



SUSITNA-WATANA HYDRO

Meeting Notes Initial Study Report (ISR) Meetings Fish and Aquatics (Studies 9.05 – 9.17) March 22, 2016

- LOCATION:** Cook Inlet Region Inc.
725 E Fireweed Ln
Anchorage, AK 99503
- TIME:** 8:30 am – 4:45 pm AKST
- SUBJECT:** ISR Meetings for Fish and Aquatics Studies (RSP Sections 9.05 through 9.17)
- Goal:** To review variances, results, decision points, proposed modifications, steps to complete studies, and discuss licensing participants' comments on ISR materials
- Attendees:** **Betsy McGregor** AEA, **Bryan Carey** AEA, **Doug Ott** AEA, **Dan Smith** AEA, **Wayne Dyok** H2O EcoPower, **Julie Anderson** DMS, **Matt Love** VNF, **Steve Padula** McMillen Jacobs, **Kathryn Peltier** McMillen Jacobs, **Sydney Hamilton** ATD, **Sunny Morrison** ATD
MaryLouise Keefe R2, **Ray Beamesderfer** R2, **Adrienne Stutes** DOWL, **Bill Fullerton** Tetra Tech, **Lyle Zevenbergen** Tetra Tech, **Rob Plotnikoff**, Tetra Tech, **Dudley Reiser** R2, **Phil Hilgert** R2, **Steve Swope** Pacific Groundwater Group, **Jon Zufelt** HDR
David Turner FERC, **Matt Cutlip** FERC, **Ken Hogan** FERC
Dirk Pedersen Stillwater Sciences, **Matthew Burak** Louis Berger, **Fred Winchell** Louis Berger, **Tyler Rychener** Louis Berger, **Tim Ruga** AKRF
Joe Klein ADF&G, **Ron Benkert** ADF&G, **Pete Cleary** ADF&G, **Richard Yanusz** ADF&G, **Jack Erickson** ADF&G, **Marie Steele** DNR
Betsy McCracken USFWS, **Douglass Cooper** USFWS, **Sue Walker** NMFS, **Sean Eagan** NMFS
Chris Holmquist-Johnson USGS, **Hal Geiger** St. Hubert Research Group, **Jeff Davis** ARRI, **Jason Mouw** Floodplain Resources
Tim Sundlov BLM, **Matthew LaCroix** EPA, **Cassie Thomas** National Park Service
Jason Brune CIRI, **Becky Long** Susitna River Coalition, **Heather Leba** SRC, **Mike Wood** SRC, **Melissa Heuer** SRC, **Emily Anderson** Wild Salmon Center, **Sam Snyder** Trout Unlimited, **Laura Briggs**,
- On Phone:** **Jerry George** R2, **Kai Steimle** R2, **Alice Shelly** R2, **Tim Nightengale** R2, **Eric Shoen** UAF, **Dana Postlewait** R2, **Laura Arendall** R2, **Kirby Gilbert** MWH, **Jon Ludwig** Tetra Tech
Russ Liebig Stillwater, **Ken Jarrett** Stillwater, **Peter Foote** Louis Berger
Chuck Guthrie NOAA, **Jeff Guyon** NMFS, **Bjorn Lake** NMFS, **Ed Meyer** NMFS, **Tom Meyer** NOAA
Greg Auble USGS, **Leanne Hanson** USGS, **Greg Ruggerone** NRC, **Lucius Caldwell** Fish Sciences, **George Gilmour** Meridian
Jennifer Curtus EPA, **Roberta Budnik** USACE

Dan Reichardt ADEC

Heide Lingenfelter Ahtna, Inc., **Sara O’Neal** Wild Salmon Center, **Rachel Burns**, **Jan Konigsberg**
Alaska Hydro Project

Introduction

As part of the Federal Energy Regulatory Commission’s (FERC) Integrated Licensing Process (ILP), Alaska Energy Authority (AEA) is required to hold meetings with licensing participants and FERC to discuss the study results and AEA’s plans to modify the Study Plan as outlined in the Initial Study Report (ISR). The ISR Parts A, B, and C for each study were filed with the FERC on June 3, 2014. For many studies, additional information was filed in technical memoranda September through December 2014. In the fall of 2015, Study Implementation Reports (SIR) and Study Completion Reports (SCR) were filed with FERC to report on the status or in some cases completion of studies since the previous ISR filings. ISR Part D, filed on November 6, 2015, provided a “roadmap” of the various components of each study, updates to the study progress, variances, modifications, and steps to complete the study. The ISR Meetings were held in Anchorage over five days, March 22, 23, 25, 29 and 30, 2016, covering the 58 FERC-approved Study Plans for the Susitna-Watana Project.

The following meeting notes are for the March 22, 2016 meeting and intended to capture any significant discussion/information in addition to the materials provided on the Project website (<http://www.susitna-watanahydro.org/>). The meeting agenda and presentations are available under the “previous meetings” tab (link provided under the meetings tab) on the Project website.

After introductions, Steve Padula, McMillen Jacobs, presented a brief overview of the history of major filings and milestones of the Project and an updated FERC schedule. AEA will file the ISR Meeting Summary April 24, 2016. Licensing participants file requests for modifications to the existing Study Plan or requests for new studies June 23, 2016. Steve reviewed the regulatory requirements for requesting a study plan modification to an existing study or a new study, and made reference to the poster boards in the room. AEA and other licensing participants file responses to the requests August 22, 2016. FERC will make its study plan determination on the meeting summaries and any disagreements or recommendations for modified or new studies by October 21, 2016. These details are in the “Introduction to ISR Meetings” presentation.

After initial introduction, Betsy McGregor, AEA, indicated that AEA would be filing a meeting summary and indicated the licensing participants need to file their proposed study plan modifications or new studies with FERC, following the regulations, for FERC’s consideration. David Turner, FERC, acknowledged this and in response to questions stated that the meeting summary is intended to summarize comments and recommendations heard today. David also stated that the Commission will make the decision on study modifications.

Jeff Davis, ARRI, asked about the criteria for study modifications, noting that most studies had variances. David Turner, FERC, responded that the entire study is open for modifications. He suggested that participants consider if the study had achieved its objectives. Jeff Davis followed up with a question as to whether there is an obligation to conduct studies. He further asked if the summary would include recommendations. An applicant is required to conduct the studies and if they are not conducted as proposed, an applicant must explain why and show how the study objectives were met.

Becky Long, Susitna River Coalition (SRC), noted that the comment process was confusing because studies were not integrated into one document. She asked what the comments should be based upon. Comments should be based upon all the study results to date that are in the record.

In response to a follow up question from Ms. Long about AEA's plan for field work, Betsy McGregor, AEA, responded that AEA's plan is for very limited field work this year. To preserve the State of Alaska's investment, field work would be limited to completing studies near completion - continue tracking collared animals, conduct moose browse surveys, complete aquatic furbearer surveys, and measure ice thicknesses and water surface elevations for the ice modeling. No other field work is planned except to remove hydrology equipment from the field.

Steve Padula, McMillen Jacobs, reiterated that the Part D road map was completed to help the record. Relevant information for each study is identified in Part D to facilitate review of available information for each study. Steve said that the purpose of the meeting today is to obtain feedback on all elements of the record for each study.

9.10 Future Reservoir Fish Community and Entrainment

MaryLouise Keefe, R2 Resource Consultants (R2), indicated that this was a desk-top study that had been deferred and no work had yet been conducted.

AEA is not proposing any modifications to the FERC-approved Study Plan.

9.15 Analysis of Fish Harvest in and Downstream of the Susitna-Watana Hydroelectric Project Area

MaryLouise Keefe, R2, indicated that this was a desk-top study that had been deferred and no work had yet been conducted. Heather Leba, SRC, asked about the process to be used to obtain the state's data, and if there would be enough lead time to obtain the data. MaryLouise Keefe responded that the schedule developed would be sufficient for data records to be obtained from ADF&G once this study is initiated.

