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SUSITNA-WATANA HYDRO

20121231-3016

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
December 31, 2012

OFFICE OF ENERGY PROJECTS

Project No. 14241-000—Alaska
Susitna-Watana Hydroelectric Project
Alaska Energy Authority

Wayne Dyok
Susitna-Watana Project Manager
Alaska Energy Authority
813 West Northern Lights Boulevard
Anchorage, AK 99503

Reference: Revised Study Plan Determination Schedule

Dear Mr. Dyok:

On December 14, 2012, Alaska Energy Authority (AEA) filed its revised study plan for the Susitna-Watana Project No. 14241 as required by the Federal Energy Regulatory Commission's (Commission's) regulations for the Integrated Licensing Process. The revised study plan includes 58 individual studies that AEA proposes to implement to study environmental resources that may be affected by the project.

Commission staff have reviewed the revised study plan and conclude that, of the 58 studies, 45 contain sufficient detail such that the Commission's study plan determination (SPD) on those studies can be completed by February 1, 2013, as set forth in the September 17, 2012, "Notice of Extension of Time To File Comments On AEA's Proposed Study Plan." However, the remaining 13 studies, which are related to water resources, instream flows, and fish and aquatic resources, contain insufficient detail. Therefore, I am modifying the SPD schedule for those studies, pursuant to section 5.29(f)(2) of the Commission's regulations.

In the 13 studies, AEA only provides conceptual details on sampling methods, techniques, analytical approaches, and study site selection (e.g., focus areas). AEA proposes to refine and finalize these details by March 15, 2013, after selecting focus areas and after reviewing the results of open-water flow routing model and initial habitat mapping efforts that will be completed in December 2012.

These study details are integral to determining whether the studies would gather the needed information to process AEA's license application. Consequently, these study details must be finalized prior to the Commission issuing its SPD. Therefore, in order to allow AEA sufficient time to develop these details, AEA must file by March 15, 2013, the following additional information: (1) the implementation plans described in section 9.5.4 of study 9.5, Study of Fish Distribution and Abundance in the Upper Susitna River; section 9.6.4 of study 9.6, Study of Fish Distribution and Abundance in the Middle and Lower Susitna River; and section 9.8.4 of study 9.8, River Productivity Study; and (2) the final site selection for focus areas for all studies to be implemented in the middle and lower Susitna River (study 5.5, 5.6, 5.7, 6.5, 6.6, 7.5, 7.6, 8.5, 8.6, 9.6, 9.8, and 9.9). Furthermore, because the results of the open-water flow routing model and initial habitat mapping will be important in developing the above details, these study results must be filed with the Commission by January 21, 2013, and a meeting must be held with interested stakeholders by February 15, 2013, to discuss the study results, the proposed implementation plans, and the selected focus areas.

By copy of this letter, interested stakeholders are notified of the modification to the process schedule described in Attachment A, and that comments on the 45 other study plans included in AEA's December 14, 2012, revised study plan, are still due by January 18, 2013. The Commission's study plan determination for these 45 studies is scheduled to be issued by February 1, 2013. Agencies with mandatory conditioning authority pursuant to sections 4(e) and 18 of the Federal Power Act or under section 401 of the Clean Water Act may file a notice of study dispute on the Commission's determination on any of these 45 studies relating to their mandatory conditioning authority within 20 days of the study plan determination. The initial and updated study reports for all studies are still due February 3, 2014, and February 2, 2015, respectively.

If you have any questions, please contact David Turner at (202) 502-6091.

Sincerely,

Jeff Wright
Director
Office of Energy Projects

Enclosure: Attachment A—Revised Study Plan Determination Schedule for December 14, 2012, revised study plan studies 5.5, 5.6, 5.7, 6.5, 6.6, 7.5, 7.6, 8.5, 8.6, 9.5, 9.6, 9.8, and 9.9.

cc: Mailing List
Public Files

ATTACHMENT A
REVISED STUDY PLAN DETERMINATION SCHEDULE FOR DECEMBER 14, 2012, REVISED STUDY PLAN STUDIES 5.5, 5.6, 5.7, 6.5, 6.6, 7.5, 7.6, 8.5, 8.6, 9.5, 9.6, 9.8, and 9.9.

A study plan determination will be issued for the following studies in accordance with the schedule below: (1) Baseline Water Quality (study 5.5), (2) Water Quality Modeling Study (study 5.6), (3) Mercury Assessment and Potential for Bioaccumulation Study (study 5.7), (4) Geomorphology Study (study 6.5), (5) Fluvial Geomorphology Modeling Below Watana Dam Study (study 6.6), (6) Groundwater Study (study 7.5), (7) Ice Processes in the Susitna River Study (study 7.6), (8) Fish and Aquatics Instream Flow Study (study 8.5), (9) Riparian Instream Flow Study (study 8.6), (10) Study of Fish Distribution and Abundance in the Upper Susitna River (study 9.5), (11) Study of Fish Distribution and Abundance in the Middle and Lower Susitna River (study 9.6), (12) River Productivity Study (study 9.8), and (13) Characterization and Mapping of Aquatic Habitats (study 9.9).

Shaded milestones are unnecessary if there are no study disputes filed by any agency with mandatory conditioning authority. If a due date falls on a weekend or holiday, the due date is the following business day.

Responsible Party	**Pre-Filing Milestone**	**Date**	**FERC Regulation**
AEA	AEA files results of open-water flow routing model and habitat mapping.	January 21, 2013	N/A
AEA	AEA holds meeting to discuss the study results, proposed implementation plans, and selected focus area sampling sites in the middle and lower Susitna River.	February 15, 2013	N/A
AEA	AEA files studies 9.5 and 9.6, Fish Distribution and Abundance Implementation Plan; study 9.8, River Productivity Implementation Plan; and description of final site selection for any focus areas in the middle and lower Susitna River as described in study 8.5	March 15, 2013	5.13(a) waived

	(including studies 5.5, 5.6, 5.7, 6.5, 6.6, 7.5, 7.6, 8.5, 8.6, 9.6, 9.8, and 9.9).		
All Stakeholders	Revised Study Plan Comments Due for studies 5.5, 5.6, 5.7, 6.5, 6.6, 7.5, 7.6, 8.5, 8.6, 9.5, 9.6, 9.8, and 9.9.	April 14, 2013	5.13(b) waived
FERC	Director's Study Plan Determination for studies 5.5, 5.6, 5.7, 6.5, 6.6, 7.5, 7.6, 8.5, 8.6, 9.5, 9.6, 9.8, and 9.9.	May 14, 2013	5.13(c) waived
Mandatory Conditioning Agencies only	Any Study Disputes Due for studies 5.5, 5.6, 5.7, 6.5, 6.6, 7.5, 7.6, 8.5, 8.6, 9.5, 9.6, 9.8, and 9.9.	June 3, 2013	5.14(a)
Dispute Panel	Third Dispute Panel Member Selected	June 18, 2013	5.14(d)
Dispute Panel	Dispute Resolution Panel Convenes	June 23, 2013	5.14(d)(3)
AEA	Applicant Comments on Study Disputes Due	June 28, 2013	5.14(i)
Dispute Panel	Dispute Resolution Panel Technical Conference	July 3, 2013	5.14(j)
Dispute Panel	Dispute Resolution Panel Findings Issued	July 23, 2013	5.14(k)
FERC	Director's Study Dispute Determination	August 12, 2013	5.14(l)

20140507-0008

The following letter was received from FERC on May 7.
Ascension number 20140513-0201 has the same letter, but is clearer.

ORIGINAL

ALASKA ENERGY AUTHORITY

April 29, 2014

Mr. Douglas L. Johnson, P.E.
FEDERAL ENERGY REGULATORY COMMISSION
Regional Engineer, Portland Regional Office
Division of Dam Safety and Inspections
805 S.W. Broadway, Suite 550
Portland, Oregon 97205

Subject: Board of Consultant Meeting #4
Susitna-Watana Hydroelectric Project P-14241-AK

Reference: AEA Letter to William H. Allerton, P.E. filed November 16, 2012

Dear Mr. Johnson:

The fourth Susitna-Watana Hydroelectric Project Independent Board of Consultants (BOC) meeting was held April 2-4, 2014 in Bellevue, Washington at the office of MWH Global Inc. The purpose of the meeting was to update and solicit advice from the BOC and advisors on the status of the Probable Maximum Precipitation (PMP) and Probable Maximum Flood (PMF) studies, the Site Specific Seismic Hazards Analysis studies, and the 2014 geotechnical investigation program plans. The progress of the RCC dam configuration feasibility and design studies was presented and discussed. A summary of the Boards comments follows.

The BOC agrees that if the planned site investigation program confirms that there are no shears, linear features or faults found that can negatively affect the performance of the dam, the configuration of the dam would be acceptable as a basis for further design evaluation, analysis and license application. The Site Specific Seismic Hazard Analysis (SSSHA) studies that are being conducted and presented are reasonable and appropriate for determining project feasibility and to serve as a basis for further design evaluation and optimization.

The SSSHA studies cover lineament, probabilistic, and deterministic seismic hazard analyses and are detailed enough to provide preliminary design ground motions for the project. Sensitivity analyses show that further analysis of regional crustal lineaments will not significantly impact the design ground motions in the period range of significant dam response. However, further analysis of site area lineaments and angled drill holes are necessary to assess potential for fault rupture under the dam as a result of primary, secondary, or sympathetic fault displacement.

The BOC agrees that the PMF inflow hydrograph presented in the draft PMF report represents generally appropriate assumptions and modeling methodologies and the study is sufficiently

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complete to be used in feasibility design.

The proposed and planned Site Investigation Program for the project entails a phased series of field investigations that respond to several of the BOC comments and concerns. The primary focus of the program is to characterize and confirm the geologic/geotechnical conditions in the dam site area. The main objectives include; 1) investigation and verification of the fracture and shear zones and geologic features, 2) evaluation of the potential for offset displacements in the foundation due to earthquake motions; 3) delineation of the frozen ground and groundwater conditions (adits) and 4) evaluation of the abutment stability. The BOC considers the present detailed and phased site investigation appropriate for developing the data for supporting the feasibility and design of the dam.

Attached are the BOC Final Report #4, the BOC Final Report #4 with AEA responses, and the BOC Comment Log for meetings 1,2,&3 with BOC comments.

Thank you for your assistance and please let me know if there is anything else you need.

Sincerely,

Bryan Carey, P.E.
Engineering Manager

cc: Mr. Wayne Dyok, P.E., Alaska Energy Authority, Susitna-Watana Project Manager
Attached Distribution List
The attachments are being made publicly available by uploading them to the "Documents" page of AEA's licensing website, http://www.susitnawatanahydro.org/type/documents.

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BOC Final Report #4 with AEA Responses
BOC Comment Log for Meetings 1, 2 & 3 with BOC Comments

20140513-0201

ALASKA ENERGY AUTHORITY

April 29, 2014

Mr. Douglas L. Johnson, P.E.
FEDERAL ENERGY REGULATORY COMMISSION
Regional Engineer, Portland Regional Office
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The BOC agrees that if the planned site investigation program confirms that there are no shears, linear features or faults found that can negatively affect the performance of the dam, the configuration of the dam would be acceptable as a basis for further design evaluation, analysis and license application. The Site Specific Seismic Hazard Analysis (SSSHA) studies that are being conducted and presented are reasonable and appropriate for determining project feasibility and to serve as a basis for further design evaluation and optimization.

The SSSHA studies cover lineament, probabilistic, and deterministic seismic hazard analyses and are detailed enough to provide preliminary design ground motions for the project. Sensitivity analyses show that further analysis of regional crustal lineaments will not significantly impact the design ground motions in the period range of significant dam response. However, further analysis of site area lineaments and angled drill holes are necessary to assess potential for fault rupture under the dam as a result of primary, secondary, or sympathetic fault displacement.

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Thank you for your assistance and please let me know if there is anything else you need.

Sincerely,

Bryan Carey, P.E.
Engineering Manager

cc: Mr. Wayne Dyok, P.E., Alaska Energy Authority, Susitna-Watana Project Manager
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Attachments: BOC Final Report #4
BOC Final Report #4 with AEA Responses
BOC Comment Log for Meetings 1, 2 & 3 with BOC Comments

ALASKA ENERGY AUTHORITY

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April 4, 2014

Mr. Bryan Carey
Engineering Manager
Alaska Energy Authority
813 West Northern Lights
Anchorage, Alaska 99503

Subject: **Susitna-Watana Dam Project (Project # P-14241-000)**
Independent Board of Consultants and Advisors
Meeting No. 4 - April 2 - 4, 2014 - Bellevue, WA

Dear Mr. Carey:

Introduction

The Fourth Meeting of the Independent Board of Consultants (BOC) was held in Bellevue, Washington during April 2nd, 3rd and 4th, 2014 at the offices of MWH. William Lettis of Lettis Consultants International was added to the Project as the seismic geology expert and advisor to the BOC. The purpose of the meeting was to update the BOC on the status of the PMP and PMF studies, the Site Specific Seismic Hazards Analysis studies, as well as the 2014 geotechnical investigation program plans. The progress of the RCC dam configuration feasibility and design studies was presented and discussed in detail. The following Report responds to the AEA Questions posed to the Board as well as presents additional considerations regarding seismic geology, fault rupture hazards and ground motions for the site.

Materials were distributed to the Board in advance for their review. The meeting was conducted in general accordance with the attached agenda as Attachment A. The list of attendees that attended the meetings is attached as Attachment B.

The AEA Susitna BOC Comment Log that was distributed to the Board was discussed briefly at the Meeting. The BOC reviewed the Comment Log in detail and will submit comments to AEA.

AEA Questions and BOC Responses

AEA Question 1: *Does the BOC agree that the configuration of the dam is acceptable as a basis for further design evaluation and optimization (and license application), with the proviso that the dynamic analysis be revised with foundation mass etc. and (results of) Site Specific Seismic Hazard Analysis studies, (and) site investigation (for the configuration)?*

BOC Response to Question 1: The BOC agrees that if the result of the planned site investigation program is positive, i.e., that there are no shears, linear features or faults found that can negatively affect the performance of the dam, the configuration of the dam would be acceptable as a basis for further feasibility/design evaluation, analysis and license application. The BOC feels that confirmation of these site conditions are paramount to the feasibility and therefore encourages early completion of the planned foundation investigation. The Site Specific Seismic Hazard Analysis (SSSHA) studies that are being conducted and presented are reasonable and appropriate for determining project feasibility and to serve as a basis for further design evaluation and optimization.

The various dynamic analyses need to be further investigated for the Operating Basis Earthquake (OBE) to show that operation can continue without interruption after an OBE event. Analysis for the MCE should be conducted as a limit case and evaluated for overall stability to ensure that the dam is stable during and after the MCE without sudden and uncontrolled release of the reservoir. Some possible damage and small displacement is acceptable for the MCE case as long as the water retention capability of the dam is maintained. With respect to follow up dynamic analyses, the BOC suggests the following:

1. It is important that dynamic analysis with massed foundation uses appropriate foundation modulus consistent with rock properties at the dam site. A low foundation modulus may be assigned to a narrow strip of elements along the footprint of the dam to account for rock fractures and joints that may exist in shallow depths, but a higher deformation modulus of the rock should be used in the rest of the foundation.
2. Appropriate transmitting or non-reflecting boundary conditions should be applied to the bottom and sides of the foundation model to eliminate reflection of seismic waves at the boundaries of the model.
3. Transmitting boundaries (dampers) with no constraint do not permit acceleration time histories as the seismic input. The ground-surface acceleration time histories therefore should first be deconvolved and then converted to stress time histories and applied to bottom and sides of the model. It is important that the deconvolution and conversion to stress time histories are verified to ensure that they produce similar ground surface acceleration when applied to a foundation block without the dam in place.

AEA Question 2: Does the BOC agree that the Site Specific Seismic Hazard Analysis (SSSHA) studies performed to date are acceptable with the proviso that further crustal lineament analysis and angled drill holes across the valley under the dam foundation (2014-15 field program) be completed before final seismic criteria can be verified?

BOC Response to Question 2:

The SSSHA studies accomplished to date cover lineament, probabilistic, and deterministic seismic hazard analyses and are detailed enough to provide preliminary design ground motions for the project. Sensitivity analyses show that further analysis of regional crustal lineaments will not significantly impact the design ground motions in the period range of significant dam response. However, further analysis of site area lineaments and angled drill holes are necessary to assess potential for fault rupture under the dam as a result of primary, secondary, or sympathetic fault displacement, as discussed in more detail under the "Additional Considerations" section below. On this basis, the BOC believes that the main purpose of further lineament analysis at the dam site including angled drill holes should focus on assessment of potential fault displacement and not necessarily on the vibratory ground motion associated with the lineaments. From the BOC perspective the probabilistic and deterministic ground motions are acceptable and can be finalized giving consideration to the following:

1. Based on preliminary measurements, V_{s30} at the dam site could be as high as 2,000 m/s, which is significantly higher than the current value considered (1,080 m/s). The BOC recommends that ground motions be estimated for V_{s30} consistent with the rock properties at the dam, and if necessary be adjusted for the effect of Kappa (effect of upper crust damping).

2. The BOC is generally satisfied with the deterministic estimates of Mmax (i.e. Magnitudes, 7.5, 7.8, and 8.0) and the associated level of ground motions (i.e., 84th% for M7.5 and 69th % for M7.8 and M8.0) for the intraslab events. However, the BOC considers that the magnitude of 7.5 is a more defensible MCE for the dimensions and historical activity of the McKinley Block beneath the site; and recommends that a Mmax of 7.5 at the closest hypocentral distance and 84th percentile deterministic ground motion (pga of 0.76g) be adopted for feasibility/design (see "Additional Considerations").

3. An ANSYS dynamic analysis of Layout-4 indicates a fundamental period of vibration of about 0.55 seconds with sliding and permanent displacements under the MCE ground motion (intraslab M7.5 at 84th percentile, equivalent to a return period of 5,000 years). The nonlinear response of the dam is therefore expected to be sensitive to long-period and long-duration ground motion, typical of interface events. As such, the BOC recommends that in addition to the intraslab ground motion, the dam also be analyzed for the interface deterministic ground motion scaled to the 5000-year UHS at the fundamental period of the dam (0.55 sec).

AEA Question 3: Does the BOC agree that the draft PMP/PMF studies – prior to completing the report – are acceptable for finalizing the feasibility design and that if there are no changes in conclusion during the finalization of the report that the conclusions can be used for the final design of the spillway?

BOC Response to Question 3:

Probable Maximum Precipitation (PMP)

Applied Weather Associates (AWA) has made subtle but very significant changes to their modeling approach, many of them based on suggestions from the BOC. It is the BOC's opinion that the current configuration of the model, and the results obtained, represent an accurate, consistent, and defensible estimate of PMP as it would affect the spillway design.

While there are some details which have been identified for modification in the PMP reports, these are mostly minor clarifications and grammar suggestions. The PMP process itself, and the resultant rainfall estimates, are excellent.

The most significant change in modeling procedure is in the storm transposition process. AWA is using a procedure which normalizes precipitation using a comparison with extreme precipitation coverage (such as 100-year grids from NOAA Atlas 14). Then this normalized grid is transposed to the target watershed and multiplied by the extreme coverage values at the target. The result is a process very similar to the so-called "isopercental" method, which is known to work well in areas with complex terrain. We believe that the storm transposition approach currently used by AWA is the most consistent and defensible method available. The BOC recommends that the report be edited for consistency and clarification prior to final submittal.

Probable Maximum Flood (PMF)

The BOC agrees that the PMF inflow hydrograph presented in the draft PMF report represents generally appropriate assumptions and modeling methodologies and the study is sufficiently complete to be used in feasibility design. The BOC commends the thoughtfulness and level of detail shown in the work to date, considering the unusual challenges posed by two factors in particular: the sparseness of historical hydrometeorological data and the dominance of snowmelt in many historical and hypothetical floods.

However, The BOC recommends that additional analyses and investigations be completed before adopting a final design inflow hydrograph, as follows:

1. The constant loss rate of 0.02 inch per hour applied to develop the PMF was less than the calibrated loss function (that is, it resulted in more computed runoff) and was chosen to provide an additional level of conservatism. The BOC concurs with this decision because the original loss function calibration for snowmelt-impacted events is somewhat unreliable, requiring an increase in the precipitation inputs relative to the values provided by Applied Weather Associates (AWA) for the calibration events. When greater-than-observed rainfall has to be added to the model in order to achieve the observed runoff volume, the other inputs affecting volume become very questionable. In fact, the calibrations were not able to conclusively prove that the loss rate was any greater than zero. In the presentation to the BOC on April 3, MWH's hydrologist noted that they had begun the process of applying the adopted PMF loss rate to the calibration events with generally acceptable results. The BOC strongly supports this step – along with the elimination of any arbitrary adjustments to the AWA-provided rainfall data – for the sake of consistency. The BOC would view a less perfect fit to the calibration events to be an acceptable sacrifice in order to avoid adjusting the rainfall data.

2. If the model continues to underestimate snowmelt-impacted events, consider the possibility that the energy budget loss method is not adequately considering the release of free water from a compacted snowpack. One reference addressing this condition is the1966 Bureau of Reclamation Engineering Monograph No. 35.

3. The near-record flood of June 2013 raises the possibility of a "sun-on-snow" PMF. In light of the fact that the PMP rainfall is relatively small and is associated with temperatures substantially lower than the temperatures that may occur in late spring/early summer with no cloud cover, the BOC suggests investigating the snowmelt-only event in at least enough depth to confirm it cannot control the PMF. This investigation would involve two elements:

    - Apply the HEC-1 model to the June 2013 event to confirm that it can replicate this type of flood;
    - Consider whether a probable maximum snowpack combined with unusually high temperatures, with no rain, could produce a controlling PMF. An efficient approach might be to make multiple model runs to determine what temperature/wind combinations would be needed to produce a PMF "contender" and then consult with AWA to evaluate whether such a combination of circumstances is plausible.

4. The sensitivity analysis leading to the adopted PMF model used a June precipitation/snowmelt combination. However, in the "base case" model runs, the August PMP with no snowmelt controlled the PMF. The final study should either address making similar conservative loss rate adjustments to the August case, or explain why the adopted changes apply to rain-on-snow floods but not to summer floods.

5. In the PMF report, Table 9.1-3, run M6 (The October PMP, or 80 percent of the all season PMP, on an October snowpack accumulation) is listed as resulting in a peak inflow of 24,000 cfs. However, in mid-October 1986 the Gold Creek gage recorded a daily flow of 36,000 cfs. The BOC agrees that this case will not control the PMF. Still, to retain confidence in the model assumptions the discrepancy between the computed extreme flood and the observed flood needs to be resolved.

AEA Question 4: *Given the configuration presented does the BOC consider that the planned site investigation is appropriate for the provision of data for feasibility/design of the dam?*

BOC Response to Question 4: The proposed and planned Site Investigation Program for the project was presented at the meeting. This program entails a phased series of field investigations, conducted over the next three years that respond to several of the BOC comments and concerns. The primary focus of the program is to characterize and confirm the geologic/geotechnical conditions in the dam site area. The main objectives include; 1) investigation and verification of the fracture and shear zones and geologic features, 2) evaluation of the potential for offset displacements in the foundation due to earthquake motions; 3) delineation of the frozen ground and groundwater conditions (adits) and 4) evaluation of the abutment stability. Given the above plan and objectives, which can be accomplished by the detailed mapping and exploratory adits and borings planned; the BOC considers the present detailed and phased site investigation appropriate for developing the data for supporting the feasibility and design of the dam.

Additional Considerations:

The BOC agrees that the Site Specific Seismic Hazard Analysis (SSSHA) studies performed to date are acceptable for further design evaluation and optimization with the proviso that the proposed site-specific studies be performed in the 2014-15 field seasons to evaluate the potential for fault rupture at the dam site.

Potential seismic hazard at the site includes two components: (1) Strong ground motion (development of design ground motion criteria), and 2) Fault rupture (documenting the absence of potential for fault displacement through the dam foundation). Fault displacement includes both tectonic fault displacement (primary, secondary or sympathetic) and non-tectonic displacement (e.g., sachung, etc.),

Considerable work has been performed to date to develop probabilistic and deterministic ground motion estimates for the dam. As described below, the BOC considers that this work is sufficient to move forward with further design and optimization studies, and the license application, pending completion of the final SSSHA studies.

Conversely, given site access limitations, only limited assessment has been performed of the potential for fault displacement at the dam site. Given the importance of this potential hazard to selection of the RCC dam design and location, the BOC concurs with the prioritization given to this assessment in the proposed work scope for 2014 field activities, including detailed field mapping, angle boreholes, and dating of identified shear zones. We reiterate our BOC comment following Meeting #2 (Comment 10) "*It is recommended that the energy of the geologists and the funding be focused on the mapping, drilling, and adits at the dam site area in a major effort to define the geometry of the shears in order to locate the dam such that any offsets occurring along these features during an earthquake do not need to be considered. This activity must be given the highest priority compared to the lineament studies at significant distances from the possible dam site*".

Fault Rupture Hazard.

In performing the upcoming 2014 site studies, the BOC recommends that particular attention be given to the following:

1. The Lineament Study provides an excellent basis for further evaluation of geologic features that may intersect the dam site area, and provides explicit criteria for "including" or "excluding" lineaments for further study. Currently, all of the criteria are related to the identification of potential seismic sources for ground motion analysis. The BOC recommends that one or more criteria be added related to the assessment of lineaments for potential fault rupture. For example, all lineaments that project toward the dam site within a 3 to 5 Km radius, regardless of length, should be evaluated for potential fault rupture.

2. During the upcoming 2014 field season, the BOC strongly recommends that explicit attention be given to the evaluation of the Susitna lineament as a potential fault structure, and the potential relationship of this lineament to the NW-SE trending shears mapped through the dam foundation (e.g., as potential Reidel shears). This potential association must be ruled out either by direct observations such as cross cutting relationships or by indirect arguments such as expected sense of slip in the current tectonic stress/strain regime.

3. In addition to mapping observed lineaments in the dam site area, the BOC recommends that a large scale lineament and detailed geologic map of the site area (approximately 1 or 2 kilometer radius around the dam) be prepared documenting the "absence" of lineaments or geologic features that may be associated with tectonic or non-tectonic activity (e.g., sachung features or

other deep-seated sympathetic structures) and explicitly stating in the report that these features are absent at the site.

4. Considerable "legacy" data exist for the site, including the Woodward Clyde lineament and trenching study. For example, trenches on the Susitna lineament and Talkeetna lineament are used to conclude that these features are not active faults. The BOC recommends that the site report include a section or commentary regarding the use of this pre-existing knowledge for current evaluation of these features.

Ground Motion Hazard.

1. Seismic Source Model. The seismic source model developed for the site is well documented and is appropriate for use in both deterministic and probabilistic analysis of ground motion at the site. Sensitivity analyses have identified those parameters of the model that are significant to hazard for further evaluation, including the Mmax distribution on the Intraslab source and selection/weighting of appropriate GMPE models. Sensitivity analyses show that crustal faults in the site region do not contribute significantly to hazard. Thus, the BOC recommends that little further effort be given to characterizing the potential activity of Lineaments in the site region. As needed, any Regional Lineaments "identified for further study" in the Lineament Report may be addressed by assigning a probability of being seismogenic (P(s)), a slip rate based on the threshold of detection, and an Mmax based on lineament length. Sensitivity analyses have shown that incorporating these lineaments as seismic sources will not contribute to ground motion hazard at the site.

2. Mmax of the Intraslab Source. For the deterministic analysis, the BOC supports the use of an Mmax of 7.5 at the closest hypocentral distance and 84th% deterministic ground motion, or an Mmax of 7.8 to 8.0 at a hypocentral distance uniformly distributed on the rupture plane and 84th% deterministic ground motion as recommended in Technical Memorandum 14-04-TM. Alternately, the latter is equivalent to the use of the closest hypocentral distance and 69th % ground motion as shown in 14-04 TM. The BOC recommends that additional discussion be provided in 14-04 TM regarding the hypocentral distribution used in the analysis both in depth (width) and length of potential Intraslab Fault Planes. The BOC recommends that the project team evaluate the fault rupture dimensions associated with recorded magnitude 8 Intraslab earthquakes in the global data base for comparison to the dimensions of the McKinley Block beneath the site. Such an evaluation can be used to assess whether the Intraslab source at the site can support similar large magnitude events, whether a lower Mmax (e.g., 7.5) is defensible for the MCE deterministic evaluation, and to inform the weighting given to the magnitude distribution for the PSHA.

3. Ground Motion Prediction Equation (GMPE) Model. The BOC recommends that a final decision be made on the selection of the GMPE model for the Intraslab source. Currently, the Deterministic and Probabilistic assessments use different GMPE models. For consistency, a final assessment of the GMPE model should be used in the SSSHA studies for development of final seismic design criteria.

Concluding Remarks:

The BOC appreciates that this phase of the Feasibility Study need not get into the final design details; however, it also feels that there are significant basic conditions that influence the configuration and performance of the dam. These factors can and may well affect the feasibility and estimated cost of the Project. Whether the present Feasibility Report addresses or tries to address all of the potential conditions of the dam and its environs is up to both the Owner and the Engineer. However, there are serious conditions and considerations that must be addressed. The following are several considerations identified, by the BOC, that need to be recognized and attended to:

1. The presence or absence of fault or shear features in the foundations that may affect both the static and dynamic performance of the RCC dam. The BOC strongly suggests that these issues be resolved in a timely manner, preferably in the 2014 detailed surface mapping and inclined cross-river borings planned during this first stage of the investigation.
2. The existence of permafrost within the foundation rock formations and how it has affected or will affect the foundation characteristics (i.e. ice jacking, rock block movements, long term foundation permeability etc.). The BOC strongly suggests that these issues be resolved in a timely manner, preferably in the first stage of the investigation (2014-15), from the proposed exploratory adits.
3. Knowing that the dam will be subject to sliding during an MCE event, consideration should be given to shaping of the foundation of each monolith to provide an upstream inclination for additional shear resistance.
4. It is important that upper abutment blocks (thrust blocks) provide adequate support for the arch thrust to capture or limit movements. This may be accomplished by appropriate orientation of the thrust blocks and possibly increasing their cross sections.
5. With the completion of the PMF and estimate of the design ground motion, the BOC reiterates its Comment 12.4 from Board Meeting 2 that special attention should be given to potential of increasing the number of spillway gates thereby reducing the height of piers, which would be more efficient in transferring the arch thrust into the adjacent blocks and improving cross-valley performance of the piers. This issue is also of concern to FERC as a result of a present incident at Wanapum project spillway.
6. Thermal considerations regarding placement of RCC directly on the cold foundations and shrinkage.
7. The transverse joint spacing that is appropriate for the cold climate and the thermal shock stresses generated by the cold water when the reservoir is impounded.
8. Considerations regarding longitudinal cracking from concrete shrinkage and foundation restraint
9. Consideration of foundation grouting within the extremely cold foundation rocks and groundwater.
10. The complications of sequencing of the seasonal placements and the thermal effects on the internal stress development

The BOC recognizes the efforts of AEA, and MWH to provide and present information for our review during the meetings and arrangements. The hospitality and accommodations provided by MWH are greatly appreciated.

The BOC Report was read during a Conference Call on Friday April 4th at 1:00PM from MWHs offices.

Sincerely,

Joseph Ehasz | Brian Forbes | Yusof Ghanaat | Alfred J. Hendron, Jr.

Ellen Faulkner | George Taylor | William R. Lettis

Attachments:

Attachment A – Meeting Agenda

Attachment B – Attendance Sheets

ATTACHMENT A

MEETING AGENDA

SUSITNA-WATANA HYDRO

Susitna-Watana Board of Consultants Meeting #4

MWH Office, 2353 130th Ave. NE #200, Bellevue, WA

Agenda
April 2-4, 2014
8:15 AM – 5:00 PM

Wednesday, April 2nd

(PUBLIC ACCESS)

1.	**Welcome and Introductions**	**8:15 AM**
	• Safety Topic	
2.	**Prior Meetings Comment Response Review**	**8:45 AM**
3.	**2013 Geotechnical Investigation Program**	**9:45 AM**
	• 2013 Site Investigation Update	
	• Seismic Hazard and Lineament Studies Update	

CONCURRENT SESSIONS

(PUBLIC ACCESS)

4A.	**PMP Breakout Session**	**1:15 PM**
	• PMP Study Update	
	• PMF Study Update	

START EXECUTIVE SESSION – CEII

(CEII)

4B.	**Dam Configuration**	
	• Deterministic Analysis of Intraslab	**1:15 PM**
	• Dam Configuration	
	• FE Analysis Update	

Adjourn

SUSITNA-WATANA HYDRO

Susitna-Watana Board of Consultants Meeting #4

MWH Office, 2353 130th Ave. NE #200, Bellevue, WA

Thursday, April 3rd

CONCURRENT SESSIONS

(PUBLIC ACCESS)

5A. PMP Breakout Session (continued) — **8:15 AM**

- PMP Study Update
- PMF Study Update

RESUME EXECUTIVE SESSION – CEII

(CEII)

5B. Dam Configuration (continued) — **8:15 AM**

- Deterministic Analysis of Intraslab
- Dam Configuration
- FE Analysis

END EXECUTIVE SESSION / CONCURRENT SESSIONS

(PUBLIC ACCESS)

6. Geotechnical Investigation Program — **10:00 AM**

7. PMP/PMF Overview — **1:00 PM**

Adjourn

SUSITNA-WATANA HYDRO

Susitna-Watana Board of Consultants Meeting #4

MWH Office, 2353 130th Ave. NE #200, Bellevue, WA

Friday, April 4th

START NON-PUBLIC SESSION

8.	**Board of Consultants Deliberations**	**8:15 AM**

END NON-PUBLIC SESSION

(PUBLIC ACCESS)

9.	**Board of Consultants Conclusions and Recommendations**	**(TBD)**
10.	**Establish Date for Next Board Meeting Adjourn**	

Adjourn

ATTACHMENT B

MEETING ATTENDANCE SHEETS

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

BOARD OF CONSULTANTS MEETING #4
APRIL 2-4, 2014
BELLEVUE, WA

SIGN-IN-SHEET DAY ONE – WEDNESDAY, APRIL 2ND (AM) Public

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BOARD OF CONSULTANTS MEETING #4
APRIL 2-4, 2014
BELLEVUE, WA

SIGN-IN-SHEET DAY ONE – WEDNESDAY, APRIL 2ND (AM) Public

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BOARD OF CONSULTANTS MEETING #4
APRIL 2-4, 2014
BELLEVUE, WA

SIGN-IN-SHEET DAY ONE – WEDNESDAY, APRIL 2ND (PMP) PM Public

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BOARD OF CONSULTANTS MEETING #4
APRIL 2-4, 2014
BELLEVUE, WA

SIGN-IN-SHEET DAY ONE – WEDNESDAY, APRIL 2ND (CEII) PM Session

Please Print

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BOARD OF CONSULTANTS MEETING #4
APRIL 2-4, 2014
BELLEVUE, WA

SIGN-IN-SHEET DAY ONE – WEDNESDAY, APRIL 2ND AM Session

Please Print

Name	Company	Email	Phone
Peter Dickson	MWH (by phone)		

ALASKA ENERGY AUTHORITY

BOC Final Report #4 with AEA Responses

AEA Questions, BOC Responses and AEA Comments

1. ***AEA Question 1:*** *Does the BOC agree that the configuration of the dam is acceptable as a basis for further design evaluation and optimization (and license application), with the proviso that the dynamic analysis be revised with foundation mass etc. and (results of) Site Specific Seismic Hazard Analysis studies, (and) site investigation (for the configuration)?*

   BOC Response to Question 1: The BOC agrees that if the result of the planned site investigation program is positive, i.e., that there are no shears, linear features or faults found that can negatively affect the performance of the dam, the configuration of the dam would be acceptable as a basis for further design evaluation, analysis and license application. The BOC feels that confirmation of these site conditions are paramount to the feasibility and therefore encourages early completion of the planned foundation investigation. The Site Specific Seismic Hazard Analysis (SSSHA) studies that are being conducted and presented are reasonable and appropriate for determining project feasibility and to serve as a basis for further design evaluation and optimization.

   The various dynamic analyses need to be further investigated for the Operating Basis Earthquake (OBE) to show that operation can continue without interruption after an OBE event. Analysis for the MCE should be conducted as a limit case and evaluated for overall stability to ensure that the dam is stable during and after the MCE without sudden and uncontrolled release of the reservoir. Some possible damage and small displacement is acceptable for the MCE case as long as the water retention capability of the dam is maintained.

