Application for Non-Capacity Related Amendment of License

Annex Creek/Salmon Creek Hydroelectric Project

(FERC Project No. 2307)




Alaska Electric Light and Power Company
Juneau, Alaska

July 2020

[This page intentionally left blank]

TABLE OF CONTENTS

APPENDICES

[This page intentionally left blank]

INITIAL STATEMENT

Alaska Electric Light and Power Company (AEL&P or Applicant) hereby seeks approval for a non-capacity related amendment to the Annex Creek and Salmon Creek Hydroelectric Project License, Federal Energy Regulatory Commission (FERC or Commission) Project No. 2307 (Project). Pursuant to Title 18 of the Code of Federal Regulations, Section 4.201, the Applicant herein provides this Initial Statement and revised exhibits associated with the proposed amendment, including supplemental Exhibits E, the Environmental Report. This amendment does affect the penstock, one of the Project features, so revisions to Exhibits A and F will be required once the project is completed. This amendment does not alter any information provided in filed Exhibits B, C, D or G so no revisions will be required. Accordingly, to the extent necessary, the Applicant requests a waiver of the requirement to provide such information.

Applicant

The Applicant respectfully applies to the Commission for a non-capacity related amendment of the license issued for the Annex Creek and Salmon Creek Hydroelectric Project, FERC No. 2307.

Applicant's Name, Address, and Telephone Number

The exact name, business address, and telephone number of the Applicant is:

Alaska Electric Light and Power Company
5601 Tonsgard Court
Juneau, Alaska 99801
(907) 780-2222

The exact name, business address, and telephone number of the person authorized to act as agent for Applicant and the person to whom all correspondence regarding this proceeding should be sent is:

Christy Yearous
Generation Engineer
Alaska Electric Light and Power Company
5601 Tonsgard Court
Juneau, Alaska 99801
(907) 463-6387

Applicant is Licensee

The Applicant is a domestic corporation, licensee for the Annex Creek and Salmon Creek Hydroelectric Project, designated as Project No. 2307 in the records of the Federal Energy Regulatory Commission, issued on the 6th day of February, 2018.

Requested Amendment and Reason for Amendment

The requested amendment is to replace the penstock for the Annex Creek Hydroelectric Project which runs from the Valvehouse to the Powerhouse. Because this modification would impact only the Annex Creek Component of the Project, the Salmon Creek Component is not discussed in the Amendment Application.

The Annex Creek penstock is a hand-riveted steel penstock that is 105 years old. A 1998 assessment of the penstock (G.J. Tupac & Associates) concluded an expected remaining life expectancy of roughly 25 years. In 2017, the penstock began to show its age when several leaks developed at various locations along the penstock, primarily located at seams between the steel plates. Further investigation into the condition of the penstock material at those seams showed parent material deterioration to be a common attribute with the maximum parent material loss found during the 2017 inspection at 0.124" or 49.6%. Due to the development of leaks and the continuing loss of material, AELP has concluded that the penstock has reached end of life and needs replacement which is in line with the previous condition assessment.

Pertinent Statutory and Regulatory Requirements

This non-capacity related amendment will affect the following Project facilities:

1) Annex Creek Valvehouse – The valvehouse would need to be expanded to include an automated valve and controls to be added immediately downstream of the originally manually operated gate valve.

2) Annex Creek Penstock Bridge – This is a historic property which will need to be replaced with a new bridge to support the new penstock.

3) Annex Creek Penstock – The entire penstock, which is a historic property, will need to be replaced with modern welded steel penstock.

Appendix A is the Distribution List for P-2307 which was compiled by downloading the Mailing List for P2307 from www.ferc.gov on June 30, 2020. To complete the distribution list, the tribes copied in the Programmatic Agreement were added and the resource agencies who participated in the Agency Meeting were added.

Appendix B is the Consultation Record which AEL&P has compiled in preparation of this license amendment application. AEL&P has consulted with the U.S. Department of Agriculture/Forest Service (USFS) as well as with other affected state and federal resource agencies concerning the proposed amendment.

Appendix C is the Environmental Report which was prepared by AEL&P and incorporates the resource agency comments received as of the filing of this application.

Name and Address of the Owner of Any Existing Project Facilities

AEL&P is the Licensee of the Annex Creek and Salmon Creek Hydroelectric Project and is the owner of all Project facilities. The owner's address is:

Alaska Electric Light and Power Company
5601 Tonsgard Court
Juneau, Alaska 99801
(907) 780-2222

This page intentionally left blank.

APPENDIX A — DISTRIBUTION LIST

This page intentionally left blank.

Cook Inlet Region, Inc.
Dara Glass, Land Manager
2525 C Street, Suite 500
Anchorage, AK 99503

National Marine Fisheries Service
ATTN: Sean Eagan
P.O. Box 21668
Juneau, AK 99802-1668

City and Borough of Juneau
Attn: City Manager
155 S Seward Street
Juneau, AK 99801-1332

Office of the Governor of Alaska
RE: FERC Projects
PO Box 110001
Juneau, AK 99811-0001

Office of the Solicitor
US Department of Interior
4230 University Drive, Suite 300
Anchorage, AK 99508

State of Alaska, DNR
ATTN: Adam Moser
Natural Resource Specialist
400 Willoughby Ave
Juneau, AK 99802

Tongass National Forest
Melissa Dinsmore, Lands Specialist
204 Siginaka Way
Sitka, AK 99835

Tongass National Forest
Bradley Orr, District Ranger
8510 Mendenhall Loop Road
Juneau, AK 99801

US Army Corps of Engineers
Commander
PO Box 2946
Portland, OR 97208-2946

U.S. Environmental Protection Agency
Attn: Region 10 Administrator
1200 Sixth Avenue
Seattle, WA 98101

U.S. Fish and Wildlife Service
Attn: Regional Office
1011 East Tudor Road, MS 331
Anchorage, AK 99503

U.S. Fish and Wildlife Service
Attn: Division of Habibtat Conservation
1011 E Tudor Road
Anchorage, AK 99503-6103

US Army Corps of Engineers
Reglatory Division Chief
PO Box 6898
Joint Base Elmendorf, AK 99506-6898

US Bureau of Land Management
Idaho State Office
1387 S Vinnell Way
Boise, ID 83709-1657

U.S. Bureau of Land Management
Alaska State Office
222 West 7th Avenue, Stop 13
Anchorage, AK 99513-7504

US Forest Service
ATTN: Roger Birk
PO Box 21628
Juneau, AK 99802-1628

US House of Representatives
Don Young
Washington, DC 20515

U.S. Bureau of Land Management
U.S. Department of the Interior
Attn: State Director
222 West 7th Avenue
Anchorage, AK 99513-7599

USDA Forest Service
Region Director
PO Box 1628
Juneau, AK 99802

USDA Forest Service
Dawn Collinsworth, Attorney
PO Box 21628
Juneau, AK 99802-1628

Washington State Dept of Fish and Wildlife
600 Capitol Way N
Olympia, WA 98501-1076

Central Council Tlingit & Haida Indian Tribes of Alaska
320 W. Willoughby Ave, Suite 300
Juneau, AK 99801

Douglas Indian Association
811 West 12th Street
Juneau, AK 99801-1802

Mr. Wally R. Frank, President
Angoon Community Association
P.O. Box 328
Juneau, AK 99820

Electronic Distribution List:

Greg Albrecht	ADF&G, Habitat Biologist
Kevin Keith	ADF&G, FERC Hydropower Coordinator
Rob Morgenthaler	USFS, Special Use Permit Administrator
Brad Orr	USFS, District Ranger
Timothy Marshall	USFS, Supervisory Archaeologist, North Zone
Don MacDougall	USFS, Wilderness Ranger
McKenzie Johnson	SHPO, Archaeologist - Review and Compliance
Sean Eagan	NOAA/NMFS, Hydrologist
Clint Gundelfinger	DNR, Natural Resource Specialist
Carl Reese	AK DNR, Southeast Regional Water Manager & Statewide Hydroelectric Specialist

This page intentionally left blank.

APPENDIX B – CONSULTATION RECORD

This appendix provides a summary of consultation with federal, state, and interstate resource agencies, Indian tribes, non-governmental organization, or other members of the public made in connection with preparing this application for non-capacity amendment of license.

This page intentionally left blank.

Consultation Summary			
Date	Type	Subject	Comments
March 3, 2020	Letter, sent by e-mail	Scheduling of Agency Meeting	Sent to USFS, ADF&G, SHPO, DNR, NMFS and USFWS
April 29, 2020	Handout – Distributed Electronically	Agency Meeting Agenda	Web Meeting due to COVID-19
April 29, 2020	Powerpoint	Describing the need for the penstock replacement, construction methods and timelines.	
April 30, 2020	Letter, sent by e-mail	Minutes for the agency meeting	Asked for comments on Exhibit E which was distributed on 4/29/20 by the end of May 2020.
April 30, 2020	E-mail from NMFS	Approving minutes and discussion of increased boat traffic.	
May 22, 2020	E-mail from SHPO	Informal concurrence of adverse effect. Will send letter.	AELP proceeding with Mitigation Plan development and agency review.
May 29, 2020	E-mail from ADF&G	Supportive of Project	Would like to review the Sediment and Erosion Control Plan and Bear Safety Plan. AELP revised Exhibit E to indicate that ADF&G would be included in the review process for both.

This page intentionally left blank.

p: 907.780.2222 • f: 907.780.3571 • 5601 Tonsgard Ct. • Juneau, AK 99801

SENT BY E-MAIL

March 3, 2020

To the Party Addressed:

Subject: Salmon Creek and Annex Creek Hydroelectric Project (FERC No. 2307) – Annex Creek Penstock Replacement

This letter is intended to inform stakeholders that Alaska Electric Light and Power Company (AELP), the licensee for Federal Energy Regulatory Commission (FERC) Project 2307 is planning to replace the 105-year-old riveted steel penstock which is part of the Annex Creek Component. In preparation for this activity, AELP would like to review the project impacts with all stakeholders so that appropriate measures can be put in place during the ground disturbing work which is scheduled for the spring and summer of 2022.

A new FERC license for the project was issued in February 2018, based on a license application that AELP submitted to FERC in August 2016. At that time, the condition of the Annex Creek penstock was fair, and replacement was outside of the 10-year planning term. However, in the summer of 2017 several leaks occurred in the upper section of penstock which were repaired by welding patches on the pipe. No new leaks have occurred since 2017 but thickness testing and additional assessments performed as part of the repairs indicated that the penstock condition is worse than previously thought and replacement is necessary.

The penstock is 7,097 feet long and is riveted steel with a diameter varying from 42 inches at the valvehouse to 34 inches at the powerhouse. The pipe thickness varies from 1/4-inch to 5/8-inch. The pipe is supported by wooden trestles. Short sections have previously been replaced with welded steel pipe during the life of the project due to damage.

The new penstock will be surface mount on pre-cast concrete supports and follow the same route as the existing penstock. The general work plan will be to cut the existing penstock into sections, remove the sections by helicopter, place equipment by helicopter at different elevations to prep the site and assemble penstock supports, set the new penstock sections by helicopter and then weld and test the new pipe. Due to the terrain, heavy-lift helicopters will be utilized for portions of the work (removing and placing pipe) with smaller helicopters used for project support between heavy-lifts. This is a conceptual level plan focused on minimizing the project footprint and ground disturbance. The plan is being refined continuously as more engineering is completed and information gathered, that work will continue through 2020.

