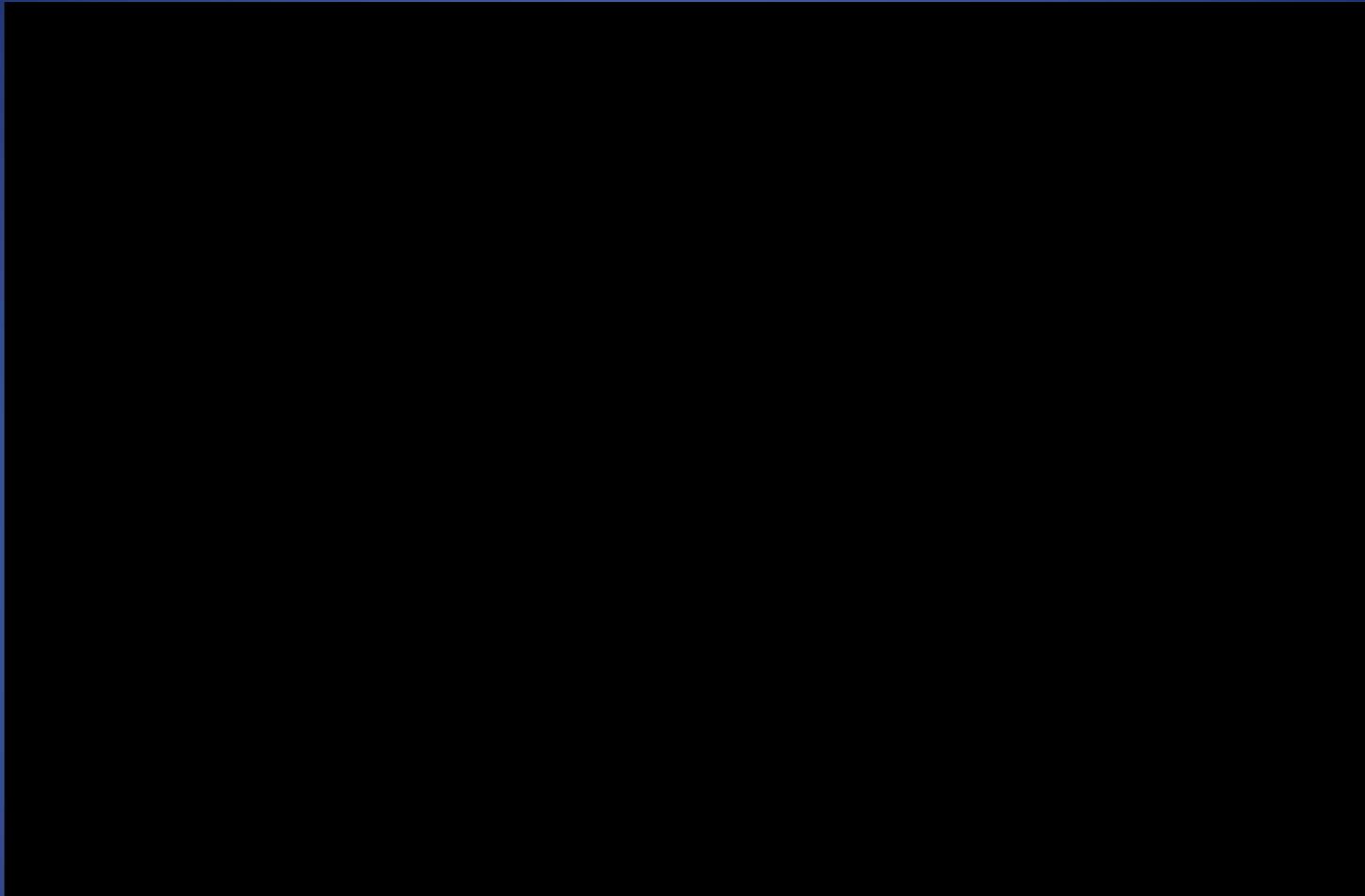
Improvements  
totaling in excess  
of

**\$342.7 Million**

Emergency  
measures are still  
necessary at

**less than the 50  
Year flood level**





# WDAY Video

## 2009 Flood -50 year event

# Grand Forks 1997



# Minot 2011



A photograph showing a light-colored house with a grey deck on the left. The deck has a lattice railing and a table with chairs. To the right of the house is a large, irregular area of disturbed earth, likely from a construction or landscaping project. In the background, there are trees, a fence, and a white structure. The sky is overcast.