   AEA Comment:

   There has always been the intention to perform a dynamic structural analysis of the dam for both the OBE and the MCE. However, using the level of OBE suggested by the various guidelines in use in the US indicates an event that can "*reasonably be expected to occur within the service life of the project, that is, with a 50-percent probability of exceedence during the service life*". This would be about a 144-yr occurrence which is less than 0.25g. AEA will discuss and may choose an OBE that is higher. In any event, the behavior of the structure under the MCE will essentially govern the feasibility design of the dam, so AEA has chosen to focus on that criteria for the time being. The analyses will be performed for that seismic criteria and when the final configuration has been derived, it will be subject to the chosen OBE - and is expected to perform satisfactorily.

   With respect to follow up dynamic analyses, the BOC suggests the following:

   - It is important that dynamic analysis with massed foundation uses appropriate foundation modulus consistent with rock properties at the dam site. A low foundation modulus may be assigned to a narrow strip of elements along the footprint of the dam to account for rock fractures and joints that may exist in shallow depths, but a higher deformation modulus of the rock should be used in the rest of the foundation.

***AEA Comment*:**

Noted.

- Appropriate transmitting or non-reflecting boundary conditions should be applied to the bottom and sides of the foundation model to eliminate reflection of seismic waves at the boundaries of the model.

***AEA Comment*:**

Intend to include.

- Transmitting boundaries (dampers) with no constraint do not permit acceleration time histories as the seismic input. The ground-surface acceleration time histories therefore should first be deconvolved and then converted to stress time histories and applied to bottom and sides of the model. It is important that the deconvolution and conversion to stress time histories are verified to ensure that they produce similar ground surface acceleration when applied to a foundation block with the dam in place.

***AEA Comment*:**

Intend to do this. However, there is, we believe a typographical error. In the last line it says "block with the dam in place" this seems wrong and that it should be "block without dam in place".

2. ***AEA Question 2:*** *Does the BOC agree that the Site Specific Seismic Hazard Analysis (SSSHA) studies performed to date are acceptable with the proviso that further crustal lineament analysis and angled drill holes across the valley under the dam foundation (2014-15 field program) be completed before final seismic criteria can be verified for final design?*

***BOC Response to Question 2*:**

The SSSHA studies accomplished to date cover lineament, probabilistic, and deterministic seismic hazard analyses and are detailed enough to provide preliminary design ground motions for the project. Sensitivity analyses show that further analysis of regional crustal lineaments will not significantly impact the design ground motions in the period range of significant dam response. However, further analysis of site area lineaments and angled drill holes are necessary to assess potential for fault rupture under the dam as a result of primary, secondary, or sympathetic fault displacement, as discussed in more detail under "Additional Considerations" section below. On this basis, the BOC believes that the main purpose of further lineament analysis at the dam site including angled drill holes should focus on assessment of potential fault displacement and not necessarily on the vibratory ground motion associated with the lineaments. From the BOC perspective the probabilistic and deterministic ground motions are acceptable and can be finalized giving consideration to the following:

- Based on preliminary measurements, V_{s30} at the dam site could be as high as 2,000 m/s, which is significantly higher than the current value considered (1,080 m/s). The BOC

recommends that ground motions be estimated for V_{s30} consistent with the rock properties at the dam, and if necessary be adjusted for the effect of Kappa (effect of upper crust damping).

AEA Comment:

Noted. In the absence of any actual site testing, we intend to run the analysis using a Vs30 that is conservative with respect to ground motions.

- The BOC is generally satisfied with the deterministic estimates of Mmax (i.e., 7.5, 7.8, and 8.0) and the associated level of ground motions (i.e., 84th% for 7.5 and 69th % for M7.8 and M8.0) for the intraslab events. However, the BOC considers that the magnitude of 7.5 is a more defensible MCE for the dimensions and historical activity of the McKinley Block beneath the site; and recommends that a Mmax of 7.5 at the closest hypocentral distance and 84th percentile deterministic ground motion (pga of 0.76g) be adopted for the feasibility/design (see "Additional Considerations").

AEA Comment:

Noted.

- An ANSYS dynamic analysis of Layout-4 indicates a fundamental period of vibration of about 0.55 seconds with sliding and permanent displacements under the MCE ground motion (intraslab M7.5 at 84th percentile, equivalent to a return period of 5,000 years). The nonlinear response of the dam is therefore expected to be sensitive to long-period and long-duration ground motion, typical of interface events. As such, the BOC recommends that in addition to the intraslab ground motion, the dam also be analyzed for the interface deterministic ground motion scaled to the 5000-year UHS at the fundamental period of the dam (0.55 sec).

AEA Comment:

Noted.

3. ***AEA Question 3:*** *Does the BOC agree that the draft PMP/PMF studies – prior to completing the report – are acceptable for finalizing the feasibility design and that if there are no changes in conclusion during the finalization of the report that the conclusions can be used for the final design of the spillway?*

BOC Response to Question 3:

3.1 Probable Maximum Precipitation (PMP)

Applied Weather Associates (AWA) has made subtle but very significant changes to their modeling approach, many of them based on suggestions from the BOC. It is the BOC's opinion that the current configuration of the model, and the results obtained, represent an accurate, consistent, and defensible estimate of PMP as it would affect the spillway design.

While there are some details which have been identified for modification in the PMP reports, these are mostly minor clarifications and grammar suggestions. The PMP process itself, and the resultant rainfall estimates, are excellent.

The most significant change in modeling procedure is in the storm transposition process. AWA is using a procedure which normalizes precipitation using a comparison with an extreme precipitation coverage (such as 100-year grids from NOAA Atlas 14). Then this normalized grid is transposed to the target watershed and multiplied by the extreme coverage values at the target. The result is a process very similar to the so-called "isopercental" method, which is known to work well in areas with complex terrain. We believe that the storm transposition approach currently used by AWA is the most consistent and defensible method available.

The BOC recommends that report be edited for consistency and clarification prior to final submittal.

AEA Comment:

Noted. Final editing and review of the PMP report will be performed.

3.2 Probable Maximum Flood (PMF)

The BOC agrees that the PMF inflow hydrograph presented in the draft PMF report represents generally appropriate assumptions and modeling methodologies and the study is sufficiently complete to be used in feasibility design. The BOC commends the thoughtfulness and level of detail shown in the work to date, considering the unusual challenges posed by two factors in particular: the sparseness of historical hydrometeorological data and the dominance of snowmelt in many historical and hypothetical floods.
However, The BOC recommends that additional analyses and investigations be completed before adopting a final design inflow hydrograph, as follows:

- The constant loss rate of 0.02 inch per hour applied to develop the PMF was less than the calibrated loss function (that is, it resulted in more computed runoff) and was chosen to provide an additional level of conservatism. The BOC concurs with this decision because the original loss function calibration for snowmelt-impacted events is somewhat unreliable, requiring an increase in the precipitation inputs relative to the values provided by Applied Weather Associates (AWA) for the calibration events. When greater-than-observed rainfall has to be added to the model in order to achieve the observed runoff volume, the other inputs affecting volume become very questionable. In fact, the calibrations were not able to conclusively prove that the loss rate was any greater than zero. In the presentation to the BOC on April 3, MWH's hydrologist noted that they had begun the process of applying the adopted PMF loss rate to the calibration events with generally acceptable results. The BOC strongly supports this step – along with the elimination of any arbitrary adjustments to the AWA-provided rainfall data – for the sake of consistency and credibility. The BOC would view a less perfect fit to the calibration events to be an acceptable sacrifice in order to avoid adjusting the rainfall data.

AEA Comment:

It is expected that the analysis of a constant loss rate of 0.02 inch per hour for the spring calibration and verification floods will be added to the PMF report in either a new or a revised report section.

- If the model continues to underestimate snowmelt-impacted events, consider the possibility that the energy budget loss method is not adequately considering the release of free water from a compacted snowpack. One reference addressing this condition is the1966 Bureau of Reclamation Engineering Monograph No. 35.

AEA Comment:

It is anticipated that the energy budget snowmelt method (as recommended in FERC guidelines) will prove adequate for simulation of historic snowmelt events. It is noted that USBR Monograph No. 35 states that it is intended for use in in inflow design flood studies in which a design rain occurs on a fresh snowpack.

- The near-record flood of June 2013 raises the possibility of a "sun-on-snow" PMF. In light of the fact that the PMP rainfall is relatively small and is associated with temperatures substantially lower than the temperatures that may occur in late spring/early summer with no cloud cover, the BOC suggests investigating the snowmelt-only event in at least enough depth to confirm it cannot control the PMF. This investigation would involve two elements:
    - Apply the HEC-1 model to the June 2013 event to confirm that it can replicate this type of flood;
    - Consider whether a probable maximum snowpack combined with unusually high temperatures, with no rain, could produce a controlling PMF. An efficient approach might be to make multiple model runs to determine what temperature/wind combinations would be needed to produce a PMF "contender" and then consult with AWA to evaluate whether such a combination of circumstances is plausible.

AEA Comment:

Noted. The sun-on-snow PMF will be investigated in sufficient detail to determine whether it could constitute the controlling case for the PMF, including simulation of the actual June 2013 flood event.

- The sensitivity analysis leading to the adopted PMF model used a June precipitation/snowmelt combination. However, in the "base case" model runs, the August PMP with no snowmelt controlled the PMF. The final study should either address making similar conservative loss rate adjustments to the August case, or explain why the adopted changes apply to rain-on-snow floods but not to summer floods.

AEA Comment:

Noted.

- In the PMF report, Table 9.1-3, run M6 (The October PMP, or 80 percent of the all season PMP, on an October snowpack accumulation) is listed as resulting in a peak inflow of 24,000 cfs. However, in mid-October 1986 the Gold Creek gage recorded a daily flow of 36,000 cfs. The BOC agrees that this case will not control the PMF. Still, to retain confidence in the model assumptions the discrepancy between the computed extreme flood and the observed flood needs to be resolved.

  ***AEA Comment*:**

  This case will be revised to present a more plausible October PMF, probably by investigating an October 1 PMF condition to replace the October 15 condition.

4. ***AEA Question 4:*** *Given the configuration presented does the BOC consider that the planned site investigation is appropriate for the provision of data for feasibility/design of the dam?*

   BOC Response to Question 4: The proposed and planned Site Investigation Program for the project was presented at the meeting. This program entails a phased series of field investigations, conducted over the next three years that respond to several of the BOC comments and concerns. The primary focus of the program is to characterize and confirm the geologic/geotechnical conditions in the dam site area. The main objectives include; 1) investigation and verification of the fracture and shear zones and geologic features, 2) evaluation of the potential for offset displacements in the foundation due to earthquake motions; 3) delineation of the frozen ground and groundwater conditions (adits) and 4) evaluation of the abutment stability. Given the above plan and objectives, which can be accomplished by the detailed mapping and exploratory adits and borings planned; the BOC considers the present detailed and phased site investigation appropriate for developing the data for supporting the feasibility and design of the dam.

   ***AEA Comment*:**

   Noted.

ADDITIONAL CONSIDERATIONS:

The BOC agrees that the Site Specific Seismic Hazard Analysis (SSSHA) studies performed to date are acceptable for further design evaluation and optimization with the proviso that the proposed site-specific studies be performed in the 2014-15 field seasons to evaluate the potential for fault rupture at the dam site.

Potential seismic hazard at the site includes two components: (1) Strong ground motion (development of design ground motion criteria), and 2) Fault rupture (documenting the absence of potential for fault displacement through the dam foundation). Fault displacement includes both tectonic fault displacement (primary, secondary or sympathetic) and non-tectonic displacement (e.g., sachung, etc.).

Considerable work has been performed to date to develop probabilistic and deterministic ground motion estimates for the dam. As described below, the BOC considers that this work is sufficient to move forward with further design and optimization studies, and the license application, pending

completion of the final SSSHA studies.

Conversely, given site access limitations, only limited assessment has been performed of the potential for fault displacement at the dam site. Given the importance of this potential hazard to selection of the RCC dam design and location, the BOC concurs with the prioritization given to this assessment in the proposed work scope for 2014 field activities, including detailed field mapping, angle boreholes, and dating of identified shear zones. We reiterate our BOC comment following Meeting #2 (Comment 10) "*It is recommended that the energy of the geologists and the funding be focused on the mapping, drilling, and adits at the dam site area in a major effort to define the geometry of the shears in order to locate the dam such that any offsets occurring along these features during an earthquake do not need to be considered. This activity must be given the highest priority compared to the lineament studies at significant distance s from the possible dam site*".

Fault Rupture Hazard. In performing the upcoming 2014 site studies, the BOC recommends that particular attention be given to the following:

1. The Lineament Study provides an excellent basis for further evaluation of geologic features that may intersect the dam site area, and provides explicit criteria for "including" or "excluding" lineaments for further study. Currently, all of the criteria are related to the identification of potential seismic sources for ground motion analysis. The BOC recommends that one or more criteria be added related to the assessment of lineaments for potential fault rupture. For example, all lineaments that project toward the dam site, regardless of length, should be evaluated for potential fault rupture.
2. During the upcoming 2014 field season, the BOC strongly recommends that explicit attention be given to the evaluation of the Susitna lineament as a potential fault structure, and the potential relationship of this lineament to the NW-SE trending shears mapped through the dam foundation (e.g., as potential Reidel shears). This potential association must be ruled out either by direct observations such as cross cutting relationships or by indirect arguments such as expected sense of slip in the current tectonic stress/strain regime.
3. In addition to mapping observed lineaments in the dam site area, the BOC recommends that a large scale lineament and detailed geologic map of the site area (approximately 1 or 2 kilometer radius) be prepared documenting the "absence" of lineaments or geologic features that may be associated with tectonic or non-tectonic activity (e.g., sachung features or other deep-seated sympathetic structures) and explicitly stating in the report that these features are absent at the site.
4. Considerable "legacy" data exist for the site, including the Woodward Clyde lineament and trenching study. For example, trenches on the Susitna lineament and Talkeetna lineament are used to conclude that these features are not active faults. The BOC recommends that the site report include a section or commentary regarding the use of this pre-existing knowledge for current evaluation of these features.

Ground Motion Hazard.

(1) Seismic Source Model. The seismic source model developed for the site is well documented and is appropriate for use on both deterministic and probabilistic analysis of ground motion at the site. Sensitivity analyses have identified those parameters of the model that are significant to hazard for further evaluation, including the M_{max} distribution on the Intraslab source and selection/weighting of appropriate GMPE models. Sensitivity analyses show that crustal faults in the site region do not contribute significantly to hazard. Thus, the BOC recommends that little further effort be given to characterizing the potential activity of

Lineaments in the site region. As needed, any external lineaments "identified for further study" in the Lineament Report may be addressed by assigning a probability of being seismogenic (P(s)), a slip rate based on the threshold of detection, and an Mmax based on lineament length. Sensitivity analyses have shown that incorporating these lineaments as seismic sources will not contribute to ground motion hazard at the site.

***AEA Comment*:**

Noted.

(2) M_{max} of the Intraslab Source. For the deterministic analysis, the BOC supports the use of an M_{max} of 7.5 at the closest hypocentral distance and 84th% deterministic ground motion, or an M_{max} of 7.8 to 8.0 at a hypocentral distance uniformly distributed on the rupture plane and 84th% deterministic ground motion as recommended in Technical Memorandum 14-04-TM. Alternately, the latter is equivalent to the use of the closest hypocentral distance and 69th % ground motion as shown in 14-04 TM. The BOC recommends that additional discussion be provided in 14-04 TM regarding the hypocentral distribution used in the analysis both in depth (width) and length of potential Intraslab Fault Planes. The BOC recommends that the project team evaluate the fault rupture dimensions associated with recorded magnitude 8 Intraslab earthquakes in the global data base for comparison to the dimensions of the McKinley Block beneath the site. Such an evaluation can be used to assess whether the Intraslab source at the site can support similar large magnitude events, whether a lower Mmax (e.g., 7.5) is defensible for the MCE deterministic evaluation, and to inform the weighting given to the magnitude distribution for the PSHA.

***AEA Comment*:**

Noted. For the moment we will continue to use both M7.5 (84th %tile) and M8.0 (69th %tile) or the higher of the two.

(3) Ground Motion Prediction Equation (GMPE) Model. The BOC recommends that a final decision be made on the selection of the GMPE model for the Intraslab source. Currently, the Deterministic and Probabilistic assessments use different GMPE models. For consistency, a final assessment of the GMPE model should be used in the SSSHA for development of final seismic criteria.

AEA Comment:

The deterministic and probabilistic assessment use the same GMPE. There is an error in the Technical Memorandum 14-04-TM that would lead the reader to believe otherwise. This error will be corrected. The computations included in the Technical Memorandum 14-04-TM are for comparison purposes only and utilize one GMPE criteria.

Concluding Remarks

The BOC appreciates that this phase of the Feasibility Study need not get into the final design details; however, it also feels that there are significant basic conditions that influence the configuration and performance of the dam. These factors can and may well affect the feasibility and

estimated cost of the Project. Whether the present Feasibility Report addresses or tries to address all of the potential conditions of the dam and its environs is up to both the Owner and the Engineer. However, these are serious conditions and considerations that must be addressed. The following are several considerations identified, that need to be recognized and attended to:

- The presence or absence of fault or shear features in the foundations that may affect both the static and dynamic performance of the RCC dam. The BOC strongly suggests that these issues be resolved in a timely manner, preferably in the 2014 detailed surface mapping and inclined cross-river borings planned during first stage of the investigation.

  AEA Comment:

  Noted.

- The existence of permafrost within the foundation rock formations and how it has affected or will affect the foundation characteristics (i.e. ice jacking, rock block movements, long term foundation permeability etc.). The BOC strongly suggests that these issues be resolved in a timely manner, preferably in the first stage of the investigation (2014-15), from the proposed exploratory adits.

  AEA Comment:

  Noted.

- Knowing that the dam will be subject to sliding during an MCE event, consideration should be given to shaping of the foundation of each monolith to provide an upstream inclination for additional shear resistance.

  AEA Comment:

  Noted.

- It is important that upper abutment blocks (thrust blocks) provide adequate support for the arch thrust to capture or limit movements. This may be accomplished by appropriate orientation of the thrust blocks and possibly increasing their cross sections.

  AEA Comment:

  Noted.

- With the completion of the PMF and estimate of the design ground motion, the BOC reiterates its Comment 12.4 from Board Meeting 2 that special attention should be given to potential of increasing the number of spillway gates thereby reducing the height of piers, which would be more efficient in transferring the arch thrust into the adjacent blocks and improving cross-valley performance of the piers. This issue is also of concern to FERC as a result of a present incident at Wanapum project spillway.

AEA Comment:

Number of gates will be increased to four.

- Thermal considerations regarding placement of RCC directly on the cold foundations and shrinkage.

AEA Comment:

Noted. A thermal analysis is planned.

- The transverse joint spacing that is appropriate for the cold climate and the thermal shock stresses generated by the cold water when the reservoir is impounded.

AEA Comment:

Noted.

- Considerations regarding longitudinal cracking from concrete shrinkage and foundation restraint

- Consideration of foundation grouting within the extremely cold foundation rocks and groundwater.

- The complications of sequencing of the seasonal placements and the thermal effects on the internal stress development.

AEA Comment:

The thermal model will address.

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Item No.	BOC Document & Date	Page or Sheet #	Technical Category	Comment	Response	Response by and Date	Status	Notes
1	BOC MTG-1 Final Report, Nov. 9, 2012	2 of 8	Hydrology & Meteorology	**Probable Maximum Precipitation (PMP)** 1) Transposability. What techniques will be used for horizontal transpositioning of selected storms? How will observed precipitation values be modified in the process? What are the linear limits of transposability (i.e., how far away from the target area could a storm be and still be transposable)?	Covered in Board Meeting 2A. AWA will follow HMR, WMO, and our standard procedures for quantifying transposition factor of the final short list of storms used to derive PMP. This includes using the updated 2-sigma SST climatology to determine the ratio of precipitable water (PW) at the in-place storm location vs. the transposition location within the basin. This will be done on the gridded basis, i.e. each grid cell will have this calculated individually. Observed precipitation values will be modified based on the combination of the in-place maximization factor, the horizontal transposition factor, and the orographic transposition factor. The linear multiplication of these three factors will results in the total adjustment factor for each individual storm at each grid cell. The transpositionability limits of the storms is TBD and will be a function of the storm type, the individual characteristics of each short list storm (which has yet to be developed) and the meteorological analysis and judgment of AWA in conjunction with discussions with the BoC. It is assumed that because all storms considered for this study will have occurred within or upwind of the basin to the coastline, transposition limits should be fairly straightforward. We will not be transpositioning storms from the interior of Alaska across major mountains ranges, such as the Alaska Range or St Elias Range. In addition, AWA will generally follow the HMR and WMO guidelines of limiting transpositioning of storms to less than 6° of latitude, as moving beyond these bounds could potentially change the storm dynamic structure of a given storm event.	AWA 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
2	BOC MTG-1 Final Report, Nov. 9, 2012	2 of 8	Hydrology & Meteorology	**2)** Maximization. Will moisture maximization be done exclusively with sea surface temperature analysis or will other techniques be used as well? Will there be any verification of the SST-based maximization (e.g., surface dew point analyses)?	It is anticipated that all storms will be maximized using SSTs unless a storm event being analyzed DID NOT have rainfall at several of the upwind weather stations (i.e Talkeetna, Anchorage, Kenai, Seward, etc). Assuming each upwind station had rainfall during the rainfall period being analyzed for a given storm event, it is required that SST be used as the rainfall at the upwind stations "contaminates" the dew points reading that would have otherwise been used. This follows the same guidance as used in previous AWA studies, HMRs 57 and 59, and the WMO PMP Manual. As an example, all storms used in both the Lewis River and Piru Creek PMP studies required SST for the storm maximization calculations and it is initially assumed the same will result in this study.	AWA 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
3	BOC MTG-1 Final Report, Nov. 9, 2012	2 of 8	Hydrology & Meteorology	**3)** Barriers. The basin in question is surrounded by higher terrain, so some barrier-based moisture reduction is expected. Please describe the procedure you will use for this project.	AWA will use the proportionality constant to quantify the effects of upwind and within basin orographics on rainfall from one location (grid cell) to another. In addition, the general inflow direction for each short list storm event will be determined and used to calculate the "effective barrier height" from each of those directions from the coastline into the basin. This will provide a minimum elevation to be used with each inflow direction in the maximization processes. Specific details on these calculations and processes will be provided in upcoming memos, teleconferences, and meetings. It is AWA's intention to ensure that all involved have complete understanding of these processes, how they affect PMP, and how they are used to quantify orographic effects on rainfall production from one location to another.	AWA 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
4	BOC MTG-1 Final Report, Nov. 9, 2012	3 of 8	Hydrology & Meteorology	**4)** Elevation corrections for moisture. How will moisture corrections (e.g., reductions in available moisture) be done in areas of high relief?	Per the discussion in the previous response, the proportionality constant and effective barrier heights will be determined. This will allow for explicit evaluations of the amount of moisture available to each short list storm, at each grid cell within the basin following standard (HMR, WMO, AWA) procedures to determine PW at a given elevation.	AWA 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
5	BOC MTG-1 Final Report, Nov. 9, 2012	3 of 8	Hydrology & Meteorology	**5)** How adequate is the data set for snowpack (SWE and depth)? How will the data be distributed (grid in GIS; Point values only; Basin average; By elevation band)?	The snowpack data is less than for many other watersheds due to the very large size of the basin and relatively few snowpack stations, but it is still expected to be adequate. The available snowpack data and analysis results are expected to be distributed by sub-basin and by elevation band based on precipitation data from PRISM.	JH 5/13/13	Response accepted.	Snowpack
6	BOC MTG-1 Final Report, Nov. 9, 2012	3 of 8	Hydrology & Meteorology	**6)** Will glacier dynamics be addressed (in terms of areal extent or water release)?	The largest glaciers have been put in separate sub-basins where their special water release characteristics can be addressed.	JH 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.

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7	BOC MTG-1 Final Report, Nov. 9, 2012	3 of 8	Hydrology & Meteorology	**7)** The issue of "how many storms should be chosen for detailed analysis?" has been addressed. AWA's contract calls for 10 storms. This is probably adequate, unless some older storms are found (see item 8. below).	Agreed, and AWA will let the data tell us the answer. If our storm search shows that 20 storm are required, we will use those, if it show 5 storms are required we will use those. Ten storms is an estimate based on previous PMP work along the West Coast and AWA's judgment. AWA will work with the BoC and hydrologist in this process of determining the final number of storms to be used in PMP development. The most importantly aspect is to ensure that no storm(s) is left off the list that could control the PMP values at any area size or duration.	AWA 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
8	BOC MTG-1 Final Report, Nov. 9, 2012	3 of 8	Hydrology & Meteorology	**8)** When asked about climate change effects on precipitation intensity, Bill Kappel stated that it is unlikely that future climate will cause a significant increase in PMP, and that our historical storm data is adequate for assessing future scenarios. However, the primary model of climate variability in Alaska is the Pacific Decadal Oscillation (PDO), which has a quasi-cyclical variation of about 50 years. This led to generally warm conditions from about 1920 to 1945, cooler conditions from the late forties through 1976-77, and warmer again through the late 1990s. Somewhat cooler conditions have returned since then. It would be interesting to identify a few storms from the two earlier periods to see if there were noticeable variations in precipitation intensity. This could be done in a "screening" capacity using a simple approach such as AWA's SPAS-Lite.	AWA agrees with this statement and has an excellent understanding of the PDO cycle, as well as its interactions (positive and negative feedback) with other cycles on varying timescales such as ENSO, MJO, AO, etc. Each of these climatic patterns affect the frequency and strength of storm systems which occur in the region. Unfortunately, the resulting affects are not well understood at a quantifiable level. Instead, AWA's storm search methods are all encompassing as far as period of record is concerned and therefore extend back to as far as the storm record allows. Generally, this include ~100-years of data. This period of record inherently includes storm events that have occurred during each potential combination of climatic cycles (i.e. +PDO, -PDO, La Nina, El Nino, etc) that would be expected over the useful lifetime of this project (50-100-years or more). If the final short list of storms does not include events that occurred during each of the cycles, AWA will try to identify storms from each cycle period if possible and provide a high level analysis of these results. However, there may be a reason that PMP-level storms don't occur during one of the cycles and the data is trying to tell us a story. This will be an ongoing investigation during the short list storm development process. If these investigations require substantial work outside of the current scope for PMP development, AWA will work with the project lead and BoC to make appropriate out-of-scope determinations.	AWA 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
9	BOC MTG-1 Final Report, Nov. 9, 2012	3 of 8	Hydrology & Meteorology	**9)** AWA acknowledged that some storms may persist beyond 72 hours, and that, in fact, the critical PMF period may be for 96 hours or more. AWA should consider these longer-duration events in their analyses.	AWA concurs and will let the data tell us what the appropriate PMP duration should be. It should be noted that it is also possible the PMP storm may be less than 72-hours. AWA will place no constraints on this duration at this time, but instead this will be based on the storm data from the short list of storms.	AWA 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
10	BOC MTG-1 Final Report, Nov. 9, 2012	3 of 8	Hydrology & Meteorology	**COINCIDENT HYDROMETEOROLOGIC CONDITIONS -** We concur with the approach described, but note that extreme snow water equivalents deserve special attention. We understand that in many scenarios and locations the depth of snow during the PMP will be so great as to be no limiting; however, there may be scenarios, seasons, and elevation bands where the snow water equivalent does limit the potential runoff.	Storm sequences of 96 hours or more, depending on analysis by AWA, will be included in the determination of the critical PMF inflow hydrograph. No predetermined maximum storm sequence length will be set.	JH 5/13/13	Response Accepted. Adopted probable maximum storm length of 216 hours is consistent with observed events and adequate to cover basin and reservoir response time.	
11	BOC MTG-1 Final Report, Nov. 9, 2012	3 of 8	Hydrology & Meteorology	**PROBABLE MAXIMUM FLOOD (PMF) -** We concur with the elements and sequence of analyses for the PMF study as proposed by MWH and believe that if successfully executed they will provide the hydrologic information necessary to meet the public safety requirements of the project with respect to flood discharge capacity and flood loading. ***Model selection.*** MWH proposes to use the HEC-1 model for the analysis. HEC-1 is a spatially lumped, single event model that has been in widespread use for PMF hydrograph development for several decades (with updates). Most of its computational algorithms (with the important exception of snowmelt, as discussed below) have been incorporated in the HEC-HMS model, which was intended to replace HEC-1. The primary advantages of HEC-HMS over HEC-1 are the Windows user interface, the Gems extension which offers the capability to work with ArcGIS data, and the option to use spatially distributed runoff algorithms. None of these are necessities in the proposed Susitna-Watana study and we have no objections to MWH's preference for HEC-1, which offers the advantages of transparency and a clearly documented energy budget snowmelt routine.	Agreed. The HEC-1 Flood Hydrograph Package will be the rainfall-runoff model used to derive the PMF.	JH 5/13/13	Response Accepted. BOC concurs with use of HEC-1.	

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12	BOC MTG-1 Final Report, Nov. 9, 2012	4 of 8	Hydrology & Meteorology	***Calibration and Verification.*** MWH has identified a number of storm/flood events and gage locations that may be used for model calibration and verification, and proposes to calibrate the model on at least two events and verify it on at least one. Applied Weather Associates will support this work by providing spatial and temporal histories of the associated storms. The calibration/verification process is essential to developing a reliable model and we strongly endorse this effort. The Gold Creek gage, located at a drainage area about 1,000 square miles more than the project area, provides the most comprehensive and long-term flow record and is expected to be a leading source of stream flow data for calibration. However, care should be taken, if at all possible, to use multiple stream gages – including some of the within-basin gages with a shorter period of record than the Gold Creek gage – in the calibration and verification effort. This will provide additional information on sensitive or critical subareas within the basin.	Agreed, as discussed further at BOC Meeting 2A.	JH 5/13/13	Response accepted. Model calibration has made use of multiple gages in the watershed	
13	BOC MTG-1 Final Report, Nov. 9, 2012	4 of 8	Hydrology & Meteorology	***Reservoir Routing.*** The significance of reservoir routing and the related issues of hydrograph shape and volume (as opposed to peak flow only) will depend on the spillway configuration, freeboard allowance, and reservoir level regime proposed for the project. These elements of the project are still not well defined but we urge both MWH and Applied Weather Associates to remain open to the possibility that a long-duration, high-volume event will be the critical one in establishing the PMF reservoir elevation. Furthermore, if reservoir storage is intended to be used in passing the PMF, we will request additional information on the expected rate and spatial distribution of sediment deposition in the reservoir.	Agreed with regards to long-duration, high volume events. Sedimentation analysis would be a study done by others, or potentially information from the 1980s could be used.	JH 5/13/13	Response Tentatively Accepted. Although sedimentation analysis is not part of the PMF study, depending on the importance of storage in the final results the BOC may request reservoir routing sensitivity analyses assuming a loss of storage due to sedimentation.	
14	BOC MTG-1 Final Report, Nov. 9, 2012	4 of 8	Hydrology & Meteorology	Energy Budget Snowmelt Routine. MWH proposes to use the energy budget snowmelt routine as recommended in FERC's Engineering Guidelines. We concur with this approach, because the energy budget method is much better suited for estimating the impacts of extreme rates of precipitation and wind on snowmelt than temperature-index methods.	Agreed.	JH 5/13/13	Response Accepted.	
15	BOC MTG-1 Final Report, Nov. 9, 2012	4 of 8	Hydrology & Meteorology	Limiting PMF Analysis to May – October. MWH provided historic peak flow data representing 59 years of record at the Gold Creek gage downstream of the project in support of their proposal to analyze PMP and PMF only for the months of May through October. The maximum recorded flows in November-March are generally an order of magnitude smaller than the maximum recorded flows in the summer and early fall months. (April falls in between.) In addition, MWH reported that peak snowmelt months are from late spring through summer, and provided a preliminary reservoir level schedule which includes a drawdown, relative to the normal maximum storage, of 30 to 100 feet in the winter months with the lowest pool projected for April. In light of this information we agree that the months of May through October are probably an appropriate focus for the PMP/PMF analysis. However, a review of annual flow hydrographs at the Gold Creek gage shows that (1) flow hydrographs for the period November - April are generally missing and have been reconstituted; and (2) it is not unusual for the reconstituted or estimated flow hydrograph to begin rising steeply in mid to late April and continue rising into May. Based on these observations we request that AWA and/or MWH provide confirmation that extreme precipitation/temperature events occurring in May and later adequately (or conservatively) represent the potential for such events in April.	Covered in BOC Meeting 2A. Derivation of the PMF inflow hydrograph will be limited to the months of May through October.	JH 5/13/13	Response Accepted. Analyses through March 2014 did include April events. MWH's and AWA's reports convincingly demonstrated that the combinations of mechanisms needed for "worst-case" flooding would not be plausible in November - March.	
16	BOC MTG-1 Final Report, Nov. 9, 2012	5 of 8	Hydrology & Meteorology	***Other sources of flooding.*** We understand that the potential for glacial dam break floods is being addressed in a separate study. We recommend that the findings of this study be considered in hydrologic design of the project.	Noted - glacial specific studies are to be done by others.	JH 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed	
17	BOC MTG-1 Final Report, Nov. 9, 2012	5 of 8	Seismic	PROBABLE SITE SPECIFIC SEISMIC HAZARD EVALUATION 1) Conduct sensitivity studies using an existing hazard model to evaluate potential impact of new data before starting additional data collection: - Focus on what is most important to hazard at the dam site - May be able to limit studies of crustal faults to faults that pass within the site region (about 20 km radius)	Agreed. In keeping with recommendations by our seismic hazard consultant, we intend to conduct sensitivity studies as part of the seismic hazard study.	MB 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.

