Susitna-Watana Hydroelectric Project
(FERC No. 14241)

Genetic Baseline Study for Selected Fish Species
Study Plan Section 9.14

Part D: Supplemental Information to
June 2014 Initial Study Report

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

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1. INTRODUCTION

Section 1 (Part A) of the June 2014 ISR for this Genetic Baseline Study for Selected Fish Species (Study Plan 9.14) details the development of this study from the Revised Study Plan (RSP) in 2012, through the end of the 2013 study season. Section 7 of the ISR (Part C), filed in June 2014, sets forth AEA's plan and schedule, at that time, for completing this study and meeting the objectives of the RSP.

As detailed in Section 2.2 of the ISR Part D Overview, various circumstances have required AEA to extend the original timeframe for completing the Commission-approved Study Plan. However, AEA has made meaningful progress with Study 9.14 since the filing of the ISR in June 2014. As detailed below, AEA's recent activities for Study 9.14 have consisted of the following:

- The study team collected juvenile and adult Chinook Salmon from above Devils Canyon.
- The study team collected adult Chinook Salmon from upper Cook Inlet tributaries.
- The study team opportunistically collected other salmon and non-salmon species from the Susitna River.
- The study team conducted genotyping of Chinook Salmon samples collected in the Middle and Upper Susitna River for single nucleotide polymorphism (SNP) and microsatellite (μSAT) loci.
- On October 15, 2014 AEA held an ISR meeting for the Genetic Baseline Study for Selected Fish Species in the Susitna River.
- In November 2015, AEA issued a 2014 – 2015 Study Implementation Report, detailing AEA's implementation of this Study 9.14 since the June 2014 ISR.

The primary purpose of this Part D Supplemental Information to the ISR is to report on the implementation of the Study Plan from the filing of the ISR in June 2014, through the Study Implementation Report. In light of this additional implementation, this Part D also identifies AEA's plans for completing Study 9.14 in a manner that meets the objectives of the Commission-approved Study Plan.

2. BACKGROUND

2.1. Purpose of Study

The goals of this study are to (1) acquire genetic material from samples of selected fish species within the Susitna River drainage, (2) characterize the genetic structure of Chinook Salmon in the Susitna River watershed and, if sufficient variation if found, (3) assess the use of Lower and Middle River habitat by juvenile Chinook Salmon originating in the Middle and Upper Susitna River.

The study objectives are established in RSP Section 9.14.1:

- Develop a repository of genetic samples for target resident fish species captured within the Lower, Middle, and Upper Susitna River drainage.
- Contribute to the development of genetic baselines for Chum, Coho, Pink, and Sockeye salmon spawning in the Middle and Upper Susitna River drainage.
- Characterize the genetic population structure of Chinook Salmon from Upper Cook Inlet, with emphasis on spawning aggregates in the Middle and Upper Susitna River.
- Examine the genetic variation among Chinook Salmon populations from the Susitna River drainage, with emphasis on Middle and Upper River populations, for mixed-stock analyses (MSA).
- If sufficient genetic variation is found for MSA, estimate the annual percent of juvenile Chinook Salmon in selected Lower River habitats that originated in the Middle and Upper Susitna River in 2013 and 2014.

2.2. Study Components

The Study Plan components include:

- Tissue sample collection for genetic analysis from fish species.
- Tissue storage.
- Laboratory analysis.
- Data retrieval and quality control.
- Genetic baseline development.

3. STATUS, HIGHLIGHTED RESULTS, AND ACHIEVEMENTS

The following tasks were completed in 2013 and reported in Part A of the ISR for Study 9.14:

- The study team made progress in 2013 towards tissue collections of Susitna River fish species in 2013, with over 4,500 samples collected representing the most species-comprehensive genetic collections from fresh waters in northern Cook Inlet.
- The study team conducted preliminary statistical analyses in 2013, which provided insights regarding the potential divergence between Chinook salmon originating from above and below Devils Canyon.

The study team has completed the following activities for Study 9.14 since the June 2014 filing of the ISR:

- The study team collected juvenile and adult Chinook Salmon from above Devils Canyon.
- The study team collected adult Chinook Salmon from upper Cook Inlet tributaries.

- The study team opportunistically collected other salmon and non-salmon species from the Susitna River.
- The study team conducted genotyping of Chinook Salmon samples collected in the Middle and Upper Susitna River for SNPs and µSAT loci.
- The study team consulted with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) on statistical analysis of Chinook Salmon genetic population structure.

4. SUMMARY OF STUDY 9.14 DOCUMENTS

Since filing of the RSP in 2012, AEA and FERC have prepared several documents pertaining to this study. To aid review by FERC staff and licensing participants, each of these documents is listed below. Each of these documents is accessible on AEA's Project licensing website (http://www.susitna-watanahydro.org/type/documents/) by clicking on the entry in the "Link" column in the table. In addition, these documents are available on FERC's eLibrary system (http://www.ferc.gov/docs-filing/elibrary.asp), in Docket No. P-14241.