AEA is not proposing any modifications to the FERC-approved Study Plan.

9.13 Aquatic Resources within the Access Alignment, Transmission Alignment, and Construction Area

MaryLouise Keefe, R2, indicated that no reporting had occurred on this study since the June 2014 ISR and that the field data collection for this study has been deferred until the next year of study.

AEA proposed three modifications to the Study Plan (Slide 8): 1) elimination of the Chulitna Corridor from the study area; 2) addition of the Denali East Option Corridor to the study area; and 3) conduct 2 sampling events during a single year of study instead of once in each of two years.

Sue Walker, NMFS, asked when the deferred field work would be conducted. Dr. Keefe answered in the next year of study and Betsy McGregor, AEA, clarified that would be sometime in the future but not likely in 2017.

Becky Long, SRC, provided written comments to FERC during the meeting. Topics covered included a request that water quality sampling be added to address background conditions at stream crossings, buffer zones and project infrastructure.

Becky Long, SRC, expressed concern about AEA completing all of the sampling in one field season, but alluded to the fact that at the October 2014 ISR meeting, MaryLouise Keefe, R2, had estimated the level of effort required and

stated that it would be reasonable to complete all of the data collection within in a single study year. Becky Long also inquired if the characterization of geomorphic conditions at stream crossings (Study 6.5) had yet occurred.

Becky Long, SRC, referenced the study goal of gathering data to determine the least environmentally damaging alternative, referenced the wetlands present in the area, and expressed the challenge of knowing where all the facilities were going to be sited due to lack of maps and raised concerns about the foot print of the study not being sufficiently expansive. She also inquired if aerial imagery had been gathered for the Denali East Option and if any data collection had occurred there. Betsy McGregor, AEA, indicated that aerial imagery had been gathered for the Denali East Option and that data collection had also occurred for many studies. Betsy McGregor also referenced the study areas of Study 11.5 (Vegetation and Wildlife Habitat Mapping) and Study 11.7 (Wetland Mapping) which consist of the entire area within a 2-mile buffer around all of the corridors, including Denali East Option, as well as the Project infrastructure. Betsy McGregor indicated that the vegetation and wetlands mapping of the area is underway, but has not yet been completed, which is why maps have not been provided yet. She noted that trails in the Denali East Option had also been mapped.

Ron Benkert, ADF&G, commented that the agency appreciated the elimination of the Chulitna Corridor alternative due to the presence of anadromous fish and ask if the State Department of Transportation had been consulted on the Denali East Corridor. Wayne Dyok, H₂O Ecopower, indicated consultation will be scheduled when the studies resume.

9.17 Cook Inlet Beluga Whale Study

Adrienne Stutes, DOWL, reviewed the objectives, study status, variances, and proposed modifications. She indicated that no field work had been conducted since that reported in the June 2014 ISR and the September 26, 2014 Tech Memo. Significant modifications to the study plan were described in the September 30, 2014 Tech Memo.

AEA had proposed three Study Plan modifications (Slide 11): 1) replacing aerial surveys with vessel-based incidental observations during other Lower River studies (e.g., the eulachon study); 2) replacing camera stations with land-based observations at similar locations; and 3) use of a water surface model (WSE) instead of habitat modeling. As discussed during the meeting and detailed in the Study 6.6 *Decision Point on Fluvial Geomorphology Modeling of the Susitna River below PRM 29.9 Technical Memorandum*, filed September 26, 2014, the potential project effects would be very minor, so the decision was made to not extend the fluvial geomorphology model downstream of PRM 29.9.

Heather Leba, SRC, noted that the 2014 vessel-based surveys did not overlap with the timing of the eulachon run and suggested that the next round of beluga monitoring should be modified to include the eulachon run timing. As a pilot study, vessel-based sonar surveys for prey species were conducted in June and July 2014. Eulachon are being addressed under a separate study. Betsy McGregor, AEA, clarified that the beluga whale aerial surveys were conducted in 2013 between the end of April and October, and that the surveys did in fact overlap the eulachon run timing.

Sue Walker, NMFS, provided comments on behalf of her colleague Mandy Migura who could not attend the meeting. She suggested that the proposed modifications do not meet the original study objectives at the Susitna River delta and that the WSE modeling was eliminated. NMFS will submit comments in writing. NMFS recommendation is that all studies report incidental sightings and requested use of their incidental observation form. She also indicated that

NMFS will be estimating abundance during the first two weeks of June this year and the data will be made available. AEA agreed to record incidental sightings during the execution of field work using the NMFS form.

Matt LaCroix, EPA, asked how the geomorphic study could extend to tidal habitat if there are no transects downstream of PRM 29.9. He also asked if the water quality studies will document salinity changes at the mouth of the Susitna River. Bill Fullerton, TetraTech, responded that AEA's decision not to extend the geomorphic model downstream of PRM 29.9 was documented in a Tech Memo (Decision Point on Fluvial Geomorphology Modeling of the Susitna River below PRM 29.9 Technical Memorandum, September 26, 2014). AEA found project effects to be minor downstream of PRM 29.9. Bill was uncertain about salinity data collection in the Lower River and noted that water quality studies would be discussed during the March 23rd meeting.

Mike Wood, SRC, asked that observations from locals be incorporated into this study. He sees belugas chasing hooligan in May and noted their presence every day from May to November. He indicated that the cameras were poorly located. Jeff Davis, ARRI, asked for clarification if the beluga surveys had coincided with the eulachon run. Betsy McGregor, AEA, noted that aerial observations of whales were made in 2013 from April through the end of October.

Action Item:

9.17-1. AEA agreed to record incidental sightings during the execution of field work using the NMFS form.

9.16 Eulachon Run Timing, Distribution, and Spawning in the Susitna River

MaryLouise Keefe, R2, reviewed the objectives, study status, variances, and proposed modifications. She indicated that no field work had been conducted since that reported in the June 2014 ISR. Proposed modifications to the study plan were described in the September 17, 2014 Tech Memo.

AEA proposed seven modifications to the Study Plan (Slide 7), all of which were presented during the October 2014 ISR meeting. The most significant modifications include: 1) elimination of a second year of radiotelemetry as the study objective has already been achieved; 2) expansion of the visual and sonar surveys below PRM 10.5 to identify the downstream extent of eulachon spawning relative to tidal fluctuation; and 3) addition of the wetted perimeter modeling of eulachon spawning habitat.

Sue Walker, NMFS, asked if there was any information on a winter run of eulachon in the Susitna River, as one had recently been documented in the Chilkat at Haines, in SE Alaska. Discussion ensued about the potential of a winter run and the AEA literature review of eulachon in the Susitna River that was completed and filed with FERC in 2013. The content of the literature review, *Eulachon Distribution and Abundance in the Susitna River*, is described in the ISR Part D as including the eulachon run time, distribution and habitat use in the Susitna River.

Heather Leba, SRC, commented that during the first field season (2013) field crews were not able to go out until the end of May, perhaps missing the beginning of the run and asked if attempts will be made to go earlier in the next study year. MaryLouise Keefe, R2, replied that while field crews were not able to sample in boats before ice out in 2013, they did do some opportunistic sampling in open water to see if they were able to catch eulachon and no eulachon were captured. They accessed the river by boat as quickly as possible once the ice was clear. The plan would be to access the water immediately as it is safe to do so in the next year of study.

Heather Leba, SRC, stated that she approved of AEA's study plan modification to do more sonar sampling in the lower reaches of the river and asked if 1) these survey would potentially impact migrating belugas and 2) if AEA would have the necessary permits to work in the delta, later clarifying that she was referring to permits under the Endangered Species Act. Ron Benkert, AD&G, noted that AEA has had all of the necessary state permits to perform work. MaryLouise Keefe<R2, indicated that AEA would acquire all of the needed permits.

