APPENDIX 4
INFORMAL CONSULTATION DOCUMENTATION

SECTION 7 – HYDROLOGY-RELATED RESOURCES

From: Klein, Joseph P (DFG) [mailto:joe.klein@alaska.gov]
Sent: Thursday, August 23, 2012 2:48 PM
To: Betsy McGregor
Cc: Benkert, Ronald C (DFG); Burch, Mark E (DFG); Erickson, Jack W (DFG); Fair, Lowell F (DFG); Fink, Mark J (DFG); Giefer, Joe (DFG); Haught, Stormy B (DFG); Holen, Davin L (DFG); King, Kimberly N (DFG); Miller, Monte D (DFG); Michael_Buntjer@fws.gov; Betsy_McCracken@fws.gov; eric Rothwell; Hill, Melissa E (DNR); Schwarz, Terence C (DNR); Sager, Kimberly R (DNR); Ashton, William S (DEC)
Subject: RE: Follow up Meeting Notes-additional comments

Following are additional comments

Baseline Water Quality
5.5.4.3.2 **In-Situ Water Quality Sampling** The sampling protocol currently calls for monthly in-situ water quality monitoring for the 4 summer months. It should be revised to include continuous (hourly or so) water quality measurements for basic parameters (pH, DO, conductivity, turbidity), year-round if possible using in-situ semi-permanent sensors (e.g. sondes). The technology is readily available and would provide very useful baseline information to assess any post project impacts.

River Productivity
7.8.4.4 **Conduct a literature/data search to identify existing river systems that could act as surrogates in evaluating future changes to productivity in the Susitna River.** We recommend supplementing or substituting this section using a reference reach in a similar Alaska river using a BACI design monitoring program in order to assess post project impacts.

From: Klein, Joseph P (DFG)
Sent: Thursday, August 23, 2012 10:42 AM
To: McGregor, Elizabeth A (AIDEA)
Cc: Benkert, Ronald C (DFG); Burch, Mark E (DFG); Erickson, Jack W (DFG); Fair, Lowell F (DFG); Fink, Mark J (DFG); Giefer, Joe (DFG); Haught, Stormy B (DFG); Holen, Davin L (DFG); King, Kimberly N (DFG); Miller, Monte D (DFG); Michael_Buntjer@fws.gov; Betsy_McCracken@fws.gov; Eric Rothwell (Eric.Rothwell@noaa.gov); Hill, Melissa E (DNR); Schwarz, Terence C (DNR); Sager, Kimberly R (DNR); Ashton, William S (DEC)
Subject: Follow up Meeting Notes

Betsy-

Thank you for the opportunity to discuss the proposed study plans for the Susitna-Watana Hydroelectric project. We look to further discussions to continue to clarify study plan details.

To assist in you and your consultants in this process, below are brief notes by ADF&G staff. We may have additional comments/or clarifications. Please feel free to contact me if you have any questions.

Regards, Joe

Fish Distribution and abundance in Upper, Middle and Lower Susitna River

- Trot lines should considered during the winter to target appropriate fish species.
- Minnow trapping under ice should be used during the winter, in all habitat types.
- Should evaluate the feasibility of under ice videography.

Salmon Escapement

- Identify locations of adult fish weir locations described on tributary streams (7.7.4.1.5, page 7-39). Consider placement of adult fish weir upstream of the proposed dam on prominent Chinook salmon streams.

Instream Flow

- What is the sampling strategy (e.g. representative reach, mesohabitat typing) for the defined habitat types?
- How many and at what range will discharge-calibration sets be collected for each sampling method?
- Will 2D modeling include side channels and sloughs within study area?
    - Based on comments at the meeting it was my understanding it would.
- What criteria will be used to identify cover types and substrate sizes?
- For PHABSIM, will transects be independent, dependent or a combination and accordingly, what WSE models and composite suitability index will be used?
- What criteria will be used to select and weight transect-derived models?
- Per the description of study sites for fish passage/off-channel connectivity (§6.5.4.5.5), what criteria will be used to identify "a representative number" of different habitat types?
- HSI data is needed for identified target species for each defined habitat type, over 2 years.
- How will the data be aggregated to evaluate single flow recommendation?
- Will a DSS-type program be available to review study results and if so, information is needed on it.
- How do you envision the "collaborative process" will work? When will major decisions be made (e.g. site and transect selections) and how often do you envision the work group will get together?
- What equipment will be used and how will they be calibrated?
- For the eulachon and boating studies, similar information is needed on what is the study area, what sampling strategy will be used, how many and what range of calibration-discharge sets if appropriate, and how will HSI curves will be developed?
- Varial zone modeling, may need more defined time steps during analysis phase (possibly down to 15-minute increments) depending on the rate of flow change over time.

Groundwater

- What are the monitoring well placement sampling approach (e.g. equal spacing along linear transects, etc.) and location (e.g. for instream flow, in all habitat types?) for the various resource studies (i.e. instream flow, riparian instream flow, water quality). Also, a description of sampling intensity would be helpful (i.e. for instream flow purposes, will the objective be to characterize entire gw/sw interaction throughout entire intensive study site or only at select microhabitats).

- What is the duration for monitoring (I believe at the meeting it would be from installation until winter 2013-14?)

- How often will monitoring wells be calibrated for various parameters to be sampled pre- post- and during field monitoring?

- For each resource discipline, what parameters will be sampled and what are range of accuracies (e.g. for water level +/- 0.1 ft?, water temp +/- 0.2 C?, etc.).

Water Quality

- Information on availability of the Sampling and Analysis Plan and Quality Assurance Project Plan is needed.
- GW Quality in Selected Habitats (Section 5.5.4.7) - need more information on study. For example, sampling intensity/number of site measurements per slough or criteria for how they will be determined. Will ground water level monitors be installed if so, what is the sampling intensity (numbers per habitat type) and duration of monitoring (e.g. continuous year-round/ point samples during field visits, etc.). If not, it is strongly recommended groundwater monitoring be performed concurrently with water quality monitoring in this study.

- Any monitors should be calibrated pre- and post-monitoring along with multiple field measurements for post monitoring calibration.

From: Betsy_McCracken@fws.gov [mailto:Betsy_McCracken@fws.gov]
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Subject: Follow up comments from August 15-17 ILP meetings

Hi Betsy,

Thank you and AEA for hosting the August ILP meetings. We all gained a lot of insight from the meetings, and we were pleased to be updated. Like others, as a result of the meetings, the Service has a few comments and concerns to share with the group.

In addition to these below, other staff from the Service may provide comments relative to their study area expertise. We hope that our collective comments will be helpful toward gaining concurrence on proposed studies, and as we move forward with the review process of the proposed Watana dam.

Thank you,
Betsy

September 7, 2012

Notes from ILP Formal Study Meetings August 15-17, 2012:

At the request of AEA and its consultants, the USFWS (Service) submits this brief summary of concerns regarding the Susitna-Watana hydropower dam formal ILP Formal Study meetings that were held August 16-17, 2012. The Service's concerns in this informal correspondence, along with other remaining concerns will be further articulated in the Service's formal response letter on AEA's ILP Proposed Study Plan (PSP) review, due to FERC October 15, 2012. Additional informal comments from the Service may be provided under separate cover before the October due date.

FWS concerns highlighted during meetings relative to Instream Flow, Habitat Utilization and the Geomorphology proposed study plans:

Overall, the Service finds that AEA's proposed study plans for instream flow, habitat utilization and geomorphology do not fully address agency's resource management concerns. During the three days of ILP study meetings, sequencing and integration of the proposed biological resource studies and the physical process studies was not described and is still a significant outstanding information need. It is necessary to describe the integration of these inter-related studies and how that integration will result in a comparison of the baseline biological information and the resulting effects to biologic resources caused by the proposed project operations. Study results must be quantifiable in order to assess potential losses to aquatic resources and their habitats, to review the project under our relevant fish and wildlife resource conservation authorities, to inform fishway prescription authority under Section 18 of the Federal Power Act, and to eventually develop recommended protection, mitigation, and enhancement for the project license. We do not believe that the current study plan proposals will yield sufficient information to allow us to adequately assess proposed project impacts to the Nation's fish and wildlife resources and develop adequate PME's.

The Service has repeatedly articulated concerns about the lack of study sequencing, connectivity and integration between the biological studies and the other proposed engineering and physical processes studies. We reiterate and highlight the need for the collection of adequate temporal and spatial baseline biological and fish habitat data to provide direct input to some of the proposed physical modeling efforts. Many of our concerns, below, are related to the temporal mismatch of biological data collection with the forward momentum of the physical modeling efforts.

-Habitat Mapping

Hierarchially-nested aquatic habitats- HDR stated at the meeting that the "habitat mapping" will be started in September; and that the sampling will be stratified by meso-habitat type as identified in the 1980's study reports.

The 1980's studies did not hierarchically nest the habitat types. The Service specifically requested hierarchially nested habitat mapping (e.g., Frissel et al, 1986). We are concerned with the proposal to use the 1980's study sites, which focus on the side sloughs, and do not consider the full breadth of fish habitats, which is currently unknown and the subject of ongoing study that has not been completed or submitted for agency review and comment. We do not endorse the use of the 1980's sites without out first completing and then applying a hierarchal assessment of the river reaches as a study framework. The hierarchally nested aquatic habitats framework is needed to structure fish distribution surveys, the instream flow study and other physical process studies. Without it, the fish surveys will be too narrowly constrained and the instream flow studies will not represent all habitats that may be affected by the proposed project. The Service recommends the following habitat hierarchy for the Susitna River be used for habitat mapping purposes and integration of studies:

Large River Floodplain Habitat Hierarchy

1. Geomorphic units: Large-scale geomorphic and hydraulic controls.

a. Bedrock controlled, single-channel units with shallow hyporheic exchange and thermal homogeneity.

b. Unconfined, multiple channel floodplain units with expansive hyporheic exchange and thermal heterogeneity.

2. Macrohabitats: Primary, flood, and spring channel networks.

a. Primary channels—Perennial channels.

b. Flood channels—Seasonally connected channels.

c. Spring channels—Disconnected sloughs that discharge groundwater.

d. Floodplain ponds—Ponded spring channel networks.

3. Mesohabitats: Bed and bank morphological controls; hydraulic features.

a. Riffle-pool sequences—Run, riffle, pool, glide, tailout.

b. Backwaters, alcoves, shallow meander margins.

4. Microhabitats: Hydraulics, water quality, substrate, cover.

a. Water depth, velocity, bulk flow characteristics (e.g. Reynolds and Froude #'s).

b. Vertical hydraulic exchange (ground and surface water exchange).

c. Bed, or intragravel temperature and dissolved oxygen.

d. Substrate size, heterogeneity.

e. Elements of wood, vegetation, and rock structure.

-Fish distribution: A first step is to assess the seasonal distributions of target species and life stages and the physical habitat criteria that influence habitat selection and suitability. As a first step, target species have to be identified, agreed upon, and their life history and habitat use similarities to other, unstudied species (i.e., non-target species) need to be determined and described. In the study requests of the Service and other agencies, we recommended studying the baselines of all affected fish species and life stages, including all five species of anadromous salmon and all resident fish.

Fish distribution data are needed to describe the baseline data to support and compliment other proposed study objectives, including those related to fish habitat selection and utilization. A first step to acquiring adequate fish distribution is to assess the full lateral and longitudinal profile of seasonal fish distribution, life stage periodicity, and suitable used and unused habitats that are influential in fish habitat site selection. The fish distribution data is needed to provide the base data layer that will support and compliment other proposed study objectives, including those related to fish habitat selection and utilization, and instream flow (ISF) needs. This information is also needed for resource agencies' fishway prescription decisions under the Federal Power Act. Baseline biological information is critical input necessary for integration with physical studies. Accordingly, the Service is reiterating the need for multiple and continuous years of biologically relevant data in order to provide robust integration with the physical modeling studies, and decision-support relative to fish and wildlife resources of the Susitna River basin.

-Habitat site selection criteria: Criteria that influence habitat selection and suitability need to be identified using statistically powerful and robust methods and current models of fish distribution including bioenergetics and not exclusively physical habitat models (Lovtang 2005). The Service remains opposed to the proposal to repeat the 1980's approaches to fisheries studies. The 1980's studies do not determine the habitat criteria influencing fish habitat site-selection, they simply report utilization functions for water depth and velocity, or depth and substrate. They also lack a fundamental baseline assessment of all available fish habitat and instead focus on study of habitats that had high fish use density. The habitats that were apparently suitable but unoccupied or underutilized by fish need to be assessed, and the entire range of habitat availability and habitat use data need to be assessed prior to habitat study site selection.

More comprehensive data collected on nearby glacial rivers may be used to demonstrate that habitat selection by salmon in side-sloughs can be independent of water depth and velocity and should be compiled.

Fish habitat study sites should be surveyed and identified using the full range of habitats seasonally utilized by agreed-upon target species and life stages. The objective is to identify the bioenergetics and physical factors that control fish habitat selection. The Service considers the assessment of habitat influential to fish habitat site selection to be an objective of the Instream Flow and Habitat Utilization Study request. In the resource agencies Instream Flow and Habitat Utilization Study Plan requests, this is a specifically stated objective.

Sequentially, appropriate flow-habitat models can be selected *after* assessment and validation of 1) the full seasonal distribution of target species and life stages,2) the physical factors (e.g., micro-habitat data) that influence habitat selection and suitability, and 3) the bioenergetic factors affecting fish habitat suitability and productivity.

Thus, field visits proposed for the end of September (2012) should be considered as reconnaissance and for discussion purposes, and not for the purpose of actual study site-selection.

-Habitat Suitability Indices: Methods for collecting site-specific habitat criteria for the glacial Susitna River need to be collaboratively identified. (As recommended in the resource agencies study plan request for Instream Flow and Habitat Utilization). These criteria also need to be evaluated in the context of the hierarchical habitat model, such that habitat criteria are determined and evaluated in all habitats of importance to each agreed-upon target species and life stage.

The 1980's studies were inconclusive in demonstrating a relationship between fish habitat criteria and fish distribution, and they were also narrowly focused on associations of spawning and rearing salmon with water

depth and velocity in spring channels (side sloughs). Not only is this not representative of existing habitat and the distribution of fish within those habitats, habitat data collected from nearby glacial rivers demonstrates that spawning habitats selection is independent of flow depth and velocity in side sloughs and may be profoundly influenced by bioenergetics and the input of organic matter .

This indicates that traditional hydraulic modeling (e.g., PHABSIM), as proposed, may be an insufficient fish focus/tool. So, first we need to identify criteria that are influential to habitat selection, within the full seasonal distributions of agreed-upon target species and life stages. Only then, after this has been adequately determined, can we begin to develop utilization functions (curves or HSC) for those criteria.

The Service has previously expressed concern with the approach of repeating the 1980's study effort, and we have repeatedly asked for both a complete compilation of available data, and a review of the 1980's information prior to accepting its use for the proposed project. Lacking that review, we independently note that, in the 1980's sites were selected that were, presumably, heavily utilized by spawning sockeye and chum (qualitative). Study sites need to be based on relevant criteria related to physical habitat site selection as documented by fish distribution and lack thereof.

-**Groundwater**- The integration of the groundwater study efforts with the biological studies is not clear. Specifically, how will the groundwater study be made relevant to the scale of fish habitat and fish habitat site selection in the Susitna River? The objectives of the groundwater study should include relevance to the hierarchially nested habitats, including macro-, meso-, and micro-habitats that are influential to fish habitat selection. The groundwater study sampling design should be relevant to fish habitat and site selection. A specific objective needs to be measuring the hydraulic gradient/head (upwelling or downwelling) under the existing hydrograph and under the proposed project hydrograph release flow schedule.

-**Model selection:** We need to first determine what criteria are important to fish habitat site/suitability and selection before we can choose an appropriate flow-habitat model. ADFG Marine Mammals biologist, Dr. Bob Small also reiterated this very same point regarding model selection for the beluga whale studies. Again, the Service notes our concern about the limited focus of the 1980's studies and using PHABSIM. Our concerns stated in earlier correspondence to AEA remain unaddressed and are reiterated here for emphasis.

Model sensitivity and relevant criteria (inputs) are critical to achieving statistically valid outputs. At this point, it is premature to select a model until we have known 1) fish distribution, and 2) identification of variables influential to fish habitat site selection.

-**Biometric Review-** The Service previously requested a biometric review of the 1980's findings. This request is remains outstanding and should be conducted prior to basing any study plans on 1980's studies or results. In all cases, including the usage of the 1980's Su-hydro data results and for the Susitna-Watana study plans, estimates of precision and accuracy of study results is required to evaluate the power of any study plan. Details of proposed study plan sampling and design methods need to be explicit and statistically valid with a priori determination of levels of precision and accuracy of model outputs.

-Fish genetics- During the August 15-17 meetings, AEA stated that genetic samples from the Chinook above the proposed dam site would not be collected. The stated rationale was due to the desire to minimize the handling of the fish after subsequent tagging of fish. Genetic samples of Chinook at locations above the proposed Susitna-Watana dam site are crucial to informing the Service's management goals specific to recommending licensing conditions under the Federal Power Act, and to conservation recommendations under the Fish and Wildlife Coordination Act, and the Anadromous Fish Act. As such, we consider our request for collection of genetic samples from Chinook salmon, and other fish species to be necessary for our resource evaluation of the Susitna-Watana hydropower project.
Because of this information need, if AEA does not plan to collect the information, AEA should document how this study request is being addressed.

Fish species genetic samples used for comparisons should be less than ten years old to reflect current gene frequencies among the sampled fish populations. Genetic samples for salmon exist for some tributaries in the

lower and middle Susitna River. Some of these samples are greater than ten years old.

Fish genetic samples should be current and include samples of the Chinook migrating above the proposed dam location. Because gene frequencies change over time, all genetic samples should be within the most recent ten years to allow for valid comparison. Genetic analysis should analyze the existing extent of genetic differentiation within and between fish using distinctly different habitats. We request genetic analysis of Chinook above the proposed dam site relative to those at other upper, middle and lower river and tributary sample locations.

-Fish Passage/fishway prescription- The Service is concerned with the lack of transparent discussion about the potential for fish passage alternatives at the proposed Susitna-Watana dam. If fish passage is required, how will that be accomplished? If it is not feasible, what is your alternative proposal? Where is your project assessment of the fish passage feasibility? What are the design criteria being considered/evaluated?

-**Compensatory Mitigation**- Compensatory mitigation is determined as part of a mitigation sequence after avoidance, and minimization efforts. The Service has inquired about potential compensatory mitigation for project impacts during several meetings. To date, this concern has not satisfactorily been addressed by the project sponsors or project consultants. Because compensatory mitigation is a requirement in order to offset unavoidable projects impacts to fish and wildlife resources and their habitats, it is should be considered throughout the review process. Please explain how you plan to quantify existing habitats, and quantify primary, secondary and cumulative (40cfr Part230 of the CWA) losses to those habitats under the proposed operational flows over the temporal scale of the license period. How will habitats change proportionally under project operations?

-Lower river- The Service is concerned with AEA consultants' proposal to establish a lower boundary for the physical studies (e.g., geomorphology, instream flow) at a location "downstream of Sunshine" at approximately river mile 75, and not extend the study efforts further down into lower river to inform the biological studies. There are many biological resource studies that would necessarily be informed by establishing a consistent study boundary between the physical and biological studies. For example, studies related to the federally listed Cook Inlet beluga whale, fish species and habitats, including the resident species, and anadromous salmon and eulachon (beluga whale prey species). The lower river also includes the Susitna Flats State Game Refuge. If the physical studies boundary is terminated at river mile 75, there will be no ability to relate or integrate biological data to those studies (e.g., geomorphology, ISF, ice processes, flow routing). Resource agencies management goals would effectively not be addressed below river mile 75, if project effects are not assessed to the mouth of the river.

According to USACE (1966), 80% of the ability to produce accurate model results depends on using appropriate bathymetry data, mesh design, and boundary conditions. The amount of time needed to collect this information, particularly the bathymetry data, depends on the complexity of the channel's geometry, which is known to be complex in the lower Susitna River. Because data collection in the lower river will likely require rigorous field collection due to the channel complexity, it is critical to initiate these efforts in a time sensitive manner. The proposal to delay work in the lower river pending analysis at an arbitrary, and certainly non-biologically relevant location, does not meet resource agencies objective of evaluating the potential project impacts to fish and wildlife resources in the lower Susitna River. This is particularly true under the FERC ILP process timeline specific to the Susitna-Watana dam project.

-**Studies integration:** A "map" or chart of how studies are proposed to be integrated is needed. AEA sponsors and consultants, committed to providing this by September. Biological resource components are currently not integrated or connected to the other studies, and appear as being treated independently of the rest of the study requests. Study proposals must demonstrate how they will be integrated to provide needed resource information.

Studies/components not address from the Non salmon anadromous, resident and invasives fish species study request: During the August ILP meetings, the follow Service requests were preliminarily noted as not being addressed or adequately addressed by AEA's PSPs.

1) **Marine derived nutrients** contribution from non salmon anadromous species. The Service requested information in our non-salmon anadromous, resident and invasive study plan request. It is not clear which study proposal it is addressing this request, or IF it is being addressed. During the August 15-17 meetings, it was indicated that it may be addressed in either the riparian instream flow, the terrestrial wildlife, the river productivity or elsewhere. However, AEA' s consultants were unable to specifically "point to it" when asked. It does not appear to have been included in the PSPs.

2) **Resource valuation** of non-salmon anadromous and resident fish resources. During the meeting, AEA consultants stated that a resource valuation would not be provided, as requested in the Service's study request for non salmon anadromous, resident and invasive fish study. An explanation of why this assessment will not be addressed was not provided. We request that an explanation be provided that describes the rationale for this determination and urge reconsideration of our study request.

3) **Trophic ecology**- The Service requested information on trophic ecology in the non salmon anadromous, resident and invasive species study request. Michael Link stated that there are "significant predator-prey dynamics" particular once fish move out of the mainstem; using this behavior to explain why fish hold there until they are ready to dash to tributaries. He noted that the creeks are heavily preyed upon by bears, for example. Dr. Bob Small (ADFG) recommended trophic ecology and/or foraging ecology information for the Cook Inlet beluga whale studies. For fish, coordination with Tim Nightengale (AEA's consultant; via teleconference) stated that he would take gut samples from fish to see what macro-invertebrates they are eating, and when, and will work with fish study teams to do some trophic analysis. The trophic ecology component needs to be clearly spelled out in a study plan identifying any aspects that will and will not be addressed explained and with appropriate rationale.

References:

Frissell, C. A., W. J. Liss, C. E. Warren, and M. D. Hurley. 1986. A hierarchical framework for stream habitat classification: viewing streams in a watershed context. Environmental Management 10:2. Pp. 199-214.

Lovtang, J. C. 2005. Distribution, habitat use, and growth of juvenile Chinook salmon in the Metolius River Basin, Oregon. M.S. Thesis, Oregon State University. March 2005.

USACE 1966. (Full citation will be provided in follow-up correspondence)

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Subject: PSP 6.6 Riparian Instream Flow Study Plan - Interim Comments

Kevin,

The following are some of the key differences the USFWS sees between our study plan request (USFWS 10.1, Instream Flows for Floodplain and Riparian Vegetation Study) and AEA's proposed study plan (PSP 6.6, Riparian Instream Flow Study). The differences and comments listed below are likely not inclusive, since we have not had a chance to fully evaluate the PSP.

Many of the PSPs rely upon or provide data from/for other studies. Recognizing these relationships is an important part of the Integrated Licensing Process (ILP); however, the study providing the data should describe the methodology and oversee the data collection and analyses, while the study requiring the results should restrict its discussion to the types of data/results required from other PSPs. Repeating the methods in a study not responsible for the data collection and analyses is unnecessary and risks confusion if the methods differ or are inadequate in one of the studies. Since the Riparian Instream Flow PSP will rely upon data from the Groundwater PSP, the Riparian Instream Flow PSP should describe only the results required from the Groundwater PSP, and then describe how those results will be used in the Riparian Instream Flow PSP (e.g., 5.7 Groundwater PSP should be the only PSP that describes the groundwater methods). This applies to other PSPs, such as the habitat mapping studies that may be providing data for this PSP.

Study Goals and Objectives: The USFWS requested a specific goal that included quantifying the frequency, timing and duration of surface-water and groundwater levels required to establish, maintain, and promote floodplain and riparian plant communities. Two ancillary goals were also requested to quantify the frequency and rate of sediment deposition required to promote soil development, and to quantify the effect of river ice on the establishment and persistence of riparian plant communities. Section 6.6.1.1 of the PSP has no stated goal, and only a general approach is provided. An "overarching goal" is provided in the Section 6.6.4 Study Methods, but this goal is also very general. While goals can be very general in nature, the specifics in our goal set the stage for a rigorous study plan to evaluate potential project-related effects on floodplain plant communities.