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18	BOC MTG-1 Final Report, Nov. 9, 2012	5 of 8	Seismic	**2)** Use the PSHA (Probabilistic Seismic Hazard Analysis) to help guide selection of a reasonable deterministic event: -Selection of Ground motion variability level (med, 84th) is still more dominant than the nominal variation in earthquake magnitude adopted	Agreed.	MB 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
19	BOC MTG-1 Final Report, Nov. 9, 2012	5 of 8	Seismic	**3)** Consider using "Approved" simulation methods for key cases (in early 2014): - M7.5-M8 slab earthquakes - M9-M9.5 interface earthquakes	Agreed. Due to funding, this activity may not be completed until 4Q13.	MB 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
20	BOC MTG-1 Final Report, Nov. 9, 2012	5 of 8	Seismic	**4)** Should collect data to constrain the VS30 (shear wave velocity in the upper 30 meters) for ground motion models	Agreed. These measurements will be collected during the 2013 field season.	MB 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
21	BOC MTG-1 Final Report, Nov. 9, 2012	5 of 8	Seismic	**5)** Consider the full network (new and existing) - What is the current broadband and strong motion instrumentation in the region? - A single strong motion recording is not of much value. Need min of about 5 stations within 100 km to be able to understand recording at dam, i.e., earthquake source, ray path, site response? - Develop an instrumentation plan that will provide results useful to ground motion evaluation, not just RTS (Reservoir Triggered Seismicity) For further details of the above see the attached presentation by N. Abrahamson (Attachment D to the BOC report).	Three additional BB seismographs are being installed in 3Q13. In addition, 3 SM seimogrpahs will be installed in conjuntion with the BB at three of the 6 BB stations. The range of the network will be expanded to 30 miles.	MB 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	
22	BOC MTG-1 Final Report, Nov. 9, 2012	6 of 8	Seismic	The BOC feels that it would be helpful to the project for Dr. Abrahamson to provide a Table of readings of seismographs which recorded motions at various distances from the 2002 Denali M 7.9 earthquake. This information from the Denali Earthquake would be most useful as a calibration and verification of the scientific information and equations proposed. This information also may be more appropriate to consider in determining an attenuation relationship for this project as opposed to information from around the world. In addition, any computational model should be calibrated to the measurements obtained from the 2002 Denali Earthquake.	The project team has the recorded motions for the 2002 Denali M 7.9 EQ. An article on the 2002 Denali EQ was provide to the BOC: Martirosyan, A., Hansen, R., and Ratchkovski, N. (2004). Strong-Motion Records of the 2002 Denali Fault, Alaska, Earthquake, Earthquake Spectra, 20, 579-596	MB 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	
23	BOC MTG-1 Final Report, Nov. 9, 2012	6 of 8	Seismic	**ADDITIONAL RECOMMENDATIONS NOT REFERRED TO OR DISCUSSED IN THE SEISMIC STUDY PLAN -** Ice Jacking Concerns. Given the present considerations of a concrete dam option (RCC), the existing foundations and associated stability and shear strength of the foundation rocks are a significant factor. Thus, the concerns regarding permafrost as well as ice jacking within the exposed foundation rocks should be explored. If ice conditions and ice jacking have moved the foundation rocks it can be a serious reduction of the shear strength properties of the foundations being considered for the concrete dam. Therefore, future geologic and geotechnical explorations should focus on this aspect of the Project. Perhaps select borings and adits into suspicious areas should be considered to establish or disprove the ice jacking concerns.	Exploratory adits have been proposed to be excavated. Priority will be given to the left abutment adit to evaluate the presense of frozen ground and the potential for ice-filled discontinuities.	BES 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	

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24	BOC MTG-1 Final Report, Nov. 9, 2012	6 of 8	Seismic	***Additional Considerations on Earthquakes.*** In addition to the proposed studies of earthquakes to arrive at the ground motions based on the most current models, it is the judgment of the BOC that work should be done within the current study or future studies to give some guidance on the possibility of the design earthquake producing a displacement or offset along the dam foundation. These features should be studied and investigated and a determination should be made whether this potential fault is a credible concern to be addressed in the design of the dam. This effort is recommended to avoid a fault being discovered during excavation along the footprint of the dam during construction. It may be necessary to align additional exploration borings or excavated adits to explore and/or eliminate such conditions. Earlier geologic studies of linear features of the site indicated a linear feature, shown on one of the plans presented during the meeting, called the "Watana Feature" that ran along the Watana River. The possibility of such a feature should be further studied and essentially discounted. Earlier studies (1980's) attempted to drill exploratory borings crisscrossing the river to investigate the continuity of the geology within the river bottom. It is not certain that the possibility of a shear/fault feature was discounted or not. This potential should be studied by an additional geologic expert like William Lettis, who is associated with the present study team. If sympathetic displacements along this feature or other linear features within the dam footprint cannot be discounted then discontinuous displacements should be considered. If it is deemed that this consideration is possible then consideration of a different type of dam may be necessary. Various dam types are available that are less sensitive to displacements and offsets and that can safely be designed to accommodate such conditions. Thus, the study plans need to address the potential of less desirable foundations such as ice jacking within the existing foundation rocks as well as the potential of foundation displacements. Until these conditions can be better understood, the type of dam must be considered preliminary. The upcoming spring geological/geotechnical study program must address these issues.	AEA believes that offset is very unlikely, but the Site investigation will be planned to include drillholes across the area of any potential geologic feature having the potential for offset and a fault evlaution will be undertaken.	BES 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	
25	BOC MTG-1 Final Report, Nov. 9, 2012	7 of 8	Geotechnical	FERC REQUESTED THAT THE FOLLOWING ADDITIONAL QUESTION BE ADDRESSED BY THE BOC - Does the BOC agree that the type of dam being considered (RCC) is the most appropriate type of dam for this site?	As stated in BOC Mtg 1 - Final Report, this question is to be addressed at the next BOC meeting (#2) scheduled for March 7-8, 2013.	DOWL HKM/ Schnabel	To be addressed during the BOC #2 Meeting.	Complete. No further action required on this for BOC MTG-1

AEA Susitna-Watana BOC Meeting #2 in Bellevue, WA (March 7-8, 2013) - Comment and Response Log

These pages are formatted to be printed on 11" x 17" paper in Landscape format

Item No.	BOC Document & Date	Page or Sheet #	Technical Category	Comment	Response	Response by and Date	Status	Notes
1	BOC MTG-2 Final Report	1 of 3	Geotechnical, Structural, Concrete, Hydroelectric	The BOC is of the opinion that the 700 foot "gravity arch" dam structure being considered is not appropriate for the shape of the valley at the Watana location. A straight or slightly curved RCC gravity structure with 1V: 0.85H, as presented in the NTP 13, Technical Memorandum No. 1 (Updated Alternatives Evaluation) is far more appropriate.	See answer to item 2	BES 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	
2	BOC MTG-2 Final Report	2 of 3	Geotechnical, Structural, Concrete, Hydroelectric	It appears from the studies presented, a hybrid configuration consisting of a central arch with outer gravity sections on both abutments, have been attempted to force fit a "gravity arch" section into the present topography. Further, the gravity sections are aligned such that they might be susceptible to down-slope sliding. Given the fact that the Watana Dam will not only be a very high dam but will also be in a seismically active area subject to very high seismic motions and deformations, it seems that tried and true methods combined with simple and predictable geometry are in order. There is a big difference between a "curved gravity dam" and a "gravity arch dam". The curved gravity dam is designed as a gravity structure dependent on the weight of the dam for stability, while the gravity arch dam is a reduced gravity structure which depends on the combined arch and gravity actions to resist loads, provided that the valley shape will permit the arch action to be fully developed. This dam will not only be among the highest dams in North America, it will also be the highest RCC dam constructed in a high seismic area of North America.	The feasibility studies for the project are progressing with the aim of the selection of an optimal arrangement for the dam at the site, taking into account the foundation and abutment conditions. The presentation to the Board of Consultants at this meeting was not of the final proposed arrangement, but only a "snapshot" of the design during the optimization process. AEA expects to continue to analyze various dam geometries, - including the results of the site investigations as they become available - and will take into account the opinions of the Board in the preparation of the final recommended proposal.	BES 5/13/13		
3	BOC MTG-2 Final Report	2 of 3	Geotechnical, Structural, Concrete, Hydroelectric	Since the construction period for the dam is restricted to the 5-6 summer months, high RCC placing rates are planned, therefore simplicity in the details of the design are important considerations. The need for contraction joint grouting and, therefore, post cooling of the RCC will be required for the gravity arch dam, as being considered, will require many additional items to be incorporated into the RCC, such as waterstops, grout tubes and cooling water tubes, all of which will be serious impediments to achieving high RCC placement rates. Thus, a cautious and conservative approach, such as a design with a simple configuration that can be analyzed and constructed with high level of confidence, should be taken in the selection of the type of RCC structure, as described in the comments above.	The opinion of the Board of Consultants is noted	BES 5/13/13		
4	BOC MTG-2 Final Report	2 of 3	Geotechnical, Structural, Concrete, Hydroelectric	Based on the maps and materials supplied, the lineaments indicated on earlier maps and studies, such as the Watana Lineament, have been indicated as insignificant and not a cause for potential foundation movement at the site. The planned 2013 and 2014 site investigation program will further investigate several earlier indicated linear features and shears to further confirm the stability of the geologic and foundation conditions.	Agreed	BES 5/13/13		
5	BOC MTG-2 Final Report	2 of 3	Geotechnical, Structural, Concrete, Hydroelectric	In addition, several borings and test trenches as well as mapping and age dating of materials will be conducted to ensure the understanding and confirmation of the earlier studies and conclusions.	Additional site investigations are planned including a fault evaluation study.	BES 5/13/13		

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Item No.	BOC Document & Date	Page or Sheet #	Technical Category	Comment	Response	Response by and Date	Status	Notes
6	BOC MTG-2 Final Report	2 of 3	Geotechnical, Structural, Concrete, Hydroelectric	Other significant investigations entail exploratory adits in each abutment to investigate the character of identified shears as well as the effects of ice and frozen conditions on the stability of rock conditions and rock foundation blocks.	The designers agree and endorse the need for exploratory adits to investigate the rock mass at depth in the abutments	BES 5/13/13		
7	BOC MTG-2 Final Report	2 of 3	Geotechnical, Structural, Concrete, Hydroelectric	The BOC encourages the use of all of the methods and technology [listed in above comments] and in particular the exploratory adits. The adits will be the most positive proof method to establish the significance of the foundation features; and thus are highly recommended.	Agreed	BES 5/13/13		
8	BOC MTG-2 Final Report	3 of 3	Geotechnical, Structural, Concrete, Hydroelectric	Further it is recommended that the 2013 field mapping and studies regarding the shear structures named GS4 and GS5 should be confirmed and located more accurately.	Agreed	BES 5/13/13		
9	BOC MTG-2 Final Report	3 of 3	Geotechnical, Structural, Concrete, Hydroelectric	Once located accurately [shear structures, GS4 and GS5] and confirmed, the dam alignment should be adjusted to eliminate founding the dam footprint on any of these structures.	The nature of these features and their characterisation will be undertaken during the site investigation, and the treatment (or design) necessary will be examined during the design process. If treatment or design is not sufficient, then consideration will be given to relocating the dam.	BES 5/13/13		
10	BOC MTG-2 Final Report	3 of 3	Geotechnical, Structural, Concrete, Hydroelectric	It is recommended that the energy of the geologists and the funding be focused on the mapping, drilling and adits at the dam site area in a major effort to define the geometry of the shears in order to locate the dam such that any offsets occurring along these features during an earthquake do not need to be considered. This activity must be given the highest priority compared to lineament studies at significant distances from the possible dam site.	Agreed	BES 5/13/13		
11	BOC MTG-2 Final Report	3 of 3	Geotechnical, Structural, Concrete, Hydroelectric	Regarding the development of the seismic design criteria for the Project, the BOC would be interested in seeing the data; namely the accelerations, velocities, displacements and attenuations recorded at the seismic stations during the recent large Alaska earthquakes. This information should be instrumental in selecting the seismic parameters for design.	Sent	MB 5/13/13		"Response" Statement subject to BOC Concurrence.
12				The BOC would like to review the following at the next meeting in May:				
	BOC MTG-2 Final Report	3 of 3	Geotechnical, Stru	1. The proposed design earthquake(s) and associated ground motions for various features of the Project.	1. AEA will provide the planning criteria that are being used in the feasibility design analysis. The proposed criteria for final design will not be available by May	BES 5/13/13	Response Tentatively Accepted. BOC will review future work and will comment if needed.	"Response" Statement subject to BOC Concurrence.
				2. Preliminary dynamic analysis of gravity section subjected to the design earthquake motions.	2. AEA will provide analyses completed by the time of the May meeting - probably only 2D analyses			

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Item No.	BOC Document & Date	Page or Sheet #	Technical Category	Comment	Response	Response by and Date	Status	Notes
				3. Preliminary thermal analysis for gravity dam.	3. AEA will perform a basic 2D analysis in time for the May meeting, but notes that the actual thermal conditions will be much more complex than that - and thus little can be surmised from a simple 2D analysis			
				4. Reduced height of spillway gates & piers for improved cross-valley response of the piers.	4. While recognizing the impetus for limiting the pier height, until the PMP and PMF studies are complete in October or November (so that proper flood routing can be performed) AEA considers that focus on this aspect of the design is unwarranted. For the purposes of studying construction planning, and the associated cost estimation, AEA proposes to continue to use the 1980s spillway configuration, but will reassess the design after the PMF has been determined.			
				5. Identify the existence of the shear zones and confirm their locations on the present mapping results of early geologic mapping.	5. Identification of the shear zones and confirming their locations on the present mapping will be performed as a part of this year's site investigations. The results of earlier geoplogical mapping will be presented at the BOC meeting 3.			

AEA Susitna-Watana BOC Meeting #3 in Anchorage, AK (May 29-30th, 2013) - Comment and Response Log

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Item No.	BOC Document & Date	Page or Sheet #	Technical Category	Comment	Response	Response by and Date	Status	Notes
1	BOC MTG-3 Final Report, June 5, 2013	1 of 5	Geotechnical, Structural, Concrete, Hydroelectric	The BOC visited the dam site on Wednesday May 29, 2013 from the air on a helicopter and could land only on the state-owned highest point on the right river bank. The helicopter ride started from Talkeetna along the Susitna River to the dam site at Watana and further upstream to observe potential landslide sites within the reservoir. Both the right and left abutments were observed flying relatively close to the river banks noting the slope conditions, presence or lack of surficial geologic features, and the planned left abutment adit location. Overall, persistent NW-SE geologic features topped with rock outcrop were evident at repeated intervals near and upstream of the dam site. The closest such geological feature was observed to be several hundred feet upstream, but not at the dam alignment. Traces of the geologic features GF4 and GF5 identified within the right abutment were not visible on the surface and could not be observed from the air, but they will be investigated by the planned 2013-2014 borings and seismic refraction surveys. Based on the above observations and information gathered recently and during previous investigations, the BOC concurs with the current location of the dam alignment pending the results of the geotechnical/geological investigations planned for 2013-2014. The observed geometry of the site with a relatively narrow section at the river channel and flatter slopes at the upper elevations confirms the BOC's previously recommended slightly curved gravity dam section for this site. The BOC is in agreement with the revised gravity dam configuration curved at a radius of 3500 feet and notes that the main purpose of such a curved layout is to provide wedging action for an improved resistance to downstream sliding and that the effects of such curvature on cantilever stresses may not be significant. As such the reduction of the high cantilever tensile stresses from the 2D analysis should be accomplished by other means such as sloping the upstream face and the use of lower rock modulus in the upper foundation layer, as discussed in the BOC response to Question 2. The geometry of the canyon section, height of the dam, and high earthquake ground motions, suggest that a group of dam monoliths in the narrower central section more likely would stay together but could potentially separate from the monoliths on the upper abutments. In this situation, the wedging action of the curvature built into the design would constrain movements of the central group of monoliths but the monoliths in the upper abutment separated from the group by opened joints might be vulnerable to sliding and could benefit from a defensive design such as stepping of the dam-foundation contact and other means that improves their resistance.	The opinion of the Board of Consultants is noted. Configuration optimization continues - as far as is reasonable - in the absence of update specific foundation information that will eventually be obtained from a focussed site investigation program.	BES 1/15/14		
2	BOC MTG-3 Final Report	2 of 5	Geotechnical, Structural, Concrete, Hydroelectric	Further, the BOC concurs with the axis of the dam being rotated upstream away from the alteration zone on the left abutment. Consistent with this rotation, the spillway has appropriately been moved to the right side to project directly into the river channel. All in all, the revised dam configuration fits reasonably well to the site geometry and provides a sound baseline design for feasibility studies, while linear features crossing the dam are being investigated to confirm the stability of the geologic and foundation conditions. In the event that features crossing the dam are more extensive than presently envisioned it may be necessary to move the dam alignment to a location away from such features.	The opinion of the Board of Consultants is noted.	BES 1/15/14		
3	BOC MTG-3 Final Report	2 of 5	Geotechnical, Structural, Concrete, Hydroelectric	At the last BOC Meeting (Meeting No. 2) the Board asked that the following be produced for review at this meeting; Meeting No. 3: 1. The proposed design earthquake(s) and associated ground motions for various features of the Project 2. Preliminary dynamic analysis of a gravity section subjected to the design earthquake motions 3. Preliminary thermal analysis for a gravity dam 4. Reduced height of spillway gates & piers for improved cross-valley response of piers 5. Identify the existence of the geologic features and confirm their locations on the present mapping. Results of early geologic mapping" All of the above items were addressed with the exception of No. 4. Item 4 will not be addressed until enough information on the PMF is developed and instead the original spillway design, from the old 1980's configuration, will be used. The Board concurs with that approach.	The opinion of the Board of Consultants is noted.	BES 1/15/14		
4	BOC MTG-3 Final Report	3 of 5	Geotechnical, Structural, Concrete, Hydroelectric	In response to a previous BOC comment concerning comparison of available recorded data with the attenuation relationships proposed for prediction of ground motions at the dam site, the BOC was furnished with a published paper entitled "Strong Motion Records of the 2002 Denali Fault, Alaska, Earthquake." This paper published in 2004 provides a comparison of recorded data with several pre NGA attenuation relationships. The BOC suggests similar comparisons be made using the NGA ground motion prediction relationships that are being used in this project. It is also noted that the seismicity data recorded and analyzed by AEIC provide an excellent opportunity for checking ground motion prediction relationships associated with the intraslab earthquakes. These data may be useful in removing some uncertainties associated with the site-to-source distance and Vs30 values.	Work is ongoing within the project team with regard to this matter.	BES 1/15/14		

AEA Susitna-Watana BOC Meeting #3 in Anchorage, AK (May 29-30th, 2013) - Comment and Response Log

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Item No.	BOC Document & Date	Page or Sheet #	Technical Category	Comment	Response	Response by and Date	Status	Notes
5	BOC MTG-3 Final Report	3 of 5	Geotechnical, Structural, Concrete, Hydroelectric	The Board is encouraged that the presently proposed dam now incorporates a gravity dam section with a downstream slope of 0.9H to 1.0V and a slight upstream curvature. This section is an improvement over the previous cross sections and is felt to be more appropriate given the difficult site and high seismic requirements. Based on the dynamic analysis results presented for the above section, it appears that there is an excessive tension calculated along the upstream portion on the dam. The Board recommends two enhancements to more accurately realize and reduce the dynamic response of the dam: 1) consider sloping the upstream face of the dam and 2) consider reducing the modulus of the upper layer of the foundation rock to account for the existing and blast generated fractures near the ground surface. An upstream slope of 0.2H to 1.0V together with a downstream slope of 0.7H to 1.0 V would be an appropriate section to analyze and would not increase the current volume of the concrete. In addition, a variation on the foundation rock modulus varying from 500,000 psi to 1,000,000 psi would be an appropriate consideration to assess sensitivity of the results to rock modulus. With consideration of these two modifications the Board feels that the tensile zones will be smaller and more localized as well as manageable. The Board also recommends that the yield acceleration be calculated, as a gravity section, for each cross section studied.	Potential variations of dam geometry continue to be investigated. Matters raised by the Board of Consultants are being addressed.	BES 1/15/14		
6	BOC MTG-3 Final Report	3 of 5	Geotechnical, Structural, Concrete, Hydroelectric	The Board does appreciate that this phase of the Feasibility need not get into the final design details however, it also feels that there are significant basic conditions that influence the performance of the dam, especially the response to seismic loading, and the internal stresses developed from extreme temperature loading. These factors can and may well affect the feasibility and estimated cost of the Project.	The opinion of the Board of Consultants is noted. Temperature studies are delayed slightly as the construction sequencing is investigated.	BES 1/15/14		
7	BOC MTG-3 Final Report	3 of 5	Geotechnical, Structural, Concrete, Hydroelectric	Whether the present Feasibility Report addresses or tries to address all of the potential conditions of the dam and its environs is up to both the Owner and the Engineer, however there are serious conditions and considerations that eventually must be addressed. The following are several considerations identified, that need to be recognized: o The existence of permafrost within the foundation rock formations and how it has affected or will affect the foundation characteristics (i.e. ice jacking, rock block movements, long term foundation permeability etc.) o Thermal considerations regarding placement of RCC directly on the cold foundations and shrinkage. o The transverse joint spacing that is appropriate for the cold climate and the thermal shock stresses generated by the cold water when the reservoir is impounded. o Considerations regarding longitudinal cracking from concrete shrinkage and foundation restraint o Consideration of foundation grouting within the extremely cold foundation rocks and groundwater. o The complications of sequencing of the seasonal placements and the thermal effects on the internal stress development The above considerations are just a few, when taken piecemeal appear to be insignificant, however the total of the above and many other conditions of the site need to be taken seriously and into consideration to fully accomplish the successful design and construction of the dam. Thus, the Board recommends that several of the above conditions be factored into the feasibility report, especially consideration of a sloping upstream face and reduction of the foundation modulus. The upstream sloping face enhances both the static and dynamic stability as well as reducing the Westergaard hydrodynamic forces on the upstream face.	The team fully recognise the importance of the matters raised - as well as others - and is working as fast as possible towards a design status that accomodates these outstanding matters. However, finalisation of project proposals is hugely dependent on the results of as yet unfinished site investigation & drilling, materials testing, geological characterization, lineament analysis and adit construction - all of which are dependent on access to the land at the site. Engineering judgement is being made and assumptions made to facilitate the completion of a draft design and draft feasibility report.	BES 1/15/14		
8	BOC MTG-3 Final Report	4 of 5	Geotechnical, Structural, Concrete, Hydroelectric	New information on Probable Maximum Precipitation (PMP) and Probable Maximum Flood (PMF) included Applied Weather Associates' update on the analysis of historic storms for PMP development and HEC-1 model calibration, and MWH's discussion of how snowmelt and glacier ice melt would be addressed in modeling the PMF. Otherwise, Applied Weather Associates and MWH provided a synopsis of the information discussed at the April 3-4, 2013 PMP/PMF Workshop. The Board concurs with MWH's proposal to develop the spatial distribution of the 100-year snow water equivalent (SWE) based on limited SWE observations and an assumed proportionality between SWE at various recurrence intervals and total October-April precipitation. This is appropriate for the months of May and June which could see significant snowpack remaining over at least part of the basin. For the later summer months the only snow- or ice-covered areas would be the glaciers in the headwater areas. The glaciers will contribute meltwater coincident with the PMP, which MWH proposes to represent as the 100-year, 3-day flow volume at the nearest downstream gage. This may prove to be a very conservative assumption, as the largest floods recorded at the upper watershed gages are probably a combination of summer storm runoff and glacier melt.	The 100-year 3-day flow volume was intended to be used as an upper bound comparison parameter to ensure that snowmelt was not over-estimated. The actual modeled method for glaciers will be to treat them as an essentially unlimited snowpack with snowmelt determined by the energy budget method. The general lack of meteorological data at high elevations suggests the desirability of making approximate checks of the PMF where possible.	JCH 1/24/14		
9	BOC MTG-3 Final Report	4 of 5	Hydrology & Meteorology	In the letter report on the April 3-4 PMP/PMF workshop, the Board members at the workshop stated an opinion that historical storms occurring south of the coastal range should not be transposed into the Susitna basin, because the coastal mountains create an effective moisture barrier. The basin flyover tour on May 29 supported the assessment of the southern mountain range as a significant topographic barrier relative to the project watershed. The airplane basin tour also provided the opportunity to note numerous pools of standing water in the low relief eastern subbasins (e.g. subbasin 17), indicating at least seasonally impervious soils	Agreed.	JCH B. Kappel 1/24/14	currently waiting on response to Comment	

AEA BOC Comments & Response Log - MEETING TWO-A REPORT (04/04/13)

AEA BOC: 2A **NOTES:**

PROJECT: SUSITNA WATANA BOC

Item No.	Sheet No. / Page No.	Design Document	Design Group	Comment By	Comment	Comment Date	Response By	Response Date
1	2	AEA BOC Workshop 2A-Letter	Meteorology / Hydrology	George Taylor / Ellen Faulkner	***Short storm list.*** We concur with the methodology used to develop the short storm list and the final results.	4/16/2013	AWA	
2	2		Meteorology / Hydrology		***Storm maximization process.*** In general the approach adopted by AWA is the accepted and most effective way to maximize moisture for historic storms. During our discussion, AWA mentioned a willingness to consider larger (regional) source areas for SST, and we believe that such a procedure would be helpful. An approach using a wider source area allays concerns that the maximization process (in which the moisture source location is shifted by exactly the same vector as the storm center) generates a redundant reduction when combined with the proportionality constant method for orographic transposition.	4/16/2013	AWA	
3	2		Meteorology / Hydrology		***Transposition of SPAS DAD analyses.*** It is our opinion that storms separated from the target basin by significant terrain boundaries should not be transposed into the basin. Based on the information presented to date, we concur with AWA's proposal to exclude storm centers south of the coastal mountains. The suggested sensitivity analysis would be informative but we do not believe it is essential to the present study.	4/16/2013	AWA	
4	2		Meteorology / Hydrology		***Proportionality constant and orographic transposition.*** AWA's proportionality constant approach appears to be superior to any other such technique, particularly the storm separation approach. Nevertheless, since the technique is still relatively new, the Board would like to continue to review results of AWA's activities in this regard. In particular, we would like to review proportionality constant results for each individual storm when they become available.	4/16/2013	AWA	
5	2		Meteorology / Hydrology		***Meteorological time series development.*** In our opinion AWA's proposed approach is appropriate and valid. Identifying the most critical intersection between rainfall potential, temperature, and snowpack depth is key to the PMF development.	4/16/2013	AWA	
6	2		Meteorology / Hydrology		***Other comments.*** We are in agreement with the work to date on the PMF model development and calibration, and agree with the calibration event selection process and outcomes. For our next meeting we would like to review existing information on permafrost within the basin, although it is understood that soil cover is thin to nonexistent over most of the basin.	4/16/2013	JH	5/13/2013

Response	Status	Notes
Agreed.	No change following Meeting 4.	
Covered in BOC Meeting 2A.	No change following Meeting 4.	AWA procedure is similar to that used in HMR-57. Considering the dearth of ground measurements of humidity in Alaska, using sea surface temperatures is certainly the favored approach. G Taylor, 4/17/14
Agreed.	No change following Meeting 4.	
Agreed.	AWA has modified its approach to storm transposition. The mew method was discussed in Meeting 4 and, while subtle, seems to be an improvement.	AWA calls its method the "Orographic Transposition Factor (OTF)". It is obtained by normalizing observed rainfall, transposing to the target watershed, and converting back to rainfall depth. G Taylor, 4/17/14
Agreed.	No change following Meeting 4.	
To be supplied at the next BOC meeting.	Accepted - The depth and spatial extent of permafrost has been addressed in the draft PMF report and the very low calibrated loss rates - while they	E Faulkner, 4/18/2014

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

September 22, 2014

Wayne Dyok
Susitna Project Manager
Alaska Energy Authority
813 W. Northern Light Boulevard
Anchorage, AK 99503

RE: FERC Project P-14241, Proposed Susitna-Watana Hydropower Project

Dear Mr. Dyok:

The Alaska Energy Authority (AEA) has requested that the National Marine Fisheries Service (NMFS) comment on portions of the Initial Study Report for the proposed Susitna-Watana Hydropower project (June 3, 2014). We also include here comments previously submitted on the 2014 Fish Genetics Implementation Plan and on the pilot 2014 Cook Inlet beluga whale and eulachon studies (May 12 and May 14, 2014). We expect that the Alaska Energy Authority (AEA) will address these issues at the upcoming meeting on the Initial Study Report in October 2014.

Briefly, our enclosed comments on the Initial Study Report's fish studies (9.5 Upper River Fish Distribution and Abundance, 9.6 Lower and Middle River Fish Distribution and Abundance, and 9.7 Salmon Escapement) identify issues with the integrity of data, the ability to effectively integrate modeled studies, and the progress and detail of the decision support systems. Model integration is a key concern, especially for assessing baselines and project impacts on the Susitna River.

NMFS recommends that the data issues be resolved as soon as possible. For NMFS to effectively review this project, the studies must accurately identify fish species, develop accurate habitat models, and use the best available science to understand anadromous fish distribution and habitat associations. Moreover, the studies require accurate data to calibrate and validate proposed models and to integrate these models without inadvertently amplifying errors. Given the current issues with the data, it is not plausible that the data for predictive modeling be used to describe baseline conditions or to predict potential impacts. Modifications, additions, and new study requests for the second year of studies cannot be developed given the current issues with the data; these issues must be resolved prior to conducting additional field studies.

In regards to the 2014 Studies and the Final Study Plan, NMFS requests that the AEA adhere to the schedule the Federal Energy Regulatory Commission (FERC) established for the Integrated

Licensing Process (ILP) for this project in their January 28, 2014 determination. In that determination, FERC ordered the AEA to submit the final Initial Study Report on June 3, 2014 and to hold a meeting in October to present the results of the Initial Study Report and discuss any proposed changes. Although the AEA has just released reports of the studies it conducted in 2014 and intends to discuss those studies at the October meeting, NMFS is not prepared to step outside the FERC-ordered process and consider those studies at this time. The limited time allocated would be more effectively spent addressing problems with the 2013 study implementation and discussing study modifications or new studies.

Any studies that the AEA conducted in 2014 cannot be construed as "Year 2 ILP Studies," because the Initial Study Report was not yet complete at the time the studies were conducted. Conducting the studies before completing the Initial Study Report precluded participants from recommending any changes to the study or making new study requests based a review of a completed Initial Study Report. As noted by FERC in an May 6, 2014 e-mail on the Implementation Plan for the Genetic Baseline Study for Selected Fish Species in the Susitna River, Alaska:

> …to clarify, we just reviewed our Study Determination letter and confirmed that the genetics operational plans are due by April 30 of 'each year of study implementation.' Because our January 2014 letter granted AEA's request, in part, for second season studies to be conducted in 2015 rather than 2014… it follows that the genetics operational plan for the second study season is due by April 30, 2015, and not by April 30, 2014.
>
> (Nicholas Jayjack, March 6, 2014 email to Susan Walker)

Although NMFS provided courtesy reviews and comments to the AEA on 2014 studies for fish genetics (Enclosure 2) and the Cook Inlet beluga whales/eulachon pilot study (Enclosure 3) by mid-May of 2014, NMFS does not consider any 2014 study to be the second year of study under the ILP process.

We consider these concerns significant and in need of resolution for NMFS to fulfill its statutory responsibilities. In the context of this project, we construe those responsibilities as follows:

1) to identify study data gaps;

2) to make recommendations for the second year of studies (and beyond);

3) to understand the project's ability to quantify baseline and proposed project operational impacts to fish and wildlife resources;

4) to support recommendations for the protection, mitigation, and enhancement measures associated with the project; and

5) to make informed decisions pursuant to our Section 18 Fishway Prescription authority under Federal Power Act.

The ILP schedule for this project has been altered and now affords the AEA an opportunity to make necessary changes to studies for this project prior to entering the second year of study. This will allow for development and implementation of a more accurate, effective, and cost-effective plan of study for this important project.

In our November 30, 2014, FERC filing we will provide detailed recommendations to address specific concerns related to the individual Initial Study Reports of June 3, 2014. If you have questions regarding this letter, please contact Susan Walker at (907) 586-7646 or Susan.Walker@noaa.gov).

Sincerely,

James W. Balsiger, Ph.D.
Administrator, Alaska Region

Enclosures (3)

cc:
e-filed under FERC docket P-14241 as distribution to all Susitna licensing participants
Sarah Goad, AIDEA
Betsy McGregor, AEA
Nicholas Jayjack, FERC
Joe Klein, ADFG
Soch Lor, USFWS
Mike Bethe, ADFG

Enclosure 1: Details regarding Data Integrity, Model Integration/Proof-of-Concept and Decision Support Systems.

DATA ISSUES:

Data Collection: Quality Assurance and Quality Control, and Methodologies

NMFS is concerned with the current status and implementation of aquatic studies and believes that, unless these issues are addressed, many study objectives will not be met. Our primary concerns are as follows:

1) Habitat classification has not been completed;
2) Fish passage criteria have not been developed;
3) Fish sampling study plans were not followed; sampling units were inappropriately subsampled;
4) Fish sampling locations did not incorporate FERC recommendations;
5) Because the fish sampling did not follow the sampling plan, this resulted in an inability to estimate relative fish abundance;
6) Fish seem to have been identified incorrectly;
7) Data were collected and reported at inappropriate mesohabitat scales;
8) Sampling sites among studies were not co-located;
9) Tagging goals were not met;
10) Fish targets for HSC sampling were not met;
11) The mainstem upper river migrant fish trap was not installed;
12) A fish wheel was not installed, and fish were not tagged near the entrance to Devils Canyon;
13) Additional problems associated with late installation and operation of migrant traps were likely influenced by environmental conditions associated with late breakup; and
14) Juvenile salmon distribution and abundance in 2013 were likely affected by the record fall floods in 2012.

We are providing some additional clarification on some of these concerns.

The actual implementation of the abundance sampling program did not follow the statistical models used to select sampling units. In particular, subareas (mesohabitats) within selected areas were 'randomly' selected for subsampling, and sampling was not consistent between sampling events (different gears, different effort, different order of gears, different total area sampled, etc). Sampling error in the fish distribution and relative abundance studies needs to be accounted for in order for these studies to accurately estimate fish distribution and abundance. Estimates of numbers of Chinook salmon that migrate above Devils Canyon need to include the assumptions, standard error, and resulting statistical confidence intervals associated with that estimate. Better descriptions of (and statistical accounting for) both sampling and non-sampling errors need to be provided. The data used to describe fish-habitat association

preferences and the standard errors associated with those species and life-stage habitat correlations need to be validated, as this analysis proposes to describe macrohabitat relationships for fish. These relationships will be used to evaluate project effects, to validate instream flow habitat model predictions, and to extrapolate results from focus areas to geomorphic reaches and river segments. Ultimately these data will be used to develop protection and mitigation measures and to serve as a basis for post-project monitoring.

Data collection and analysis

Data collection methods need improvement. For example, detection and recovery of PIT (Passive Integrated Transponder) tags need to be improved to yield useful data to meet study goals and objectives. Location of the detection arrays did not cover the entire channel and was biased toward fish migrating down channel. Also, because too few tags were recovered, efficiency estimates could not be made.

Misidentification of juvenile fish by species induces significant error, and application of this erroneous data would result in inaccurate conclusions. Our review of the Initial Study Report finds that a very high percentage of the juvenile salmonids were misidentified. We also question the accuracy of all juvenile fish sampling data because of the following details:

- large numbers of unidentified salmonid juveniles (some of which were PIT tagged);
- anomalous length distributions and habitat associations (e.g., juvenile Chinook 150 mm fork-length;
- the large abundance of juvenile Chinook in beaver ponds;
- the absence of pink salmon in any samples; and
- the disappearance of sockeye salmon from Indian River between the February draft Initial Study Report and the June draft Initial Study Report).

Considering the length distributions and habitat associations reported, we have reservations also about the identification of these juvenile fish and conclude that many juvenile salmonids identified as Chinook salmon were coho salmon.

There is an absence of quantitative analysis of habitat sampling, fish distribution and relative abundance, and early life history data collected to date. Deviations from the Revised Study Plan (RSP) and FERC staff recommendations make developing estimates from these data difficult or even impossible. These data are the basis of the fish and habitat sampling design and must be collected appropriately for the study to yield useful information. Without better integration of historical data into assessment of current results (e.g., the data from studies collected in 2012, which used different methodology and locations), these data should not be used to assess habitat associations for salmon by species and life stage. Much of the data on species distribution, relative abundance, and habitat associations appears anomalous in comparison to available

science on these species and their life stages as known through data previously collected and past studies conducted in the Susitna River and environs.

One of the main objectives of radio-tagging was locating spawning locations. The proposed activity of circling over a tag that remained in the same location for a period of time was not done (mainly for salmon). For non-salmon species, it was proposed to tag some species after their spawning season and monitor the tag in the following year to locate spawning locations. It remains to be seen if this actually worked. If not, the objective of locating spawning locations was not met

Scale

We do not believe that data has been collected among individual related studies at an appropriate scale to allow fish/habitat associations to be made and extrapolated. A related concern is that fish and habitat data have not been collected at a biologically relevant scale.

To assess project-caused impacts to fisheries resources (for example), the sampling effort must be at a scale relevant to Susitna River fish species and life stages and must adequately quantify baseline conditions for accurate extrapolation. In some instances, the *spatial* scale of data collection implemented varies inappropriately within and among studies, resulting in a mismatch between the data collected and the purpose of its collection. Additionally, the *temporal* scale of data collection needs improvement. The Initial Study Report indicates that winter fish sampling did not occur in all focus areas as proposed. Early spring sampling occurred only in three focus areas due to record late breakup. Initial sampling following breakup and installation of migrant traps did not occur until the middle of June (after juvenile outmigration had begun), and spring sampling for fish distribution and abundance was not conducted. Improvements need to be made to capture the full seasonality of fish life history strategies which vary considerably within a single season. (Fish move around, and the extent of that movement must be captured through sampling. A single-day of sampling is insufficient to understand the habitat associations of many different and mobile species and life-stages of fish.)

The error inherent in the inappropriate scale of data collection would be compounded by the proposal to extrapolate study results throughout the river; this would perpetuate and increase sampling errors across the entire length and width of the river and its habitats. Resource agencies are particularly concerned about this proposal to "scale up," and requested rationale for its implementation (Riverine Modeling Integration Meeting, November 2013). The ability to "scale up" is only valid when the initial sampling has been conducted accurately and at a scale relevant to resource concerns, which is not the case with studies conducted thus far.

Co-location of sampling sites

Review of the Initial Study Report reveals that sampling sites for the various study disciplines have not been consistently and thoroughly co-located, as laid out in the RSP as modified by

FERC staff recommendations, to provide an assessment of baseline conditions of habitats relative to fish use and preference. For example, invertebrate sampling locations (River Productivity 9.8) were not co-located with fish sampling locations. Rather than addressing this issue, or NMFS's previous concerns about the number of middle river sampling locations, AEA is proposing a study modification to sample in tributaries above the dam inundation zone. At some locations, sampling of variables such as depth and velocity was appropriately co-located, but other variables that should also be co-located such as groundwater exchange were not. NMFS recommends that at Focus Areas data collection for the full suite of interdependent variables should be co-located.

The cumulative effects of deficiently implemented sampling methods, failure to co-locate sampling sites, lack of integrative links, and discrepancies in data collection scales are magnified because these data are proposed for inputs to models. Model calibration, validation and decision making processes will then be used to assess potential impacts to resources.

NMFS recommends that the data issues be resolved as soon as possible. Accurate data is required to calibrate and validate proposed models; and quality data from individual studies is necessary to integrate models without amplifying errors unknowingly. Given these concerns about the data, it is not plausible to use the data for the predictive modeling that is proposed to describe baseline conditions or to predict potential project impacts.

These issues of data integrity and data collection are based in part on studies being conducted with significant differences from the FERC-modified RSP. These issues must be resolved prior to conducting additional field studies. NMFS cannot develop appropriate recommendations for study modifications or make new study requests for the second year of study given the current issues with the studies and the data.

