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Instream Flow Study-Fish, IFS-Riparian, Groundwater, Ice, Geomorphology, Water Quality Technical Work Group Meeting Notes 2 October 2012

- LOCATION:** AEA Project offices – 1st Floor Conference Room
411 W 4th Avenue; Suite 1
Anchorage, Alaska 99501
- TIME:** 8:30 am – 4:00 pm (AKDT)
- ATTENDEES:** Kathryn Toews LVA, Dudley Reiser R2, Phil Hilgert R2, Bill Fullerton TetraTech, Bob Mussetter TetraTech, Chiska Derr NMFS, Kevin Fetherston R2, Dirk Pedersen Stillwater, Betsy McCracken USFWS, Jeff Davis ARRI, Mike Buntjer USFWS, Ron Benkert ADF&G, Joe Klein ADF&G, Eric Rothwell NMFS, Matt Cutlip FERC, Stormy Haught ADF&G, Bob Henszey USFWS Steve Padula LVA, Betsy McGregor AEA, Wayne Dyok AEA, Justin Crowther AEA, Michael Lilly GWS, Scott Crowther Ratepayers, Jan Konigsburg NHI/HRC, Hal Shepard CWA
- ON PHONE:** Matt Love VNF, Sue Walker NMFS, Laura Arendall R2, Mike Sondergaard, BLM

This meeting was held to prepare licensing participants for the site visit on October 2-4, 2012 to three candidate Focus Areas. Dudley Reiser began the presentation “Instream Flow Methods Review October 2-4, 2012” (available at <http://www.susitna-watanahydro.org/wp-content/uploads/2012/09/TWGMeeting20121002.pdf>).

Phil Hilgert explained that a number of Focus Areas will be selected to represent the habitats and in which detailed, cross-discipline resource studies will be completed. After that, supplemental study locations can be selected to sample additional areas of biological importance. Focus Areas are reaches of the Susitna River where multiple disciplines will be sampling for a better understanding of the ecosystem as a whole. Betsy McCracken asked if the Focus Area locations were decided before fish distribution data were available. Dudley Reiser explained that the candidate Focus Area locations were selected using best professional judgment and all available data. This includes information on juvenile salmonids, gathered in previous studies completed in the 1970s and 1980s and recent studies completed in 2012. The proposed fish distribution study results will be applied to refine study site area selections, as necessary.

Matt Cutlip expressed concern that AEA assumes the site selection will be confirmed by March 2013 (slide 2). Phil Hilgert explained that without complete habitat mapping, one is unable to employ statistics to ensure that a substantial ratio of all habitats are being sampled. Agreement is necessary prior to initiating the 2013 studies and with incoming data, additional sites may be necessary for a representative portion of all habitats to be studied. Matt asked for justification of the proposed 10 candidate Focus Area locations and Phil said that the Technical Work Group (TWG) meeting held on 9/14/2012 explained the rationale for selecting the sites. Phil added that the potential need for lower river site selection was not presented in the 9/14/2012 meeting, but will be included, with rationale, in the Revised Study Plan (RSP).

Eric Rothwell suggested that randomization of site selection may be a better approach for extrapolating the data than basing Focus Area site selection on incomplete data. Wayne Dyok said that a plethora of



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data from the 1980s is available to support site selection. Phil Hilgert explained how the 1980s data was utilized, but confirmed the ability to refine sample site selection as additional data are collected. When habitat mapping is completed, sites will be double checked to ensure the selected focus areas are representative and enable the ability to extrapolate data. Dudley Reiser acknowledged that random selection is one of several approaches to study site selection but that when strictly applied to a system such as the Susitna River, there is a risk of missing important biologically relevant areas. He indicated that randomization would likely factor into some elements of the study, such as selection of specific habitat units for detailed study, or transect selection. Mike Buntjer suggested that some of the licensing participants' wariness in using 1980s data may be due to a lack of being presented a summarization of the data and methods.

