SUSITNA-WATANA HYDRO

Meeting Notes
Geomorphology Workgroup
Geomorphology Meeting
05-21-2013

LOCATION: **Call-in**

TIME: **1:00 p.m. – 4:00 p.m. (AKDT)**

SUBJECT: **Presentation and Discussion of the Draft Fluvial Geomorphology Modeling Approach Technical Memorandum**

Goal **1. Develop a better understanding of the Fluvial Geomorphology Modeling Study approach**
2. Receive agency comments and questions on the draft technical memorandum in order to finalize the document for submittal to the FERC by June 30, 2013

ATTENDEES: **Bill Fullerton** Tetra Tech**, Steve Padula** McMillen**, Betsy McGregor** AEA, **Kathryn Peltier** McMillen, **Eric Rothwell** NMFS, **Leanne Hansen** USGS, **Greg Aubel** USGS, **Chris Holmquist-Johnson** USGS, **Jan Konigsberg** AK Hydro Reform, **Lyle Zevenbergen** Tetra Tech, **Rachael Cox** CIRI, **Becky Long** Coalition, **Bill Miller** Miller Eco., **Joe Klein** ADF&G, **Bob Henszey** USFWS (partial)

As part of FERC's study plan determination regarding the Geomorphology Study, AEA was directed to provide further detail on the proposed modeling approach. A technical memorandum (TM) was provided to licensing participants for their review on May 3, 2013. AEA had received comments from NMFS which included USGS (Fort Collins) concerns. Today's meeting provides an opportunity to discuss these concerns and for licensing participants to express any further comments. The presentation, draft TM and comments on the draft TM are available on the Project website (www.susitna-watanahydro.org) under the May 21st Geomorphology TWG meeting within the previous meetings tab.

Fluvial Geomorphology Modeling Approach Presentation – Bill Fullerton and Lyle Zevenbergen

Bill Fullerton provided a presentation which summarizes FERC's request and the modeling approach explained in the Draft Fluvial Geomorphology Modeling Approach TM. The following information is additional to that provided in the presentation and other meeting materials.

- 1D modeling will be applied to PRM 30 (Susitna Station) through PRM 187 (Dam site).
- 2D modeling will be applied to the Focus Areas (Middle River).
- HEC-6T has been selected as the 1-D sediment transport model
- The 2D bed evolution model selection has been narrowed to two candidate models, SRH-2D and River2D. Both models will be tested on a single Focus Area and based on their performance, the final selection will be made.
- The Geomorphology Cross Sections (first illustrated on slide 13) are extended to encompass the 100-year flood level.

- The Chulitna River and Talkeetna River modeling reaches were added in response to comments from the licensing participants. The Chulitna River will be modeled approximately 10 miles upstream of the confluence and the Talkeetna River will be modeled approximately 5 miles upstream, both using 1D sediment transport modeling. All transects in the figures will not be surveyed in 2013, LiDAR data may be used to fill data gaps. LiDAR data will be collected at low flows to maximize the topography captured. With the LiDAR data as well as water surface elevations and discharge data from gages at the time of the LiDAR flight, the portions of the cross sections not captured with LiDAR (areas the beneath the water surface) can be approximated to fully develop the 1-D model cross sections.
- Although more tributaries that will require estimates of water and sediment inflow for modeling exist than are listed in slide 21, the results from the listed tributaries will be scaled to the other tributaries. 1D sediment transport analysis of the listed tributaries will generate sediment input for use in the mainstem 1D and 2D models. The tributary hydrology will be developed in the Fish and Aquatics Instream Flow Study (IFS) using USGS information as well as data collected for selected tributaries as part of the current study.
- The tributary drainage area and fan size do not always appear consistent, so a range of tributaries will be evaluated to develop sediment input rates from all tributaries for the 1D sediment transport modeling.
- Focus Area 128 (Skull Creek) includes a riparian area of interest, a tributary, and somewhat difficult boundary conditions. For these reasons, Tetra Tech has tentatively this complex Focus Area as the testing site for the two 2D model finalists.
- Unlike the Chulitna and Talkeetna rivers, the Yentna River will not be modeled as a reach, but only its sediment input will be included in the model. The sediment input from the Yenta will be based on rating curves developed from the USGS data.
- Models will not directly lead to changes in habitat unit classification, but with interpretation these changes may be determined. Aggradation/degradation of the main channel from the 1D 25-year results would be used to update the 2D and hydraulic models. For example, if a side slough is seen to not experience overtopping in the model, one can consider reclassifying it as an upland slough, but would also need to factor in vegetation encroachment and ice effects.
- Slide 25 summarizes the modeling approach and outputs/inputs of each model.
    - The "unsteady" 2D model includes a mobile bed and incorporates sediment transport. This model is also referred to as the "2-D bed evolution" model in the RSP. This model provides a short term (the open-water portion of a year or less) look at aggradation and degradation of the riverbed. Trends from individual one year snapshots will be interpreted to evaluate potential change in lateral features and fish access.
    - The "steady" 2D model with a fixed bed will be used to determine hydraulic conditions (velocity, depth, shear stress, etc…) for the Fish and Aquatics IFS. This model is also referred to as the 2-D hydraulic model and will have a finer resolution mesh to provide the level of detailed required to analyze conditions in aquatic micro-habitats.
- Modeling will be performed for three operational scenarios as well as existing conditions (no project). These scenarios include load following, base load and an intermediate load following operation. Becky Long and Eric Rothwell voiced their concern with not including a run of the river scenario. Becky McGregor explained that the added cost and efforts do not support modeling a scenario that will never occur. Eric Rothwell agreed with the run of the river option not being a feasible design to build, but he feels that modeling such a scenario could help understand the impacts of a dam structure separate from the effects of operations, as well as support to support the evaluation of operations to mimic those of a run of the river project during critical periods. Betsy McGregor indicated that AEA would proceed as directed by FERC.
- The mesh geometry for both 2-D models will be updated to represent the conditions predicted at year 25 and year 50. 1D sediment transport model results will feed into the 2D bed evolution model to adjust the bed