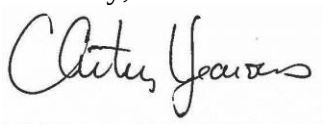
Attached to this letter is a table of the resources so far evaluated by AELP, the potential effects and the proposed measures. Many of the necessary studies and subsequent analysis of the

penstock corridor area were completed for the 2016 FERC License Application, with details included in that application. The table attached is based on the work completed to date with specific effects related to the penstock replacement identified. This is a first draft meant to start the conversation with stakeholders. The last page attached is a map of the area showing the Project Boundary, land ownership and the penstock route.

AELP has scheduled a meeting at the AELP Lemon Creek Office at 5601 Tonsgard Court at 10am on April 29, 2020. If there are people who cannot attend in person, but would like to call in, please let me know and I will send out a telephone conference number. Following this meeting, AELP will complete any follow-up activities, revise the potential effects and proposed measures as appropriate and file a Non-Capacity License Amendment Application with FERC.

If you have any questions regarding this project, or know of additional agencies who should be included, please contact me at (907) 463-6387 or by e-mail at christy.yearous@aelp.com.

Sincerely,



Christy Yearous
Vice President, Generation

Electronic Addresses:

Rob Morgenthaler, Special Use Permit Administrator USFS
rob.morgenthaler@usda.gov

McKenzie Johnson, Review and Compliance Archaeologist AK SHPO/OHA
mckenzie.johnson@alaska.gov

Kevin Keith, FERC Hydropower Coordinator ADF&G
kevin.keith@alaska.gov

Clint Gundelfinger, Natural Resource Specialist, AK DNR DMLW, Water Resources
clint.gundelfinger@alaska.gov

Sean Eagan, Hydrologist, NOAA-NMFS
sean.eagan@noaa.gov

Doug Cooper, Branch Chief, USFWS
douglass_cooper@fws.gov

Attachments

Resource	Potential Effects	Proposed Measures
Geology and Soils	This will be ground disturbing work, there will be the possibility of erosion.	AELP will prepare an Erosion Control Plan which will be followed during construction.
Water Resources	The duration of the project will be 6 months, during that time it is likely that Upper Annex Lake will spill. This is a normal activity which should have no effect. The Annex Creek camp facility uses penstock water as the raw water supply, this will not be available.	During construction, water will be taken from Lower Annex Creek for use in the camp facilities. The existing water treatment system will be used in the powerhouse.
Fish and Aquatic Resources	Studies performed in 2012 confirmed Brook Trout presence in both Upper and Lower Annex Lake. The Upper penstock section follows the shoreline of Annex Lake so there could be the possibility of runoff entering the Lower Lake.	AELP will prepare an Erosion Control Plan which will be followed during construction.
Wildlife and Botanical Resources	The project area is frequented by Black Bears, the possibility of human-bear encounters during construction are high. In 2014, the penstock corridor was surveyed for non-native, rare and invasive plants. None were found.	AELP will prepare a Bear Safety Plan which will be followed during construction. All construction personnel will receive training on the plan. As a condition of the 2018 FERC License, AELP prepared an Invasive Plant Management Plan in consultation with the agencies. This plan will be followed during construction.
Wetlands, Riparian, and Littoral Habitat	The project area has not had a specific wetland delineation. However, the National Wetland Inventory (NWI) shows wetlands adjacent to the project area.	AELP will complete a wetland delineation for the penstock corridor during the 2020 field season.
Rate, Threatened and Endangered Species	In 2015, AELP consulted with the USFWS regarding threatened or endangered species in the overall Project Area. To obtain a new license, in 2014 AELP completed a Goshawk survey of the penstock corridor, which resulted in no indication of presence. The 2014 botanical survey discussed with invasive plants, included rare plants, no rare plant species were found in the penstock corridor.	No actions are proposed by AELP.

	This project will involve increased barge traffic to the site. Occasionally there are humpback whales and stellar sea lions (no identified haul-outs) in the Taku Inlet. The number of trips is projected to be less than ten and will be spread out over the duration of the project.	
Land Use, Recreation, Aesthetics	This project will allow the land to continue to be used for hydroelectric generation. After the project, the land use will remain the same as it is currently. Presently, there the only access to Upper Annex Lake is by walking on top of the existing penstock and is limited to project and agency personnel. With this project, there is potential for new recreational access but that conflicts with the industrial nature of the project. During the project, the entire penstock corridor, 40' in width will be disturbed. This will be visible from both the land and air. After construction, AELP will allow native plants to establish and resume normal brushing activities.	No actions are proposed by AELP.
Historic and Cultural Resources	As part of the license application submitted in 2016, a complete survey of the penstock corridor for historic and cultural resources was completed. A condition of the 2018 license was development of a Historic Properties Management Plan (HPMP) which addresses the identified resources and establishes protocols for routine and non-routine activities which could impact those resources. The penstock replacement will impact two historic properties, the Annex Creek penstock (JUN-1101) and the penstock bridge (JUN-1102). Both will be replaced with modern equivalents constructed out of steel. During construction, there is the possibility of discovery of human remains or unanticipated discovery of historic or cultural resources.	AELP has contracted with Walking Dog Archaeology to complete a Determination of Effect and develop a Mitigation Plan in conjunction with the SHPO and USFS. Construction will be supervised by the AELP HPMP Coordinator and a Qualified Professional. All construction personnel will receive training on the Historic Properties Management Plan.

Socio-economic Resources	Project construction will result in additional local spending and jobs for the region. Long term, this project will allow operation of the Annex Creek Component to continue to supply hydroelectric power to the community of Juneau as it currently does.	No actions are proposed by AELP.

Land Ownership in the Annex Creek Component Vicinity (showing Penstock Routing)

p: 907.780.2222 • f: 907.780.3571 • 5601 Tonsgard Ct. • Juneau, AK 99801

Annex Creek Penstock Replacement Agency Meeting

Date: April 29, 2020 10am Alaska Time Web Meeting

Attendee	Agency/Company	Present
Greg Albrecht	ADF&G, Habitat Biologist	
Kevin Keith	ADF&G, FERC Hydropower Coordinator	
Rob Morgenthaler	USFS, Special Use Permit Administrator	
Brad Orr	USFS, District Ranger	
Timothy Marshall	USFS, Supervisory Archaeologist, North Zone	
McKenzie Johnson	SHPO, Archaeologist - Review and Compliance	
Sean Eagan	NOAA/NMFS, Hydrologist	
Clint Gundelfinger	DNR, Natural Resource Specialist	
Carl Reese	AK DNR, Southeast Regional Water Manager & Statewide Hydroelectric Specialist	
Douglass Cooper	USFWS, Branch Chief - Ecological Services	
Mark Pipkin	Walking Dog Archaeology, AELP Contractor	
Steve Vorderbruggen	AELP, System Electrical Engineer	
Bryan Farrell	AELP, System Mechanical Engineer	
Christy Yearous	AELP, VP Power Generation, HPMP Coordinator	

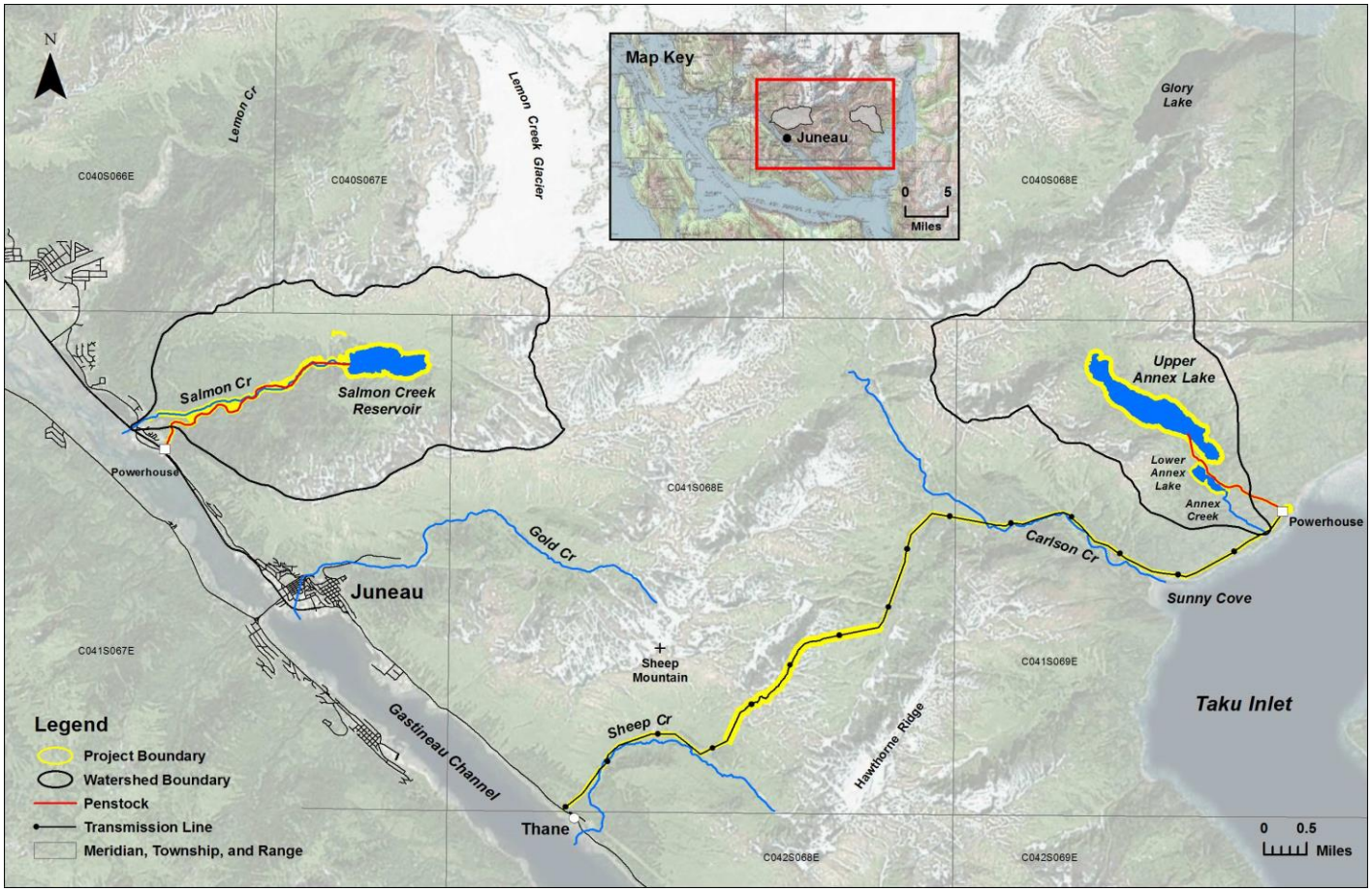
Agenda

1. Introductions
2. Presentation
3. Review of Plans for 2020
    - Impact of COVID-19
    - Wetlands Delineation
    - Engineering & Walk Through with Potential Contractors
    - Submission of FERC License Amendment Application
    - Historical Properties Mitigation Plan
4. General Discussion