Eric Rothwell said that to see the Susitna River system as a whole, one must rely on the Focus Areas as being representative. However he stressed the need for the data collected at the Focus Areas to be able to be extrapolated to unmeasured areas. He felt that if AEA is selecting the areas based only on biologic characteristics, it would be difficult to extrapolate to other disciplines. He said that if the only sites sampled by multiple disciplines are the Focus Areas, they need to be representative of all resources so that they can be extrapolated for all resources. Phil Hilgert explained that the candidate Focus Areas are based on information from the 1980s, current information where available, as well as available photography and 2012 field reconnaissance. From the photographs and field reconnaissance, a general sense of the present habitat types was achieved and candidate Focus Areas are based on the assumption that they are proportionately representative. The Focus Areas include habitat components and other features (e.g. geomorphology, groundwater, riparian, ice, water quality) that will be evaluated by other resource disciplines. The representativeness of these areas will be confirmed once the habitat mapping is available in December 2012.

Bob Henszey suggested that all resources mark their proposed study locations on a map, and where multiple disciplines overlap, deem that area a Focus Area. Betsy McGregor explained that in a sense, that is how these candidate Focus Areas were chosen. The study locations were identified verbally by AEA's resource experts rather than marked on a figure. Dudley Reiser explained that this approach was taken so that AEA could identify candidate sites and present them to licensing participants as a starting point for comments or approval. He emphasized that the 10 proposed Focus Areas are candidates and not finalized. Sue Walker requested written methodology of Focus Area selection. Betsy McGregor said that site selection methodology will be included in the draft RSPs, as well as the RSPs to be filed with FERC in December.

Eric Rothwell suggested not releasing draft RSPs until all comments were completed by licensing participants and received by AEA. Betsy McGregor explained that the purpose of the draft RSPs is to provide an updated PSP to comment on that reflected in the continuing consultation with licensing participants since issuance of the Proposed Study Plan (PSP) in July 2012. Sue Walker noted that this is a new addition to the Federal Energy Regulatory Commission's (FERC) Integrated Licensing Process (ILP) and said that NMFS will be filing comments only on the information provided in the PSP. Betsy McGregor explained that one can comment on their preferred version (PSP or draft RSP). She agreed that the draft RSP is an added step to the FERC process that informs one of the progress made since the PSP and explained that draft RSPs were requested by other licensing participants. Matt Cutlip indicated that FERC finds the production of draft RSPs useful.

As clarified in the Presentation: Process Overview (found at http://www.susitna-watanahydro.org/wp-content/uploads/2012/10/IFS-TWGMTgs_Schedule_20120930.pdf), Dudley Reiser introduced a concept for continuing instream flow TWG meetings to finalize study details beyond the filing of the RSP. He proposed that an Instream Flow Study – Aquatic TWG meeting be held the third Thursday of every



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month. These would rotate between a full day in-person meeting or half day conference call. Focus groups would meet as needed to discuss specialized details and present them at these TWG meetings. The general consensus of the group was that everyone will think about this proposal and respond at a later date.

Dudley Reiser began his presentation. Dudley described the purpose of the following day's site visit as a chance for those attending to see many types of Susitna River habitats and to discuss different methodologies that may be applied for evaluating them, but that AEA was not looking for anyone to confirm their agreement with Focus Area selection.

Dudley Reiser's presentation provided an overview of the potential flow-related Project effects and influential parameters of upstream migration, fish spawning, incubation and fry emergence, and downstream passage (slides 7-12). He briefly explained the formation and functions of habitats and ice (slides 13-14). A figure on slide 15 provides an overview of the riparian – flow interaction and slide 16 lists many factors involved in assessing instream flows. Dudley continued the presentation by explaining the methods employed in the 1980s studies. In addition to the information on the slides (17-21) the following details were discussed:

- IFG4 and IFG2 (PHABSIM) – In the 1980s studies these methods were applied primarily to the side channels and sloughs. These methods were not applied to the main channel.
- DIHAB – This method was utilized because PHABSIM did not capture all fish habitat types nor did it incorporate groundwater/upwelling as an influence. This method was primarily used to characterize chum salmon spawning areas.
- RJHAB – This method was used to characterize juvenile fish habitats by establishing a series of grids to relate habitat to fish density using depth, velocity, substrate and turbidity.
- Aerial Imagery and Habitat Mapping (Digitization) – This method was used to compare areas over different flow conditions.

The 1980s studies were never integrated and evaluated fully due to the Project studies ending.

The bullets below list multiple candidate Focus Areas and discussions pertaining to them.