The USFWS requested six objectives to help meet our goal. Three of the PSP objectives are similar to our requests {1) Synthesize 1980s data, 2) Study sites, and 6) Seed dispersal}, but they lack the additional specifics stated in our requested objectives. Two of the PSP objectives appear to be wholly or at least partially the objectives for other PSPs and not appropriate as stated {3) Map riparian vegetation, and 10) Impacts to shallow groundwater well users}. What the PSP objectives lack, however, are our specific requests for river ice, sediment deposition, and water-level regime (USFWS Objectives 4, 5, and 6). These missing objectives may be studied under AEA's PSP objectives, but the USFWS prefers they be considered as standalone objectives, and possibly integrated into a single modeling objective after they have been studied individually. The USFWS is particularly interested in our Objective 6 to characterize the water-level regime required to maintain floodplain and riparian plant communities. Much of the discussion so far has focused on floodplain plant succession, but little or no discussion so far has involved maintenance flows. Succession is important, but without maintenance flows whole floodplain plant communities may collapse or the direction of succession changed to an unnatural target (e.g., non-floodplain plant communities).

Study Area: The USFWS agrees with the PSP study area and four river segments, with the following additional comments. The width of the active valley should also include the distance from the River that the River influences groundwater, as well as define the return interval for both groundwater and flooding (e.g., 100-year event under current or climate-change induced conditions). Much discussion has centered on the downstream

influence of the Project. The PSP study area Lower Reach would extend to RM 0. Will this lower extent remain even if all agree that the Project influence on surface- and ground-water becomes indistinguishable from normal environmental variation?

Study Methods: The methods need to follow the order of the objectives and use section headings that refer to the intent of the objectives. Few methods are referenced, and some references that are cited are not included in the literature cited. The relationship with other PSPs often seems confusing. It would be more helpful to state what results will be required from PSP "x" to evaluate a Riparian ISF objective, and potentially what results from a Riparian ISF objective will be required by PSP "y." It is not necessary to repeat coordination for every objective, only state the inputs required and the outputs provided by an objective. This applies across PSPs and among a PSP's objectives. The following comments on methods follow the order of the Objectives requested by the USFWS:

RIFS-1 Synthesize Historical Data: In addition to other North American hydro-projects, this review should also include a review of relatively undisturbed riverine systems.

RIFS-2 Select and Design Study Sites: The number of study sites should provide sufficient replication to address the needs of the objectives, and should include sites where Project operation is expected to cause early channel bed degradation or aggradation. The casual reference to pseudoreplication in one of the other objectives needs to be addressed at the study-site level. Study sites are typically the experimental unit where replication is used for true statistical analysis. All other sampling (e.g., within the study site) is really subsampling used to obtain a better average value for that one replicate. As envisioned by many of the PSPs, the "representative" study sites are really only one replicate for each process-domain. For more on pseudoreplication see:

Hurlbert, Stuart H. 1984. Pseudoreplication and the Design of Ecological Field Experiments. Ecological Monographs 54:187–211. http://dx.doi.org/10.2307/1942661

RISF-3 Characterize Seed Dispersal and Frequency of Establishment: Not sure where this objective is addressed in the PSP. It appears to be scattered across several sections in the methods. If the methods have been described by other similar projects, then cite their methods if appropriate and include enough details to help others understand the methods that will be used. How will the Susitna River bimodal peak flows be addressed? On a float trip down the Susitna 27-29 July 2012, there were newly emerging dicot seedlings on the sandbars. How will the fate of these "second peak" seedlings be addressed? How will the role of precipitation in maintaining favorable soil moisture conditions be evaluated? Will soil texture be considered? If so, how will the soil profile be described?

In Section 6.6.4.3.1.4: Is "abundance" density or some other metric? What is "elevation" referenced to: ASL, an arbitrary datum, or some elevation that can be linked to the local river or groundwater stage (keep in mind the river drops downstream, so that must be accounted for also)? Is there a citation for others using 2-meter square plots? What is the shape of these plots? A square plot may not be appropriate for a narrow band of seedlings along a specific elevation in the gradient above the river. MODFLOW is a groundwater model, and many not be sensitive enough to quantify hydroperiod relationships for seedlings. What other metrics will be used to quantify/separate surface water, groundwater, soil moisture, precipitation, and other potential hydrological process that support seedling establishment and recruitment?

How will the results from this objective be used to predict potential Project-related changes in seedling establishment and recruitment into the population?

RISF-4 Characterize the Role of Ice in the Establishment, Survival and Recruitment of Riparian Species: The discussion on ice processes (Section 6.6.4.4.1) seems unfocused, and essentially provides no discernible methods: "Final details of the geomorphology and ice processes modeling ... will be developed as the 2012 studies are obtained." The goal of this study should be to characterize the role of river ice in the establishment (colonization), survival (first 3 years) and recruitment into the future reproductive population of dominant riparian species (e.g., balsam poplar, willows). Have others investigated the role of ice on riparian plant communities?

If so, can their methods be used here? How will the magnitude, frequency, and longitudinal distribution of ice events affecting dominant riparian species/communities be evaluated?

RISF-5 Characterize the Role of Sediment Deposition in the Formation of Soils: The proposed soil sampling techniques are included in Section 6.6.4.3.1.5, but based on these techniques it is unclear how the USFWS requested objective to characterize the role of sediment deposition in the formation of floodplain and riparian soils, and how sediment deposition affects the rate and trajectory of plant community succession. This objective should investigate the rate of deposition, depth of sediment, and soil profile development required for natural floodplain plant community succession, and then use the predicted sediment deposition characteristic from the Fluvial Geomorphology Study to predict the effects of Project operation on floodplain plant communities. Sampling to only a depth of 50 cm, and describing cumulative thickness of all organic horizons and loess (windblown material?) without stratigraphy will likely be insufficient to meet this objective. Soil texture by feel should follow standard techniques (e.g., Thien 1979, http://soils.usda.gov/education/resources/lessons/texture/).

RISF-6 Characterize Water-Level Regime Required to Maintain Floodplain and Riparian Plant Communities: This is a critical objective that has not been sufficiently discussed in past workgroup meetings, possibly due to lack of time, and the PSP methods are insufficient to evaluate if the USFWS requested objective will be met. Suggest this objective be discussed near the beginning of future meetings to allow sufficient time for discussion.

Objective 6 combines hydrologic information from the groundwater study (PSP 5.7) and the plant community information from this study (PSP 6.6) and possibly the habitat mapping studies (PSPs 9.6 and 9.7) to produce plant species/community response curves. The USFWS's Objectives RISF-3 to RISF-5 target critical stages in plant community succession, while RISF-6 targets critical instream flows required for maintaining plant communities as succession progresses (i.e., both succession and maintenance are important).

The methods for groundwater belong in the Groundwater PSP, and not in this PSP for reasons discussed above. This PSP should request the required hydrologic information from PSP 5.7 and begin the discussion from that point. The following comments, however, include the pertinent groundwater methods that should be discussed in PSP 5.7.

Section 6.6.4.5 (Groundwater): The suggested four to six intensive study reaches instrumented with groundwater and surface-water recording instruments may be insufficient to address this objective if plant response will be described by process-domains (see pseudoreplication discussion above). However, hydrology is likely the most dominant physical factor required for maintaining floodplain plant communities across the various process-domains, and baring some other dominant physical factor (e.g., soil parent material, weather, etc.) it may be possible to use data from the individual intensive study-site transects to build response curves (see Henszey et al. 2004 {ne.water.usgs.gov/platte/reports/wetlands_24-3.pdf}, Figure 7 for an indication of the number of data points required to build a response curve).

One-and-a-half growing seasons (July 2013 to September 2014) will likely provide insufficient groundwater hydrology data to fit individual species response curves (especially for annual species), and may not be enough data to reasonably predict groundwater relationships with river stage and to verify the model predictions with independent data. Precipitation may also dramatically affect transient but critical groundwater levels (a few days to a week or more of elevated water levels), which would be difficult to evaluate with limited data. How will these potential problems be addressed?

What are the "project accuracy standards used for water-level measurements" for horizontal, vertical and temporal measurements?

In addition to the Work Products described in Section 6.6.4.5.2, the products should provide water-level summary statistics for each location (e.g., point, plot, or transect) that will be used to test and fit plant response curves, such as growing season cumulative frequency, 7-day moving average, 10-day moving average, 14-day moving average, and arithmetic mean (see Henszey et al. 2004 {ne.water.usgs.gov/platte/reports/wetlands_24-3.pdf}, Table 1).

Section 6.6.4.7 (Succession Models and Flow Response Guilds) appears to potentially address the USFWS's Objective 6 request; however, two critical referenced papers (Merritt et al. 2010 and Pearlstine et al. 1985) were not included in the Literature Cited. These references were not provided until 8/28/2012, and the USFWS has had insufficient time to review these papers in detail. The concept of the PSP response guilds is similar to the USFWS's request to develop plant community response curves, but the PSP methods are insufficient to evaluate if our requested Objective 6 will be met. The USFWS requested evaluating specific water-level summary statistics (see above discussion for groundwater) with a rigorous curve-fitting technique similar to Henszey et al. (2004). The methods should provide sufficient detail to show how quantifiable (not qualitative) hydrologic (surface-water and groundwater) gradients will be constructed to show the optimum and range of favorable water levels required for maintaining floodplain species/communities.

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From: Eric Rothwell [mailto:eric.rothwell@noaa.gov]
Sent: Wednesday, September 12, 2012 5:37 PM
To: dreiser@r2usa.com
Cc: PHilgert@r2usa.com; Laura Arendall; Betsy McGregor; susan walker; Berg, Catherine; Betsy McCracken (FWS); Michael_Buntjer@fws.gov
Subject: Re: Meeting on the 12th

Dudley,

Thank you for coming over and meeting today. Also, thank you for providing the meeting presentation before hand, having it to review helped facilitate the discussion. The aerial imagery with the proposed study reaches was also helpful in our conversation, when they are available I would like a copy.

I typed up some of my comments from today, starting with general comments, twg meeting protocol comments, and then specific comments on the site selection process. I cc'd other agency personnel that will likely attend the meeting Friday, hoping that it will provide some useful discussion points and I look forward to continuing the discussion September 26-28th. Betsy, Sue, etc. the attached presentation that Dudley provided is draft and parts will likely change prior to Friday's meeting.

General comments about all of the PSPs:

- What can be determined from each of the study components, a description of deliverables (not results) this will help us understand if our requests have been met.
- How will uncertainty be determined for each of the study components? (ice processes -> hydraulic flow routing -> winter fish and habitat effects)
- How will incomplete study components, data, or results be dealt with - situations where an extension of the study period is necessary.

General comments about TWG meetings, as Friday will start to define what TWG will look like:

- An agenda should be provided with enough time to review and submit changes
- All meeting materials provided with enough time for review prior to the meeting, including presentations
- Relevant background material that will aid the discussion will be provided
- Meeting summary and minutes within two weeks of the meeting, distributed to all attendees as a draft. Then a two week period to submit additions and/or corrections
- And - attendees (agency personnel included) will be prepared by reviewing all the materials prior to meeting.

Comments specific to the study site selection process

The proposed methods for site selection are first to select sites in a hierarchical framework (segment by hydrology, then geomorphology, then habitat units). Sites selected will include all the riverine habitat types that are defined (relevant to that reach, for example MR2 may not have any upland sloughs).

The site selection will be informed by selecting sites that are 'critical', meaning that they are likely to be highly affected/sensitive to flow changes and highly important biologically. Generally I agree with prioritizing sites that will by hydraulically affected and are biologically important, but we have incomplete biologic information The data from the 1980s provides some useful information about utilization of off-channel habitats that should inform our studies but the information is limited in that it does not fully capture mainstem utilization or overwintering. So, with new fish utilization and distribution information site selection should include some flexibility to include sites where life histories are not assessed under the currently proposed sites. This seems to be suggested in

the site selection process schedule if it includes fish distribution/habitat utilization information, November 2013 evaluate summer 2013 data and modify/add sites as needed in collaboration with TWG

The schedule provided includes refinement of selected sites by the use of mapping results to evaluate habitat variability, conduct statistical power analysis, refine intensive sites and identify supplementary sites. If possible an addendum to the PSP or definitely in the RSP a description of the initial site selection (by the hierarchical framework) and refinement (by habitat mapping results and fish studies) methods should be presented, not just the selected sites. This depends on the fish studies being sufficient to describe the full distribution of fish and their habitat use.

Incorporation of multiple study elements, such as ice processes, groundwater, geomorphology, and water quality. This is especially important in habitats where one of the other study elements is driving habitat use by fish, for example if upwelling and water temperature is a determining factor for site selecting for Chinook to overwinter then the study site should include this habitat and integrate the WQ and GW studies to understand distribution of thermal refugia for overwintering and how the project would affect those processes/characteristics.

The slides presenting the 1980s electrofishing and sampling was informative, but again shows an incomplete understanding of habitat utilization. The 1980s sampling focused on the off-channel habitats (side sloughs/channel, upland sloughs, and confluences with tributaries). This information should be used to inform selections but must also be put into context that we really don't know very much about mainstem utilization and overwintering, and so need to be flexible (potential with extended study years) when a better understanding is gained through the 2013 and 2014 fish studies.

The slides on each of the species, I had a general comment that they should be put into perspective. That the 1980s data does not represent a complete understanding so comments like no mainstem spawning should be qualified. There likely is a riverine component to sockeye (and other species) that do spawn in the river but that just wasn't captured in the 1980s due to the methodologies available. We do not currently know the full spawning distribution.

Representative reaches, extrapolation of results, and replication. We touched on this and I look forward to talking about this more. I did not review Aaserude et al. 1985 prior to our meeting but plan on reading it prior to the Sept. 26-28 meetings.

Although not discussed, I have a concern with winter flow routing and ice processes, and how they will inform site selection. Site selection for analyzing winter instream flow effects to fish and their habitat will depend on an understanding of operational effects downstream (to flow timing and quantity, hydraulics, and water quality). Also the extension of the studies downstream will depend on these results. The winter hydraulic flow routing model will rely on ice process modeling to determine the downstream extent and magnitude of operational flow effects. The ice process modeling will need several years of data, in addition to the ice thickness measurements and discharge measurements at each of the cross-sections for the winter routing model. I see a lack of time to collect data for the models (winter flow routing and ice process) calibrate the models and then selection sites and methods to conduct ISF studies to assess project effects on fish during winter operations under the currently proposed study period.

This was a very targeted meeting to discuss site selection, I look forward to discussing this and other parts of the ISF and other study plans in the near future. After Friday's meeting I hope to see the selection methods written up with consideration of the agency comments (including the proposed methods for extrapolation), this should help us continue the discussion.

Best Regards,
Eric

APPENDIX 4

INFORMAL CONSULTATION DOCUMENTATION

SECTION 8 – INSTREAM FLOW STUDY: FISH, AQUATICS, AND RIPARIAN

From: Klein, Joseph P (DFG) [joe.klein@alaska.gov]
Sent: Thursday, August 02, 2012 10:32 AM
To: dreiser@r2usa.com
Cc: Betsy McGregor; Erickson, Jack W (DFG); Betsy_McCracken@fws.gov; Michael Buntjer; Steele, Marie C (DNR); eric Rothwell
Subject: Instream Flow Study Plan

Dudley-

Thank you for the channel summaries – there are very helpful and informative.

Following up with the suggestion below, additional information that would be helpful with development of the study design would be a summary of the relative proportions of channel types. It would be great if the information was combined with relative densities of documented fish use. I see that some of this information is included in the proposed study plan and so I'm not clear on when this information will be available.

As you know, this information is one of the initial steps for identifying sampling strategies (representative reach vs macro habitat), habitat selections as well as modeling selections (transects, weighting protocols, hydraulic and habitat simulation programs, aggregation protocols, etc.). Two key issues that I am not clear on are 1) how will the decision be made on which habitat specific model(s) will be used, and 2) how and when will other related riverine studies be integrated (e.g. water temperature, ground water, fish passage, sediment transport, channel maintenance, and ice processes)?

I am looking forward to discussing these topics at the upcoming and future meetings.

Per a future site visit, right now my calendar is open for September.

Hope this helps, Joe

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joe.klein@alaska.gov

From: Betsy McGregor
Sent: Wednesday, August 01, 2012 11:50 AM
To: Betsy_McCracken@fws.gov; dreiser@r2usa.com
Cc: eric Rothwell; 'Phil Hilgert (R2)'; Lori_Verbrugge@fws.gov; Catherine_Berg@fws.gov; jklein@alaska.gov; jerickson@alaska.gov; James.brady@hdrinc.com; mlink@lgl.com; susan walker; shawn.florio@hdrinc.com; mkeefe@r2usa.com; bburgess@abrinc.com; lawhead@abrinc.com; tschick@abrinc.com; pdworian@urs.com; bridget.easley@urs.com; mtuttell@dowlhkm.com; paul.anderson2@alaska.gov; mobley@alaska.net; donna.logan@mcdowellgroup.net; jmh@northernlanduse.com; keri.lestyk@hdrinc.com; mlilly@gwscientific.com; jshook@abrinc.com; amy.rosenthal@urs.com; louise.kling@urs.com; john.gangemi@erm.com;

marie.steele@alaska.gov; bill.fullerton@tetratech.com; Butera, Bob; robert.plotnikoff@tetratech; tracie.krauthoefer@hdrinc.com; Burden, Pat; khansen@dowlhkm.com; bob_henszey@fws.gov; michael_buntjer@fws.gov
Subject: RE: July 26th Su-Watana Field Visit- ISF

Hi Betsy.

Thanks for providing Dudley with your availability for the ISF field trip. Hopefully others will do so as well so the trip can be as beneficial for the licensing participants as possible. R2 prepared the slough and side channel summaries that we used during the site visit last week. It would be great to provide any feedback as to how that summary could be modified or any additional information that may be useful for the September ISF site visit.

Data gathered thus far will be disseminated to the agencies, as well as all other interested licensing participants through AEA. AEA is committed to an open process with all of the licensing participants. However, any requests for summaries of information gathered, project status or data should be directed to AEA instead of AEA's individual contractors.

At this time, contractors are very busy preparing for the August TWG meetings and some are also concurrently in the midst of conducting the 2012 studies. The 2012 study plans have been presented at TWG meetings and can be found on AEA's website. The status of the current data gathering efforts will be mentioned during the August TWG meetings and some information will be presented where it is relevant to development of the Revised Study Plan, which is the primary objective of the upcoming TWG meetings. Additional interim data may also be made available to the licensing participants as it relates to further refinement of the study plans. The 2012 studies will be summarized and data will be presented to the licensing participants after the field season is completed.

Thanks for your participation in this Project.

Betsy

Betsy McGregor
AEA Environmental Manager

From: Betsy_McCracken@fws.gov [Betsy_McCracken@fws.gov]
Sent: Wednesday, August 01, 2012 9:33 AM
To: dreiser@r2usa.com
Cc: Betsy McGregor; eric Rothwell; 'Phil Hilgert (R2)'; Lori_Verbrugge@fws.gov; Catherine_Berg@fws.gov
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Also, as you are likely aware, resource agencies are in the midst of reviewing study plans provided by AEA's consultants. Relative to R2's proposed Instream Flow (ISF), Groundwater and Habitat Utilization study plans,

would you please provide a summary of recent field work conducted or currently in the works from this summer (2012) season? For example, has there been any groundwater (reconnaisance or otherwise) work done this season that would inform the ISF and habitat utilization efforts? I am asking this in an effort to gain an understanding of where we are at, or where we will be at with efforts when we head out to the river in September.

Thank you very much,
Betsy
Betsy W. McCracken

Fishery Biologist
Conservation Planning Assistance
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US Fish and Wildlife Service/Region 7/Anchorage Field Office
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Sent: Thursday, August 02, 2012 10:32 AM
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marie.steele@alaska.gov; bill.fullerton@tetratech.com; Butera, Bob; robert.plotnikoff@tetratech; tracie.krauthoefer@hdrinc.com; Burden, Pat; khansen@dowlhkm.com; bob_henszey@fws.gov; michael_buntjer@fws.gov
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AEA Environmental Manager

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To: dreiser@r2usa.com
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From: Klein, Joseph P (DFG) [mailto:joe.klein@alaska.gov]
Sent: Thursday, August 23, 2012 2:48 PM
To: Betsy McGregor
Cc: Benkert, Ronald C (DFG); Burch, Mark E (DFG); Erickson, Jack W (DFG); Fair, Lowell F (DFG); Fink, Mark J (DFG); Giefer, Joe (DFG); Haught, Stormy B (DFG); Holen, Davin L (DFG); King, Kimberly N (DFG); Miller, Monte D (DFG); Michael_Buntjer@fws.gov; Betsy_McCracken@fws.gov; eric Rothwell; Hill, Melissa E (DNR); Schwarz, Terence C (DNR); Sager, Kimberly R (DNR); Ashton, William S (DEC)
Subject: RE: Follow up Meeting Notes-additional comments

Following are additional comments

Baseline Water Quality
5.5.4.3.2 **In-Situ Water Quality Sampling** The sampling protocol currently calls for monthly in-situ water quality monitoring for the 4 summer months. It should be revised to include continuous (hourly or so) water quality measurements for basic parameters (pH, DO, conductivity, turbidity), year-round if possible using in-situ semi-permanent sensors (e.g. sondes). The technology is readily available and would provide very useful baseline information to assess any post project impacts.

River Productivity
7.8.4.4 **Conduct a literature/data search to identify existing river systems that could act as surrogates in evaluating future changes to productivity in the Susitna River.** We recommend supplementing or substituting this section using a reference reach in a similar Alaska river using a BACI design monitoring program in order to assess post project impacts.

From: Klein, Joseph P (DFG)
Sent: Thursday, August 23, 2012 10:42 AM
To: McGregor, Elizabeth A (AIDEA)
Cc: Benkert, Ronald C (DFG); Burch, Mark E (DFG); Erickson, Jack W (DFG); Fair, Lowell F (DFG); Fink, Mark J (DFG); Giefer, Joe (DFG); Haught, Stormy B (DFG); Holen, Davin L (DFG); King, Kimberly N (DFG); Miller, Monte D (DFG); Michael_Buntjer@fws.gov; Betsy_McCracken@fws.gov; Eric Rothwell (Eric.Rothwell@noaa.gov); Hill, Melissa E (DNR); Schwarz, Terence C (DNR); Sager, Kimberly R (DNR); Ashton, William S (DEC)
Subject: Follow up Meeting Notes

Betsy-

Thank you for the opportunity to discuss the proposed study plans for the Susitna-Watana Hydroelectric project. We look to further discussions to continue to clarify study plan details.

To assist in you and your consultants in this process, below are brief notes by ADF&G staff. We may have additional comments/or clarifications. Please feel free to contact me if you have any questions.

Regards, Joe

Fish Distribution and abundance in Upper, Middle and Lower Susitna River

- Trot lines should considered during the winter to target appropriate fish species.
- Minnow trapping under ice should be used during the winter, in all habitat types.
- Should evaluate the feasibility of under ice videography.

Salmon Escapement

- Identify locations of adult fish weir locations described on tributary streams (7.7.4.1.5, page 7-39). Consider placement of adult fish weir upstream of the proposed dam on prominent Chinook salmon streams.

Instream Flow

- What is the sampling strategy (e.g. representative reach, mesohabitat typing) for the defined habitat types?
- How many and at what range will discharge-calibration sets be collected for each sampling method?
- Will 2D modeling include side channels and sloughs within study area?
    - Based on comments at the meeting it was my understanding it would.
- What criteria will be used to identify cover types and substrate sizes?
- For PHABSIM, will transects be independent, dependent or a combination and accordingly, what WSE models and composite suitability index will be used?
- What criteria will be used to select and weight transect-derived models?
- Per the description of study sites for fish passage/off-channel connectivity (§6.5.4.5.5), what criteria will be used to identify "a representative number" of different habitat types?
- HSI data is needed for identified target species for each defined habitat type, over 2 years.
- How will the data be aggregated to evaluate single flow recommendation?
- Will a DSS-type program be available to review study results and if so, information is needed on it.
- How do you envision the "collaborative process" will work? When will major decisions be made (e.g. site and transect selections) and how often do you envision the work group will get together?
- What equipment will be used and how will they be calibrated?
- For the eulachon and boating studies, similar information is needed on what is the study area, what sampling strategy will be used, how many and what range of calibration-discharge sets if appropriate, and how will HSI curves will be developed?
- Varial zone modeling, may need more defined time steps during analysis phase (possibly down to 15-minute increments) depending on the rate of flow change over time.

Groundwater

- What are the monitoring well placement sampling approach (e.g. equal spacing along linear transects, etc.) and location (e.g. for instream flow, in all habitat types?) for the various resource studies (i.e. instream flow, riparian instream flow, water quality). Also, a description of sampling intensity would be helpful (i.e. for instream flow purposes, will the objective be to characterize entire gw/sw interaction throughout entire intensive study site or only at select microhabitats).

- What is the duration for monitoring (I believe at the meeting it would be from installation until winter 2013-14?)

- How often will monitoring wells be calibrated for various parameters to be sampled pre- post- and during field monitoring?

- For each resource discipline, what parameters will be sampled and what are range of accuracies (e.g. for water level +/- 0.1 ft?, water temp +/- 0.2 C?, etc.).

Water Quality

- Information on availability of the Sampling and Analysis Plan and Quality Assurance Project Plan is needed.
- GW Quality in Selected Habitats (Section 5.5.4.7) - need more information on study. For example, sampling intensity/number of site measurements per slough or criteria for how they will be determined. Will ground water level monitors be installed if so, what is the sampling intensity (numbers per habitat type) and duration of monitoring (e.g. continuous year-round/ point samples during field visits, etc.). If not, it is strongly recommended groundwater monitoring be performed concurrently with water quality monitoring in this study.