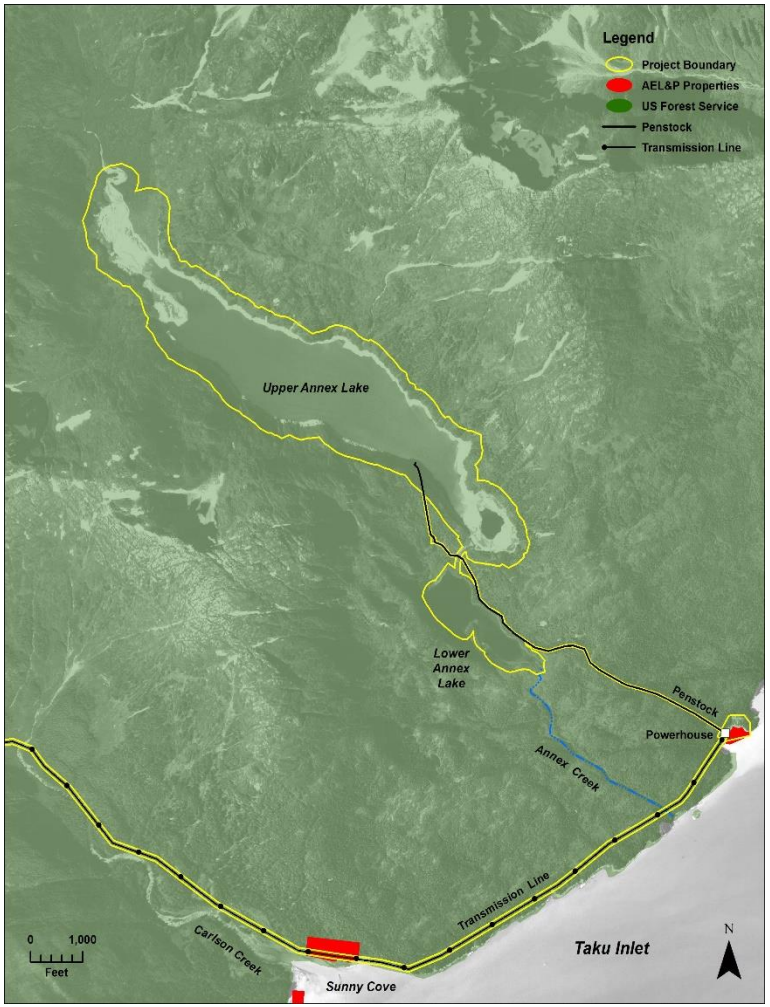
Annex Creek Penstock Replacement – Agency Meeting

April 29, 2020

Site Location



Site Overview



- The yellow lines are the FERC Project Boundary (Exhibit G)
- Red areas are private properties (AELP)
- All surrounding lands are Tongass National Forest

Annex Creek Project History

Date	Event
1915–1916	Annex Creek Hydroelectric Project constructed by Alaska Gastineau Mining Company.
1918	Joint Final Power Permit for Annex Creek and Salmon Creek issued to Alaska Gastineau Mining Company by Departments of Agriculture and Interior.
1921	Alaska Gastineau Mining Company closes mine and ceases operations.
1933	Alaska Juneau Mining Company buys Alaska Gastineau Mining Company and its hydro projects.
1935	Annex Creek Dam destroyed.
1936	Annex Creek Dam rebuilt.
1944	Alaska Juneau mine closes; AJ Industries continues to operate hydro projects.
1963	Federal Power Commission (FPC) issues license for Salmon Creek and Annex Creek to AJ Industries.
1967	Annex Creek Dam replaced.
1973	AEL&P buys assets of AJ Industries including Annex Creek and Salmon Creek Projects. FPC license transferred from AJ Industries to AEL&P.
1988	New FERC license issued to AEL&P for Salmon Creek and Annex Creek Hydroelectric Project. License expired August 2018.
1999	FERC license amended for undergrounding a section of the Annex Creek transmission line. Work completed in 2001.
2003	FERC license amended to clarify the project description regarding the small saddle dam at the Annex Creek Development.
2014	FERC license amended and work completed on extension of the underground portion of the Annex Creek transmission line by 0.3 miles.
2018	New FERC license issued to AEL&P for Salmon Creek and Annex Creek Hydroelectric Project. License expires August 2058.

AEL&P since 1893 ALASKA ELECTRIC LIGHT & POWER CO.

Project Facilities

- Dam

- Valvehouse (Replaced 2014)

- Penstock

Project Facilities

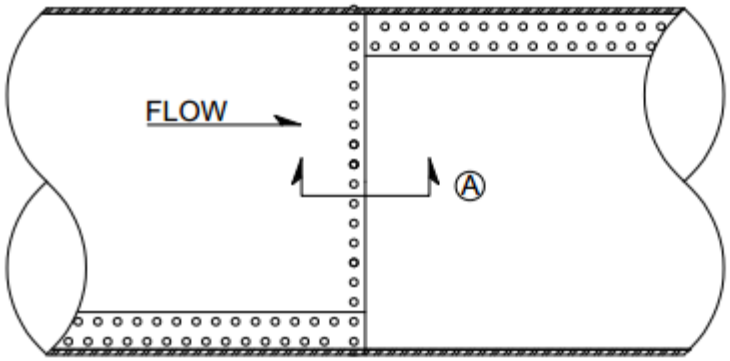
- Camp
  - Powerhouse, Caretaker's House, Employee's House, Blacksmith Shop, Hilton, Welding Shop, Boat House, Switchyard

- Transmission Line

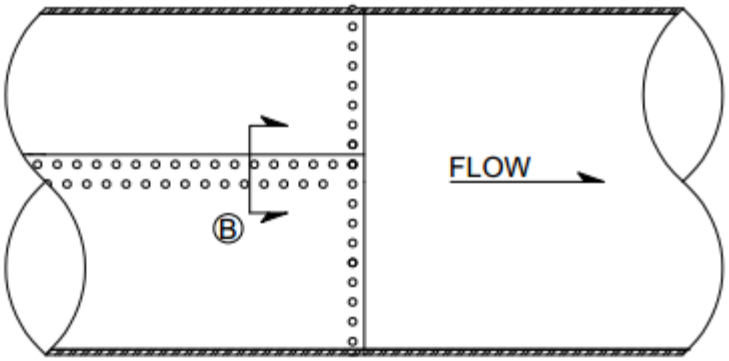
Why are we doing this?

Late spring 2017 plant was offline for 6 weeks for work on the tailrace, during that time several leaks were noted in the penstock.

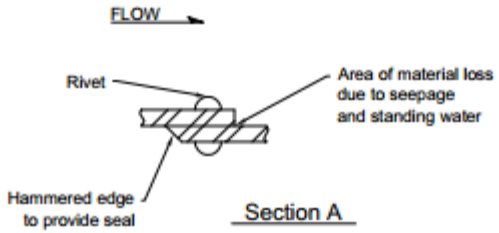
Failure Mode

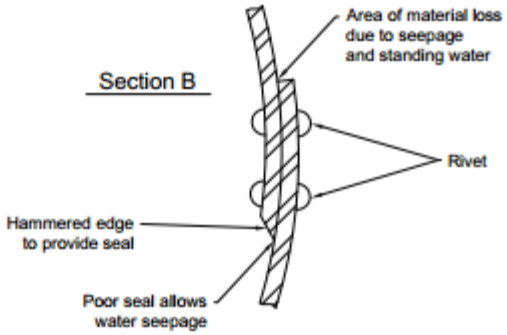


PLAN



PROFILE





Options

- Temporary
  - Paint
    - Condition of pipe too rusty and so fragile that surface prep could case more damage.
    - Very temporary
  - Wrap pipe with Fiber Reinforced Polymer tape
    - Would require extensive hand work, to allow tape to go all around pipe.
    - Would require crews and equipment on site for months.
    - Exposure to UV degrades product
  - Weld repair
    - Requires surface prep which could case more damage.
    - Pipe must be dewatered which increases movement/damage.
    - Provides most robust temporary repair.
- Permanent
  - Replace Penstock
  - Install a liner in the existing penstock
    - Reduces inside diameter which would significantly reduce the power output of the project

Weld Repairs

Annex Creek Project

1915

Present

Construction – Typical Disturbance

Construction – Across Lower Lake

Construction – Near Valvehouse

Construction – Penstock Bridge

Present Condition

Challenges

Tides – Low Tide March 2009

General Work Plan

- Will use existing camp facilities to support contractor crews as much as possible, extra personnel may commute to Juneau.
- Due to poor site access, most work will be accomplished with the assistance of helicopters.
- Will use the existing penstock alignment. The new penstock will be surface mount like the existing penstock.
- Will be removing overburden but will remain within the project boundary as much as possible and within the previously disturbed area.
- The existing penstock will be removed from site to keep the Project Boundary clear for future brushing as required by FERC.
- Power and communication will be run from the powerhouse to the valvehouse to allow for additional monitoring at the valvehouse and an automated valve to be installed to provide penstock break detection.
- The new penstock will be welded steel construction, coated inside and out, the outside color will be selected in conjunction with the USFS.

General Work Plan

- Phase 1
  - Close and lock penstock valve, put clearance in place. Dewater penstock.
  - Mobilize ground crews to start cutting penstock into lengths. Use an A-star to move their equipment between locations.
  - Mobilize a heavy lift helicopter to remove penstock pieces to a barge moored offshore. When complete, place 6-7 small excavators along the penstock alignment for Phase 2.
- Phase 2
  - Ground crews use excavators to clear grass and overburden back to rock surface.
  - Prep penstock support locations with prefabricated components slung into place by A-star.
  - Construct new penstock bridge.
  - Expand valvehouse to accommodate a new automated penstock valve directly downstream of existing gate valve.

General Work Plan

- Phase 3
  - Mobilize heavy lift helicopter to sling new penstock pieces from barge moored offshore into place on supports constructed.
- Phase 4
  - Penstock assembly
    - Welding & inspection crew
    - Painting crew
    - Ground crew anchoring penstock to supports.
- Phase 5
  - Testing of new penstock
  - Demob and return plant to service.

Environmental Effects – Page 1

Resource	Potential Effects	Proposed Measures
Geology and Soils	This will be ground disturbing work, there will be the possibility of erosion.	AELP will prepare an Erosion Control Plan which will be followed during construction.
Water Resources	The duration of the project will be 6 months, during that time it is likely that Upper Annex Lake will spill. This is a normal activity which should have no effect. The Annex Creek camp facility uses penstock water as the raw water supply, this will not be available.	During construction, water will be taken from Lower Annex Creek for use in the camp facilities. The existing water treatment system will be used in the powerhouse.
Fish and Aquatic Resources	Studies performed in 2012 confirmed Brook Trout presence in both Upper and Lower Annex Lake. The Upper penstock section follows the shoreline of Annex Lake so there could be the possibility of runoff entering the Lower Lake.	AELP will prepare an Erosion Control Plan which will be followed during construction.
Wildlife and Botanical Resources	The project area is frequented by Black Bears, the possibility of human-bear encounters during construction are high. In 2014, the penstock corridor was surveyed for non-native, rare and invasive plants. None were found.	AELP will prepare a Bear Safety Plan which will be followed during construction. All construction personnel will receive training on the plan. As a condition of the 2018 FERC License, AELP prepared an Invasive Plant Management Plan in consultation with the agencies. This plan will be followed during construction.
Wetlands, Riparian, and Littoral Habitat	The project area has not had a specific wetland delineation. However, the National Wetland Inventory (NWI) shows wetlands adjacent to the project area.	AELP will complete a wetland delineation for the penstock corridor during the 2020 field season.