**Thank You for your consideration.**

**This is not a permanent solution!**

8:48

Presentation to the

# CIVIL WORKS REVIEW BOARD

## Fargo-Moorhead Metropolitan Area Flood Risk Management Feasibility Study Report and Environmental Impact Statement

by  
**MG Michael J. Walsh**

*Commander  
Mississippi Valley Division*

*September 23, 2011*



®

**US Army Corps of Engineers  
BUILDING STRONG®**



# MVD Command Endorsement

- Concur with MVP Commander's findings and recommendations for Fargo-Moorhead Metropolitan Project
- Report complies with all applicable policies and laws in place at this time
- Anticipate a favorable response to the draft Chief's Report
- Plan supported by sponsor and congressional delegation
- Consistent with the Environmental Operating Principles



# Certification of Legal and Policy Compliance

- Legal certification completed on July 15, 2011
- Technical and policy compliance:
  - ▶ ATR performed by staff from FRM-PCX, NWO, HEC, SWT, and NWW
  - ▶ ATR certification dated July 19, 2011
  - ▶ Significant ATR comment is now resolved



# MVD Quality Assurance Activities

- MVD reviewed ATR comments/responses to ensure appropriate resolution
- Active participation by vertical team
- Worked with MVP to successfully resolve HQ review comments
- MVD concurs that project is technically and policy compliant



# MVD Recommendation

- Approve Final Report for release for State and Agency Review
- Complete Chief's Report NLT 22 Dec 11



# Fargo-Moorhead Metropolitan Area Flood Risk Management Feasibility Study Report and Environmental Impact Statement

## *Civil Works Review Board*

**AGENCY TECHNICAL REVIEW (ATR)**

**Mr. Christopher Fassero (NWO)**

**ATR Lead, FRM Center of Expertise**

**23 September 2011**

**Headquarters, US Army Corps of Engineers**

**Washington, DC**



**US Army Corps of Engineers**  
**BUILDING STRONG®**



# Agency Technical Review (ATR)

---

- ATR led by Omaha District with review team members from Omaha, Walla Walla, Tulsa, and HEC.
- ATR conducted for:
  - ▶ FSM submittal
  - ▶ AFB submittal
  - ▶ SDEIS
- Received 617 total comments.
- Two outstanding issues noted in SDEIS ATR Report; both were subsequently resolved.
- Cost Engineering DX Certification signed 21 Jun 11.
- Certification of Technical Review signed 19 Jul 11.



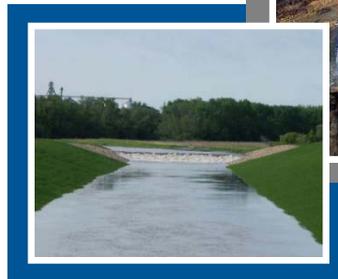
# ATR Issue

---

- Classification of embankment surrounding Storage Area 1 as a levee versus a dam.
  - ▶ Important to resolve this issue early, so correct design standards can be applied.
  - ▶ MVP addressed this issue with their vertical team.



# Independent External Peer Review (IEPR) - Fargo-Moorhead



Battelle

Karen Johnson-Young, Program Manager  
Julian DiGialleonardo, Project Manager

# IEPR – Fargo-Moorhead

- **The IEPR was conducted in two phases from 2010 – 2011.**
- **Phase I and Phase II IEPRs were conducted by the same Panel for consistency.**
- **Five Experts on IEPR Panel**
  - NEPA & Biology – *Brandon Kulik*
  - Hydrology & Hydraulic Engineering – *Marcelo Garcia, Ph.D., P.Eng.*
  - Geotechnical Engineering – *Douglas Spaulding, P.E.*
  - Economics – *Gretchen Greene, Ph.D.*
  - Civil Design & Construction Cost Engineering – *David Love, P.E.*

# IEPR – Fargo-Moorhead (continued)

- **Phase I IEPR**

- Final IEPR Report Submitted on May 17, 2010
- IEPR Results: 23 Final Panel Comments: 7 high significance; 13 medium significance; 3 low significance
- Comment/Response Results Documented on July 6, 2010
- USACE response to Final Panel Comments: 21 concurs, 2 non-concurs
- Panel's response to USACE: 23 concurs, 0 non-concurs

- **Phase II IEPR**

- Final IEPR Report Submitted on July 7, 2011
- IEPR Results: 16 Final Panel Comments: 1 high significance; 11 medium significance; 4 low significance
- Comment/Response Results Documented on August 8, 2011
- USACE response to Final Panel Comments: 12 concurs, 4 non-concurs
- Panel's response to USACE: 16 concurs, 0 non-concurs

# IEPR – Fargo-Moorhead (continued)

- **Phase I and Phase II IEPR Issues Resolved**

- Environmental analyses were complete; all issues identified in the Final Panel Comments were adequately addressed.
- Hydraulic and hydrologic engineering studies were complete; all issues identified in the Final Panel Comments were adequately addressed.
- Geotechnical engineering studies were complete; all issues identified in the Final Panel Comments were adequately addressed.
- Economic analyses were complete; all issues identified in the Final Panel Comments were adequately addressed.
- Civil design and construction cost engineering studies were complete; all issues identified in the Final Panel Comments were adequately addressed.

