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Susitna-Watana Hydroelectric Project
(FERC No. 14241)

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

Final Study Plan

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

July 2013

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

On December 14, 2012, Alaska Energy Authority (AEA) filed with the Federal Energy Regulatory Commission (FERC or Commission) its Revised Study Plan (RSP), which included 58 individual study plans (AEA 2012). Section 9.13 of the RSP described the Aquatic Resources Study for Project areas within the access alignment, transmission alignment, and construction area. Construction and operation of the Project could affect aquatic habitat where Project access roads, transmission lines, airports, and construction areas cross or encroach on streams and other water bodies. This section focuses on providing a baseline description of aquatic habitats and fish species present in the vicinity of Project-related infrastructure in order to provide a basis for assessing potential Project effects and to assist in developing plans for protection, mitigation, and enhancement (PM&E) measures, including resource management and monitoring plans. RSP 9.13 provided goals, objectives, and proposed methods for this aquatic resources study.

On February 1, 2013, FERC staff issued its study plan determination (February 1 SPD) for 44 of the 58 studies, approving 31 studies as filed and 13 with modifications. RSP Section 9.13 was one of the 31 studies approved with no modifications. As such, in finalizing and issuing Final Study Plan Section 9.13, AEA has made no modifications to this study from its Revised Study Plan.

9.13.1. General Description of the Proposed Study

Construction and operation of facilities associated with the proposed Project will require both temporary and permanent infrastructure including road, railroad siding, airstrip, transmission lines, and construction camps and staging areas (ADOT&PF 2012). Construction and operation of the Project could affect aquatic habitat where Project access roads, transmission lines, airports, and construction areas cross or encroach on streams and other water bodies.[1] A baseline description of aquatic habitats and fish species present in the vicinity of Project-related infrastructure is needed to provide a basis for assessing potential Project effects and to assist in developing plans for protection, mitigation, and enhancement (PM&E) measures, including resource management and monitoring plans.

Study Goals and Objectives

The goals of this study are as follows: (1) characterize baseline condition of the aquatic habitat and fish species composition in the vicinity of the proposed Project's infrastructure including access roads, transmission lines, airports, construction areas, and operation facilities; (2) evaluate the potential for the proposed Project's infrastructure to affect these resources; (3) provide data for determining the least environmentally damaging alternative for purposes of U.S. Army Corps of Engineers (USACE) issuance of a dredge and fill permit under Section 404(c) of the Clean Water Act; and (4) provide data for developing any necessary PM&E measures, which may include resource management and monitoring plans.

[1] Streams would be crossed using standard Alaska ADOT&PF bridge design, or using culverts, as appropriate. AEA anticipates that construction would be completed using standard methods and would rely on local borrow pits/quarries within the corridor for fill and surfacing (AEA 2011).

Specific study objectives are as follows:

1. Characterize the aquatic habitats and fish assemblages at potential stream crossings within a 200-meter (650-foot) buffer zone along proposed access road and transmission line alignments.
2. Describe aquatic habitats and species present within the construction area for the dam and related hydropower facilities.

9.13.2. Existing Information and Need for Additional Information

Alaska Energy Authority (AEA) will evaluate up to three possible access alternatives for road and transmission lines. The Denali Corridor would run north from the Watana Dam site and connect to the Denali Highway by road (Figure 9.13-1). Within this corridor, the transmission lines would generally parallel the road to the Denali Highway and would run west along the existing Denali Highway to connect to the Anchorage–Fairbanks Intertie. The Chulitna Corridor would accommodate east–west running transmission lines and a road along the north side of the Susitna River that would connect to the Anchorage–Fairbanks Intertie and the Alaska Railroad near the Chulitna station. The Gold Creek Corridor would also accommodate an east–west access and transmission corridor but would run along the south side of the Susitna River (Figure 9.13-1).

Fisheries and aquatic habitat work specific to each of the proposed transportation access and transmission line alignments has not been conducted since the 1980s. Because these data were collected a number of years ago, it will be useful for corridor planning to have updated data. Given the 30-year timespan, it is possible that shifts in fish species distribution and range expansion may have occurred since the historic data were collected. Thus, a description of current aquatic habitats and fish species in the vicinity of Project-related infrastructure is needed to inform Project design, impact assessment, and development of potential PM&E measures, as necessary.

The most comprehensive fish and aquatic habitat dataset relevant to this study was generated during the 1980s. In 1983, the Alaska Department of Fish and Game (ADF&G) established study sites to characterize aquatic habitat and document fish species presence at 42 stream crossings within the then-proposed access and transmission corridors. Study sites were established at 22 stream crossing sites from the Denali Highway to the Watana Dam site, 14 sites along the Devils Canyon access corridor, and 6 sites along the then-proposed Gold Creek rail portion of the corridor (Schmidt et al. 1984). The 22 crossing sites along the then-proposed Denali-North (Seattle Creek) alignment correspond reasonably well to the present-day Denali Corridor crossing sites. The 14 study sites along the then-proposed Devils Canyon access, which extended from corridor mile 38 of the old Denali Corridor to Devils Creek dam site to the old Gold Creek intertie, relate fairly well to a portion of the present-day Chulitna Corridor. The 6 sites along the old Gold Creek intertie correspond to some of the crossings associated with the western portion of the present day Gold Creek Corridor.