- Any monitors should be calibrated pre- and post-monitoring along with multiple field measurements for post monitoring calibration.

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Subject: Follow up comments from August 15-17 ILP meetings

Hi Betsy,

Thank you and AEA for hosting the August ILP meetings. We all gained a lot of insight from the meetings, and we were pleased to be updated. Like others, as a result of the meetings, the Service has a few comments and concerns to share with the group.

In addition to these below, other staff from the Service may provide comments relative to their study area expertise. We hope that our collective comments will be helpful toward gaining concurrence on proposed studies, and as we move forward with the review process of the proposed Watana dam.

Thank you,
Betsy

September 7, 2012

Notes from ILP Formal Study Meetings August 15-17, 2012:

At the request of AEA and its consultants, the USFWS (Service) submits this brief summary of concerns regarding the Susitna-Watana hydropower dam formal ILP Formal Study meetings that were held August 16-17, 2012. The Service's concerns in this informal correspondence, along with other remaining concerns will be further articulated in the Service's formal response letter on AEA's ILP Proposed Study Plan (PSP) review, due to FERC October 15, 2012. Additional informal comments from the Service may be provided under separate cover before the October due date.

FWS concerns highlighted during meetings relative to Instream Flow, Habitat Utilization and the Geomorphology proposed study plans:

Overall, the Service finds that AEA's proposed study plans for instream flow, habitat utilization and geomorphology do not fully address agency's resource management concerns. During the three days of ILP study meetings, sequencing and integration of the proposed biological resource studies and the physical process studies was not described and is still a significant outstanding information need. It is necessary to describe the integration of these inter-related studies and how that integration will result in a comparison of the baseline biological information and the resulting effects to biologic resources caused by the proposed project operations. Study results must be quantifiable in order to assess potential losses to aquatic resources and their habitats, to review the project under our relevant fish and wildlife resource conservation authorities, to inform fishway prescription authority under Section 18 of the Federal Power Act, and to eventually develop recommended protection, mitigation, and enhancement for the project license. We do not believe that the current study plan proposals will yield sufficient information to allow us to adequately assess proposed project impacts to the Nation's fish and wildlife resources and develop adequate PME's.

The Service has repeatedly articulated concerns about the lack of study sequencing, connectivity and integration between the biological studies and the other proposed engineering and physical processes studies. We reiterate and highlight the need for the collection of adequate temporal and spatial baseline biological and fish habitat data to provide direct input to some of the proposed physical modeling efforts. Many of our concerns, below, are related to the temporal mismatch of biological data collection with the forward momentum of the physical modeling efforts.

-Habitat Mapping

Hierarchially-nested aquatic habitats- HDR stated at the meeting that the "habitat mapping" will be started in September; and that the sampling will be stratified by meso-habitat type as identified in the 1980's study reports.

The 1980's studies did not hierarchically nest the habitat types. The Service specifically requested hierarchially nested habitat mapping (e.g., Frissel et al, 1986). We are concerned with the proposal to use the 1980's study sites, which focus on the side sloughs, and do not consider the full breadth of fish habitats, which is currently unknown and the subject of ongoing study that has not been completed or submitted for agency review and comment. We do not endorse the use of the 1980's sites without out first completing and then applying a hierarchal assessment of the river reaches as a study framework. The hierarchally nested aquatic habitats framework is needed to structure fish distribution surveys, the instream flow study and other physical process studies. Without it, the fish surveys will be too narrowly constrained and the instream flow studies will not represent all habitats that may be affected by the proposed project. The Service recommends the following habitat hierarchy for the Susitna River be used for habitat mapping purposes and integration of studies:

Large River Floodplain Habitat Hierarchy

1. Geomorphic units: Large-scale geomorphic and hydraulic controls.

a. Bedrock controlled, single-channel units with shallow hyporheic exchange and thermal homogeneity.

b. Unconfined, multiple channel floodplain units with expansive hyporheic exchange and thermal heterogeneity.

2. Macrohabitats: Primary, flood, and spring channel networks.

a. Primary channels—Perennial channels.

b. Flood channels—Seasonally connected channels.

c. Spring channels—Disconnected sloughs that discharge groundwater.

d. Floodplain ponds—Ponded spring channel networks.

3. Mesohabitats: Bed and bank morphological controls; hydraulic features.

a. Riffle-pool sequences—Run, riffle, pool, glide, tailout.

b. Backwaters, alcoves, shallow meander margins.

4. Microhabitats: Hydraulics, water quality, substrate, cover.

a. Water depth, velocity, bulk flow characteristics (e.g. Reynolds and Froude #'s).

b. Vertical hydraulic exchange (ground and surface water exchange).

c. Bed, or intragravel temperature and dissolved oxygen.

d. Substrate size, heterogeneity.

e. Elements of wood, vegetation, and rock structure.

-Fish distribution: A first step is to assess the seasonal distributions of target species and life stages and the physical habitat criteria that influence habitat selection and suitability. As a first step, target species have to be identified, agreed upon, and their life history and habitat use similarities to other, unstudied species (i.e., non-target species) need to be determined and described. In the study requests of the Service and other agencies, we recommended studying the baselines of all affected fish species and life stages, including all five species of anadromous salmon and all resident fish.

Fish distribution data are needed to describe the baseline data to support and compliment other proposed study objectives, including those related to fish habitat selection and utilization. A first step to acquiring adequate fish distribution is to assess the full lateral and longitudinal profile of seasonal fish distribution, life stage periodicity, and suitable used and unused habitats that are influential in fish habitat site selection. The fish distribution data is needed to provide the base data layer that will support and compliment other proposed study objectives, including those related to fish habitat selection and utilization, and instream flow (ISF) needs. This information is also needed for resource agencies' fishway prescription decisions under the Federal Power Act. Baseline biological information is critical input necessary for integration with physical studies. Accordingly, the Service is reiterating the need for multiple and continuous years of biologically relevant data in order to provide robust integration with the physical modeling studies, and decision-support relative to fish and wildlife resources of the Susitna River basin.

-Habitat site selection criteria: Criteria that influence habitat selection and suitability need to be identified using statistically powerful and robust methods and current models of fish distribution including bioenergetics and not exclusively physical habitat models (Lovtang 2005). The Service remains opposed to the proposal to repeat the 1980's approaches to fisheries studies. The 1980's studies do not determine the habitat criteria influencing fish habitat site-selection, they simply report utilization functions for water depth and velocity, or depth and substrate. They also lack a fundamental baseline assessment of all available fish habitat and instead focus on study of habitats that had high fish use density. The habitats that were apparently suitable but unoccupied or underutilized by fish need to be assessed, and the entire range of habitat availability and habitat use data need to be assessed prior to habitat study site selection.

More comprehensive data collected on nearby glacial rivers may be used to demonstrate that habitat selection by salmon in side-sloughs can be independent of water depth and velocity and should be compiled.

Fish habitat study sites should be surveyed and identified using the full range of habitats seasonally utilized by agreed-upon target species and life stages. The objective is to identify the bioenergetics and physical factors that control fish habitat selection. The Service considers the assessment of habitat influential to fish habitat site selection to be an objective of the Instream Flow and Habitat Utilization Study request. In the resource agencies Instream Flow and Habitat Utilization Study Plan requests, this is a specifically stated objective.

Sequentially, appropriate flow-habitat models can be selected *after* assessment and validation of 1) the full seasonal distribution of target species and life stages,2) the physical factors (e.g., micro-habitat data) that influence habitat selection and suitability, and 3) the bioenergetic factors affecting fish habitat suitability and productivity.

Thus, field visits proposed for the end of September (2012) should be considered as reconnaissance and for discussion purposes, and not for the purpose of actual study site-selection.

-Habitat Suitability Indices: Methods for collecting site-specific habitat criteria for the glacial Susitna River need to be collaboratively identified. (As recommended in the resource agencies study plan request for Instream Flow and Habitat Utilization). These criteria also need to be evaluated in the context of the hierarchical habitat model, such that habitat criteria are determined and evaluated in all habitats of importance to each agreed-upon target species and life stage.

The 1980's studies were inconclusive in demonstrating a relationship between fish habitat criteria and fish distribution, and they were also narrowly focused on associations of spawning and rearing salmon with water

depth and velocity in spring channels (side sloughs). Not only is this not representative of existing habitat and the distribution of fish within those habitats, habitat data collected from nearby glacial rivers demonstrates that spawning habitats selection is independent of flow depth and velocity in side sloughs and may be profoundly influenced by bioenergetics and the input of organic matter .

This indicates that traditional hydraulic modeling (e.g., PHABSIM), as proposed, may be an insufficient fish focus/tool. So, first we need to identify criteria that are influential to habitat selection, within the full seasonal distributions of agreed-upon target species and life stages. Only then, after this has been adequately determined, can we begin to develop utilization functions (curves or HSC) for those criteria.

The Service has previously expressed concern with the approach of repeating the 1980's study effort, and we have repeatedly asked for both a complete compilation of available data, and a review of the 1980's information prior to accepting its use for the proposed project. Lacking that review, we independently note that, in the 1980's sites were selected that were, presumably, heavily utilized by spawning sockeye and chum (qualitative). Study sites need to be based on relevant criteria related to physical habitat site selection as documented by fish distribution and lack thereof.

-**Groundwater**- The integration of the groundwater study efforts with the biological studies is not clear. Specifically, how will the groundwater study be made relevant to the scale of fish habitat and fish habitat site selection in the Susitna River? The objectives of the groundwater study should include relevance to the hierarchially nested habitats, including macro-, meso-, and micro-habitats that are influential to fish habitat selection. The groundwater study sampling design should be relevant to fish habitat and site selection. A specific objective needs to be measuring the hydraulic gradient/head (upwelling or downwelling) under the existing hydrograph and under the proposed project hydrograph release flow schedule.

-**Model selection:** We need to first determine what criteria are important to fish habitat site/suitability and selection before we can choose an appropriate flow-habitat model. ADFG Marine Mammals biologist, Dr. Bob Small also reiterated this very same point regarding model selection for the beluga whale studies. Again, the Service notes our concern about the limited focus of the 1980's studies and using PHABSIM. Our concerns stated in earlier correspondence to AEA remain unaddressed and are reiterated here for emphasis.

Model sensitivity and relevant criteria (inputs) are critical to achieving statistically valid outputs. At this point, it is premature to select a model until we have known 1) fish distribution, and 2) identification of variables influential to fish habitat site selection.

-**Biometric Review-** The Service previously requested a biometric review of the 1980's findings. This request is remains outstanding and should be conducted prior to basing any study plans on 1980's studies or results. In all cases, including the usage of the 1980's Su-hydro data results and for the Susitna-Watana study plans, estimates of precision and accuracy of study results is required to evaluate the power of any study plan. Details of proposed study plan sampling and design methods need to be explicit and statistically valid with a priori determination of levels of precision and accuracy of model outputs.

-Fish genetics- During the August 15-17 meetings, AEA stated that genetic samples from the Chinook above the proposed dam site would not be collected. The stated rationale was due to the desire to minimize the handling of the fish after subsequent tagging of fish. Genetic samples of Chinook at locations above the proposed Susitna-Watana dam site are crucial to informing the Service's management goals specific to recommending licensing conditions under the Federal Power Act, and to conservation recommendations under the Fish and Wildlife Coordination Act, and the Anadromous Fish Act. As such, we consider our request for collection of genetic samples from Chinook salmon, and other fish species to be necessary for our resource evaluation of the Susitna-Watana hydropower project.
Because of this information need, if AEA does not plan to collect the information, AEA should document how this study request is being addressed.

Fish species genetic samples used for comparisons should be less than ten years old to reflect current gene frequencies among the sampled fish populations. Genetic samples for salmon exist for some tributaries in the

lower and middle Susitna River. Some of these samples are greater than ten years old.

Fish genetic samples should be current and include samples of the Chinook migrating above the proposed dam location. Because gene frequencies change over time, all genetic samples should be within the most recent ten years to allow for valid comparison. Genetic analysis should analyze the existing extent of genetic differentiation within and between fish using distinctly different habitats. We request genetic analysis of Chinook above the proposed dam site relative to those at other upper, middle and lower river and tributary sample locations.

-Fish Passage/fishway prescription- The Service is concerned with the lack of transparent discussion about the potential for fish passage alternatives at the proposed Susitna-Watana dam. If fish passage is required, how will that be accomplished? If it is not feasible, what is your alternative proposal? Where is your project assessment of the fish passage feasibility? What are the design criteria being considered/evaluated?

-**Compensatory Mitigation**- Compensatory mitigation is determined as part of a mitigation sequence after avoidance, and minimization efforts. The Service has inquired about potential compensatory mitigation for project impacts during several meetings. To date, this concern has not satisfactorily been addressed by the project sponsors or project consultants. Because compensatory mitigation is a requirement in order to offset unavoidable projects impacts to fish and wildlife resources and their habitats, it is should be considered throughout the review process. Please explain how you plan to quantify existing habitats, and quantify primary, secondary and cumulative (40cfr Part230 of the CWA) losses to those habitats under the proposed operational flows over the temporal scale of the license period. How will habitats change proportionally under project operations?

-Lower river- The Service is concerned with AEA consultants' proposal to establish a lower boundary for the physical studies (e.g., geomorphology, instream flow) at a location "downstream of Sunshine" at approximately river mile 75, and not extend the study efforts further down into lower river to inform the biological studies. There are many biological resource studies that would necessarily be informed by establishing a consistent study boundary between the physical and biological studies. For example, studies related to the federally listed Cook Inlet beluga whale, fish species and habitats, including the resident species, and anadromous salmon and eulachon (beluga whale prey species). The lower river also includes the Susitna Flats State Game Refuge. If the physical studies boundary is terminated at river mile 75, there will be no ability to relate or integrate biological data to those studies (e.g., geomorphology, ISF, ice processes, flow routing). Resource agencies management goals would effectively not be addressed below river mile 75, if project effects are not assessed to the mouth of the river.

According to USACE (1966), 80% of the ability to produce accurate model results depends on using appropriate bathymetry data, mesh design, and boundary conditions. The amount of time needed to collect this information, particularly the bathymetry data, depends on the complexity of the channel's geometry, which is known to be complex in the lower Susitna River. Because data collection in the lower river will likely require rigorous field collection due to the channel complexity, it is critical to initiate these efforts in a time sensitive manner. The proposal to delay work in the lower river pending analysis at an arbitrary, and certainly non-biologically relevant location, does not meet resource agencies objective of evaluating the potential project impacts to fish and wildlife resources in the lower Susitna River. This is particularly true under the FERC ILP process timeline specific to the Susitna-Watana dam project.

-**Studies integration:** A "map" or chart of how studies are proposed to be integrated is needed. AEA sponsors and consultants, committed to providing this by September. Biological resource components are currently not integrated or connected to the other studies, and appear as being treated independently of the rest of the study requests. Study proposals must demonstrate how they will be integrated to provide needed resource information.

Studies/components not address from the Non salmon anadromous, resident and invasives fish species study request: During the August ILP meetings, the follow Service requests were preliminarily noted as not being addressed or adequately addressed by AEA's PSPs.

1) **Marine derived nutrients** contribution from non salmon anadromous species. The Service requested information in our non-salmon anadromous, resident and invasive study plan request. It is not clear which study proposal it is addressing this request, or IF it is being addressed. During the August 15-17 meetings, it was indicated that it may be addressed in either the riparian instream flow, the terrestrial wildlife, the river productivity or elsewhere. However, AEA' s consultants were unable to specifically "point to it" when asked. It does not appear to have been included in the PSPs.

2) **Resource valuation** of non-salmon anadromous and resident fish resources. During the meeting, AEA consultants stated that a resource valuation would not be provided, as requested in the Service's study request for non salmon anadromous, resident and invasive fish study. An explanation of why this assessment will not be addressed was not provided. We request that an explanation be provided that describes the rationale for this determination and urge reconsideration of our study request.

3) **Trophic ecology**- The Service requested information on trophic ecology in the non salmon anadromous, resident and invasive species study request. Michael Link stated that there are "significant predator-prey dynamics" particular once fish move out of the mainstem; using this behavior to explain why fish hold there until they are ready to dash to tributaries. He noted that the creeks are heavily preyed upon by bears, for example. Dr. Bob Small (ADFG) recommended trophic ecology and/or foraging ecology information for the Cook Inlet beluga whale studies. For fish, coordination with Tim Nightengale (AEA's consultant; via teleconference) stated that he would take gut samples from fish to see what macro-invertebrates they are eating, and when, and will work with fish study teams to do some trophic analysis. The trophic ecology component needs to be clearly spelled out in a study plan identifying any aspects that will and will not be addressed explained and with appropriate rationale.

References:

Frissell, C. A., W. J. Liss, C. E. Warren, and M. D. Hurley. 1986. A hierarchical framework for stream habitat classification: viewing streams in a watershed context. Environmental Management 10:2. Pp. 199-214.

Lovtang, J. C. 2005. Distribution, habitat use, and growth of juvenile Chinook salmon in the Metolius River Basin, Oregon. M.S. Thesis, Oregon State University. March 2005.

USACE 1966. (Full citation will be provided in follow-up correspondence)

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Subject: Follow up Notes from the August 2012 Work Group meeting

Hello Betsy:

Thank you for the opportunity to discuss the proposed study plans for the Susitna-Watana Hydroelectric Project. We look forward to further discussions to clarify the details of the proposed study plans. I have attached some initial notes, comments, and questions regarding the objectives in our three fish study requests, our River Productivity Study Request, and those found in the proposed study plan.

These comments are in addition to those provided during the August 2012 work group meetings, and are intended to assist in further discussions about development of the study plans. In addition to the attached comments, I have some overall questions, comments, and concerns about the proposed fish studies. Based on the proposed methodologies, there does not appear to be any studies to collect baseline biological or physical spawning habitat information between the time eggs are deposited in redds and the time of fry emergence, and no information on the timing and movement of fish from spawning to rearing areas, and only limited information on the distribution and abundance of juvenile fish up to 60 mm, particularly in winter. These are the life stages most vulnerable to load-following operations.

Although I have more questions and comments regarding linkages between proposed studies and project details, these should serve as a starting point for the upcoming fish sub-workgroup meetings. If you have any questions, please feel free to contact me. Thanks.

Mike

(See attached file: ELH Juvenile Adult Fish D and A Riv Pro mb initial draft comments on PSP.docx)

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ATTACHMENT: ELH Juvenile Adult Fish D and A Riv Pro mb initial draft comments on PSP.doc

For each USFWS Study Request below (including our three fish studies and River Productivity) I listed the objectives in each study request and then followed them with the objectives I found in the PSP. I noted where the objectives were the same, where they differed, and where our study requests were not addressed in the PSP. I also include other notes, comments, and questions to assist in further discussions about the proposed studies.

Early Life History and Juvenile Fish Distribution and Abundance in the Susitna River (USFWS Study Request; Enclosure 13)

Specific study request objectives versus objectives included in PSP Study 7.5 (upper reach) and Study 7.6 (middle and lower reach):

1. Determine the seasonal distribution, relative abundance (as determined by CPUE, fish density, and counts), and fish-habitat associations of juvenile anadromous and resident juvenile fish species in the mainstem Susitna River (side channel, slough, backwater, and tributary confluence habitats).

1. Describe the seasonal distribution, relative abundance (as determined by CPUE, fish density, and counts), and fish-habitat associations of resident fishes, juvenile anadromous salmonids, and the freshwater life stages of non-salmon anadromous species; (7.5 upper reach)

- Only winter sampling I see proposed in the upper reach includes using DIDSON and video cameras in 10 "selected" sloughs and side channels; how were/will sites be selected?; What other habitat types are available and why are they not being sampled? Is this sufficient to get at winter distribution and abundance for all life stages?; will not likely be able to identify juvenile species using these techniques (therefore, no distribution and abundance information and habitat use by species, particularly for early life stages (<60 mm); other winter sampling (using gill nets, minnow traps, and trot lines) is listed in the schedule section (and not in methods), but it is not described.

1) Describe the seasonal distribution, relative abundance (as determined by CPUE, fish density, and counts), and fish-habitat associations of juvenile anadromous salmonids, non-salmonid anadromous fishes and resident fishes; (7.6 middle and lower reach).

- The list of habitat types to be sampled in this study (middle and lower reaches) appears longer than habitats proposed for the upper reach, but otherwise same comments as listed above for Study 7.5 (upper reach).

2. Describe the seasonal movements and migratory patterns of juvenile anadromous and resident juvenile fish species among mainstem habitats and between tributaries and mainstem habitats with emphasis on identifying foraging and overwintering habitats.

5. Use biotelemetry (PIT and radio tags) to describe seasonal movements of selected fish species (including rainbow trout, Dolly Varden, whitefish, northern pike, burbot, and Pacific lamprey if present) with emphasis on identifying spawning and overwintering habitats within the hydrologic zone of influence upstream of the project; (7.5 upper reach)

- Unclear if this includes or excludes PIT tagging juvenile anadromous salmon, particularly Chinook salmon; i.e., none are listed
- Also, mentions installing up to six antenna arrays in selected sloughs and side channels in winter; is that sufficient to determine movement of juveniles in and out of habitats? What about other habitats? Unclear how sites were selected and what habitats were or were not sampled in the 1980s. Therefore, what is rationale and assumptions for selecting habitat types and sites?
- See nothing on movement (and timing) of newly emergent fish from spawning to rearing areas or movement of juvenile fish <60 mm in winter (i.e., the post-emergent life stages most vulnerable to load-following operations)

2) Describe seasonal movements of selected fish species such as rainbow trout, eulachon, Dolly Varden, whitefish, northern pike, Pacific lamprey, and burbot) using biotelemetry (PIT and radio-tags) with emphasis on identifying foraging, spawning and overwintering habitats within the mainstem of the Susitna River and its associated off-channel habitat; (7.6 middle and lower reach)

- Unclear if this includes or excludes PIT tagging juvenile anadromous salmon; i.e., none are listed
- Also, mentions installing up to 10 antenna arrays; is that sufficient to determine movement of juveniles in and out of habitats by reach? When, where, and how will sites be selected? What is rationale and assumptions for selecting habitat types and sites?
- See nothing on movement (and timing) of newly emergent fish from spawning to rearing areas or movement of juvenile fish <60 mm in winter, particularly for anadromous salmonids.

3. Document the timing of downstream movement of all juvenile fish species and outmigration for anadromous salmon.

6. Document the timing of downstream movement and catch for fish species via outmigrant traps; (7.5 upper reach)

- Unclear if this includes or excludes addressing outmigration and winter sampling

3) Document the timing of downstream movement and catch for all fish species using outmigrant traps; (7.6 middle and lower reach)

Unclear if this includes or excludes addressing outmigration

4. Document the age structure, growth, and condition of juvenile anadromous and juvenile resident fish by season.

4) Characterize the age structure, growth, and condition of juvenile anadromous and resident fish by season; (7.6 middle and lower reach)

- Is there a difference between Document (as requested) and Characterize (as proposed)? Explain
- Is this study objective limited to juveniles or should it say "all" resident fish.
- This objective is not included in upper reach; should at least characterize age structure for all resident and anadromous fish by season

5. Collect and analyze tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Genetic Analysis study.

3. Collect tissue samples to support the Genetic Baseline Study for Selected Fish Species (Section 7.14); (7.5 upper reach)

- No mention of analyzing samples; analysis mentioned in Genetic Baseline Study, but link/integration to analyzing samples collected in this study is not discussed. Will samples be analyzed? Explain.

6) Collect tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Genetic Baseline Study (Section 7.14). (7.6 middle and lower reach)

- Again, no mention of analyzing samples; analysis mentioned in Genetic Baseline Study, but link/integration to analyzing samples collected in this study is not discussed. Will samples be analyzed? Explain.
- Because PSP is not structured similarly to our study requests, why is this study objective limited to juvenile salmon? This may be okay, because genetic sampling included in Salmon Escapement Study, though no mention in study of analyzing samples or overall links between studies. Without providing linkages between studies, there is a lot of searching required to find if, where, and how information is being collected.

6. Collect and provide the Instream Flow study with habitat suitability criteria (HSC) data to support analysis of potential project impacts.

Mention of HSC is in Study 6.5, but the study request objective is not addressed in the upper, middle, or lower reaches for juvenile anadromous, resident fish, and non-salmonid anadromous fish studies. It is unclear how HSC information will be collected, particularly in winter for post-emergent fish up to 60 mm when fish will be most vulnerable to load-following operations. I see no empirical baseline information being collected to evaluate potential project effects or for inclusion in habitat modeling efforts. There is generic reference to developing HSC model in Study 6.5 for these species and life stages, but unclear about the source of that information.

7. Evaluate salmon incubation (embryo development, hatching success, and emergence times) and associated water quality conditions (e.g., temperature, DO, pH) at existing spawning habitats (slough,

side channel, tributary, and mainstem) in areas with and without groundwater upwelling in the middle and lower reaches of the Susitna River.

Study Request objectives 7-9 are not addressed in 7.5 or 7.6; there is no mention of egg incubation (rates or success), hatching (rates or success), stranding (ramping rates) or emergence (dates and times) sampling anywhere; no mention of baseline intragravel temperature or water quality monitoring of spawning and pre-emergent juvenile fish habitats; no mention of characterizing baseline water quality conditions at spawning or rearing habitats.