MODEL INTEGRATION/PROOF-OF-CONCEPT:

Biological relevance

During the Riverine Modeling Integration Meeting (November 2013), 25- and 50-year scenarios for predicting project impacts to the physical river channel and habitats were proposed. While those timelines are consistent with the study plan and may present a manageable timeframe for the modeling work (B. Fullerton, POC meeting, November 2013), they may not answer questions related to assessing impacts on important biological resources in a biologically meaningful timeframe. Models need to be sensitive enough to detect changes that are biologically meaningful to the species and habitats likely to be affected by project operations. As currently planned, this is not the case.

NMFS has identified a need to develop and incorporate biological input and output parameters and evaluate these under an appropriate range of operational scenarios (e.g., base load, ecological flows, load-following, run-of-river). The temporal scales (i.e., 25- and 50-year scales)

that are needed must have biological relevance. For example, 5-, 10- and 15-year operational scenarios should be considered to demonstrate the model's ability to detect generational impacts to fish populations and habitat persistence (e.g., Susitna River Chinook salmon, 5-7 years; or 2-4 years for eulachon). NMFS is concerned that the present model cannot answer the biological questions it proposes to answer.

Some study plan data collection efforts do not provide the information needed for the integrated modeling efforts. For example, during the November 2013 Riverine Modelling Integration meeting, it was revealed that the Water Quality Modeling study would require data on the spatial distribution of groundwater discharge to surface water bodies. Analytical or numerical groundwater flow simulation would be one way to satisfy this input requirement. However, the Groundwater Study in the Initial Study Report does not explicitly state that analytical or numerical groundwater flow simulations would be undertaken in support of the other physical process models.

Model integration is at this point largely an *ad hoc* exercise. A stand-alone model integration study is required to allow stakeholders to develop confidence in the models, understand inputs and outputs, and have the conceptual linkages demonstrated via an interactive riverine working model. Many questions remain about the predictive capabilities of the models, particularly under integration and model assumptions. Sensitivity and uncertainty analyses need to be conducted to contribute to understanding of model limitations. The full extent of mismatch of purported integration of models is currently unknown, even to the project proponent, much less to stakeholders reviewing study results.

DECISION SUPPORT SYSTEMS:

Decision Support Systems (DSS) are critical for evaluating potential impacts of the project. We believe that their development should be expedited to the extent possible without excluding input from stakeholders.

The RSP (Instream Flow Study 8.5 RSP) includes the use of conceptual ecological models as the DSS to assess the project's impacts on a free flowing river and its resources. Also, the Fish Passage study includes use of a DSS to assess the feasibility and effectiveness of different fish passage options. It is our understanding that AEA intends to develop the conceptual ecological model DSS using manual matrices by early 2015 (FERC 2013) and to use a modified existing DSS for fish passage (currently past due). Considering the potential of these DSSs to support critical assessments of impacts from the project, development of the DSS should be a collaborative process with mutual development of, and agreement about fundamental objectives, assumptions, critical inputs, weighting methods, and other parts of the models. Formulation of the fundamental objectives for the DSS may reveal important, time-sensitive data gaps that require modifications to existing studies or perhaps development of new studies. An example for the fish passage DSS is reservoir ice studies: we expect to be used to design tributary collectors for outmigrating juvenile fish but don't know if the model will provide that information. An

example for the conceptual ecological model is the groundwater studies which we expect will allow estimation of project impacts to areas of upwelling, but project effects to upwelling are not one of the goals of that study. Therefore, we request that the schedule for DSS development be accelerated so potential data needs not currently covered in the existing study plans can be identified and added to the study plan.

Enclosure 2: NMFS Comments on the 2014 Fish Genetics Implementation Plan

SUMMARY:

NMFS Fisheries geneticists; Dr. Jeff Guyon, Supervisory Research Geneticist and the Fisheries Genetics Program Manager at the Ted Stevens Marine Research Laboratory of NOAA's Alaska Fisheries Science Center and Dr. Robin Waples, Senior Scientist at NOAA's Northwest Fisheries Science Center, reviewed the "Implementation Plan for the Genetic Baseline Study for Selected Fish Species in the Susitna River, Alaska." NMFS appreciates that AEA and the Alaska Department of Fish & Game (ADF&G) incorporated most of the comments and suggestions provided to AEA in our review, and included the topics discussed with ADF&G, U.S. Fish and Wildife Service and NMFS at the technical meeting in March in the final 2014 implementation plan.

COMMENTS PROVIDED TO AEA:

This report reflects a carefully thought-out approach to sampling from natural populations to provide baseline data prior to a proposed hydroelectric project. As proposed, the project would no doubt produce a great deal of very useful information. Comments below are intended to help improve certain aspects of the experimental design and/or data analysis.

Hypotheses for Chinook salmon:

Page 3: NMFS agrees that departures from HWE [Hardy-Weinberg Equilibrium] could support hypothesis 1b (fish above Devils Canyon are derived from spawners above and below), but only if the departures are in the direction of a deficit of heterozygotes, as expected under the Wahlund effect (population mixture). However, Hypothesis 2 would not necessarily produce any such departures if all the fish above the canyon were derived from a single lower population.

Page 3: "On the other hand, low genetic divergence between fish spawning above Devils Canyon and fish spawning in aggregates below the canyon would indicate that a large proportion of the fish ascending Devils Canyon are strays or colonizers, and have not established a self-sustaining population (support for Hypothesis 2)." This conclusion cannot be supported simply from failing to find a difference. It would be necessary to conduct a power analysis to determine how large a difference (e.g., Fst value) could exist and not be detected as statistically significant. Then, it would be necessary to translate the genetic data into estimates of gene flow to evaluate what levels of connectivity are consistent with the observed data.

Sampling design:

NMFS concurs that that samples from multiple years are essential to be able to make sense of the relative magnitude of spatial and temporal differences. Three years of samples may be inadequate for this purpose, especially considering that Chinook and perhaps some of the other species have generation lengths much longer than three years.

The required sample sizes depend on the particular objective, as well as the (unknown) differences among populations. In general the numbers proposed seem reasonable. However, the logic for requiring larger samples for msat [microsatellite] analyses is inadequately explained. This may be based on the idea that larger samples are required to provide precise estimates of all the low frequency alleles involved with msats. However, that is not the objective; the objective is to use all the data to draw biological conclusions about the species of interest. From this perspective, each msat locus is worth several SNP [single nucleotide polymorphism] loci in terms of information content, as a large number of empirical studies have demonstrated.

Analyses:

Page 12-13: NMFS strongly recommends that the PIs [primary investigators] not remove putative siblings as proposed. Siblings, in fact, contribute part of the signal in genetic analyses that provides insights into biological processes. Purging them from the sample universe scrubs the data of this biological signal, particularly for small populations where siblings are common. The effects that this has on subsequent analyses cannot be easily determined, but could be substantial. This purging makes the remaining individuals more similar to what would be expected from populations that are infinite in size and hence have no relatives. Purging of a particular sample might be justified, if the sample has been collected non-randomly (that is, if it is thought to represent progeny from only a few families). However, in that case the proper amount of purging could only be determined if one knows exactly how non-random the collection is. But this will seldom if ever be known in practice. Furthermore, even if this was known and relatives were removed, the result still would not be a representative collection from the population as a whole. Therefore, the solution to non-random sampling is not purging relatives but to going back into the field and collecting a representative sample.

Page 13: "We will exclude juvenile collections from the baseline if they show significant allele frequency differences from adult collections or show deviations from HWE when pooled with adult collections." We note that age structure creates mini-Wahlund effects that could cause HW departures even in mixed-age adult samples. Likewise the same thing could happen if you combine juveniles and adults produced by different cohorts. That does not mean that combining them won't produce a more robust overall estimate of population allele frequencies.

NMFS does not agree with using the Bonferroni correction for HWE tests; there are too many overall tests and thus the criterion become too conservative. Bonferroni correction controls the probability of false positives only and the correction ordinarily comes at the cost of increasing the probability of producing false negatives, consequently reducing the statistical power of the HWE tests. Instead, we suggest starting with unadjusted tests and evaluating what fraction are significant for each locus (across all pops) and for each pop (across all loci). If the resulting proportions do not deviate much from the expected proportion (dictated by the significance level

of the test), there is no reason to reject HWE. Loci or pops that are outliers can be singled out for more detailed analysis, perhaps using Bonferroni or FDR [false discovery rate].

Minor comments:

Page 1: The project "will modify the flow, thermal, and sediment regimes of the Susitna River. . . ." The project will also affect migration and fish passage, among a host of other important effects. The description of project effects should be written to comprehensively describe all major project effects.

Page 1: "If breeding isolation (lack of migration) among populations occurs over sufficient time and population sizes are small enough, genetic drift will result in variation in allele frequencies at neutral loci (loci not under natural selection) among populations." Genetic drift will *always* result in some differences unless there is complete panmixia.

Analyses of genetic distance: it is fine to use Fst as an index of genetic distance, but it must include a correction for sample size (like W&C theta). Otherwise, small samples will tend to look like outliers.

Page 6: "For mixed stock collections, sample sizes of 200 fish or 100 fish per collection are adequate to provide stock composition estimates that are within 7% or 10% of the true estimate 95% of the time, respectively (Thompson 1987)." That might have been true for the particular study cited, but how large a sample is required will depend on the number of markers and the magnitude of divergence among populations, so this general statement is not valid.

Page 8, the numbering is off under "Sample Collection Targets."

Page 9, under "Sample Collection Targets" item #9, we understand the issues regarding sample numbers, but an adequate adult Chinook salmon sample set from above the proposed dam is needed at the end of the study to make the necessary conclusions. What happens if the goal of 100 adult Chinook salmon is not realized? This should be addressed in advance.

Page 10, Section 4.2.4.1, identifies a sample target of 200 juvenile Chinook salmon from 4 systems in or above Devils Canyon, but later in the report under section 4.5 "Data Retrieval and Quality Control" it mentions that software will be used to identify siblings and exclude all but one individual in the baseline for every set of siblings identified. As such, given the likely small population sizes above the proposed dam site, 200 juveniles from each system is unlikely to be sufficient.

Page 16, Section 4.6.5, where it says "Collections will be pooled when tests indicate no difference between collections (P>0.01)." While we agree that it is difficult to prove there is no difference between collections, we recommend though using a p value greater than 0.05 as more appropriate to reject the null hypothesis.

Appendix A Section 2.2 Regarding the radio telemetry studies, the potential impacts of the tag on the migration pattern of the salmon, especially for a stock that has to migrate the farthest and through a 7-mile long Class 5+ canyon must be considered and discussed. Also please address whether the tags let you know where the fish spawned (or if they spawned) or just indicate where they were when relocated, including noting the spatial accuracy of the tag signal recoveries.

Appendix B - page 1, for the Black River: Were the Chinook that were sampled two juveniles which were collected in 2013? Please confirm and identify them as juveniles if that's true.

Table B5, Is there an overall HWE test for all markers for each population?

Enclosure 3: NMFS Initial Comments to AEA regarding the 2014 Pilot Study for Cook Inlet Beluga Whales and Eulachon

SUMMARY:
Beginning in early May 2014, NMFS staff were contacted and asked to meet with AEA and their contractors (hereinafter referred to collectively as AEA) to discuss AEA's plans to modify the [RSP as modified by FERC's determination] for the Cook Inlet Beluga Whale Study (Study 9.17). AEA informed NMFS staff of their intent to conduct a boat-based pilot study involving both a Cook Inlet beluga whale research effort and a eulachon research effort. Despite the very short notice from the intended start date of the research activities, NMFS agreed to provide some initial comments and preliminary recommendations to AEA. These initial comments were primarily provided to help reduce the high harassment and harm potential this pilot project could have on the endangered Cook Inlet beluga whales, and to help AEA avoid violating both the Marine Mammal Protection Act and the Endangered Species Act. These comments were not an endorsement of the pilot study, nor an acknowledgement that the pilot study would constitute the second year of the required FERC-approved study plans. These comments were sent to AEA by email on May 14, 2014, and are reproduced in Enclosure 3. As a result of these NMFS comments, AEA did make modifications to the pilot study in an effort to reduce the harassment potential to Cook Inlet beluga whales. NMFS has had multiple meetings with AEA to discuss the progress and status of the 2014 pilot study since early May. During several meetings, AEA has provided inconsistent information regarding their plans for 2015 Cook Inlet beluga studies. At this time, it is unclear which aspects of the FERC-approved study plans for Cook Inlet beluga whales AEA intends to implement in 2015, if any. Additionally, AEA has a pattern of providing information to NMFS immediately prior to a meeting (e.g., one hour in advance) or after the meeting, but has an expectation that NMFS will provide official comments during the meeting. This process has substantially limited the ability of NMFS to provide meaningful comments to AEA. Finally, while the focus of Study 9.17 is on Cook Inlet beluga whales, NMFS reiterates that the Marine Mammal Protection Act pertains to all marine mammals, regardless of any additional protections under the Endangered Species Act. Thus, harassment of any marine mammal resulting from AEA's activities is prohibited.

COMMENTS PROVIDED TO AEA:
These initial comments are intended to provide early guidance and preliminary recommendations regarding this pilot study. NMFS intends to submit formal comments on this study proposal to FERC.

NMFS received a draft copy of the AEA's "Pilot Study of Cook Inlet Beluga Whale and Prey Species in the Susitna River Delta" on Monday May 12, 2014. AEA and their contractors intend to implement the pilot study beginning the week after NMFS received the draft study plan for review, and continue through all of June. The pilot study is submitted in lieu of the FERC-approved beluga studies (aerial surveys, video cameras, still cameras, and water surface

elevation model) for 2014. Although NMFS agreed to try and get these preliminary comments back to AEA prior to implementation of the pilot study, NMFS advises that these are not official comments, and as such do not indicate NMFS's support for or rejection of the pilot study. Furthermore, NMFS does not consider any 2014 study to be the second year of study under the ILP process. This is because the Initial Study Report is not complete, and licensing participants have not been able to recommend any changes to the study or make new study requests based on a review of the completed Initial Study Report. Our initial comments regarding the draft pilot study after an abbreviated review period are as follows:

We understand neither AEA nor its contractors will be obtaining authorizations under the federal Marine Mammal Protection Act (MMPA) for the unintentional take by harassment of marine mammals. Thus no harassment or take of any marine mammal under NMFS' jurisdiction is authorized under either the MMPA or the Endangered Species Act (ESA) and AEA and/or its contractors would be responsible for any violation of these federal laws.

The draft pilot study references LGL Alaska Research, Inc.'s ongoing boat-based surveys for Cook Inlet belugas as good documentation of Cook Inlet belugas as a result of closer proximity and longer encounter durations with the whales than by aerial surveys. While we agree that a boat survey has the potential to get closer to and spend more time with a group of marine mammals than an airplane, we do note that the referenced LGL studies have a NMFS-issued MMPA research permit and ESA authorization to allow harassment and close approaches. The level of information collected by these two different boat-based studies will not be comparable. Furthermore, we note that the LGL researchers associated with the NMFS permitted photo-identification study are not indicated as participating in this pilot study.

The pilot study has the potential to disturb or harass marine mammals due to the presence of the boat and operation of the split-beam sonar. The pilot study does suggest the implementation of the "Marine Mammal Viewing Guidelines and Regulations" as found on our website (http://alaskafisheries.noaa.gov/protectedresources/mmv/guide.htm) as an effort to reduce the potential for harassment or take. We note that many of the steps of the viewing guidelines are stated in the "2014 Pilot Study Methods" section of the draft pilot study, but add that whales should not be encircled or trapped between boats or boats and shore, and that the study needs to ensure that when approaching the whales the boat stays fully clear of whales' path of travel (i.e., the boat doesn't approach belugas "head-on"). These guidelines are intended to reduce the likelihood that marine mammals would be affected by this study, but do not guarantee no harassment or take will occur. This is a directed research project targeting Cook Inlet beluga whales, and a research permit may be necessary if the project may result in take or harassment of this endangered species or other marine mammals.

The pilot study is designed for repeated approaches to Cook Inlet beluga whales, albeit theoretically no less than 100m away. This study design increases the potential for harassment, including behavioral modifications or displacement that may not be evident from the boat, despite one of the pilot study's goals being to not cause any disturbance to the whales themselves. Given the repeated approaches, and potential for belugas or other marine mammals to not be visible below the water, implementation of the Marine Mammal Viewing Guidelines may be insufficient for preventing harassment or take. This potential for disturbance or harassment is of concern to NMFS, not only in general, but specifically during the first two weeks of June when we will be conducting our aerial surveys to assess official population abundance and distribution. Any disturbance or behavioral modification of the beluga whales associated with the pilot study may result in a reduction of our ability to accurately conduct our aerial surveys. The Susitna delta area is an important foraging area to the Cook Inlet belugas in late spring/early summer, after limited food during the winter. Any disturbance to the whales may result in reduced foraging success, and thus have population-level adverse effects.

The draft pilot study plan indicates that "if whales move away from the area where they were initially detected, an attempt will be made to obtain a depth reading and prey information at that location", but there is no information regarding how much time must pass without a beluga sighting before the survey crew moves to that location to attempt to obtain depth and prey information. There are confirmed reports that some stressed, chased, or harassed Cook Inlet beluga whales do not swim away, but rather submerge and remain on the bottom of the seafloor, which can be very shallow in Cook Inlet. If the observers do not wait a sufficient length of time, the potential exists for a beluga exhibiting this behavior to be struck by the vessel or propellers as the boat approaches the area where belugas were observed.

Given the topography and mudflats surrounding the Susitna Delta, as well as the potential that belugas will be traveling and not staying still, it is unclear how accurately or consistently the fine-scale surveys could be implemented. Should the belugas be traveling, it is possible the boat may inadvertently chase the whales group while trying to accomplish the fine scale sampling scheme as depicted in Figure 3. This could result in increased stress or harassment to the belugas or other marine mammals (i.e., seals) in the vicinity.

The draft pilot study does not provide much detail about the acoustic component of the split-beam sonar, but we understand some split-beam sonars have the potential for operating at multiple frequencies. Frequencies below 200 kHz are within the hearing range of Cook Inlet belugas, and thus noises associated with the sonar with frequencies below 200 kHz have the potential to harass belugas and other marine mammals. Noise has been identified as one of the highest threats to Cook Inlet belugas. Based on the information in the draft pilot study plan, it appears there may only be a single frequency during operation, at 206 kHz. It is unclear whether the split-beam sonar will be operated when conducting the "fine-scale sampling" triggered by

Cook Inlet beluga sightings or if it will only be operated when no belugas are sighted, or if it will be in constant operation.

In general, the pilot study plan is unclear about the primary goal of the study; is this a beluga study that has a fish component or a fish study that will record beluga sightings? The study plan states that data on prey and belugas will be "collected simultaneously", however, fish data can only be recorded after the whales leave the area, and the split-beam sonar is unlikely to be able to collect adequate fish data from over 100 m away (the minimum distance the boat will stay from the belugas and other marine mammals). Overall, while it appears this pilot study attempts to combine information regarding the distribution of beluga whales and their prey, we do have initial concerns about the harassment potential to the belugas. Although there is information on the data collection protocol sheets and software, there is no information regarding protocols should the vessel be closer to 100m of the Cook Inlet beluga whales, or if the presence of the boat or use of the split-beam sonar results in a change of behavior, disturbance, or displacement of the whales. These are indications of harassment and take, and are currently not authorized by NMFS. NMFS requests to be provided a survey schedule in advance of the first survey.

20140929-5059

ALASKA ENERGY AUTHORITY

September 26, 2014

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Susitna-Watana Hydroelectric Project, Project No. 14241-000

Second Set of 2014 Technical Memoranda for Initial Study Plan Meetings

Dear Secretary Bose:

As the Alaska Energy Authority (AEA) explained in its September 17, 2014 filing with the Federal Energy Regulatory Commission (Commission or FERC) for the proposed Susitna-Watana Hydroelectric Project, FERC Project No. 14241 (Project), the June 3, 2014 Initial Study Report (ISR) provided for AEA to prepare certain technical memoranda and other information based on 2014 work. In accordance with Commission Staff direction, on September 17, 2014, AEA filed and distributed the first set of technical memoranda and other information generated during the 2014 study season.

With this letter, AEA is filing and distributing the second set of technical memoranda generated during the 2014 study season, as described below. As part of its continued implementation of the study plan, AEA expects to file a third set of technical memoranda prior to October 1, 2014.

This second set of technical memoranda includes:

- Attachment A: *Geomorphology Study (Study 6.5) - Updated Mapping of Aquatic Macrohabitat Types in the Middle Susitna River Segment from 1980s and Current Aerials Technical Memorandum.* This technical memorandum updates the Middle Susitna River Segment portion of the aquatic macrohabitat mapping results previously provided in the technical memorandum titled *Mapping of Aquatic Macrohabitat Types at Selected Sites in the Middle and Lower Susitna River Segments from 1980s and 2012 Aerials* (Tetra Tech 2013a).

- Attachment B: *Geomorphology Study (Study 6.5) - Mapping of Geomorphic Features and Turnover within the Middle and Lower Susitna River Segments from 1950s, 1980s, and Current Aerials Technical Memorandum.* This technical memorandum updates the geomorphic mapping and assessment of channel change that were initially provided in *Mapping of Geomorphic*

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Features and Assessment of Channel Change in the Middle and Lower Susitna River Segments from 1980s and 2012 Aerials (Tetra Tech 2013a). The initial technical memorandum provided the results from tasks identified in Revised Study Plan Study 6.5 Section 6.5.4.4. This update extends the previous 30 year analysis between the 1980s and 2012 by an additional 30 years with aerial photography from the 1950s, and also provides a short term analysis of geomorphic changes by comparing 2012 with 2013 aerial photography.

- Attachment C: *Fluvial Geomorphology Modeling below Watana Dam Study (Study 6.6) - Decision Point on Fluvial Geomorphology Modeling of the Susitna River below PRM 29.9 Technical Memorandum*. This technical memorandum describes the decision of whether to extend the downstream limit of the 1-D bed evolution model below Susitna Station at PRM 29.9.

- Attachment D: *Fluvial Geomorphology Modeling Below Watana Dam (Study 6.6) - Winter Sampling of Main Channel Bed Material Technical Memorandum*. The overall purpose of this technical memorandum is to quantify main channel bed material gradations at selected sites in the Upper, Middle, and Lower Susitna River Segments. The data obtained from this study serves as input for the 1-D and 2-D bed evolution modeling efforts being conducted under the Fluvial Geomorphology Modeling Study (Study 6.6).

- Attachment E: *Cook Inlet Beluga Whale Study (Study 9.17) - 2014 Cook Inlet Beluga Whale Prey Study Implementation Technical Memorandum.* This technical memorandum summarizes activities implementing the Cook Inlet Beluga Whale Study (Study 9.17) conducted in 2014 that tested methods to document Cook Inlet Beluga Whale prey and prey habitat in the Susitna River delta.

- Attachment F: *River Productivity Study (Study 9.8) - 2013 Initial River Productivity Results Technical Memorandum*. This technical memorandum provides a preliminary review and summary of 2013 river productivity sample results based on laboratory data received after the ISR submittal in June 2014.

- Attachment G: *River Productivity Study (Study 9.8) - 2014 Field Season River Productivity Progress Report Technical Memorandum*. This technical memorandum presents an update on activities conducted during the Spring field sampling event in June 2014, which was focused on data collection to support the needs of the trophic modeling and stable isotope analysis objectives of the River Productivity Study.

AEA appreciates the opportunity to provide this additional information to the Commission and licensing participants, which it believes will be helpful in determining the appropriate development of the 2015 study plan as set forth in the ISR. If you have questions concerning this submission please contact me at wdyok@aidea.org or (907) 771-3955.

Sincerely,

Wayne M Dyok

Wayne Dyok
Project Manager
Alaska Energy Authority

Attachments

cc: Distribution List (w/o Attachments)

FERC PDF

20140929-5059

Susitna-Watana Hydroelectric Project, FERC Project no. 14241-000; Second Set of 2014 Technical Memoranda for Initial Study Plan Meetings

This cover letter accompanied seven reports:

• Attachment A: Geomorphology Study (Study 6.5) - Updated Mapping of Aquatic Macrohabitat Types in the Middle Susitna River Segment from 1980s and Current Aerials Technical Memorandum.

• Attachment B: Geomorphology Study (Study 6.5) - Mapping of Geomorphic Features and Turnover within the Middle and Lower Susitna River Segments from 1950s, 1980s, and Current Aerials Technical Memorandum

• Attachment C: Fluvial Geomorphology Modeling below Watana Dam Study (Study 6.6) - Decision Point on Fluvial Geomorphology Modeling of the Susitna River below PRM 29.9 Technical Memorandum.

• Attachment D: Fluvial Geomorphology Modeling Below Watana Dam (Study 6.6) - Winter Sampling of Main Channel Bed Material Technical Memorandum.

• Attachment E: Cook Inlet Beluga Whale Study (Study 9.17) - 2014 Cook Inlet Beluga Whale Prey Study Implementation Technical Memorandum.

• Attachment F: River Productivity Study (Study 9.8) - 2013 Initial River Productivity Results Technical Memorandum.

• Attachment G: River Productivity Study (Study 9.8) - 2014 Field Season River Productivity Progress Report Technical Memorandum.

The cover letter and seven attachments are catalogued as a set of documents in the library catalog and are numbered SuWa 239 – SuWa 246. They are available in print format at ARLIS and are available online at:

http://www.arlis.org/docs/vol1/Susitna2/2/SuWa239.html

20140930-5303

ALASKA ENERGY AUTHORITY

September 30, 2014

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Susitna-Watana Hydroelectric Project, Project No. 14241-000

Third Set of 2014 Technical Memoranda for Initial Study Plan Meetings

Dear Secretary Bose:

As the Alaska Energy Authority (AEA) explained in its September 17, 2014 filing with the Federal Energy Regulatory Commission (Commission or FERC) for the proposed Susitna-Watana Hydroelectric Project, FERC Project No. 14241 (Project), the June 3, 2014 Initial Study Report (ISR) provided for AEA to prepare certain technical memoranda and other information based on 2014 work. In accordance with Commission Staff direction, on September 17 and September 26, AEA filed and distributed the first and second sets of technical memoranda and other information generated during the 2014 study season.

With this letter, AEA is filing and distributing the third set of technical memoranda generated during the 2014 study season, as described below.

This third set of technical memoranda includes:

- Attachment A: *Baseline Water Quality Study (Study 5.5) and Water Quality Modeling Study (Study 5.6), Water Quality and Lower River Modeling Technical Memorandum*. This technical memorandum evaluates water quality data collected during 2013 and 2014 for adequacy in representation of current riverine conditions. This Technical Memorandum further includes an assessment of whether to extend the Water Quality Modeling Study's riverine model below PRM 29.9.

- Attachment B: *Mercury Assessment and Potential for Bioaccumulation Study (Study 5.7), Evaluation of Continued Mercury Monitoring Beyond 2014 Technical Memorandum*. This technical memorandum evaluates the need for continued monitoring of mercury data beyond 2014 and whether the existing data collection efforts are sufficient to satisfy objectives for characterizing baseline mercury conditions in the Susitna River and tributaries (Revised Study Plan (RSP) Section 5.7.1).

- Attachment C: *Groundwater Study (Study 7.5), Preliminary Groundwater and Surface-Water Relationships in Lateral Aquatic Habitats within Focus Areas FA-128 (Slough 8A) and FA-138 (Gold Creek) in the Middle Susitna River Technical Memorandum.* This technical memorandum provides an overview of the types of data and information that are being collected to support the Task 6 activities of the Groundwater Study, and describes the methods and techniques that are being applied in analyzing the data leading to development of response functions to be used for evaluating Project operational effects. The TM centers on the analysis for FA-128 (Slough 8A) and to a lesser extent FA-138 (Gold Creek) and represents an expansion of the presentation materials provided during the Proof of Concept meetings held on April 15-17, 2014.

- Attachment D: *Groundwater Study (Study 7.5), Groundwater and Surface-Water Relationships in Support of Riparian Vegetation Modeling Technical Memorandum*. This technical memorandum provides an overview of the types of data and information that are being collected to support the Task 5 activities within the Groundwater Study, and describes the methods and techniques that are being applied in analyzing the data leading to development of response functions for evaluating Project operational effects. The TM provides analysis objectives for FA-115 (Slough 6A) as a primary example of upland versus riverine dominated groundwater conditions. Additional examples are shown for FA-128 (Slough 8A) and FA-138 (Gold Creek).

- Attachment E: *Salmon Escapement Study (Study 9.7), 2014 Implementation and Preliminary Results Technical Memorandum*. This technical memorandum describes 2014 implementation (including methods and variances) of and preliminary results from the Salmon Escapement Study.

- Attachment F: *Cook Inlet Beluga Whale Study Plan (Study 9.17), 2015 Implementation Plan Technical Memorandum.* This implementation plan describes the methods for study activities proposed for 2015 that would implement the Cook Inlet Beluga Whale Study (instead of those described in RSP Section 9.17.1).

AEA appreciates the opportunity to provide this additional information to the Commission and licensing participants, which it believes will be helpful in determining the appropriate development of the 2015 study plan as set forth in the ISR. If you have questions concerning this submission please contact me at wdyok@aidea.org or (907) 771-3955.

Sincerely,

Wayne Dyok
Project Manager
Alaska Energy Authority

Attachments

cc: Distribution List (w/o Attachments)

FERC PDF

20140930-5303

Susitna-Watana Hydroelectric Project, FERC Project no. 14241-000; Third Set of 2014 Technical Memoranda for Initial Study Plan Meetings

This cover letter accompanied six reports:

• Attachment A: Baseline Water Quality Study (Study 5.5) and Water Quality Modeling Study (Study 5.6), Water Quality and Lower River Modeling Technical Memorandum.

• Attachment B: Mercury Assessment and Potential for Bioaccumulation Study (Study 5.7), Evaluation of Continued Mercury Monitoring Beyond 2014 Technical Memorandum.

• Attachment C: Groundwater Study (Study 7.5), Preliminary Groundwater and Surface-Water Relationships in Lateral Aquatic Habitats within Focus Areas FA-128 (Slough 8A) and FA-138 (Gold Creek) in the Middle Susitna River Technical Memorandum.

• Attachment D: Groundwater Study (Study 7.5), Groundwater and Surface-Water Relationships in Support of Riparian Vegetation Modeling Technical Memorandum.

• Attachment E: Salmon Escapement Study (Study 9.7), 2014 Implementation and Preliminary Results Technical Memorandum.

• Attachment F: Cook Inlet Beluga Whale Study Plan (Study 9.17), 2015 Implementation Plan Technical Memorandum.

The cover letter and six attachments are catalogued as a set of documents in the library catalog and are numbered SuWa 247 – SuWa 253. They are available in print format at ARLIS and are available online at:

http://www.arlis.org/docs/vol1/Susitna2/2/SuWa247.html

20141003-3041

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
October 3, 2014

OFFICE OF ENERGY PROJECTS

Project No. 14241-000—Alaska
Susitna-Watana Hydroelectric Project
Alaska Energy Authority

Wayne Dyok
Project Manager
Alaska Energy Authority
813 West Northern Lights Boulevard
Anchorage, AK 99503

Reference: Response to Filing of Technical Memoranda and Modification of ILP Process Plan and Schedule

Dear Mr. Dyok:

This letter contains our response to the filing of Alaska Energy Authority's (AEA) 30 "technical memoranda" on September 17, 29, and 30, 2014 for the Susitna-Watana Hydroelectric Project No. 14241, and modifies the Integrated Licensing Process (ILP) plan and schedule to provide additional time for ILP participants to review the technical memoranda.

Background

On January 6, 2014, AEA filed a request for an extension of time to file the Initial Study Report (ISR) under the ILP for the project from February 3, 2014, to June 3, 2014, and to postpone most second-season studies scheduled for 2014 until 2015. Specifically, AEA stated that in 2014, it would: only complete studies with a winter component already scheduled for early 2014 or those studies that did not require sustained logistical support; continue ongoing study components such as monitoring and wildlife tracking at sites where equipment had already been installed; develop and calibrate analytical models for the project; and continue an analysis of data gathered in 2012 and 2013 in comparison with data collected in the 1980's. Several licensing participants filed comments on the proposed extension of time request and revised schedule, stating, among other things, that the revised schedule would create a hardship for many of the licensing participants because it would shift review and comment on the ISR to the busy summer season when many of the participants would be engaged in field studies or operating tourism-based

businesses. The commenters recommended postponing the ISR meeting by at least 120 days beyond the June 18, 2014 date proposed by AEA.

By letter order issued on January 28, 2014, Commission staff granted AEA's request to extend the ISR due date to June 3, 2014, and to postpone most second-season studies until 2015. Commission staff also granted the commenter's requests to extend the deadline for holding the meeting by at least 120 days by establishing a meeting date of October 16, 2014. The letter order included a revised process plan and schedule commensurate with the approved extensions of time.

On June 3, 2014, AEA filed its ISR, which contains a description of AEA's progress in implementing the 58 studies required by the ILP study plan, an explanation of instances where the study method used varied from that required by the study plan, and AEA's proposed modifications to the study plan. In the ISR filing, AEA also states that it had double the budget that it anticipated it would have when it made its extension of time request in January 2014, and therefore, included an updated and more extensive scope of work for summer 2014 studies.

On September 17, 29, and 30, 2014, AEA filed a total of 30 technical memoranda into the project record for consideration in the upcoming Director's determination on modifications to the study plan. The 30 technical memoranda include: (1) proposed study plan modifications; (2) the results of studies conducted during 2013 and 2014 that were not available at the time AEA filed the ISR in June 2014; (3) the results of second season studies that had been postponed until 2015 by Commission staff's January 28, 2014 letter order, but AEA decided to conduct one year ahead of schedule in 2014; and (5) the results of studies not required by the approved study plan to occur in 2014, but AEA decided to conduct in 2014 to maintain continuity of study results between 2013 and 2015. In the filings, AEA states that it wishes to discuss the information presented in the technical memoranda at the ISR meetings scheduled for October 15-17 and October 21-23, 2014, and that the information provided in the technical memoranda will help to inform the decision on the need for modifications to the study plan.

On September 22, 2014, the National Marine Fisheries Service (NMFS) responded to the September 17, 2014 technical memoranda requesting that AEA adhere to the approved ILP schedule by only discussing the June 3, 2014 ISR at the October 2014 ISR meetings. NMFS did not make any recommendations as to how the 30 technical memoranda should be addressed.

Discussion

The Commission's ILP regulations state that the purpose of the ISR meeting is for the potential license applicant and ILP participants to discuss the study results and any proposals for study plan modifications in light of the progress on the study plan and data

collected.[1] The information presented in the technical memoranda supplement study data presented in the ISR; therefore, consistent with the stated purposes of the ISR meeting, presentation and discussion of the technical memoranda at an ISR meeting would help to inform the ILP participants on needed study plan modifications.

However, the filing of technical memoranda is neither a milestone under the ILP regulations nor under the approved ILP plan and schedule for the project. When the project's ILP plan and schedule were last revised, at AEA's request, in January 2014, there were no expectations on the part of ILP participants, including Commission staff, that technical memoranda would be filed and discussed at the October 2014 ISR meeting. The volume of additional information included in the 30 technical memoranda is not inconsequential in that it comprises over 1,800 pages, and when added to the several thousands of pages of material already provided in the ISR, would be difficult to present and discuss in the time allotted for the October 2014 ISR meetings. Therefore, this letter modifies the ILP process plan and schedule for the project to require AEA to hold a second set of ISR meetings in January 2015 to provide ILP participants with sufficient time to review the new material and provide sufficient time to discuss the new material at an ISR meeting. Subsequent ILP milestones are modified, accordingly in Attachment A. We note that the new due date for the Director's determination on study plan modifications is April 22, 2015.

In the interest of efficiency and to provide ILP participants with sufficient time to review the technical memoranda, we recommend that at the October 2014 meetings, AEA focus its presentations predominantly on the data provided in the June 3, 2014 ISR, and, where feasible, hold any discussion on data presented in the 30 technical memoranda until the January 2015 meetings.

If you have any questions, please contact Nicholas Jayjack at (202) 502-6073.

Sincerely,

Jeff Wright
Director
Office of Energy Projects

[1] *See* 18 C.F.R. §5.15(c)(2) (2014).

Enclosure: Attachment A—Revised Process Plan and Schedule

cc: Mailing List
Public Files

ATTACHMENT A

REVISED SUSITNA PROJECT PROCESS PLAN AND SCHEDULE

If a due date falls on a weekend, holiday, or other day on which the Commission is not open for business, the due date is the following business day.