In addition to the *Access and Transmission Corridor Aquatic Investigations* (July–October 1983) report (Schmidt et al. 1984), relevant existing information sources include fish species presence and aquatic habitat data collected and maintained under the *Alaska Freshwater Fish Inventory* (AFFI) program (e.g., Buckwalter 2011) and anadromous fish presence data maintained by the

ADF&G *Anadromous Waters Catalog* (*AWC*; ADF&G 2011). The Aquatic Resources Data Gap Analysis (ARDGA; HDR 2011) and AEA's Pre-Application Document (PAD) (AEA 2011) summarized existing information and identified data gaps for aquatic conditions and fish species.

The Alaska Department of Transportation and Public Facilities (ADOT&PF) recently conducted a transportation access study to evaluate access corridors to the Watana Dam site (ADOT&PF 2012). In 2011, the ADOT&PF study team used a helicopter to fly over each access route and identified each stream crossing (those previously mapped and those that did not appear on the U.S. Geological Survey [USGS] map; ADOT&PF 2012). The ADOT&PF team landed at selected stream crossings and estimated channel width and incision depth, and where possible, identified more efficient crossing locations (ADOT&PF 2012). Based on the 2011 field reconnaissance coupled with review of existing aquatic resource data, the ADOT&PF identified the number of stream crossings that would be necessary under each alternative. The ADOT&PF considered the number of stream crossings and associated fish passage requirements as part of the screening criteria evaluation (ADOT&PF 2012).

The access and transmission line corridors for the proposed Project have not been finalized. Historic data on fish species presence and aquatic habitat are available for many of the streams that would be crossed; however, an updated characterization study is needed to assess current conditions and to ensure fish presence is accounted for in all streams and water bodies within the vicinity of the proposed crossing locations. Additionally, a more comprehensive and systematically-collected aquatic habitat dataset is necessary to characterize baseline conditions prior to potential development.

A brief summary of the existing information for each of the proposed access/transmission line corridors is presented below.

9.13.2.1. Denali Corridor

The current Denali access alignment corridor (referred to by ADOT&PF as the Seattle Creek [North] alignment) would require approximately 15 stream crossings from the Watana Dam site to the Denali Highway (ADOT&PF 2012). The Denali Corridor alignment would cross streams within both the Nenana River and Susitna River watersheds. Seattle Creek and Brushkana Creek are the two major drainages crossed within the Nenana River watershed. The Denali Corridor would require eight crossings of tributaries within the Nenana River basin and two crossings in the Susitna River watershed. Deadman Creek is the major stream crossed within the Susitna River watershed.

In the 1980s, biologists conducted fish presence surveys in the vicinity of 10 of these 15 stream crossing sites and recorded general habitat and water quality conditions (Schmidt et al. 1984). Resident fish species were confirmed to be present in the vicinity of nine proposed crossing locations, three sites with intermittent flow were deemed unsuitable for fish use and were not sampled for fish presence, and one site had no fish present (Schmidt et al. 1984).

Schmidt et al. (1984) documented that Dolly Varden, slimy sculpin, and Arctic grayling were relatively widespread along the Denali Corridor. Sculpin were captured near nine of the proposed crossing locations and Dolly Varden and Arctic grayling near six of the proposed crossings. No anadromous fish habitat was documented during these surveys. These streams will be re-surveyed in 2013 along with a subset of streams that would be crossed by the transmission line along the Denali Highway.

The Denali Corridor is the only study area with existing infrastructure. Under this alignment corridor, upgrades to the existing Denali Highway would be necessary to accommodate Project traffic (ADF&G 2012). ADF&G has indicated that a comprehensive survey of Denali Highway stream crossings would be required if the Denali Corridor is chosen (ADF&G 2012). From 2006 to 2007, ADF&G conducted a Level 1 assessment of stream crossings for central and Interior Alaska road systems including the Denali Highway (O'Doherty 2010). The ADF&G methodology followed a standardized protocol focusing on juvenile salmonid fish passage. Culverts were surveyed for type, size, slope, outfall height, and other physical parameters. Of the 1,591 culverted stream crossings evaluated throughout the state, the Denali Highway crossings were classified among those "having the greatest potential to pass juvenile fish" (O'Doherty 2010). If the Denali Corridor is chosen, all crossings will be re-inventoried and surveyed to the ADF&G Level 1 standard. This survey work will be completed in 2014.

9.13.2.2. Chulitna Corridor

The current Chulitna Corridor alignment (referred to by ADOT&PF as the Hurricane [West] alignment) would require approximately 36 stream crossings. All streams and water bodies that would be intersected by this corridor drain into the Susitna River watershed. The majority of streams that would be crossed by this alignment are smaller tributary streams. However, this alignment would also cross a number of larger streams, including Pass Creek, the Indian River, and Thoroughfare, Portage, Devil, Tsusena, and Deadman creeks.