evolution model for changes in bed elevation due to aggradation and degradation. In combination with other studies and the stakeholders a 50 year period out of the 61 year extended record will be selected for the 1-D sediment transport model runs. A unique event, such as a 100-year flood, can be added to the 50-year of flows.

- Because high spring runoff and ice break up coincide temporally, it is difficult to separate the channel forming and maintenance effects of each.
- Historic and current ice studies will be applied to understand recurrence of ice jam distribution.
- Tributary sediment loading will be analyzed. As part of this analysis, the potential for increased sediment loading form Project related lowering of water surface elevation in the mainstem will be evaluated. Change in water surface elevations in the Susitna River are not likely to affect sediment contribution from minor tributaries as most of these tributaries have coarse bed material and many have depositional fans at their confluence with the Susitna. The two major tributaries, Talkeetna and Chulitna rivers, will be incorporated into the 1-D sediment transport model to determine the potential for changes in sediment supply from these tributaries as a result of the Project induced changes in the Susitna River.
- Comments on the TM enquired about developing an initial 1-D sediment transport model based on 1980s conditions and running a simulation up to current conditions to provide verification of the model. Tetar Tech indicated it is not possible to create such a model due to lack of 1980s topography and limited 1980s cross sections. A possibility may be to compare historic trends to modeled trends at locations where 1980s cross sections are available.
- The top figure of slide 35 is from a study on the Missouri River. It is an example of conditions that may be simulated for ice blockage diverting or concentrating flow into secondary channels, other lateral features, or floodplain areas.
- Large wood effects will be addressed differently in the 1D and 2D models. The 1D model will evaluate flow resistance, while the 2D model can evaluate the hydraulic influence of LWD accumulations and flow acceleration near blockages.

Open Discussion

- Bill Fullerton will try to provide 1980s cross section locations that correspond with current cross sections in the final TM. If not available by the time of filing (6/30/2013) he will provide them once they are available.
- The geomorphology and ice processes studies will need to coordinate to determine if the levels of changes in the 2-D model geometry from the fluvial geomorphology modeling study at years 25 and 50 are sufficient to necessitate adjustment to and rerunning of the ice process 2-D ice cover model. Chris Holmquist-Johnson said that this is not clear in the TM.
- RTK GPS will be utilized by Tetra Tech for tributary cross section surveys wherever feasible for accurate geospatial referencing.
- General agreement that modeling plan was comprehensive, would address both reach scale and local scale effects, would allow evaluation of special cases and that the plan should be adaptable as the effort progresses. Next update to the TM in 1st quarter 2014.

Action Item	Date	Responsibility
Provide the 1980s cross section locations that correspond with current cross sections to assist with calibration/verification of the 1-D model.	In Final TM or when available	Bill Fullerton
Explain within the TM that the 1D and 2D Ice Models may need to incorporate the geometry shifts predicted by the geomorphology models. The geomorphology and ice processes studies will need to coordinate to determine if this step is necessary depending on the amount of change.	In Final TM	Bill Fullerton
Preliminary scheduling of next small group technical meeting in late July	Firm up closer to date	AEA