Heather Leba, SRC, also made a comment about needing information in the Lower River during low flow conditions. MaryLouise Keefe, R2, explained that is the point of AEA's proposed modification to add the eulachon wetted-perimeter model. Sean Eagan, NMFS, noted that the open water flow routing model ended at PRM 29.9. Phil Hilgert, R2, elaborated that AEA will identify spawning areas, set up transects, and install pressure transducers below river mile 29.9 that will allow for correlation with the flow routing model upstream for the determination of stage heights. In the 1980s, investigations occurred during the eulachon run and it was determined that there would not be any project effects at flows between 35,000 and 90,000 cfs, but they did not extend the analysis into lower flows when eulachon are not present. The proposed physical habitat based approach and taking measurements in September during low flows will allow changes in stage from Project operations to be estimated at a flow much lower than occurred in the 1980s. Phil Hilgert also clarified for Ken Hogan, FERC, that while tidal influence creates difficulty in modeling velocity, velocity is not a metric that will be used in the spawning model due to the small theoretical potential for velocity change that would likely be undetectable given anticipated variance around the measurements. The model will consider depth and substrate. Phil Hilgert noted that a dam located 187 miles up river, where the Susitna River contributes 16 percent of the total flow of the river at the delta, would result in minor change in stage at the delta; however, that potential of that stage change to affect eulachon spawning habitat is what this model will address.

Mike Wood, SRC, mentioned that historically the distribution of eulachon has been up to Talkeetna and that tracking history is important. He also commented that he was uncertain about a winter run of eulachon on the river, indicating that looking through the ice other species, such as Bering Cisco, could be confused with eulachon.

9.14 Genetic Baseline Study for Selected Fish Species

Chris Habicht, ADF&G, reviewed the objectives, study status, variances, and proposed modifications. He presented summary slides indicating the completion of two years of field sampling and screening of single-nucleotide polymorphisms (SNPs) and microsatellites (μ SATs) in the laboratory. Statistical analyses and reporting are ongoing.

As presented in Slide 12, AEA proposes two modifications to the Study Plan: 1) use of non-lethal buccal swab sampling instead of lethal caudal fin sampling of Chinook Salmon juveniles upstream of Devils Canyon; and 2) increasing the number of markers to include 190 SNP markers and 12 microsatellite markers to be analyzed for all Chinook Salmon captured in the Middle and Upper River. Following the ISR Meeting, a technical meeting between AEA, ADF&G, NMFS and USFWS was held on April 12, 2016 to discuss genetic analysis of the Chinook Salmon samples. As a result of the meeting discussion, AEA is proposing a third modification to the Study Plan pertaining to Objective 5 "If sufficient genetic variation is found for mixed stock assessment (MSA), estimate the annual percent of juvenile Chinook Salmon in selected Lower River habitats that originated in the Middle and Upper Susitna River". After concerted field sampling effort, genetic samples were obtained from only 8 juvenile Chinook Salmon in the Lower River. All of these were sampled from a single habitat type. This sample size is inadequate for analysis. Thus, AEA is proposing a modification to remove this objective from the FERC-approved Study Plan for Study 9.14. (See

meeting notes filed April 24, 2016 as Attachment 7 to Transmittal of Meeting Summary and Action Items of Alaska Energy Authority, Project No. 14241-000.)

After the presentation, discussion ensued with Betsy McCracken, USFWS, and Jeff Guyon, NMFS, about the lower DNA yields associated with buccal swabs as compared to caudal fin tissue sampling and how to optimize it in the future. Chris Habicht, ADF&G, indicated that buccal swab was still the preferable technique where sampling mortality is a concern (such as for Chinook Salmon juveniles above Devils Canyon because they are present in such low numbers). In the future, ADF&G would incorporate pre-amplification of the DNA to increase genotyping success.

There were questions from Betsy McCracken and Heather Leba, SRC, regarding the adequacy of the sample size. Chris Habicht, ADF&G, responded that scientists always want more, but noted that the two years of juvenile samples were adequate to look at temporal stability. He noted that determining the adequacy for statistical power would depend on the amount of difference or instability, which would not be known until the data was analyzed.

There was discussion about the relative value of the SNPs versus μ SATs when limited DNA is available. Chris Habicht, ADF&G, commented that in this circumstance his preference would be for μ SATs, which have many alleles, over SNPs, which have 2 alleles, as μ SATs provide for more statistically powerful opportunities to test among the hypotheses of gene flow. With μ SATs one can look at allele richness and degrees of variation, useful in determining effective population size.

Jeff Guyon, NMFS, inquired if all of the 18 adult Chinook Salmon from above Devils Canyon were radiotagged and if there was an impact to the power by using radiotagged fish. Chris Habicht, ADF&G, responded that both radiotagged and untagged adult fish were sampled. He indicated that there was a lack of statistical power due to sample size to test fish above versus below Devils Canyon and that there would be more power by looking at juvenile relatedness.

Matt Burak, Louis Berger, inquired about pooling of samples into a population as mentioned in the Implementation Plan. Chris Habicht, ADF&G, clarified that samples collected at the same location were automatically pooled. If the samples were collected close by and there is a biological reason why they are likely from the same population, a homogeneity test was done to determine if the samples could be pooled.

There was some discussion of the upcoming consultation for this study to discuss analytical methods with geneticists from the federal agencies. Chris Habicht, ADF&G, mentioned that sample sizes, family relationships, and temporal stability among samples remains to be considered in the interpretation of population structure. The preliminary analysis of population structure shows high genetic divergence between collections from Oshetna and Kosina rivers. However, additional analyses will be needed to determine if this divergence is stable and indicative of self-perpetuating populations or if it is unstable due to variables such as low sample size, family effects, or migration from other populations. That consultation was scheduled for April 12, 2016 and a summary is presented under action items.

Jeff Guyon, NMFS, asked if future collections for genetics are planned. Betsy McGregor, AEA, indicated that collections will be part of any future fish studies in the Upper River and if samples are not approaching the target sample size, then a directed effort for collection of genetic samples could be implemented.

Betsy McCracken, USFWS, also asked about location of Arctic Lamprey samples. Jerry George, R2, replied that all lamprey identified to species by field crews were Arctic Lamprey and clarified that no Pacific Lamprey had been caught. Chris Habicht, ADF&G, confirmed that page 31 of the Study 9.14 SIR only reported Arctic Lamprey.

Ron Benkert, ADF&G, commented that it was great that a genetic tool had been developed to differentiate between species, noting the difficulty in identifying small salmonids encountered in prior study years for the Susitna Project as well as in other areas. He asked if there was any cross-referencing between the field species identification and the genetics species identification protocols. MaryLouise Keefe, R2, confirmed there was cross referencing as described in the Species Identification Protocol filed with FERC and that Jerry George, R2, would discuss field species identification later in the afternoon (Study 9.5 and 9.6 presentations).

Action Items

9.14-1. Consultation on the next steps in the analysis was scheduled for April 12, 2016. See Action Item for Study 9.14 (Attachment 6 to Transmittal of Meeting Summary and Action Items of Alaska Energy Authority, Project No. 14241-000 (filed April 24, 2016)).

9.12 Study of Fish Passage Barriers in the Middle and Upper Susitna River and Susitna Tributaries

MaryLouise Keefe, R2, presented summary slides indicating that the field effort for this study was complete, that the proposed target species list and passage criteria had been provided in the Fish Passage Criteria Tech Memo filed with FERC November 14, 2014 and the November 2015 Study Implementation Report.

AEA is not proposing any modifications to the FERC-approved Study Plan (Slide 10).