The Chulitna Corridor alignment would cross several known anadromous fish streams (ADF&G 2011). A crossing of Granite Creek, west of the Parks Highway, would facilitate access to the existing railroad line. The ADF&G *AWC* lists Granite Creek (AWC No. 247-41-10200-2381-3600) as anadromous fish habitat (ADF&G 2011). Bader and Sinnott (1989) captured juvenile Chinook and coho salmon at a point downstream of the proposed Granite Creek crossing (ADF&G 2011; Bader and Sinnott 1989), and no passage barriers have been identified in that creek between the fish capture site and the proposed crossing.

Pass Creek, located southwest of the Chulitna route crossing, is specified as an anadromous fish stream in the *AWC* (AWC No. 247-41-10200-2381-3236) and is designated to provide habitat for all five species of Pacific salmon (ADF&G 2011). However, a waterfall located downstream of the Chulitna alignment crossing presents a barrier to upstream migration of anadromous fish (ADF&G 2011). The Chulitna alignment intersects nine small, unnamed tributaries to Pass Creek; however, only limited electrofishing assessment data are available and indicate the presence of Dolly Varden and slimy sculpin at the one location sampled (Buckwalter et al. 2003).

Three additional streams—Indian River (AWC No. 247-41-10200-2551), Thoroughfare Creek (AWC No. 247-41-10200-2582-3201), and Portage Creek (AWC No. 247-41-1020-2585)—have been cataloged (ADF&G 2011) as providing habitat for anadromous fish at the potential crossing sites.

The Chulitna alignment would cross ten small, unnamed tributaries of Portage Creek, the mainstem of Devils Creek and three of its tributaries, seven smaller tributaries to the Upper Susitna River (in the Swimming Bear drainages; Schmidt et al. 1984), as well as Tsusena Creek and two of its tributaries. Fish presence sampling has not been conducted in many of these tributary streams, and passage barriers have not been identified. The presence of barriers on some of the Susitna River tributaries above Devils Canyon is being documented as part of the 2012 Upper Susitna River Fish Distribution and Habitat Study.

9.13.2.3. Gold Creek Corridor

The current road and transmission line alignment within the Gold Creek Corridor would require approximately 23 stream crossings (ADOT&PF 2012). All streams and water bodies that would be intersected by this alignment drain into the Susitna River watershed. The major streams that would be crossed include Gold Creek, Fog Creek, and Cheechako Creek. Smaller streams that would be crossed include tributaries to Prairee and Jack Long creeks and a number of unnamed tributaries to the Susitna River.

The Susitna River (including side channels and sloughs), Fog Creek, Cheechako Creek, and Gold Creek are known to provide habitat for anadromous Pacific salmon (ADF&G 2011). Many of the streams that would be crossed are unnamed tributaries of the Susitna River. Fish data are available for a number of streams that would be crossed. However, much of the available fish data were collected downstream from (i.e., not in the direct vicinity of) the proposed crossing sites (Delaney et al.1981; ADF&G 2011; Schmidt et al. 1984). A total of 8 of the 23 streams intersected by the southern alignment are known to provide habitat for anadromous fish downstream of the proposed crossing sites (ADF&G 1981, 2011; Schmidt et al. 1984).

9.13.3. Study Area

The access corridor study area includes streams and water bodies within both the Susitna River and Tanana River watersheds (Figure 9.13-1). The Denali alignment would cross streams within both the Nenana River (a tributary of the Tanana River) and Susitna River watersheds. Seattle Creek and Brushkana Creek are the two major drainages that would be crossed within the Nenana River watershed. Deadman Creek is the major stream that would be crossed within the Susitna River watershed. All streams and water bodies that would be intersected by the Chulitna and Gold Creek alignments drain into the Susitna River watershed.

The study area will include the aquatic habitats (streams and lakes) in the vicinity of both temporary and permanent Project-related infrastructure including access roads, transmission lines, airports, and construction areas. AEA will establish study sites in aquatic habitats within a 200-meter (650-foot) buffer zone along each access alignment corridor, in the vicinity of the potential airport and hydropower facility construction areas. Figure 9.13-1 shows the streams and lakes (based on the most current hydrography layer) within the three access corridors.

The study area will be adjusted as refinements are made to the proposed Project features and specific alignment routes. AEA expects that the initial 2013 sampling effort will occur over a broad area and that collection of more detailed information within refined alignments will be necessary during subsequent sampling efforts in 2014.

9.13.4. Study Methods

9.13.4.1. Synthesis of Existing Information

Historic data for aquatic resources sampling reported in Schmidt et al. 1984 (and associated data to the extent possible), the AWC, and AFFI will be incorporated into a geospatial database for the proposed access alignments. AEA will consult with the agencies and will identify gaps in the historic aquatic habitat and fish species presence database to prioritize the initial 2013 sampling efforts and refine the overall field sampling approach. Based on the existing data review, the overall priority for data collection will be as follows: (1) sites not previously surveyed; (2) sites with no previously documented fish presence; (3) sites with fish presence documented downstream of the potential crossing location; and (4) sites with fish presence documented upstream of the potential crossing location. In this study, AEA does not propose to survey for fish presence in streams where the known anadromous fish distribution extends upstream of a proposed crossing location, but aquatic habitat surveys may be conducted in these locations.