Environmental Effects – Page 2

Rare, Threatened and Endangered Species	In 2015, AELP consulted with the USFWS regarding threatened or endangered species in the overall Project Area. To obtain a new license, in 2014 AELP completed a Goshawk survey of the penstock corridor, which resulted in no indication of presence. The 2014 botanical survey discussed with invasive plants, included rare plants, no rare plant species were found in the penstock corridor. This project will involve increased barge traffic to the site. Occasionally there are humpback whales and stellar sea lions (no identified haul-outs) in the Taku Inlet. The number of trips is projected to be less than ten and will be spread out over the duration of the project.	No actions are proposed by AELP.
Land Use, Recreation, Aesthetics	This project will allow the land to continue to be used for hydroelectric generation. After the project, the land use will remain the same as it is currently. Presently, there the only access to Upper Annex Lake is by walking on top of the existing penstock and is limited to project and agency personnel. With this project, there is potential for new recreational access but that conflicts with the industrial nature of the project. During the project, the entire penstock corridor, 40’ in width will be disturbed. This will be visible from both the land and air. After construction, AELP will allow native plants to establish and resume normal brushing activities.	No actions are proposed by AELP.

Environmental Effects – Page 3

Historic and Cultural Resources	As part of the license application submitted in 2016, a complete survey of the penstock corridor for historic and cultural resources was completed. A condition of the 2018 license was development of a Historic Properties Management Plan (HPMP) which addresses the identified resources and establishes protocols for routine and non-routine activities which could impact those resources. The penstock replacement will impact two historic properties, the Annex Creek penstock (JUN-1101) and the penstock bridge (JUN-1102). Both will be replaced with modern equivalents constructed out of steel. During construction, there is the possibility of discovery of human remains or unanticipated discovery of historic or cultural resources.	AELP has contracted with Walking Dog Archaeology to complete a Determination of Effect and develop a Mitigation Plan in conjunction with the SHPO and USFS. Construction will be supervised by the AELP HPMP Coordinator and a Qualified Professional. All construction personnel will receive training on the Historic Properties Management Plan.
Socio-economic Resources	Project construction will result in additional local spending and jobs for the region. Long term, this project will allow operation of the Annex Creek Component to continue to supply hydroelectric power to the community of Juneau as it currently does.	No actions are proposed by AELP.

Plans for 2020

- Wetlands Delineation (Kai Environmental)
- Continued Engineering (McMillen Jacbobs)
- Site Visit with Prospective Contractors
- Historical Properties Mitigation Plan and Mitigation Efforts (Walking Dog Archaeology)
- FERC Amendment

Plans for 2021

- Finish engineering
- Finish Historical Properties Mitigation
- Order penstock for delivery
- Get contracts in place with key contractors

Plans for 2022

- May 2022 – Start Project
- November 2022 – Finish Project

p: 907.780.2222 • f: 907.780.3571 • 5601 Tonsgard Ct. • Juneau, AK 99801

Annex Creek Penstock Replacement Agency Meeting - Minutes

Attendee	Agency/Company
Greg Albrecht	ADF&G, Habitat Biologist
Kevin Keith	ADF&G, FERC Hydropower Coordinator
Rob Morgenthaler	USFS, Special Use Permit Administrator
Brad Orr	USFS, District Ranger
Timothy Marshall	USFS, Supervisory Archaeologist, North Zone
Don MacDougall	USFS, Wilderness Ranger
McKenzie Johnson	SHPO, Archaeologist - Review and Compliance
Sean Eagan	NOAA/NMFS, Hydrologist
Clint Gundelfinger	DNR, Natural Resource Specialist
Carl Reese	AK DNR, Southeast Regional Water Manager & Statewide Hydroelectric Specialist
Mark Pipkin	Walking Dog Archaeology, AELP Contractor
Steve Vorderbruggen	AELP, System Electrical Engineer
Bryan Farrell	AELP, System Mechanical Engineer
Christy Yearous	AELP, VP Power Generation, HPMP Coordinator

Christy Yearous opened the meeting at 10am with an introduction and a request for all participants to give a brief introduction.

After introductions, Christy Yearous gave a PowerPoint presentation which reviewed the Annex Creek Component location, history and project features. The presentation also included information on the penstock failure modes, the options considered for repair/replacement and an outline of the work plan.

The penstock will be replaced with a modern welded steel penstock located above ground on supports founded on the original shot rock base. Heavy lift helicopters will be used for removal of the existing pipe, setting equipment and installation of the new pipe.

The work scope for 2020 was discussed. A wetlands delineation of the penstock corridor has been contracted to Kai Environmental. This has been delayed to later in the summer due to COVID-19 procedures. All AELP generation facilities are critical energy infrastructure and access to site is currently limited to essential personnel only.

Engineering will be continued in 2020 and there will be a project walk-through with prospective contractors to determine best practices to ensure maximum safety, minimize ground disturbance and complete the project on schedule.

A focus will be Historic Properties; both the Penstock and Penstock Bridge are independently eligible for inclusion in the National Register of Historic Places as well as being contributing elements to the Historic District. The Finding of Effect completed by Walking Dog Archaeology has found that this project will have an adverse effect on both.

AELP also intends to submit a FERC license application in 2020, one portion of that is Exhibit E which was distributed on April 15, 2020 to meeting participants.

Christy opened the meeting up for general discussion and initial comments from participants.

Tim Marshall asked if it could be possible that the proposed work could impact any other historic properties and if AELP had any future work plans which could impact other historic properties.

Mark Pipkin responded that the Penstock and Penstock Bridge would both be impacted, and that two other items have components located in the project area. Those are the original locomotive track and aerial tramway used during construction. Components of those features are still located in the project area but are not intact and it was determined that they were not eligible for inclusion in the National Register.

Christy added that in the future AELP is planning to rewind the Annex Creek generators, the plan would be to remove the frames and windings from site to perform the work and then return the new windings on the original frame. This would be a direct replacement only noticeable by electrical personnel since the frame is the outside portion of the generator and most visible. The generators were last rewound in 1977.

Tim asked what monitoring activities would be performed during construction. Mark Pipkin responded that due to the prior surveys being completed and lack of other historic properties in the area being disturbed that little monitoring would be required. Christy added that all personnel working on the project will be trained on the Historic Properties Management Plan, which includes procedures for inadvertent discovery of both historic and cultural resources as well as human remains. Christy added that AELP personnel would be providing monitoring and that Mark would be available if any questions arose during construction.

McKenzie Johnson said that the SHPO would like to see an overall discussion of the Historic District incorporated into the Mitigation Plan, to identify which elements of the district will remain and discuss if/when the district could lose the necessary criteria for inclusion into the National Register and what could be done to prevent that from occurring.

Christy responded that the “historic feeling” of the project is really held together by the Caretaker’s House, Employee’s House and Powerhouse and to a lesser extent the Blacksmith Shop in the camp area. Those structures are original and create the overall feeling of Annex Creek. Mark added that the Tunnel which is another original feature will not be impacted, it is independently eligible under Criteria C. It was the first lake tap for power generation in the United States.

Rob Morgenthaler asked what the intention was in the steep sections, would the penstock be similar to existing with stairs on top for access. Christy replied that yes, the plan as it currently stands does not involve doing any significant blasting in the steep section so the penstock would be similar to existing. The only modification would be if the USFS requests a new recreational trail, in that case a stairway may have to be constructed next to the penstock instead of on top of the penstock. Rob replied that this could be a future consideration but isn't likely since the primary land use in the area is hydroelectric generation.

Rob asked about clearing of trees, and if that effort would be significant. Christy responded that the project boundary is 40' in the penstock corridor and currently AELP doesn't keep all 40' cleared. In some locations it may be necessary to clear additional ground out to the 40' project boundary width. Rob asked about the quantity of trees. Christy replied that currently AELP didn't have a good estimate, but identification of areas where additional tree clearing is needed will be added to the work list for the 2020 field season. Rob said that federal rules exist for any trees removed from federal property and that the USFS would work with AELP to come up with a plan.

There was a discussion about increased boat traffic in the Taku Inlet, Christy commented that for portions of the project some of the crew may commute daily to Juneau and barges would be required for many of the project activities. Sean Eagan said that he would follow up with NMFS Protected Resources. Christy said that she would send Sean an e-mail with a quick estimate of type and quantity of boat/barge traffic needed to support the project.

Christy asked about the possibility of a site visit. Several people responded that they would like to see the project area. Christy said that she would reach out to the group at the end of May to see how COVID-19 rules have changed for everyone, to see if a site visit could be scheduled. The annual FERC operational inspection is currently scheduled for mid-July.

Mark asked if anyone would be interested in discussing the Historic Properties Mitigation Plan, Tim responded affirmatively. Mark said that he would reach out to both Tim and McKenzie and he asked if John Wachtel was still with the NPS. McKenzie confirmed that he was. Mark stated that HAER documentation would be included as well as a discussion about the overall condition and future care of the historic district as requested earlier by McKenzie. Christy added that one of the items that she and Mark had been discussing would be to relocate a section of penstock to an area accessible to the public near Sheep Creek where an interpretive sign could be included and perhaps a bench. Tim said that could be good mitigation and McKenzie agreed that it may be suitable. McKenzie would like to see a draft Mitigation Plan for comment.

Christy asked if comments on Exhibit E could reasonably be received in 30 days given the present unusual work environment. All present commented that they thought that was possible. Christy thanked everyone and said she would look for comments by the end of May.

Rob thanked AELP for planning early and the meeting ended at 11:13am.

Minutes taken by Christy Yearous.

From: Sean Eagan - NOAA Federal <sean.eagan@noaa.gov>
Sent: Thursday, April 30, 2020 9:40 AM
To: Christy Yearous
Subject: ** EXTERNAL ** Re: Minutes from Agency Meeting

Christy,

Those minutes look good. I reached out to Aleria Jensen about the boat traffic and I'm going to
talk with her probably tomorrow.

Sean

On Thu, Apr 30, 2020 at 8:12 AM Christy Yearous <Christy.Yearous@aelp.com> wrote:
Attached are minutes taken for the meeting yesterday, please let me know if you have any comments
or questions. I don’t have an e-mail for Don MacDougall with the USFS, would someone please forward
these to him?

Thank you all for attending yesterday and for the good discussion. While this project will be very visible
in the short term, it will allow Annex Creek to keep generating power for hopefully another 100 years!

Thanks again,
Christy

--
Sean Eagan
Hydrologist
NOAA - National Marine Fisheries Service

P.O. Box 21668
709 W. 9th Street
Juneau, Alaska 99802-1668

907-586-7345
FAX: 907- 586-7358

From: Johnson, McKenzie S (DNR) <mckenzie.johnson@alaska.gov>
Sent: Friday, May 22, 2020 9:49 AM
To: Christy Yearous
Subject: ** EXTERNAL ** Re: Annex Creek Penstock - Determination of Effect

Hi Christy, I have not forgotten about this. We obviously will be concurring it is an adverse
effect, but I expect I won't be able to get an answer out until tuesday!

Mckenzie S. Johnson
Archaeologist I - Review and Compliance
Alaska State Historic Preservation Office (AKSHPO)/Office of History and Archaeology (OHA)
550 W. 7th Ave, Suite 1310
Anchorage, AK 99507
mckenzie.johnson@alaska.gov
Currently working out of office, e-mail correspondence is best to reach me.