Only mention is in Study Goals (6.5.1.2, page 6-10); Objective 8. Conduct a variety of post-processing comparative analyses derived from the output metrics under aquatic habitat models. Approach appears to evaluate using only physical habitat models and without empirical sampling post-spawning through emergence and for juveniles up to PIT tagging size (i.e., 60 mm).

8. Evaluate the potential for stranding of juvenile fish and stranding mortality by season under proposed operational conditions.

This Study Request objective is not addressed. Stranding is mentioned in Chapter 6, but the study approach is not discussed

9. Measure intragravel water temperature in spawning habitats and winter juvenile fish habitats at different surface elevations and different depths to determine the potential for freezing of redds, freezing of juvenile fish, and their habitats.

This Study Request objective is not addressed anywhere.

Adult Salmon Distribution, Abundance, Habitat Utilization and Escapement in the Susitna River (USFWS Study Request: Enclosure 15)

Specific objectives included in study request versus objectives listed in PSP Study 7.6:

1. Capture, radio tag and track adults of the five species of Pacific salmon in proportion to their abundance.

   1. Capture, radiotag, and track adults of five species of Pacific salmon in the middle and upper Susitna River in proportion to their abundance. Capture and tag Chinook and coho salmon in the lower Susitna River.

2. Determine the migration behavior and spawning locations of radio-tagged fish in the lower, middle, and upper Susitna River.

   2. Characterize the migration behavior and spawning locations of radiotagged fish in the lower, middle, and upper Susitna River.

3. Characterize adult salmon migration behavior and run timing within and above Devils Canyon.

   3. Characterize adult salmon migration behavior and timing within and above Devils Canyon.

4. If shown to be an effective sampling method during the 2012 study, and where feasible, use sonar to document salmon spawning locations in turbid water.

   4. If shown to be an effective sampling method during the 2012 study, and where feasible, use sonar to document salmon spawning locations in turbid water in 2013 and 2014.

5. Compare historical and current data on run timing, distribution, relative abundance, and specific locations of spawning and holding salmon.

   5. Compare historical and current data on run timing, distribution, relative abundance, and specific locations of spawning and holding salmon.

6. Estimate escapement of adult salmon spawning by mainstem reaches and tributaries.

   6. Generate counts of adult Chinook salmon spawning in the Susitna River and its tributaries.

   Need to define “generate count” and how generated. If it is an index of abundance, then need to identify the standardized unit of effort. Also, not sure why escapement estimate is not being determined? This study references escapement estimates from the 1980s, but not here. Explain.

7. Collect tissue samples to support the Genetic Analysis Study.

   7. Collect tissue samples to support the Fish Genetic Baseline Study (Section 7.14).

8. Determine system-wide Susitna River escapement and run apportionment.

   8. Estimate system-wide Chinook and coho salmon escapement to the Susitna River and the distribution of those fish among tributaries of the Susitna River.

9. Determine the availability and accessibility of spawning habitats by adult salmon to mainstem and tributary locations based upon flow regime.

   Unclear if, how, or where this Study Request objective is being addressed.

Not listed as an objective in this study; section 6.5.4.3.1 (page 6-19) describes assessing access to rearing and spawning habitats via output from flow routing models. Also, objective 13 (shown below) in fish passage study (section 7.12); page 7-98):

13. Evaluate the potential creation of fish passage barriers within existing habitats (tributaries, sloughs, side channels, off-channel habitats) related to future flow conditions, water surface elevations, and sediment transport.

10. Measure critical habitat characteristics (e.g., channel type, flow, substrate, and groundwater) at reaches used for spawning and compare these characteristics with those in adjacent reaches that do not contain spawning adults.

    Do not see this study request objective addressed or any objective that looks at characterizing use, availability, or quality of potential spawning habitats. There appears to be no empirical baseline information being collected; only see determining distribution and potential abundance of redds. Also, see mention of evaluating potential dewatering or scouring of redds in Chapter 6, but no empirical baseline information to assess daily load-following operations.

River Productivity Study (USFWS Study Request: Enclosure 11)
Specific Study Request objectives versus objectives listed in proposed study 7.8:

1. Develop a white paper on the impacts of hydropower development and operations (including temperature and turbidity) on benthic macroinvertebrate and algal communities in cold climates.

   1. Synthesize existing literature on the impacts of hydropower development and operations (including temperature and turbidity) on benthic macroinvertebrate and algal communities;

   - Any difference in developing a white paper versus synthesizing existing literature?

2. Characterize the pre-project benthic macroinvertebrate and algal communities with regard to species composition and abundance in the lower, middle and upper Susitna River.

   2. Characterize the pre-Project benthic macroinvertebrate and algal communities with regard to species composition and abundance in the middle and upper Susitna River;

   - Omission of lower reach is an apparent typo.

3. Estimate drift of benthic macroinvertebrates in habitats within the lower, middle and upper Susitna River to assess food availability to juvenile and resident fishes.

   3. Estimate drift of benthic macroinvertebrates in selected habitats within the middle and upper Susitna River to assess food availability to juvenile and resident fishes;

   - Omission of lower reach is an apparent typo.

4. Conduct a trophic analysis to describe potential changes in the primary and secondary productivity of the riverine community following post-project construction and operation.

   5. Conduct a review on the feasibility of a trophic analysis to describe potential changes in the primary and secondary productivity of the riverine community following Project construction and operation;

   - Shouldn't this read: Conduct a trophic analysis, if feasible, to describe…? Also, why would it not be feasible? Explain.

5. Generate habitat suitability criteria (HSC) for Susitna River benthic macroinvertebrate and algal habitats to predict potential change in these habitats downstream of proposed dam site.

6. Generate habitat suitability criteria for Susitna benthic macroinvertebrate and algal habitats to predict potential change in these habitats downstream of proposed dam site;

6. Characterize the benthic macroinvertebrate compositions in the diets of representative fish species in relationship to their source (benthic or drift component).

7. Characterize the macroinvertebrate compositions in the diets of representative fish species in relationship to their source (benthic or drift component);

- I assume this should include term "benthic". If not, explain difference.

7. Evaluate the feasibility of reference sites on the Talkeetna and Chulitna Rivers to monitor baseline productivity, pre- and post-construction. (***deleted in PSP; and not addressed***)

AEA replaced this objective (with #4 below), but based on discussion at August 15, 2012, TWG meeting it was suggested to do both or keep the original Study Request objective. We recommend and support that suggestion.

4. Conduct a literature/data search to identify existing river systems that could act as surrogates in evaluating future changes to productivity in the Susitna River. (***added in PSP***)

8. Characterize organic matter resources (e.g., available for macroinvertebrate consumers) including course particulate organic matter, fine particulate organic matter, and suspended organic matter in the lower, middle, and upper Susitna River.

8. Characterize organic matter resources (e.g., available for macroinvertebrate consumers) including course particulate organic matter, fine particulate organic matter, and suspended organic matter in the lower, middle, and upper Susitna River.

9. Estimate benthic macroinvertebrate colonization rates in the middle and lower reaches to monitor baseline conditions and evaluate future changes to productivity in the Susitna River.

9. Estimate benthic macroinvertebrate colonization rates in the middle and lower reaches to monitor baseline conditions and evaluate future changes to productivity in the Susitna River.

Note: Page 7-12 of PSP states that marine derived nutrients are included in River Productivity Study, but there is no mention of it in Chapter 7; i.e., is not addressed.

Adult and juvenile non-salmon anadromous, resident and invasive fish studies in the Susitna River basin (RM 0 - RM 233)(USFWS Study Request; Enclosure 14)

General objectives for this study request are to:

COMMUNITIES AND ASSEMBLAGES

- Characterize the seasonal (spring, summer, fall, winter) distribution, relative abundance, and habitat utilization in the Susitna River mainstem (RM 0-RM 233) for all life stages of non-salmon anadromous, resident, and invasive fish species. [Documenting both hierarchal nested habitat type and use-type as described in the resource agency Instream Flow Study and Habitat Utilization Study Request].

  Recommendation for hierarchical nested habitat type and use-type not addressed in PSP.
- Characterize the seasonal (spring, summer, fall and winter) movement patterns of all subject fish species and life stages as they relate to foraging, spawning, rearing and overwintering habitats. The characterization of seasonal movements includes run timing (immigration and emigration) and extent (periodicity) of non-salmon anadromous species in the Susitna River (RM 0-RM 233) and movement into and out of tributary streams. [Interface with resource agency Instream Flow and Habitat Utilization Study Request hierarchal nested habitat types and habitat mapping].

  Interface with resource agency Instream Flow and Habitat Utilization Study Request hierarchal nested habitat types and habitat mapping does not appear to be addressed.

- Characterize the flow-related or synchronized life history strategies (migration, movement, spawning, rearing, hatching, emergence) of non-salmon anadromous, resident and invasive species, and their biological behavorial response (e.g., potential for false attraction, delayed migration or increased holding time, synchrony of spawning, relative hatching and emergence timing) to Project-affected flow alterations (flow, temperature, habitat, water quality).

  Similar to juvenile anadromous salmonid comments above, much of this Study Request objective does not appear to be addressed in the PSP, particularly for movement, rearing, hatching, emergence and juvenile fish (<60 mm) in winter.

RESOURCE DATA SYNTHESIS

- Synthesize existing resource data, results and information from 1980's Susitna Hydroelectric studies, and other relevant literature to determine applicability and utility of results and information to the currently proposed project.

  What is timeframe for completing? Not addressed in PSP

GENETICS

- Collect tissue samples from all resident and non-salmon anadromous fish species for genetic population structure database and future stock identification analysis. This is particularly important for salmon species, anadromous lamprey, and Bering cisco of the Susitna River drainage.

TROPHIC ECOLOGY

- Characterize trophic interactions using seasonal diets (stomach content analysis) of all age classes of non-salmon anadromous, resident and invasive fish species. [Interface with the productivity study, riparian, and instream flow study requests]

- Quantify the relative contribution (biomass) of marine-derived nutrients to the ecology of the Susitna River from adult returns of non-salmon anadromous fish species (e. g., Pacific and Arctic lamprey, eulachon, Bering cisco).

Page 7-12 of PSP states that marine derived nutrients are included in River Productivity Study, but there is no mention of it in Chapter 7; i.e., is not addressed.

From: Bob_Henszey@fws.gov [mailto:Bob_Henszey@fws.gov]
Sent: Tuesday, September 11, 2012 12:26 PM
To: 'Kevin Fetherston'; Betsy McGregor
Cc: Catherine_Berg@fws.gov; Ann_Rappoport@fws.gov; Betsy_McCracken@fws.gov; Jennifer_Spegon@fws.gov; Lori_Verbrugge@fws.gov; Michael_Buntjer@fws.gov; chiska.derr@noaa.gov; Klein, Joseph P (DFG); 'Matthew LaCroix'; 'Michael R. Lilly, GW Scientific'; eric Rothwell; susan walker; 'William Rice'; matt.cutlip@ferc.gov; dreiser@r2usa.com
Subject: PSP 6.6 Riparian Instream Flow Study Plan - Interim Comments

Kevin,

The following are some of the key differences the USFWS sees between our study plan request (USFWS 10.1, Instream Flows for Floodplain and Riparian Vegetation Study) and AEA's proposed study plan (PSP 6.6, Riparian Instream Flow Study). The differences and comments listed below are likely not inclusive, since we have not had a chance to fully evaluate the PSP.

Many of the PSPs rely upon or provide data from/for other studies. Recognizing these relationships is an important part of the Integrated Licensing Process (ILP); however, the study providing the data should describe the methodology and oversee the data collection and analyses, while the study requiring the results should restrict its discussion to the types of data/results required from other PSPs. Repeating the methods in a study not responsible for the data collection and analyses is unnecessary and risks confusion if the methods differ or are inadequate in one of the studies. Since the Riparian Instream Flow PSP will rely upon data from the Groundwater PSP, the Riparian Instream Flow PSP should describe only the results required from the Groundwater PSP, and then describe how those results will be used in the Riparian Instream Flow PSP (e.g., 5.7 Groundwater PSP should be the only PSP that describes the groundwater methods). This applies to other PSPs, such as the habitat mapping studies that may be providing data for this PSP.

Study Goals and Objectives: The USFWS requested a specific goal that included quantifying the frequency, timing and duration of surface-water and groundwater levels required to establish, maintain, and promote floodplain and riparian plant communities. Two ancillary goals were also requested to quantify the frequency and rate of sediment deposition required to promote soil development, and to quantify the effect of river ice on the establishment and persistence of riparian plant communities. Section 6.6.1.1 of the PSP has no stated goal, and only a general approach is provided. An "overarching goal" is provided in the Section 6.6.4 Study Methods, but this goal is also very general. While goals can be very general in nature, the specifics in our goal set the stage for a rigorous study plan to evaluate potential project-related effects on floodplain plant communities.

The USFWS requested six objectives to help meet our goal. Three of the PSP objectives are similar to our requests {1) Synthesize 1980s data, 2) Study sites, and 6) Seed dispersal}, but they lack the additional specifics stated in our requested objectives. Two of the PSP objectives appear to be wholly or at least partially the objectives for other PSPs and not appropriate as stated {3) Map riparian vegetation, and 10) Impacts to shallow groundwater well users}. What the PSP objectives lack, however, are our specific requests for river ice, sediment deposition, and water-level regime (USFWS Objectives 4, 5, and 6). These missing objectives may be studied under AEA's PSP objectives, but the USFWS prefers they be considered as standalone objectives, and possibly integrated into a single modeling objective after they have been studied individually. The USFWS is particularly interested in our Objective 6 to characterize the water-level regime required to maintain floodplain and riparian plant communities. Much of the discussion so far has focused on floodplain plant succession, but little or no discussion so far has involved maintenance flows. Succession is important, but without maintenance flows whole floodplain plant communities may collapse or the direction of succession changed to an unnatural target (e.g., non-floodplain plant communities).

Study Area: The USFWS agrees with the PSP study area and four river segments, with the following additional comments. The width of the active valley should also include the distance from the River that the River influences groundwater, as well as define the return interval for both groundwater and flooding (e.g., 100-year event under current or climate-change induced conditions). Much discussion has centered on the downstream

influence of the Project. The PSP study area Lower Reach would extend to RM 0. Will this lower extent remain even if all agree that the Project influence on surface- and ground-water becomes indistinguishable from normal environmental variation?

Study Methods: The methods need to follow the order of the objectives and use section headings that refer to the intent of the objectives. Few methods are referenced, and some references that are cited are not included in the literature cited. The relationship with other PSPs often seems confusing. It would be more helpful to state what results will be required from PSP "x" to evaluate a Riparian ISF objective, and potentially what results from a Riparian ISF objective will be required by PSP "y." It is not necessary to repeat coordination for every objective, only state the inputs required and the outputs provided by an objective. This applies across PSPs and among a PSP's objectives. The following comments on methods follow the order of the Objectives requested by the USFWS:

RIFS-1 Synthesize Historical Data: In addition to other North American hydro-projects, this review should also include a review of relatively undisturbed riverine systems.

RIFS-2 Select and Design Study Sites: The number of study sites should provide sufficient replication to address the needs of the objectives, and should include sites where Project operation is expected to cause early channel bed degradation or aggradation. The casual reference to pseudoreplication in one of the other objectives needs to be addressed at the study-site level. Study sites are typically the experimental unit where replication is used for true statistical analysis. All other sampling (e.g., within the study site) is really subsampling used to obtain a better average value for that one replicate. As envisioned by many of the PSPs, the "representative" study sites are really only one replicate for each process-domain. For more on pseudoreplication see:

Hurlbert, Stuart H. 1984. Pseudoreplication and the Design of Ecological Field Experiments. Ecological Monographs 54:187–211. http://dx.doi.org/10.2307/1942661

RISF-3 Characterize Seed Dispersal and Frequency of Establishment: Not sure where this objective is addressed in the PSP. It appears to be scattered across several sections in the methods. If the methods have been described by other similar projects, then cite their methods if appropriate and include enough details to help others understand the methods that will be used. How will the Susitna River bimodal peak flows be addressed? On a float trip down the Susitna 27-29 July 2012, there were newly emerging dicot seedlings on the sandbars. How will the fate of these "second peak" seedlings be addressed? How will the role of precipitation in maintaining favorable soil moisture conditions be evaluated? Will soil texture be considered? If so, how will the soil profile be described?

In Section 6.6.4.3.1.4: Is "abundance" density or some other metric? What is "elevation" referenced to: ASL, an arbitrary datum, or some elevation that can be linked to the local river or groundwater stage (keep in mind the river drops downstream, so that must be accounted for also)? Is there a citation for others using 2-meter square plots? What is the shape of these plots? A square plot may not be appropriate for a narrow band of seedlings along a specific elevation in the gradient above the river. MODFLOW is a groundwater model, and many not be sensitive enough to quantify hydroperiod relationships for seedlings. What other metrics will be used to quantify/separate surface water, groundwater, soil moisture, precipitation, and other potential hydrological process that support seedling establishment and recruitment?

How will the results from this objective be used to predict potential Project-related changes in seedling establishment and recruitment into the population?

RISF-4 Characterize the Role of Ice in the Establishment, Survival and Recruitment of Riparian Species: The discussion on ice processes (Section 6.6.4.4.1) seems unfocused, and essentially provides no discernible methods: "Final details of the geomorphology and ice processes modeling ... will be developed as the 2012 studies are obtained." The goal of this study should be to characterize the role of river ice in the establishment (colonization), survival (first 3 years) and recruitment into the future reproductive population of dominant riparian species (e.g., balsam poplar, willows). Have others investigated the role of ice on riparian plant communities?

If so, can their methods be used here? How will the magnitude, frequency, and longitudinal distribution of ice events affecting dominant riparian species/communities be evaluated?

RISF-5 Characterize the Role of Sediment Deposition in the Formation of Soils: The proposed soil sampling techniques are included in Section 6.6.4.3.1.5, but based on these techniques it is unclear how the USFWS requested objective to characterize the role of sediment deposition in the formation of floodplain and riparian soils, and how sediment deposition affects the rate and trajectory of plant community succession. This objective should investigate the rate of deposition, depth of sediment, and soil profile development required for natural floodplain plant community succession, and then use the predicted sediment deposition characteristic from the Fluvial Geomorphology Study to predict the effects of Project operation on floodplain plant communities. Sampling to only a depth of 50 cm, and describing cumulative thickness of all organic horizons and loess (windblown material?) without stratigraphy will likely be insufficient to meet this objective. Soil texture by feel should follow standard techniques (e.g., Thien 1979, http://soils.usda.gov/education/resources/lessons/texture/).

RISF-6 Characterize Water-Level Regime Required to Maintain Floodplain and Riparian Plant Communities: This is a critical objective that has not been sufficiently discussed in past workgroup meetings, possibly due to lack of time, and the PSP methods are insufficient to evaluate if the USFWS requested objective will be met. Suggest this objective be discussed near the beginning of future meetings to allow sufficient time for discussion.

Objective 6 combines hydrologic information from the groundwater study (PSP 5.7) and the plant community information from this study (PSP 6.6) and possibly the habitat mapping studies (PSPs 9.6 and 9.7) to produce plant species/community response curves. The USFWS's Objectives RISF-3 to RISF-5 target critical stages in plant community succession, while RISF-6 targets critical instream flows required for maintaining plant communities as succession progresses (i.e., both succession and maintenance are important).

The methods for groundwater belong in the Groundwater PSP, and not in this PSP for reasons discussed above. This PSP should request the required hydrologic information from PSP 5.7 and begin the discussion from that point. The following comments, however, include the pertinent groundwater methods that should be discussed in PSP 5.7.

Section 6.6.4.5 (Groundwater): The suggested four to six intensive study reaches instrumented with groundwater and surface-water recording instruments may be insufficient to address this objective if plant response will be described by process-domains (see pseudoreplication discussion above). However, hydrology is likely the most dominant physical factor required for maintaining floodplain plant communities across the various process-domains, and baring some other dominant physical factor (e.g., soil parent material, weather, etc.) it may be possible to use data from the individual intensive study-site transects to build response curves (see Henszey et al. 2004 {ne.water.usgs.gov/platte/reports/wetlands_24-3.pdf}, Figure 7 for an indication of the number of data points required to build a response curve).

One-and-a-half growing seasons (July 2013 to September 2014) will likely provide insufficient groundwater hydrology data to fit individual species response curves (especially for annual species), and may not be enough data to reasonably predict groundwater relationships with river stage and to verify the model predictions with independent data. Precipitation may also dramatically affect transient but critical groundwater levels (a few days to a week or more of elevated water levels), which would be difficult to evaluate with limited data. How will these potential problems be addressed?

What are the "project accuracy standards used for water-level measurements" for horizontal, vertical and temporal measurements?

In addition to the Work Products described in Section 6.6.4.5.2, the products should provide water-level summary statistics for each location (e.g., point, plot, or transect) that will be used to test and fit plant response curves, such as growing season cumulative frequency, 7-day moving average, 10-day moving average, 14-day moving average, and arithmetic mean (see Henszey et al. 2004 {ne.water.usgs.gov/platte/reports/wetlands_24-3.pdf}, Table 1).

Section 6.6.4.7 (Succession Models and Flow Response Guilds) appears to potentially address the USFWS's Objective 6 request; however, two critical referenced papers (Merritt et al. 2010 and Pearlstine et al. 1985) were not included in the Literature Cited. These references were not provided until 8/28/2012, and the USFWS has had insufficient time to review these papers in detail. The concept of the PSP response guilds is similar to the USFWS's request to develop plant community response curves, but the PSP methods are insufficient to evaluate if our requested Objective 6 will be met. The USFWS requested evaluating specific water-level summary statistics (see above discussion for groundwater) with a rigorous curve-fitting technique similar to Henszey et al. (2004). The methods should provide sufficient detail to show how quantifiable (not qualitative) hydrologic (surface-water and groundwater) gradients will be constructed to show the optimum and range of favorable water levels required for maintaining floodplain species/communities.

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From: Eric Rothwell [mailto:eric.rothwell@noaa.gov]
Sent: Wednesday, September 12, 2012 5:37 PM
To: dreiser@r2usa.com
Cc: PHilgert@r2usa.com; Laura Arendall; Betsy McGregor; susan walker; Berg, Catherine; Betsy McCracken (FWS); Michael_Buntjer@fws.gov
Subject: Re: Meeting on the 12th

Dudley,

Thank you for coming over and meeting today. Also, thank you for providing the meeting presentation before hand, having it to review helped facilitate the discussion. The aerial imagery with the proposed study reaches was also helpful in our conversation, when they are available I would like a copy.

I typed up some of my comments from today, starting with general comments, twg meeting protocol comments, and then specific comments on the site selection process. I cc'd other agency personnel that will likely attend the meeting Friday, hoping that it will provide some useful discussion points and I look forward to continuing the discussion September 26-28th. Betsy, Sue, etc. the attached presentation that Dudley provided is draft and parts will likely change prior to Friday's meeting.

General comments about all of the PSPs:

- What can be determined from each of the study components, a description of deliverables (not results) this will help us understand if our requests have been met.
- How will uncertainty be determined for each of the study components? (ice processes -> hydraulic flow routing -> winter fish and habitat effects)
- How will incomplete study components, data, or results be dealt with - situations where an extension of the study period is necessary.

General comments about TWG meetings, as Friday will start to define what TWG will look like:

- An agenda should be provided with enough time to review and submit changes
- All meeting materials provided with enough time for review prior to the meeting, including presentations
- Relevant background material that will aid the discussion will be provided
- Meeting summary and minutes within two weeks of the meeting, distributed to all attendees as a draft. Then a two week period to submit additions and/or corrections
- And - attendees (agency personnel included) will be prepared by reviewing all the materials prior to meeting.

Comments specific to the study site selection process

The proposed methods for site selection are first to select sites in a hierarchical framework (segment by hydrology, then geomorphology, then habitat units). Sites selected will include all the riverine habitat types that are defined (relevant to that reach, for example MR2 may not have any upland sloughs).

The site selection will be informed by selecting sites that are 'critical', meaning that they are likely to be highly affected/sensitive to flow changes and highly important biologically. Generally I agree with prioritizing sites that will by hydraulically affected and are biologically important, but we have incomplete biologic information The data from the 1980s provides some useful information about utilization of off-channel habitats that should inform our studies but the information is limited in that it does not fully capture mainstem utilization or overwintering. So, with new fish utilization and distribution information site selection should include some flexibility to include sites where life histories are not assessed under the currently proposed sites. This seems to be suggested in

the site selection process schedule if it includes fish distribution/habitat utilization information, November 2013 evaluate summer 2013 data and modify/add sites as needed in collaboration with TWG

The schedule provided includes refinement of selected sites by the use of mapping results to evaluate habitat variability, conduct statistical power analysis, refine intensive sites and identify supplementary sites. If possible an addendum to the PSP or definitely in the RSP a description of the initial site selection (by the hierarchical framework) and refinement (by habitat mapping results and fish studies) methods should be presented, not just the selected sites. This depends on the fish studies being sufficient to describe the full distribution of fish and their habitat use.

Incorporation of multiple study elements, such as ice processes, groundwater, geomorphology, and water quality. This is especially important in habitats where one of the other study elements is driving habitat use by fish, for example if upwelling and water temperature is a determining factor for site selecting for Chinook to overwinter then the study site should include this habitat and integrate the WQ and GW studies to understand distribution of thermal refugia for overwintering and how the project would affect those processes/characteristics.