At the onset of this study, locations where aquatic habitat and fish species presence data have been previously collected in the vicinity of the proposed access corridors will be identified. AEA will code streams and water bodies by fish presence (e.g., anadromous fish, resident fish, no fish captured or observed) and will identify streams and water bodies for which no data records were found. For areas where no sampling data are available, the team will review connectivity to adjacent streams and water bodies (e.g., where fish/habitat data are available) to aid in field sample planning.

AEA initiated studies in 2012 to begin the characterization of fish communities, fish distribution, and aquatic habitat throughout the Susitna River. Studies will continue and expand in 2013–2014. AEA also began a study to document the presence of fish passage barriers in the Upper Susitna River, with a focus on streams within the proposed inundation zone. In 2013 and 2014, AEA will expand these efforts to identify the presence of existing fish passage barriers to tributaries downstream of the proposed Watana Dam site. Data collected as part of the fish distribution and aquatic habitat mapping studies will be used to supplement data collection and analysis specific to this study, where appropriate.

9.13.4.2. Field Data Collection

Study sites will be established at proposed crossing sites in streams along the three potential access and transmission corridors and within the vicinity of construction areas and potential airport locations. To account for potential alignment changes or refinements, sampling will occur within a 200-meter (650-foot) buffer along each alignment corridor in 2013. Study sites will also be established on lakes that fall within the proposed access corridors and in the vicinity of construction locations.

Each alignment will be flown to verify that all streams and/or water bodies within 200 meters (650 feet) of the access and transmission corridors and construction areas are included in the field study. The field team will record the location of each area to be sampled with a global positioning system (GPS) unit. The field team will also take photographs to document channel conditions during each field data collection effort. The team will sample for fish presence and record aquatic habitat parameters at each study site, as described below.

AEA expects that the initial fisheries and aquatic habitat data collected for the Project in 2012 and 2013 will be assessed during the facilities alternatives analysis and will be used to refine Project design. AEA anticipates that the collection of additional site-specific data may be necessary in 2014 to address any newly identified crossing locations and/or fill data gaps.

9.13.4.2.1 Aquatic Habitat Data Collection

The field team will record aquatic habitat characteristics in the vicinity of each potential crossing site. At stream crossing locations, AEA will characterize habitat units to the mesohabitat level in accordance with the channel typing and aquatic habitat classification system currently being developed for the Project by the Fish and Aquatic TWG, as presented in Section 9.9. Habitat characterization will be based on a modified version of the USFS Aquatic Habitat Survey Protocol (2001). Habitat units encountered will be typed, and parameters that describe the current condition of the habitat unit will be measured. If sections of stream contain two or more different habitat units they will be delineated to the mesohabitat level, denoting a primary and secondary unit, and recorded correspondingly. Field data collection methods will be consistent with those identified for the ground-based surveys described in Section 9.9. The habitat survey for each stream will be conducted by a two-person field team. A GPS point will be used to identify the upstream boundary of each mesohabitat unit. For pools, maximum depth and pool crest depth will be measured with a stadia rod and recorded in meters, where possible. Wetted and bankfull widths and the lengths of each mesohabitat unit will be measured with a tape or laser range finder and recorded in meters. Percent substrate composition will be estimated by visual identification based on USFS (2001) classifications. Slope measurements representative of the potential crossing location within the 200-meter corridor will will also be recorded.

Large woody debris (LWD) observed will be counted for each habitat unit. For a piece of wood to be considered LWD, it must be at least 0.1 meter (4 inches) in diameter, and at least 1.0 meter (39 inches) of the LWD must be below the water's surface at bankfull flow (USFS 2001).

The amount of undercut bank (UCB) on each side of the stream will be measured to the nearest meter for each habitat unit. A bank will be considered undercut if the undercut is greater than or equal to 0.3 meter (12 inches) incised into the bank and greater than 1.0 meter (39 inches) long. If, at bankfull stage, the bank would be considered undercut, then it will be measured even if it is above the current surface of the water (USFS 2001).

The linear distance of stream habitat characterized at the mesohabitat unit level will be a function of wetted channel width (40 times the wetted width up to a maximum of 400 meters [1,300 feet]). AEA developed a systematic approach to characterize lake habitats in the Characterization and Mapping of Aquatic Habitats Study (Section 9.9); this study will utilize results as they become available in 2013.

As Project features are refined, additional site-specific data will be recorded along transects in the close vicinity (in accordance with the Habitat Characterization Protocol) of the anticipated crossing location. Data recorded along transects will include but not be limited to channel bed width, wetted channel width, several water depth measurements across each transect (where feasible), gradient[2], Rosgen channel type (Rosgen 1994), and water quality field parameters. AEA anticipates the need for such parameters to meet permitting requirements (e.g., ADF&G Fish Habitat Title 16 Permit).