From: DNR, Parks OHA Review Compliance (DNR sponsored) <oha.revcomp@alaska.gov>
Sent: Friday, April 24, 2020 11:24 AM
To: Christy Yearous <Christy.Yearous@aelp.com>; DNR, Parks OHA Review Compliance (DNR sponsored)
<oha.revcomp@alaska.gov>
Cc: Johnson, McKenzie S (DNR) <mckenzie.johnson@alaska.gov>; Morgenthaler, Rob -FS <rob.morgenthaler@usda.gov>
Subject: RE: Annex Creek Penstock - Determination of Effect

Good morning,
The Office of History and Archaeology/Alaska State Historic Preservation Office received your
documentation and its review has been assigned to Mckenzie Johnson as ID No: 2020-00513. We may
contact you if we require additional information. Our office ordinarily has 30 calendar days after receipt
to complete our review, but our office has entered tolling in response to complications from COVID-19
and our review may be delayed as a result. Please contact the project reviewer or myself by email if you
have any questions or concerns.
Best,
Sarah Meitl

Review and Compliance Coordinator
Alaska State Historic Preservation Office
Office of History and Archaeology

550 W. 7th Avenue, Suite 1310
Anchorage, AK 99501-3561
Office: 907-269-8720

Teleworking - Email is best method of communication.

From: Christy Yearous <Christy.Yearous@aelp.com>
Sent: Thursday, April 23, 2020 1:53 PM
To: DNR, Parks OHA Review Compliance (DNR sponsored) <oha.revcomp@alaska.gov>
Cc: Johnson, McKenzie S (DNR) <mckenzie.johnson@alaska.gov>; Morgenthaler, Rob -FS <rob.morgenthaler@usda.gov>
Subject: Annex Creek Penstock - Determination of Effect

I apologize for the delay, attached is the Determination of Effect for the replacement of the Annex Creek penstock (JUN-1101) and penstock bridge (JUN-1102). The HPMP allows for a 30 day review period, so please provide any comments to me by May 25, 2020. In the meantime, I have asked Walking Dog to start working on a Mitigation Plan which we anticipate will include HAER documentation for both historic properties which will be effected. I look forward to talking with you both next week at the agency meeting on 4/29 at 10am.

Thanks,
Christy Yearous
HPMP Coordinator
AELP

From: Keith, Kevin D (DFG) <kevin.keith@alaska.gov>
Sent: Friday, May 29, 2020 11:32 AM
To: Christy Yearous
Cc: Albrecht, Gregory T (DFG)
Subject: ** EXTERNAL ** ADF&G comments on proposed Annex Creek penstock replacement

Hello Christy-

Thank you for sending along the minutes from last month's meeting to discuss AELP's plans to replace the penstock for the Annex Creek Hydropower project. ADF&G is supportive of the project, and we feel that the Plans you have proposed address the concerns we have.

ADF&G is concerned that the project could increase sedimentation into Annex Creek; increased sedimentation can have a negative impact on aquatic resources. We are therefore very supportive of your proposal to put together a Sediment and Erosion Control Plan. We would like the opportunity to review the Sediment and Erosion Control Plan before it is finalized by FERC.

Bear safety (both the safety of the workers AND the safety of the bears) is also a concern of ours. We would like the opportunity to review the Bear Safety Plan before it is finalized with FERC.

Please let me know if there's anything else I can do or if you have any questions.

-Kevin

Kevin D. Keith
FERC Hydropower Coordinator
Instream Flow Program
Alaska Department of Fish & Game

907-267-2836

From: Christy Yearous <Christy.Yearous@aelp.com>
Sent: Thursday, April 30, 2020 8:12 AM
To: Morgenthaler, Rob -FS <rob.morgenthaler@usda.gov>; Orr, Brad -FS <brad.orr@usda.gov>; Marshall, Timothy P -FS <timothy.marshall@usda.gov>; Johnson, McKenzie S (DNR) <mckenzie.johnson@alaska.gov>; Sean Eagan - NOAA Federal <sean.eagan@noaa.gov>; Keith, Kevin D (DFG) <kevin.keith@alaska.gov>; Albrecht, Gregory T (DFG)

<greg.albrecht@alaska.gov>; Reese, Carl D
(DNR) <carl.reese@alaska.gov>; Gundelfinger, Clint E (DNR)
<clint.gundelfinger@alaska.gov>;
douglass_cooper@fws.gov
Cc: Steve Vorderbruggen <Steve.Vorderbruggen@aelp.com>; Bryan Farrell
<Bryan.Farrell@aelp.com>;
Mark Pipkin <walkdog@alaskan.com>
Subject: Minutes from Agency Meeting

Attached are minutes taken for the meeting yesterday, please let me know if you have any comments or
questions. I don't have an e-mail for Don MacDougall with the USFS, would someone please forward
these to him?

Thank you all for attending yesterday and for the good discussion. While this project will be very visible
in the short term, it will allow Annex Creek to keep generating power for hopefully another 100 years!

Thanks again,
Christy

This page intentionally left blank.

APPENDIX C –
EXHIBIT E: ENVIRONMENTAL REPORT

This page intentionally left blank.

Exhibit E- Environmental Report

Annex Creek Development

Annex Creek/Salmon Creek Hydroelectric Project

(FERC Project No. 2307)

Alaska Electric Light and Power Company
Juneau, Alaska

July 2020

[This page intentionally left blank]

TABLE OF CONTENTS

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

A	ampere
AAC	Alaska Administrative Code
ACHP	Advisory Council on Historic Preservation
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AEL&P	Alaska Electric Light and Power
AHRS	Alaska Heritage Resources Survey
AJ Industries	Alaska Juneau Gold Mining Company
AKEPIC	Alaska Exotic Plants Information Clearing House
AKNHP	Alaska Natural Heritage Program
ANHP	Alaska Natural Heritage Program
APE	Area of Potential Effects
BMP	Best Management Practice
CBJ	City and Borough of Juneau
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission (FERC)
CWA	Clean Water Act
DBH	diameter at breast height
DIPAC	Douglas Island Pink and Chum, Inc.
EAP	Emergency Action Plan
EFH	Essential Fish Habitat
Ecology	Washington State Department of Ecology
EFHA	EFH Areas Protected from Fishing
EIS	Environmental Impact Statement
El.	Elevation
EPA	U.S. Environmental Protection Agency

ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission (or Commission)
FLPMA	Federal Land Policy and Management Act
FPA	Federal Power Act
FPC	Federal Power Commission
FSM	Forest Service Manual
GMU	Game Management Unit
GWh	gigawatt hour
HAPC	Habitat Areas of Particular Concern
hp	horsepower
HPMP	Historic Properties Management Plan
km	kilometer
kV	kilovolt
kVA	kilovolt ampere
kW	kilowatt
KWh	kilowatt hour
LSCD	Lower Salmon Creek Datum
LUD	Land Use Designation
m	meter
MBTA	Migratory Bird Treaty Act
MCL	maximum contamination level
mg/L	milligrams per liter
MIS	Management Indicator Species
MLLW	Mean Lower Low Water
mm	millimeter
MSL	Mean Sea Level
MVA	megvolt ampere
MW	megawatt
MWh	megawatt hour

NAGPRA	Native American Graves and Repatriation Act of 1990
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA, National Marine Fisheries Service
NOI	Notice of Intent
NPS	National Park Service
NRHP	National Register of Historic Places (or National Register)
NSRAA	Northern Southeast Regional Aquaculture Association
NTU	nephelometric turbidity units
NWI	National Wetland Inventory
O&M	operations and maintenance
OHA	Alaska Department of Natural Resources/Office of History & Archaeology
PAD	Pre-Application Document
PCE	Power Cost Equalization
pF	picofarad
PM&Es	protection, mitigation, and enhancement measures
Project	Annex Creek/Salmon Creek Hydroelectric Project
rpm	revolutions per minute
RTE	rare, threatened, or endangered
SCADA	Supervisory Control and Data Acquisition (system)
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SHPO	State Historic Preservation Office
TLP	Traditional Licensing Process
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCD	Upper Salmon Creek Datum

USDA	U.S. Department of Agriculture
USFS	U.S. Department of Agriculture, Forest Service
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
V	volt
VOC	volatile organic chemicals

1. APPLICATION

1.1. Introduction

The Annex Creek/Salmon Creek Hydroelectric Project, FERC Project 2307 (Project), is located in a mountainous region of Southeast Alaska in the City and Borough of Juneau (CBJ). The Project consists of two geographically separate developments: Annex Creek and Salmon Creek (Figure 1-1). Alaska Electric Light and Power (AEL&P) owns and operates the Project for power production through the current operating license granted by the Federal Energy Regulatory Commission (FERC, or Commission). AEL&P, an investor-owned utility, also accommodates public interests in the recreational use of Project facilities.

AEL&P was issued a new 40-year license for the Project effective August 31, 2018. AEL&P diligently followed FERC's consultation and study development regulations when preparing the Application for New License filed with FERC in August 2016. Study plans were developed and studies were conducted between 2012 and 2015. In February 2016, AEL&P distributed its Draft License Application and began the process of incorporating agency comments and recommendations into the application for final filing. Comments were received from FERC, the National Park Service (NPS), and the Alaska Department of Fish and Game (ADF&G).

At the time the Final Application for new license was submitted to FERC in August 2016, the condition of the Annex Creek penstock was fair and replacement was outside of the 10-year planning term for AEL&P. However, in the summer of 2017 several leaks occurred in the upper section of penstock which were repaired by welding patches on the pipe. No new leaks have occurred since 2017 but thickness testing and additional assessments performed as part of the repair process indicate that the penstock condition is worse than previously thought and replacement is necessary.

This report used the information presented in the Application for New License submitted in August 2016 to prepare this Exhibit, with a focus on the penstock corridor which is the portion of the Project which will be impacted by the proposed action.