- Whiskers Slough - Dudley Reiser proposed repeating the methods conducted in the 1980s at Whiskers Slough to indicate changes, if any. He noted that Whiskers Slough includes an area where chum spawning was identified in the 1980s as well as in 2012.
- Slough 11 - Slough 11 is a candidate Focus Area but that permits for land access are currently incomplete. The 1980s had studied instream flow – habitat relationships here. Sue Walker indicated that she may have aerial photos from September 25, 2012. She asked if any aerial photos had been taken after the recent flooding. Bill Fullerton said that photos were taken the previous Sunday and Monday (9/30/12 and 10/1/12). Betsy McGregor clarified an early comment made by Betsy McCracken, and pointed out that this area was studied for both juvenile and adult salmon presence in the 1980s. Sue Walker asked if the current study plan will be studying spawning in the main channel, and Dudley Reiser said it would, if spawning is found. Jeff Davis hypothesized spawning habitat to be located in the lower side channel of this Focus Area where Dudley indicated a beaver dam currently blocks upstream passage under most flow conditions.
- Indian River - Dudley Reiser suggested that chum salmon may use the lower portion of the Indian River for spawning.
- Slough 21 – Dudley Reiser feels that breaching flows may be an important factor in this candidate Focus Area. Many isolated areas seem to be influenced by groundwater. It will be



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important to understand the breaching flows to these areas with respect to life stage periodicities and how Project operations may influence these.

Eric Rothwell was pleased to see the current study plan relating flow to groundwater, as the 1980s studies did not. Michael Lilly added that the 1980s provided good observational data but lacked the modeling tools. With the current tools, the instream flow studies will be able to advance the groundwater efforts for a better understanding of the surface water - groundwater relationship.

Joe Klein asked if pre-flood data were collected. Michael Lilly said that about 98 cross sections were completed and that changes in the river system are being observed including mass wasting. The helicopter pilot had taken oblique photos from his helicopter throughout the summer of 2012.

Jeff Davis voiced concern with the ability to correlate habitat and fish use, particularly juveniles and that areas with fish may be missed. He feels it difficult to include all habitat characteristics that drive fish distribution and fish growth. Dudley Reiser said that as many variables as possible will be studied.

The Fish and Aquatics Instream Flow Study leads will be working with the Water Quality studies lead to create FLIR/TIR imaging. This will be scheduled for optimal implementation to identify upwelling areas. Jeff Davis is concerned that a thermocline will not be identifiable using these methods. Dudley Reiser said that hopefully, the mixing point of the temperatures will be identified and direct the team to the location of upwelling. Dudley continued his presentation by explaining contemporary methods to assess effects using the Sultan River Projects as an example of past implementation methods (slides 23-46).

PHABSIM – Dudley Reiser explained that PHABSIM addresses microenvironments:

- 1D Modeling - This method models physical parameters.
- 2D Modeling - This method models habitats spatially based on physical parameters. Allows one to create polygons of different habitats.

Stranding/Trapping and Varial Zone Analysis

Phil Hilgert presented an example of stranding/trapping and varial zone analysis using the Baker Hydroelectric Project. This project is located on the Baker River, a tributary of the Skagit River in Washington. When compared to the Susitna River the Skagit River is similarly glacially influenced, but has a lower gradient and 50 percent higher main channel flow. Coho and sockeye spawn in the tributaries during clear water flow. The Baker Project causes tributary flows to vary between 4000 cfs to 80 cfs and flow routing models have been applied to compute the effects of this high flow flux. As flow effects travel downstream the wave height and wavelength dissipate. The flow routing model being developed by Stuart Beck, and anticipated to be available December 2012, will provide the same information for the Susitna-Watana Project during ice free conditions. The ice model, which will be developed by HDR, is anticipated to be available at a later date due to 2012-2013 winter data collection inputs.

Spawning / Incubation Model

Phil presented the spawning/incubation model developed on the Baker Project noting a similar model will be developed for the Susitna-Watana Project. The spawning/incubation model will characterize the groundwater, surface water and temperature influences on spawning and incubation. When modeling, if substrate is mobilized due to flow velocity, one will consider the eggs a complete loss. Mike Buntjer asked if the model will take into account the change of temperature due to possible moving of fine sediment and that a total loss may not be the case in such a scenario. Phil Hilgert answered that the Baker Model did not. That model considered water hardened eggs without water for two days, as a total loss.