Several water quality parameters that affect aquatic life will be measured during the aquatic habitat assessment, including field measurements of surface water temperature, pH, dissolved

[2] One study considered stream width and gradient as two of the most influential factors that affected species richness among different habitat variables (Grenouillet et al. 2004).

oxygen (DO), and specific conductivity. Alaska Department of Environmental Conservation (ADEC) water quality criteria for all applicable water use classes and subclasses will be used to evaluate measured parameters. Water quality sampling will be conducted in coordination with water quality sampling protocols currently being developed for the Project.

9.13.4.2.2 Fish Data Collection

The goal of this task is to characterize fish assemblages in the vicinity of potential stream crossings. Therefore, sampling will not be conducted throughout the entire length of the stream but instead within close proximity to crossing sites (see below). Species richness in stream fish assemblages is related to both environmental conditions within the stream and stream spatial position within the drainage (Grenouillet et al. 2004). In an effort to characterize species composition at each stream crossing, the field team will establish segments of stream habitat to sample for fish presence at each crossing site. Streams will be sampled as described below. As requested by ADF&G during Fish and Aquatic TWG meetings, sampled water body crossings where no fish are found will be sampled again during a different season to adequately assess fish presence.

The field team will use backpack electrofishing gear (Smith-Root LR-24 or similar) as the primary capture method to inventory streams for fish presence. Single-pass electrofishing was selected as the primary fish capture method because it is considered to be the most effective (Barbour et al. 1999; Simon and Sanders 1999; Flotemersch and Blocksom 2005) and widely applied (Hughes et al. 2002) method used in streams and rivers. Electrofishing typically captures more species with less size selectivity than other gear types (Hendricks et al. 1980), electrofishing equipment is relatively compact and portable, and electrofishing is recommended as a standard sampling method for coldwater fishes in streams (Bonar et al. 2009; J. Buckwalter, ADF&G/Habitat Biologist II, personal communication, October 17, 2011).

Electrofishing settings will be determined in the field based on water quality conditions (e.g., conductivity) and professional judgment. Backpack electrofishing will be conducted by trained staff consistent with established protocols and guidelines (e.g., NMFS 2000; Temple and Pearsons 2007; Buckwalter et al. 2010; J. Buckwalter, ADF&G/Habitat Biologist II, personal communication, October 17, 2011). If adult salmonids or aggregations of large (>300 millimeters [11.8 inches]) salmonids are encountered, electrofishing activities in the immediate vicinity will cease, except to capture fish for species identification (Buckwalter et al. 2010). Other fish sampling methods (e.g., fyke nets, minnow traps, snorkeling, etc.) may be used when adult anadromous fish are present (or when habitat conditions are not suitable for electrofishing).

The length of stream habitat sampled at each crossing site will be directly proportional to the stream channel's wetted width. The linear distance of stream habitat sampled needs to be long enough to provide a true representation of the fish species present but not so long that it becomes more labor intensive than is necessary to meet the study's objectives (Temple and Pearson 2007). In general, large streams require longer sampling sections than smaller streams to assess community structure (Temple and Pearsons 2007). Temple and Pearsons found that a sample reach with a length between 27 and 31 wetted channel widths was the minimum sampling distance required to detect 90 percent of the fish species present (2007). For small streams, such as headwater streams, other studies report minimum sampling distances of 12 to 50 wetted channel widths (Patton et al. 2000), 35 wetted channel widths (Lyons 1992), and 40 wetted channel widths (Reynolds et al. 2003; Buckwalter et al. 2010). Recent analysis of data collected by single-pass electrofishing using the 40 wetted channel width reach length found that species richness was typically underestimated on intermediate (e.g., drains 200 square kilometers) and mainstem (e.g., drains 1,500 square kilometers) streams in Alaska (as opposed to target headwater (drains 50 square kilometers) streams (J. Buckwalter, ADF&G/Habitat Biologist II, personal communication, October 17, 2011). Based on the study results described above and the anticipated channel size for crossing surveys, AEA proposes to survey a stream length of 40 wetted channel widths, a minimum of 50 meters and up to a maximum of 400 meters (1,300 feet) of stream length.

One or more alternative fish sampling methods may be used in stream habitats not suitable for electrofishing and in lake habitats. Sampling may include the use of multi-mesh gillnets, baited minnow traps, fyke nets, seine nets, and angling gear. The gear used at individual sampling locations will be a function of habitat conditions encountered. Gear type specifications are as follows:

- Gillnets used in lakes will be situated perpendicular to shore and fished at varying depths. The team will deploy nets for a minimum of two hours and check nets frequently to minimize potential fish mortality. To the extent possible, the team will sample multiple locations throughout lakes, including around the inlet and outlet areas. If no fish are captured within several hours, gear will be set overnight. The team will use a boat and/or drysuits to deploy gear in offshore habitats.
- Minnow traps (also known as basket traps) will be baited with commercially processed roe and secured to vegetation or substrate. Soak times are anticipated to be 90 minutes (Bryant et al. 2000). These authors demonstrated that 45 percent of total catch can be obtained from an initial soak of this duration.
- Fyke nets will be used with attached wings and detachable center leads with floats and weighted line. Alternative fyke net sizes and designs may also be used depending on conditions encountered.
- Beach seines may be used to target fish too small to be captured by traps or species that typically are not susceptible to sampling with traps. The team may use a variety of sizes, including a 1.2-meter (4-foot) by 6.1-meter (20-foot) black mesh beach seine with 6.4-millimeter (0.25-inch) mesh. Beach seine sampling area will be recorded and involve a single pass through the sample area.
- Angling gear will target larger fish in deeper portions of streams and lakes. A variety of gear will be used.

Captured fish will be held in buckets and/or live wells until the sampling of each segment is complete. Fish will be identified to species and counted. Up to 100 fish of each species collected at each sampling location will be measured to the nearest millimeter to record fork or total length as appropriate. Fish will be released within the sampling location once sampling activities have ceased. Fish disposition (e.g., released, unintended mortality, voucher specimen, injury) will be recorded for each fish handled. Data will be recorded on a standardized datasheet or field computer form.

AEA will obtain a fish resource permit (FRP) from ADF&G prior to initiation of field sampling activities. Sampling activities will be carried out in compliance with FRP stipulations. Any deviations from the approved study plan will be communicated to ADF&G during or immediately following sampling activities.

9.13.4.2.3 Data Analysis and Reporting

Data generated during this study will provide baseline data related to fish and aquatic habitat in the vicinity of potential water body crossing locations associated with potential transportation access alignments, transmission alignments, and construction areas. AEA will complete a technical report that summarizes methods and results of the aquatic habitat characterization and fish species assemblages in the study area.

Data generated during this study will be incorporated into the Project's geospatially-referenced relational database. Naming conventions of files and data fields, spatial resolution, and metadata descriptions will meet the standards established for the Project. Use of the Project's geospatial database will also allow data specific to each stream crossing to be queried and readily accessible for Project reporting. The database will be designed to create individual reports by crossing location.

Fish capture data will be submitted to ADF&G per FRP requirements. Fish species assemblage (composition and species richness) and distribution will be reported by sampling location and by stream drainage or lake. Catch per unit effort (CPUE) will be determined by dividing the catch (number of fish captured or observed) by the effort (e.g., sample time). To the extent possible, data collected using different methods will be normalized so results can be appropriately compared. CPUE will be determined for each species by location (e.g., stream reach sampled) and gear type. CPUEs will be used to develop an index of relative abundance (as related to sample time, not sample area) for each species captured at stream crossing sites.

9.13.5. Consistency with Generally Accepted Scientific Practice

Electrofishing, gillnets, seine nets, minnow traps, angling, fyke nets, and snorkel surveys are commonly used methods for sampling fish populations (Murphy and Willis 1996; Backiel and Welcomme 1980). Angling using single barbless lures or flies has become a common method for capturing subject fish. These methods described herein have been developed in consultation with the agencies and other licensing participants. All data collection efforts will follow state guidelines and FRP permit stipulations.

9.13.6. Schedule

Table 9.13-1 shows the study activity timeline. AEA will begin this study by reviewing results of the efforts currently underway to compile existing fisheries and aquatic habitat data. AEA anticipates that the historic and more recent existing data on stream crossings will be available in early 2013.

The field team will conduct fish surveys primarily during July and August 2013, at which time fish should be well distributed throughout feeding or rearing habitats. It is possible that some sampling efforts may start earlier and extend beyond August, such as those in lake habitats or those associated with migration periods. Aquatic habitat surveys are typically conducted at low flows. The timing of low-water events is not known for all crossing locations; in general, low water during the open-water season may occur during fall months just prior to freeze up.

Aquatic habitat surveys will be conducted concurrent with fish sampling as conditions allow. However, crossing locations may need to be visited more than once. For sites where no fish are encountered on a first survey, a second survey during a different season of 2013 or in 2014 (if conditions do not permit a second event in 2013) will be conducted to help confirm seasonal fish use of habitat. As discussed in the methods section, additional surveys are anticipated in 2014 to refine the alignments and/or fill in data gaps. The number of 2014 surveys that will be needed cannot be determined until more information is available. Initial and Updated Study Reports discussing actions to date will be issued within 1 and 2 years, respectively, of FERC's Study Plan Determination (i.e., February 1, 2013).

This study is dependant on well-defined access and transmission corridor alignment center lines and construction area boundaries.