Title	Date	Description	Link
9.14. Genetic Baseline Study for Selected Fish Species (Revised Study Plan)	12/14/2012	This document presents the plan for this study, including goals, objectives, the study area, and proposed study methods for genetic analyses of fish species.	RSP for Study 9.14
FERC's Study Plan Determination for Study 9.14.	2/1/2013	FERC SPD for Study 9.14, which approved the study with additional recommendations.	FERC SPD for Study 9.14
Regional Operational Plan DF.#R.13-XX Implementation Plan for the Genetic Baseline Study for Selected Fish Species in the Susitna River, Alaska (2013 Regional Operational Plan)	4/30/2013	Describes the operational plan for implementing the study in 2013.	2013 IP for Study 9.14
Draft Initial Study Report for Study 9.14	2/3/2014	This draft of the ISR summarized the study methods and variances during the 2013 study season, and presented preliminary data collected for Study 9.14. This draft ISR was later republished as Part A of the final ISR.	Draft ISR for Study 9.14
Initial Study Report for Study 9.14	6/3/2014	This document is the Initial Study Report (Parts A, B and C) for Study 9.14. Part A republishes the Draft ISR. Part B identifies supplemental information and errata in Part A. Part C presents study modifications and plans for completing the study.	ISR Part A for Study 9.14 ISR Part B for Study 9.14 ISR Part C for Study 9.14

Title	Date	Description	Link
Final 2014 Implementation Plan for the Genetic Baseline Study for Selected Fish Species in the Susitna River, Alaska (2014 Regional Operational Plan)	6/3/2014	Describes the operational plan for implementing the study in 2014 (filed as part of ISR Part B).	June 2014 TM for Study 9.14
Initial Study Report Meetings, October 15, 2014 (Parts A and B)	11/15/2014	Transcripts and AEA's Agenda and Powerpoint presentations for the ISR meeting concerning the Project fish and aquatic studies filed by AEA.	Transcripts from ISR Meeting Materials from ISR Meeting
Genetic Baseline Study for Selected Fish Species Study Plan Section (9.14) - 2014 Study Implementation Report	11/4/2015	Describes AEA's progress in implementing the Genetic Baseline Study 9.14 from September 2013 through December 2014.	2014-2015 SIR for Study 9.14

5. NEW STUDY DOCUMENTATION SUPPLEMENTING THE ISR

The following table identifies and describes additional reports and other documents that update, refine, or otherwise supplement certain sections of the ISR pertaining to this Study 9.14, during AEA's continued implementation of the Study Plan since the ISR was filed in June 2014.

ISR Reference	Description
Part A, Section 4	This Section is supplemented by Section 4 of the Study Implementation Report, which details methods employed in 2014 to meeting Study Plan objectives.
Part A, Section 5	This Section is supplemented by Section 5 of the Study Implementation Report, which details the results of the 2014 data collection and analysis.
Part A, Section 6	This section is supplemented by Section 6 of the Study Implementation Report, which analyzes data collected during 2014

6. VARIANCES

6.1. 2013 Study Season

The following variance was reported in the June 2014 ISR:

- Access was not granted to CIRWG lands in 2013, thereby fully or partially restricting sampling on some streams. Lack of access to prevented sampling in Cheechako, Devil, Fog, Tsusena, Watana creeks for Chinook Salmon, prevented sampling in Portage and Prairie creeks for Coho Salmon, and reduced sampling in Prairie Creek for Sockeye Salmon.

6.2. 2014 – 2015 Study Season

As noted in Section 4.5 of the Study Implementation Report for this study, AEA encountered the following variance from the *2014 Regional Operation Plan* when implementing this study following the filing of the June 2014 ISR.

- Associated sampling data (latitude/longitude, length and sex of fish) were not recorded for all tissue samples collected, including 12 adult Chinook Salmon captured and sampled in Fog Creek. Lack of these data will have minimal effect on the ability to test among hypotheses for population structure.

7. STUDY PLAN MODIFICATIONS

7.1. Modifications Identified in ISR

Section 7 of the ISR (Part C) detailed one modification for this study following the 2013 study season as summarized below.

- The *2013 Regional Operation Plan* (filed with FERC April 30,2013) provided that collection of samples from non-Chinook Salmon would be opportunistic between late July and August 4, after that would target these species based on aerial surveys of potential spawning locations. This approach was modified by the *2014 Regional Operation Plan* (9.14 ISR Part B, Section 4.2.3) as discussed in Study 9.14 ISR Part C, Section 7.1.2, and, in 2014, AEA sampled non-Chinook Salmon species opportunistically during targeted sampling of Chinook Salmon in 2014.

The following modification, added after the June 2014 ISR and prior to the 2014 field season, was implemented during the 2014 field season:

- As discussed the *2014 Regional Operation Plan* (Study 9.14, ISR Part B, Section 4.2.4.1) methods for tissue samples from Chinook Salmon juveniles collected from tributaries upstream of Devils Canyon differed between 2013 and 2014. Methods in the *2013 Regional Operation Plan* describe sampling caudal fin tissue, which is lethal to the fish. In the *2014 Regional Operation Plan* methods describe sampling using buccal swabs to allow for non-lethal sampling. Within each year, methods followed those described in their respective operation plans.

7.2. Modifications Identified since the June 2014 ISR

As detailed in the Study Implementation Report, AEA plans no modifications of the methods for this study.

8. STEPS TO COMPLETE THE STUDY

In light of the variances and modifications described above, the steps necessary for AEA to complete this study are summarized below. As necessary and appropriate, these steps have been updated from those appearing in Section 7 of the ISR (Part C).

- The study team will complete laboratory analysis of Chinook Salmon samples collected within the Susitna Basin.
- The study team will screen and statistically analyze additional SNP and µSAT genetic markers for fish collected in the Middle and Upper Susitna River to satisfy USFWS and NMFS recommendations to better characterize genetic structure of Chinook Salmon and to increase statistical power to test the hypotheses.
- The study team will examine population structure of Chinook Salmon within sampled upper Cook Inlet tributaries.
- The study team will examine potential for mixed-stock analysis of Chinook Salmon within the Susitna River.
- The study team will establish biological basis for species determination by genetic marker.