Greg Ruggerone, NRC, commented that he was uncertain how many tributaries had been surveyed, because in the 2014 SIR it referred to 16 yet the ISR indicated a list of 27 tributaries. He also asked how the tributaries surveyed were selected. MaryLouise Keefe, R2, explained that some of the tributary mouths were surveyed in 2013 and others in 2014 and some were surveyed under Study 9.12 and some were surveyed by Study 6.6. She referred to Table 4.3-3 of the Study 9.12 ISR Part A that indicated which tributary mouths had been and were to be sampled by the two studies. She also indicated that she would follow up after the meetings to provide additional clarification for Greg.

Discussion ensued about modifications to beaver dam methods and how the remote assessment would be used to evaluate beaver dams as barriers. MaryLouise Keefe, R2, noted that beaver dams were to be modeled in Focus Areas as part of the 2-D modeling effort (Study 6.6), that they were identified and characterized by fish and aquatic field crews (Study 9.6 and 9.9) and that the remote assessment reported in the Study 9.12 SIR was in addition to these efforts and was intended to provide a comprehensive characterization of the occurrence of beaver dams at that point in time. She clarified that while modeling barriers into and out of sloughs and tributary mouths is part of the Study Plan, the Study Plan does not suggest that passage through beaver dams was to be modeled.

Greg Ruggerone, NRC, inquired about the criteria used for selecting tributaries and asked what percent of the tributary mouths in the Middle River were being modeled. Bill Fullerton, TetraTech, replied that all tributary mouths in Focus Areas will be included in the 2-D model and outside of Focus Areas tributaries, Middle River tributaries with mouths and sediment input will be addressed with the 1-D model. After Greg suggested that AEA may need to consider modeling tributary mouths in the Lower River, MaryLouise Keefe, R2, pointed out that the need to model in the Lower River will be evaluated if barrier creation is evident in the Middle River (Step 5 of Steps to Complete Study 9.12 on Slide 11).

Greg Ruggerone, NRC, asked about surrogate species and life stages for target species that were selected, as he indicated he could find no information on that in the 2014 Study Implementation Report and some discussion ensued

about where that information was available. MaryLouise Keefe, R2, indicated she would locate and provide the information.

Jeff Davis, ARRI, asked about how the barrier assessment of Upper River tributaries was going to occur without velocity and depth data. He suggested the need to develop additional methods to evaluate the stream distance that would be opened up beyond current physical barriers that would be inundated to address the potential for creation of velocity and depth barriers within the inundation zone. MaryLouise Keefe, R2, indicated that this was not part of the study objectives for 9.12. Phil Hilgert, R2, responded that changes in velocity within the reservoir zone of fluctuation would not be able to be identified and that is why gradient would be used in evaluating potential effects as the distribution of various species and life stages is restricted by the degree of gradient. Phil added that the geomorphology study would be looking at post-Project tributary delta formation and if the project would erode the toe of the delta, increasing the gradient and potentially creating a barrier, and then how frequently that passage barrier would be inundated under post-Project conditions. Jeff Davis, ARRI, suggested that if slope distance criteria was going to be used, AEA should specify how it was going to be applied in the field, the slope data source and the criteria for defining a barrier.

For Middle River tributaries, Jeff Davis, ARRI, noted the need for assessing velocities across the delta. Bill Fullerton, Tetra Tech, explained that the hydraulics, depths and velocities would be modeled for tributary mouths within the Focus Areas up to the extent of the backwater influence of the Susitna River mainstem and noted that the velocities within the deltas will be a combination of both the Susitna River and the respective tributary. Jeff Davis suggested additional field data on depth and velocities was needed because he did not know how the analysis was going to be applied. Bill Fullerton replied that an example of the of the 2-D bed evolution model had been completed for Skull Creek, as a proof of concept, and noted that the analysis was presented in the Study 6.6 SIR filed with FERC November 2015.

Jeff Davis, ARRI, noted that he had not seen the approach for modeling barriers in the Middle River yet and MaryLouise Keefe, R2, indicated that was correct, that the approach would be developed once the model output was available so that AEA could develop an effective approach for linking models to barrier field data and criteria.

Matt Burak, Louis Berger, noted that the 42 potential barriers in Table 4.3-1 were evaluated based on Chinook Salmon leaping criteria and asked if AEA was planning on going back and reevaluating those barriers for all target species, given the criteria. . MaryLouise Keefe, R2, indicated that AEA did not plan on reevaluating those barriers based upon the criteria for other target species.

Matt LaCroix, EPA, inquired how a velocity barrier was going to be evaluated for Northern Pike. MaryLouise Keefe, R2, indicated that, that species and the potential for removing an existing Middle River velocity barrier in the mainstem was raised by FERC at the last Fish Barrier Technical Team meeting. The species was added but no work had proceeded on the study after that point, so those methods have not yet been established.

Mike Wood, SRC, noted the floods that had occurred since the data was collected and that the mouths of Gold, Fog and Fourth of July Creeks had changed.

Action Items

9.12-1. AEA to clarify numbers of tributary mouths surveyed by Study 9.12 and Study 6.6 and how this compares with the Study Plan. See Action Items for Study 9.12 (Attachment 7 to Transmittal of Meeting Summary and Action Items of Alaska Energy Authority, Project No. 14241-000 (filed April 24 2016)).

9.12-2. AEA to provide document reference(s) for selection of tributaries for tributary delta/mouth surveys.

9.12-3. AEA to provide clarification on where surrogate species are addressed in the Study 9.12 SIR.

9.11 Fish Passage Feasibility at Watana Dam

Dana Postlewait, R2, reviewed the objectives, study status, variances, and proposed modifications. The only variances from the Study Plan have been schedule related. AEA is not proposing any modifications to the FERC-approved Study Plan.

There was some confusion about whether or not the Biological Performance Tool had been implemented. Dana Postlewait, R2, clarified that the framework for that tool was developed and made specific for the Susitna River system, and that it was reported in Appendix A of the Study Implementation Report, but no runs of the model had been conducted. Betsy McCracken, USFWS, indicated that they had not yet looked at that information. Sue Walker, NMFS, followed up saying that they would look at the information. Both of the NMFS fish passage engineers, Bjorn Lake and Ed Meyer, indicated that they did not have any comments.

9.9 Characterization and Mapping of Aquatic Habitats

Kai Steimle, R2, reviewed the objectives, study status, variances, and proposed modifications. She noted that surveys have been completed and reported in accordance with the study plan in the Study Completion Report filed with FERC November 2015. AEA plans no modifications to the Study Plan, as this study is considered complete.

Matthew LaCroix, EPA, asked what habitat mapping was completed in the Lower River. Betsy McGregor, AEA, and Kai Steimle, R2, explained that Lower River mapping occurred under the geomorphic study, Study 6.5. The results are presented in *Mapping of Aquatic Macrohabitat Types at Selected Sites in the Middle and Lower Susitna River Segments from 1980s and 2012 Aerials*, filed with FERC March 21, 2013.

Jeff Davis, ARRI, expressed concern that the habitat calls reported in the SCR were not made consistently and suggested that an interdisciplinary team other than AEA's contractors should review the data and determine all of the habitat classifications. George Gilmour, Meridian, and Sue Walker, NMFS, supported the recommendation that remote line-mapping habitat classifications be completed by an interdisciplinary stakeholder team rather than AEA's contractors.

Jeff Davis, ARRI, identified the definition of tributary mouths and mapping of clearwater plumes as an area of concern. He inquired about the basis for designating clearwater plumes as a mainstem mesohabitat type instead of a tributary habitat type. Kai Steimle, R2, explained that there is an inherent challenge in habitat mapping as it requires putting boxes around continuous features; both the tributary and the mainstem have influence at tributary mouths. The hierarchy implemented considers tributary mouths as part of the mainstem habitat because they are affected by mainstem flow; clearwater plumes are nested within tributary mouth habitat types. Kai noted that the goal is to find the habitat types in the landscape, and characterize their frequency and attributes. That has been done in a

consistent manner. Because the habitat types have been delineated, one could put them in either system as needed to answer other questions.