9.13.7. Relationship with Other Studies

The Aquatic Resources Study within the Access Alignment, Transmission Alignment, and Construction Area (Access) Study will interrelate with at least five other AEA Project studies (Figure 9.13-2). Potential transmission route options and construction areas as a component of Project design will provide input for some of the relevant sampling locations. The Characterization of Aquatic Habitat Study (Section 9.9), and the Upper River Fish Distribution and Abundance Study (Section 9.5) will provide aquatic habitat and fish species presence data in areas that overlap the potential corridors. This information may eliminate or reduce the data collection needs for sites sampled on the respective alignments. The Fish Passage Barriers Study (Section 9.12) will work cooperatively by providing physical locations of anadromous fish passage barriers for tributary streams crossed by the respective alignments. The flow of information into and out of the Access Study is anticipated to occur over the two-year study period through an iterative process. As relevant data (described above) is collected, it will be disseminated from the Fish Program to the Access Study team. To maximize communication among the Fish Study Program, study leads will participate in regularly scheduled internal meetings where preliminary data will be presented and implications to other studies discussed. Two milestone deliveries are anticipated of data that has been subject to QA/QC procedures: (1) the 2012 Upper River Fish Barrier Study will be incorporated in Q1 2013, and (2) video habitat assessment data of Deadman Creek will be available in Q4 2013. The Access Study will also provide findings as output information to the Upper River Fish Distribution and Abundance Study (Section 9.5).

9.13.8. Level of Effort and Cost

This study will require that data be collected over at least two field seasons, primarily to accommodate potential refinements in Project design. AEA anticipates that data will be collected over a broader study area in 2013, for example, within the larger access corridors shown in Figure 9.13-1. As elements of the Project are refined and specific crossing locations are chosen, additional sites may need to be sampled and the collection of more detailed, site-specific information may be necessary at selected crossing sites throughout the study area.

The study will require at least one part-time senior biologist as study lead and additional support staff including multiple field biologists, a Geographic Information System (GIS) team, and administrative staff. The 2013 field effort will require helicopter support for a minimum of two field teams to collect fish and habitat data at potential water body crossings over the span of approximately 30 field days. The remainder of the 2013 study effort will be office-based, with data entry and quality assurance/quality control, analysis, GIS and database queries, and report development. AEA anticipates that the study area within which additional data will need to be collected in 2014 will be refined and therefore reduced. AEA estimates the 2014 field effort will require helicopter support for potentially two field teams for up to 20 days. The remainder of the 2014 effort will be office-based.

The initial cost estimate for completion of the study objectives for all three access corridors is roughly $600,000 for the two-year study period. However, costs could be reduced if the number of proposed corridors is reduced and the alignment(s) is refined for year 2014.

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9.13.10. Tables

Table 9.13-1. Preliminary schedule for the Aquatic Resources Study within the access alignment, transmission alignment, and construction area.

Activity	2013				2014				2015
	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q
Existing Information Summary	- - - -				- - - -				
Fish Distribution Surveys		———	———	———		———	———	———	
Aquatic Habitat Surveys		———	———	———		———	———	———	
Data Analysis and Reporting				———	Δ			———	▲

Legend:

——— Planned Activity
- - - Follow- up activity (as needed)
Δ Initial Study Report
▲ Updated Study Report

