

# Susitna-Watana Hydroelectric Project Document

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## **1.1. Fish Passage Barriers in the Upper Susitna and Select Middle Susitna Tributaries**

### **1.2. Requester of Proposed Study**

AEA anticipates resource agencies will request this study.

### **1.3. Responses to Study Request Criteria (18 CFR 5.9(b))**

The following sections provide the necessary context and justification for the proposed study.

#### **1.3.1. Describe the goals and objectives of each study proposal and the information to be obtained.**

Construction and operation of the Project as described in the Pre-application Document (PAD, AEA 2011) likely will affect flow, water depth and surface water elevation in the mainstem channel at tributary confluences as well as at the inlets and outlets to side channels, sloughs, and various off-channel habitat features both in the area of the inundation upstream from the Watana Dam site and downstream in the potential zone of project hydrologic influence. Understanding existing conditions of barriers, how those conditions change over a range of stream flows, and the relative importance of habitats upstream of the barrier to fishes will provide baseline information needed for predicting the likely extent and nature of potential changes that will occur due to Project operational effects on flow and water surface elevations.

The overarching objective of this study is to evaluate the potential effects of the Project-induced changes in flow and water surface elevation on free access of fish into and out of suitable habitats in the middle and upper Susitna River.

1. Locate and categorize all existing fish passage barriers (e.g., waterfall, chute, cascade) located in selected tributaries in the middle and upper Susitna River (tributaries to be determined during study plan development).
2. Identify the type (permanent, partial, temporary, seasonal) and characterize the physical nature of any existing fish barriers located within the project hydrologic zone of influence.
3. Evaluate the potential changes to existing fish barriers located within the project hydrologic zone of influence.
4. Evaluate the potential creation of fish passage barriers within existing habitats (tributaries, sloughs, side channels, off-channel habitats) related to future flow conditions, water surface elevations and sediment transport.

#### **1.3.2. If applicable, explain the relevant resource management goals of the agencies and/or Alaska Native entities with jurisdiction over the resource to be studied. [Please include any regulatory citations and references that will assist in understanding the management goals.]**

ADF&G, through the Commissioner, is responsible for the management, protection, maintenance, and improvement of Alaska's fish and game resources in the interest of the economy and general well-being of the state (AS 16.05.020). ADF&G monitors fish populations and manages commercial, sport, personal use, and subsistence fisheries through regulations set by the Board of Fisheries (AS 16.05.251). ADF&G's authority for protection of fish resources and habitat is further established through the Anadromous Fish Act (AS 16.05.871 – 901) and the Fishway Act (AS 16.05.841). The Federal Subsistence Board, which comprises representatives of the U.S. Fish and Wildlife Service, National Park Service, Bureau of Land

Management, Bureau of Indian Affairs, and U.S. Forest Service, oversees the Federal Subsistence Management Program (57 FR 22940; 36 CFR Parts 242.1–28; 50 CFR Parts 100.1–28), with responsibility for managing subsistence resources on Federal public lands for rural residents.

According to the Alaska constitution, the legislature shall provide for the use, development, and conservation of all natural resources belonging to the state, including land and waters, for the maximum benefit of the people and, wherever occurring in their natural state, fish, wildlife, and waters are reserved to the people for common use. The Alaska National Interest Lands Conservation Act (ANILCA) passed in 1980 mandated that the state maintain a subsistence hunting and fishing preference for rural residents on federal public lands. The State of Alaska has established a priority for subsistence use of fish and game by Alaskan residents (AS 16.05.258) on all lands, but this rural resident preference was found to contradict the state constitution’s “common use” provision; subsequent attempts to amend the state constitution were unsuccessful. Consequently, Federal management agencies exerted authority over subsistence harvests on Federal lands in 1990.

The ADF&G manages the Susitna River fisheries in accordance with the sustained yield principle. Fisheries are managed based on perceived abundance and Alaska Board of Fisheries approved management plans. ADF&G has emergency order authority (5 AAC 75.003) to modify time, Area, and bag/possession limits. Emergency orders are implemented as an in season fisheries management tool usually in accordance with a Board of Fisheries approved management plan.