Jeff Davis, ARRI, also expressed concern that the definition of side channels and split channels were not applied consistently, citing examples of vegetation differences on some classifications of the types. Kai Steimle, R2, responded that the distinction between split channels and main channels includes both the proportion of flow and vegetation. The distinction is described in the SCR and follows the RSP. It was recommended that Jeff Davis provide his specific concerns in writing so that they could be addressed.

George Gilmour, Meridian, expressed concern for potential observer bias and suggested a guidance document. MaryLou Keefe, R2, noted that in addition to the Implementation Plan, field crews were provided definitions of the habitat types, along with descriptions of the characteristics and photos.

Sue Walker, NMFS, summarized that she agrees with NMFS' contractors (George Gilmour, Meridian, and Jeff Davis, ARRI) and that they believe there are "significant errors" in the habitat mapping, but noted that they have not had a chance to review the information. NMFS will provide its comments to the habitat classifications in writing.

George Gilmour, Meridian, noted that the habitat data was all laid out and well summarized. However, he added that there is a need for linkages between the habitat and its value to fish species and lifestages and at various times of year. Kai noted that Project effects was not the goal of this study. The goal of all of the studies, which are building blocks of a broader study program, is to provide baseline conditions and the basis to form those linkages and interconnections moving through the licensing process to facilitate future evaluation of Project effects.

Jeff Davis, ARRI, commented that characterizing aquatic habitats at a single flow level would not support future evaluation of potential project impacts. Jeff Davis requested the study be modified to include classifications at multiple flows. Betsy McCracken, USFWS, and Mike Wood, SRC, supported this request. Ken Hogan, FERC, requested clarification on the concerns. Betsy McCracken, USFWS, indicated that their concern was not in the mainstem, but that the lateral habitats were not being well represented. Sue Walker, NMFS, responded that there were "errors" in the habitat classification system being applied to the mapping and that would lead to a magnification of error if applied to assess Project impacts.

Chris Holmquist-Johnson, USGS, requested evaluation of lateral habitats under various flows. Kai Steimle, R2, responded that the classifications include field indicators of inundation frequency that account for flow variability in lateral habitats; these are described in the SCR.

During the discussion, R2 staff noted that the habitat definitions were applied consistently, following the Study Plan; field crews were trained and provided field manual in addition to the Implementation Plan; and that remote line mapping and field classifications were largely in agreement.

MaryLouise Keefe, R2, characterized the disputed habitat classifications as differences in interpretation between NMFS and AEA's contractors rather than "errors", which Sue Walker, NMFS, later conceded. MaryLouise Keefe reminded everyone of the protocol that was followed where ground-truthing of the classifications made on 2012 remote line mapping was conducted in 2013 and 2014 and then a detailed comparison of classifications that were potentially different was conducted. This comparison was completed in 2014 and only a few discrepancies resulted because all other potential discrepancies could be explained by differences in flow at time of ground surveys and those at the time of remote image capture. Habitat classifications were made consistently with justification for

interpretations. Earlier in the meeting, MaryLouise Keefe also questioned how any systematic differences of professional opinion would hinder analysis of Project effects.

Action Item

9.9-1. AEA reviewed habitat definitions of tributary mouth and clearwater plumes after the meeting and noted what might appear to a reviewer as an inconsistency because tributary mouth and clearwater plume habitats are defined quite similarly (Table 9.9.4 of the Revised Study Plan) yet were mapped separately during both remote and field assessments. As requested by the FERC Study Plan Determination clearwater plumes were delineated as macrohabitats (page B-201), but because they also occurred within some macrohabitats they were also treated as special habitat features. Tributary mouths were treated as distinct macrohabitats as was described in Section 3.1 of the Middle Susitna River Remote Habitat Line Mapping Technical Memorandum (filed with FERC January 31, 2013) and Section 4.1.1.1 of the Study 9.9 SCR (filed November 9, 2015). This distinction was not made in the table of macrohabitat definitions. In addition, because not all tributaries contained clear water, AEA determined that the definition of tributary mouth carried forward from the Study Plan and presented in Table 4.1-1 of the Study 9.9 Study Completion Report (SCR) was incomplete. AEA has prepared a supplement to the Study 9.9 SCR that revises the definition of tributary mouth to accurately reflect habitat data collection and mapping. See Action Item for Study 9.9 (Attachment 10 to Transmittal of Meeting Summary and Action Items of Alaska Energy Authority, Project No. 14241-000 (filed April 24 2016)).

9.8 River Productivity

Tim Nightengale, R2, reviewed the study status, objectives, variances, and proposed modifications for the River Productivity Study. Highlighted results include:

- More than 1,341 benthic and drift samples from 21 sites at 5 stations spanning over 100 miles of the Susitna River, from just below the proposed dam site to the mouth of Montana Creek, have been collected. The information gathered from this effort achieves the objectives and goal of the study by establishing a baseline of information on the benthic communities in the Susitna River, helping define and understand what these communities look like now and how they function spatially and seasonally, and coupled with the trophic modeling objective, a better understanding of the benthic and drift components importance to fish and the food web has been gained.
- As part of the Fish Diet Analysis, efforts in 2013 yielded 261 target species fish. In 2014, an increased effort using a dedicated fish crew with the River Productivity team yielded 449 target species fish, a noted improvement.
- Also with the Fish Diet Analysis, Fish Diet Sample Size Sufficiency Analysis was requested at the October 2014 ISR meeting. The resulting tech memo was filed in December 2014, and suggested that a sample size of 8 was sufficient to characterize diet composition.

AEA proposes several modifications to the Study Plan in addition to carrying forward the variances reported in the ISR Part A and ISR Part C, Section 7.1.2 (Slide 18): 1) redesign of adult insect emergence traps by increasing floatation and improving anchoring and deployment methodology to minimize loss; 2) change the colonization sampling to investigate the overall differences in colonization rates and compositions among the five macrohabitat types within sites instead of by turbidity and temperature conditions; and 3) add an extra collection of six Hester-Dendy sampler

sets at a main channel site at increasing depth increments to record the effects of stage changes and exposures along the main channel's fluctuating shoreline, deployed for 4-6 week periods during the open water period.

There was discussion about the FERC process and confusion from Services' contractors about when and how input to the studies occurs.

Lucius Caldwell, Cramer Fish Sciences, expressed frustration that they had made several recommendations and requests in technical memoranda but the River Productivity 2014 Study Implementation Report had not addressed any of them. AEA's contractors (MaryLouise Keefe, R2, and Tim Nightengale, R2, and Erik Schoen, UAF) pointed out that the study team had completed the 2014 field season prior to the October 2014 meeting, no data has been collected on this study since 2014, and no written comments had been submitted to AEA on the ISR or the 2014 Study Implementation Report. Marie Steele, ADNR, clarified that the reports and memoranda that Lucius was referring to were still internal documents and had not been provided to AEA. Sue Walker, NMFS, indicated that the reports in question would be delivered with the agencies' written comments.

Lucius Caldwell, Cramer Fish Sciences, commented that the trophic modeling needed more interpretation, such as a comprehensive food web model. Both MaryLouise Keefe, R2, and Dr. Schoen, UAF, explained that the Study Plan and study objective did not propose to conduct a comprehensive food web model, but instead a broader analysis looking at energy pathways and food web relationships.

Lucius Caldwell, Cramer Fish Sciences, expressed concern that the fish diet sample size analysis was biased since not all of the sites had 8 samples and that the study team misinterpreted the literature regarding sample size. Dr. Erik Schoen, UAF, replied that the methods reported in the sample size tech memo were consistent with the literature, which provides a range of sample sizes over which the diet proportions of salmonids tend to stabilize, with diminishing returns at higher sample sizes. The study set a target sample size at the low end of this range to maximize the number of sites that could be sampled, because the study objective was to quantify broad-scale patterns in energy flow across the watershed. The statistical methods were robust to smaller sample sizes, particularly the Bayesian stable isotope mixing model. Dr. Schoen expressed that he was confident in his statistical analysis but offered to check on the question raised by Dr. Caldwell.