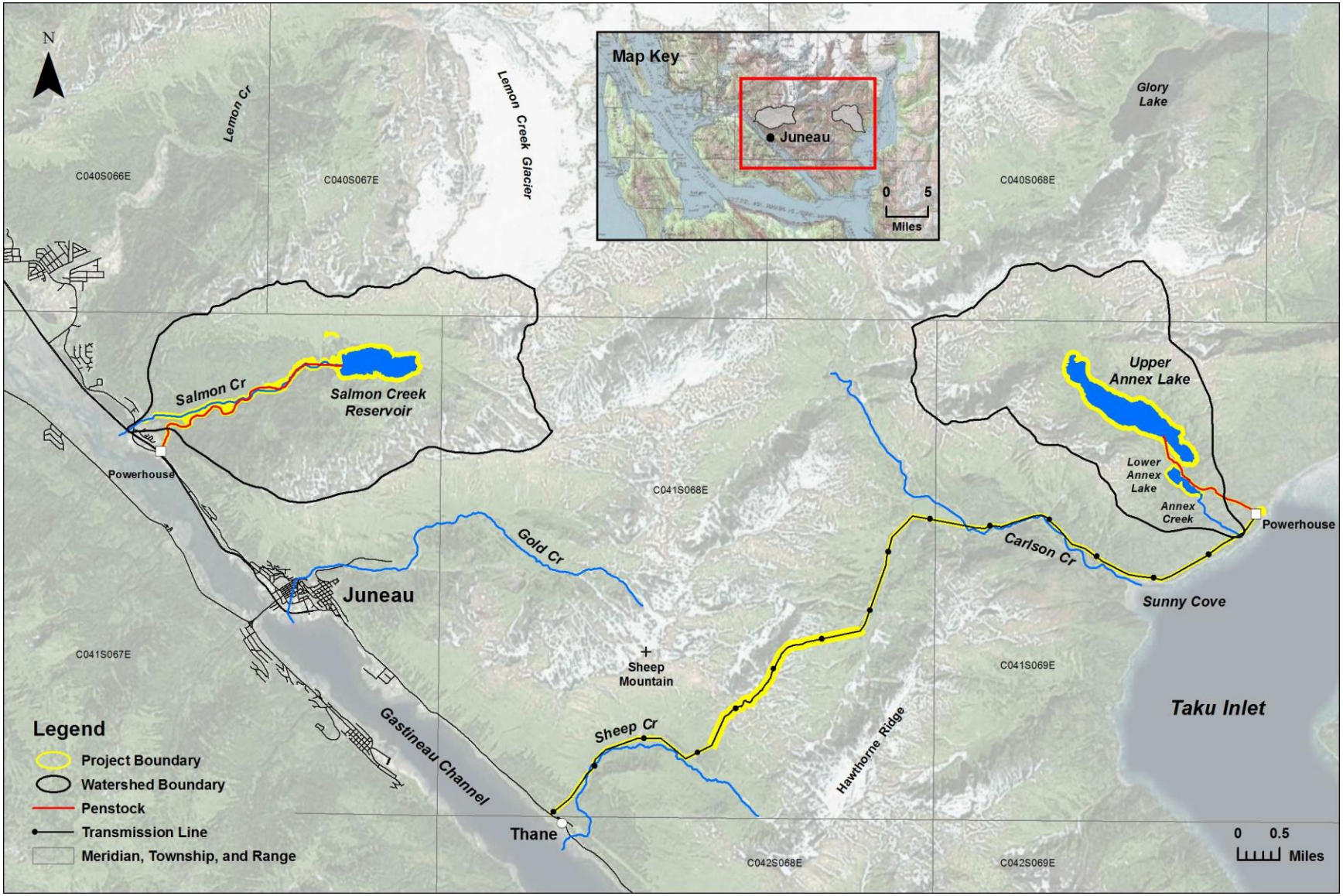


Figure 1-1. Project vicinity

1.2. Background on AEL&P and the Annex Creek and Salmon Creek Developments

In the summer of 1894, AEL&P was organized and began to generate and distribute electricity produced from the waters of Gold Creek to residences and small businesses in Juneau. As Juneau grew, the use of electricity increased, and steam generation facilities were added to the system. The mining companies in the Juneau area also built their own private generating facilities, most of which were hydroelectric.

Between 1912 and 1915, the Gastineau Mining Company constructed first the Salmon Creek and then the Annex Creek (Figure 1-2) facilities. By 1936, all the mining companies and their electrical generating facilities in the Juneau area had been amalgamated into the Alaska Juneau Gold Mining Company (AJ Industries). As AEL&P's load continued to grow, it met its additional energy requirements with power purchased from AJ Industries. When the mines were permanently closed in 1944, AEL&P became the sole purchaser of AJ Industries' hydroelectric energy. In 1963, the Federal Power Commission (FPC) issued a license to AJ Industries for continued operation of the Project on the condition that both the Annex Creek and Salmon Creek dams be rehabilitated. In 1973, AEL&P purchased AJ Industries' hydroelectric generating facilities and transmission system (the existing Project facilities), and the operating license was transferred to AEL&P. AEL&P applied for a new license for the Project in 1985, and FERC issued a 30-year license in 1988. AEL&P applied for a new license for the Project in 2016, and FERC issued a 40-year license in 2018. AEL&P is continuing to operate the project as licensed by FERC. Table 1-2 summarizes important milestones in the history of the Annex Creek Development.

Figure 1-2. Annex Creek Powerhouse, 1916

Table 1-1. Milestones in the history of the Annex Creek and Salmon Creek Developments

Date	Event
1887	First Juneau area hydroelectric facility constructed by Treadwell Mining Co.
1894	AEL&P founded by Willis Thorp, F. D. Kelsey, and B. M. Smith.
1894	Gold Creek Hydroelectric Project constructed by AEL&P.
1896	AEL&P purchased by J.P. Corbus, A.W. Corbus, J.F. Malony, and R. Duncan.
1911	Alaska Gastineau Mining Company organized by Bart Thane.
1912–1914	Salmon Creek Hydroelectric Project constructed by Alaska Gastineau Mining Company.
1915	Department of Agriculture issues permit to construct Salmon Creek and Annex Creek facilities.
1915–1916	Annex Creek Hydroelectric Project constructed by Alaska Gastineau Mining Company.
1918	Joint Final Power Permit for Annex Creek and Salmon Creek issued to Alaska Gastineau Mining Company by Departments of Agriculture and Interior.
1921	Alaska Gastineau Mining Company closes mine and ceases operations.
1922	Lower Salmon Creek Powerhouse burns down.
1933	Alaska Juneau Mining Company buys Alaska Gastineau Mining Company and its hydro projects.
1934	Lower Salmon Creek Powerhouse rebuilt.
1935	Annex Creek Dam destroyed.
1936	Annex Creek Dam rebuilt.
1938–1941	Rehabilitation work on Salmon Creek Dam.
1944	Alaska Juneau mine closes; AJ Industries continues to operate hydro projects.
1963	Federal Power Commission (FPC) issues license for Salmon Creek and Annex Creek to AJ Industries.
1967	Major rehabilitation of Salmon Creek Dam.
1967	Annex Creek Dam replaced.
1973	AEL&P buys assets of AJ Industries including Annex Creek and Salmon Creek Projects. FPC license transferred from AJ Industries to AEL&P.
1983	FERC license amended to construct new penstock and rehabilitate old Lower Salmon Creek Powerhouse.
1984	FERC license amended to construct new penstock and new powerhouse at Lower Salmon Creek.
1984	FERC license amended to restrict maximum operating level of Salmon Creek Reservoir to elevation 1,140 feet USCD (1,174.85 feet Mean Sea Level [MSL]) to mitigate concerns of dam stability under full water conditions.
1985	Construction of City and Borough of Juneau (CBJ) water treatment facility at Salmon Creek.
1988	New FERC license issued to AEL&P for Salmon Creek and Annex Creek Hydroelectric Project. License expires August 2018.
1990	Douglas Island Pink and Chum, Inc. (DIPAC) fish hatchery at Salmon Creek completed.

Date	Event
1998	Upper Salmon Creek Powerhouse decommissioned and 2 miles of transmission lines and two generating units removed. FERC amended license in March 1998.
1999	FERC license amended for undergrounding a section of the Annex Creek transmission line.
2001	Burying of approximately 1 mile of Annex Creek transmission line completed.
2003	FERC license amended to clarify the Project description regarding the small saddle dam at the Annex Creek Development.
March 2013	AEL&P initiates the relicensing process with Notice of Intent (NOI) to file for a new license and Pre-Application Document (PAD).
September 2014	Extension of the underground portion of the Annex Creek transmission line by 0.3 miles. FERC amended license in May 2014.
December 2015	FERC license amended to modify stream gage operations and reporting requirements required in License Article 401 and 402. New stream gage installed in April 2016.
January 2016	FERC license amended to revise Project description and annual charges (incorporate Project boundary changes).
February 2016	AEL&P files and distributes Draft License Application to agencies and stakeholders.
August 2016	AEL&P files Final License Application.
February 2018	FERC issues a new 40-year license for the Project.

2. PURPOSE AND NEED OF ACTION AND NEED FOR POWER

2.1. Purpose of Action

The purpose of the Proposed Action is to replace the Annex Creek penstock which has reached the end of life. The penstock must be replaced to ensure safe and reliable operation of the project for the remainder of the project license. If the penstock is not replaced, small scale weld repair will be possible for a short period of time, after which the project would have to cease operation.

This Environmental Report, Exhibit E, summarizes the effects associated with replacement of the penstock, and alternatives to the proposed Project. The effects of the No Action Alternative were considered.

2.2. Need of Power

The Project licensee, AEL&P, is a regulated electric utility that serves approximately 17,400 customers in the City and Borough of Juneau, which encompasses an area of 3,255 square-miles and includes Juneau, Douglas Island, and portions of Admiralty Island.

The Annex Creek Hydroelectric Development provides about 6% of Juneau's energy. At this time, all of the constructed hydroelectric resources connected to the Juneau power system are fully loaded, meaning that a loss of 6% of the local energy supply could not be replaced with existing hydroelectric resources. The alternative would be to supply that energy from existing fossil fuel fired generation sources or yet to be constructed hydroelectric sources. In either case the cost/kWH would be significantly higher than the cost of power produced by the Annex Creek Development.

2.3. Project Safety

2.3.1. Annex Creek Development

Due to the fact that the dam on Upper Annex Lake is a low hazard dam, the development was exempted from the requirement for filing an Emergency Action Plan (EAP) by letter dated April 13, 1983. Annually, the circumstances upstream and downstream of the development are inspected and re-evaluated, and FERC is made aware of any changes. To date, no changes have occurred that might endanger life, health, or property; therefore, FERC has extended the EAP exemption (FERC 2015a).

3. PROPOSED ACTION AND ALTERNATIVES

3.1. Existing Project Description

The Project is located in a mountainous region of Southeast Alaska. The Project (P-2307) has two developments: Annex Creek and Salmon Creek. The two developments are physically and electrically separated but are covered under the same FERC license. The penstock replacement will only affect the Annex Creek Development, so this report only focuses on the Annex Creek Development and specifically with the areas of the development which could be impacted by the proposed action. The Annex Creek transmission line and dam are outside of the proposed project area and therefore descriptions are included for information only.

PROJECT ELEVATIONS

All elevation references for the Annex Creek Development reference Mean Sea Level (MSL).

3.1.1. Annex Creek Development

The Annex Creek Development is located in a remote area of the Tongass National Forest and was originally built in 1915–1916. The site can be accessed only via air or water and is typically accessed by AEL&P via helicopter. No roads are included in this development. The penstock serves as a trail between the powerhouse and lakes for maintenance and operations activities. Table 3-1 lists the locations of facilities used or affected by the Project—within and outside of the Project boundary—by township, range, and section in the Copper River Meridian.

Table 3-1. Locations of facilities used or affected by the Project, Annex Creek Development

Facilities used or affected by the Project			Location
Facility	Within Project Boundary	Outside of Project Boundary	
Upper Annex Lake	●		T41S/R69E Sec 4, 5, 8, 9, and 10
Lower Annex Lake	●		T41S/R69E Sec 9, 10, 15, and 16
Annex Creek Dam/Spillway	●		T41S/R69E Sec 9
Intake (Lake Tap)	●		T41S/R69E Sec 9
Tunnel (Power Conduit)	●		T41S/R69E Sec 9
Valvehouse	●		T41S/R69E Sec 9
Penstock	●		T41S/R69E Sec 9, 10, and 15

Facilities used or affected by the Project			Location
Facility	Within Project Boundary	Outside of Project Boundary	
Powerhouse	•		T41S/R69E Sec 15
Tailrace	•		T41S/R69E Sec 15
Transmission Line	•		T41S/R69E Sec 15, 16, 17, 18, and 21
	•		T41S/R68E Sec 13, 23, 24, 26, 27, 32, 33, and 34
Thane Substation		•	T41S/R68E Sec 32

3.1.2. Existing Project Facilities, Annex Creek Development

3.1.2.1. General Configuration

The Annex Creek Development includes two lakes in the Annex Creek drainage: Upper and Lower Annex Lake. Upper Annex Lake, the larger of the two, serves as the reservoir for the Annex Creek Development. A timber buttress dam is located at the outlet of Upper Annex Lake. The dam's spillway discharges into Lower Annex Lake, which is drained by Annex Creek. Annex Creek runs 0.5 miles from the outlet of Lower Annex Lake and flows into Taku Inlet.