Responsible Party	Pre-Filing Milestone	Date
AEA	File Initial Study Report	June 3, 2014
AEA	Hold First Initial Study Report Meetings	October 16, 2014
AEA	Hold Second Initial Study Report Meetings	January 7, 2015
AEA	File Initial Study Report Meeting Summary (October 2014 and January 2015 Meetings, combined)	January 22, 2015
All Stakeholders	File disagreements with Meeting Summary and recommendations for modified or new studies	February 21, 2015
All Stakeholders	File responses to meeting summary disagreements and recommendations for modified or new studies	March 23, 2015
FERC	Issue Director Determination on meeting summary disagreements and recommendations for modified or new studies	April 22, 2015
AEA	Second Study Season	2015
AEA	File Updated Study Report	February 1, 2016
AEA	Hold Updated Study Report Meeting	February 16, 2016
AEA	File Updated Study Report Meeting Summary	March 2, 2016
All Stakeholders	File disagreements with Meeting Summary and recommendations for modified or new studies	April 1, 2016

Responsible Party	**Pre-Filing Milestone**	**Date**
All Stakeholders	File responses to meeting summary disagreements and recommendations for modified or new studies	May 1, 2016
FERC	Issue Director Determination on meeting summary disagreements and recommendations for modified or new studies	May 31, 2016
AEA	Third Study Season (if required)	2016
AEA	File Preliminary Licensing Proposal or Draft License Application	July 5, 2016
All Stakeholders	File comments on Preliminary Licensing Proposal or Draft License Application	October 3, 2016
AEA	File License Application	December 1, 2016

20141007-5131

ALASKA ENERGY AUTHORITY

October 7, 2014

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Susitna-Watana Hydroelectric Project, Project No. 14241-000
Initial Study Report Meetings

The Alaska Energy Authority (AEA) is in receipt of the letter from Mr. Jeff Wright, Director, Federal Energy Regulatory Commission (Commission), Office of Energy Projects, dated October 3, 2014, regarding the 2014 study results and changes to the Integrated Licensing Process (ILP) plan and schedule (October 3 Letter). AEA appreciates the Commission's direction on integration of the 2014 study results into the licensing process, and has no objection to a second set of Initial Study Report (ISR) meetings in January 2015 to discuss the results of studies conducted in 2014.

Although we will focus our October presentations on material submitted in the June 2014 ISR filing, there are two types of instances in which 2014 study results have been included in AEA's ISR presentations. The first is where the results of 2014 studies bear directly on the discussion of future study plans or proposed modifications; in these cases, limiting discussions to 2013 data would provide an incomplete or distorted picture. The second is where Commission-approved studies begun in 2013 were completed in 2014. Thus, while AEA's presentations will predominantly involve 2013 data, it is not feasible to defer all discussions of 2014 data. In addition, State resource agencies have conveyed to AEA that they expect to discuss 2014 study results in the October ISR meetings. Licensing participants will be not be required to comment on, or ask questions about, the 2014 study results at the October ISR meetings. However, AEA expects that the entities who have consistently requested additional data and information would welcome the opportunity to be presented this additional information collected during the study implementation process.

The 2014 study results and their applicability will be fully discussed in the January 2015 ISR meetings as directed by the Commission.[1] AEA notes that moving the Director's determination on requests for modified or new studies from January to April 2015 could affect AEA's ability to implement certain biological studies in 2015. AEA

[1] In addition to the technical memoranda filed with the Commission in September as noted by the Commission's October 3 Letter, there are data from the 2014 field season that AEA and its contractors are still in the process of reviewing. Once the data have been QA/QC'd, they will be posted to the Project website per AEA's past practice. These data will be available to licensing participants well in advance of the January ISR meetings.

813 West Northern Lights Boulevard Anchorage, Alaska 99503 T 907.771.3000 Toll Free (Alaska Only) 888.300.8534 F 907.771.3044

may seek to revisit this if there are critical path studies that could be affected by that timing.

AEA would like to take this opportunity to address some other suggestions and requests regarding the ISR meetings that it has received from licensing participants. First, it has been requested that AEA avoid long presentations summarizing studies, and leave the majority of time for licensing participants to offer their analysis and proposals for modification. AEA plans to limit its presentations to a few minutes, depending on the study, and to focus the presentations on explaining any study variances and AEA's proposed modifications to future study implementation. AEA will leave ample meeting time to discuss licensing participants' proposals.

Second, it has been requested that AEA provide specific meeting agendas at least two weeks in advance of the meetings. AEA has been posting the meeting agendas and the study plan presentations on its Project website two weeks in advance of each meeting day. *See* http://www.susitna-watanahydro.org/meetings/.

Third, licensing participants have requested that the meetings be recorded and that transcripts be provided to licensing participants. AEA will have a court reporter at the meetings and the transcripts will be posted to the Project website and filed in the Commission's docket following the meetings. Thus, although the Commission's revised schedule does not call for AEA's meeting summary of the October ISR meetings to be provided until after the January 2015 ISR meetings, the actual record of the October ISR meetings will be available to licensing participants and the Commission much sooner.

If you have questions concerning this submission please contact me at wdyok@aidea.org or (907) 771-3955.

Sincerely,

Wayne Dyok
Project Manager
Alaska Energy Authority

cc: Distribution List

20141008-5071

ALASKA ENERGY AUTHORITY

October 7, 2014

James W. Balsiger
Administrator, Alaska Region
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

Re: Susitna-Watana Hydroelectric Project, FERC Project No. 14241-000

Dear Mr. Balsiger:

The Alaska Energy Authority (AEA) is in receipt of a letter from the National Marine Fisheries Service (NMFS) dated September 22, 2014,[1] in which you provide comments on portions of the Initial Study Report (June 3, 2014) (ISR) for the proposed Susitna-Watana Hydroelectric Project, Federal Energy Regulatory Commission (FERC) Project No. 14241 (Project). Your letter raises a number of what it refers to as "issues with the data," including alleged questionable data collection methods, absence of quantitative analysis, and inappropriate scale of data collection, among others. You opine that these supposed anomalies mean that "it is not plausible that the data for predictive modeling be used to describe baseline conditions or to predict potential impacts," and that "these issues must be resolved prior to conducting additional field studies." In other words, you believe we are at a standstill.

Frankly, for NMFS to take the position that the massive amount of scientific data AEA has collected and summarized in the ISR is unreliable is untenable, bordering on the absurd. As documented in the ISR, AEA was largely successful in implementing the FERC-approved study plan in 2013. This effort included, among many other studies, a large-scale field effort for fishery studies with a suite of 10 studies covering more than 200 sampling sites across more than 200 miles of river, with sampling occurring during not only the open water period but also during winter and spring periods. Your letter, however, focuses on the limited exceptions in which AEA's data collection varied from FERC-approved study plan methods during the 2013 field season. These variances, as we all know, occurred mostly due to private land access issues, and conditions in the field such as the late ice breakup in the spring of 2013. The ISR includes a detailed description of proposed modifications to the study plan to account for these variances.

[1] Letter from James W. Balsiger, National Marine Fisheries Service, to Wayne Dyok, Alaska Energy Authority, Project No. 14241-000 (filed with Federal Energy Regulatory Commission on September 23, 2014).

Noticeably absent from your letter is any critique or analysis of AEA's proposed modifications, or any alternative method that would help achieve study plan objectives in light of the variances.

AEA also takes exception to any suggestion that it has not implemented the FERC-approved study plan in a professional manner. The fisheries field work was led by nationally renowned experts in their respective fields, representing five independent contractors, all with significant hydropower licensing and Alaska experience. The field technicians employed by these contractors are highly qualified, and many have advanced degrees from the University of Alaska-Fairbanks and University of Alaska-Anchorage. In contrast, NMFS's generalized comments either ignore the data and analysis presented in the ISR, or reflect a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan, which NMFS helped develop.

For example, NMFS asserts that AEA has misidentified or was unable to identify juvenile fish species in its field sampling efforts. As you should know, all field identifications of juvenile salmon are subject to error due to the inherent variations in each species' distinguishing characteristics at those life stages. Your letter claims we have an unacceptable level of error because the juveniles we identified as Chinook salmon in our samples were too large, and too many were found in sloughs or with beaver ponds. We instructed our crews to make field calls based on the physical characteristics used for distinguishing coho and Chinook salmon, not on their size or where they were found. There are several possible explanations for why larger juveniles might be found in the sloughs, including displacement during the 2012 fall flood, or during 2013 spring flooding at breakup, or as a result of ice processes. Simply to dismiss the possibility that these fish were Chinook because of where they were found would have been unscientific. You also cite an unusually large number of unidentified juveniles in our sampling. Our field crews followed instructions per AEA's Quality Assurance/Quality Control (QA/QC) measures that, when unable to make a call in the few seconds that is safe to hold a juvenile fish out of water, they should subsample in a location by photographing juveniles and collecting genetic samples and voucher specimens. The senior scientists from our study team and Alaska Department of Fish and Game staff review these photographs, genetic samples, and vouchers to verify field identification. Some unidentified salmon calls remain at some sites, but these are not material to the objectives of relevant studies (Studies 9.5 and 9.6).

Under the FERC-approved study plan (Studies 8.5, 9.5, and 9.6), the purpose of this particular data collection effort is to determine the distribution of fish species within different aquatic habitats. This information will be used as inputs to habitat models. Whether a specific juvenile salmon is correctly identified as coho versus Chinook salmon will have no bearing whatsoever on the outcome of the habitat modeling because these models will consider all life stages of all five of the Pacific salmon species present in the Susitna basin. With respect to coho and Chinook salmon, the habitat suitability criteria

for the rearing life stages of these species substantially overlap, ensuring that the model will adequately characterize the most protective habitat for both species.

Your letter also contains a number of outright errors and instances in which you ignore available information. Among these, your letter states that there was an "absence of pink salmon in any samples." However, pink salmon counts are reported in several tables in the ISR. Your letter also states that AEA did not include estimates of relative abundance, yet relative abundance is presented in the ISR in text and detailed tables of "catch per unit effort." Your letter states that fish passage criteria have not been developed—they have been developed, and reviewed with licensing participants including NMFS at the March 19, 2014 fish barriers technical meeting.

Attached to this letter is a comment-response table that addresses in detail each of the comments in your September 22 letter. I think you will agree, on careful review of our responses, that the 2013 study program provides a solid foundation of data upon which we can continue to build.

AEA remains committed to implementing the comprehensive suite of studies proposed in the FERC-approved study plan and encourages NMFS to work with us in good faith in studying the feasibility of and potential effects associated with an undertaking that is critically important to Alaskans. If you have questions or comments concerning this matter, please feel free to contact me directly at (907) 771-3955.

Sincerely,

Wayne M Dyok

Wayne Dyok
Project Manager
Alaska Energy Authority

Attachment

Cc: Distribution List
Samuel D. Rauch III
Jeff Wright
Ann Miles
Vince Yearick
Dr. Jennifer Hill
Nick Jayjack

AEA'S RESPONSE TO NMFS SEPTEMBER 22, 2014 ISR COMMENT LETTER

OCTOBER 7, 2014

Comment Page Para	Comment Number	Comment	Response
Page 4[1] Para 5	1	1) Habitat classification has not been completed;	This comment ignores the data and analysis presented in the ISR. Remote habitat classification was completed in 2013, as presented in Study 9.9 ISR Sections 5.1 and 5.2, and Study 6.5 ISR Section 5.4 and Part 2 of 3 Figures. Land access restrictions resulted in a delay to complete the field surveys to ground-truth remote classification. The variance regarding delay in the ground-truthing study component was addressed in Study 9.9 ISR Section 4.2.4. The schedule for completion of the ground-truthing surveys was presented in 9.9 ISR Section 7.2. All field work was completed in 2014 as described in the 2013 and 2014 Aquatic Habitat Mapping Field Season Completion Progress Technical Memorandum that was filed with FERC on September 17, 2014.
Page 4 Para 6	2	2) Fish passage criteria have not been developed;	AEA disagrees. With respect to Study 9.12 Fish Passage Barriers, AEA proposed leaping, depth, and velocity criteria. AEA reviewed this criterion with the Licensing Participants during Interdisciplinary Fish Barriers Technical Meeting on March 19, 2014.
Page 4 Para 7	3	3) Fish sampling study plans were not followed; sampling units were inappropriately subsampled;	This comment ignores the data and analysis presented in the ISR. The Fish Distribution and Abundance Study Plan Determination and Final Implementation Plan (filed April 1, 2013) were implemented by AEA field crew. However, as noted and explained in Study 9.5 ISR Section 4.4.4, there were variances to the plan methods that occurred during implementation, including sub-sampling GRTS panels and transects sites in the Upper River, as a result of conditions in the field. NMFS does not acknowledge the reason for the variances or AEA's proposed modifications to account for them, nor does it explain why subsampling was inappropriate in the circumstances. AEA conducted additional analysis of the data collected in the Upper River and proposed modifications in Study 9.5 ISR Section 7.1.2 to ensure that the data will meet all Study 9.5 objectives. This information also was presented in a Fish Technical Meeting on March 20, 2014 and input from stakeholders including NMFS was solicited. The modifications, as proposed in Study 9.5 ISR Section 7.2, were implemented in 2014 to collect data supplemental to the 2013 field effort. The results of the 2014 surveys were summarized in the Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Technical Memorandum filed with FERC on September

[1] Page and Paragraph Numbering:
- Partial sentences at the top of a page are considered Sentence 1.
- Partial paragraphs at the top of a page are considered Paragraph 1.
- Paragraphs are numbered by their position on a page, not within a Section.
- Paragraphs are blocks of text separated by hard returns; each heading, bullet, and item in a numbered list is considered one paragraph.

Comment Page Para	Comment Number	Comment	Response
			17, 2014.
Page 4 Para 8	4	4) Fish sampling locations did not incorporate FERC recommendations;	This comment ignores the data and analysis presented in the ISR. Fish sampling locations followed the FERC recommendations where feasible. As explained in Studies 9.5 and 9.6, there were some variances due to field conditions and land access limitations. These variances did not affect the quality or the integrity of the data collected, or the ability to meet study plan objectives.
Page 4 Para 9	5	5) Because the fish sampling did not follow the sampling plan, this resulted in an inability to estimate relative fish abundance;	AEA disagrees that variances from the sampling plan identified in Comments 3 and 4 resulted in an inability to obtain accurate estimates. See answers to Comments 3 and 4. Estimates of relative abundance are reported in Study 9.5 ISR Sections 5.1.2, 9.5, and Appendix E (Upper River Fish Observations and Relative Abundance 2013) as well as Study 9.6 ISR Section 5.1.2 and Appendix E (Relative Abundance Tables).
Page 4 Para 10	6	6) Fish seem to have been identified incorrectly;	Please see below for responses to specific comments concerning fish identification.
Page 4 Para 11	7	7) Data were collected and reported at inappropriate mesohabitat scales;	This comment ignores the data and analysis presented in the ISR. Fish Distribution and Abundance (FDA) data were collected and reported at meso- and macro-habitat scales consistent with the study plan (Study 9.5 ISR Section 4.4.2 and Study 9.6 ISR Section 4.4.2). Based on USFWS comments, Comment 7 appears to be specific to the Barrier Study (Study 9.12) and the HSI/HSC component of the IFS Study (Study 8.5). The Fish Barriers and IFS studies are collaborating, regarding target species, passage criteria, and sampling locations. This will ensure that the model outputs from IFS are useful for analysis of passage barriers.
Page 4 Para 12	8	8) Sampling sites among studies were not co-located;	This is incorrect; the sampling sites were co-located. This comment ignores the data and analysis presented in the ISR. AEA's selection of sampling sites was consistent with the River Productivity Implementation Plan. As presented in the River Productivity Implementation Plan Section 2.1: "All stations established within the Middle River Segment will be located at Focus Areas established by the Instream Flow Study (AEA 2012, Section 8.5.4.2.1.2), in an attempt to correlate macroinvertebrate data with additional environmental data (flow, substrates, temperature, water quality, riparian habitat, etc.) collected by other studies (e.g., AEA 2012, Section 5.5, Baseline Water Quality), for uses in statistical analyses, and HSC/HSI development. Furthermore sites for Fish Distribution and Abundance, Habitat Suitability Criteria, and River Productivity were all co-located within Middle River Focus Areas. In 2013, private land access restrictions prevented fish sampling in some desired locations, yet River Productivity sampling was able to be conducted because the sites for that study were located in mainstem and within ordinary high water. Maps depicting the co-locations of sampling sites among these three studies will be presented in the October 15, 2014 ISR meeting.
Page 4 Para 13	9	9) Tagging goals were not met;	This comment ignores the data and analysis presented in the ISR. Tagging goals were generally, but not precisely, met for every location and species in the Escapement Study in 2013 (9.7 Section 4.1.4). These few discrepancies do not affect the quality or the integrity of the data collected. In the Lower River, the targets were 700 Chinook salmon, 600 coho salmon, and 200 pink salmon. Actual tagging

<table>
<tr><th>Comment Page Para</th><th>Comment Number</th><th>Comment</th><th>Response</th></tr>
<tr><td></td><td></td><td></td><td>numbers were 698 Chinook salmon, 596 coho salmon, and 197 pink salmon. At the Yentna, 690 Chinook salmon were tagged as compared to the 700 fish target. In the Middle River, tagging targets were met for all salmon species except sockeye; 139 sockeye were tagged out of the 200 fish target.

For resident species tagging target in Studies 9.5 and 9.6, the study plan indicated that "the goal is to implant 30 radio transmitters per target species" and the winter movement objective specified "up to 30" fish as the target for burbot, humpback whitefish and round whitefish. In 2013, progress was made toward these goals as indicated in Study 9.6 ISR Section 4.5.2 and Study 9.6 ISR Section 4.5.2. Further progress toward the tagging goals was made in 2014 and will be presented at the ISR meeting on October 15, 2014.</td></tr>
<tr><td>Page 4
Para 14</td><td>10</td><td>10) Fish targets for HSC sampling were not met;</td><td>This comment ignores the data and analysis presented in the ISR and reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. The targets pertain to the total number of HSC data points collected over the entire licensing study period, not one field season. Absolute target numbers were not established for HSC data collection (see RSP 8.5.4.5.1.1.5) for the first year of study, or the licensing study period in general. The FERC-approved Study Plan noted that: "If possible, a minimum of 100 habitat use observations will be collected for each target species life stage. However, the actual number of measurements will be based on a statistical analysis that considers variability and uncertainty. While information will be collected on all species and life stages encountered, the locations, timing, and methods of sampling efforts may target key species and life stages identified in consultation with the TWG." This was discussed during several TWG meetings where it was emphasized that the approach AEA is taking in developing HSC curves will include several components, including collection of new site specific data, which is AEA's and agencies preferred approach, as well as other approaches for species or life stages infrequently encountered. AEA listed those in RSP 8.5.4.5.1.1 and included use of existing site specific data collected during the 1980s studies, use of site specific data from other similar Alaska systems, as well as professional opinion.

A summary of HSC collection efforts to date is provided below. As noted, there are a number of species for which the numbers of observations have exceeded 100, including those for Chinook salmon juvenile, Chum fry and spawning, Coho fry, Sockeye fry and spawning, Arctic Grayling fry, and whitefish fry. These species and life stage mixes reflect the majority of the target species and life stages that are central to the habitat-flow modeling for evaluating Project effects.

<table>
<tr><th>Species</th><th>Lifestage</th><th>2013</th><th>2014 Through July</th><th>Project Total</th><th>1980s Total</th></tr>
<tr><td>Chinook</td><td>Fry</td><td>54</td><td>164</td><td>218</td><td></td></tr>
</table>
</td></tr>
</table>

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	Juvenile	38	25	63	
Chum	Fry	14	258	272	
	Spawning	348		348	333
Coho	Fry	99	181	280	
	Juvenile	56	28	84	
Pink	Fry	0	39	39	
	Spawning	59	0	59	NR
Sockeye	Fry	79	299	378	
	Spawning	181		181	81
Arctic Grayling	Fry	113	7	120	
	Juvenile	43	9	52	
	Adult	4	4	8	140
Burbot	Juvenile	2	4	6	
	Adult	17	3	20	18
Dolly Varden	Fry	20		20	
	Adult	1	1	2	2
Longnose Sucker	Fry	41	46	87	
	Juvenile	52	27	79	
	Adult	70	3	73	157
Rainbow Trout	Juvenile	5	2	7	
	Adult	6	1	7	143
Whitefish	Fry	39	73	112	
	Juvenile	39	15	54	
	Adult	29	4	33	384

Additional HSC/HSI sampling is planned for the next year of study and it is anticipated that most

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			HSC relationships will be updated. However, for species and life stages that are rarely observed, final HSC curves may be based on additional data, including utilization data from 2012 and the 1980s studies on the Susitna River. Even then, there may still be some species where few or no empirical HSC/HSI data were able to be collected. In those cases, AEA will consider other methods for developing curves. This may include the use of literature based curves, developing envelope curves (see, for example, Jowett et al. 1991, and GSA BBEST 2011), guilding (e.g., creating a combined HSC/HSI curve representing multiple species and/or life stages; see, for example, Vadas, Jr. and Orth 2001, GSA BBEST 2011), developing curves based on expert opinion/round table discussions) and the use of Bayesian statistical methods for updating data distributions (see, for example, Hightower 2012).
Page 4 Para 15	11	11) The mainstem upper river migrant fish trap was not installed;	This comment ignores the data and analysis presented in the ISR. This variance was identified in Study 9.5 ISR Section 4.1.6.2 due to lack of access to areas above the ordinary high water mark. AEA completed this task in 2014 as described in Study 9.5 ISR Section.7 and TM for Study 9.05.
Page 4 Para 16	12	12) A fish wheel was not installed, and fish were not tagged near the entrance to Devils Canyon;	This comment ignores the data and analysis presented in the ISR. This variance was described in Study 9.7 ISR Section 4.1.8.1. This change in tagging location was compensated for by increased fishwheel effort and an increase in tagging targets at the Curry fishwheels.
Page 4 Para 17	13	13) Additional problems associated with late installation and operation of migrant traps were likely influenced by environmental conditions associated with late breakup; and	Downstream migrant traps were installed and operated as indicated in the Study 9.5 ISR Section 9.5.4.4.10 and Study 9.6 ISR Section 9.6.4.4.10: "flow conditions permitting, traps will be fished on a cycle of 48 hours on, 72 hours off throughout the ice-free period." As soon as break-up and flow conditions allowed in mid-June 2013 traps were fished immediately upon installation in June through mid-October 2013. In 2014 breakup occurred earlier and migrant traps installation occurred in mid-May with traps operated immediately after installation (the Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Technical Memorandum filed with FERC on September 17, 2014).
Page 4 Para 18	14	14) Juvenile salmon distribution and abundance in 2013 were likely affected by the record fall floods in 2012.	AEA agrees that floods can affect juvenile salmonid abundance. While the fall 2012 floods did not approach the magnitude of the flood of record, they potentially distributed juvenile salmonids into lateral habitats that may not otherwise be occupied during a low water year. AEA believes that the range of hydrologic events that occur over the multi-year study period provide opportunities to better understand the response of aquatic resources to flow fluctuations.
Page 4 Para 20 – Page 5 Para 1	15	The actual implementation of the abundance sampling program did not follow the statistical models used to select sampling units. In particular, subareas (mesohabitats) within selected areas were 'randomly' selected for subsampling, and sampling was not consistent between sampling events	AEA disagrees. This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. The random selection of meso-habitat units within GRTS selected panel sites and at transects was implemented as proposed in the Fish Distribution and Abundance Implementation Plan filed with FERC on March 1, 2013. The use of different gears consistent with habitat characteristics was implemented as proposed in the Fish Distribution and Abundance Implementation Plan filed with FERC on March 1, 2013 with

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		(different gears, different effort, different order of gears, different total area sampled, etc.). Sampling error in the fish distribution and relative abundance studies needs to be accounted for in order for these studies to accurately estimate fish distribution and abundance. Estimates of numbers of Chinook salmon that migrate above Devils Canyon need to include the assumptions, standard error, and resulting statistical confidence intervals associated with that estimate. Better descriptions of (and statistical accounting for) both sampling and non-sampling errors need to be provided. The data used to describe fish-habitat association preferences and the standard errors associated with those species and life-stage habitat correlations need to be validated, as this analysis proposes to describe macrohabitat relationships for fish. These relationships will be used to evaluate project effects, to validate instream flow habitat model predictions, and to extrapolate results from focus areas to geomorphic reaches and river segments. Ultimately these data will be used to develop protection and mitigation measures and to serve as a basis for post-project monitoring.	modification described in Study 9.5 ISR Section 4.4.4 and Study 9.6 ISR Section 4.4.4. AEA disagrees that sampling error will impact AEA's ability to meet objectives of fish distribution and abundance sampling for Studies 9.5 and 9.6. The fish distribution and relative abundance methods were implemented consistent with Studies 9.5 and 9.6 RSPs, the Fish Distribution and Abundance Implementation Plan, and FERC's SPD. As described in RSP Section 9.7.4.1.5 (Objective 1) and Section 9.7.4.6 (Objective 6), AEA planned to examine fish on selected spawning grounds (e.g., Indian River) in part to establish mark rates (proportion of fish tagged) so that inferences could be made about the representativeness of tagging across stocks. In addition, AEA stated that mark rates from these areas can be used to estimate the abundance passing the tagging sites (but not the abundance at the recovery site). If sufficient sampling can be obtained and some assumptions met, some inference can be made about relative abundance among recovery locations using the estimates of mark rates and the number of radio-tagged fish present. However, it was not an objective of this study to produce a mark-recapture estimate of the number of Chinook salmon migrating above Devils Canyon (or above the proposed dam site). In the FERC SPD (page B-13), NMFS and the USFWS requested that AEA add the additional goal of estimating the numbers of fish above Devils Canyon (and the proposed dam site) to the study. FERC did not recommend this additional goal be included in the study. Instead, FERC recommended the study be modified to require AEA to include in the 2013 ISR an evaluation of the feasibility of putting in a weir or sonar counting station at or near the dam site during the 2014 study season to count anadromous fish. In ISR Section 5.6.4, AEA used two different approaches to estimate of the number of Chinook salmon that migrated above Devils Canyon in 2013. The first approach involved expanding the peak aerial spawner count in tributaries above Devils Canyon (29 fish) by the estimated observer efficiency (46.3 percent, as observed in the Indian River; 26/0.463 = 63 fish). This expanded count should be considered a minimum number since only fish counted on the July 25-27 survey were included. Chinook salmon were also observed in tributaries above Devils Canyon on four other surveys, so it is possible that some of these fish were not present during the July 25-27 survey. Also, this approach assumed that the observer efficiency in tributaries above Devils Canyon was similar to that in the Indian River (which was 'ground-truthed' with weir counts in 2013). The second approach involved expanding the number of radio-tagged Chinook salmon detected above Devils Canyon (3 fish) by the marked fraction of Chinook salmon in the Middle River (6.3

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			percent; 3/0.063 = 48 fish). It was highly unlikely that more than three fish migrated above Devils Canyon. This approach assumed that the mark rate of fish above Devils Canyon was the same as the mark rate of fish sampled in the Indian River. Sensitivity analyses were included in ISR Sections 5.6.4 and 6.6 to illustrate how extreme, but unlikely, parameter values affected the expanded counts derived from both approaches. In summary, too few tagged and untagged fish were observed above Devils Canyon to derive a statistically valid estimate of the number of Chinook salmon that passed Impediment 3 (or the proposed dam site). Regardless, the study was not designed to produce such estimates. As proposed in the RSP, AEA used available data to make inferences about the abundance of Chinook salmon above Devils Canyon. Although lacking statistical rigor, these estimates provided insight into the order of magnitude of Chinook salmon abundance above Devils Canyon (e.g., 50-65 fish above Devils Canyon in 2013 was likely, but 100 or more was unlikely). These estimates also illustrate how difficult it would be to achieve sufficient samples sizes to derive a reasonably accurate and precise mark-recapture estimate for Chinook salmon above Devils Canyon. **Summary of passage events for large Chinook salmon (MEF ≥ 50 cm) released in the Middle River, 2012-2014. Small Chinook salmon, and large Chinook salmon released in the Lower River, were not included in this table.**

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	2012	2013	2014	Total
Tags Released at Curry	352	536	590	1,478
Number of Tags Detected Above:				
Gateway	313	445	491	1,249
Impediment 1	23	17	11	51
Impediment 2	20	13	8	41
Impediment 3	10	3	2	15
Proposed Dam Site	6	2	1	9
Percent of Tags Released Detected Above:				
Gateway	88.9	83.0	83.2	84.5
Impediment 1	6.5	3.2	1.9	3.5
Impediment 2	5.7	2.4	1.4	2.8
Impediment 3	2.8	0.6	0.3	1.0
Proposed Dam Site	1.7	0.4	0.2	0.6
Percent of Tags Past Gateway Detected Above:				
Impediment 1	7.3	3.8	2.2	4.1
Impediment 2	6.4	2.9	1.6	3.3
Impediment 3	3.2	0.7	0.4	1.2
Proposed Dam Site	1.9	0.4	0.2	0.7
Number of Tags That Approached Impediment 1 (within 1 km)	34	60	32	126
Percent of Tags Released That Approached Impediment 1	9.7	11.2	5.4	8.5
Percent of Tags Past Gateway That Approached Impediment 1	10.9	13.5	6.5	10.1

As stated in Study 9.5 ISR Section 5.1.3 and Study 9.6 ISR Section 5.1.3 data presented on habitat associations was preliminary and based only on counts and therefore have no standard error associated with these data. Once QAQC has been completed on the fish data, the analysis of fish-habitat associations will be completed with additional inputs including relative abundance, species

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			richness, and life stages supported. As stated in the RSP Section 9.6.4.3.1, Study 9.5 ISR Section 5.1.3, and Study 9.6 ISR Section 5.1.3 fish-habitat associations will be evaluated at the meso-habitat level. These data will not be used to validate the instream flow model but to further characterize at macrohabitat that are subject to flow effects at the meso-habitat level.
Page 5 Para 3	16	Data collection methods need improvement. For example, detection and recovery of PIT (passive Integrated Transponder) tags need to be improved to yield useful data to meet study goals and objectives. Location of the detection arrays did not cover the entire channel and was biased toward fish migrating down channel. Also, because too few tags were recovered, efficiency estimates could not be made.	This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. As stated in RSP Sections 9.5.4.4.1.2 and 9.6.4.4.1.2, remote telemetry techniques were "intended to provide detailed information on relatively few individual fish." PIT tags were used to "document relatively localized movements of fish as well as growth information from tagged individuals." Due to the size of the study rivers, the necessity for installing arrays across split channels, side-channels and/or as partial coverage arrays across a portion of the main channel is described in the Fish Distribution and Abundance Implementation Plan Section 5.6.5. Furthermore, both FA-104 and FA-128, the PIT tag arrays spanned the entire channels. Data from PIT tag arrays provided limited but valuable information on fish movements. As indicated in Study 9.5 ISR Section 5.2.2.2 and Study 9.6 ISR Section 5.2.2.2, antenna arrays recorded 29,047 detections of 33 fish in the Upper River and 126,351 detections of 664 fish at Middle River arrays. These resightings provided information on local and inter-stream movements of individual for six species in the Upper River and 11 species in the Middle River as well as site-specific growth rates for individuals of several species (Study 9.6 ISR Section 5.5.1).
Page 5 Para 4	17	Misidentification of juvenile fish by species induces significant error, and application of this erroneous data would result in inaccurate conclusions. Our review of the Initial Study Report finds that a very high percentage of the juvenile salmonids were misidentified. We also question the accuracy of all juvenile fish sampling data because of the following details:	AEA disagrees. This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. NMFS concern appears to be centered on the potential mis-identification of coho versus Chinook salmon in certain habitats that were part of fish distribution studies. Whether those identifications are correct or not has no bearing on the outcome of the habitat-modeling studies that will consider all of the Pacific salmon species. AEA has focused a substantial effort into the development of resource specific models that will link with habitat-flow based models for evaluating the effects of flow regulation below the dam on various fish species and processes both spatially and temporally. The biological inputs to the habitat models will be provided primarily via the HSC analysis that includes a suite of flow sensitive parameters associated with different species and life stages. The HSC data are being collected in accordance with the study plan and will result in a series of species specific HSC curves that will be brought into the fish-habitat modeling. At this time the plan is to run the habitat-flow models for all of the target salmonid species and life stages including sockeye and chum salmon adults/spawning, which are the species most often associated with the lateral habitats that are likely to be most influenced by Project operations, as well as coho, Chinook, and pink salmon.
Page 5 Para 5	18	• large numbers of unidentified salmonid juveniles (some of which were PIT tagged);	AEA disagrees that numbers of unidentified juvenile salmonids are significant.

<table>
<tr><th>Comment Page Para</th><th>Comment Number</th><th>Comment</th><th>Response</th></tr>
<tr><td></td><td></td><td></td><td>In Study 9.6 ISR Table 5.1-2: 865 undifferentiated Pacific salmon Juveniles in MR, five percent of all juvenile salmon, ~ half from Slough 6A. 436 fish identified after photo review and classified to species. Resulting in a total of 429 undifferentiated Pacific salmon remaining in database, 2.5 percent of total.

In Study 9.46 ISR Table 5.1-3: 78 undifferentiated Pacific salmon juveniles in LR, two percent of total.

AEA is in the process of reviewing photos from the Lower River, which should reduce the number of unidentified juvenile salmonids.

In 2013, 11 undifferentiated pacific salmon were PIT-tagged (67 reported in ISR but photo review resulted in identification of 56 of the 67); four of these 11 tagged unidentified pacific salmon met length criteria to be two-year-olds. Ten of these 11 fish have photos that are under review. In total 1,872 Chinook salmon and 2,793 Coho salmon were PIT-tagged in 2013 and Winter 2014.</td></tr>
<tr><td>Page 5
Para 6</td><td>19</td><td>• anomalous length distributions and habitat associations (e.g., juvenile Chinook 150 mm fork-length;</td><td>Summary of large juvenile Chinook and coho salmon. Based on growth modeling, juvenile Chinook and coho >100mm in May and June were presumed to be two-year-old fish and >120mm from July-April were presumed to be two-years of age. These data are not consistent with data from the 1980s and are undergoing additional analysis.
<table>
<tr><th>Location</th><th>PRM</th><th>Habitat</th><th>Chinook salmon</th><th>Coho salmon</th><th>Pacific salmon, undifferentiated</th><th>Total</th></tr>
<tr><td>DMT-Talkeetna Station</td><td>106.9</td><td>MS Susitna River</td><td>72</td><td>8</td><td>3</td><td>83</td></tr>
<tr><td>Indian River DMT</td><td>142.1</td><td>Tributary</td><td>70</td><td>4</td><td></td><td>74</td></tr>
<tr><td>FA-141-Slough 17</td><td>142.3</td><td>Upland Slough Beaver Complex</td><td>70</td><td>16</td><td>1</td><td>87</td></tr>
<tr><td>Montana Creek DMT</td><td>80.8</td><td>Tributary</td><td>37</td><td>4</td><td></td><td>41</td></tr>
<tr><td>FA-104-Slough 3A</td><td>105.7</td><td>Upland Slough Beaver Complex</td><td>15</td><td>25</td><td>1</td><td>41</td></tr>
<tr><td>FA-104-SS</td><td>105</td><td>Side Slough</td><td>14</td><td>2</td><td></td><td>16</td></tr>
</table></td></tr>
</table>

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<tr><th>Comment Page Para</th><th>Comment Number</th><th>Comment</th><th>Response</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>PRM-63.5-US</td><td>62.5</td><td>Upland Slough Beaver Complex</td><td>9</td><td>11</td><td></td><td>20</td></tr>
<tr><td>FA-115-Slough 6A</td><td>116.2</td><td>Upland Slough Beaver Complex</td><td>6</td><td>31</td><td></td><td>37</td></tr>
</table>

Genetics samples were collected from 37 of these large Chinook and four large coho salmon, 2013. An additional 29 samples were collected from Chinook salmon >100 mm collected July 2013-April 2014. Analysis of these samples is currently underway. A total of approximately 600 Chinook salmon tissue samples have been delivered to ADF&G for analysis and can be used to determine overall Chinook salmon identification error rate if needed.

Approximately 24 voucher specimens have been collected for Chinook (10) and coho salmon (14). These fish will be used for meristic counts to determine species ID. Our ADF&G permit limited us to 10 per species but was recently modified to up to 20 Chinook and coho salmon.