Jeff Davis, ARRI, commented that the fish diet analysis and stable isotope analysis study components did not have enough samples or sites. Mr. Davis commented that in order to estimate and compare fish growth between macrohabitats, more replication of those macrohabitats was needed. Dr. Erik Schoen, UAF, replied that larger sample sizes would always be nice, but AEA collected a sufficient number of samples and used a conservative analytical approach to meet the objectives. Dr. Schoen clarified that the objective was to test whether growth differed among macrohabitats and along the river corridor, not generate precise estimates at each individual site. He continued by explaining that the objective of the isotope analysis was characterizing energy flow at the landscape scale, so it was important for AEA to cover a large number of sites. He concluded that compared to other energy flow studies of this type, 21 sites and 2,800 isotope samples would be considered very large sample sizes. Furthermore, AEA had to balance the competing goals of spatial representativeness and maintaining adequate sample sizes within each site. If the study had sampled more sites in an effort to be more representative, then sample sizes would be lower within each site.

Jeff Davis, ARRI, listed several problems he perceived that were part of study design, site selection and methods. He commented that AEA increased the sites for the stable isotope analysis, but the Services had previously made

comments on the locations for stable isotope analyses, and recommended that additional sites be selected within the Middle River, where it was more likely to have anadromous fish. He commented that AEA did not focus sites within the Middle River downstream of Devils Canyon and sites were selected without consultation with the Services that were outside of the Middle River. Tim Nightengale, R2, clarified FERC's SPD stated "AEA consult with NMFS and FWS when identifying *the appropriate two focus areas for stable isotope sampling, where within the focus areas each type of stable isotope samples would be collected...*" He explained, as was identified as a variance in the ISR and discussed in the October 2014 ISR meeting, that AEA had modified the isotopic sampling design, increasing the number of stations and sites at each station, from 3 macrohabitat sites at 2 stations to all macrohabitats at 4 stations that represented 4 out of 5 of the Focus Areas and making further consultation about which two focus areas no longer relevant.

Jeff Davis, ARRI, stated that the use of the Hess samplers as a method was problematic because they are too depth-limited, and he commented that during 2013 and 2014 algal samples were not taken at multiple water depths, up to three feet as required by the FERC determination. He noted the need for collecting algal, up to three feet, and stated that AEA collected data to a maximum depth of a foot-and-a-half. Tim Nightengale, R2, replied that AEA collected and reported algal sampling at multiple depths up to three feet, that sampling records indicated 4 percent of samples were taken at depths over 2 feet, and maximum depth of algal sampling was at 3.3 feet. Tim clarified that AEA attempted to sample in deeper waters when it was considered safe to do so given velocities, and noted that the FERC determination specifically states "to the extent feasible given the limits of field safety." In many cases, these deeper waters had higher velocities (4 to 5 feet per second) and were a considerable distance from shore, so the crew collected samples at depths and conditions in which they felt safe to do so. Furthermore, Tim noted that light attenuation often reached 0 at 10 cm due to high turbidity during sampling events.

Jeff Davis, ARRI, also disagreed with several of the choices for sampling sites, suggesting that such sites were unrepresentative for either the macrohabitat selection or for the Middle or Lower river. Specifically called out were the Montana Creek upland slough site, which he maintained was a relic channel of Montana Creek, and not really a flood plain channel, and the side channel site at FA-141, which he suggested was not the best choice for a side channel in the area. Mr. Davis also stated that there was not the expected 4 to 5 replicate sites for each of the macrohabitat types, pointing out only two side sloughs were sampled, maintaining that the one at FA-104 is also "not representative" for that macrohabitat. To keep the meeting on schedule, it was suggested that Mr. Davis submit his comments in comments in writing.

Throughout the discussion, Jeff Davis, ARRI, referenced comments that had been provided to the Revised Study Plan, prior to FERC's Study Plan Determination, and Lucius Caldwell, Cramer Fish Sciences, referenced comments that were provided in tech memo(s) to the Services. Sue Walker (NMFS) noted that this study was a good example of how the ILP process inhibited studies. Agencies have the expectation that their comments will be considered but the short time intervals between completing data collection does not allow for changes to occur. Tim Nightengale, R2, reiterated that the Services have not provided any comments for this study in writing to AEA and that the 2014 data collection had already been completed by the time the October 2014 ISR Meetings occurred.

Betsy McCracken, USFWS, asked if winter sampling had been conducted as part of this study. Tim Nightengale, R2, replied that winter sampling was not part of the Study Plan; sampling had occurred during spring, summer and fall. Mike Wood, SRC, supported the concept of winter sampling and noted that there are accessible open water leads with algae evident at a water depth of 6 feet.

9.7 Salmon Escapement Study

Ray Beamesderfer, R2, reviewed the objectives, study status, variances, and proposed modifications. Ray briefly summarized the results for each of the eight study objectives that have been documented in various reports for the three study years (2012-2014). The data gathered has met the study objectives and the Study Plan is considered complete. AEA plans no modifications to the Study Plan, as this study has been completed.

Hal Geiger, St. Hubert Research Group, provided comments and questions about statistical validity of the data collected during the study. His review focused on whether estimates are supported by the data and whether estimates are suitable for the intended purpose. He identified three particular areas of concern: 1) the basis for statistical inference in spawner estimates; 2) effects of “non-sampling” errors on the accuracy of population estimates; and 3) representativeness of Chinook Salmon estimates given current low abundance.

Hal Geiger, St. Hubert Research Group, commented that the study and the report demonstrated a lot of competence. He questioned the statistical basis for estimates of spawning escapement from aerial surveys based on the area-under-the-curve (AUC) method. In particular, he questioned the precision of the statistical estimates and the adequacy of observer calibration. Estimates of precision determine confidence levels in expansions of spawner counts into escapement estimates. Observer calibration affects the potential accuracy or bias in spawner counts due to under or over counting relative to actual numbers.

Ray Beamesderfer, R2, explained that rather than qualifying estimates with statistical confidence intervals, the study addressed the question of statistical uncertainty with a sensitivity analysis. High and low expansion factors were used to show that reasonably narrow estimates of fish upstream of the dam site were produced by a range of assumptions. MaryLouise Keefe, R2, further explained that a redundancy of estimation methods was employed in 2014 to counter uncertainty with AUC estimates. The AUC estimates were added to the original study design in 2014 after the salmon weir was damaged in a flood. Ongoing aerial surveys were increased in number and frequency to allow calculation of the numbers of fish in the Indian River using AUC. It was not intended to provide a rigorous statistical estimate. Further, study objectives never intended for the “count” data to be used for absolute population estimates but rather for inferences about relative abundances. Wayne Dyok, H₂O Ecopower, advised that the first study report provided detailed documentation on the basis for observer efficiency estimates. This information was not included in the second report because it had already been addressed previously.

With respect to the effects of non-sampling error on the accuracy of escapement estimates, Hal Geiger, St. Hubert Research Group, suggested that loss of marks from fish that die will result in overestimates of escapement. He felt that explanations of the results of statistical tests of related estimator assumptions were not accurately characterized (e.g., just because a test hypothesis was rejected or not rejected does not mean the related assumption was correct). He was not suggesting that the estimates were wrong but rather that use of a different estimator or data pooling strata would probably have produced a slightly smaller number. He suggested that several sources of uncertainty were “sort of ignored.” Ray Beamesderfer, R2, replied that the study included substantial efforts to look at non-sampling errors and to include related corrections in estimates. The 2014 Study Completion Report Appendix I contained extensive analysis of potential bias and how they were handled by the study team. (For instance, biases related to injury or mortality due to capture and tagging were addressed by basing estimates only on fish where “known fates” did not identify anomalous tagging effects.)