The slides presenting the 1980s electrofishing and sampling was informative, but again shows an incomplete understanding of habitat utilization. The 1980s sampling focused on the off-channel habitats (side sloughs/channel, upland sloughs, and confluences with tributaries). This information should be used to inform selections but must also be put into context that we really don't know very much about mainstem utilization and overwintering, and so need to be flexible (potential with extended study years) when a better understanding is gained through the 2013 and 2014 fish studies.

The slides on each of the species, I had a general comment that they should be put into perspective. That the 1980s data does not represent a complete understanding so comments like no mainstem spawning should be qualified. There likely is a riverine component to sockeye (and other species) that do spawn in the river but that just wasn't captured in the 1980s due to the methodologies available. We do not currently know the full spawning distribution.

Representative reaches, extrapolation of results, and replication. We touched on this and I look forward to talking about this more. I did not review Aaserude et al. 1985 prior to our meeting but plan on reading it prior to the Sept. 26-28 meetings.

Although not discussed, I have a concern with winter flow routing and ice processes, and how they will inform site selection. Site selection for analyzing winter instream flow effects to fish and their habitat will depend on an understanding of operational effects downstream (to flow timing and quantity, hydraulics, and water quality). Also the extension of the studies downstream will depend on these results. The winter hydraulic flow routing model will rely on ice process modeling to determine the downstream extent and magnitude of operational flow effects. The ice process modeling will need several years of data, in addition to the ice thickness measurements and discharge measurements at each of the cross-sections for the winter routing model. I see a lack of time to collect data for the models (winter flow routing and ice process) calibrate the models and then selection sites and methods to conduct ISF studies to assess project effects on fish during winter operations under the currently proposed study period.

This was a very targeted meeting to discuss site selection, I look forward to discussing this and other parts of the ISF and other study plans in the near future. After Friday's meeting I hope to see the selection methods written up with consideration of the agency comments (including the proposed methods for extrapolation), this should help us continue the discussion.

Best Regards,
Eric

From: Klein, Joseph P (DFG) [mailto:joe.klein@alaska.gov]
Sent: Tuesday, September 18, 2012 10:18 AM
To: dreiser@r2usa.com
Cc: Benkert, Ronald C (DFG); 'Mike Buntjer'; Betsy_McCracken@fws.gov; eric Rothwell; 'Michael R. Lilly, GW Scientific'; 'Kevin Fetherston'; PHilgert@r2usa.com; 'MaryLou Keefe'; matt.cutlip@ferc.gov; Catherine_Berg@fws.gov; Haught, Stormy B (DFG); Bob Henszey Ph. D. (Bob_Henszey@fws.gov); Betsy McGregor
Subject: Follow up notes on Sept 14 Meeting

Dudley & Company-

I found the Instream Flow Technical Working Group meeting last Friday very helpful. I am concerned, however, that at the pace we are going we are going to run out of time before we have the opportunity to thoroughly discuss key elements (e.g. target species, HSC development, methods per habitat types, transect selection criteria and number, desired outputs). I am grateful for the time extension granted by FERC and encourage you and your staff to take advantage of this opportunity to put forth a concerted effort to hold more meetings (either in person or via teleconference) and address the study topics mentioned.

Site selection is a key component and a good starting point. The upcoming field visit at the end of the month will greatly enhance these discussions and understandings and perhaps during this time some of the topics mentioned can also be discussed.

Following are comments on the meeting last Friday:

- Please include a definition list for each study plan of key terms. We are not overly concerned about consistency between groups since different specialties often have their own terminology, however a list would help understand these differences/similarities.
- After reading my notes, details about the sampling approaches discussed are not clear to me. For example, how many intensive sites are planned? I believe the fish studies mentioned the previous day that they were looking at 8-10 sites – would these be the same? For both instream flow and riparian studies? What is the sampling approach for other habitats in addition to identified critical sites?
- We support and agree with the approach proposed for using 2-D modeling for sampling the intensive sites.
- Likewise, we support and agree with the approach proposed for assessing surface water/ground water interactions.

Regards,

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From: Dudley Reiser [mailto:dreiser@r2usa.com]
Sent: Tuesday, September 18, 2012 4:32 PM
To: 'Klein, Joseph P (DFG)'
Cc: 'Benkert, Ronald C (DFG)'; 'Mike Buntjer'; Betsy_McCracken@fws.gov; 'eric Rothwell'; 'Michael R. Lilly, GW Scientific'; 'Kevin Fetherston'; PHilgert@r2usa.com; 'MaryLou Keefe'; matt.cutlip@ferc.gov; Catherine_Berg@fws.gov; 'Haught, Stormy B (DFG)'; 'Bob Henszey Ph. D.'; 'McGregor, Elizabeth A (AIDEA)'; 'Laura Arendall'; 'Fullerton, Bill'
Subject: RE: Follow up notes on Sept 14 Meeting

Hi Joe – thanks for the positive feedback on the September 14th meeting and for your comments and suggestions related to certain key study elements. They are most helpful. I want you to know that although we share your concern about scheduling, we are confident that within the next few months we will be able to address, or at least discuss and agree on the process, criteria, and schedule for addressing the majority of the key instream flow related issues including those you mentioned below. As you have suggested, we are planning on introducing and discussing several of the elements (target species and HSC development) during the upcoming TWG meeting on September 26th, but I am sure there will be a need for additional meetings before those and other elements are fully discussed. In fact, one of the topics we want to discuss during the September 26th meeting is the future scheduling of other TWG meetings (some to occur via teleconference) so that everyone is aware of when these will occur.

As for your specific comments, I have provided my preliminary responses to those at the end of each comment.

Thanks again for your comments and we will plan on seeing you next week.

Best regards,

Dudley

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Cell - 425-681-6048

From: Klein, Joseph P (DFG) [mailto:joe.klein@alaska.gov]
Sent: Tuesday, September 18, 2012 11:18 AM
To: dreiser@r2usa.com
Cc: Benkert, Ronald C (DFG); 'Mike Buntjer'; Betsy_McCracken@fws.gov; eric Rothwell; 'Michael R. Lilly, GW Scientific'; 'Kevin Fetherston'; PHilgert@r2usa.com; 'MaryLou Keefe'; matt.cutlip@ferc.gov; Catherine_Berg@fws.gov; Haught, Stormy B (DFG); Bob Henszey Ph. D. (Bob_Henszey@fws.gov); McGregor, Elizabeth A (AIDEA)
Subject: Follow up notes on Sept 14 Meeting

Dudley & Company-

I found the Instream Flow Technical Working Group meeting last Friday very helpful. I am concerned, however, that at the pace we are going we are going to run out of time before we have the opportunity to thoroughly discuss key elements (e.g. target species, HSC development, methods per habitat types, transect selection criteria and number, desired outputs). I am grateful for the time extension granted by FERC and encourage you and your staff to take advantage of this opportunity to put forth a concerted effort to hold more meetings (either in person or via teleconference) and address the study topics mentioned.

Site selection is a key component and a good starting point. The upcoming field visit at the end of the month will greatly enhance these discussions and understandings and perhaps during this time some of the topics mentioned can also be discussed.

Following are comments on the meeting last Friday: **My responses immediately follow**.

- Please include a definition list for each study plan of key terms. We are not overly concerned about consistency between groups since different specialties often have their own terminology, however a list would help understand these differences/similarities. **Good suggestion and this will be provided in each RSP.**
- After reading my notes, details about the sampling approaches discussed are not clear to me. For example, how many intensive sites are planned? I believe the fish studies mentioned the previous day that they were looking at 8-10 sites – would these be the same? For both instream flow and riparian studies? What is the sampling approach for other habitats in addition to identified critical sites? **We will review the site selection process at the beginning of the September 26th meeting.**

- We support and agree with the approach proposed for using 2-D modeling for sampling the intensive sites. **2-D modeling will be more thoroughly discussed during the September 26th meeting along with other methods and models. We subsequently envision having a more focused discussion on model selection during the TWG meetings scheduled for the week of October 22. While we consider 2-D modeling to be one of several models that may be used, it will not be the only method/model we apply to the Focused Areas.**

- Likewise, we support and agree with the approach proposed for assessing surface water/ground water interactions. **I am sure there will be some refinements to that approach based on the questions needing to be addressed at the different sites and as well, logistical considerations.**

Regards,

Joe Klein, P.E.
Supervisor Aquatic Resources Unit
Alaska Department of Fish and Game
333 Raspberry Rd
Anchorage, AK 99518
(907) 267-2148
joe.klein@alaska.gov

APPENDIX 4
INFORMAL CONSULTATION DOCUMENTATION

SECTION 9 – FISH AND AQUATIC RESOURCES

From: Klein, Joseph P (DFG) [mailto:joe.klein@alaska.gov]
Sent: Thursday, August 23, 2012 2:48 PM
To: Betsy McGregor
Cc: Benkert, Ronald C (DFG); Burch, Mark E (DFG); Erickson, Jack W (DFG); Fair, Lowell F (DFG); Fink, Mark J (DFG); Giefer, Joe (DFG); Haught, Stormy B (DFG); Holen, Davin L (DFG); King, Kimberly N (DFG); Miller, Monte D (DFG); Michael_Buntjer@fws.gov; Betsy_McCracken@fws.gov; eric Rothwell; Hill, Melissa E (DNR); Schwarz, Terence C (DNR); Sager, Kimberly R (DNR); Ashton, William S (DEC)
Subject: RE: Follow up Meeting Notes-additional comments

Following are additional comments

Baseline Water Quality
5.5.4.3.2 **In-Situ Water Quality Sampling** The sampling protocol currently calls for monthly in-situ water quality monitoring for the 4 summer months. It should be revised to include continuous (hourly or so) water quality measurements for basic parameters (pH, DO, conductivity, turbidity), year-round if possible using in-situ semi-permanent sensors (e.g. sondes). The technology is readily available and would provide very useful baseline information to assess any post project impacts.

River Productivity
7.8.4.4 **Conduct a literature/data search to identify existing river systems that could act as surrogates in evaluating future changes to productivity in the Susitna River.** We recommend supplementing or substituting this section using a reference reach in a similar Alaska river using a BACI design monitoring program in order to assess post project impacts.

From: Klein, Joseph P (DFG)
Sent: Thursday, August 23, 2012 10:42 AM
To: McGregor, Elizabeth A (AIDEA)
Cc: Benkert, Ronald C (DFG); Burch, Mark E (DFG); Erickson, Jack W (DFG); Fair, Lowell F (DFG); Fink, Mark J (DFG); Giefer, Joe (DFG); Haught, Stormy B (DFG); Holen, Davin L (DFG); King, Kimberly N (DFG); Miller, Monte D (DFG); Michael_Buntjer@fws.gov; Betsy_McCracken@fws.gov; Eric Rothwell (Eric.Rothwell@noaa.gov); Hill, Melissa E (DNR); Schwarz, Terence C (DNR); Sager, Kimberly R (DNR); Ashton, William S (DEC)
Subject: Follow up Meeting Notes

Betsy-

Thank you for the opportunity to discuss the proposed study plans for the Susitna-Watana Hydroelectric project. We look to further discussions to continue to clarify study plan details.

To assist in you and your consultants in this process, below are brief notes by ADF&G staff. We may have additional comments/or clarifications. Please feel free to contact me if you have any questions.

Regards, Joe

Fish Distribution and abundance in Upper, Middle and Lower Susitna River

- Trot lines should considered during the winter to target appropriate fish species.
- Minnow trapping under ice should be used during the winter, in all habitat types.
- Should evaluate the feasibility of under ice videography.

Salmon Escapement

- Identify locations of adult fish weir locations described on tributary streams (7.7.4.1.5, page 7-39). Consider placement of adult fish weir upstream of the proposed dam on prominent Chinook salmon streams.

Instream Flow

- What is the sampling strategy (e.g. representative reach, mesohabitat typing) for the defined habitat types?
- How many and at what range will discharge-calibration sets be collected for each sampling method?
- Will 2D modeling include side channels and sloughs within study area?
    - Based on comments at the meeting it was my understanding it would.
- What criteria will be used to identify cover types and substrate sizes?
- For PHABSIM, will transects be independent, dependent or a combination and accordingly, what WSE models and composite suitability index will be used?
- What criteria will be used to select and weight transect-derived models?
- Per the description of study sites for fish passage/off-channel connectivity (§6.5.4.5.5), what criteria will be used to identify "a representative number" of different habitat types?
- HSI data is needed for identified target species for each defined habitat type, over 2 years.
- How will the data be aggregated to evaluate single flow recommendation?
- Will a DSS-type program be available to review study results and if so, information is needed on it.
- How do you envision the "collaborative process" will work? When will major decisions be made (e.g. site and transect selections) and how often do you envision the work group will get together?
- What equipment will be used and how will they be calibrated?
- For the eulachon and boating studies, similar information is needed on what is the study area, what sampling strategy will be used, how many and what range of calibration-discharge sets if appropriate, and how will HSI curves will be developed?
- Varial zone modeling, may need more defined time steps during analysis phase (possibly down to 15-minute increments) depending on the rate of flow change over time.

Groundwater

- What are the monitoring well placement sampling approach (e.g. equal spacing along linear transects, etc.) and location (e.g. for instream flow, in all habitat types?) for the various resource studies (i.e. instream flow, riparian instream flow, water quality). Also, a description of sampling intensity would be helpful (i.e. for instream flow purposes, will the objective be to characterize entire gw/sw interaction throughout entire intensive study site or only at select microhabitats).

- What is the duration for monitoring (I believe at the meeting it would be from installation until winter 2013-14?)

- How often will monitoring wells be calibrated for various parameters to be sampled pre- post- and during field monitoring?

- For each resource discipline, what parameters will be sampled and what are range of accuracies (e.g. for water level +/- 0.1 ft?, water temp +/- 0.2 C?, etc.).

Water Quality

- Information on availability of the Sampling and Analysis Plan and Quality Assurance Project Plan is needed.
- GW Quality in Selected Habitats (Section 5.5.4.7) - need more information on study. For example, sampling intensity/number of site measurements per slough or criteria for how they will be determined. Will ground water level monitors be installed if so, what is the sampling intensity (numbers per habitat type) and duration of monitoring (e.g. continuous year-round/ point samples during field visits, etc.). If not, it is strongly recommended groundwater monitoring be performed concurrently with water quality monitoring in this study.

- Any monitors should be calibrated pre- and post-monitoring along with multiple field measurements for post monitoring calibration.

THE STATE of ALASKA
GOVERNOR SEAN PARNELL

Department of Fish and Game

DIVISION OF SPORT FISH
Research and Technical Services

333 Raspberry Road
Anchorage, Alaska 99518-1599
Main: 907.267.2148
Fax: 907.267.2422

August 31, 2012

Wayne Dyok, Project Manager
Alaska Energy Authority
Susitna-Watana Hydroelectric Project
813 W. Northern Lights Blvd
Anchorage, AK 99503

Subject: Comments on the Watana Transportation Access Analysis Draft Report for the Susitna-Watana Hydroelectric Project, FERC No. 14241

Dear Mr. Dyok:

Alaska Department of Fish and Game (ADF&G) has reviewed the "Watana Transportation Access Analysis" draft report prepared by the Alaska Department of Transportation and Public Facilities for the Susitna-Watana Hydroelectric Project (FERC No. 14241). We offer the following comments from the Divisions of Habitat, Wildlife Conservation, and Subsistence per the Alaska Energy Authority's request for comments.

I. DIVISION OF HABITAT

Access Alternatives

The North Route (Seattle Creek) is ADF&G Division of Habitat's preferred alternative. The North Route would minimize impacts to anadromous systems resulting from construction of transportation infrastructure. West and South Routes would each necessitate several anadromous stream crossings.

Stream Crossings

Fish presence and distribution information is scarce for at least some portion of each proposed access corridor, particularly in regards to resident species. Fish surveys at proposed crossing locations should be conducted. Surveys should consist of electrofishing a distance equal to 40 wetted stream widths in the vicinity of the crossing, with a minimum survey length of 50 meters. If initial surveys do not detect fish presence at specific crossings, at least one additional fish survey should be conducted during a different season to verify that the stream is non-fish bearing. Fish

Habitat Permits will be required from ADF&G Division of Habitat for all stream crossings and Fish Resource Permits will be required from ADF&G Division of Sport Fish for all fish surveys. ADF&G Division of Habitat will make the final determination regarding fish presence if surveys fail to detect fish.

Bridges and culverts utilizing the Streambed Simulation Design Method (NMFS 2011) are recommended for stream crossings. Culverts width should be at least 1.2 times the bankfull channel width of the stream, should have a slope that approximates the average slope of the adjacent stream from approximately ten channel widths upstream and downstream, and should not exceed 6% slope where closed bottom culverts are used. Culverts should be embedded not less than 30% and not more than 50% of culvert height, and fill material should be of similar size composition as adjacent natural streambed material.

NMFS (National Marine Fisheries Service). 2011. Anadromous Salmonid Passage Facility Design. Chapter 7: Culverts and other road crossings. NMFS, Northwest Region, Portland, Oregon.

Improvements to Existing Infrastructure

If a northern route is chosen, replacement or improvement of existing stream crossings along the Denali Highway will be a necessary component of upgrading the highway to accommodate project traffic. A comprehensive survey of Denali Highway stream crossings will be required. Culverts found to be undersized, perched, damaged or otherwise inadequate for fish passage should be repaired or replaced with bridges or culverts designed for fish passage. The Access Study indicates six replacement culverts along the Denali Highway (Table 5-1, page 96). ADF&G Fish Passage Inventory records indicate at least 12 Denali Highway stream crossings between Cantwell and Seattle creek which are currently in conditions unsuitable for fish passage (Table 1).

Table 1.–Denali Highway stream crossings between Cantwell and Seattle Creek unsuitable for fish passage.

Stream	Lat	Long
Unnamed stream	63.38771	-148.88483
Jack River	63.38032	-148.86179
Fish Creek tributary	63.37249	-148.82681
Unnamed pond connection	63.37203	-148.82124
Unnamed Nenana River tributary	63.39041	-148.60771
Unnamed Nenana River tributary	63.38967	-148.56854
Edmonds Creek	63.39304	-148.52495
Unnamed Nenana River tributary	63.38359	-148.43508
Unnamed Nenana River tributary	63.38046	-148.40971
Unnamed Nenana River tributary	63.3744	-148.37766
West Fork Lily Creek	63.33508	-148.2782
East Fork Lily Creek	63.33375	-148.27148

II. DIVISION OF WILDLIFE AND CONSERVATION

The Seattle Creek (North) alternative may have a greater effect on moose, caribou, and ptarmigan (willow, rock and potentially white-tailed) due to increases in hunter access. Increasing access will likely result in increased harvest pressure in Game Management Unit (GMU) 13E. While new access routes may help disperse hunters, conflict among hunters accessing new areas may occur initially. Portions of the area are currently accessible by all-terrain vehicles (ATV) coming off the Denali Highway, but the new road would mean additional highway vehicle access and would also provide new starting points for ATV's. Increases in harvest can be managed through the Board of Game regulatory process by changing seasons, bag limits, methods and means. Social issues due to competition for hunting areas and/or access routes can also be managed to some extent, but solutions can be more elusive and often demand more creative approaches.

Current and planned telemetry studies are expected to inform the assessment of the effects on moose, caribou and ptarmigan. Based on existing information, the Seattle Creek (North) alternative may result in increased vehicular collisions when caribou move through the area seasonally. The full extent to which caribou and moose utilize each of the proposed access routes will remain speculative until ongoing research has been completed. The willow ptarmigan study is inquiring into the extent to which the area between the impoundment and Denali Highway serves as refugia for the greater GMU 13 ptarmigan population. To the extent that ptarmigan have been moving from the affected area to resupply adjacent currently accessible hunting areas, loss of that area as refugia could stress the ptarmigan population throughout the unit.

With any new access road into GMU 13E, additional trapping pressure could result which could lead to increased harvests of certain furbearers. Again, should conservation concerns arise, harvest can be managed through the Board of Game regulatory process.

III. DIVISION OF SUBSISTENCE

The three alternatives allow for differing levels of access. The two southern routes, the Gold Creek and Chulitna Route, would provide road access to open up areas for a diversity of harvesting opportunities for residents of Southcentral Alaska where a majority of the State's population resides. These areas are already used extensively by ATV and airplane traffic from the Talkeetna-Willow area. No comprehensive harvest mapping efforts are available for this area currently; however, this will be addressed through the subsistence harvest surveys planned for the communities of Talkeetna and Trapper Creek.

The northern route, the Denali Corridor (Seattle Creek), would increase accessibility for all harvesting activities, but especially for hunting caribou, to rural residents of Cantwell and the Copper River Basin. Based on past mapping and ethnographic research, residents of these communities have traditionally utilized this area for the harvest of caribou (Nelchina Herd) and

freshwater fish. Although a road may be beneficial to local residents, it could also increase competition as better road access, and the upgrade of the Denali Highway, would enable easier access for residents of the road system, both north and south of the area. As noted in the comments above opening up the northern area would demand more creative approaches to managing social issues.

Sincerely,

Joe Klein, Susitna-Watana FERC Coordinator
Alaska Department of Fish and Game

Cc: Doug Vincent-Lang, ADF&G
Bob Clark, ADF&G
Stormy Haught, ADF&G
Mark Burch, ADF&G
Davin Holen, ADF&G
Maria Steele, ADNR
Betsy McGregor, AEA

From: Klein, Joseph P (DFG) [mailto:joe.klein@alaska.gov]
Sent: Thursday, September 06, 2012 1:58 PM
To: Betsy McGregor
Subject: RE: Follow up Meeting Notes-additional comments

Betsy- Per a follow up to our River Productivity comment below, we wish to revise our statement to read:

We support the effort to provide a means to evaluate future changes in the Susitna River under different operation scenarios and also recommend identifying a reference reach in a similar Alaska river for using a BACI design monitoring program to assess post project impacts.

Regards, Joe

From: Klein, Joseph P (DFG)
Sent: Thursday, August 23, 2012 2:48 PM
To: McGregor, Elizabeth A (AIDEA)
Cc: Benkert, Ronald C (DFG); Burch, Mark E (DFG); Erickson, Jack W (DFG); Fair, Lowell F (DFG); Fink, Mark J (DFG); Giefer, Joe (DFG); Haught, Stormy B (DFG); Holen, Davin L (DFG); King, Kimberly N (DFG); Miller, Monte D (DFG); Michael_Buntjer@fws.gov; Betsy_McCracken@fws.gov; Eric Rothwell (Eric.Rothwell@noaa.gov); Hill, Melissa E (DNR); Schwarz, Terence C (DNR); Sager, Kimberly R (DNR); Ashton, William S (DEC)
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Subject: Follow up Meeting Notes

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instream flow, riparian instream flow, water quality). Also, a description of sampling intensity would be helpful (i.e. for instream flow purposes, will the objective be to characterize entire gw/sw interaction throughout entire intensive study site or only at select microhabitats).

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- Information on availability of the Sampling and Analysis Plan and Quality Assurance Project Plan is needed.
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- Any monitors should be calibrated pre- and post-monitoring along with multiple field measurements for post monitoring calibration.

From: Michael_Buntjer@fws.gov [mailto:Michael_Buntjer@fws.gov]
Sent: Friday, September 07, 2012 5:37 PM
To: Betsy McGregor
Cc: Betsy_McCracken@fws.gov; Catherine_Berg@fws.gov; Lori_verbrugge@fws.gov; eric Rothwell; Brian Lance; susan walker; joe.klein@alaska.gov; MaryLou Keefe; Cassie_Thomas@nps.gov; tsundlov@blm.gov
Subject: Follow up Notes from the August 2012 Work Group meeting

Hello Betsy:

Thank you for the opportunity to discuss the proposed study plans for the Susitna-Watana Hydroelectric Project. We look forward to further discussions to clarify the details of the proposed study plans. I have attached some initial notes, comments, and questions regarding the objectives in our three fish study requests, our River Productivity Study Request, and those found in the proposed study plan.

These comments are in addition to those provided during the August 2012 work group meetings, and are intended to assist in further discussions about development of the study plans. In addition to the attached comments, I have some overall questions, comments, and concerns about the proposed fish studies. Based on the proposed methodologies, there does not appear to be any studies to collect baseline biological or physical spawning habitat information between the time eggs are deposited in redds and the time of fry emergence, and no information on the timing and movement of fish from spawning to rearing areas, and only limited information on the distribution and abundance of juvenile fish up to 60 mm, particularly in winter. These are the life stages most vulnerable to load-following operations.

Although I have more questions and comments regarding linkages between proposed studies and project details, these should serve as a starting point for the upcoming fish sub-workgroup meetings. If you have any questions, please feel free to contact me. Thanks.

Mike

(See attached file: ELH Juvenile Adult Fish D and A Riv Pro mb initial draft comments on PSP.docx)

Mike Buntjer
US Fish and Wildlife Service, Anchorage Field Office
Conservation Planning Assistance
605 W. 4th Ave, Room G-72
Anchorage, AK 99501
(907)271-3053
(907)271-2786 FAX

ATTACHMENT: ELH Juvenile Adult Fish D and A Riv Pro mb initial draft comments on PSP.doc

For each USFWS Study Request below (including our three fish studies and River Productivity) I listed the objectives in each study request and then followed them with the objectives I found in the PSP. I noted where the objectives were the same, where they differed, and where our study requests were not addressed in the PSP. I also include other notes, comments, and questions to assist in further discussions about the proposed studies.