31 photos of these large Chinook salmon are also available for review. Review is complete for R2 photos but need to review photos from HDR and Golder. Results of photo review will be used in combination with genetics and meristic data to evaluate accuracy of field identification.</td></tr>
<tr><td>Page 5
Para 7</td><td>20</td><td>• the large abundance of juvenile Chinook in beaver ponds;</td><td>Habitats where Chinook salmon were collected in 2013 and winter 2014. Larger Chinook salmon are defined in Comment Number 19. 681 juvenile Chinook salmon were collected from upland slough beaver complexes compared to 3,414 coho salmon. Approximately 14 percent of Chinook salmon were associated with upland slough beaver complexes. The highest habitat supporting collection was tributaries, over 21 percent of total collections. Of larger Chinook salmon, roughly a third, 100 out of 313, were associated with upland slough beaver complexes.
<table>
<tr><th></th><th colspan="2">Chinook salmon</th><th colspan="2">Coho salmon</th><th colspan="2">Pacific salmon, undifferentiated</th><th>Total</th></tr>
<tr><th>Macro Habitat</th><th>All Sizes</th><th>Larger fish</th><th>All Sizes</th><th>Larger fish</th><th>All Sizes</th><th>Larger fish</th><th></th></tr>
<tr><td>Additional Open Water</td><td>1</td><td></td><td>32</td><td>1</td><td></td><td></td><td>33</td></tr>
<tr><td>Backwater</td><td>31</td><td>1</td><td>107</td><td></td><td>3</td><td></td><td>141</td></tr>
<tr><td>Clear Water Plume</td><td>69</td><td>2</td><td>144</td><td></td><td>14</td><td></td><td>227</td></tr>
<tr><td>Main Channel</td><td>1,038</td><td>74</td><td>1,210</td><td>23</td><td>79</td><td>3</td><td>2,327</td></tr>
</table>
</td></tr>
</table>

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			Side Channel 176 12 291 1 42 **509** Para Side Channel Complex 11 1 3 **14** Side Slough 177 3 554 147 **878** Side Slough Beaver Complex 76 1 221 11 25 **322** Tributary 1,875 43 1,411 6 53 **3,339** Tributary Mouth 615 70 2,123 7 28 **2,766** Upland Slough 108 6 378 19 1 **487** Upland Slough Beaver Complex 681 100 3,414 65 131 1 **4,226** **Grand Total** **4,858** **313** 9,885 133 526 **4** **15,269**
Page 5 Para 8	21	• the absence of pink: salmon in any samples; and	This is incorrect. Pink salmon were caught during winter sampling and ELH. Winter data are provided in Study 9.6 ISR Appendix C Tables C2.2-5 and c2.2-5 and Figure C A1-17. ELH data are provided in Study 9.6 ISR Tables 5.3-1, 5.3-2, and 5.3-3.
Page 5 Para 9	22	• the disappearance of sockeye salmon from Indian River between the February draft Initial Study Report and the June draft Initial Study Report).	This is incorrect. AEA reviewed ISRs for Studies 9.5, 9.6, 9.7, and 8.5 and the numbers of reported sockeye salmon did not differ between the Draft and Final ISR.
Page 5 Para 10	23	Considering the length distributions and habitat associations reported, we have reservations also about the identification of these juvenile fish and conclude that many juvenile salmonids identified as Chinook salmon were coho salmon.	AEA disagrees. See Comment Response Number 20. Consistent with QAQC protocol's AEA is verifying fish identifications. In addition, 681 out of the 757 total Chinook salmon in habitats with beaver influence came from three sloughs: Slough 6A, Slough 17, and Slough 3B (Whiskers). The photo review, meristic, and genetic sampling are ongoing for these sites and will provide an estimate of error associated with field identifications. Based on the recent photo review for Slough 6A we are confident that Chinook and coho salmon do co-occur at this site; however, we also anticipate additional corrections to field identifications due to the phenotypic variations evident in juvenile salmon at this location. We have over 500 photos of Chinook and coho salmon that can be used for photo-based QAQC in addition to more than 550 genetic samples of Chinook and coho salmon for verification of field identification.
Page 5 Para 11 – Page 6	24	There is an absence of quantitative analysis of habitat sampling, fish distribution and relative abundance, and early life history	AEA disagrees with these assertions. This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. As shown in the ISR sufficient data has been collected to indicate that progress has been made towards meeting study

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Para 1		data collected to date. Deviations from the Revised Study Plan (RSP) and FERC staff recommendations make developing estimates from these data difficult or even impossible. These data are the basis of the fish and habitat sampling design and must be collected appropriately for the study to yield useful information. Without better integration of historical data into assessment of current results (e.g., the data from studies collected in 2012, which used different methodology and locations), these data should not be used to assess habitat associations for salmon by species and life stage. Much of the data on species distribution, relative abundance, and habitat associations appears anomalous in comparison to available science on these species and their life stages as known through data previously collected and past studies conducted in the Susitna River and environs.	objectives in spite of variances. Furthermore, AEA has proposed modification where needed to improve data collection efforts based on a quantitative analysis of the data in the ISR. In all cases the study modifications implemented in 2014 have been shown to be successful at improving rigor of the data set as presented in Fish Distribution and Abundance Technical Memorandum filed with FERC on September 17, 2014.
Page 6 Para 2	25	One of the main objectives of radio-tagging was locating spawning locations. The proposed activity of circling over a tag that remained in the same location for a period of time was not done (mainly for salmon). For non-salmon species, it was proposed to tag some species after their spawning season and monitor the tag in the following year to locate spawning locations. It remains to be seen if this actually worked. If not, the objective of locating spawning locations was not met.	This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. AEA met the study plan objective within Study 9.7. Aerial telemetry survey methods are stated in RSP 9.7 Section 9.7.4.2.2: "When tagged fish are within 2 km of their last seen location, the helicopter will circle at a lower altitude to pinpoint the fish location to mainstem, side channel, or slough habitats. As well, when aggregations of two or more tagged fish are found stationary (i.e., within 2 km on one or more surveys) and/or when visual observations of spawning fish are made from the helicopter, ground and boat-based surveys will pinpoint spawning locations to within 5-10 meters," and Study 9.7 ISR Section 4.2.2. "When aggregations of two or more tagged fish were found stationary (i.e., within 2 km on one or more surveys), spawning locations were more intensively tracked to achieve relatively high resolution geographic positions."

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			Aerial survey protocol with respect to identifying the position of a radio-tag adapted to the local physical environment, weather conditions, timing relative to the migration, helicopter pilots, and abundance of radio-tags, but always maintained the stated goal of achieving each position to within 300 meters. Obtaining an accurate fix on a tag did not necessarily require circling or changing altitude although those maneuvers were used; sometimes it involved hovering, changing orientation of the antenna, or simply making an additional pass at a particular location. Therefore, the adaptive protocol provided higher accuracy of positions than the original protocol. The aerial protocol was adapted to conditions during the salmon season with respect to monitoring non-salmon frequencies (RSP 9.6, Section 4.5.3.3). More specifically, "Resident tag frequencies were programmed into a receiver and scanned automatically. No manual tracking, directed searching, or identification of habitat type was conducted during the period when adult salmon were being tracked." (ISR 9.6, Section 4.5.3.3). This was done to accommodate the high number of frequencies that needed to be scanned for salmon and resident fish (i.e., it was impossible for two crew to actively monitor six to eight receivers), and "may make habitat use inferences less accurate if habitat delineations were much smaller than the resolution of the tag positions." The adapted approach was not necessary during surveys above Devils Canyon nor during the period when only resident tags were being tracked. The 2013 data on spawning and holding locations for radio tagged salmon were reported in Study 9.7 ISR Section 5.5.3. AEA notes that as part of the radio tagging surveys in the Middle River, there was cross-communication between the radio tagging teams and HSC study teams. In instances where stationary adult fish were observed, ground or boat based surveys were conducted and measurements of depth and velocity made at a number of locations to define the areas as potential spawning locations. Furthermore, telemetry tagging targets are stated in IP 9.5/9.6 Section 5.8.1 and Study 9.6 ISR Section 4.5.2.1. "Tags will be surgically implanted (see Appendix 5) in 60 fish of sufficient body size (i.e., ≥200 grams) of each target species. For each species, 30 tags will be allocated to the Upper River, and 30 tags will be allocated to the combined Middle/Lower River. To the extent possible given the constraints of field sampling conditions, …" FERC recommended (SPD at B-135) tagging 10 of a 30 tag species allocation prior to and during

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			spawning periods for Arctic grayling, burbot, Dolly Varden, humpback whitefish, rainbow trout, and round whitefish. As Study 9.6 ISR Section 4.5.3.2, AEA's implementation varied from this recommendation. However, tagging the identified species during the specified periods was conducted based on the surgeon's discretion. For 2013 and 2014, tagging resulted in the FERC recommendation being achieved for Arctic grayling and rainbow trout in the Middle-Lower River, and Arctic grayling and burbot in the Upper River (Table 1). Further, the available tags-at-large in spawning periods subsequent to tagging also achieved the FERC recommendation for burbot and round whitefish in the Middle-Lower River (Table 2). The species yet to achieve the recommendation are Dolly Varden and humpback whitefish in the Middle-Lower River, and round whitefish in the Upper River. Note that the FERC recommendation will not be met for Dolly Varden, humpback whitefish, and rainbow trout in the Upper River because there have been none of sufficient size caught (i.e., too low abundance). Activities in 2015 will target achievement of feasible targets by applying tags in June. Therefore, the approach being used is achieving the tagging targets designed to allow locating spawning locations.
Page 6 Para 4	26	We do not believe that data has been collected among individual related studies at an appropriate scale to allow fish/habitat associations to be made and extrapolated. A related concern is that fish and habitat data have not been collected at a biologically relevant scale.	This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. The scale at which fish data were to be collected was described in the RSP Sections 8.5.4.5.1.1.3, 9.5.4.4.3, 9.5.4.4.2, 9.6.4.4.3, and 9.6.4.4.2 and in the results of data collected at these scales are presented in Studies 8.5 ISR Section 4.5.1.3, 9.5 ISR Sections 4.4.3 and 4.4.2, and 9.6 ISR Section 4.4.3 and 4.4.2. These studies followed the Study Plan for scale at which data were to be collected and no variance was implemented with respect to scale for data on fish/habitat associations. Furthermore, as fish distribution and abundance data collected at the mesohabitat level were nested within macrohabitats (Study 9.6 ISR 4.4.3) and again within Geomorphic Reaches which will facilitate use of the data by other studies. As a point of clarification, AEA is not developing fish/habitat associations so they can be extrapolated. Rather, AEA is developing HSC curve sets that will be used in the habitat-flow models for defining how Project operations may influence fish habitats (target species and life stages) within different habitat types. AEA has identified several approaches for extrapolating the results of this type of analysis to other areas of the Middle River but has not selected a specific approach pending further stakeholder review.
Page 6 Para 5	27	To assess project-caused impacts to fisheries resources (for example), the sampling effort must be at a scale relevant to Susitna River fish species and life stages and must adequately quantify baseline conditions for accurate extrapolation. In some instances, the spatial scale of data	See AEA's response to Comment 26 regarding scale. Fish sampling followed the sampling plan. In RSP Section 9.6.4.1 it stated that "winter sites will be selected based on information gathered during 2012-2013 pilot studies . . . attempts will be made to sample all Focus Areas." The winter pilot study was conducted in Winter 2013 at two Focus Areas as described in the Study 9.6 RSP Section 9.6.4.5. AEA made recommendations based upon the winter pilot study for sampling sites, as stated in Study 9.6 ISR Appendix C Section 6.1.1, and the

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		collection implemented varies inappropriately within and among studies, resulting in a mismatch between the data collected and the purpose of its collection. Additionally, the temporal scale of data collection needs improvement. The Initial Study Report indicates that winter fish sampling did not occur in all focus areas as proposed. Early spring sampling occurred only in three focus areas due to record late breakup. Initial sampling following breakup and installation of migrant traps did not occur until the middle of June (after juvenile outmigration had begun), and spring sampling for fish distribution and abundance was not conducted. Improvements need to be made to capture the full seasonality of fish life history strategies which vary considerably within a single season. (Fish move around, and the extent of that movement must be captured through sampling. A single-day of sampling is insufficient to understand the habitat associations of many different and mobile species and life-stages of fish.)	2014 Winter Study was expanded to three Focus Areas and opportunistic sampling at accessible sites outside of the Focus Areas. Results of the first year of the winter study for fish are presented in the Study 9.5 Winter Study Technical Memorandum filed with FERC on September 17, 2014. In 2013 Early Life History sampling began two weeks after winter sampling was stopped and continued bi-weekly through June with the exception that no sampling was conducted for two weeks during the dynamic break up in mid-May 2013 (Study 9.6 ISR Section 4.6). As stated in Study 9.6 ISR Section 4.6.2 ELH sampling included six Focus Areas identified to have both spawning and rearing habitat as well as additional sites in the Upper (Study 9.5 ISR 4.6.2), Middle, and Lower River (Study 9.6 ISR 4.6.5). Sample sites for these various fish study components were visited multiple times during the Winter Study (1-3 times), Early Life History Study (3 times), and Fish Distribution and Abundance Study (3 times). Some sites were visited during all three seasonal study components and ended up being sampled more than eight times in 2013. Downstream migrant traps were installed and operated as indicated in the Study 9.5 ISR Section 9.5.4.4.10 and Study 9.6 ISRs Section 9.6.4.4.10: "flow conditions permitting, traps will be fished on a cycle of 48 hours on, 72 hours off throughout the ice-free period." As soon as break-up and flow conditions allowed in mid-June 2013 traps were installed fished immediately upon installation in June through mid-October 2013. In 2014 breakup occurred earlier and migrant traps installation occurred in mid-May with traps operated immediately after installation (the Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Technical Memorandum filed with FERC on September 17, 2014). ELH sampling was conducted in 2013 during May and June in the Upper (Study 9.5 ISR Section 4.6.2, Middle and Lower (Study 9.6 ISR Section 4.62) River segments. For clarification, the spring break-up of 2013 did not reach the magnitude or the late timing of the breakup of record. AEA believes that the range of hydrologic events that occur over the multi-year study period provide opportunities to better understand the response of aquatic resources to spring break up and flow fluctuations associated with Project operations. While the harsh and dangerous field conditions associated with the spring breakup of 2013 inhibited AEA's ability to install migrant traps, data collected in spring 2013 will be combined with other data collected to evaluate the response of juvenile fish to Project operations over a range of environmental conditions. Furthermore, data on fish movement were documented with downstream migrant traps and biotelemetry as indicated in Study 9.5 ISR Sections 4.5.1 and 4.5.2, and Study 9.6 ISR Sections 4.5.1 and 4.5.2. Results for biotelemetry included a total of more than 150,000 repeat detections of tags for

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			more than 1,000 tagged fish (Study 9.5 ISR Sections 5.2.1 and 5.2.2, and Study 9.6 ISR Sections 5.2.1 and 5.2.2).
Page 6 Para 6	28	The error inherent in the inappropriate scale of data collection would be compounded by the proposal to extrapolate study results throughout the river; this would perpetuate and increase sampling errors across the entire length and width of the river and its habitats. Resource agencies are particularly concerned about this proposal to "scale up," and requested rationale for its implementation (Riverine Modeling Integration Meeting, November 2013). The ability to "scale up" is only valid when the initial sampling has been conducted accurately and at a scale relevant to resource concerns, which is not the case with studies conducted thus far.	See above Response to Comment 26 on extrapolation. Additionally, AEA provided several options for scaling up/extrapolating results of the habitat-flow models being developed during the April 15-17, 2014 Riverine Modelers Meeting (see http://www.susitna-watanahydro.org/wp-content/uploads/2014/04/2014_04_17TT_Riverine_SpatialExtrapolation.pdf). AEA intends to seek the input of the Licensing Participants prior to selecting the specific option for scaling.
Page 6 Para 8 – Page 7 Para 1	29	Review of the Initial Study Report reveals that sampling sites for the various study disciplines have not been consistently and thoroughly co-located, as laid out in the RSP as modified by FERC staff recommendations, to provide an assessment of baseline conditions of habitats relative to fish use and preference. For example, invertebrate sampling locations (River Productivity 9.8) were not co-located with fish sampling locations. Rather than addressing this issue, or NMFS's previous concerns about the number of middle river sampling locations, AEA is proposing a study modification to sample in tributaries above the dam inundation zone. At some locations, sampling of variables such as depth and velocity was appropriately co-located, but other variables that should also	AEA disagrees with the assertion that it did not follow the FERC-approved study plan with respect to co-location of sampling sites. Regarding Sentence 1: As an initial matter, the RSPs never specified the co-location of sample sites across study disciplines. It did specify the location of 10 specific Focus Areas that would be evaluated relative to the different resource disciplines (RSP 8.5.4.2.1.2). AEA disagrees with NMFS comments regarding the locations of the groundwater measurements. The Focus Areas represent areas of intensive study across resource disciplines (see approved Study Plan, Section 8.5.4.2.1.2). Detailed two-dimensional hydraulic models are being developed for each of the Focus Areas and will support analysis by other resource disciplines being conducted within those areas. The Focus Areas represent a variety of habitat types with varying complexity that factored directly into determining the types and level of detail of resource specific studies. Thus, where groundwater influence was important relative to habitat features that included riparian communities, then detailed groundwater studies and riparian investigations occurred. For those where groundwater exchange was not as important, e.g., those associated with tributaries (Focus Area 141 – Indian River, Focus Area 151 – Portage Creek) than groundwater studies were scaled back or not included as part of the overall study of that Focus Area.

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		be co-located such as groundwater exchange were not. NMFS recommends that at Focus Areas data collection for the full suite of interdependent variables should be co-located.	
Page 7 Para 2	30	The cumulative effects of deficiently implemented sampling methods, failure to co-locate sampling sites, lack of integrative links, and discrepancies in data collection scales are magnified because these data are proposed for inputs to models. Model calibration, validation and decision making processes will then be used to assess potential impacts to resources.	AEA disagrees. This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. As describe in the ISR, AEA anticipates that the data generated will provide the necessary inputs for the models within the FERC-approved study plan.
Page 7 Para 3	31	NMFS recommends that the data issues be resolved as soon as possible. Accurate data is required to calibrate and validate proposed models; and quality data from individual studies is necessary to integrate models without amplifying errors unknowingly. Given these concerns about the data, it is not plausible to use the data for the predictive modeling that is proposed to describe baseline conditions or to predict potential project impacts.	AEA disagrees with NMFS assertion that the models cannot be used to predict potential project impacts. Those models were fundamentally designed to be able to evaluate Project effects related to flow regulation and the data that have been and will continue to be collected to support their development have been rigorously collected and checked in accordance with a stringent set of QA/QC protocols.
Page 7 Para 4	32	These issues of data integrity and data collection are based in part on studies being conducted with significant differences from the FERC-modified RSP. These issues must be resolved prior to conducting additional field studies. NMFS cannot develop appropriate recommendations for study modifications or make new study requests for the second year of study given the current issues with the studies and the data.	AEA disagrees that there are significant differences in how the studies have been implemented versus the FERC-approved study plans. AEA acknowledges that there have been some slight variances in the plans but has specified those in the ISR and noted that none of the variances will substantively affect the completion of the respective studies.
Page 7	33	During the Riverine Modeling Integration	AEA disagrees. The time frames of 0, 25, and 50 years were selected because they represent time

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Para 7		Meeting (November 2013), 25- and 50-year scenarios for predicting project impacts to the physical river channel and habitats were proposed. While those timelines are consistent with the study plan and may present a manageable timeframe for the modeling work (B. Fullerton, POC meeting, November 2013), they may not answer questions related to assessing impacts on important biological resources in a biologically meaningful timeframe. Models need to be sensitive enough to detect changes that are biologically meaningful to the species and habitats likely to be affected by project operations. As currently planned, this is not the case.	intervals that span the potential length of the FERC license, and as well are reasonable increments from which to gauge and compare changes in channel morphology (RSP 6.6, Section 6.6.4.2.2.1) that may translate into changes in fish habitat. Having time intervals at shorter increments of geomorphological modeling would be less likely to elicit substantive changes in channel morphologies and would therefore be less likely to elicit changes in the results of the habitat-flow modeling. However, the greatest potential effects of Project operations on fish and fish habitats are on the actual regulation of flows that would occur over much shorter time intervals (annual, seasonal, weekly, daily, hourly) and for which the habitat-flow models are being developed to evaluate. As described in RSP 8.5, Section 8.5.7.4.1.1, the "[t]emporal analysis will involve the integration of hydrology, Project operations, the Mainstem Open-water Flow Routing Model, and the various habitat-flow response models to project spatially explicit habitat changes over time. Several analytical tools will be utilized for evaluating Project effects on a temporal basis. This will include development and completion of habitat-time series that represent habitat amounts resulting from flow conditions occurring over different time steps (e.g., daily, weekly, monthly), as well as separate analysis that address effects of rapidly changing flows (e.g., hourly) on habitat availability and suitability. The Mainstem Open-water Flow Routing Model and habitat models will be used to process output from the Project operations model. This will be done for different operating scenarios, hydrologic time periods (e.g., ice free periods: spring, summer, fall; ice-covered period: winter [will rely on Ice Processes Model – Section 7.6]), Water Year types (wet, dry, normal), and biologically sensitive periods (e.g., migration, spawning, incubation, rearing) and will allow for the quantification of Project operation effects on the following: • Habitat areas (for each habitat type – main channel, side channel, slough, etc.) by species and life stage; this will also allow for an evaluation of the effects of breaching flows on these respective habitat areas and biologically sensitive periods (e.g., breaching flows in side channels during egg incubation period resulting in temperature change). • Varial zone area (i.e., the area that may become periodically dewatered due to Project operations, subjecting fish to potential stranding and trapping and resulting in reduced potential invertebrate production). • Effective spawning areas for fish species of interest (i.e., spawning sites that remain wetted through egg incubation and hatching). • Other riverine processes" These shorter time intervals (hourly, daily, weekly, monthly) represent those that are the most biologically meaningful in the sense that they would have the most direct and immediate effect on

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			fish and fish habitats. If warranted, it will also be possible to evaluate effects over longer time steps that encompass Project operations over several different water years.
Page 7 Para 8 – Page 8 Para 1	34	NMFS has identified a need to develop and incorporate biological input and output parameters and evaluate these under an appropriate range of operational scenarios (e.g., base load, ecological flows, load-following, run-of-river). The temporal scales (i.e., 25-and 50-year scales) that are needed must have biological relevance. For example, 5-, 10-, and 15-year operational scenarios should be considered to demonstrate the model's ability to detect generational impacts to fish populations and habitat persistence (e.g., Susitna River Chinook salmon, 5-7 years; or 2-4 years for eulachon). NMFS is concerned that the present model cannot answer the biological questions it proposes to answer.	See AEA's response to Comment 33.
Page 8 Para 2	35	Some study plan data collection efforts do not provide the information needed for the integrated modeling efforts. For example, during the November 2013 Riverine Modelling Integration meeting, it was revealed that the Water Quality Modeling study would require data on the spatial distribution of groundwater discharge to surface water bodies. Analytical or numerical groundwater flow simulation would be one way to satisfy this input requirement. However, the Groundwater Study in the Initial Study Report does not explicitly state that analytical or numerical groundwater flow simulations would be undertaken in support of the other physical process models.	AEA disagrees. This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. The data collection effort will provide the information needed for integrated modeling efforts. AEA notes that there have been two, three day Riverine Modelers meetings designed to provide Licensing Participants with updates on model development and integration and to solicit feedback and suggestions on model refinements. The first of these was held from November 13-15, 2013, the second April 15-17, 2014. During both meetings, each of the resource modelers explained first the specific models they were working on and the model dependencies on other models or data sources, as well as the model outputs to other models. Review of the November meeting notes (http://www.susitna-watanahydro.org/wp-content/uploads/2014/02/2013.11.13Modelers_Notes.pdf) indicates questions did occur related to the Water Quality model that pertained to the integration of groundwater. These comments were addressed by noting that data from targeted grab samples as well as data from groundwater wells would be used, as well as data from other locations. Additional information was provided on the groundwater study during the April Proof of Concept meetings (http://www.susitna-watanahydro.org/wp-content/uploads/2014/04/2014_04_15TT_Riverine_Presentation-Groundwater.pdf), and more

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			recently in two Technical Memoranda (GWS and R2 2014a, http://www.susitna-watanahydro.org/wp-content/uploads/2014/09/07.5_GW_GWS_T6_TM_Aquatic_Hydro_Final_Draft_20140925.pdf; GWS and R2 2014b, http://www.susitna-watanahydro.org/wp-content/uploads/2014/09/07.5_GW_GWS_T5_TM_Riparian_Final_Draft_20140926.pdf) which describe some of the analysis leading to development of preliminary groundwater/surface water relationships in selected Focus Areas.
Page 8 Para 3	36	Model integration is at this point largely an ad hoc exercise. A stand-alone model integration study is required to allow stakeholders to develop confidence in the models, understand inputs and outputs, and have the conceptual linkages demonstrated via an interactive riverine working model. Many questions remain about the predictive capabilities of the models, particularly under integration and model assumptions. Sensitivity and uncertainty analyses need to be conducted to contribute to understanding of model limitations. The full extent of mismatch of purported integration of models is currently unknown, even to the project proponent, much less to stakeholders reviewing study results.	AEA disagrees. This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. The model integration is not an ad-hoc exercise. The two Riverine Modelers Meetings held in November 2013 and April 2014 respectively were specifically held in response to stakeholder concerns about model integration. Review of the presentations from both of these meetings which are available on AEA's website (http://www.susitna-watanahydro.org/meetings/past-meetings/) clearly demonstrate the linkages between the models and how individual model outputs will be used in evaluating Project effects for each resource discipline, with an emphasis on effects on fish habitats. The meeting notes for the two meetings provide a clear record of the major topics discussed and stakeholder questions pertaining to model integration. Indeed, one of the comments provided at the end of the April meeting by a USGS representative suggested that the modeling and model integration efforts were moving in the right direction – "…. thought it was a great meeting and that the studies are making good progress. Feels that there has been tremendous amount of focus on where the problem areas are and are a lot further along than in November 2013." Since then, the resource modelers have continued working in a collaborative fashion on each of the respective models.
Page 8 Para 5	37	Decision Support Systems (DSS) are critical for evaluating potential impacts of the project. We believe that their development should be expedited to the extent possible without excluding input from stakeholders.	AEA agrees that DSS are important for evaluating Project effects and presented several options for this during the November modelers meetings (http://www.susitna-watanahydro.org/wp-content/uploads/2013/11/SuWa-DSS-presentation-20131115_DRAFT.pdf). As was noted in the Study Plan (RSP Section 8.5.4.8.1), the development of the DSS including selection of indicator variables will be done in a collaborative process with stakeholder input.
Page 8 Para 6 – Page 9 Para 1	38	The RSP (Instream Flow Study 8.5 RSP) includes the use of conceptual ecological models as the DSS to assess the project's impacts on a free flowing river and its resources. Also, the Fish Passage study includes use of a DSS to assess the feasibility and effectiveness of different fish passage options. It is our understanding	AEA does not consider the DSS to be a conceptual ecological model but rather a platform to reduce the complexity of information and focus attention on tradeoffs involved with decisions regarding project operations. Likewise, AEA notes that the Fish Passage Study does not include a DSS type evaluation, but rather utilization of an analytical tool to weigh various passage options. The development of both of these will be done in a collaborative framework. As to the schedule of the DSS, the major elements of this are scheduled for 2015, and will require stakeholder inputs at various intervals.

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		that AEA intends to develop the conceptual ecological model DSS using manual matrices by early 2015 (FERC 2013) and to use a modified existing DSS for fish passage (currently past due). Considering the potential of these DSSs to support critical assessments of impacts from the project, development of the DSS should be a collaborative process with mutual development of, and agreement about fundamental objectives, assumptions, critical inputs, weighting methods, and other parts of the models. Formulation of the fundamental objectives for the DSS may reveal important, time-sensitive data gaps that require modifications to existing studies or perhaps development of new studies. An example for the fish passage DSS is reservoir ice studies: we expect to be used to design tributary collectors for outmigrating juvenile fish but don't know if the model will provide that information. An example for the conceptual ecological model is the groundwater studies which we expect will allow estimation of project impacts to areas of upwelling, but project effects to upwelling are not one of the goals of that study. Therefore, we request that the schedule for DSS development be accelerated so potential data needs not currently covered in the existing study plans can be identified and added to the study plan.	
Page 10 Para 1	**39**	**Enclosure 2: NMFS Comments on the 2014 Fish Genetics Implementation Plan**	These comments were reviewed and incorporated in the Final 2014 Genetics Implementation Plan filed with the Study 9.14 ISR on June 3, 2014. A comment-response table was filed with the Study 9.14 ISR Part B Section 8. These comments are not addressed here again.
Page 14	**40**	**Enclosure 3: NMFS Initial Comments to**	AEA filed the 2015 Implementation Technical Memorandum on September 10, 2014. AEA expects

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Para 3 – Page 17, Para 1		**AEA regarding the 2014 Pilot Study for Cook Inlet Beluga Whales and Eulachon:** Beginning in early May 2014, NMFS staff were contacted and asked to meet with AEA and their contractors (hereinafter referred to collectively as AEA) to discuss AEA's plans to modify the [RSP as modified by FERC's determination] for the Cook Inlet Beluga Whale Study (Study 9.17). AEA informed NMFS staff of their intent to conduct a boat-based pilot study involving both a Cook Inlet beluga whale research effort and a eulachon research effort. Despite the very short notice from the intended start date of the research activities, NMFS agreed to provide some initial comments and preliminary recommendations to AEA. These initial comments were primarily provided to help reduce the high harassment and harm potential this pilot project could have on the endangered Cook Inlet beluga whales, and to help AEA avoid violating both the Marine Mammal Protection Act and the Endangered Species Act. These comments were not an endorsement of the pilot study, nor an acknowledgement that the pilot study would constitute the second year of the required FERC-approved study plans. These comments were sent to AEA by email on May 14, 2014, and are reproduced in Enclosure 3. As a result of these NMFS comments, AEA did make modifications to the pilot study in an effort to reduce the harassment potential to Cook Inlet beluga whales. NMFS has had multiple meetings	that through implementation of this plan along with the continued implementation of the Eulachon Study (Study 9.16), AEA will meet all Study Plan objectives. From May through August, AEA held a series of four meetings (May 7, May 22, August 7, and August 26, 2014) with NMFS personnel to discuss alternative methods for collecting data on Cook Inlet beluga whales (CIBW) and their prey. The intent of these meetings was to openly discuss and collaborate on the development of alternative study methods that could be used by AEA to better understand potential impacts of the project on CIBWs while minimizing any potential impacts of conducting the research itself. During the first meeting in May 2014, AEA described preliminary plans to test the feasibility of using boat-based surveys to document relationships between beluga whales and their prey in Cook Inlet at the mouth of the Susitna River. Upon review of a written description of the proposed methods, NMFS provided, via email, the comments also contained in this letter from NMFS to FERC. Although AEA felt there was very little risk of harassment and no chance of harm to CIBW's from the proposed boat-based survey methods, NMFS concerns were incorporated into revised pilot-study methods (discussed with NMFS during the May 22, 2014 meeting) that focused solely on beluga whale prey and included provisions to specifically avoid beluga whales. Nine surveys were conducted in June and July, 2014 as described in the 2014 Cook Inlet Beluga Whale Prey Study Implementation Technical Memorandum filed with FERC on September 26, 2014 (LGL 2014a). The surveys in 2014 were successful in detecting fish and marine mammals; however, it was decided that the boat-based surveys should not be carried out in 2015 because of concerns regarding the potential disturbance of CIBW. Documenting habitats where CIBW and their prey are closely associated may require approaching beluga whales at closer distances than deemed appropriate as well as limitations to the survey method caused by weather (see further details in the 2014 Cook Inlet Beluga Whale Prey Study Implementation Technical Memorandum filed with FERC on September 26, 2014 (LGL 2014a), and the Cook Inlet Beluga Whale Study 2015 Implementation Plan Technical Memorandum filed with FERC on September 30, 2014). AEA has provided NMFS with several documents throughout the process of discussing CIBW study methods. A description of AEA's plans to conduct limited field work in 2014 and, based on the results, submit a Cook Inlet Beluga Whale Study 2015 Implementation Plan in September 2014 was included in Study 9.17 ISR Section 7.1 and Attachment 1 (LGL and R2 2014). The two meetings with NMFS in August were primarily intended to discuss the methods that would be included in the Cook Inlet Beluga Whale Study 2015 Implementation Plan. Prior to the August 7, 2014 meeting, AEA shared with NMFS an outline and rationale for proposed methods to be included in the Cook Inlet Beluga Whale Study 2015 Implementation Plan. Preliminary results from the 2014 field work were discussed with NMFS at the beginning of that meeting and that occupied a majority of the time

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		with AEA to discuss the progress and status of the 2014 pilot study since early May. During several meetings, AEA has provided inconsistent information regarding their plans for 2015 Cook Inlet beluga studies. At this time, it is unclear which aspects of the FERC-approved study plans for Cook Inlet beluga whales AEA intends to implement in 2015, if any. Additionally, AEA has a pattern of providing information to NMFS immediately prior to a meeting (e.g., one hour in advance) or after the meeting, but has an expectation that NMFS will provide official comments during the meeting. This process has substantially limited the ability of NMFS to provide meaningful comments to AEA. Finally, while the focus of Study 9.17 is on Cook Inlet beluga whales, NMFS reiterates that the Marine Mammal Protection Act pertains to all marine mammals, regardless of any additional protections under the Endangered Species Act. Thus, harassment of any marine mammal resulting from AEA's activities is prohibited.	allotted for the meeting. AEA used the remaining meeting time to describe to NMFS the intent and content of the 2015 study outline. Because there was insufficient time to fully discuss the outline and content of the Cook Inlet Beluga Whale Study 2015 Implementation Plan, a follow-up meeting with NMFS was scheduled for August 26, 2014. Prior to the August 26, 2014 meeting, AEA provided the identical meeting materials and outline to NMFS as was provided ahead of the August 7, 2014 meeting. The rationale and content of the outline and methods to be included in the Cook Inlet Beluga Whale Study 2015 Implementation Plan were more fully discussed during the meeting on August 26, 2014 and the results of that discussion were incorporated into the Cook Inlet Beluga Whale Study 2015 Implementation Plan Technical Memorandum filed with FERC on September 30, 2014 (LGL 2014b).

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Table 1. Radio-tags released in resident fish, 2013-2014.

River Section	2013					2014					Total '13+'14	Total FERC period	Balance of 30 target
Middle-Lower	**Ma/Ju**	**July**	**August**	**Sept**	**Total**	**Ma/Ju**	**July**	**August**	**Sept**	**Total**			
Arctic grayling	11	17	1	5	34	8	0	0	0	8	42	19	-12
Burbot	2	0	5	2	9	0	0	0	5	5	14	7	16
Dolly Varden	1	6	2	0	9	0	0	0	0	0	9	2	21
Humpback whitefish	3	4	0	0	7	0	0	0	0	0	7	0	23
Lake trout	0	0	0	0	0	0	0	0	0	0	0	-	30
Longnose sucker	13	8	6	1	28	0	0	0	0	0	28	-	2
Northern pike	0	0	5	0	5	0	0	0	0	0	5	-	25
Rainbow trout	11	17	3	13	44	0	0	0	0	0	44	11	-14
Round whitefish	11	3	0	7	21	0	0	0	0	0	21	0	9

	2013					2014					Total '13+'14	Total FERC period	Balance of 30 target
Upper	**Ma/Ju**	**July**	**August**	**Sept**	**Total**	**Ma/Ju**	**July**	**August**	**Sept**	**Total**			
Arctic grayling	0	31	1	26	58	53	0	0	0	53	111	53	-81
Burbot	0	0	0	7	7	14	0	0	19	33	40	26	-10
Dolly Varden	0	0	0	0	0	0	0	0	0	0	0	0	30
Humpback whitefish	0	0	0	0	0	0	0	0	0	0	0	0	30
Lake trout	0	0	0	0	0	0	0	0	12	12	12	-	18
Longnose sucker	0	5	0	5	10	17	0	0	17	34	44	-	-14
Northern pike	0	0	0	0	0	0	0	0	0	0	0	-	30
Rainbow trout	0	0	0	0	0	0	0	0	0	0	0	0	30
Round whitefish	0	0	0	18	18	7	0	0	16	23	41	0	-11

Table 2. Radio-tags at large by month.

Mid-or-Lower-Susitna-released resident fish at large, by study month. Tags released in a given month become "at-large" in the following month.

Species	Jun '13	Jul '13	Aug '13	Sep '13	Oct '13	Nov '13	Dec '13	Jan '14	Feb '14	Mar '14	Apr '14	May '14	Jun '14	July '14	Aug'14	Sep'14	Total FERC period
Arctic Grayling	0	11	24	17	18	13	12	8	8	8	8	8	6	13	10	10	14
Burbot	0	2	2	4	4	3	3	2	2	2	1	1	1	1	1	6	10
Dolly Varden	0	1	5	6	4	4	3	3	3	3	3	3	3	2	1	1	6
Humpback Whitefish	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Lake Trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Longnose Sucker	0	8	9	7	5	4	4	1	0	0	0	0	0	0	0	0	-
Northern Pike	0	0	0	3	3	3	3	3	3	3	3	3	2	2	2	2	-
Rainbow Trout	0	11	25	14	21	21	20	20	20	20	20	17	16	16	15	15	33
Round Whitefish	0	10	13	11	13	11	11	9	9	7	7	5	3	3	2	2	15

Shaded cells are FERC periods to tag a total of 10 of 30 tags.

