

**FMM GEOMORPHOLOGY MEETING WITH MINNESOTA DNR 1/25/13**  
**AGENDA and NOTES**

**AGENDA ITEMS**

Follow up on Data Gaps from 12/10/12 meeting with the DNR

1. Upstream Impacts
  - a. Bank Stability
    - i. Rosgen Analysis & Recommendations
    - ii. Sedimentation
  - b. Reservoir Drawdown
    - i. Hydrographs & Inundation Mapping at Oxbow
    - ii. Drawdown Rates – Proposed Geotechnical Analysis
2. Gradients
  - a. Shear Stress Hydrographs & Location Map
  - b. Velocity Hydrographs & Location Map
3. Operational plan
  - a. Proposed plan from EAW
  - b. Possible adjustments based on Reservoir Drawdown analysis

Summary & Index of all Geomorphology-related Data & Reports

- Exhibit I - Sediment Transport, of Appendix F - Hydraulic Structures, of Attachment 5 - Consultant's Report, of Final Environmental Impact Statement for the Fargo Moorhead Flood Risk Management Project - Final March 9, 2011 by Barr Engineering
- Sediment Concentrations, Loads and Particle-Size Distributions in the Red River of the North and Selected Tributaries near Fargo, North Dakota, during the 2010 Spring High-Flow Event, Scientific Investigations Report 2011-5064 Published May 19, 2011 by USGS
- Sediment Transport Analysis for Diversion in the Red River Basin near Fargo-Moorhead - Draft July 12, 2012 by USACE
- Meander Belt Width Analysis - Draft Technical Memo July 31, 2012 by Barr Engineering
- Sediment Loads in the Red River of the North and Selected Tributaries near Fargo, North Dakota, 2010-2011, Scientific Investigations Report 2012-5111, Published August 9, 2012 by USGS
- Geomorphology Study of the Fargo, ND and Moorhead, MN Flood Risk Management Project - Final October 25, 2012 by WEST Consultants
- Suspended sediment, bedload, bed sediment, vertical-profile point samples and turbidity measurements - Data received January 17, 2013 by USGS

Monitoring Plan

**NOTES:**

Attendees:

DNR: Nathan Kestner, Luther Aadland, Ian Chisholm, Stuart Arkley, Randall Doneen

Diversion Authority: Bob Zimmerman, Mark Bittner, Tim Thoreen, Miguel Wong, Jeff Weiss

USACE: Michelle Larson, Aaron Buesing, Greta Schmalle, Jon Sobiech, Alex Nelson, Craig Evans

Refer to USACE slide presentation for technical details.

Upstream Impacts:

Chisholm: DNR's position on Rosgen Level III was that it appeared to be incomplete. DNR is willing to move beyond the current submittal to look at what future monitoring should include. Red River is colloidal, but Sheyenne and Buffalo may not be. Need to look at the individual streams.

Greta: based on our analysis, it will be important to look at natural levees because that is where sediment is more likely to settle out.

Anecdotal info from Maple River near confluence with Sheyenne was an area where there was more sand in the load.

Aadland: 2011 event near Hickson there was 5-6" of deposition.

Buesing: Greta's info supports the idea that there are localized places where deposition occurs, but we don't see it everywhere.

Wong: We can use LIDAR to assess the reaches where natural levees exist. Compare that to the anecdotal info to see if they line up. The material shown in the photo is clay material, as seen by the cracks.

Kestner: cumulative deposition in wetlands could lead to conversion to non-wetland and/or impacts.

Wong: since 1992 we have had several flood events that would have had these impacts if they were likely to occur. We should look not at isolated recent events but look more broadly.

Kestner: DNR needs to be comfortable with the analysis presented.

Doneen: Need something in the EIS to address DNR's earlier comments about deposition. Scoping Decision Document will address what more needs to be done.

Buesing: Keep in mind the assumption that all of the material settles out—with residence times of 15 days or so, clay materials won't settle out. Our numbers are conservative.

Wong: FEIS addressed comparing upstream sediment loads to loads at Fargo gage. Measurements showed that there was not significant material settling out.

Chisholm: Rosgen concurred that the stream is sediment limited. Anything that changed the amount of sediment available would be a concern.

### Gradients:

Buesing: stages at Oxbow with emergency measures in Fargo would be higher than the existing line shown on our plots. Stage increases closer to Fargo would be higher. Rate of drawdown could be adjusted using gates on the diversion or the control structures. Operation will balance impacts upstream due to longer inundation against downstream impacts and potential impacts to bank stability from faster drawdown.