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Ramping Rate Models

Phil Hilgert explained that ramping rate models indicate the survival of specific life stages of specific fish species relative to flow and velocity. For example, salmon fry (<50 mm) are considered to have a mortality of 100 percent when stranding occurs. Trapping is not considered to cause immediate mortality of 100 percent. The mortality may increase with the duration of the time they are trapped due to elevated water temperatures and increased predation. Another possible influence is the difference of day versus night activity (steelhead have the same response for day and night flow changes). Naturally the Susitna River experiences three annual stage drops. By using screw traps to collect periodicity information, one can see when stranding and trapping are most critical. The river productivity study will be looking at colonization rates which may be integrated into the ramping rate models. Phil Hilgert explained that the models will initially be looking at two load following events a day and can adjust time periods upon operations. Discussion ensued regarding slope gradient and susceptibility to stranding. Joe Klein asked that areas within the Middle Susitna River where slopes are less than 4 or 5%, where fish are more susceptible to stranding, be identified. Phil Hilgert confirmed that would be done as part of the study. Joe also indicated that Hunter compared natural and regulated ramping rates and asked for both to be incorporated into the IHA table.

Phil Hilgert discussed the Boundary Hydroelectric Project on the Pend Oreille River in Washington as an example of ramping rate model use. A stranding index of less than 4 percent gradient was used. A trapping index used in the Boundary Project defined breaching elevations for trapping areas. For the Boundary Project, tools were modified as observations were made. For example, the presence of macrophytes impacted stranding rates. The Susitna River does not have significant macrophyte presence, but emergent vegetation, which is present may have a similar impact.

Betsy McCracken asked if any of these methods have been used on unregulated rivers. Dudley Reiser stated that to his knowledge, these types of studies are typically conducted on regulated rivers. This is because it has not been necessary/funded to study unregulated rivers in such detail.

Gradient will be presented as a GIS product with a range of colors representing percent gradients. This will show trapping areas relative to different flows. Jeff Davis asked if ice layers, overflow and stranding on ice or within ice are being considered as influences on stranding and trapping. He hypothesized that increases in winter flow will cause breaching into lateral habitats and displace fish to these areas. Phil Hilgert explained that an ice routing model should show the effects of added winter flow on ice and lateral habitats. Jeff Davis is concerned that if the Project avoids stranding and trapping by increasing load following, added velocity may dislocate fish. Dudley Reiser explained that vulnerable life stages will be considered when determining load following. Jeff added the need to look at fish's decreased ability to swim in cold winter water. Joe Klein asked if it were possible to operate the Project in the early winter with a more constant flow level in order to create stable ice cover. Robin Beebee recalled the Peace River Project in British Columbia that operated in such a way to get rapid and stable ice formation. The reasoning for this was to avoid ice jams for the sake of avoiding floods in towns downstream.

Method Selection

Dudley Reiser reviewed the factors that will be used in determining methods (slide 52). He said that the process, criteria and schedule are to be agreed upon and that part of the process in determining methods is applying professional knowledge and experience. The site visit the following day is intended to help those participating to gain first-hand knowledge of the complexity of the environment and how methods may be limited by the habitats and site logistics. Dudley explained the considerations when choosing methods and wants everyone comfortable and accepting of methods and models. Matt Cutlip said that at times, details may not be resolved. FERC can order specifics be added to a plan and has the



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authority to approve an approach regardless of a disagreement. He explained that the ILP includes a mechanism for additional changes post-RSP filing if needed.

Dudley presented slide 53, a chart of proposed methods, and informed everyone that these were simply candidate methods and changes may be necessary in the future. He asked all attending the site visit to consider these methods while in the field. Eric Rothwell questioned if the instream flow team would be sampling water quality. Dudley Reiser explained that certain water quality measurements may be taken by instream flow and linked to the water quality study results. Michael Lilly said that the Water Quality Modeling Study's model will be at a larger scale than instream flows.

