FM Diversion Project

Alternatives Discussion
Flood Damage Reduction Strategies

1. Reduce Flood Volume
2. Increase Conveyance Capacity
3. Increase Temporary Flood Storage
4. Protection/Avoidance

There are several individual measures within each of the broad strategy categories shown above.
A Basin Approach to Flood Damage Reduction

- All of the aforementioned strategies can be used to provide local FDR benefits, but they affect downstream areas differently depending on location
  - Primary consideration should be given to measures that also work toward achieving basin flood damage reduction goals
  - Measures that work against meeting basin flood damage reduction goals should be minimized or avoided, if possible
  - Unavoidable adverse basin impacts should be mitigated
- The downstream impacts are largely determined by timing
Timing is affected by storage, travel time, and snowmelt progression.
Red River @ Fargo Drainage Area within the Red River Basin

- The Red River Watershed Upstream of Fargo
  - ~75% within the Basin Late Zone
  - ~25% within the Basin Middle Zone
The Basin Preferred Alternative to reduce Flooding at Fargo-Moorhead is to Add Storage

• Implementing storage in late and middle areas reduces downstream mainstem peak flows by slowing the water down.
  • Therefore, it would be the preferred flood control alternative from a basin perspective.

• Conversely, removing floodplain storage in late and middle areas increases downstream peak flows by speeding the water up.
  • Therefore, from a basin perspective, strategies that decrease floodplain storage should be avoided to the extent practical.
Incorporating Storage

• Distributed upstream storage strategy as developed by the Red River Basin Commission
  • 20% Mainstem peak flow reduction
  • Flood control effect
    • 100 year peak flows reduced to about that of 50 year
    • 200 year peak flows reduced to about that of 100 year
  • Likely achieves greater than 20% flow reduction on most tributaries
  • Provides local flood control benefits where implemented
  • Creates opportunities for other environmental benefits
20% Peak Flow Reduction Red River @ Fargo

• What would it take?
  • ~40 sites in Bois de Sioux, Otter Tail, Wild Rice ND, and Upper Red Sub-basins
  • ~226,000 acre-feet of flood storage

• Implementing the strategy on the Sheyenne River which affects the area northwest of Fargo would require:
  • ~26 sites in Sheyenne, Maple, and Rush River Sub-basins
  • ~121,000 acre-feet of flood storage

• Potential storage sites from the Halstad Upstream Study are shown on the following map:
Distributed Storage (Halstad upstream shown)
Fargo-Moorhead Flood Control
Role for Distributed Storage

• Problems
  • Uncertain future implementation
  • Extended time frame of implementation

• Appropriate role
  • Provide protection beyond 100-year
  • Mitigate increased future flood potential
Preserve Existing Floodplain Storage

• There currently is a vast floodplain south, west, and north of the FM Metro Area
• Flood water stored in the floodplain reduces downstream peak flows
• The proposed Diversion Project alignment reduces floodplain storage in those areas by:
  • Lowering flood elevations, and
  • Protecting existing floodplain by levee and dam embankments
Diversion Channel Impacts

• The Primary Purpose of a Diversion Channel is to carry water around a protected area.
  • This doesn’t necessarily cause much, if any, downstream impact
  • So why is the proposed diversion channel such a big deal?

• The proposed diversion channel doesn’t just carry water around the city

• The proposed diversion channel also drains a huge floodplain area

• Thereby reducing storage
Levee and Dam Alignments

• Levees along the east side of the diversion channel isolate a large area of the floodplain between the diversion and existing developed city areas

• The staging area dam upstream from Fargo isolates a large area of floodplain between the diversion and existing city areas
Loss of Floodplain Storage necessitated the Addition of a Staging Area Dam Primarily to Mitigate Downstream Impacts. The Amount of Floodplain Storage Lost determines the Minimum Required Staging area capacity.
The Joint Powers Authority (JPA) Proposed a Lower Impact Alternative

• The JPA Diversion Alignment is farther east, thereby greatly reducing the amount of existing floodplain area isolated by the Plan B levees and reducing the drainage impacts of the diversion channel

• The JPA Dam Alignment is farther north, thereby greatly reducing the existing floodplain area isolated by the Dam Embankment
JPA Diversion Channel Alignment

- Farther East by about 3 miles than the Plan B Alignment in the area north of I-94
- Area between the Plan B and JPA alignments is primarily undeveloped floodplain except for the City of Harwood
- Maple and Rush Rivers follow their natural outlet into the Sheyenne River
- Eliminates Maple River Aqueduct
- Diversion Channel crosses Sheyenne River a second time north of West Fargo, potentially at grade
Dam Alignment

- About two miles farther north than the Plan B alignment
- Area is primarily undeveloped existing floodplain
Results (based on preliminary analysis and MNDNR further analysis)

• The greatest reduction in hydrologic impacts are achieved by the northwest alignment change because it preserved the greatest amount of floodplain storage
  • Reduced the 100-year flood pool volume by about 35,000 acre-feet
  • Reduced the 100-year flood pool area by 4,700 - 5,200 acres

• The primary effect of the revised dam alignment is to reduce the flood pool elevations due to its placement farther downstream
  • Lowered the 100-year flood pool elevation by 4.6 to 4.8 feet, from 921.0 to 916.2 – 916.4
  • Combined with a properly designed gate and spillway system, peak elevations of the 500-year and PMF should be similarly reduced
    • Reduced dam elevation
    • Elimination of the Eastern Tieback and the Wolverton Creek box culverts
Environmental Concerns

• Upon the introduction of the JPA Alternative, as with any alternative, several concerns were raised

• The designer normally is challenged to address to those concerns based on further analysis of impact potential and/or project modifications

• Unfortunately there was no opportunity to address the concerns other than to provide brief comments to the DSEIS

• While I do not believe any of the concerns are both significant and unresolvable I do acknowledge that they would need to be addressed in greater detail
Summary

• The Diversion Project as proposed is excessive in that it eliminates an unnecessarily large amount of existing floodplain storage
• Excessive loss of flood plain storage results in the need for greater mitigation storage
• Alternatives are available that would significantly reduce the loss of floodplain storage and thereby reduce the need for staging area storage
• The JPA Alignment is an unrefined example of a less impactful alternative
• The 20% Flow Reduction Strategy should be aggressively pursued