Upper-Susitna-released resident fish at large, by study month

Species	Jun '13	Jul '13	Aug '13	Sep '13	Oct '13	Nov '13	Dec '13	Jan '14	Feb '14	Mar '14	Apr '14	May '14	Jun '14	July '14	Aug'14	Sep'14	Total FERC period
Arctic Grayling	0	0	24	19	40	36	27	25	23	22	21	18	15	57	47	47	33
Burbot	0	0	0	0	6	5	5	4	4	4	4	3	2	15	12	31	31
Dolly Varden	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback Whitefish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake Trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	-
Longnose Sucker	0	0	3	1	5	5	2	2	1	1	1	1	1	17	15	32	-
Northern Pike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Rainbow Trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Round Whitefish	0	0	0	0	18	15	12	9	6	5	5	4	3	10	9	25	9

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

September 22, 2014

Wayne Dyok
Susitna Project Manager
Alaska Energy Authority
813 W. Northern Light Boulevard
Anchorage, AK 99503

RE: FERC Project P-14241, Proposed Susitna-Watana Hydropower Project

Dear Mr. Dyok:

The Alaska Energy Authority (AEA) has requested that the National Marine Fisheries Service (NMFS) comment on portions of the Initial Study Report for the proposed Susitna-Watana Hydropower project (June 3, 2014). We also include here comments previously submitted on the 2014 Fish Genetics Implementation Plan and on the pilot 2014 Cook Inlet beluga whale and eulachon studies (May 12 and May 14, 2014). We expect that the Alaska Energy Authority (AEA) will address these issues at the upcoming meeting on the Initial Study Report in October 2014.

Briefly, our enclosed comments on the Initial Study Report's fish studies (9.5 Upper River Fish Distribution and Abundance, 9.6 Lower and Middle River Fish Distribution and Abundance, and 9.7 Salmon Escapement) identify issues with the integrity of data, the ability to effectively integrate modeled studies, and the progress and detail of the decision support systems. Model integration is a key concern, especially for assessing baselines and project impacts on the Susitna River.

NMFS recommends that the data issues be resolved as soon as possible. For NMFS to effectively review this project, the studies must accurately identify fish species, develop accurate habitat models, and use the best available science to understand anadromous fish distribution and habitat associations. Moreover, the studies require accurate data to calibrate and validate proposed models and to integrate these models without inadvertently amplifying errors. Given the current issues with the data, it is not plausible that the data for predictive modeling be used to describe baseline conditions or to predict potential impacts. Modifications, additions, and new study requests for the second year of studies cannot be developed given the current issues with the data; these issues must be resolved prior to conducting additional field studies.

In regards to the 2014 Studies and the Final Study Plan, NMFS requests that the AEA adhere to the schedule the Federal Energy Regulatory Commission (FERC) established for the Integrated

Licensing Process (ILP) for this project in their January 28, 2014 determination. In that determination, FERC ordered the AEA to submit the final Initial Study Report on June 3, 2014 and to hold a meeting in October to present the results of the Initial Study Report and discuss any proposed changes. Although the AEA has just released reports of the studies it conducted in 2014 and intends to discuss those studies at the October meeting, NMFS is not prepared to step outside the FERC-ordered process and consider those studies at this time. The limited time allocated would be more effectively spent addressing problems with the 2013 study implementation and discussing study modifications or new studies.

Any studies that the AEA conducted in 2014 cannot be construed as "Year 2 ILP Studies," because the Initial Study Report was not yet complete at the time the studies were conducted. Conducting the studies before completing the Initial Study Report precluded participants from recommending any changes to the study or making new study requests based a review of a completed Initial Study Report. As noted by FERC in an May 6, 2014 e-mail on the Implementation Plan for the Genetic Baseline Study for Selected Fish Species in the Susitna River, Alaska:

> …to clarify, we just reviewed our Study Determination letter and confirmed that the genetics operational plans are due by April 30 of 'each year of study implementation.' Because our January 2014 letter granted AEA's request, in part, for second season studies to be conducted in 2015 rather than 2014… it follows that the genetics operational plan for the second study season is due by April 30, 2015, and not by April 30, 2014.
>
> (Nicholas Jayjack, March 6, 2014 email to Susan Walker)

Although NMFS provided courtesy reviews and comments to the AEA on 2014 studies for fish genetics (Enclosure 2) and the Cook Inlet beluga whales/eulachon pilot study (Enclosure 3) by mid-May of 2014, NMFS does not consider any 2014 study to be the second year of study under the ILP process.

We consider these concerns significant and in need of resolution for NMFS to fulfill its statutory responsibilities. In the context of this project, we construe those responsibilities as follows:

1) to identify study data gaps;

2) to make recommendations for the second year of studies (and beyond);

3) to understand the project's ability to quantify baseline and proposed project operational impacts to fish and wildlife resources;

4) to support recommendations for the protection, mitigation, and enhancement measures associated with the project; and

5) to make informed decisions pursuant to our Section 18 Fishway Prescription authority under Federal Power Act.

The ILP schedule for this project has been altered and now affords the AEA an opportunity to make necessary changes to studies for this project prior to entering the second year of study. This will allow for development and implementation of a more accurate, effective, and cost-effective plan of study for this important project.

In our November 30, 2014, FERC filing we will provide detailed recommendations to address specific concerns related to the individual Initial Study Reports of June 3, 2014. If you have questions regarding this letter, please contact Susan Walker at (907) 586-7646 or Susan.Walker@noaa.gov).

Sincerely,

James W. Balsiger, Ph.D.
Administrator, Alaska Region

Enclosures (3)

cc:
e-filed under FERC docket P-14241 as distribution to all Susitna licensing participants
Sarah Goad, AIDEA
Betsy McGregor, AEA
Nicholas Jayjack, FERC
Joe Klein, ADFG
Soch Lor, USFWS
Mike Bethe, ADFG

Enclosure 1: Details regarding Data Integrity, Model Integration/Proof-of-Concept and Decision Support Systems.

DATA ISSUES:

Data Collection: Quality Assurance and Quality Control, and Methodologies

NMFS is concerned with the current status and implementation of aquatic studies and believes that, unless these issues are addressed, many study objectives will not be met. Our primary concerns are as follows:

1) Habitat classification has not been completed;
2) Fish passage criteria have not been developed,
3) Fish sampling study plans were not followed; sampling units were inappropriately subsampled;
4) Fish sampling locations did not incorporate FERC recommendations;
5) Because the fish sampling did not follow the sampling plan, this resulted in an inability to estimate relative fish abundance;
6) Fish seem to have been identified incorrectly;
7) Data were collected and reported at inappropriate mesohabitat scales;
8) Sampling sites among studies were not co-located;
9) Tagging goals were not met;
10) Fish targets for HSC sampling were not met;
11) The mainstem upper river migrant fish trap was not installed;
12) A fish wheel was not installed, and fish were not tagged near the entrance to Devils Canyon;
13) Additional problems associated with late installation and operation of migrant traps were likely influenced by environmental conditions associated with late breakup; and
14) Juvenile salmon distribution and abundance in 2013 were likely affected by the record fall floods in 2012.

We are providing some additional clarification on some of these concerns.

The actual implementation of the abundance sampling program did not follow the statistical models used to select sampling units. In particular, subareas (mesohabitats) within selected areas were 'randomly' selected for subsampling, and sampling was not consistent between sampling events (different gears, different effort, different order of gears, different total area sampled, etc). Sampling error in the fish distribution and relative abundance studies needs to be accounted for in order for these studies to accurately estimate fish distribution and abundance. Estimates of numbers of Chinook salmon that migrate above Devils Canyon need to include the assumptions, standard error, and resulting statistical confidence intervals associated with that estimate. Better descriptions of (and statistical accounting for) both sampling and non-sampling errors need to be provided. The data used to describe fish-habitat association

preferences and the standard errors associated with those species and life-stage habitat correlations need to be validated, as this analysis proposes to describe macrohabitat relationships for fish. These relationships will be used to evaluate project effects, to validate instream flow habitat model predictions, and to extrapolate results from focus areas to geomorphic reaches and river segments. Ultimately these data will be used to develop protection and mitigation measures and to serve as a basis for post-project monitoring.

Data collection and analysis

Data collection methods need improvement. For example, detection and recovery of PIT (Passive Integrated Transponder) tags need to be improved to yield useful data to meet study goals and objectives. Location of the detection arrays did not cover the entire channel and was biased toward fish migrating down channel. Also, because too few tags were recovered, efficiency estimates could not be made.

Misidentification of juvenile fish by species induces significant error, and application of this erroneous data would result in inaccurate conclusions. Our review of the Initial Study Report finds that a very high percentage of the juvenile salmonids were misidentified. We also question the accuracy of all juvenile fish sampling data because of the following details:

- large numbers of unidentified salmonid juveniles (some of which were PIT tagged);
- anomalous length distributions and habitat associations (e.g., juvenile Chinook 150 mm fork-length;
- the large abundance of juvenile Chinook in beaver ponds;
- the absence of pink salmon in any samples; and
- the disappearance of sockeye salmon from Indian River between the February draft Initial Study Report and the June draft Initial Study Report).

Considering the length distributions and habitat associations reported, we have reservations also about the identification of these juvenile fish and conclude that many juvenile salmonids identified as Chinook salmon were coho salmon.

There is an absence of quantitative analysis of habitat sampling, fish distribution and relative abundance, and early life history data collected to date. Deviations from the Revised Study Plan (RSP) and FERC staff recommendations make developing estimates from these data difficult or even impossible. These data are the basis of the fish and habitat sampling design and must be collected appropriately for the study to yield useful information. Without better integration of historical data into assessment of current results (e.g., the data from studies collected in 2012, which used different methodology and locations), these data should not be used to assess habitat associations for salmon by species and life stage. Much of the data on species distribution, relative abundance, and habitat associations appears anomalous in comparison to available

science on these species and their life stages as known through data previously collected and past studies conducted in the Susitna River and environs.

One of the main objectives of radio-tagging was locating spawning locations. The proposed activity of circling over a tag that remained in the same location for a period of time was not done (mainly for salmon). For non-salmon species, it was proposed to tag some species after their spawning season and monitor the tag in the following year to locate spawning locations. It remains to be seen if this actually worked. If not, the objective of locating spawning locations was not met

Scale

29 28 27 26

We do not believe that data has been collected among individual related studies at an appropriate scale to allow fish/habitat associations to be made and extrapolated. A related concern is that fish and habitat data have not been collected at a biologically relevant scale.

To assess project-caused impacts to fisheries resources (for example), the sampling effort must be at a scale relevant to Susitna River fish species and life stages and must adequately quantify baseline conditions for accurate extrapolation. In some instances, the *spatial* scale of data collection implemented varies inappropriately within and among studies, resulting in a mismatch between the data collected and the purpose of its collection. Additionally, the *temporal* scale of data collection needs improvement. The Initial Study Report indicates that winter fish sampling did not occur in all focus areas as proposed. Early spring sampling occurred only in three focus areas due to record late breakup. Initial sampling following breakup and installation of migrant traps did not occur until the middle of June (after juvenile outmigration had begun), and spring sampling for fish distribution and abundance was not conducted. Improvements need to be made to capture the full seasonality of fish life history strategies which vary considerably within a single season. (Fish move around, and the extent of that movement must be captured through sampling. A single-day of sampling is insufficient to understand the habitat associations of many different and mobile species and life-stages of fish.)

The error inherent in the inappropriate scale of data collection would be compounded by the proposal to extrapolate study results throughout the river; this would perpetuate and increase sampling errors across the entire length and width of the river and its habitats. Resource agencies are particularly concerned about this proposal to "scale up," and requested rationale for its implementation (Riverine Modeling Integration Meeting, November 2013). The ability to "scale up" is only valid when the initial sampling has been conducted accurately and at a scale relevant to resource concerns, which is not the case with studies conducted thus far.

Co-location of sampling sites

Review of the Initial Study Report reveals that sampling sites for the various study disciplines have not been consistently and thoroughly co-located, as laid out in the RSP as modified by

FERC staff recommendations, to provide an assessment of baseline conditions of habitats relative to fish use and preference. For example, invertebrate sampling locations (River Productivity 9.8) were not co-located with fish sampling locations. Rather than addressing this issue, or NMFS's previous concerns about the number of middle river sampling locations, AEA is proposing a study modification to sample in tributaries above the dam inundation zone. At some locations, sampling of variables such as depth and velocity was appropriately co-located, but other variables that should also be co-located such as groundwater exchange were not. NMFS recommends that at Focus Areas data collection for the full suite of interdependent variables should be co-located.

The cumulative effects of deficiently implemented sampling methods, failure to co-locate sampling sites, lack of integrative links, and discrepancies in data collection scales are magnified because these data are proposed for inputs to models. Model calibration, validation and decision making processes will then be used to assess potential impacts to resources. 34 33 32 31 30

NMFS recommends that the data issues be resolved as soon as possible. Accurate data is required to calibrate and validate proposed models; and quality data from individual studies is necessary to integrate models without amplifying errors unknowingly. Given these concerns about the data, it is not plausible to use the data for the predictive modeling that is proposed to describe baseline conditions or to predict potential project impacts.

These issues of data integrity and data collection are based in part on studies being conducted with significant differences from the FERC-modified RSP. These issues must be resolved prior to conducting additional field studies. NMFS cannot develop appropriate recommendations for study modifications or make new study requests for the second year of study given the current issues with the studies and the data.

MODEL INTEGRATION/PROOF-OF-CONCEPT:

Biological relevance

During the Riverine Modeling Integration Meeting (November 2013), 25- and 50-year scenarios for predicting project impacts to the physical river channel and habitats were proposed. While those timelines are consistent with the study plan and may present a manageable timeframe for the modeling work (B. Fullerton, POC meeting, November 2013), they may not answer questions related to assessing impacts on important biological resources in a biologically meaningful timeframe. Models need to be sensitive enough to detect changes that are biologically meaningful to the species and habitats likely to be affected by project operations. As currently planned, this is not the case.

NMFS has identified a need to develop and incorporate biological input and output parameters and evaluate these under an appropriate range of operational scenarios (e.g., base load, ecological flows, load-following, run-of-river). The temporal scales (i.e., 25- and 50-year scales)

that are needed must have biological relevance. For example, 5-, 10- and 15-year operational scenarios should be considered to demonstrate the model's ability to detect generational impacts to fish populations and habitat persistence (e.g., Susitna River Chinook salmon, 5-7 years; or 2-4 years for eulachon). NMFS is concerned that the present model cannot answer the biological questions it proposes to answer.

Some study plan data collection efforts do not provide the information needed for the integrated modeling efforts. For example, during the November 2013 Riverine Modelling Integration meeting, it was revealed that the Water Quality Modeling study would require data on the spatial distribution of groundwater discharge to surface water bodies. Analytical or numerical groundwater flow simulation would be one way to satisfy this input requirement. However, the Groundwater Study in the Initial Study Report does not explicitly state that analytical or numerical groundwater flow simulations would be undertaken in support of the other physical process models. 38 37 36

Model integration is at this point largely an *ad hoc* exercise. A stand-alone model integration study is required to allow stakeholders to develop confidence in the models, understand inputs and outputs, and have the conceptual linkages demonstrated via an interactive riverine working model. Many questions remain about the predictive capabilities of the models, particularly under integration and model assumptions. Sensitivity and uncertainty analyses need to be conducted to contribute to understanding of model limitations. The full extent of mismatch of purported integration of models is currently unknown, even to the project proponent, much less to stakeholders reviewing study results.

DECISION SUPPORT SYSTEMS:

Decision Support Systems (DSS) are critical for evaluating potential impacts of the project. We believe that their development should be expedited to the extent possible without excluding input from stakeholders.

The RSP (Instream Flow Study 8.5 RSP) includes the use of conceptual ecological models as the DSS to assess the project's impacts on a free flowing river and its resources. Also, the Fish Passage study includes use of a DSS to assess the feasibility and effectiveness of different fish passage options. It is our understanding that AEA intends to develop the conceptual ecological model DSS using manual matrices by early 2015 (FERC 2013) and to use a modified existing DSS for fish passage (currently past due). Considering the potential of these DSSs to support critical assessments of impacts from the project, development of the DSS should be a collaborative process with mutual development of, and agreement about fundamental objectives, assumptions, critical inputs, weighting methods, and other parts of the models. Formulation of the fundamental objectives for the DSS may reveal important, time-sensitive data gaps that require modifications to existing studies or perhaps development of new studies. An example for the fish passage DSS is reservoir ice studies: we expect to be used to design tributary collectors for outmigrating juvenile fish but don't know if the model will provide that information. An

example for the conceptual ecological model is the groundwater studies which we expect will allow estimation of project impacts to areas of upwelling, but project effects to upwelling are not one of the goals of that study. Therefore, we request that the schedule for DSS development be accelerated so potential data needs not currently covered in the existing study plans can be identified and added to the study plan.

Enclosure 2: NMFS Comments on the 2014 Fish Genetics Implementation Plan

SUMMARY:

NMFS Fisheries geneticists; Dr. Jeff Guyon, Supervisory Research Geneticist and the Fisheries Genetics Program Manager at the Ted Stevens Marine Research Laboratory of NOAA's Alaska Fisheries Science Center and Dr. Robin Waples, Senior Scientist at NOAA's Northwest Fisheries Science Center, reviewed the "Implementation Plan for the Genetic Baseline Study for Selected Fish Species in the Susitna River, Alaska." NMFS appreciates that AEA and the Alaska Department of Fish & Game (ADF&G) incorporated most of the comments and suggestions provided to AEA in our review, and included the topics discussed with ADF&G, U.S. Fish and Wildife Service and NMFS at the technical meeting in March in the final 2014 implementation plan.

COMMENTS PROVIDED TO AEA:

This report reflects a carefully thought-out approach to sampling from natural populations to provide baseline data prior to a proposed hydroelectric project. As proposed, the project would no doubt produce a great deal of very useful information. Comments below are intended to help improve certain aspects of the experimental design and/or data analysis.

Hypotheses for Chinook salmon:

Page 3: NMFS agrees that departures from HWE [Hardy-Weinberg Equilibrium] could support hypothesis 1b (fish above Devils Canyon are derived from spawners above and below), but only if the departures are in the direction of a deficit of heterozygotes, as expected under the Wahlund effect (population mixture). However, Hypothesis 2 would not necessarily produce any such departures if all the fish above the canyon were derived from a single lower population.

Page 3: "On the other hand, low genetic divergence between fish spawning above Devils Canyon and fish spawning in aggregates below the canyon would indicate that a large proportion of the fish ascending Devils Canyon are strays or colonizers, and have not established a self-sustaining population (support for Hypothesis 2)." This conclusion cannot be supported simply from failing to find a difference. It would be necessary to conduct a power analysis to determine how large a difference (e.g., Fst value) could exist and not be detected as statistically significant. Then, it would be necessary to translate the genetic data into estimates of gene flow to evaluate what levels of connectivity are consistent with the observed data.

Sampling design:

NMFS concurs that that samples from multiple years are essential to be able to make sense of the relative magnitude of spatial and temporal differences. Three years of samples may be inadequate for this purpose, especially considering that Chinook and perhaps some of the other species have generation lengths much longer than three years.

The required sample sizes depend on the particular objective, as well as the (unknown) differences among populations. In general the numbers proposed seem reasonable. However, the logic for requiring larger samples for msat [microsatellite] analyses is inadequately explained. This may be based on the idea that larger samples are required to provide precise estimates of all the low frequency alleles involved with msats. However, that is not the objective; the objective is to use all the data to draw biological conclusions about the species of interest. From this perspective, each msat locus is worth several SNP [single nucleotide polymorphism] loci in terms of information content, as a large number of empirical studies have demonstrated.

Analyses:

Page 12-13: NMFS strongly recommends that the PIs [primary investigators] not remove putative siblings as proposed. Siblings, in fact, contribute part of the signal in genetic analyses that provides insights into biological processes. Purging them from the sample universe scrubs the data of this biological signal, particularly for small populations where siblings are common. The effects that this has on subsequent analyses cannot be easily determined, but could be substantial. This purging makes the remaining individuals more similar to what would be expected from populations that are infinite in size and hence have no relatives. Purging of a particular sample might be justified, if the sample has been collected non-randomly (that is, if it is thought to represent progeny from only a few families). However, in that case the proper amount of purging could only be determined if one knows exactly how non-random the collection is. But this will seldom if ever be known in practice. Furthermore, even if this was known and relatives were removed, the result still would not be a representative collection from the population as a whole. Therefore, the solution to non-random sampling is not purging relatives but to going back into the field and collecting a representative sample.

Page 13: "We will exclude juvenile collections from the baseline if they show significant allele frequency differences from adult collections or show deviations from HWE when pooled with adult collections." We note that age structure creates mini-Wahlund effects that could cause HW departures even in mixed-age adult samples. Likewise the same thing could happen if you combine juveniles and adults produced by different cohorts. That does not mean that combining them won't produce a more robust overall estimate of population allele frequencies.

NMFS does not agree with using the Bonferroni correction for HWE tests; there are too many overall tests and thus the criterion become too conservative. Bonferroni correction controls the probability of false positives only and the correction ordinarily comes at the cost of increasing the probability of producing false negatives, consequently reducing the statistical power of the HWE tests. Instead, we suggest starting with unadjusted tests and evaluating what fraction are significant for each locus (across all pops) and for each pop (across all loci). If the resulting proportions do not deviate much from the expected proportion (dictated by the significance level

of the test), there is no reason to reject HWE. Loci or pops that are outliers can be singled out for more detailed analysis, perhaps using Bonferroni or FDR [false discovery rate].

Minor comments:

Page 1: The project "will modify the flow, thermal, and sediment regimes of the Susitna River. . . ." The project will also affect migration and fish passage, among a host of other important effects. The description of project effects should be written to comprehensively describe all major project effects.

Page 1: "If breeding isolation (lack of migration) among populations occurs over sufficient time and population sizes are small enough, genetic drift will result in variation in allele frequencies at neutral loci (loci not under natural selection) among populations." Genetic drift will *always* result in some differences unless there is complete panmixia.

Analyses of genetic distance: it is fine to use Fst as an index of genetic distance, but it must include a correction for sample size (like W&C theta). Otherwise, small samples will tend to look like outliers.

Page 6: "For mixed stock collections, sample sizes of 200 fish or 100 fish per collection are adequate to provide stock composition estimates that are within 7% or 10% of the true estimate 95% of the time, respectively (Thompson 1987)." That might have been true for the particular study cited, but how large a sample is required will depend on the number of markers and the magnitude of divergence among populations, so this general statement is not valid.

Page 8, the numbering is off under "Sample Collection Targets."

Page 9, under "Sample Collection Targets" item #9, we understand the issues regarding sample numbers, but an adequate adult Chinook salmon sample set from above the proposed dam is needed at the end of the study to make the necessary conclusions. What happens if the goal of 100 adult Chinook salmon is not realized? This should be addressed in advance.

Page 10, Section 4.2.4.1, identifies a sample target of 200 juvenile Chinook salmon from 4 systems in or above Devils Canyon, but later in the report under section 4.5 "Data Retrieval and Quality Control" it mentions that software will be used to identify siblings and exclude all but one individual in the baseline for every set of siblings identified. As such, given the likely small population sizes above the proposed dam site, 200 juveniles from each system is unlikely to be sufficient.

Page 16, Section 4.6.5, where it says "Collections will be pooled when tests indicate no difference between collections (P>0.01)." While we agree that it is difficult to prove there is no difference between collections, we recommend though using a p value greater than 0.05 as more appropriate to reject the null hypothesis.

Appendix A Section 2.2 Regarding the radio telemetry studies, the potential impacts of the tag on the migration pattern of the salmon, especially for a stock that has to migrate the farthest and through a 7-mile long Class 5+ canyon must be considered and discussed. Also please address whether the tags let you know where the fish spawned (or if they spawned) or just indicate where they were when relocated, including noting the spatial accuracy of the tag signal recoveries.

Appendix B - page 1, for the Black River: Were the Chinook that were sampled two juveniles which were collected in 2013? Please confirm and identify them as juveniles if that's true.

Table B5, Is there an overall HWE test for all markers for each population?

Enclosure 3: NMFS Initial Comments to AEA regarding the 2014 Pilot Study for Cook Inlet Beluga Whales and Eulachon

SUMMARY:
Beginning in early May 2014, NMFS staff were contacted and asked to meet with AEA and their contractors (hereinafter referred to collectively as AEA) to discuss AEA's plans to modify the [RSP as modified by FERC's determination] for the Cook Inlet Beluga Whale Study (Study 9.17). AEA informed NMFS staff of their intent to conduct a boat-based pilot study involving both a Cook Inlet beluga whale research effort and a eulachon research effort. Despite the very short notice from the intended start date of the research activities, NMFS agreed to provide some initial comments and preliminary recommendations to AEA. These initial comments were primarily provided to help reduce the high harassment and harm potential this pilot project could have on the endangered Cook Inlet beluga whales, and to help AEA avoid violating both the Marine Mammal Protection Act and the Endangered Species Act. These comments were not an endorsement of the pilot study, nor an acknowledgement that the pilot study would constitute the second year of the required FERC-approved study plans. These comments were sent to AEA by email on May 14, 2014, and are reproduced in Enclosure 3. As a result of these NMFS comments, AEA did make modifications to the pilot study in an effort to reduce the harassment potential to Cook Inlet beluga whales. NMFS has had multiple meetings with AEA to discuss the progress and status of the 2014 pilot study since early May. During several meetings, AEA has provided inconsistent information regarding their plans for 2015 Cook Inlet beluga studies. At this time, it is unclear which aspects of the FERC-approved study plans for Cook Inlet beluga whales AEA intends to implement in 2015, if any. Additionally, AEA has a pattern of providing information to NMFS immediately prior to a meeting (e.g., one hour in advance) or after the meeting, but has an expectation that NMFS will provide official comments during the meeting. This process has substantially limited the ability of NMFS to provide meaningful comments to AEA. Finally, while the focus of Study 9.17 is on Cook Inlet beluga whales, NMFS reiterates that the Marine Mammal Protection Act pertains to all marine mammals, regardless of any additional protections under the Endangered Species Act. Thus, harassment of any marine mammal resulting from AEA's activities is prohibited.

COMMENTS PROVIDED TO AEA:
These initial comments are intended to provide early guidance and preliminary recommendations regarding this pilot study. NMFS intends to submit formal comments on this study proposal to FERC.

NMFS received a draft copy of the AEA's "Pilot Study of Cook Inlet Beluga Whale and Prey Species in the Susitna River Delta" on Monday May 12, 2014. AEA and their contractors intend to implement the pilot study beginning the week after NMFS received the draft study plan for review, and continue through all of June. The pilot study is submitted in lieu of the FERC-approved beluga studies (aerial surveys, video cameras, still cameras, and water surface

elevation model) for 2014. Although NMFS agreed to try and get these preliminary comments back to AEA prior to implementation of the pilot study, NMFS advises that these are not official comments, and as such do not indicate NMFS's support for or rejection of the pilot study. Furthermore, NMFS does not consider any 2014 study to be the second year of study under the ILP process. This is because the Initial Study Report is not complete, and licensing participants have not been able to recommend any changes to the study or make new study requests based on a review of the completed Initial Study Report. Our initial comments regarding the draft pilot study after an abbreviated review period are as follows:

We understand neither AEA nor its contractors will be obtaining authorizations under the federal Marine Mammal Protection Act (MMPA) for the unintentional take by harassment of marine mammals. Thus no harassment or take of any marine mammal under NMFS' jurisdiction is authorized under either the MMPA or the Endangered Species Act (ESA) and AEA and/or its contractors would be responsible for any violation of these federal laws.

The draft pilot study references LGL Alaska Research, Inc.'s ongoing boat-based surveys for Cook Inlet belugas as good documentation of Cook Inlet belugas as a result of closer proximity and longer encounter durations with the whales than by aerial surveys. While we agree that a boat survey has the potential to get closer to and spend more time with a group of marine mammals than an airplane, we do note that the referenced LGL studies have a NMFS-issued MMPA research permit and ESA authorization to allow harassment and close approaches. The level of information collected by these two different boat-based studies will not be comparable. Furthermore, we note that the LGL researchers associated with the NMFS permitted photo-identification study are not indicated as participating in this pilot study.

The pilot study has the potential to disturb or harass marine mammals due to the presence of the boat and operation of the split-beam sonar. The pilot study does suggest the implementation of the "Marine Mammal Viewing Guidelines and Regulations" as found on our website (http://alaskafisheries.noaa.gov/protectedresources/mmv/guide.htm) as an effort to reduce the potential for harassment or take. We note that many of the steps of the viewing guidelines are stated in the "2014 Pilot Study Methods" section of the draft pilot study, but add that whales should not be encircled or trapped between boats or boats and shore, and that the study needs to ensure that when approaching the whales the boat stays fully clear of whales' path of travel (i.e., the boat doesn't approach belugas "head-on"). These guidelines are intended to reduce the likelihood that marine mammals would be affected by this study, but do not guarantee no harassment or take will occur. This is a directed research project targeting Cook Inlet beluga whales, and a research permit may be necessary if the project may result in take or harassment of this endangered species or other marine mammals.

The pilot study is designed for repeated approaches to Cook Inlet beluga whales, albeit theoretically no less than 100m away. This study design increases the potential for harassment, including behavioral modifications or displacement that may not be evident from the boat, despite one of the pilot study's goals being to not cause any disturbance to the whales themselves. Given the repeated approaches, and potential for belugas or other marine mammals to not be visible below the water, implementation of the Marine Mammal Viewing Guidelines may be insufficient for preventing harassment or take. This potential for disturbance or harassment is of concern to NMFS, not only in general, but specifically during the first two weeks of June when we will be conducting our aerial surveys to assess official population abundance and distribution. Any disturbance or behavioral modification of the beluga whales associated with the pilot study may result in a reduction of our ability to accurately conduct our aerial surveys. The Susitna delta area is an important foraging area to the Cook Inlet belugas in late spring/early summer, after limited food during the winter. Any disturbance to the whales may result in reduced foraging success, and thus have population-level adverse effects.

The draft pilot study plan indicates that "if whales move away from the area where they were initially detected, an attempt will be made to obtain a depth reading and prey information at that location", but there is no information regarding how much time must pass without a beluga sighting before the survey crew moves to that location to attempt to obtain depth and prey information. There are confirmed reports that some stressed, chased, or harassed Cook Inlet beluga whales do not swim away, but rather submerge and remain on the bottom of the seafloor, which can be very shallow in Cook Inlet. If the observers do not wait a sufficient length of time, the potential exists for a beluga exhibiting this behavior to be struck by the vessel or propellers as the boat approaches the area where belugas were observed.

Given the topography and mudflats surrounding the Susitna Delta, as well as the potential that belugas will be traveling and not staying still, it is unclear how accurately or consistently the fine-scale surveys could be implemented. Should the belugas be traveling, it is possible the boat may inadvertently chase the whales group while trying to accomplish the fine scale sampling scheme as depicted in Figure 3. This could result in increased stress or harassment to the belugas or other marine mammals (i.e., seals) in the vicinity.

The draft pilot study does not provide much detail about the acoustic component of the split-beam sonar, but we understand some split-beam sonars have the potential for operating at multiple frequencies. Frequencies below 200 kHz are within the hearing range of Cook Inlet belugas, and thus noises associated with the sonar with frequencies below 200 kHz have the potential to harass belugas and other marine mammals. Noise has been identified as one of the highest threats to Cook Inlet belugas. Based on the information in the draft pilot study plan, it appears there may only be a single frequency during operation, at 206 kHz. It is unclear whether the split-beam sonar will be operated when conducting the "fine-scale sampling" triggered by

Cook Inlet beluga sightings or if it will only be operated when no belugas are sighted, or if it will be in constant operation.

In general, the pilot study plan is unclear about the primary goal of the study; is this a beluga study that has a fish component or a fish study that will record beluga sightings? The study plan states that data on prey and belugas will be "collected simultaneously", however, fish data can only be recorded after the whales leave the area, and the split-beam sonar is unlikely to be able to collect adequate fish data from over 100 m away (the minimum distance the boat will stay from the belugas and other marine mammals). Overall, while it appears this pilot study attempts to combine information regarding the distribution of beluga whales and their prey, we do have initial concerns about the harassment potential to the belugas. Although there is information on the data collection protocol sheets and software, there is no information regarding protocols should the vessel be closer to 100m of the Cook Inlet beluga whales, or if the presence of the boat or use of the split-beam sonar results in a change of behavior, disturbance, or displacement of the whales. These are indications of harassment and take, and are currently not authorized by NMFS. NMFS requests to be provided a survey schedule in advance of the first survey.

20141014-5094

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Anchorage Field Office
605 West 4th Avenue, G-61
Anchorage, Alaska 99501

IN REPLY REFER TO:
FWS/AFWFO

OCT 10 2014

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

RE: Alaska Energy Authority, 2014 Studies; Susitna-Watana Hydroelectric Project, FERC Project #14241

Dear Secretary Bose:

The U.S. Fish and Wildlife Service (Service) appreciates FERC's October 3, 2014, decision to modify the Integrated Licensing Process plan and schedule established for the Alaska Energy Authority's (AEA) proposed Susitna-Watana Hydroelectric Project (No 14241). With 1871 pages of new information filed by AEA in late September, 2014, the Service agrees with FERC's determination that more time is needed for review and assessment of those reports on 2014 studies. As stated in our September 22, 2014, letter to AEA (attached), the Service believes the upcoming October, 2014 Initial Study Report meetings should focus on discussions regarding the 2013 studies, for which our staff have been working diligently to review and prepare.

The Service is hopeful AEA will follow FERC's recent guidance and the licensing agencies' request to postpone its plans to discuss the newly submitted 2014 study reports until the January, 2015 Initial Study Report meetings. We look to FERC's leadership during the October, 2014 Initial Study Report meetings to ensure they are productive and meet the intended objectives of assessing 2013 studies and needed study plan modifications.

Thank you for the opportunity to comment. If you have any questions, please contact Ellen W. Lance at 907-271-1467.

Sincerely,

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c=US, o=U.S. Government, ou=Department of the Interior, ou=U.S. Fish and Wildlife Service, cn=SOCHEATA LOR, 0.9.2342.19200300.100.1.1=14001001195792
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Socheata Lor, Ph.D.
Anchorage Field Supervisor

Attachment

Attachment

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Anchorage Field Office
605 W. 4th Avenue, Room G-61
Anchorage, Alaska 99501-2250

In Reply Refer To:
FWS/AFES/AFWFO

SEP 22 2014

Mr. Wayne Dyok
Susitna-Watana Project Manager
Alaska Energy Authority
813 West Northern Lights Boulevard
Anchorage, Alaska 99503

FERC Project P-14241, Susitna-Watana Hydropower

Dear Mr. Dyok:

The U. S. Fish and Wildlife Service (Service) is providing comments on the Alaska Energy Authority's (AEA) June 3, 2014, Initial Study Report (ISR) for the proposed Susitna-Watana Hydropower project (Project). We provide AEA with our preliminary findings of concern so that they may be meaningfully considered prior to and discussed at the October, 2014 ISR meeting. The Service intends to provide full and detailed comments on these and other topics by the November 30, 2014, Federal Energy Regulatory Commission's (FERC) filing deadline.

As per the FERC Integrated Licensing Process (ILP; 18 CFR 5.15 (c)(2)), the ISR meeting scheduled in October, 2014, provides an opportunity for AEA and licensing participants to discuss the 2013 studies and identify potential modifications to study designs based on the first year's data collection. The process allows for review and recommendation of changes to sampling methodologies implemented by first year studies to ensure study objectives, as specified in the FERC-approved Revised Study Plans (RSP), are met. Our filing to FERC by November 30, 2014, will formalize our comprehensive comments and recommendations after AEA has had the opportunity to address our concerns during the October, 2014 ISR meeting.

The Service has identified three topics of significant concern: 1) data collection and reporting, 2) effective model integration, and 3) development of decision support systems (DSS). These three topics are closely tied together because precise and accurate data provide inputs to models that are used to support Project decision-making.

In these preliminary comments, the Service identifies data collection and reporting concerns (Attachment I) and recommends the data issues be resolved as soon as possible. Without robust data from individual studies, we are concerned the data do not meet study objectives, that model validation will be hindered, and model integration may lead to incorrect conclusions. Given the magnitude of our concerns related to data collection and reporting, we believe it may not be

possible to yield plausible model predictions describing baseline conditions or to predict potential impacts. It is important that these issues be resolved prior to conducting additional field studies.