Resident and anadromous fish are important to commercial, sport, personal use, and subsistence fisheries in the Susitna River basin. Pacific salmon and eulachon in the Susitna River basin support commercial fisheries occurring in Upper Cook Inlet (Shields 2010). Sport fisheries occur in the Susitna River basin for the five species of Pacific salmon indigenous to Alaska, Arctic grayling, Dolly Varden, rainbow trout, burbot, and northern pike. Sport fisheries within the Susitna drainage are managed under the Eastside Susitna and Westside Susitna subunits. Pacific salmon, Dolly Varden, rainbow trout, lake trout, eulachon, whitefish, and burbot support subsistence and personal use fisheries (Oslund and Ivey 2010, Fall and Foster 1987).

Sockeye salmon runs into the Susitna River drainage over the past decade have been reported to be declining (Shields 2010). At the 2008 Alaska Board of Fisheries (BOF) meeting, Susitna River sockeye salmon were found to be a stock of yield concern<sup>1</sup>. As a result, a separate action plan was developed by ADF&G, identifying conservative management measures and a research plan.

**1.3.3. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.**

Fisheries resources are owned by the State of Alaska and the Project could potentially affect these public interest resources by affecting fish habitat.

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<sup>1</sup> A stock of yield concern is defined in the State of Alaska’s Policy for Management of Sustainable Salmon Fisheries (5 AAC 39.222), as a concern arising from a chronic inability, despite the use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock’s escapement needs.

**1.3.4. Describe existing information concerning the subject of the study proposal, and the need for additional information.**

Existing information includes recent and historic aerial photography of the study area. The Aquatic Resources Data Gap Analysis (AEA 2011a) and PAD (AEA 2011b) summarized existing information and identified data gaps for aquatic habitats in the middle and upper Susitna River. The licensing effort of the 1980s APA Project generated a substantial body of literature, some of which will be summarized and used to support the 2013–2014 data collection efforts. Results of studies conducted by ADF&G, including habitat characterization (Schmidt et al. 1984; ADF&G 1983; ADF&G 1984) are summarized in Exhibit E of the 1985 License Application (Harza-Ebasco 1985). In recent years, ADF&G has conducted sampling in the Upper Susitna River sub basin as part of their Alaska Freshwater Fish Inventory (AFFI) program. In 2003, the ADF&G conducted a reconnaissance inventory in 19 reaches upstream of Devils Canyon. Existing fish and aquatic resource information appears insufficient to address the following issues that were identified in the PAD (AEA 2011):

**F2:** Potential effect of fluctuating reservoir surface elevations on fish access and movement between the reservoir and its tributaries and habitats\

**F6:** Potential influence of the proposed Project flow regime and the associated response of tributary mouths on fish movement between the mainstem and tributaries within the Middle River reach.

**F7:** Influence of Project-induced changes to mainstem water surface elevations July through September on adult salmon access to upland sloughs, side sloughs, and side channels.

**1.3.5. Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.**

In addition to potentially obstructing fish passage in the mainstem Susitna with the construction of a dam, the operation of the hydropower facility has the potential to affect the passage of fish into and out of foraging, overwintering and spawning habitats throughout the project area in three ways.

1. Potential for the Project to affect fish passage at existing fish passage barriers related to project-induced changes in flow, water depth, and surface water elevations.
2. Potential for the Project to create fish passage barriers downstream of the Watana dam site via flow alteration.
3. Potential to inundate existing barriers and create new barriers due to changes in surface water elevation and sediment transport.

Understanding the relationship between Project-induced flows and fish access to suitable habitats is important for refining project operations and assessing potential project impacts. Project-induced low flows could prevent fish from accessing suitable habitats during low-flow conditions. In addition, variability in Project flows over time could potentially strand fish in tributary, side-channel and/or off-channel habitats where access is possible at high flow but egress is prevented when flows recede.