Early Life History and Juvenile Fish Distribution and Abundance in the Susitna River (USFWS Study Request; Enclosure 13)

Specific study request objectives versus objectives included in PSP Study 7.5 (upper reach) and Study 7.6 (middle and lower reach):

1. Determine the seasonal distribution, relative abundance (as determined by CPUE, fish density, and counts), and fish-habitat associations of juvenile anadromous and resident juvenile fish species in the mainstem Susitna River (side channel, slough, backwater, and tributary confluence habitats).

1. Describe the seasonal distribution, relative abundance (as determined by CPUE, fish density, and counts), and fish-habitat associations of resident fishes, juvenile anadromous salmonids, and the freshwater life stages of non-salmon anadromous species; (7.5 upper reach)

- Only winter sampling I see proposed in the upper reach includes using DIDSON and video cameras in 10 "selected" sloughs and side channels; how were/will sites be selected?; What other habitat types are available and why are they not being sampled? Is this sufficient to get at winter distribution and abundance for all life stages?; will not likely be able to identify juvenile species using these techniques (therefore, no distribution and abundance information and habitat use by species, particularly for early life stages (<60 mm); other winter sampling (using gill nets, minnow traps, and trot lines) is listed in the schedule section (and not in methods), but it is not described.

1) Describe the seasonal distribution, relative abundance (as determined by CPUE, fish density, and counts), and fish-habitat associations of juvenile anadromous salmonids, non-salmonid anadromous fishes and resident fishes; (7.6 middle and lower reach).

- The list of habitat types to be sampled in this study (middle and lower reaches) appears longer than habitats proposed for the upper reach, but otherwise same comments as listed above for Study 7.5 (upper reach).

2. Describe the seasonal movements and migratory patterns of juvenile anadromous and resident juvenile fish species among mainstem habitats and between tributaries and mainstem habitats with emphasis on identifying foraging and overwintering habitats.

5. Use biotelemetry (PIT and radio tags) to describe seasonal movements of selected fish species (including rainbow trout, Dolly Varden, whitefish, northern pike, burbot, and Pacific lamprey if present) with emphasis on identifying spawning and overwintering habitats within the hydrologic zone of influence upstream of the project; (7.5 upper reach)

- Unclear if this includes or excludes PIT tagging juvenile anadromous salmon, particularly Chinook salmon; i.e., none are listed
- Also, mentions installing up to six antenna arrays in selected sloughs and side channels in winter; is that sufficient to determine movement of juveniles in and out of habitats? What about other habitats? Unclear how sites were selected and what habitats were or were not sampled in the 1980s. Therefore, what is rationale and assumptions for selecting habitat types and sites?
- See nothing on movement (and timing) of newly emergent fish from spawning to rearing areas or movement of juvenile fish <60 mm in winter (i.e., the post-emergent life stages most vulnerable to load-following operations)

2) Describe seasonal movements of selected fish species such as rainbow trout, eulachon, Dolly Varden, whitefish, northern pike, Pacific lamprey, and burbot) using biotelemetry (PIT and radio-tags) with emphasis on identifying foraging, spawning and overwintering habitats within the mainstem of the Susitna River and its associated off-channel habitat; (7.6 middle and lower reach)

- Unclear if this includes or excludes PIT tagging juvenile anadromous salmon; i.e., none are listed
- Also, mentions installing up to 10 antenna arrays; is that sufficient to determine movement of juveniles in and out of habitats by reach? When, where, and how will sites be selected? What is rationale and assumptions for selecting habitat types and sites?
- See nothing on movement (and timing) of newly emergent fish from spawning to rearing areas or movement of juvenile fish <60 mm in winter, particularly for anadromous salmonids.

3. Document the timing of downstream movement of all juvenile fish species and outmigration for anadromous salmon.

6. Document the timing of downstream movement and catch for fish species via outmigrant traps; (7.5 upper reach)

- Unclear if this includes or excludes addressing outmigration and winter sampling

3) Document the timing of downstream movement and catch for all fish species using outmigrant traps; (7.6 middle and lower reach)

Unclear if this includes or excludes addressing outmigration

4. Document the age structure, growth, and condition of juvenile anadromous and juvenile resident fish by season.

4) Characterize the age structure, growth, and condition of juvenile anadromous and resident fish by season; (7.6 middle and lower reach)

- Is there a difference between Document (as requested) and Characterize (as proposed)? Explain
- Is this study objective limited to juveniles or should it say "all" resident fish.
- This objective is not included in upper reach; should at least characterize age structure for all resident and anadromous fish by season

5. Collect and analyze tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Genetic Analysis study.

3. Collect tissue samples to support the Genetic Baseline Study for Selected Fish Species (Section 7.14); (7.5 upper reach)

- No mention of analyzing samples; analysis mentioned in Genetic Baseline Study, but link/integration to analyzing samples collected in this study is not discussed. Will samples be analyzed? Explain.

6) Collect tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Genetic Baseline Study (Section 7.14). (7.6 middle and lower reach)

- Again, no mention of analyzing samples; analysis mentioned in Genetic Baseline Study, but link/integration to analyzing samples collected in this study is not discussed. Will samples be analyzed? Explain.
- Because PSP is not structured similarly to our study requests, why is this study objective limited to juvenile salmon? This may be okay, because genetic sampling included in Salmon Escapement Study, though no mention in study of analyzing samples or overall links between studies. Without providing linkages between studies, there is a lot of searching required to find if, where, and how information is being collected.

6. Collect and provide the Instream Flow study with habitat suitability criteria (HSC) data to support analysis of potential project impacts.

Mention of HSC is in Study 6.5, but the study request objective is not addressed in the upper, middle, or lower reaches for juvenile anadromous, resident fish, and non-salmonid anadromous fish studies. It is unclear how HSC information will be collected, particularly in winter for post-emergent fish up to 60 mm when fish will be most vulnerable to load-following operations. I see no empirical baseline information being collected to evaluate potential project effects or for inclusion in habitat modeling efforts. There is generic reference to developing HSC model in Study 6.5 for these species and life stages, but unclear about the source of that information.

7. Evaluate salmon incubation (embryo development, hatching success, and emergence times) and associated water quality conditions (e.g., temperature, DO, pH) at existing spawning habitats (slough,

side channel, tributary, and mainstem) in areas with and without groundwater upwelling in the middle and lower reaches of the Susitna River.

Study Request objectives 7-9 are not addressed in 7.5 or 7.6; there is no mention of egg incubation (rates or success), hatching (rates or success), stranding (ramping rates) or emergence (dates and times) sampling anywhere; no mention of baseline intragravel temperature or water quality monitoring of spawning and pre-emergent juvenile fish habitats; no mention of characterizing baseline water quality conditions at spawning or rearing habitats.

Only mention is in Study Goals (6.5.1.2, page 6-10); Objective 8. Conduct a variety of post-processing comparative analyses derived from the output metrics under aquatic habitat models. Approach appears to evaluate using only physical habitat models and without empirical sampling post-spawning through emergence and for juveniles up to PIT tagging size (i.e., 60 mm).

8. Evaluate the potential for stranding of juvenile fish and stranding mortality by season under proposed operational conditions.

This Study Request objective is not addressed. Stranding is mentioned in Chapter 6, but the study approach is not discussed

9. Measure intragravel water temperature in spawning habitats and winter juvenile fish habitats at different surface elevations and different depths to determine the potential for freezing of redds, freezing of juvenile fish, and their habitats.

This Study Request objective is not addressed anywhere.

Adult Salmon Distribution, Abundance, Habitat Utilization and Escapement in the Susitna River (USFWS Study Request: Enclosure 15)

Specific objectives included in study request versus objectives listed in PSP Study 7.6:

1. Capture, radio tag and track adults of the five species of Pacific salmon in proportion to their abundance.

   1. Capture, radiotag, and track adults of five species of Pacific salmon in the middle and upper Susitna River in proportion to their abundance. Capture and tag Chinook and coho salmon in the lower Susitna River.

2. Determine the migration behavior and spawning locations of radio-tagged fish in the lower, middle, and upper Susitna River.

   2. Characterize the migration behavior and spawning locations of radiotagged fish in the lower, middle, and upper Susitna River.

3. Characterize adult salmon migration behavior and run timing within and above Devils Canyon.

   3. Characterize adult salmon migration behavior and timing within and above Devils Canyon.

4. If shown to be an effective sampling method during the 2012 study, and where feasible, use sonar to document salmon spawning locations in turbid water.

   4. If shown to be an effective sampling method during the 2012 study, and where feasible, use sonar to document salmon spawning locations in turbid water in 2013 and 2014.

5. Compare historical and current data on run timing, distribution, relative abundance, and specific locations of spawning and holding salmon.

   5. Compare historical and current data on run timing, distribution, relative abundance, and specific locations of spawning and holding salmon.

6. Estimate escapement of adult salmon spawning by mainstem reaches and tributaries.

   6. Generate counts of adult Chinook salmon spawning in the Susitna River and its tributaries.

   Need to define “generate count” and how generated. If it is an index of abundance, then need to identify the standardized unit of effort. Also, not sure why escapement estimate is not being determined? This study references escapement estimates from the 1980s, but not here. Explain.

7. Collect tissue samples to support the Genetic Analysis Study.

   7. Collect tissue samples to support the Fish Genetic Baseline Study (Section 7.14).

8. Determine system-wide Susitna River escapement and run apportionment.

   8. Estimate system-wide Chinook and coho salmon escapement to the Susitna River and the distribution of those fish among tributaries of the Susitna River.

9. Determine the availability and accessibility of spawning habitats by adult salmon to mainstem and tributary locations based upon flow regime.

   Unclear if, how, or where this Study Request objective is being addressed.

Not listed as an objective in this study; section 6.5.4.3.1 (page 6-19) describes assessing access to rearing and spawning habitats via output from flow routing models. Also, objective 13 (shown below) in fish passage study (section 7.12); page 7-98):

13. Evaluate the potential creation of fish passage barriers within existing habitats (tributaries, sloughs, side channels, off-channel habitats) related to future flow conditions, water surface elevations, and sediment transport.

10. Measure critical habitat characteristics (e.g., channel type, flow, substrate, and groundwater) at reaches used for spawning and compare these characteristics with those in adjacent reaches that do not contain spawning adults.

    Do not see this study request objective addressed or any objective that looks at characterizing use, availability, or quality of potential spawning habitats. There appears to be no empirical baseline information being collected; only see determining distribution and potential abundance of redds. Also, see mention of evaluating potential dewatering or scouring of redds in Chapter 6, but no empirical baseline information to assess daily load-following operations.

River Productivity Study (USFWS Study Request: Enclosure 11)
Specific Study Request objectives versus objectives listed in proposed study 7.8:

1. Develop a white paper on the impacts of hydropower development and operations (including temperature and turbidity) on benthic macroinvertebrate and algal communities in cold climates.

   1. Synthesize existing literature on the impacts of hydropower development and operations (including temperature and turbidity) on benthic macroinvertebrate and algal communities;

   - Any difference in developing a white paper versus synthesizing existing literature?

2. Characterize the pre-project benthic macroinvertebrate and algal communities with regard to species composition and abundance in the lower, middle and upper Susitna River.

   2. Characterize the pre-Project benthic macroinvertebrate and algal communities with regard to species composition and abundance in the middle and upper Susitna River;

   - Omission of lower reach is an apparent typo.

3. Estimate drift of benthic macroinvertebrates in habitats within the lower, middle and upper Susitna River to assess food availability to juvenile and resident fishes.

   3. Estimate drift of benthic macroinvertebrates in selected habitats within the middle and upper Susitna River to assess food availability to juvenile and resident fishes;

   - Omission of lower reach is an apparent typo.

4. Conduct a trophic analysis to describe potential changes in the primary and secondary productivity of the riverine community following post-project construction and operation.

   5. Conduct a review on the feasibility of a trophic analysis to describe potential changes in the primary and secondary productivity of the riverine community following Project construction and operation;

   - Shouldn't this read: Conduct a trophic analysis, if feasible, to describe…? Also, why would it not be feasible? Explain.

5. Generate habitat suitability criteria (HSC) for Susitna River benthic macroinvertebrate and algal habitats to predict potential change in these habitats downstream of proposed dam site.

6. Generate habitat suitability criteria for Susitna benthic macroinvertebrate and algal habitats to predict potential change in these habitats downstream of proposed dam site;

6. Characterize the benthic macroinvertebrate compositions in the diets of representative fish species in relationship to their source (benthic or drift component).

7. Characterize the macroinvertebrate compositions in the diets of representative fish species in relationship to their source (benthic or drift component);

- I assume this should include term "benthic". If not, explain difference.

7. Evaluate the feasibility of reference sites on the Talkeetna and Chulitna Rivers to monitor baseline productivity, pre- and post-construction. (***deleted in PSP; and not addressed***)

AEA replaced this objective (with #4 below), but based on discussion at August 15, 2012, TWG meeting it was suggested to do both or keep the original Study Request objective. We recommend and support that suggestion.

4. Conduct a literature/data search to identify existing river systems that could act as surrogates in evaluating future changes to productivity in the Susitna River. (***added in PSP***)

8. Characterize organic matter resources (e.g., available for macroinvertebrate consumers) including course particulate organic matter, fine particulate organic matter, and suspended organic matter in the lower, middle, and upper Susitna River.

8. Characterize organic matter resources (e.g., available for macroinvertebrate consumers) including course particulate organic matter, fine particulate organic matter, and suspended organic matter in the lower, middle, and upper Susitna River.

9. Estimate benthic macroinvertebrate colonization rates in the middle and lower reaches to monitor baseline conditions and evaluate future changes to productivity in the Susitna River.

9. Estimate benthic macroinvertebrate colonization rates in the middle and lower reaches to monitor baseline conditions and evaluate future changes to productivity in the Susitna River.

Note: Page 7-12 of PSP states that marine derived nutrients are included in River Productivity Study, but there is no mention of it in Chapter 7; i.e., is not addressed.

Adult and juvenile non-salmon anadromous, resident and invasive fish studies in the Susitna River basin (RM 0 - RM 233)(USFWS Study Request; Enclosure 14)

General objectives for this study request are to:

COMMUNITIES AND ASSEMBLAGES

- Characterize the seasonal (spring, summer, fall, winter) distribution, relative abundance, and habitat utilization in the Susitna River mainstem (RM 0-RM 233) for all life stages of non-salmon anadromous, resident, and invasive fish species. [Documenting both hierarchal nested habitat type and use-type as described in the resource agency Instream Flow Study and Habitat Utilization Study Request].

  Recommendation for hierarchical nested habitat type and use-type not addressed in PSP.
- Characterize the seasonal (spring, summer, fall and winter) movement patterns of all subject fish species and life stages as they relate to foraging, spawning, rearing and overwintering habitats. The characterization of seasonal movements includes run timing (immigration and emigration) and extent (periodicity) of non-salmon anadromous species in the Susitna River (RM 0-RM 233) and movement into and out of tributary streams. [Interface with resource agency Instream Flow and Habitat Utilization Study Request hierarchal nested habitat types and habitat mapping].

  Interface with resource agency Instream Flow and Habitat Utilization Study Request hierarchal nested habitat types and habitat mapping does not appear to be addressed.

- Characterize the flow-related or synchronized life history strategies (migration, movement, spawning, rearing, hatching, emergence) of non-salmon anadromous, resident and invasive species, and their biological behavorial response (e.g., potential for false attraction, delayed migration or increased holding time, synchrony of spawning, relative hatching and emergence timing) to Project-affected flow alterations (flow, temperature, habitat, water quality).

  Similar to juvenile anadromous salmonid comments above, much of this Study Request objective does not appear to be addressed in the PSP, particularly for movement, rearing, hatching, emergence and juvenile fish (<60 mm) in winter.

RESOURCE DATA SYNTHESIS

- Synthesize existing resource data, results and information from 1980's Susitna Hydroelectric studies, and other relevant literature to determine applicability and utility of results and information to the currently proposed project.

  What is timeframe for completing? Not addressed in PSP

GENETICS

- Collect tissue samples from all resident and non-salmon anadromous fish species for genetic population structure database and future stock identification analysis. This is particularly important for salmon species, anadromous lamprey, and Bering cisco of the Susitna River drainage.

TROPHIC ECOLOGY

- Characterize trophic interactions using seasonal diets (stomach content analysis) of all age classes of non-salmon anadromous, resident and invasive fish species. [Interface with the productivity study, riparian, and instream flow study requests]

- Quantify the relative contribution (biomass) of marine-derived nutrients to the ecology of the Susitna River from adult returns of non-salmon anadromous fish species (e. g., Pacific and Arctic lamprey, eulachon, Bering cisco).

Page 7-12 of PSP states that marine derived nutrients are included in River Productivity Study, but there is no mention of it in Chapter 7; i.e., is not addressed.

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Sent: Friday, September 07, 2012 4:02 PM
To: Betsy McGregor
Cc: Bryan Carey; 'Fullerton, Bill'; Betsy McGregor; Bob_Henszey@fws.gov; eric Rothwell; 'Klein, Joseph P (DFG)'; 'Kevin Fetherston'; 'Matthew LaCroix'; 'Laura Arendall'; 'Mike Buntjer'; 'MaryLou Keefe'; 'Michael R. Lilly, GW Scientific'; PHilgert@r2usa.com; rob.plotnikoff@tetratech.com; 'Benkert, Ronald C (DFG)'; susan walker; 'William Rice'; matt.cutlip@ferc.gov; Lori_Verbrugge@fws.gov; Catherine_Berg@fws.gov; Jennifer_Spegon@fws.gov; dreiser@r2usa.com
Subject: Follow up comments from August 15-17 ILP meetings

Hi Betsy,

Thank you and AEA for hosting the August ILP meetings. We all gained a lot of insight from the meetings, and we were pleased to be updated. Like others, as a result of the meetings, the Service has a few comments and concerns to share with the group.

In addition to these below, other staff from the Service may provide comments relative to their study area expertise. We hope that our collective comments will be helpful toward gaining concurrence on proposed studies, and as we move forward with the review process of the proposed Watana dam.

Thank you,
Betsy

September 7, 2012

Notes from ILP Formal Study Meetings August 15-17, 2012:

At the request of AEA and its consultants, the USFWS (Service) submits this brief summary of concerns regarding the Susitna-Watana hydropower dam formal ILP Formal Study meetings that were held August 16-17, 2012. The Service's concerns in this informal correspondence, along with other remaining concerns will be further articulated in the Service's formal response letter on AEA's ILP Proposed Study Plan (PSP) review, due to FERC October 15, 2012. Additional informal comments from the Service may be provided under separate cover before the October due date.

FWS concerns highlighted during meetings relative to Instream Flow, Habitat Utilization and the Geomorphology proposed study plans:

Overall, the Service finds that AEA's proposed study plans for instream flow, habitat utilization and geomorphology do not fully address agency's resource management concerns. During the three days of ILP study meetings, sequencing and integration of the proposed biological resource studies and the physical process studies was not described and is still a significant outstanding information need. It is necessary to describe the integration of these inter-related studies and how that integration will result in a comparison of the baseline biological information and the resulting effects to biologic resources caused by the proposed project operations. Study results must be quantifiable in order to assess potential losses to aquatic resources and their habitats, to review the project under our relevant fish and wildlife resource conservation authorities, to inform fishway prescription authority under Section 18 of the Federal Power Act, and to eventually develop recommended protection, mitigation, and enhancement for the project license. We do not believe that the current study plan proposals will yield sufficient information to allow us to adequately assess proposed project impacts to the Nation's fish and wildlife resources and develop adequate PME's.

The Service has repeatedly articulated concerns about the lack of study sequencing, connectivity and integration between the biological studies and the other proposed engineering and physical processes studies. We reiterate and highlight the need for the collection of adequate temporal and spatial baseline biological and fish habitat data to provide direct input to some of the proposed physical modeling efforts. Many of our concerns, below, are related to the temporal mismatch of biological data collection with the forward momentum of the physical modeling efforts.

-Habitat Mapping

Hierarchially-nested aquatic habitats- HDR stated at the meeting that the "habitat mapping" will be started in September; and that the sampling will be stratified by meso-habitat type as identified in the 1980's study reports.

The 1980's studies did not hierarchically nest the habitat types. The Service specifically requested hierarchially nested habitat mapping (e.g., Frissel et al, 1986). We are concerned with the proposal to use the 1980's study sites, which focus on the side sloughs, and do not consider the full breadth of fish habitats, which is currently unknown and the subject of ongoing study that has not been completed or submitted for agency review and comment. We do not endorse the use of the 1980's sites without out first completing and then applying a hierarchal assessment of the river reaches as a study framework. The hierarchally nested aquatic habitats framework is needed to structure fish distribution surveys, the instream flow study and other physical process studies. Without it, the fish surveys will be too narrowly constrained and the instream flow studies will not represent all habitats that may be affected by the proposed project. The Service recommends the following habitat hierarchy for the Susitna River be used for habitat mapping purposes and integration of studies:

Large River Floodplain Habitat Hierarchy

1. Geomorphic units: Large-scale geomorphic and hydraulic controls.

a. Bedrock controlled, single-channel units with shallow hyporheic exchange and thermal homogeneity.

b. Unconfined, multiple channel floodplain units with expansive hyporheic exchange and thermal heterogeneity.

2. Macrohabitats: Primary, flood, and spring channel networks.

a. Primary channels—Perennial channels.

b. Flood channels—Seasonally connected channels.

c. Spring channels—Disconnected sloughs that discharge groundwater.

d. Floodplain ponds—Ponded spring channel networks.

3. Mesohabitats: Bed and bank morphological controls; hydraulic features.

a. Riffle-pool sequences—Run, riffle, pool, glide, tailout.

b. Backwaters, alcoves, shallow meander margins.

4. Microhabitats: Hydraulics, water quality, substrate, cover.

a. Water depth, velocity, bulk flow characteristics (e.g. Reynolds and Froude #'s).

b. Vertical hydraulic exchange (ground and surface water exchange).

c. Bed, or intragravel temperature and dissolved oxygen.

d. Substrate size, heterogeneity.

e. Elements of wood, vegetation, and rock structure.

-Fish distribution: A first step is to assess the seasonal distributions of target species and life stages and the physical habitat criteria that influence habitat selection and suitability. As a first step, target species have to be identified, agreed upon, and their life history and habitat use similarities to other, unstudied species (i.e., non-target species) need to be determined and described. In the study requests of the Service and other agencies, we recommended studying the baselines of all affected fish species and life stages, including all five species of anadromous salmon and all resident fish.

Fish distribution data are needed to describe the baseline data to support and compliment other proposed study objectives, including those related to fish habitat selection and utilization. A first step to acquiring adequate fish distribution is to assess the full lateral and longitudinal profile of seasonal fish distribution, life stage periodicity, and suitable used and unused habitats that are influential in fish habitat site selection. The fish distribution data is needed to provide the base data layer that will support and compliment other proposed study objectives, including those related to fish habitat selection and utilization, and instream flow (ISF) needs. This information is also needed for resource agencies' fishway prescription decisions under the Federal Power Act. Baseline biological information is critical input necessary for integration with physical studies. Accordingly, the Service is reiterating the need for multiple and continuous years of biologically relevant data in order to provide robust integration with the physical modeling studies, and decision-support relative to fish and wildlife resources of the Susitna River basin.

-Habitat site selection criteria: Criteria that influence habitat selection and suitability need to be identified using statistically powerful and robust methods and current models of fish distribution including bioenergetics and not exclusively physical habitat models (Lovtang 2005). The Service remains opposed to the proposal to repeat the 1980's approaches to fisheries studies. The 1980's studies do not determine the habitat criteria influencing fish habitat site-selection, they simply report utilization functions for water depth and velocity, or depth and substrate. They also lack a fundamental baseline assessment of all available fish habitat and instead focus on study of habitats that had high fish use density. The habitats that were apparently suitable but unoccupied or underutilized by fish need to be assessed, and the entire range of habitat availability and habitat use data need to be assessed prior to habitat study site selection.

More comprehensive data collected on nearby glacial rivers may be used to demonstrate that habitat selection by salmon in side-sloughs can be independent of water depth and velocity and should be compiled.

Fish habitat study sites should be surveyed and identified using the full range of habitats seasonally utilized by agreed-upon target species and life stages. The objective is to identify the bioenergetics and physical factors that control fish habitat selection. The Service considers the assessment of habitat influential to fish habitat site selection to be an objective of the Instream Flow and Habitat Utilization Study request. In the resource agencies Instream Flow and Habitat Utilization Study Plan requests, this is a specifically stated objective.

Sequentially, appropriate flow-habitat models can be selected *after* assessment and validation of 1) the full seasonal distribution of target species and life stages,2) the physical factors (e.g., micro-habitat data) that influence habitat selection and suitability, and 3) the bioenergetic factors affecting fish habitat suitability and productivity.

Thus, field visits proposed for the end of September (2012) should be considered as reconnaissance and for discussion purposes, and not for the purpose of actual study site-selection.

-Habitat Suitability Indices: Methods for collecting site-specific habitat criteria for the glacial Susitna River need to be collaboratively identified. (As recommended in the resource agencies study plan request for Instream Flow and Habitat Utilization). These criteria also need to be evaluated in the context of the hierarchical habitat model, such that habitat criteria are determined and evaluated in all habitats of importance to each agreed-upon target species and life stage.