9.13.11. Figures

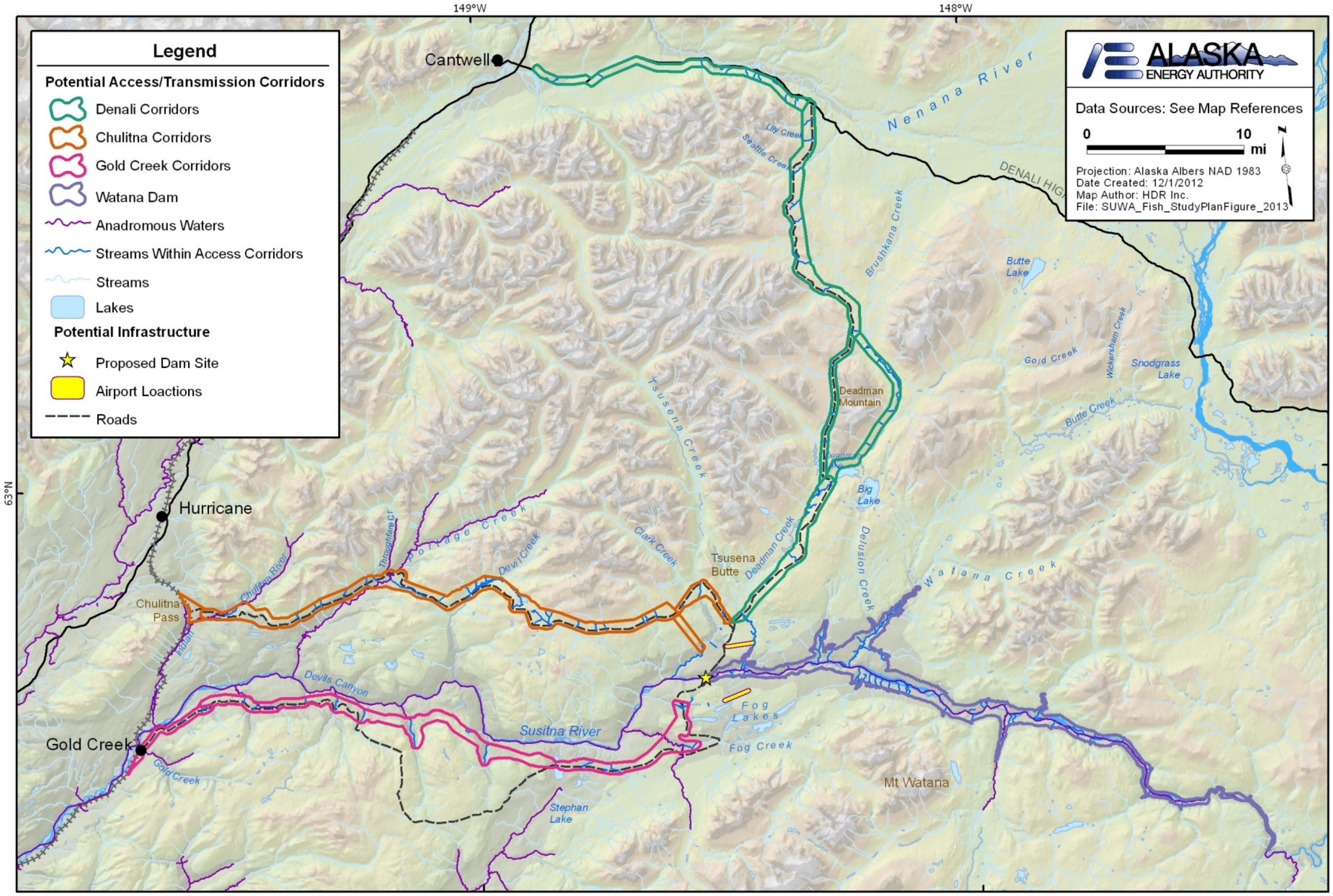

Figure 9.13-1. Study area for aquatic resources in the potential access and/or transmission alignment corridors.

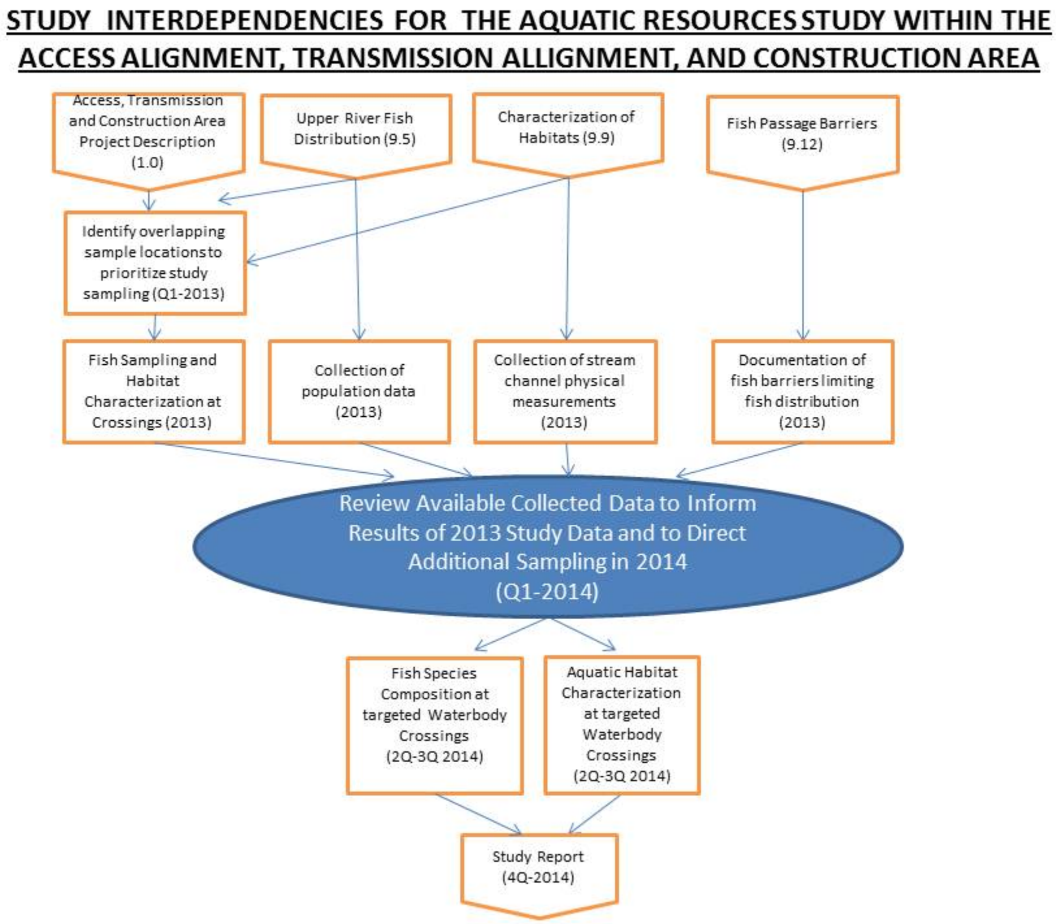

Figure 9.13-2. Study interdependencies for Aquatic Resources Study within the access alignment, transmission alignment, and construction area.