With respect to effects of current low abundance cycle for Alaska Chinook Salmon, Hal Geiger, St. Hubert Research Group, questioned how representative current estimates would be of more typical future conditions. Ray Beamesderfer, R2, advised that increases in Chinook returns will result in greater estimates of abundance (for any given area) but the assumption would be that distribution and relative proportions of fish based on recoveries would be similar to that reported under current conditions.

Hal Geiger, St. Hubert Research Group, asked specifically how the escapement estimates were going to be used in the models. Sue Walker, NMFS, also noted that it was unclear how these escapement estimates will be used if they are not going to be used in models. MaryLouise Keefe, R2, and Dudley Reiser, R2, confirmed that fish distribution and timing of movements would be used in the instream flow model but no fish counts or estimates were to be used in the models.

Sue Walker, NMFS, asked what percentage of fish returned to the Oshetna and the Upper River upstream from the Oshetna. Jerry George, R2, replied that the answer is zero - no radio-tagged fish were assigned fates that included spawning above Kosina Creek. Ms. Walker noted that was confusing because a couple hundred juvenile salmon were reported sampled out of Black River. Betsy McCracken, USFWS, also commented that there was an apparent disconnect between the "large" number of Chinook Salmon juveniles collected in the Black River and no tagged adults tracked there. Mr. George reported that juvenile Chinook Salmon were collected in the Black River in 2013 but none in 2014 despite the increased sampling intensity. Sample timing for juveniles was similar in both years. There were three Chinook Salmon juveniles captured in the Oshetna River screw trap and they were generally larger than those caught in 2013 and could be age-1 fish. Adults were documented in the Upper River in 2012 and it is possible that all of the Black River juveniles were from the same spawning pair as they were collected in the same location.

Sue Walker, NMFS, questioned whether the aerial survey Chinook Salmon numbers in the upper Susitna for 1982-1985 were indeed peak counts as identified on Slide 18. MaryLouise Keefe, R2, provided a reference to Table 5.3-5 from the Study 9.7 Errata to the Study Completion Report, filed with FERC February 2016, where the peak count and date were presented by tributary for 1982-1984 aerial surveys. Multiple aerial survey flights were conducted during each year for 1982-1984 and the reported numbers were the maximum observed on any flight in each location and year. Ms. Walker indicated that they were "advised" that the errata did not have much bearing and did not warrant their examination. MaryLouise Keefe noted that the same information was also provided in the SCR with the same table number, Table 5.3-5. It was suggested that NMFS consider the errata as it was filed as a correction to the SCR.

Jeff Davis, ARRI, asked what proportion of each species is spawning in the turbid main channel or side channels. Ray Beamesderfer, R2, advised that the study distinguished mainstem spawning locations of known fate fish among slough/side channel, tributary mouth or mainstem proper (e. g., Study Completion Report Table 5.2.1). Jeff Davis, ARRI, asked whether surveys were ground-truthed and Mr. Beamesderfer confirmed ground surveys were conducted. Mr. Davis also wondered if sample sizes of fish in mainstem habitats were representative. MaryLouise Keefe, R2, reported that sample sizes were available in the report. Mr. Beamesderfer reported that consistency of observations of fish spawning in the same areas of the mainstem in multiple years provides some confidence that estimates of distribution are relatively sound. (Table D-2 in the Study Completion Report identifies a total of 18 potential Chinook spawning sites in the Middle River in 2014. The 44 identified during the meeting was in error.) Mr. Davis questioned whether Coho distribution was similar with 1980s studies. Mr. Beamesderfer reported that detailed distribution information is available for Coho Salmon (2014 Study 9.7 ISR, part D). Coho Salmon distribution was generally similar among samples from different years (although proportions vary).

Heather Leba, SRC, asked for clarification of the numbers of fish that went above Devils Canyon. Ray Beamesderfer, R2, reported that 17 tagged Chinook Salmon passed upstream of Devils Canyon in three years of study, 24 Chinook Salmon were counted in 2014 at the sonar located at the proposed dam site, and total numbers estimated from multiple methods were not more than 50-100 Chinook Salmon per year upstream of Devils Canyon.

9.5 Study of Fish Distribution and Abundance in the Upper Susitna River

Jerry George, R2, provided an overview of the objectives, components, variances, modifications, and a summary of the results. In addition to the June 2014 ISR, four tech memos were filed between September 17, 2014 and December 17, 2014: *Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Tech Memo; Appendix 3. Protocol for Site-Specific Gear Type Selection, Version 5; Draft Chinook and Coho Salmon Identification Protocol; and Evaluation of the 2014 Study Modifications in the Black River Tech Memo*. The SIR was filed in November 2015.

AEA proposed nine modifications to the Study Plan (Slides 16 and 17): 1) ELH sampling to take place every two weeks from ice breakup through the end of June; 2) at each site, 25 fish per species/life stage will be weighed and measured and PIT tagged if appropriate; 3) PIT antennas will be relocated to smaller water bodies to improve stream coverage; 4) single-pass sampling will be used; 5) modify tributary sampling lengths and distances as described in the September 2014 Tech Memo; 6) implement hybrid sampling approach and reduce the target mainstem transects from 10 to 20 and increase sampling in off-channel habitat types, as described in the September 2014 Tech Memo; and 7) operate rotary screw trap at the mouth of the Oshetna River and PRM 200 and fyke net at mouth of Kosina Creek and its clearwater plume; 8) conduct direct sampling for unnamed tributaries 197.7, 204.5, and 206.3, as described in the September 2014 Tech Memo; and 9) follow the gear specifications and descriptions of field application outlined in IP Appendix 3 Protocol for Site-Specific Gear Type Selection, Version 5.

Hal Geiger, St. Hubert Research Associates, raised the same questions as for Studies 9.7 and 9.6, are the estimates appropriate based on the data that was generated and are the estimates appropriate for their intended use. He commented that the reported fish catch data lacked estimates of variability. Hal Geiger then stated that it is hard to evaluate whether data collected in the first year of study are suitable because he does not understand the intended use of the data. MaryLouise Keefe, R2, directed the discussion back to the study objectives in the Study Plan and emphasized that the goal of the study is baseline characterization of distribution, relative abundance (CPUE), habitat associations, movements, timing, etc. that will be used for impact analysis. As was clarified in the October 2014 ISR Meeting, Dudley Reiser, R2, reiterated that the instream flow modeling (Study 8.5) was occurring in the Middle River and not the Upper River (this study) and that the fish distribution and abundance data from the Middle River (Study 9.6) was not feeding directly into the instream flow modeling in the sense of the habitat suitability criteria (depth, velocity, substrate), but data gathered such as periodicity, timing, and distribution of fish will be incorporated into the instream flow analysis (Study 8.5). Jerry George, R2, indicated that AEA has been working with the CPUE data and developing an approach to combine fish catch with multiple gear types. Jeff Davis, ARRI, recommended that a document summarizing the combined gear CPUE approach is provided to stakeholders for review prior to another year of study.

NMFS representatives (Sue Walker, Hal Geiger, and Jeff Davis) expressed concern that PIT tag information collected to date was not very useful and PIT tag arrays that are capable of assessing directional movement would be more informative. NMFS reiterated that they have previously recommended that PIT tagging be dropped from Study 9.5 and that it could be replaced with mark-recapture methods in off-channel habitats. Jerry George, R2, indicated that

re-capture rate in the Upper River was around 3% compared to 13% for the Middle River and that the channel sizes of the stream where information on downstream movement was thought to be most important, such as the Oshetna River and Kosina Creek, were too wide and made it infeasible to establish, maintain and power efficient arrays across the channel. Because of this AEA has proposed as a modification to move arrays to smaller channels in specific areas that existing data suggest would be useful for understanding downstream and upstream movements such as Jay Creek and Goose Creek. Jerry asked NMFS representatives to include specific PIT tagging and PIT tag array concerns and suggestions in their written comments. Ron Benkert, ADF&G, mentioned that USFWS will be using an alternative type of PIT tag array on the Montana Creek weir this year (2016) and will let AEA know how that works.