An intake (lake tap) in Upper Annex Lake allows water to enter a tunnel (power conduit) and flow to the valvehouse. From the valvehouse, a penstock runs to the powerhouse located on the shore of Taku Inlet. The powerhouse, which contains two turbines, is connected to a transmission line that runs to the Thane Substation on the Juneau road system. Adjacent to the powerhouse is a tailrace that discharges over a weir into Taku Inlet.

3.1.2.2. Dam, Spillway, and Reservoir; Annex Creek Development

Tables 3-2 and 3-3 provide details about the Annex Creek Dam, spillway, and reservoir. The original dam was 15 feet high but was damaged by debris during storms in 1935. In 1936, the dam was redesigned with a larger spillway crest and constructed at the present 20-foot height. In 1967, a major effort was undertaken to rebuild the dam; at that time, treated lumber was used. The Annex Creek Dam (Figure 3-1) is now approximately 20 feet high by 118 feet long at the crest of the dam. The dam's upstream face is composed of 3-inch tongue-and-groove decking over 8-inch by 8-inch horizontal stringers. The stringers are supported by 8-inch by 10-inch beams that rest on 8-inch by 10-inch timber buttress struts. When first installed, the upstream face was protected with an application of coal tar pitch, which has been replaced by treated lumber over the Project's life. The toe of the dam is a concrete curb that provides a watertight seal with the rock foundation.

Table 3-2. Dam and reservoir characteristics, Annex Creek Development

Structural height of dam	20 feet
Length of crest of dam	118 feet
Dam construction	3-inch-thick tongue-and-groove decking over 8-inch by 8-inch horizontal stringers. Stringers are supported by 8-inch by 10-inch beams that rest on 8-inch by 10-inch buttress struts.
Elevation at crest of dam	846 feet (MSL)
Normal reservoir water surface elevation	844.3 feet (MSL)
Maximum reservoir drawdown	139 feet
Normal operating range for annual power production	139 feet
Total reservoir storage	26,000 acre-feet, at reservoir elevation 844.3 feet (MSL)
Usable reservoir storage	23,400 acre-feet, at reservoir elevation 844.3 feet to 705 feet (MSL)
Length of reservoir	1.9 miles
Surface area of reservoir	264 acres, at reservoir elevation 844.3 feet (MSL)
Shoreline length	5 miles (approximate)

Table 3-3. Spillway characteristics, Annex Creek Development

Spillway crest elevation	844.3 feet (MSL)
Dimensions of spillway (constructed of timber decking and bracing)	57 feet
Spillway hydraulic capacity	458 cubic feet per second (cfs)

A 57-foot-long spillway crest, constructed of timber decking, is supported by 8-inch by 8-inch braced timber columns at the center of the dam crest. The total hydraulic capacity of the spillway is approximately 458 cubic feet per second (cfs) with no freeboard on the dam.

A small timber saddle dam 61 feet long is located just west of the main dam. The saddle dam is constructed of 3-inch tongue-and-groove decking supported by 4-inch by 4-inch timber frame braces on 4-foot centers. The crest of the saddle dam is at elevation 848 feet MSL.

Upper Annex Lake has a normal maximum surface area of 264 acres and normal surface elevation of 844.3 feet MSL. The gross storage capacity is 26,000 acre-feet at this elevation. The usable storage capacity is 23,400 acre-feet at reservoir elevation 844.3 feet to 705 feet MSL.

Dam and spillway

Upstream face of dam

Figure 3-1. Annex Creek Dam

3.1.2.3. Intake (Lake Tap), Tunnel (Power Conduit), Valvehouse, and Penstock; Annex Creek Development

Table 3-4 provides details about the Annex Creek power intake and penstock. An intake (lake tap) at Elevation (El.) 690 feet MSL in Upper Annex Lake connects directly with the Annex Creek tunnel, which is 1,433 feet long. Trash racks are not incorporated into the intake in Upper Annex Lake. The tunnel is approximately 8-feet by 8-feet and is unlined at the upstream end for approximately 540 feet, then protected by a 2-inch gunite covering for the next 628 feet. The last 250 feet of the tunnel (approximate) is lined with reinforced concrete. In this last section of tunnel, a transition is made to a 78-inch-diameter conduit section that permits connection to the riveted steel penstock just upstream of the valvehouse. Flow through the tunnel is controlled by a manually operated 42-inch rising stem gate valve in the valvehouse. The valvehouse contains a small battery bank and telemetry equipment for monitoring the pressure at the chamber. This information is reported to the AEL&P Supervisory Control and Data Acquisition (SCADA) system through a radio link and converted to feet of water for monitoring of the water surface elevation.

From the valvehouse, a riveted steel penstock (Figure 3-2) runs to the powerhouse. The penstock is 7,097 feet long and is riveted steel with a diameter varying from 42 inches at the valvehouse to 34 inches at the powerhouse. The pipe thickness varies from 0.25-inch to 0.675-inch. The pipe is supported by wooden trestles. Short sections have been replaced with welded steel pipe due to damage.

Table 3-4. Power intake and penstock characteristics, Annex Creek Development

Lake tap:	
Elevation of invert	690 feet (MSL)
Tunnel structure:	
Size	8-feet by 8-feet
Total length	1,433 feet
Tunnel linings	Unlined 540 feet (from upstream end) 2-inch gunite lining for the next 628 feet Last 250 feet are reinforced concrete lined
Intake conduit:	
Number of intakes	1
Pipe dimensions	78 inch
Penstock:	
Length	7,097 feet
Diameter	Varies from 42 inches to 34 inches
Penstock thickness	Varies from 0.25 to 0.675 inch

During installation

November 2008

Figure 3-2. Annex Creek Penstock, during installation and in 2008

3.1.2.4. Powerhouse and Tailrace, Annex Creek Development

Table 3-5 provides details about the powerhouse and tailrace.

Table 3-5. Powerhouse physical and equipment characteristics, Annex Creek Development

Peak electrical output	Approximately 3,600 kilowatts (kW)
Annual capacity factor	Approximately 50 percent, on average
Powerhouse	
Total length	67 feet
Total height	40 feet
Total width	48 feet
Bridge crane capacity	25 tons (derated to 15 tons)
Normal gross head	819 feet
Turbine elevation	27.15 feet (MSL)
Allis Chalmers Turbine ratings	Two at 2,500 hp at a head of 765 feet, 300 rpm
Authorized Installed Capacity	1,800 kW Unit 5; 1,875 kW Unit 6; 3,675 kW Total
Tailrace:	
Size	8 feet deep by 18 feet wide
Weir crest elevation	17.41 feet (MSL)

The Annex Creek Powerhouse (Figure 3-3) is located directly on Taku Inlet northeast of the mouth of Annex Creek. The powerhouse, approximately 67 feet long by 48 feet wide, has a concrete and wood-framed substructure and a steel frame superstructure with a corrugated metal covering. The floor is at El. 28.56 feet MSL and the height of the powerhouse is approximately 40 feet measured to the top of the roof.

The powerhouse contains two 2,500-horsepower (hp) impulse-type turbines connected to two generator units; one is rated at 1,800 kilowatts (kW) and the other at 2,250 kW[1] (see nameplate information below).

Unit #5
Allis Chalmers Synchronous Generator
No. 106059, 2300 V, 440 A, 300 rpm
Stator rewound in 1967 by General Electric
1800 kW @ 0.8 pF, 2400 V, 440 A

Unit #6
Allis Chalmers Synchronous Generator
No. 106044, 2300 V, 440 A, 300 rpm
Stator & Rotor rewound in 1977 by General Electric
2250 kW @ 0.8 pF, 2400 V, 676 A

[1] The turbine limits the output to 1,875 kW.

The area over the units is equipped with a manually operated 25-ton (derated to 15 tons) overhead bridge crane.

Just upstream of the units, the 34-inch-diameter penstock bifurcates, and an automated turbine shutoff valve is located on each branch, permitting independent operation of the units. A single 34-inch manually operated rising stem gate valve is located just upstream of the bifurcation as a backup. A concrete tailrace, measuring 8 feet deep by 18 feet wide, discharges over a weir into Taku Inlet. The weir crest is at El. 17.41 feet MSL.

Figure 3-3. Annex Creek Powerhouse

3.1.2.5. Primary Transmission Line, Annex Creek Development

A 12.5 miles, 23-kV transmission line runs from the Annex Creek Powerhouse to Thane Substation, which is located on the Juneau road system approximately 4 miles south of downtown Juneau. The majority of the line is overhead and uses a mix of wood and steel lattice-type structures. The majority of the circuit is bare 2/0 copper conductor; steep sections of the line are copper-clad steel conduit conductors. These conductors generate enough heat to help reduce line icing in the winter months. Despite this mode of operation, the overhead transmission lines across Sheep Mountain between Carlson Creek and Sheep Creek are prone to severe icing and weather-related service disruptions.

In 1999, AEL&P buried a 1 mile long section of the transmission line underground, utilizing 34.5-kV rated armored cable along the top of Sheep Mountain. There are four separate 4/0 copper conductors, three that are in use and one installed spare. In 2014, AEL&P extended the underground section of the transmission line another 0.3 miles.

3.1.2.6. Additional Mechanical, Electrical, and Transmission Equipment

There are a number of other facilities included as part of the Annex Creek Development:

- A small switchyard adjacent to the powerhouse with a 4 MegaVolt Ampere (MVA), 2.4 kV-24 kV step-up transformer with a 3-pole, gang-operated disconnect switch on the line side of the transformer.
- Upper and lower helipads.
- Boat building used for boat storage through the winter and a dock crane used for launching the boat in the summer. The crane is also used for unloading and loading Project materials from barges.
- Mooring buoy used for floatplane access.
- Operator's house.
- Crew quarters and bunkhouse.
- Water and wastewater treatment systems.
- Electrical distribution system with standby generator.
- Three storage and workshop buildings.
- Wooden boardwalk to connect the camp facilities.

The remote location of the powerhouse, coupled with its limited means of access (boat, floatplane or helicopter), makes the on-site "camp" facilities an important and frequently used component of Project operations. An operator resides on-site full time.

3.1.3. Existing Project Operation, Annex Creek Development

3.1.3.1. Water Surface Elevation

The Annex Creek Development includes an intake structure (lake tap) and storage reservoir. During the winter months, water is removed from below the ice formed on top of the lake's surface. The typical drawdown is to El. 740 feet MSL. During the late spring, snowmelt starts to refill the reservoir and precipitation through the summer and fall refills the lake to the maximum elevation of 844.3 feet MSL. During a typical year, the lake fills by the end of September and water is spilled into Lower Annex Lake and Annex Creek.

Figure 3-4 shows the water surface elevations of Upper Annex Lake for water years 2018, 2019 and water year to date 2020. The bottom line shows the rule curve, or recommended operation of the reservoir to ensure that it fills back to the maximum operating level each fall for a normal water year. The reservoir typically reaches a minimum elevation around early May and then snowmelt starts to fill the reservoir.