Wong: empirical observations agree with what Alex is presenting. We have not seen significant erosion in past flood events where velocities have been high.

Buesing: looking at the erosion rate data from our testing, one would think that portions of the river should be eroding at a faster rate than we see anywhere.

Wong: the erodibility data is important, but we also need to see the bigger picture.

Nelson: Data shows for the Rush River that we may need to protect a portion of the river upstream of the drop into the diversion. The current design includes grade-control measures to prevent head-cutting.

Wong: This data can show where to place the grade control measures to control the erosion problem.

Aadland: The DNR brought this issue up because we've seen it in other projects.

Wong: The design includes measures to address this concern.

Buesing: we're hoping with operation and design to reduce shear stresses in places. Most important to reduce it for long duration events.

Chisholm: question about potential for erosion on streams entering the RRN downstream of the control structure.

Buesing: worst case for those tribs isn't going to be worse, because they typically don't run off during the RRN peak. Normally they will flow off prior to the peak, so the project will not make conditions worse for them.

Nelson: up to 17,000 cfs, there will be no changes through the protected area.

Aadland: I think that's reasonable.

Chisholm: Reasonable for moving forward, but flags an issue to watch in the future. If we don't see any detrimental changes, we don't need to monitor as often. Pick one of the more significant tribs to verify that this is true.

Wong: I agree with Chisholm. But, could we prepare a with-project inundation map for 17,000 cfs to show that it won't matter much because the elevation of the tribs in MN are significantly higher elevation.

Buesing: we have that data and could prepare those maps.

Chisholm: would like to see it.

### Operation Plan:

Buesing: 103,000 CFS is approximately a SPF event. Would be the event where the minimum freeboard elevation would be reached in the staging area.

This is the general operation plan. Changes from this will be minimal.

Chisholm: could you model the 1997 event using this operation plan?

Buesing: Yes we could do that. What we need to do is figure out how to operate when we don't know what the next day will bring.

Wong: FEIS included model runs with the historic floods already w/r to downstream flood stages.

Buesing: The operation plan will be stage-based, not flow-based.

Doneen: Who will operate the project?

Evans: After construction, the Corps will turn over the project and O&M manual to the Diversion Authority. The DA will be expected to operate in accordance with the approved O&M manual.

#### Existing Data:

Wong: Meander Belt Width Analysis, Appendix C presents an updated analysis of sediment data that was presented in the FEIS, Consultant's Report Appendix I. These are wash load dominated systems with extremely low meandering rates. MBWA report included additional analyses.

Larson: will leave all of the references on CD. USACE is willing to meet again with DNR staff to go over any of this info.

Arkley: That may be helpful as we get into more details.

Larson/Wong: 2012 sediment sampling data from USGS is very similar to 2010 and 2011, although 2012 was a low-flow year.

Nelson: completed a sediment transport analysis of the Sheyenne River diversions to see what we can learn about designing. Wong has several comments that need to be incorporated.

Wong: the Sheyenne Diversion was designed without info on sediment transport. We are considering lessons to be learned from that project as we design the FMM Diversion. Rosgen concurred with using the Sheyenne Diversion as an indicator of what may happen.

#### Further Discussion:

Chisholm: When WEST looked at the Banks model, near-bank shear stresses were low, but the method used was the velocity gradient. This is typically not done outside of a research setting. Why/how did WEST do that? Isobells. Would like to see the backup data.

Larson: will look at the backup data to see what they did. WEST did their own discharge measurements at each reach.

Evans: USACE policy is moving Nationally toward accepting more risk and being willing to make decisions without the 100% certainty.

Evans/Doneen/Sobiech/Chisholm: It will be important to develop a monitoring and adaptive management plan. DNR plans to include development of that plan in the Mn EIS. USACE wants to make sure that M&AM plan is reasonable.

Wong: Rosgen doesn't apply. This project has already done significant work to document pre-project conditions. We have much higher level of information on this project than a typical project. All of this info is allowing us to move away from typical text-book cases and toward project-specific data.

Arkley: DNR needs to look at all of the data that has been provided to decide what more is needed.

Chisholm: Monitoring will be used to establish change and impacts of changes. Monitoring needs to be very focused and clear so that we can agree when a change has occurred and when adaptive actions are needed.

Wong: The info is more than just data; it is also a lot of thinking. The question to document is distinguishing natural change from project-caused change. WEST's report is a good start.