Jeff Davis, ARRI, commented that he was glad that GRTS selection of macrohabitats in the Upper River was effective in addition to transect sampling is working in the Upper River and would like to see that approach applied in the Lower River. Jerry George, R2, indicated that transect approach was originally applied as mapping of the Lower River was a task under the geomorphology study (Study 6.6) and not 2013 line mapping of aquatic habitat (Study 9.9) and asked that NMFS include this comment in their written comments for study 9.6, Fish Distribution and Abundance in the Middle/Lower River.

NMFS representatives (Sue Walker and Jeff Davis) asked several questions pertaining to the downstream migrant trapping objective; specifically, they asked around the mesh size of the Kosina Creek fyke nets, how often were they checked, and posed the concern that juvenile Chinook Salmon were out-migrating before the traps were operating. Jerry George, R2, answered that the mesh size for the Kosina Creek fyke nets was 1/8" and the nets were fished on the same cycle as the rotary screw traps, 2 days on/3 days off. Debris in the fyke nets was not typically an issue in Kosina Creek. The traps and nets in both 2013 and 2014 were installed and operated as soon as possible after ice-out, within seven to ten days of ice break-up at most locations. Traps and nets cannot be fished while a high debris load of ice is free-flowing down the river but traps were fished while bank ice was present and snow was still on the ground near the trapping sites. Mike Wood, SRC, commented that 2013 was the latest breakup on record.

Ron Benkert, ADF&G, and Sue Walker, NMFS, posed a series of questions and comments regarding the interannual variability in presence of adult and juvenile Chinook Salmon in the Upper River, and in particular the Black River. They made the comment that in Black River juveniles were observed in 2013 but not in 2014 and questioned whether year classes were missing or if fish stage but not make it to spawning. Jerry George, R2, replied that the information from the radio tagged fish in Salmon Escapement Study (9.7) indicated that there may be variability in the number of fish that reach the Upper River; the 2012 spawning year, may have had more spawners than 2013 and this would be consistent with the size distribution of juveniles collected in 2013 and 2014 and reported in the SIR.

9.6 Study of Fish Distribution and Abundance in the Middle and Lower Susitna River

Jerry George, R2, provided an overview of the objectives, components, variances, modifications, and a summary of the results. In addition to the June 2014 ISR, three tech memos were filed between September 17, 2014 and November 14, 2014: *2013-2014 Winter Fish Study Tech Memo; Appendix 3. Protocol for Site-Specific Gear Type Selection, Version 5*; and *Draft Chinook and Coho Salmon Identification Protocol*. The SIR was filed in November 2015.

AEA proposed fourteen modifications to the Study Plan (Slides 13 - 15): 1) ELH sampling to take place every two weeks from ice breakup through the end of June; 2) adjust sample sites and include FA-113 and main channel habitat placed into single stratum; 3) relocate mainstem Curry Station RST to mainstem below Portage Creek (PRM 151.3-152.3); 4) relocate Montana Creek RST to mainstem in vicinity of Montana Creek; 5) relocate Indian River and

Montana Creek PIT antennas closer to source of PIT-tagged fish; 6) relocate radio tag receivers from Slough 21 to Powerline station and eliminate Slough 11 and Fog Creek stations; 7) continue to PIT tag fish at capture locations until 4,000 tags (1,000 tags x four PIT antennas) have been allocated per target species in the entire Middle/Lower River segments; 8) continue implementation of Winter Fish Studies as described in ISR Part C, Section 7.1.2.5; 9) continue with modified sample reach lengths for main channel habitat types (500 m (0.3 mi) for boat electrofishing and drift gillnetting, and 200 meters for other techniques); 10) continue to use single-pass sampling; 11) 25 fish, per species, per life stage, per gear will be weighed, measured for length and PIT tagged if appropriate; 12) continue to survey the same study sites used for 2013-2014 winter PIT tag arrays for future winter efforts; 13) collect additional tissue samples for genetic analysis and increase photo documentation of juvenile Chinook and Coho salmon; and 14) follow the gear specifications and descriptions of field application outlined in IP Appendix 3 Protocol for Site-Specific Gear Type Selection; Version 5.

Sue Walker, NMFS, and Jeff Davis, ARRI, commented on the fish species identification. NMFS was glad to see that identification of Coho and Chinook juveniles improved in 2014. Jerry George, R2, explained that field identification of these species can be very hard in some areas of the Susitna River and nearby basins. He attributed the increased accuracy to intensive training in the field looking at difficult specimens in various habitat types and review of photos and voucher specimens. NMFS indicated that they thought it was important to correctly identify Chinook and Coho salmon in order to understand habitat preferences. Jerry replied that an initial review of habitat preferences and size/age of genetically identified fish in SIR Appendix B showed substantial overlap, including Chinook Salmon in the 170-180 mm range, and encouraged NMFS to provide written comments on the subject. NMFS asked whether ID issues were isolated to particular places or habitats and if genetically confirmed Chinook were found above beaver dams. MaryLouise Keefe, R2, and Jerry George, R2, indicated that both Chinook and Coho salmon identified through genetics were found in beaver ponds and that there was no single location in particular just the variability in physical traits of fish below Devils Canyon that made identification difficult. Dr. Keefe, indicated that habitat characteristics of species with genetic identification are available (<ftp://ftp.gina.alaska.edu/SIR/9/9.6/>).

Jeff Davis, ARRI, commented on the 2014 combining of Sockeye and Chum salmon fry during early life history sampling and understood the desire to minimize mortality when hundreds of fry are collected at once but suggested a subsample be selected for identification. Jerry George, R2, encouraged Jeff to include this suggestion in their written comments.

Sean Eagen, NMFS, commented on the winter fish sampling, noted that sampling occurred in March/April and that it was important to know where the fish are in January and February. Jerry George, R2, indicated that during 2013-2014 winter, sampling was conducted using helicopters during initial freeze-up in November 2013 and again in February, March, and April, 2014. Jerry explained that no sampling was proposed for December or January due to unstable and potentially dangerous ice conditions and limited photoperiod.

Jeff Davis, ARRI, commented that overwinter spawning locations determined from radio telemetry for burbot and whitefish, seemed wide on the order of a few miles, and asked whether radio tagged fish were positioned on foot or by snow machine in the winter as had been proposed in the 2013 winter fish sampling TM. Jerry George, R2, indicated that during winter aerial surveys helicopters would circle around to pinpoint tag locations with good accuracy, within 200 meters, and that ground surveys would be dangerous and were not needed to get the desired resolution on positioning. Jeff Davis asserted that ground surveys would provide further resolution on positions in areas with multiple macro habitats present.

Hal Geiger, St. Hubert Research Associates, reiterated his concerns from the Upper River about how it is not clear how the data collected are going to be used and that it is difficult to address data adequacy it is not clear how data will be used or how much variability there is in data. He questioned how CPUE from multiple methods will be combined and used. Jerry George, R2, combining gear types for analysis is underway and encouraged comments to be submitted in writing.

Chris Holmquist-Johnson, USGS, suggested that even if the fish distribution and abundance dataset is not a direct input for instream flow modeling, it could still be integrated with instream flow for validation purposes.

Betsy McCracken, USFWS, indicated that lamprey are a species of interest to USFWS and asked for a synopsis on lamprey in the study area. Jerry George, R2, gave a short overview of lamprey species identification (all metamorphosed adults that have been identified have been Arctic Lamprey), distribution, effective gear types, and that the ammocoetes have been very sensitive to PIT tagging with high mortality and PIT tagging for this species was discontinued. Betsy followed up asking whether spawning locations have been determined. Jerry replied that identifying spawning locations for lamprey was not a study objective for Study 9.6, Fish Distribution and Abundance in the Middle and Lower River.