The 1980's studies were inconclusive in demonstrating a relationship between fish habitat criteria and fish distribution, and they were also narrowly focused on associations of spawning and rearing salmon with water

depth and velocity in spring channels (side sloughs). Not only is this not representative of existing habitat and the distribution of fish within those habitats, habitat data collected from nearby glacial rivers demonstrates that spawning habitats selection is independent of flow depth and velocity in side sloughs and may be profoundly influenced by bioenergetics and the input of organic matter .

This indicates that traditional hydraulic modeling (e.g., PHABSIM), as proposed, may be an insufficient fish focus/tool. So, first we need to identify criteria that are influential to habitat selection, within the full seasonal distributions of agreed-upon target species and life stages. Only then, after this has been adequately determined, can we begin to develop utilization functions (curves or HSC) for those criteria.

The Service has previously expressed concern with the approach of repeating the 1980's study effort, and we have repeatedly asked for both a complete compilation of available data, and a review of the 1980's information prior to accepting its use for the proposed project. Lacking that review, we independently note that, in the 1980's sites were selected that were, presumably, heavily utilized by spawning sockeye and chum (qualitative). Study sites need to be based on relevant criteria related to physical habitat site selection as documented by fish distribution and lack thereof.

-**Groundwater**- The integration of the groundwater study efforts with the biological studies is not clear. Specifically, how will the groundwater study be made relevant to the scale of fish habitat and fish habitat site selection in the Susitna River? The objectives of the groundwater study should include relevance to the hierarchially nested habitats, including macro-, meso-, and micro-habitats that are influential to fish habitat selection. The groundwater study sampling design should be relevant to fish habitat and site selection. A specific objective needs to be measuring the hydraulic gradient/head (upwelling or downwelling) under the existing hydrograph and under the proposed project hydrograph release flow schedule.

-**Model selection:** We need to first determine what criteria are important to fish habitat site/suitability and selection before we can choose an appropriate flow-habitat model. ADFG Marine Mammals biologist, Dr. Bob Small also reiterated this very same point regarding model selection for the beluga whale studies. Again, the Service notes our concern about the limited focus of the 1980's studies and using PHABSIM. Our concerns stated in earlier correspondence to AEA remain unaddressed and are reiterated here for emphasis.

Model sensitivity and relevant criteria (inputs) are critical to achieving statistically valid outputs. At this point, it is premature to select a model until we have known 1) fish distribution, and 2) identification of variables influential to fish habitat site selection.

-**Biometric Review-** The Service previously requested a biometric review of the 1980's findings. This request is remains outstanding and should be conducted prior to basing any study plans on 1980's studies or results. In all cases, including the usage of the 1980's Su-hydro data results and for the Susitna-Watana study plans, estimates of precision and accuracy of study results is required to evaluate the power of any study plan. Details of proposed study plan sampling and design methods need to be explicit and statistically valid with a priori determination of levels of precision and accuracy of model outputs.

-Fish genetics- During the August 15-17 meetings, AEA stated that genetic samples from the Chinook above the proposed dam site would not be collected. The stated rationale was due to the desire to minimize the handling of the fish after subsequent tagging of fish. Genetic samples of Chinook at locations above the proposed Susitna-Watana dam site are crucial to informing the Service's management goals specific to recommending licensing conditions under the Federal Power Act, and to conservation recommendations under the Fish and Wildlife Coordination Act, and the Anadromous Fish Act. As such, we consider our request for collection of genetic samples from Chinook salmon, and other fish species to be necessary for our resource evaluation of the Susitna-Watana hydropower project.
Because of this information need, if AEA does not plan to collect the information, AEA should document how this study request is being addressed.

Fish species genetic samples used for comparisons should be less than ten years old to reflect current gene frequencies among the sampled fish populations. Genetic samples for salmon exist for some tributaries in the

lower and middle Susitna River. Some of these samples are greater than ten years old.

Fish genetic samples should be current and include samples of the Chinook migrating above the proposed dam location. Because gene frequencies change over time, all genetic samples should be within the most recent ten years to allow for valid comparison. Genetic analysis should analyze the existing extent of genetic differentiation within and between fish using distinctly different habitats. We request genetic analysis of Chinook above the proposed dam site relative to those at other upper, middle and lower river and tributary sample locations.

-Fish Passage/fishway prescription- The Service is concerned with the lack of transparent discussion about the potential for fish passage alternatives at the proposed Susitna-Watana dam. If fish passage is required, how will that be accomplished? If it is not feasible, what is your alternative proposal? Where is your project assessment of the fish passage feasibility? What are the design criteria being considered/evaluated?

-**Compensatory Mitigation**- Compensatory mitigation is determined as part of a mitigation sequence after avoidance, and minimization efforts. The Service has inquired about potential compensatory mitigation for project impacts during several meetings. To date, this concern has not satisfactorily been addressed by the project sponsors or project consultants. Because compensatory mitigation is a requirement in order to offset unavoidable projects impacts to fish and wildlife resources and their habitats, it is should be considered throughout the review process. Please explain how you plan to quantify existing habitats, and quantify primary, secondary and cumulative (40cfr Part230 of the CWA) losses to those habitats under the proposed operational flows over the temporal scale of the license period. How will habitats change proportionally under project operations?

-Lower river- The Service is concerned with AEA consultants' proposal to establish a lower boundary for the physical studies (e.g., geomorphology, instream flow) at a location "downstream of Sunshine" at approximately river mile 75, and not extend the study efforts further down into lower river to inform the biological studies. There are many biological resource studies that would necessarily be informed by establishing a consistent study boundary between the physical and biological studies. For example, studies related to the federally listed Cook Inlet beluga whale, fish species and habitats, including the resident species, and anadromous salmon and eulachon (beluga whale prey species). The lower river also includes the Susitna Flats State Game Refuge. If the physical studies boundary is terminated at river mile 75, there will be no ability to relate or integrate biological data to those studies (e.g., geomorphology, ISF, ice processes, flow routing). Resource agencies management goals would effectively not be addressed below river mile 75, if project effects are not assessed to the mouth of the river.

According to USACE (1966), 80% of the ability to produce accurate model results depends on using appropriate bathymetry data, mesh design, and boundary conditions. The amount of time needed to collect this information, particularly the bathymetry data, depends on the complexity of the channel's geometry, which is known to be complex in the lower Susitna River. Because data collection in the lower river will likely require rigorous field collection due to the channel complexity, it is critical to initiate these efforts in a time sensitive manner. The proposal to delay work in the lower river pending analysis at an arbitrary, and certainly non-biologically relevant location, does not meet resource agencies objective of evaluating the potential project impacts to fish and wildlife resources in the lower Susitna River. This is particularly true under the FERC ILP process timeline specific to the Susitna-Watana dam project.

-**Studies integration:** A "map" or chart of how studies are proposed to be integrated is needed. AEA sponsors and consultants, committed to providing this by September. Biological resource components are currently not integrated or connected to the other studies, and appear as being treated independently of the rest of the study requests. Study proposals must demonstrate how they will be integrated to provide needed resource information.

Studies/components not address from the Non salmon anadromous, resident and invasives fish species study request: During the August ILP meetings, the follow Service requests were preliminarily noted as not being addressed or adequately addressed by AEA's PSPs.

1) **Marine derived nutrients** contribution from non salmon anadromous species. The Service requested information in our non-salmon anadromous, resident and invasive study plan request. It is not clear which study proposal it is addressing this request, or IF it is being addressed. During the August 15-17 meetings, it was indicated that it may be addressed in either the riparian instream flow, the terrestrial wildlife, the river productivity or elsewhere. However, AEA' s consultants were unable to specifically "point to it" when asked. It does not appear to have been included in the PSPs.

2) **Resource valuation** of non-salmon anadromous and resident fish resources. During the meeting, AEA consultants stated that a resource valuation would not be provided, as requested in the Service's study request for non salmon anadromous, resident and invasive fish study. An explanation of why this assessment will not be addressed was not provided. We request that an explanation be provided that describes the rationale for this determination and urge reconsideration of our study request.

3) **Trophic ecology**- The Service requested information on trophic ecology in the non salmon anadromous, resident and invasive species study request. Michael Link stated that there are "significant predator-prey dynamics" particular once fish move out of the mainstem; using this behavior to explain why fish hold there until they are ready to dash to tributaries. He noted that the creeks are heavily preyed upon by bears, for example. Dr. Bob Small (ADFG) recommended trophic ecology and/or foraging ecology information for the Cook Inlet beluga whale studies. For fish, coordination with Tim Nightengale (AEA's consultant; via teleconference) stated that he would take gut samples from fish to see what macro-invertebrates they are eating, and when, and will work with fish study teams to do some trophic analysis. The trophic ecology component needs to be clearly spelled out in a study plan identifying any aspects that will and will not be addressed explained and with appropriate rationale.

References:

Frissell, C. A., W. J. Liss, C. E. Warren, and M. D. Hurley. 1986. A hierarchical framework for stream habitat classification: viewing streams in a watershed context. Environmental Management 10:2. Pp. 199-214.

Lovtang, J. C. 2005. Distribution, habitat use, and growth of juvenile Chinook salmon in the Metolius River Basin, Oregon. M.S. Thesis, Oregon State University. March 2005.

USACE 1966. (Full citation will be provided in follow-up correspondence)

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SUSITNA-WATANA HYDROELECTRIC PROJECT

RECORD OF TELEPHONE CONVERSATION

AEA Team Member		Other Party	
Name:	*Dani Evenson*	**Name:**	*Randy Brown*
Organization:	*R2 Resource Consultants*	**Organization:**	*USFWS*
Study Area:	*Fish & Aquatics - Fish Distribution and Abundance Study Plan*	**Phone Number:**	*(907) 456-0295*
Date:	*9/18/12*	**Time:**	*3:30 PM – 4:45 PM*
Call Placed by: [X] AEA Team [ ] Other Party			

Others on Call:
N/A

Subject: Fish Distribution and Abundance Study Plan

Discussion:
Discussed Randy Brown's recent research on whitefish and Dolly Varden on Susitna River.

1. Humpback whitefish. Has n=20 otoliths from Yentna (ADF&G) and n=20 from Upper Su (from J. Buckwalter @ ADF&G. Will analyze otoliths to determine anadromy.
2. Round whitefish. Only has n=60 otoliths. Less migratory; little to no time in salt/brackish water.
3. Bering cisco. 4 years of recent data (2008-2011)
    a. Spawn in mainstem downstream of 3 rivers confluence; most of the population is within the 5 river miles below Montana Creek.
    b. Enter the Susitna in August from the sea.
    c. Spawn 2nd week in October
    d. Otolith microchemistry analysis suggests they all go to sea.
    e. Sampled on spawning grounds for genetic tissues; no results yet.
    f. Length distributions are the same as in the 1980's. Aging methods may be suspect, but lengths are not. Consistent lengths between now and the 1980's suggest stability and validate 80's data.
    g. Did not think additional data on cisco are warranted.
4. Dolly Varden. Lots of variability; some venturing into brackish water- semi-anadromous.

Randy shared his unpublished data with D. Evenson

SUSITNA-WATANA HYDROELECTRIC PROJECT

RECORD OF TELEPHONE CONVERSATION

AEA Team Member		Other Party	
Name:	*Dani Evenson*	**Name:**	*Matt Evenson*
Organization:	*R2 Resource Consultants*	**Organization:**	*ADF&G-Division of Sport Fish*
Study Area:	*Fish & Aquatics - Fish Distribution and Abundance Study Plan*	**Phone Number:**	*(907) 459-7273*
Date:	*9/19/12*	**Time:**	*10:00 AM – 11:00 AM*
Call Placed by: [X] AEA Team [ ] Other Party			

Others on Call:
N/A

Subject: Fish Distribution and Abundance Study Plan

Discussion:
Matt reviewed his burbot research on the Tanana River.

1. Suggested reviewing Bernard et al 1991 for description of hoop traps.
2. Indicated that trot lines are lethal sampling for burbot; suggested using hoop traps to capture fish for tagging. Offered to loan AEA consultants their traps.
3. Methods:
    a. Sampling is best right before freeze up. Suggested sampling in late August-early Oct.
    b. Burbot prefer slack water in the mainstem. Deploy hoop traps near cut banks or snags where they can easily be anchored.
    c. Soak overnight, but not too long as accumulation of sediment can be lethal.
    d. Catch rates highest in spring and fall.
    e. Bait traps with herring.
    f. Tag and release in open water.
    g. Spread out sampling above and below proposed dam site.
    h. Only tag fish >550mm.
4. Would like to participate in burbot sampling if possible.
5. Would like info on when burbot spawn.

River Productivity Study Subgroup Meeting

September 27, 2012

Draft Agenda Items

Determine if AEA proposed study plans are sufficient to meet agency objectives in the following study plan requests.

1. Characterize the pre-project benthic macroinvertebrate and algal communities with regard to species composition and abundance in the lower, middle and upper Susitna River.

   AEA Proposal. Samples will be collected at 9 mainstem and 18 off channel habitats above and below the proposed dam site, stratified by macrohabitat classification, side channel, side slough, upland slough, tributary, and tributary mouth (study plan only identifies mainstem, side channels, and sloughs). Six replicates will be collected at each sampling location, and samples will be collected on three sampling dates from April through September. "Woody snags" would be removed from the stream and invertebrates collected from the snags and identified.

   Additional Questions. Are all mainchannel locations equal. That is, will a sample along an outside bend be the same as a sample collected on a point bar? Will sample locations be selected randomly or only those sites that are easily accessed? If equally divided among four macrohabitat types (excluding tributaries}, this will result in approximately 4 replicates of each habitat type. Is this enough to characterize macroinvertebrates in the upper, lower, and middle river? Should sample locations be stratified based on degree of project effect (i.e. closer to the dam site to further downstream)? Will the replicates sample the same microhabitat (i.e. water depth, substrate, cover, velocity, temperature, turbidity)? How will sampling be stratified based on these microhabitats? Should macrophyte beds be added as an additional microhabitat? What constitutes a snag (i.e. LWD 10 cm diameter and 1 m length)? How will sections of logs be removed, chain saw? Will this disturb the insects? How will submerged or buried logs be located in turbid water? Other Questions?

2. Estimate drift of benthic macroinvertebrates in habitats within the lower, middle and upper Susitna River to assess food availability to juvenile and resident fishes.

   AEA Proposal. Collect macroinvertebrates in the drift at 9 of the benthic collection sites. Duplicate samples will be collected. Water velocity measured when nets deployed and just before removal.

   Additional Questions. Not clear whether samples will be collected during spring, summer and fall. Are 9 [middle river only] locations sufficient to characterize invertebrate drift?

udy plan requests.

Characterize the pre-project benthic macroinvertebrate and algal communities with regard to species composition and abundance in the lower, middle and upper Susitna River.

AEA Proposal. Samples will be collected at 9 mainstem and 18 off channel habitats above and below the proposed dam site, stratified by macrohabitat classification, side channel, side slough, upland slough, tributary, and tributary mouth (study plan only identifies mainstem, side channels, and sloughs). Six replicates will be collected at each sampling location, and samples will be collected on three sampling dates from April through September. "Woody snags" would be removed from the stream and invertebrates collected from the snags and identified.

Additional Questions. Are all mainchannel locations equal. That is, will a sample along an outside bend be the same as a sample collected on a point bar? Will sample locations be selected randomly or only those sites that are easily accessed? If equally divided among four macrohabitat types (excluding tributaries), this will result in approximately 4 replicates of each habitat type. Is this enough to characterize macroinvertebrates in the upper, lower, and middle river? Should sample locations be stratified based on degree of project effect (i.e. closer to the dam site to further downstream)? Will the replicates sample the same microhabitat (i.e. water depth, substrate, cover, velocity, temperature, turbidity)? How will sampling be stratified based on these microhabitats? Should macrophyte beds be added as an additional microhabitat? What constitutes a snag (i.e. LWD 10 cm diameter and 1 m length)? How will sections of logs be removed, chain saw? Will this disturb the insects? How will submerged or buried logs be located in turbid water? Other Questions?

Estimate drift of benthic macroinvertebrates in habitats within the lower, middle and upper Susitna River to assess food availability to juvenile and resident fishes.

AEA Proposal. Collect macroinvertebrates in the drift at 9 of the benthic collection sites. Duplicate samples will be collected. Water velocity measured when nets deployed and just before removal.

Additional Questions. Not clear whether samples will be collected during spring, summer and fall. Are 9 [middle river only] locations sufficient to characterize invertebrate drift? Will sample collection be related to the hydrograph (i.e. rising or falling limb)? How will drift be sampled in backwater sloughs with no velocity? How will rapid changes in flow alter invertebrate drift? Is fish abundance at tributaries related to invertebrate drift? Other Questions?

Conduct a trophic analysis to describe potential changes in the primary and secondary productivity of the riverine community following post-project construction and operation.

AEA Proposal. The proposed study plan states that a literature review will be conducted to determine the feasibility of a trophic study. The results of that review will be used to determine if a trophic analysis should be conducted.

Additional Questions. Is a literature review sufficient? Project operations will store wate during the spring and summer. This will reduce the surface e area for primary and secondary production and may affect the portion of the bed within the photic zone. The changes may be offset by reduced turbidity. This seems to be a major project related study request that is not being addressed by AEA. Measures of primary and secondary production require more than just algal chl-a and invertebrate density. They are measures of the change in biomass (usually carbon) over time. Productivity often is a function of temperature, nutrient availability, solar radiation, and velocity, all of which can be effected by project operations.

ienerate habitat suitability criteria (HSC) for Susitna River benthic macroinvertebrate and lgal habitats to predict potential changes in these habitats downstream of the proposed am site.

AEA Proposal. Habitat suitability criteria would be determined concurrent with macroinvertebrate and algal sampling at the 27 sampling locations above and below t dam stratified by macrohabitat type and collected three times from April to September

Additional Questions. Is the proposed sampling sufficient to develop habitat suitability criteria for macroinvertebrates and periphyton? What about macrophytes? These criteria will be used to evaluate how modeled changes in water depth, velocity, and substrate will affect the macroinvertebrate and algal communities. They do not curre evaluate how changes in turbidity, temperature, and macronutrients will affect invertebrate and algal communities or primary and secondary production. A good argument could be made that this level of sampling is insufficient.

aracterize the benthic macroinvertebrate compositions in the diets of representative f ecies in relationship to their source (benthic or drift component).

AEA Proposal. Stomach contents will be flushed from fish target species at the 9 locat where benthic and drift samples are collected. Samples will be processed compatible other Alaska studies, and taking federal protocols into consideration.

Additional Questions. What is the objective of this study? Is this sampling effort (locations and frequency) sufficient? Does AEA provide enough detail for the agencie

secondary production and may affect the por... changes may be offset by reduced turbidity. This seems to be a major project related study request that is not being addressed by AEA. Measures of primary and secondary production require more than just algal chl-a and invertebrate density. They are measures of the change in biomass (usually carbon) over time. Productivity often is a function of temperature, nutrient availability, solar radiation, and velocity, all of which can be effected by project operations.

Generate habitat suitability criteria (HSC) for Susitna River benthic macroinvertebrate and algal habitats to predict potential changes in these habitats downstream of the proposed dam site.

AEA Proposal. Habitat suitability criteria would be determined concurrent with macroinvertebrate and algal sampling at the 27 sampling locations above and below the dam stratified by macrohabitat type and collected three times from April to September.

Additional Questions. Is the proposed sampling sufficient to develop habitat suitability criteria for macroinvertebrates and periphyton? What about macrophytes? These criteria will be used to evaluate how modeled changes in water depth, velocity, and substrate will affect the macroinvertebrate and algal communities. They do not currently evaluate how changes in turbidity, temperature, and macronutrients will affect invertebrate and algal communities or primary and secondary production. A good argument could be made that this level of sampling is insufficient.

Characterize the benthic macroinvertebrate compositions in the diets of representative fish species in relationship to their source (benthic or drift component).

AEA Proposal. Stomach contents will be flushed from fish target species at the 9 locations where benthic and drift samples are collected. Samples will be processed compatible with other Alaska studies, and taking federal protocols into consideration.

Additional Questions. What is the objective of this study? Is this sampling effort (locations and frequency) sufficient? Does AEA provide enough detail for the agencies to evaluate the study? If this is to determine the relative importance of different food sources, shouldn't weights of invertebrate species and cohorts be collected? Should there be some information on terrestrial invertebrates and the relationship between riparian vegetation cover?

Evaluate the feasibility of reference sites on the Talkeetna and Chulitna Rivers to monitor baseline productivity, pre- and post-construction.

AEA Proposal. Conduct a literature review to identify existing river systems that could act as surrogates in evaluating future changes in productivity. If identified, evaluate the feasibility of collecting data from these river(s).

Additional Questions. There seems to be only slight differences between the agency and AEA proposed studies. Are these differences significant? How and who will determine if additional reference data collection at other sites be "feasible"? Is the intent to compare changes in macroinvertebrate community composition and algal abundance or primary and secondary production?

g. Characterize organic matter resources (e.g., available for macroinvertebrate consumers) including course particulate organic matter, fine particulate organic matter, and suspended organic matter in the lower, middle, and upper Susitna River.

AEA Proposal. In order to quantify the amounts of organic matter available in the Susitna River for river productivity, CPOM and FPOM (specifically FBOM) will be collected concurrently with all benthic macroinvertebrate sampling (Objective 2, Section 7.8.4.2.1). Suspended FPOM (Seston) [27 locations 3 times from April through September] will be collected at same time and alongside invertebrate drift sampling (Objective 3, Section 7.8.4.3). Organic matter collection will be conducted using methods compatible with other Alaska studies, to allow for comparable results. State and federal protocols will be considered as study plans are developed, in consultation with resource agencies.

Additional Questions. This also appears to be a major project component as organic matter will be trapped in the reservoir (serial discontinuity Stanford and Ward 2002). Is this level of evaluation sufficient (benthic samples at 27 locations and transport samples at 9 locations)? Should FPOM be divided into ultra fine and fine fractions? Will there still be 6 replicates of BOM and 2 replicates of transported OM at each sampling location and each sampling date? What about organic matter processing (i.e. decomposition rates) that can be influenced by temperature and nutrients? How about the effects of flow fluctuation on organic matter transport, that is flushing organic matter out of the system How about the relationship between flood flows and organic matter transport from the riparian to the stream (river flood plain interactions)? What are the state and federal protocols and how will they be considered?

Estimate benthic macroinvertebrate colonization rates in the middle and lower reaches to monitor baseline conditions and evaluate future changes to productivity in the Susitna River.

AEA Proposal. Using a stratified sampling approach, a field study will be conducted to estimate potential benthic macroinvertebrate colonization rates for different seasons in the Susitna River. Sets of three to five preconditioned artificial substrates will be deploye incrementally for set periods of colonization time (e.g., 12, 8, 6, 4, 2, and 1 weeks) and

organic matter in the lower, middle, and upper Susitna River.

AEA Proposal. In order to quantify the amounts of organic matter available in the Susitna River for river productivity, CPOM and FPOM (specifically FBOM) will be collected concurrently with all benthic macroinvertebrate sampling (Objective 2, Section 7.8.4.2.1). Suspended FPOM (Seston) [27 locations 3 times from April through September] will be collected at same time and alongside invertebrate drift sampling (Objective 3, Section 7.8.4.3). Organic matter collection will be conducted using methods compatible with other Alaska studies, to allow for comparable results. State and federal protocols will be considered as study plans are developed, in consultation with resource agencies.

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AEA Proposal. Using a stratified sampling approach, a field study will be conducted to estimate potential benthic macroinvertebrate colonization rates for different seasons in the Susitna River. Sets of three to five preconditioned artificial substrates will be deployed incrementally for set periods of colonization time (e.g., 12, 8, 6, 4, 2, and 1 weeks) and then pulled simultaneously at the conclusion of the colonization period. Artificial substrates will be deployed at three depths at fixed sites along the channel bed. Benthic macroinvertebrate colonization rates may be conducted in a variety of habitats (e.g., turbid vs. non-turbid areas, groundwater upwelling areas vs. areas without groundwater upwelling). Benthic macroinvertebrate processing protocols would be identical to those used in sampling.

Additional Questions. How are samples stratified? Is colonization of tiles the same as colonization of newly inundated stream beds? Will colonization be related to drift? Does

substrate effect colonization (i.e. use natural substrate, cobble, woody debris)? Will colonization of a substrate suspended in the water column be the same as on the stream bed?

AEA Proposed Agenda

n Address the feasibility of a trophic analysis to describe potential changes in the primary and secondary productivity of the riverine community following Project construction and operation.

-What is productivity?

-Options to consider, bioenergetics model, ecosystem productivity study, isotope analysis, other?

m Reference sites on the Talkeetna and Chulitna Rivers to monitor baseline productivity, pre- and post-construction.