Joe Klein asked if PHABSIM 2D modeling was intended to be used for all study sites. Dudley Reiser said that at every site, both 1D and 2D will be considered, and the most practical model will be applied. Accordingly, Joe Klein requested "(2D)" to be changed to "(1D, 2D)" in the proposed habitat modeling techniques table (slide 53). Dudley Reiser continued that the lower river is only practically modeled using 1D. Betsy McCracken requested 2D modeling to be applied to tributary mouths. Dudley explained that it depends on the question being asked as to which tool to use. Michael Lilly explained that modeling everything at all times is not practical or scientifically defensible. Dudley mentioned the use of 1D, 2D and habitat mapping for the Clackamas Hydroelectric Project in Oregon and that the results of all three methods in the same stretch of river were generally similar. He mentioned that even though there are advances in methodologies and modeling techniques all the time, these do not invalidate earlier methods and they should not be dismissed outright if they provide reliable results. Thus, specific methods and models will be selected based on a variety of factors including the types of habitats being measured, logistical considerations, need for spatial depiction, etc.

Pilot Winter Studies

Resource discipline leads discussed an approach for completing pilot winter studies during the 2012-2013 winter. These studies will determine logistical constraints such as safety and access, as well as the practicality of using different sampling/monitoring techniques. The study objectives are presented in slides 63-67. The following clarifications were discussed in the meeting.

With the use of videos and data from the 1980s studies, open water leads may be identified. Intragravel dissolved oxygen (DO) and temperature conditions may be affected by the Project and have implications on egg survival. Intragravel temperature probes will be installed at different locations and depths; these will be coupled with DO meters to see if relationships between flow and temperature and DO can be detected. Michael Lilly stated that there may be a need in using probes that remain on site and are removed to retrieve the data as well as probes that are not disrupted when retrieving the data. He will be looking into the best way of collecting DO in extremely cold waters (-0.2°C - 3.0°C). Underwater cameras may be used to observe fish activities in different locations at different times. Joe Klein asked if cameras can be deployed remotely. Michael Lilly said that he is looking into it. Dudley Reiser mentioned the use of pressure transducers to understand the relationship of flow and stage with temperature changes in reference to the main channel. Michael mentioned that piezometers may be placed in shallow streambeds to observe hydraulic gradients. He explained that an increase of ice causes an increase of pressure in the main channel. This may affect the groundwater level. An understanding of these relationships is necessary when evaluating Project scenarios. Dudley proposed the use of stand pipes and Bob Henszey mentioned that stand pipes may be difficult to maintain through the winter. In regards to fish sampling, Dudley said that minnow traps, electrofishing if open areas are present, trot lines (which the 1980s studies used), and other techniques may be used. Stormy Haight reminded AEA that any winter instrumentation installation requires a fish habitat permit.



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Mike Buntjer asked if PIT tagging will be used this winter. Dudley Reiser said that it is not planned for this winter. Jeff Davis suggested using a hand held antenna in the winter to track fish movement. He suggested contacting Dan Renella of the University of Alaska Fairbanks. Mike asked if the plan would continue for the winter of 2013-2014 and Betsy McGregor answered yes, as well as 2014-2015. Betsy McCracken asked how these winter studies will be presented in the RSP. Dudley Reiser said that in terms of the RSP, the pilot winter studies will be described with a note that additional studies will be conducted in 2013/2014 and 2014/2015. Jeff Davis asked if the pilot winter studies will be targeting areas of spawning, emergence and rearing. Dudley Reiser explained that the intent is to cover multiple habitat types. He suspects that the open water leads will be in areas utilized by rearing juveniles but they may also have resident adults. Jeff Davis suspects that sloughs will have less ice thickness but no open water. Dudley explained that at Whiskers Slough Robin Beebee's videography in 2012 had captured what seems to be open water leads.

Matt Cutlip asked if the equipment is being placed before the ice cover begins. Michael Lilly said that the plan is to start as soon as possible, but may not be able to beat the ice. He said that all will be done as safety permits. Betsy McCracken finds the pilot winter studies a great addition and asked if they will be included in the RSPs. Wayne Dyok said that they will but planning is already underway due to timing.

Meeting Adjourned.

Action Items

- The group is going to consider holding Instream Flow and Water Resources TWG meetings every third Thursday beginning in January 2013.
- In the proposed habitat modeling techniques table (slide 53), "(2D)" to be changed to "(1D, 2D)" to reflect that either technique will be used, as appropriate.
- Michael Lilly is investigating the feasibility of using under water cameras that can be deployed remotely.
- Jeff Davis suggested using a hand held antenna in the winter to track fish movement. He suggested contacting Dan Renella of the University of Alaska Fairbanks.