In addition, if access to suitable tributary habitat is currently limited for certain migratory fish species due to the presence of permanent fish passage barriers, the knowledge of the locations of these barriers and characterization of the habitats and fish communities upstream of them may [inform decisions with respect to the need for and content of any PM&E measures, offer important options to consider for P&A and PM&E measures.](#)

**1.3.6. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.**

All remote and field sampling associated with this study is intended to occur in 2013. In 2014, potential effects resulting from Project operations will be modeled and field validation will be conducted as necessary. The proposed methods are outlined, by objective, below.

**Objective 1:** Locate and categorize all existing fish passage barriers (e.g., waterfall, chute, cascade) located in selected tributaries in the middle and upper Susitna River (tributaries to be determined during study plan development)

- Review existing documentation, available imagery, and GIS data to identify known and potential barriers.
- Develop training and QA/QC protocol to reduce bias associated with identification of fish passage barriers
- Conduct aerial survey to verify barrier presence and location.
- Create GIS layer of existing barriers.
- Determine fish presence above these barriers using data collected in 1980s and 2012.
- Where no existing fish data are available, conduct fish surveys to document fishes above select barriers.
- Coordinate with fish study teams conducting genetics sampling.

**Objective 2:** Identify the type (permanent, partial, temporary, seasonal) and characterize the physical nature of any existing fish barriers located within the project hydrologic zone of influence.

- Conduct surveys to confirm type and describe physical conditions in areas of potential hydrologic influence based on protocol described in Powers and Orsborne (1984).
- For partial or seasonal barriers, establish transects at the barrier to collect data relative to flow, stage, water surface elevation, and water depth at the location of the potential barrier.
- For barriers created by deposition within the inundation zone or zone of hydrological influence downstream, collect substrate data.

**Objective 3:** Evaluate the potential changes to existing fish barriers located within the project hydrologic zone of influence.

- Assess the potential change to the existing barriers with under project operations.
- Where necessary, coordinate with the instream flow team to model flow based changes in barrier conditions.
- Conduct geomorphic analysis of potential changes related to flow-sediment interactions.

**Objective 4:** Evaluate the potential creation of fish passage barriers within existing habitats (tributaries, sloughs, side channels, off-channel habitats) related to future flow conditions, water surface elevations and sediment transport.

- Use aerial imagery, existing ISF and topographic data to evaluate the potential tributary, side channel, slough, and off-channel fish habitats where access could be compromised due to Project operational flows.
- Establish ISF transects at aquatic habitats identified above and collect necessary data on flow, water surface elevation, and depth under high, medium, and low flow conditions.
- Identify fish species and life stages using these habitats seasonally.
- Coordinate with the ISF modeling team to model changes in fish access to habitats above based on predicted flow changes which will include a seasonal component.

Deliverable work products will include the following.

### 1. Proposed Study Plan

**2. Revised Study Plan.** The study plan for 2013-14 will be finalized in consultation with AEA, the Program Lead, resource agencies and other licensing participants.

**3. Summary of Interim Results.** Interim reports will be prepared and presented to the Work Group to provide study progress. Reports will include up-to-date compilation and analysis of the data and ArcGIS spatial data products.

**4. ArcGIS spatial products.** Shape files of the potential passage barriers will be created. All map and spatial data products will be delivered in the two-dimensional Alaska Albers Conical Equal Area projection, and North American Datum of 1983 (NAD 83) horizontal datum consistent with ADNR standards. Naming conventions of files and data fields, spatial resolution, and metadata descriptions must meet the ADNR standards established for the Susitna-Watana Hydroelectric Project.

**5. Technical Memorandum.** A technical memorandum summarizing the study results will be prepared and presented to resource agency personnel and other licensing participants, along with spatial data products.

#### 1.3.7. Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The schedule, staffing, and costs will be detailed as the 2013–2014 Study Plan develops. Estimated total cost for this study is \$400,000.

#### 1.3.8. Literature Cited

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