-Potential reference sites
-Need for/utility of BACI design
-Evaluation of reference sites

m Need for/value of a literature/data search to identify existing river systems that could act as surrogates in evaluating future changes to productivity in the Susitna River

-Quick overview of literature on regulated glacial rivers,
-Discussion of potential AK surrogates and existing data

APPENDIX 4
INFORMAL CONSULTATION DOCUMENTATION

SECTION 10 – WILDLIFE RESOURCES

Documentation of Consultation on Wildlife Resources Study Plans
(from release of PSP on July 16, 2012 through Interim Draft RSP on October 31, 2012)

08/16/2012 Telephone conversation between Mark Burch, ADF&G, and Brian Lawhead, ABR

09/06/2012 Notes from Small Group Meeting on Shorebirds and Landbirds

09/13/2012 Notes from Small Group Meeting on Selected Mammals

09/22/2012 Email from Steve Matsuoka, USFWS, to Brian Lawhead, ABR

09/24/2012 Email from Mark Burch, ADF&G, to Brian Lawhead, ABR

09/24/2012 Telephone conversation between Mark Burch, ADF&G, and Brian Lawhead, ABR

10/04/2012 Notes from Small Group Meeting on Waterbirds

10/12/2012 Email (re: wolverine study) from Mark Burch, ADF&G, to Brian Lawhead, ABR

10/12/2012 Email (re: Dall's sheep study) from Mark Burch, ADF&G, to Brian Lawhead, ABR

10/31/2012 Email from Mark Burch, ADF&G, to Brian Lawhead, ABR

11/21/2012 Telephone conversation between Mark Burch, ADF&G, and Brian Lawhead, ABR

11/29/2012 Telephone conversation between Sarah Bullock, BLM, and Brian Lawhead, ABR

12/04/2012 Telephone conversation between Howard Golden, ADF&G, and Brian Lawhead, ABR

12/04/2012 Telephone conversation between Merav Ben-David, University of Wyoming and Brian Lawhead, ABR

12/7/2012 Email from Mark Burch, ADF&G, to Brian Lawhead, ABR

Robin Reich

From: Brian Lawhead <lawhead@abrinc.com>
Sent: Friday, December 07, 2012 4:03 PM
To: Robin Reich
Subject: FW: BLM comments on AEA study requests

From: Burch, Mark E (DFG) [mailto:mark.burch@alaska.gov]
Sent: Thursday, August 16, 2012 4:34 PM
To: 'Brian Lawhead'
Cc: McGregor, Elizabeth A (AIDEA); Dale, Bruce W (DFG); Merizon, Richard A (DFG); 'mslindberg@alaska.edu'; King, Kimberly N (DFG)
Subject: RE: BLM comments on AEA study requests

Hi Brian,

Here is our response to BLM's comment (Methods are very vague in relation to "multistate models" and "occupancy models". The BLM recommends more specificity about which models are used to ensure that the analysis represents the best science available to produce valid results.):

Multistate and occupancy models are the most advanced analytical techniques for estimating movement, survival, and distributional patterns of marked and unmarked wildlife populations. These analytical approaches are a specific form of modeling that account for detection in the estimation algorithms and each approach is described in detail in the references provided. A more detailed description of the modeling would be extensive and redundant to that provided in the references and the references provide evidence that we are using best tools for valid results. We could provide additional reference to support our choice of methods if necessary.

Hopefully the meeting notes from the terrestrial working group will reflect resolution of the other issues raised by BLM. If not, we can provide written responses to any unresolved concerns.

As you have probably noticed, I've been in a long period of transitioning my office to Palmer. My email address will remain the same, but my mailing address and office telephone number are changing as indicated below.

Mark

Mark Burch
Special Projects Coordinator
1800 Glenn Highway, Suite 4,
Palmer, Alaska 99645
Office (907) 861-2109
Cell (907) 863-8518

Robin Reich

From: Terry Schick <tschick@abrinc.com>
Sent: Thursday, November 01, 2012 4:17 PM
To: Robin Reich
Subject: Fwd: species list
Attachments: pic24767.gif

---------- Forwarded message ----------
From: <Steve_Matsuoka@fws.gov>
Date: Wed, Sep 12, 2012 at 1:25 PM
Subject: Re: species list
To: Brian Lawhead <lawhead@abrinc.com>
Cc: Jim_A_Johnson@fws.gov, Maureen_deZeeuw@fws.gov, Richard_Lanctot@fws.gov, Terry Schick <tschick@abrinc.com>

Hi Brian,

Thanks for the explanation about the wildlife-gap analysis and the Kessel surveys. Thanks also for including the two shorebirds as species possibly occurring in the project area.

The BCC list that I referenced is the 2008 version (http://library.fws.gov/bird_publications/bcc2008.pdf). It incudes species at 3 different levels: BCR, Region, and National. It would be useful if the BCC column in your document reflected whether the species was on at least one of these 3 levels.

Thanks again Brian for fielding our comments.

Steve Matsuoka
U.S. Fish and Wildlife Service
Migratory Bird Management
1011 E. Tudor Road, ms 201
Anchorage, Alaska 99503
907-786-3853

Brian Lawhead <lawhead@abrinc.com>

Brian Lawhead
<lawhead@abrinc.com>

09/12/2012 11:18 AM

To Steve_Matsuoka@fws.gov

cc Terry Schick <tschick@abrinc.com>, Maureen_deZeeuw@fws.gov, Jim_A_Johnson@fws.gov, Richard_Lanctot@fws.gov

Subject Re: species list

Hi Steve,

Thanks very much for this review. The table that Terry sent you was from the wildlife data-gap analysis that we provided to AEA in August 2011. It reflects the BCC lists for BCR 4 and the Alaska region (Tables 4 and 46 in the 2008 version, which was cited at that time in the FERC/USFWS MOU). It sounds as though a newer version of the BCC document is now available, so we would appreciate a copy if you have it handy (otherwise we will check the national USFWS site), and we will update the list and citations accordingly.

We did not include Short-billed Dowitcher or Hudsonian Godwit because they were not recorded in the study area during the 2 years of field surveys done by Kessel's UA Museum crews, but we will add them to the list as possible species.

It was good to see you last week -- thanks again for your contributions in the meeting and since then!

Brian

On Wed, Sep 12, 2012 at 9:29 AM, <Steve_Matsuoka@fws.gov> wrote:

> Hi Terry,
>
> Jim Johnson, Rick Lanctot, and I looked over the list and and a couple of quite minor comments.
>
> 1. A few species on your list are on the BCC list for Alaska or nationally, but are not checked off under the BCC column. Some examples include Short-eared Owl and Surfbird. I recommend that you review the Alaska and national lists in the BCC report to make sure that all the relevant species are properly included.
>
> 2. Two shorebirds that are on the BCC list that could be added are Hudsonian Godwit and Short-billed Dowitcher.These are probably occur in quite low densities, but should be included to the list.
>
> Thanks for the opportunity for us to weigh in on this.
>
> Steve Matsuoka
> U.S. Fish and Wildlife Service
> Migratory Bird Management
> 1011 E. Tudor Road, ms 201
> Anchorage, Alaska 99503
> 907-786-3853
> Terry Schick <tschick@abrinc.com>

Terry Schick
<tschick@abrinc.com>

09/10/2012 06:45 PM

To Steve_Matsuoka@fv

cc Maureen_deZeeuw@
Brian Lawhead
<lawhead@abrinc.co

Subject Re: species list

Steve,

It was nice to see you again, and thanks again for your input into the process. Attached is the table of bird species of conservation concern that we were discussing in the meeting. This set of species was selected based on the FERC-USFWS MOU on migratory birds (also attached).

-Terry

On Mon, Sep 10, 2012 at 10:39 AM, <Steve_Matsuoka@fws.gov> wrote:

> Hi Terry,
>
> Nice talking with you last week. Just wanted to follow up on a few things that I promised you during our meeting.
>
> 1. Priority species list. Can you send me the priority species list that Brian showed us so that I can quickly review it for important omissions? Thanks.
>
> 2. Kessel versus Viereck. I could not find a copy of Colleen Handel's summary of the differences between Kessel and Viereck classifications. I emailed Colleen to get a copy but have not heard back from her. I'll get back in touch with you about this after I have heard back from Colleen.

Robin Reich

From: Brian Lawhead <lawhead@abrinc.com>
Sent: Monday, September 24, 2012 3:47 PM
To: Robin Reich
Cc: Betsy McGregor; Alex Prichard
Subject: Fwd: Caribou and Moose Proposed Study Plans
Attachments: SuWa_Telephone-Record_ADFG_20120924.docx

Robin,

Here is a record of further consultation with ADF&G today on wildlife study plans. Also see the attached telephone record for other items I discussed with Mark by telephone this afternoon.

Brian

---------- Forwarded message ----------
From: **Burch, Mark E (DFG)** <mark.burch@alaska.gov>
Date: Mon, Sep 24, 2012 at 2:48 PM
Subject: Caribou and Moose Proposed Study Plans
To: "Brian Lawhead (lawhead@abrinc.com)" <lawhead@abrinc.com>
Cc: "King, Kimberly N (DFG)" <kimberly.king@alaska.gov>, "Dale, Bruce W (DFG)" <bruce.dale@alaska.gov>, "Butler, Lem G (DFG)" <lem.butler@alaska.gov>, "Schwanke, Becky A (DFG)" <becky.schwanke@alaska.gov>

Hi Brian,

We would like to make a change to the caribou study as indicated below:

"Document productivity and ~~calf~~ survival of caribou using the greater Project area;"

The change is to simply strike calf from the third objective.

The moose study plan contemplates conducting one or more GSPE's above and below the proposed dam. As we discussed, if conditions allow and it is otherwise feasible one large (200 sample units) GSPE for both upstream and downstream of the proposed dam will be conducted in November of 2012. Otherwise the proposed study plan will need to be amended to include one or more GSPE's at a later date.

Mark Burch

SUSITNA-WATANA HYDROELECTRIC PROJECT

RECORD OF TELEPHONE CONVERSATION

AEA Team Member		Other Party	
Name:	*Brian Lawhead*	**Name:**	*Mark Burch*
Organization:	*ABR, Inc.*	**Organization:**	*Alaska Dept. of Fish & Game*
Study Area:	*Various*	**Phone Number:**	*907-861-2109*
Date:	*24 Sep 2012*	**Time:**	*~14:00*
Call Placed by: [X] AEA Team [ ] Other Party			

Others on Call: None

Subject: Expansion of ADF&G role in 2013–2014 wildlife study plans

Discussion:

Brian called Mark to initiate further discussion on ADF&G's potential interest in expanding the agency's role in the 2013–2014 study plans, first discussed at the September 13 meeting at ADF&G. Mark is currently trying to organize internal ADF&G meetings to follow up on specifics with the appropriate departmental staff.

Specific items of discussion included the following:

Wolverine study: ADF&G is potentially interested in participating in the proposed survey effort, using the Sample-Unit Probability Estimator (SUPE) method. ABR could potentially provide some observers if ADF&G needs additional help.

Dall's sheep study: ADF&G is potentially interested in conducting the proposed aerial survey in the study area. Other items being considered by ADF&G are the possibility of genetic sampling to elucidate the degree of isolation of the sheep inhabiting the Watana Creek Hills (north of the proposed reservoir inundation zone), as well as the extent of the aerial survey area needed on the southern side of the Susitna River.

Large carnivores study: ADF&G is pursuing the feasibility of conducting the density modeling (discussed at the Sep. 13 meeting) with David Miller of the University of Rhode island. They also will discuss their potential involvement in the DNA and stable isotope sampling proposed for bears using anadromous fish spawning streams downstream from the dam in the middle reach of the Susitna River drainage.

Aquatic furbearer study: ADF&G is willing to assist in obtaining hair samples for preconstruction characterization of mercury levels in aquatic furbearers, although the small number of trappers, and the small number of piscivorous furbearers likely harvested, in the reservoir inundation zone and stream drainages immediately downstream from the proposed dam site would be problematic for obtaining samples. Hair snags might be a better way to obtain samples.

Also discussed minor revisions to the Proposed Study Plans for caribou (drop calf survival estimation from objectives) and moose (GeoSpatial Population Estimator [GSPE] survey is being planned for November 2012, so, if successful, then the GSPE effort could be dropped from the 2013–2014 study plan. If not successful in 2012 due to unsuitable survey conditions, then the GSPE survey effort would be retained in the study plan. See follow-up email about the caribou and moose plan revisions from Mark Burch to Brian Lawhead on same date.

SUSITNA-WATANA HYDROELECTRIC PROJECT

RECORD OF TELEPHONE CONVERSATION

AEA Team Member		Other Party	
Name:	*Brian Lawhead*	**Name:**	*Mark Burch*
Organization:	*ABR, Inc.*	**Organization:**	*Alaska Dept. of Fish & Game*
Study Area:	*Dall's Sheep & Wolverine*	**Phone Number:**	*907-861-2109*
Date:	*5 Oct 2012*	**Time:**	*(not recorded)*
Call Placed by: [X] AEA Team [ ] Other Party			

Others on Call: None

Subject: Expansion of ADF&G role in 2013–2014 wildlife study plans

Discussion:

Mark called Brian to discuss ADF&G's interest in expanding the agency's role in the 2013–2014 study plans, as discussed at the small-group follow-up meeting at ADF&G September 13 and in a phone conversation on September 24.

Specific items of discussion included the following:

Dall's sheep study: ADF&G is interested in conducting the proposed aerial survey in the study area, focusing on Game Management Unit 13E east of the Parks Highway, using their standard summer survey timing in late July or early August, shortly before the hunting season begins. Another potential study component being considered by ADF&G is the possibility of radio-collaring sheep at the Jay Creek mineral lick to examine movements in sheep range north of the Susitna River. He requested an electronic version of the most current version of the study plan for revision.

Wolverine study: ADF&G is interested in conducting the proposed survey effort, using the Sample-Unit Probability Estimator (SUPE) method and possibly extending the sampling over 2 years to allow for occupancy modeling. He requested an electronic version of the most current version of the study plan for revision.

Robin Reich

From: Burch, Mark E (DFG) [mailto:mark.burch@alaska.gov]
Sent: Friday, October 12, 2012 11:22 AM
To: Brian Lawhead (lawhead@abrinc.com)
Cc: Dale, Bruce W (DFG); Schwanke, Becky A (DFG); King, Kimberly N (DFG); Butler, Lem G (DFG); Bender, Louis C (DFG); Rinaldi, Todd A (DFG)
Subject: Draft RSP-10_Wildlife Resources_10 9 Wolverine DWCa

Brian,

Our revised wolverine study plan is attached in track changes as you requested. For the purposes of planning, we needed an idea of how many sample units we were dealing with so we developed the attached map. I realize you will need to develop an entirely new figure once you get the revised shape files for the inundation area. The grid depicted in the attachments is rough. Note the shape file for the grid is also attached. Generally we make the grid 3 degrees by 2 degrees so the lat and long stay constant for the sample unit. This also figures pretty close to 25 km2. The result is that the number of sample units should remain at about 320, but the grid lines may move on the map. The attachments should be fine for study review at this time, even though they may change by February. We may also consider another change if we can work it out. For the occupancy modeling it would be more efficient to have hexagonal shaped sample units. We're not sure if we could make that work logistically for the SUPE at this point. Whatever we do, the sample units for the occupancy model must be constant and would have to match the SUPE if we want to use the SUPE data to run the occupancy modeling.

Mark

Robin Reich

From: Burch, Mark E (DFG) [mailto:mark.burch@alaska.gov]
Sent: Friday, October 12, 2012 3:15 PM
To: Brian Lawhead (lawhead@abrinc.com)
Cc: Dale, Bruce W (DFG); Schwanke, Becky A (DFG); Butler, Lem G (DFG); King, Kimberly N (DFG)
Subject: FW: Revised Sheep Study draft

Brian,

The revised sheep study plan without the collaring included is attached. As we discussed on the phone the Division of Wildlife Conservation believes this approach will be adequate. We commented previously that, "The Dall's Sheep project calls for delineating seasonal home ranges, but summer range should be adequate. The Jay Creek mineral lick is above the area of inundation, so there is no reason to believe the current data is not adequate."

Mark Burch
Special Projects Coordinator
1800 Glenn Highway, Suite 4,
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Robin Reich

-----Original Message-----
From: Burch, Mark E (DFG) [mailto:mark.burch@alaska.gov]
Sent: Wednesday, October 31, 2012 9:39 AM
To: 'Brian Lawhead'
Subject: RE: Susitna-Watana study area boundary

Brian,

We have to draw the line somewhere and we are saying we will draw it at the subunit boundary. Note the 13A mountains are some distance from the impoundment area. I recognize that makes the south boundary adjacent to 13A a bit arbitrary too.

Mark

-----Original Message-----
From: Brian Lawhead [mailto:lawhead@abrinc.com]
Sent: Tuesday, October 30, 2012 6:36 PM
To: Becker, Earl F (DFG)
Cc: Burch, Mark E (DFG)
Subject: Susitna-Watana study area boundary

Hi Earl,
We're currently revising all of the study area maps for the Revised Study Plan; the attached are from the Proposed Study Plan (July version) for your reference.

I'm changing the "downstream area" boundary to correspond to cataloged anadromous spawning streams, but I need you to indicate the outlines of your area for the spatial modeling of bear densities. I included the revised moose map in case the study area boundary is close to what you envision for the bear density modeling.

You can either print one of these and draw something on by hand to scan and send back, or use descriptive geographic features, or ask Becky Strauch to draw something for you and send it as a shapefile. It need not be elaborate and can be approximate, but it I need your best take on it for our next draft, which is due to AEA early next week.

Thanks!
Brian

PS -- Mark, is the attached moose study area similar to what you envision for sheep? The only difference from the text description you provided for the sheep survey area is that part of 13A is included for moose. I'm wondering if you want

to include the mountains in that portion of 13A for the sheep surveys too, rather than dividing it at the 13E boundary (Kosina Creek).

SUSITNA-WATANA HYDROELECTRIC PROJECT

RECORD OF TELEPHONE CONVERSATION

AEA Team Member		Other Party	
Name:	*Brian Lawhead*	**Name:**	*Mark Burch*
Organization:	*ABR, Inc.*	**Organization:**	*Alaska Dept. of Fish & Game*
Study Area:	*Various*	**Phone Number:**	*907-861-2109*
Date:	*21 Nov 2012*	**Time:**	*~12:00*
Call Placed by: [X] AEA Team [X] Other Party			

Others on Call: None

Subject: Follow-up on ADF&G comments on selected wildlife study plans for 2013–2014 Revised Study Plan

Discussion:

Brian returned Mark's call, which was a follow-up to an email from Brian requesting a conversation to discuss ADF&G comments in an email from Mark to Brian on November 19, 2012.

Specific items of discussion included the following:

Wood frog study (Section 10.18): Brian described ABR's proposed response to Mark's email comment (dated Monday, November 19, 2012) regarding the need to conduct two visits to each sampling site for frog surveys. As proposed, the frog study plan will incorporate removal sampling, which should be slightly more efficient than the standard design for estimating occupancy rate and will allow sampling of more ponds in the failry short time period available for sampling, which will help meet the objective to sample a broad area throughout the entire Project area.

Aquatic furbearer study (Section 10.11): Brian asked for clarification on the PSP comment regarding the use of transects for river otter surveys, and Mark suggested that Brian contact Howard Golden of ADF&G DWC for further discussion.

Moose study (Section 10.5): The GeoSpatial Population Estimator (GSPE) survey planned for November 2012 has not yet been conducted because of insufficient snow cover in the study area during preliminary stratification survey flights. They will keep trying, but the cut-off date is December 5. If the GSPE cannot be flown in 2012 due to unsuitable survey conditions, then it will be retained in the study plan for November 2013 or March 2014.

SUSITNA-WATANA HYDROELECTRIC PROJECT

RECORD OF TELEPHONE CONVERSATION

AEA Team Member		Other Party	
Name:	*Brian Lawhead*	**Name:**	*Sarah Bullock*
Organization:	*ABR, Inc.*	**Organization:**	*Bureau of Land Management*
Study Area:	*Project area*	**Phone Number:**	*(907) 822-3217*
Date:	*29 November 2012*	**Time:**	*3:00 PM*
Call Placed by: [X] AEA Team [ ] Other Party			

Others on Call: None

Subject: 2013–2014 Revised Study Plans for Willow Ptarmigan and Small Mammals

Discussion:

Willow Ptarmigan (Section 10.17): Brian described the comment response received by email on 16 August 2012 from the Alaska Department of Fish and Game and the University of Alaska Fairbanks, sent in response to Sarah's comment on the study request in BLM's May submittal and discussed at the Terrestrial Resources Technical Work Group meeting on 9 August 2012. Although Brian had received the original email from Mark Burch, she was not cc'd and Brian did not forward it to Sarah for her records. Brian discussed the response with Sarah and she was satisfied with the response. After the call, Brian forwarded the email response to Sarah for her records.

Small Mammals (Section 10.12): Brian described the proposed conversion of the small mammal study from one with both desktop and field components to a desktop-only analysis, as proposed at the Terrestrial Resources Technical Work Group meeting on 16 October 2012. He explained the rationale for doing so, which is that, based on the intensive work conducted using appropriate sampling methods by the University of Alaska Museum in the early 1980s for the original APA Susitna Hydroelectric Project, additional field trapping using the same sampling methods is unlikely to provide significant new information on the occurrence and habitat use of small mammal species in the Project area. The combination of the existing data with the habitat map to be produced for the Project area is expected to provide sufficiently detailed information to fulfill the goal of the study. Sarah appreciated the call and was satisfied with the proposed change. After the call, Brian forwarded some information and publications to Sara on the Alaska tiny shrew, which is listed by BLM as a sensitive species.

SUSITNA-WATANA HYDROELECTRIC PROJECT

RECORD OF TELEPHONE CONVERSATION

AEA Team Member		Other Party	
Name:	*Brian Lawhead*	**Name:**	*Howard Golden*
Organization:	*ABR, Inc.*	**Organization:**	*Alaska Dept. of Fish and Game*
Study Area:	*Project area*	**Phone Number:**	*(907) 267-2177*
Date:	*4 December 2012*	**Time:**	*11:10 AM*
Call Placed by: [X] AEA Team [ ] Other Party			

Others on Call: Alex Prichard, ABR, Inc.

Subject: 2013–2014 Revised Study Plan for Aquatic Furbearers

Discussion:

Aquatic Furbearers (Section 10.11): Brian and Alex called Howard to discuss ADF&G's comment on the draft interim Revised Study Plan, dated 14 November 2012, in which it was suggested that transect surveys or occupancy modeling might be considered as part of the study design. Howard suggested that transect surveys to count tracks intercepting the flight lines (marked as GPS waypoints and quantified as tracks per kilometer) would be more useful for river otters than would an occupancy model design.

The discussion focused on layout of transects perpendicular to the main Susitna River drainage and tributary drainages, rather than following the watercourses, as proposed in the plan. The purpose of the perpendicular transects would be to attempt to detect river otters using lakes away from streams and crossing from one drainage into adjacent ones.

Howard also described the design of the modified snare he suggested using to sample otter hair for mercury sampling. Following the call, Howard sent an article describing the otter hair snare design he suggested.

SUSITNA-WATANA HYDROELECTRIC PROJECT

RECORD OF TELEPHONE CONVERSATION

AEA Team Member		Other Party	
Name:	*Brian Lawhead*	**Name:**	*Merav Ben-David*
Organization:	*ABR, Inc.*	**Organization:**	*University of Wyoming*
Study Area:	*Project area*	**Phone Number:**	*(307) 766-5307*
Date:	*4 December 2012*	**Time:**	*11:40 AM*
Call Placed by: [X] AEA Team [ ] Other Party			

Others on Call: Alex Prichard and Rick Johnson, ABR, Inc.

Subject: 2013–2014 Revised Study Plan for Aquatic Furbearers

Discussion:

Aquatic Furbearers (Section 10.11): Brian, Alex, and Rick called Dr. Ben-David to discuss her suggestions for potential sampling methods and study design considerations for aquatic furbearers. Rather than using measures of relative abundance or snow-tracking transects, she favors using noninvasive sampling of sampling of hair obtained with snags or scats collected from latrine sites for DNA genotyping, combined with capture–recapture methods, to derive population estimates, which would require an intensive ground-based sampling effort in an area as large as the Project area. Following the call, she emailed several articles describing various hair and fecal sampling techniques.

Robin Reich

From: Brian Lawhead <lawhead@abrinc.com>
Sent: Friday, December 07, 2012 3:39 PM
To: Robin Reich
Subject: FW: Interim Draft Revised Study Plan for Wood Frog Occupancy

From: Burch, Mark E (DFG) [mailto:mark.burch@alaska.gov]
Sent: Monday, November 19, 2012 2:36 PM
To: Brian Lawhead (lawhead@abrinc.com)
Cc: McGregor, Elizabeth A (AIDEA); Klein, Joseph P (DFG); Dale, Bruce W (DFG)
Subject: Interim Draft Revised Study Plan for Wood Frog Occupancy

Brian,

After the deadline for comments on the Study Plans had passed, I was catching up on reviewing some of the Interim draft revised study plans that I had not been able to carefully review previously. That lead to a concern about the occupancy study for wood frogs. Rather than wait for the next opportunity to comment, I'm bringing the concern to you now.

The document says, "The second survey at each site will be conducted by a different observer with no knowledge of the survey results from the first survey." This makes sense, but it goes on to say, "However, if detected on the first survey, a second survey will not be needed." The two statements don't really jive. The second statement apparently assumes a detectability of "1". All sites should be surveyed twice to assess detectability. The draft goes on to explain that a small number of acoustic monitoring devices will be deployed to increase accuracy. That is a good approach in addition to making at least two site visits.

The document lists a number of covariates such as habitat and environmental characteristics that will be noted. Recording these parameters will be very useful.

Thank you for considering these comments outside of the formal process. I hope you find them helpful.

Mark Burch
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