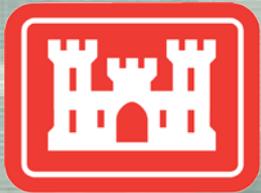


# HQUSACE POLICY REVIEW CONCERNS

## Civil Works Review Board

### Fargo - Moorhead Flood Risk Management Project

Thomas Hughes  
Office of Water Project Review  
Planning and Policy Division  
Washington, DC – 23 September 2011



®

US Army Corps of Engineers  
**BUILDING STRONG**®

# HQUSACE Team Reviews:

- FSM was held in May 2009
- AFB was held in May 2010
- Review of Draft Report concurrent with public review August 2010
- Back check of remaining outstanding comments completed September 2011
- Final Feasibility Report /EIS: current review being completed by HQUSACE team



# Policy Questions from AFB and Draft Report Reviews

- Problems and Opportunities
- Base Year – Period of Analysis
- Screening of Management Measures and Alternatives
- **Flood Fighting Effectiveness**
- **NED, Federally Comparable Plan and Locally Preferred Plan**
- **Downstream Impacts**
- Mitigation Plan
- Sediment Transport
- Environmental Compliance
- Cost Sharing
- Cost Estimate
- Cultural Resources



# Areas of Policy Concern:

- Flood Fighting Effectiveness
- NED, Federally Comparable Plan and Locally Preferred Plan
- Downstream Impacts



# Flood Fighting Effectiveness

**CONCERN:** The Fargo/Moorhead community has a very well organized flood fighting program that has been successful in the past, significantly reducing flood damages. However , the economic analysis did not account for any flood risk reduction from these flood fighting activities.

**REASON:** Past performance of the flood fighting demonstrates that they have been successful in reducing flood damages. By not accounting for some level of risk reduction benefits could be overstated.

**RESOLUTION:** There is a significant amount of uncertainty with the performance of these flood fighting measures. An analysis was performed to demonstrate the sensitivity of project justification to the level of performance of the flood fighting that showed the project maintained its economic justification even when these measures were successful to approximately a 50-year event.

**RESOLUTION IMPACT:** Concern Resolved.



# NED, Federally Comparable Plan and Locally Preferred Plan (LPP)

**CONCERN:** The recommended plan is not the NED Plan.

**REASON:** The alternative plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment, the NED plan, shall be selected. The Assistant Secretary of the Army for Civil Works (ASA (CW)) may grant an exception when there are overriding reasons for selecting another plan based upon other Federal, State, local and international concerns.

**RESOLUTION:** ASA (CW) granted an exception, dated 28 April 2011, allowing the LPP to be the recommended plan. All costs of the LPP that exceeded the Federally Comparable Plan would be the responsibility of the non-Federal sponsor.

**RESOLUTION IMPACT:** Concern Resolved.



# Downstream Impacts

**CONCERN:** The tentatively selected plan would cause a small rise of water surface elevations downstream of the project. Issues with potential impacts associated with this rise in water surface elevations were raised by downstream communities and FEMA. These effects would also extend as far as Canada requiring further international coordination.

**REASON:** In accordance with Corps policy, the impacts of this increase were evaluated. The downstream impacts were evaluated as to a potential 5<sup>th</sup> amendment takings or if a cost effective measure could reduce the impacts. Neither of these options were identified so impacts were accounted for by including the associated damages in the costs of the project to properly identify the NED plan and the associated net benefits.

**RESOLUTION:** The NED plan was correctly identified but a locally preferred plan was developed and recommended that would minimize downstream impacts.

**RESOLUTION IMPACT:** Concern Resolved.



# **HQUSACE POLICY COMPLIANCE REVIEW TEAM RECOMMENDATION**

**Release the report and EIS for S&A Review**



# Fargo-Moorhead Metropolitan Area Flood Risk Management Feasibility Study Report and Environmental Impact Statement

## *Civil Works Review Board*

### LESSONS LEARNED

COL Michael J. Price

District Commander, St. Paul  
District

23 September 2011

Headquarters, US Army Corps of Engineers

Washington, DC



US Army Corps of Engineers  
**BUILDING STRONG**®



# Lessons Learned

---

- Employing Regional assets, A/E firms and Sponsor A/E firms is important in achieving an accelerated schedule
- Important to engage the Vertical Team early and often in the Study process to address critical issues
- The PDT must actively participate in the ATR and IEPR review processes
- Effective & continuous communication with the sponsor and stakeholders is essential
- Dedicated team able to commit to project completion – little disruption due to other Corps commitments
- Working on many major items simultaneously can result in rework – but completed faster in the end
- Aggressive schedule led to team fatigue – lots of personal sacrifice



Presentation to the

# CIVIL WORKS REVIEW BOARD

Lessons Learned  
Fargo-Moorhead Metropolitan Area  
Flood Risk Management Feasibility  
Study Report and Environmental  
Impact Statement

by  
**MG Michael J. Walsh**  
Commander  
Mississippi Valley Division

September 23, 2011



®

US Army Corps of Engineers  
**BUILDING STRONG**®



# MVD Lessons Learned

- Used regional resources to provide necessary expertise
- Active Vertical Team involvement was essential
- Early written buy-in from leadership on areas of policy interpretation allowed the study to progress quickly
- PDT excelled at communication with the sponsor and public
- Sponsor willing to make difficult decisions at key milestones
- Aggressive schedule necessitated making many key assumptions and working on parallel tracks - assumptions for downstream impacts were not anticipated and the schedule was adjusted accordingly to properly conduct the analysis.