Much of the data collected under FERC approved study plans are proposed for use in fish habitat models, and the development of those models are based on changes to channel geomorphology and hydrology. Relationships among hydrologic models should be validated and models calibrated for the Susitna River system before their use in fish habitat models. Likewise, relationships among fish habitat models should be validated, and models calibrated for the Susitna River system prior to their use in estimating Project effects under various operational scenarios. To our knowledge there is currently no specific model integration process proposed that will ensure sound relationships among models and their accurate calibration for the Susitna River system. The Service believes that development and implementation of rigorous model integration procedures is critical to our review of this project and we discuss our preliminary concerns in detail (Attachment II).

A DSS is one of the end products of the studies, where data and models from the studies are ultimately used to help make decisions on the effects of the Project on natural resources. We understand AEA intends to develop a DSS using a manual matrix method by early 2015 (FERC 2013). As the DSS plays such an important role in the assessment of Project impacts, the Service requests its development be a collaborative process so that the fundamental objectives, assumptions, critical inputs, weighting methods, and other parts of the model are mutually agreed upon. Furthermore, we are concerned that the timeline for DSS development is lagging other efforts. The ILP process is founded under the principal of early identification of potential issues and conducting studies needed to fill information gaps (FERC 2014). Data gaps may be revealed once the fundamental objectives for the DSS are formulated. Until the DSS development process occurs, it is uncertain all the data needed to implement the DSS has been gathered. Because the DSS is not scheduled for development until 2015, it is distinctly possible that crucial new data needs may be revealed when updated study reports are filed by AEA in 2016 (as per the ILP extension approved by FERC on January 28, 2014). However, going forward, the Service believes the development of a collaboratively designed DSS is of great importance to this Project and recommends that, if practicable, the timeline for its development be accelerated.

Finally, FERC established a new schedule for the proposed Susitna-Watana hydroelectric project ILP in their January, 2014 determination. In that determination, FERC ordered AEA to submit final ISRs on June 3, 2014, for stakeholder review, to hold a meeting in October, 2014, to present results of those ISRs, and to discuss AEA proposed changes to the studies or those proposed by other licensing participants. During a meeting with the Service and National Marine Fisheries Service on September 2, 2014, AEA stated its intent to release reports from 21 new or continued studies conducted in 2014, with intent to discuss results at the October 15, 2014, ISR meeting. On September 17, 2014, AEA filed 10 of 21 reports to FERC. Because the data were gathered outside timelines specified by the FERC-ordered process, and given the limited review

time the Service will have, we will be unable to consider and comment on those study reports in advance of the October, 2014 ISR meeting. Furthermore, we recommend AEA dedicate the limited time at the October, 2014, ISR meeting to discuss concerns related to 2013 studies, as reported in the June 3, 2014, ISR. Additionally, an email on May 6, 2014, copied to the Service by FERC, indicated that studies carried out by AEA in 2014 were conducted outside of the ILP process and would not be considered "second year" studies. This is procedurally very important because neither the Service, nor other licensing participants (Non-Governmental Organizations (NGO) Participants 2014), will have the opportunity to fully review or comment on the design and implementation of the 2014 studies. The Service will be unable to meaningfully contribute to the discussion of the 2014 studies and urge AEA to not discuss any work conducted in 2014 at the ISR meeting. Instead, we suggest the interim results gathered between study years (i.e., 2014 data collection) be discussed at the next quarterly Technical Workgroup meeting, once we have had sufficient opportunities to review those additional data.

Summary

This letter describes some of the Service's concerns with studies reported in the June 3, 2014, ISR, and we are providing them to AEA prior to the November 30, 2014, FERC filing deadline so some issues can be discussed and resolved in a timely manner. The concerns address: 1) data collection and reporting, 2) ability to recommend further studies under the FERC ILP licensing process, 3) development of valid models to assess baseline conditions and effects from Project operations on fish and wildlife resources, 4) capacity to formulate recommendations under section 10(j) of the Federal Power Act for protection, mitigation, and enhancement measures associated with the Project, and 5) formulation of informed decisions pursuant to our Section 18 Fishway Prescription authority under the Federal Power Act. We believe the modified ILP schedule for the Project affords AEA the opportunity to make necessary changes to studies prior to entering the second year of study. The Service believes this review process accommodates the development and implementation of more accurate, effective, and cost-effective plans of study for the Project.

Thank you for the opportunity to submit these comments in advance to the October, 2014 ISR meeting. We hope they are useful to AEA and will generate valuable conversations at the meeting. If you have questions, please contact Ellen Lance (907) 271-1467.

Sincerely,

Socheata Lor, Ph.D.
Anchorage Field Supervisor

Cc: Sarah Goad, AIDEA
Betsy McGregor, AEA
Nicholas Jayjack, FERC
Joe Klein, ADFG, Sport Fish Division
Jeanne Hansen, NMFS
Sue Walker, NMFS
Mike Bethe, ADFG, Habitat Division
Matthew LaCroix, EPA

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[NGO Participants] Wood, M., W. Wolff, J. Konigsberg, M. Wood, R. Schryver, J. Seebach (collectively the NGO Participants). 2014. Initial Study Report Meeting, Susitna-Watana Hydroelectric Project (P-14241). Letter filed with FERC, September 16, 2014.

[USFWS] U.S. Fish and Wildlife Service. 2013. Letter to FERC Re: Alaska Energy Authority's Revised Study Plan for the Susitna-Watana Hydroelectric Project No. 14241-000. March 18, 2013.

Attachment I. Data Issues

Below we discuss our preliminary concerns relating to deviations from study plans, quality assurance and control, and statistical practices and procedures for the 2013 study year.

Deviations From Study Plans – Deviations from established sampling designs occurred in some studies for various reasons, and in some cases resulted in reduced sample size or compromised reliability of data. Below we provide examples.

- As currently planned, some two-year studies cannot be completed because access to all Focus Areas (FAs) was not granted until after the first study year (e.g., ISRs 8.5, 9.6, 9.7, 9.9). For example, a fish wheel was not installed and fish were not tagged near the entrance to Devil's Canyon (e.g., ISR 9.7).

- Anomalous weather conditions prevented or delayed fieldwork on aquatic studies (e.g., ISR 8.5), resulted in late installation of migrant traps, which were likely influenced by environmental conditions associated with late breakup (e.g., ISR 9.6). Moreover, juvenile salmon distribution and abundance measured in 2013 were likely affected by the record fall floods in 2012 (e.g., ISR 9.6).

- Sampling has not been *temporally* adequate across all seasons. ISR 9.6 reports winter fish sampling did not occur across all FAs as proposed; early spring sampling occurred only in three FAs; initial sampling following breakup and installation of migrant traps did not occur until the middle of June, and therefore, spring sampling for fish distribution and abundance was not conducted (e.g., ISRs 7.5, 8.5, 8.6). The extent to which fishes move must be described through sampling; multiple sampling days across all seasons are required to capture the full seasonality of a fish's life-history strategy, which varies considerably within a single season. A single-day of sampling is insufficient to understand the habitat associations of different fish species with differing mobility and life-stages.

- Sample site selections for integrated studies were inconsistently co-located. For example, invertebrate sampling locations (ISR 9.8) were not co-located with fish sampling locations (ISR 9.6). Failure to co-locate sampling sites risks the magnification of data discrepancies, and because the data will be used as inputs for predictive models, may jeopardize the validity of the models.

- Detection arrays did not cover the entire channel and tagging efforts did not allow for detection of fish migrating upstream, therefore the data were biased and efficiency estimates cannot be calculated. Detection rate and recovery of passive integrated transponder (PIT) tags is insufficient to yield useful data to meet study goals and objectives (ISR 9.6).

- Fish targets for fish Habitat Suitability Curve (HSC) sampling were not met (e.g., ISR 8.5), therefore, power to assess fish habitat-preferences and relationships is reduced.

- Data collected on fish habitat for the Fish Passage Barrier Study (ISR 9.12) and the HSI/HSC component of the fish and aquatic Instream Flow Study (ISR 8.5) were gathered at incompatible spatial scales to meet the study objectives.

Quality Assurance and Control Concerns - Below we preliminarily provide some discrete examples where the Service has data quality concerns. Poor data quality has a rippling effect throughout this assessment process because extrapolating inaccurate results throughout the river would amplify errors across the river and associated habitat.

- Water quality samples were qualified as either estimated or rejected by the analytical laboratory due to quality-related failures (ISR 5.5). Issues included failure to deliver samples to the laboratories within the method-specified temperature range; failure to meet procedure specified holding times; contaminated or missing field, trip, and method blanks; and Chain of Custody and bottle labeling discrepancies. AEA proposed to apply a correction factor to the 2013 data to render it useable, but provided no details on how that would be done.

- There is evidence that juvenile salmon may have been misidentified. A comparison of juvenile fish collections from the Susitna River in the 1980s (Alaska Department of Fish and Game 1983 as cited by R2 Consultants in the Fish Population Summary Document), local Alaskan rivers (Alaska Department of Fish and Game, unpublished data; Davis et al. 2013), recent studies on the Susitna River (Kirsch et al. 2014), and nearby tributaries (Miller et al. 2011), signal substantial differences in total fork length distribution and habitat associations among juvenile salmon from that which is expected. Large numbers of unidentified salmonid juveniles (some of which were PIT tagged), anomalous length distributions and questionable habitat associations decrease our confidence in the accuracy of species identification. For example, juvenile Chinook salmon measuring 150 mm fork-length were reported, juvenile Chinook salmon were reportedly most abundant in beaver ponds, there was absence of pink salmon in any samples, and a disappearance of sockeye salmon from Indian River between the February draft ISR and the June draft ISR. We have strong reservations about the identification of these juvenile fish, and suspect many juvenile salmons identified as Chinook salmon may be coho salmon.

- Information used to describe fish/habitat preferences were gathered using professional best judgment, literature, and limited field data, but were not confirmed with an adequate sample from the Susitna River system (ISR 8.5). Fish/habitat data gathered from the Susitna River is necessary to identify preferential use of the habitats. It is vital that these data are accurate as they will be used to: 1) develop Habitat Suitability Indices (HSI) and Habitat Suitability Criteria (HSC); 2) describe fish-macrohabitat relationships, which may be used to evaluate project effects; 3) validate the Instream Flow Study (8.5) habitat model predictions; and 4) extrapolate results from FAs to geomorphic reaches and river segments. Ultimately the data will be used to develop protection and mitigation measures and to provide a basis for post-project monitoring.

- The Service is concerned about AEA's proposal to "scale up", and requests rationale for its implementation (Riverine Model Integration Meeting 2013). "Scaling up" is only

appropriate when the sampling is conducted accurately, in a random fashion throughout the population, and at a scale relevant to resource concerns. To assess impacts from the Project on fish resources, sampling effort must be at a scale relevant to Susitna River fish species at various life stages in order to adequately quantify baseline conditions with the accuracy required for accurate extrapolation. For example, incorrect fish identification and would lead to imprecise and inaccurate extrapolation of species-specific habitat associations.

Statistical Practices and Procedures – Based on our preliminary reviews, we note (below) failures to report standard statistical procedures and calculations required for complete analyses.

- Standard error was not reported for stated relationships between species of juvenile salmonids at various life stages and their habitat (e.g., ISRs 9.5, 9.6). A robust assessment of statistical results must include calculations for standard error.

- Assumptions for the estimating numbers of Chinook salmon migrating above Devils Canyon were not clearly specified and the standard error of that estimate was not reported (e.g., ISRs 9.6, 9.7).

- Sampling and non-sampling errors were not clearly stated (e.g., ISR 9.7). Sampling error is the error resulting from sampling only a part of the population and not the whole population. Non-sampling errors are those errors resulting from selection bias, systematic non-representativeness of samples, and transcription or recording errors. Sampling error is usually quantified and reported with confidence intervals or standard errors and related to *precision* of the estimates. Non-sampling errors are harder to recognize, yet very important, and more closely related to the *accuracy* of the estimates. Sampling errors must be clearly accounted for in statistical analyses to assess data reliability and interpret results.

- Consistent fish sampling methods were not applied (i.e., different gear types used, different effort was applied within and across sampling units, concurrent use of non-compatible gear types within a sampling unit). This resulted in inability to estimate sampling error because (e.g., ISR 9.6) inconsistent sampling methods resulted in individual datasets that are not comparable.

- No power analysis was reported (ISR 9.14), and it is unclear how sample size for both adult and juvenile Chinook salmon was determined. Based on the number of genetic markers sampled and the magnitude of genetic divergence measured in the population documented thus far, a power analysis would inform determination of the number of samples needed to provide a robust estimate of genetic diversity. Furthermore, three years of samples may not be adequate to characterize genetic diversity among a species with a life cycle of five to seven years; this limitation must be addressed in the study results.

- Samples from presumed siblings were proposed for removal from the genetic analyses (ISR 9.14). Only if the samples have been collected in a non-random way may this method be justified. Purging related animals as proposed will bias the results. Furthermore, ISR 9.14 proposes to exclude samples from juvenile Chinook salmon if they show significant differences in allele frequency from adult Chinook salmon. Using all data will produce a more robust estimate of allelic frequencies across the entire population.

- Using a Bonferroni adjustment on the tests for Hardy-Weinberg Equilibrium (ISR 9.14) will increase the risk of a Type-2 error and reduce the statistical power of the test to detect a difference. Furthermore, estimates of genetic distance using F^{st} must include a correction for sample size otherwise small samples tend to look like outliers (ISR 9.14).

Literature Cited

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Davis, J.C., and G.A. Davis. 2013. Water quality in the Lower Little Susitna River: Cumulative draft report, July 2007 through June 2012. Final Report for the Alaska Department of Environmental Conservation. Aquatic Restoration and Research Institute, Talkeetna, AK.

Kirsch, J.M., J.D. Buckwalter, and D.J. Reed. 2014. Fish inventory and anadromous cataloging in the Susitna River, Matanuska River, and Knik River basins, 2003 and 2011. Alaska Department of Fish and Game, Fishery Data Series No 14-4, Anchorage.

Miller, E.M., J.C. Davis, and G.A. Davis. 2011. Monitoring juvenile salmon and resident fish in the Matanuska-Susitna Basin. Final Report for the U.S. Fish and Wildlife Service, Mat-Su Salmon Habitat Partnership. Aquatic Restoration and Research Institute, Talkeetna, AK.

Riverine Model Integration Meeting. 2013. AEA meeting minutes. November 2013.

Attachment II. Model Integration

Model integration is the manner in which all of the physical studies interact to assess baselines and Project impacts on the Susitna River. Within the ISRs, methodologies for model integration are not transparent and it is not possible to determine if model integration will identify project impacts with any degree of certainty.

As previously stated by the Service (USFWS 2013), we are concerned that time allotted to develop methods for model integration is inadequate. Prior to the release of the June 3, 2014, ISRs, a three-day Riverine Modeling Integration Meeting (RMIM) was held (November 13-15, 2013). The goal of this meeting was to provide a forum to review and discuss various riverine-related modeling and study integration efforts (AEA Instream Flow Study-Technical Team [ISF-TT] Riverine Modeling Integration Meeting Agenda, 2013). A collaborative meeting such as this one was a good effort toward developing meaningful model integration methods and the Service encourages AEA to continue this type of cooperative work.

During the RMIM, 25 and 50-year scenarios for predicting project impacts to the physical river channel and habitats were proposed. While those timelines are consistent with what is specified in RSP and may present a manageable timeframe for the modeling work (B. Fullerton, Personal Communication, November, 2013), they may not be sufficient to assess impacts to fish and wildlife resources in a biologically meaningful way.

The Service is concerned the modeling capability to answer biological questions is not sensitive enough to detect biologically meaningful changes to species and habitats likely to be affected by project operations. We recommend that modelling capabilities be developed that incorporate biological inputs and deliver outputs that are validated under an appropriate range of operational scenarios (e.g., base load, ecological flows, load-following, run-of-river). The temporal scales (e.g., 25, 50-year) must have biological relevance. For example, 5, 10 and 15 year operational scenarios should be considered to demonstrate the model's ability to detect generational impacts to fish populations and habitat persistence (e.g., Susitna River Chinook salmon; five to seven years).

Data collected for some studies do not provide the information needed for the proposed integrated modeling efforts. During the RMIM, for example, it was revealed the Water Quality Modeling study (ISR 5.6) would require data collected on the spatial distribution of groundwater discharge to surface water bodies. Analytical or numerical groundwater flow simulation would be one (of several) ways to satisfy this input requirement. However, the Groundwater Study (ISR 7.5) does not explicitly state analytical or numerical groundwater flow simulations would be undertaken in support of the other physical process models.

As a follow up to the RMIM, a Proof of Concept (POC) meeting was held April 15-17, 2014. This meeting was to: 1) confirm successful integration of models and associated metrics in a single FA (Slough 128); 2) examine the modeling process rather than focus on the actual POC results; and 3) clarify many questions related to the integration of multiple models. The discussions of modeling processes at the POC meeting was considered valuable by the Service, but not fully effective in demonstrating successful model development and integration; many

questions regarding model development and integration were unanswered. To develop greater stakeholder confidence in the models, the Service recommends conducting a formal model integration meeting to: 1) establish a model development process, 2) develop an understanding of inputs and outputs, 3) demonstrate conceptual linkages, 4) demonstrate the predictive capabilities of the models, and 4) conduct sensitivity analyses to better understand model limitations and reduce uncertainty.

Literature Cited

IFS-TT: Riverine Modeling, Draft Meeting Agenda, November 13-15, 2013, http://www.susitna-watanahydro.org/wp-content/uploads/2013/10/SuWa_IFS-TT_Modeling2013Nov13-15_-Agenda.pdf

20141027-5014

Licensing Participant Becky Long
Initial Study Review(ISR) Public Review Comments
Sec. 10.6 ISR Parts A-C Caribou Distribution, Abundance, Movements, Productivity

1.0 Seasonal Use and Movement Documentation

RSP 10.6.1 (ISR A.2) states that one of the Study Goals and Objective is to obtain sufficient population information on caribou to evaluate projet related effects on important seasonal ranges such as calving areas, rutting areas, wintering areas and movement corridors.

10.6.2 discuses the need for documentation of currently used areas, along with information on the timing, duration and proportion of the regional population that uses those areas. This can be used to develop any necessary protection, mitigation, and enhancement measures. Appropriate sufficient data must be collected in order to assess impacts for the license application.

1.1 Local Ecological Knowledge

The boots on the ground local knowledge is an important part of this documentation.

These comments speak on behalf of Susitna River Coalition members in Game Management Units 13 and 14. These are people who have hunted the caribou of either the Nelchina or Delta herd for 10 to over 30 years. The words they speak are what the study industry calls now local ecological knowledge.

The current movement of the herds has changed in response to two things. The warm late fall season and Tier 1 hunting pressure are driving these changes according to local hypotheses.
Usually the herds have come down from the high country.by hunting time. They did not do that this year. The hunting pressure is overwhelming. The use of ATV vehicles penetrate further into the remote areas. The gravel pit at the Susitna River bridge on the Denali Highway was mass motor homes, campers and ATVs testifying to large amounts of people in the area.

According to local hunters, “The Nelchina Caribou Herd has hunting pressure like never before.” The general area around and adjacent to both the Denali East and Denali West **has been characterized as a “war zone”.**

Hunters say that the caribou herds are fractured. Where in the Tier II hunting days, hunters would see bands of caribou. But now they often see single caribou, and they look panicked.

2.0 Documentation of other Human Caused Disturbances in the 10.6 Study Area

The evaluation of population and density estimates, delineation of seasonal ranges, and

movement corridors will make conclusions on post project habitat loss and detrimental impacts to these herds. This is a major goal of 10.6. An impact assessment will be conducted in 2015 for the FERC License Application. There must be a study focus on the cumulative negative impacts from all the development actions in the Caribou lives. Specific development to consider:

2.1 MMG Mineral Exploration Drilling Project

In 2012 and 2013, MMG Mineral Exploration LLC has done exploratory drilling on state lands south of the Susitna River. They have been drilling rock core samplings.
This year, MMG applied for a mineral drilling exploration application with the Bureau of Land Management Glenallen Field Office on tentatively approved state land east of the Susitna River which is within 10.6 study area. The locations are T29N R5 E sections 13, 14,20,21,23,24 and T30N R6E Sec. 29. The Environmental Assessment is found as DOI-BLM-AK-A020-2014-0013-EA. Sec302 of the Federal Land Policy Management Act covers this application.

This is the northern part of the traditional Nelchina herd calving area.
THE TALKEETNA MOUNTAIN CALVING GROUNDS ARE CONSIDERED THE MOST IMPORTANT SINGLE GEOGRTAPHIC AREA TO THE HERD.

MMG helicopter flights flew in that area and also south of the Susitna Bridge on the Denali Highway towards the headwaters and the Susitna glacier. Perhaps some of these flights were connected to AEA's study flights.
The helicopter noise was throughout the day with the usual high noise level that permeates the air space.

2.2 Joint Pacific Alaska Range Complex (JPARC) Fox3 and Paxon Military Operation Areas (MOA)

The Fox 3 MOA Expansion and the Paxon MOA Addition are well-defined actions for the JPARC Master Plan by the Air Force.
Both actions are to provide vertical and horizontal airspace structures needed to modernize the JPARC training exercises according to the plan. This is both low and high altitude training with elevation as low as 500 feet up to 5000 feet. The subsonic noise levels for Fox3 can be as much as 50dB. For the Paxon, it would be 54dB. The average number of sonic booms per training day could be 5.2. Emissions and pollution from chaff and flare use are a consideration.

<u>Conclusion</u>

The above projects are coupled with the road building, dam construction, inter-tie building, etc. that will accompany the Susitna Dam if built. This means that the cumulative effect on the Nelchina Herd is an issue that must be part of the data for the impact assessment. The helicopter use of the study area by AEA study staff and MMG staff is already impacting both the herds.

20141027-5019

Licensing Participant Becky Long
Initial Study Review (ISR) Public Review Comments
Sec. 15.9 Air Quality Study

1.0 ISR Part A 5.1.1 Meteorology and Climate

An important statement from this stakeholder's literature review of Air Quality issues to be entered into the public record. This is information from the draft Environmental Impact Statement for the previous hydroelectric project on the Susitna River. [1]

> "An important feature characteristic of Alaska and the project area in particular in terms of air quality is the so-called "extreme" meteorology. Because of the dramatic topographical and meteorological conditions in Alaska, the potential for air pollution is far greater than in the rest of the U.S. The winter inversions in Alaska are among the strongest anywhere in the world. Strong inversions occur when ground surface cools faster that the overlying air, a condition common in the arctic winter when there is little sunlight to heat the ground surface. The long winter nights prolong these inversion periods, and a strong potential for air pollution may last for several weeks."

2.0 Modification Requests

Modifications of 5.2 Project Emissions are proposed.by this stakeholder. The modification would be a quantification of greenhouse gas emissions from reservoir inundation, permafrost melting from project development along with climate change, and cement production emissions.

The proposed Susitna Dam Project Manager in his 2014 presentations in meetings in the Railbelt and to the media quotes the quantification of carbon dioxide emissions that supposedly will be displaced by the proposed dam. This figure he got from this study. This study has not been finished nor the data accepted by FERC. But this emission statement is now out there being promoted as fact. This figure does not tell the whole story about air emissions. The public has a right to know the whole picture of short and long term emissions.

2.1 Reservoir Greenhouse Gas Emissions

Both FERC's 2/1/13 Study Plan Determination and the applicant's Technical Work Group meetings state that AEA intends to assess greenhouse gas (GHG) emissions in the license application.

According to the 2/1/13 FERC Study Plan Determination B-69:

> "AEA intends to assess greenhouse gas emissions in its license application based on

[1] Office of Electric Power Regulation, Federal Energy Regulatory Commission, "Draft Environmental Impact Statement Alaska Power Authority, Susitna Hydroelectric Project," (May 1984): G-3

> unspecified guidelines for projects in boreal regions and using existing information from studies that show such emissions from reservoirs in boreal regions are low. While greenhouse gas emissions initially increased under construction, within 10 years they returned to levels similar to natural water bodies (Tremblay 2009). "

Both FERC and AEA state that existing information from this study shows that methane and carbon dioxide emission from reservoirs in boreal regions are low. GHG emissions initially increased under construction; but within 10 years. they returned to levels similar to natural water bodies. These statements come from 1 study which is Tremblay 2009. [2]

There are 3 major pathways of reservoir emitted GHG emissions:

1. diffusion at the reservoir surface,
2. bubbles produced at the sediment-water interface which migrate through the water column into the atmosphere,
3. diffusion in turbulent waters downstream of the generating station in a process called degassing.

Tremblay did indeed make the above conclusions. But the study also states:

- There must be further measurements in the Eastman 1 Hydroelectric reservoir in Quebec to confirm this trend. Thus, I don't think FERC and AEA should state the assumption as fact.
- The values presented have significant uncertainty due to the biological nature of organic matter degradation, sampling method diversity and spatial and temporal variation of emissions.

These caveats should be placed into the public record regarding this study which is becoming baseline-type data for the applicant.. Thus, both FERC and AEA should not take Tremblay conclusions as fact. Models to predict GHG emissions are being developed by a few specialized groups which will help evaluate the uncertainty about total GHG reservoir emissions. The science of determining reservoir emissions is still young. An increasing plethora of media in the scientific and general populations regarding the dam reservoir GHG emissions makes this an important issue in order to understand climate impacts. In separate studies, researchers have seen methane jump 20 and 36 fold during reservoir drawdowns.

2.2 Permafrost

Also there needs to be quantitative analysis of permafrost degradation in the project area. Melting permafrost also emits the GHG emissions of methane and carbon dioxide based on the aerobic or anerobic conditions. We know from 7.7 study Glacier and Runoff Changes and the draft Watana Transportation Access Analysis that the majority of the whole project area including all the access alternatives are underlain with discontinuous permafrost.

[2] Bastien, Julie and Maud Demarly, Alain Tremblay."CO2 and CH4 diffusive and degassing emissions from 2003 to 2009 at Eastmain1 hydroelectric reservoir, Quebec, Canada,"6/21/2011.

There is significant permafrost evident at the abutments of the dam site. This was found in the 80s and is currently being quantified in study section 4.5 Geology and Soils. In the 10/22/14 recent ISR meeting, the 4.5 Geology and Soils study staff stated that frozen ground could be 235 feet deep on the south side of the dam. The temperatures are very close to 32 degrees F. Calculations for the north side are still being quantified. The data from the 1980s studies shows permafrost conditions exist to a depth of 120 feet on the south side and up to 60 feet on the north side.

The development in permafrost areas that causes melting and emissions needs to be quantified as an air quality emission.

2.3 Cement Manufacturing Emissions

The applicant has not made public or does not know where the cement will be made. Thus, the quantitative analysis of emissions if the applicant locates a Portland cement plant in the project area will be put off until the license application This must be analyzed in this ILP study in order to get a full picture of emissions in dam construction.

Section 3.3.1.1 of applicant's Preliminary Application Document states that there will be 5.2 million cubic yards total volume of concrete in the dam structure. This does not include the 35 foot diversion tunnel, a 1800 foot concrete lined tunnel and also the spillway. This is a lot of concrete to not be talking about in this air quality study. This cement will be manufactured somewhere with the resulting emissions.

Conclusion

The above three emission sources should be analyzed in 15.9 in order for the study to adequately describe both the short and long term air emissions from the proposed project.

20141202-3032

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Alaska Energy Authority Project No. 14241-000

NOTICE OF REVISED RESTRICTED SERVICE LIST FOR A PROGRAMMTIC AGREEMENTS FOR MANAGING PROPERTIES INCLUDED IN OR ELIGIBLE FOR INCLUSION IN THE NATIONAL REGISTER OF HISTORIC PLACES

(December 2, 2014)

On February 25, 2014, the Federal Energy Regulatory Commission (Commission) issued notice of a proposed restricted service list for the preparation of a programmatic agreement for managing properties included in, or eligible for inclusion in, the National Register of Historic Places at the Susitna-Watana Hydroelectric Project No. 14241. Rule 2010(d)(1) of the Commission's Rules of Practice and Procedure, 18 CFR 2010(d)(1) (2005), provides for the establishment of such a list for a particular phase or issue in a proceeding to eliminate unnecessary expense or improve administrative efficiency. Under Rule 2010(d)(4), persons on the official service list are to be given notice of any proposal to establish a restricted service list and an opportunity to show why they should also be included on the restricted service list.

On March, 11, 2014, Sharon Corsaro, Concerned Citizen for the Historic District of Talkeetna, Alaska (Talkeetna Historic District), and Robert Gerlach, President of Talkeetna Airmen's Association filed requests to include: Sharon Corsaro, Talkeetna Historic District; Constance Twigg, property owner in the Talkeetna Historic District; and Robert Gerlach, Talkeetna Airmen's Association on the proposed restricted service list.

On March 12, 2014, Van Ness Feldman, LLP (Van Ness) on behalf of the Alaska Energy Authority (AEA) filed a request to include Wayne Dyok, Susitna-Watana Project Manager of AEA and Charles Sensiba of Van Ness, and council for AEA, on the proposed restricted service list.

On May 12, 2014, AEA filed a letter opposing the additions of such persons as Ms. Corsaro, Ms. Twigg, and Mr. Gerlach to the restricted service list because AEA maintains that their particular interests are more broad and non-regulatory in nature and they should not have access to sensitive cultural information that is protected by law from

public disclosure.[1] In this regard, we agree with AEA to restrict such sensitive information from individuals who are not associated with the involved agencies and Alaska Native entities.

Under Rule 2010(d)(2), any restricted service list will contain the names of each person on the official service list, or the person's representative, who, in the judgment of the decisional authority establishing the list, is an active participant with respect to the phase or issue in the proceeding for which the list is established. As the proposed licensee for the project, AEA, and their legal representative at Van Ness, have an identifiable interest in issues relating to the management of historic properties at the Susitna-Watana Hydroelectric Project No. 14241. Therefore, AEA's representatives will be added to the restrictive service list. In regards to the representatives associated with the Talkeetna Historic District and Talkeetna Airmen's Association, these additional three individuals will also be added to the restricted service list as they too have identifiable interest in issues relating to the management of historic properties at the Susitna-Watana Hydroelectric Project No. 14241. These interests are: (1) the partial ownership of the Talkeetna Village Air Strip by the Talkeetna Airmen's Association and the preservation and protection of this historic property; and (2) the preservation and protection of the Talkeetna Historic District. However, these three individuals should not receive any information deemed sensitive or confidential in nature that is associated with: (1) data or reports involving archeological finds; or (2) Alaska Native areas, items, or perspectives deemed to be of religious or cultural significance and considered sensitive to one or more the involved Alaska Native entities. Finally, the Bureau of Land Management also needs to have a representative added to the restricted service list because they manage lands within the proposed project's boundary and are participants within the technical work group for cultural resources.

Accordingly, the restricted service list issued on October 12, 2006, for the Susitna-Watana Hydroelectric Project No. 14241, is revised to add the following persons:

Wayne Dyok or Representative
Susitna-Watana Project Manager
Alaska Energy Authority
813 West Northern Lights Boulevard
Anchorage, AK 99503

John Jangela or Representative
Bureau of Land Management
Glennallen Field Office
P.O. Box 147, Mile Post 186.5 Glenn Hwy.
Glennallen, AK 99588

Charles Sensiba or Representative
Van Ness Feldman, LLP
1050 Thomas Jefferson St., NW
Seventh Floor
Washington, DC 20007

Constance Twigg or Representative
Property Owner
Historic Townsite of Talkeetna
P.O. Box 266
Talkeetna, AK 99676

[1] See 16 U.S.C. 470w-3(a); also see 18 CFR 5.2(c).

Sharon Corsaro or Representative
Concern Citizen
Historic District of Talkeetna
P.O. Box 255
Hermosa Beach, CA 90254

Robert Gerlach or Representative
President of the Talkeetna Airman's Association
P.O. Box 23
Talkeetna, AK 99676

Kimberly D. Bose,
Secretary.

20141208-0047

ORIGINAL

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS
REGULATORY DIVISION
P.O. BOX 6898
JBER, ALASKA 99506-0898

CEPOA-RD
(POA-2011-1107)

28 November 2014

P-14241

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Dear Secretary Bose:

This is in regard to the June 3, 2014, letter from the Alaska Energy Authority that gave notice of filing and distribution of the Initial Study Report (ISR) prepared for the Susitna-Watana Hydroelectric Project, FERC No. 14241-000. In response to the notice, we are providing comments on proposed new or modified studies included in this report. Our review was limited to the studies central to our regulatory authority under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. The following are our comments on the Aquatic Resources Study within the Access Alignment (9.13) and the Wetland Mapping Study (11.7).

1) We understand the wetland mapping study is currently on-going, including QA/QC of the field data, aerial imagery interpretation and mapping of wetlands, and wetland functional assessment analysis. To ensure the final products are suitable and appropriate for our potential future use and consideration, we request that we be notified by the applicant at the soonest possible date this information becomes available for review.

2) The Corps supports incorporating the interdependency studies in the wetland functional assessment as a way of developing a sound evaluation system that reflects the project site aquatic resources functions and values. Integration of the Vegetation and Wildlife Habitat Mapping Study and the Riparian Study into the Modified Magee 1988 Functional Assessment should be useful to development of a robust aquatic resource evaluation method for this project.

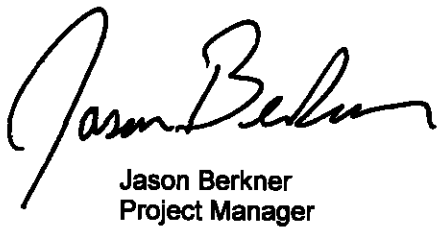
3) We would like to be consulted on the proposed modifications to the Magee 1988 Functional Assessment methodology, including an opportunity to review and provide input on adjustments to the field wetland functions investigation forms and the wetland functional assessment models.

4) The Corps Special Public Notice (SPN) 2010-45 is to serve as guidance for Consultant-Supplied Jurisdictional Reports within the Alaska District. As per SPN 2010-45, specific document format and data submittals are necessary, including georeferenced information such as shapefiles of wetland polygons, sampling points GPS, project footprint, contour lines, streams, aerial imagery, among others. Incorporation of this information format into the wetland study may be of assistance to avoid duplication of future efforts.

5) It is not apparent in Study 9.13 what criteria were used in selection of the alternatives for the access and transmission alignments, and construction areas.

Please contact me via email at Jason.R.Berkner@usace.army.mil, by mail at the address above, by phone at (907) 753-5778, or toll free from within Alaska at (800) 478-2712, if you have questions. For more information about the Regulatory program, please visit our website at http://www.poa.usace.army.mil/Missions/Regulatory.aspx.

Sincerely,



Jason Berkner
Project Manager

20141208-0048

ORIGINAL

ALASKA ENERGY AUTHORITY

November 26, 2014

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Susitna-Watana Hydroelectric Project, FERC Project No. 14241-000; Errata to June 3, 2014 and November 14, 2014 Filings

Dear Secretary Bose:

On June 3, 2014, the Alaska Energy Authority (AEA) filed with the Federal Energy Regulatory Commission (Commission or FERC) the Initial Study Report for the proposed Susitna-Watana Hydroelectric Project, FERC Project No. 14241 (Project).[1] Additionally, on November 14, 2014, AEA filed Initial Study Plan meetings transcripts and additional technical memoranda.[2] The purpose of this filing is to submit errata to two documents:

- Attachment A: *River Productivity Study, Study Plan Section 9.8, Initial Study Report, Errata to Appendix A (June 3, 2014 Final Initial Study Report).* This errata corrects references to reviews conducted by R2 Resource Consultants and adds literature cited to the initial study report filed on June 3.

- Attachment B: *Errata to Fish Distribution and Abundance in the Upper and Middle/Lower Susitna River (Studies 9.5 and 9.6): Draft Chinook and Coho Salmon Identification Protocol.* This errata makes minor revisions to the language in the introduction of the protocol filed on November 14. Included with this attachment is a revised protocol that includes this revision.

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1 Initial Study Report for the Susitna-Watana Hydroelectric Project of Alaska Energy Authority, Project No. 14241-000 (filed June 3, 2014).

2 Filing of Initial Study Plan Meetings Transcripts and Additional Information in Response to October 2014 Initial Study Plan Meetings of Alaska Energy Authority, Project No. 14241-000 (filed Nov. 14, 2014).

813 West Northern Lights Boulevard Anchorage, Alaska 99503 T 907.771.3000 Toll Free (Alaska Only) 888.300.8534 F 907.771.3044

If you have any questions related to this matter or need additional information, please do not hesitate to contact the undersigned at (907) 771-3955.

Sincerely,

Wayne M Dyok

Wayne Dyok
Project Manager
Alaska Energy Authority

cc: Distribution List