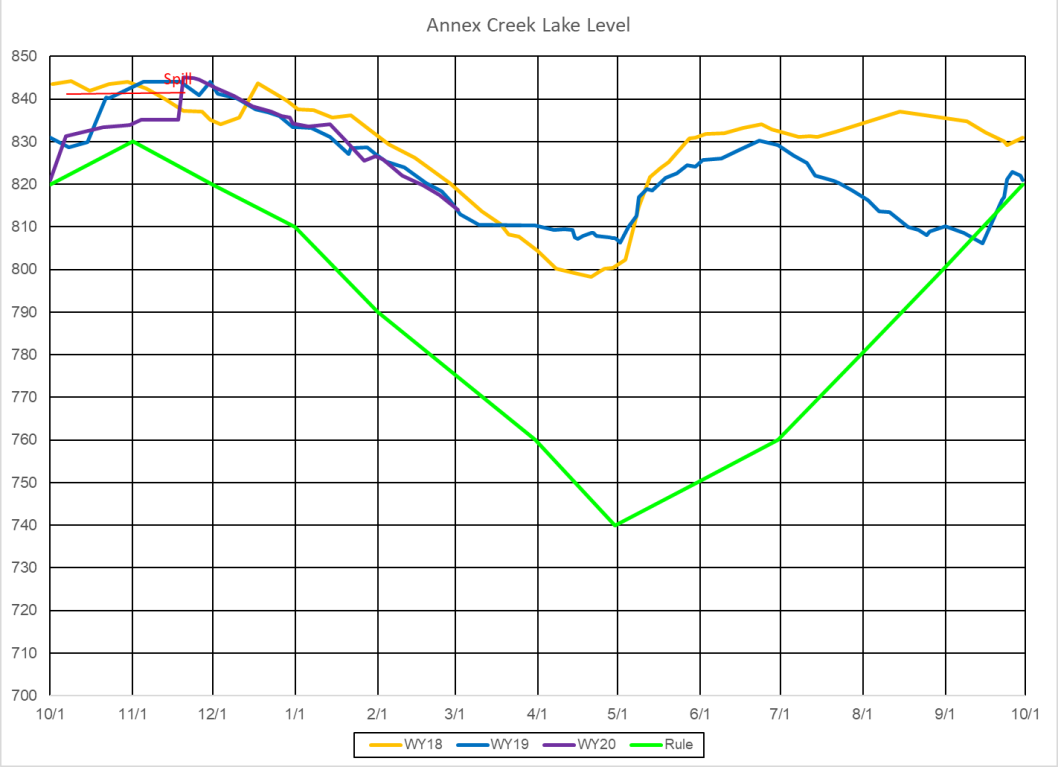


Figure 3-4. Upper Annex Lake water surface elevations, Water Years 2018, 2019 and WYTD 2020

3.2. Applicant's Proposed Action

The Proposed Alternative would remove the existing penstock and penstock bridge installed in 1915 and replace them with a new welded steel penstock and steel bridge in the same alignment. The new

penstock will be surface mount on supports constructed of a combination of concrete, steel and treated wood. Thrust restraint will be supplied by wire rope and collars installed on the pipe connected to rock anchors. The original penstock was surface mount on wooden supports over shot rock with wire rope wrapped around the pipe connected to rock anchors for thrust restraint, so the new construction will be similar to the original construction methods.

There is an existing 40' easement within the P-2307 project boundary which is centered on the existing penstock alignment. It is AEL&P's intention to restrict construction activities to within that boundary unless site conditions found during construction require a small adjustment or additional area to properly secure rock anchors. Figure 3-5 shows the typical ground disturbance of the penstock corridor during original construction, with the railway to the left of the bench prepared for the penstock installation.

Top of Lower Railway

Route Lower Lake

Figure 3-5. Annex Creek Penstock Historical Disturbance

The existing valve at the outlet of the lake tap tunnel is a manually operated gate valve. With the new penstock, an electrically operated valve will be installed to allow remote operation of the valve. As part of the new project, conduits will be run at the base of the penstock supports for power and communications lines from the powerhouse to the valvehouse. Automation will be added to the valvehouse to monitor flow, pressure and valve position. The existing solar panel will be removed.

3.3. No Action Alternative

Under the No Action Alternative, the Annex Creek Development would have to be decommissioned and the energy generated from the project provided by an alternate source. Special Use Permit, Authorization ID JUN1141, issued by the US Department of Agriculture Forest Service to AEL&P in August 2018 would apply if the site were to be decommissioned.

Condition VII(E) states that "Upon revocation or termination of this permit without issuance of a new permit, the holder shall remove all structures and improvements, except those owned by the United States, within a reasonable period prescribed by the authorized officer and shall restore the site to the satisfaction of the authorized officer. If the holder fails to remove all structures and improvement

within the prescribed period, they shall become the property of the United States and may be sold, destroyed, or otherwise disposed of without any liability to the United States. However, the holder shall remain liable for all costs associated with their removal, including the costs of sale and impoundment, cleanup, and restoration of the site."

The costs for removal of structures and improvements and restoration of the site would be similar in cost to the proposed alternative of replacing the penstock to continue present project operations. Therefore, the No Action Alternative would be more expensive for AEL&P and the Juneau electrical customers.

Under the National Environmental Policy Act (NEPA) guidelines and Commission policy, the No Action Alternative serves as the baseline against which the Applicant's Proposed Action and any other alternatives are evaluated.

4. CONSULTATION AND COMPLIANCE

4.1. Review and Consultation

4.1.1. Agency Requests and Comments

Table 4-1. Agency requests and comments

Commenter	Date	Summary
NMFS	April 30, 2020	Approving minutes and discussion of increased boat traffic.
SHPO	May 22, 2020	Informal concurrence of adverse effect. Will send letter.
ADF&G	May 29, 2020	Would like to review the Sediment and Erosion Control Plan and Bear Safety Plan. AELP revised Exhibit E to indicate that ADF&G would be included in the review process for both.

5. ENVIRONMENTAL ANALYSIS

5.1. Annex Creek Development

The Annex Creek Development is located in a remote, mountainous area of the Tongass National Forest, about 11 miles east of Juneau. The Annex Creek watershed (Figure 5-1) occupies an area of about 6.2 square-miles, draining elevations ranging from about 4,170 feet to sea level. There are two natural lakes in the watershed, Upper and Lower Annex lakes, which are approximately 264 acres and 25 acres in surface area, respectively. Upper Annex Lake serves as the reservoir for the Annex Creek Development. A timber buttress dam is located at the natural outlet of Upper Annex Lake. The dam's spillway

discharges via the short (0.15-mile) outlet stream into the north end of Lower Annex Lake. The lower lake is approximately 0.4-mile long and is drained by lower Annex Creek, which exits the south end of the lake. Lower Annex Creek runs 0.5 miles from the outlet of Lower Annex Lake, flowing over very steep terrain directly into Taku Inlet.

Figure 5-1. Upper Annex Lake with Lower Annex Lake visible in lower left corner

The principal tributary stream to Upper Annex Lake is upper Annex Creek, which flows into the northwest corner of the lake. This stream has a length of about 2.5 miles. Many small snowmelt streams enter Upper Annex Lake along the length of its steep shoreline. There is no glacial input to the watershed. Lower Annex Lake receives input from Upper Annex Lake, as described above, at times when the reservoir level is high enough for water to spill over the dam. A very small, unnamed stream enters Lower Annex Lake at its northwest corner, providing additional input to the lake.

The entirety of the Annex Creek watershed is located within the Tongass National Forest; and is subject to forest management plans. There is no other development in the vicinity of Annex Creek, and recreational use in the immediate area is currently very light because of the remote location and difficult access. Power production is the dominant land and water use.

5.1.1. Construction Practices

AEL&P has planned the project to utilize heavy lift helicopters to remove the old penstock and place the new penstock to minimize the ground disturbing activity for this project. The penstock alignment includes several steep bluffs which are not passable by ground equipment. To deal with these natural barriers, small excavators will be placed in each zone by helicopter. During de-mobilization from site at

the end of the project, all equipment will be removed. Air support will be used extensively during the project for moving personnel and tools between locations.

The project will be broken into the following activities:

Task 1 – Demolition of old pipe

This will be done in the late spring using hand-held cutting equipment which will be moved between sites by helicopter. The upper penstock will be cut into lengths of 50' maximum and the lower penstock into 40' maximum lengths. When the cuts are complete, a heavy lift helicopter will be mobilized and the penstock sections loaded on a barge moored off-shore. When finished, the heavy lift helicopter will stage equipment in each zone for the next activity. This will involve a period of intensive aircraft use which will require communication with local tourism operators.

Task 2 – Preparation of penstock alignment

This will include replacement of the penstock bridge and installation of penstock supports. This will be a period of ground disturbance, which should be limited to the existing penstock project boundary. The overburden will be removed, exposing the 1915 as-left shot rock base. New modular penstock supports will be installed in the entire penstock alignment.

Task 3 – Penstock installation.

A heavy lift helicopter will be mobilized to transport lengths of penstock from a barge moored offshore to the prepared penstock alignment. This will involve a period of intensive aircraft use which will require communication with local tourism operators. After the penstock is set in place, ground crews will begin the process of welding, touch-up painting and anchoring.

Task 4 – Demobilization.

A heavy lift helicopter will be mobilized to remove all equipment used during the project which will be transported off-site by barge.

5.2. Geology and Soils

5.2.1. Affected Environment

5.2.1.1. Overview

The penstock runs from the powerhouse located near sea level to the valvehouse located near elevation 700' MSL. The penstock has been constructed along a corridor that has been brushed to maintain a 10 to 15 feet width. Construction reports indicate that a second penstock was considered for the

development, but never constructed. As a result, a small, approximately 10-footwide bench of shot rock fill is present along much of the southwest side of the penstock. The Project Boundary for the penstock corridor is 20' on each side of the centerline of the penstock. Along lower Annex Lake, there is a 100' project boundary around the lake, this extends the Project Boundary in that area from the shore of the lake to 20' from the penstock centerline on the uphill side. A larger Project Boundary also existing immediately surrounding the powerhouse and camp area. The Project Boundary for the affected areas is shown in Exhibit G-2.

AEL&P contracted with McMillen Jacobs in 2019 to inspect the penstock routing and to do preliminary engineering on a replacement. McMillen Jacobs personnel visited site twice, the second time with Collier Geophysics who performed a geophysical investigation using Seismic Refraction Tomography along the penstock corridor. The information presented in this section is from the analysis performed in 2019 and it is focused solely on the penstock corridor.

5.2.1.2. Setting

Both Upper and Lower Annex lakes are natural lakes lying in a steep-sided valley surrounded by precipitous peaks (Figure 5-1). Annex Creek is a short, high-gradient stream that flows from the natural outlet of Lower Annex Lake directly into Taku Inlet. It was likely formed by water erosion (AEL&P 1985). The Annex Creek Dam is located at the natural outlet to Upper Annex Lake with the penstock extending to the powerhouse at tidewater on Taku Inlet.

5.2.1.3. Geology and Soils

Rock underlying this portion of the Annex Creek Development is primarily mapped as homogenous gneiss. A limited portion of the central penstock alignment is mapped as a similar, migmatitic hornblende tonalite gneiss (Figure 5-2; Brew and Ford, 1977). Geologic mapping also shows that two regional lineaments are present in the vicinity of the Annex Creek Development. One of the lineaments crosses the penstock at the unnamed stream near STA 18+00. The western termination of the second lineament is mapped southeast of Upper Annex Lake, just east of the penstock alignment. Neither of these lineaments have been mapped as active faults by the United States Geological Survey and Alaska Department of Natural Resources (USGS and AKDNR, 2019).

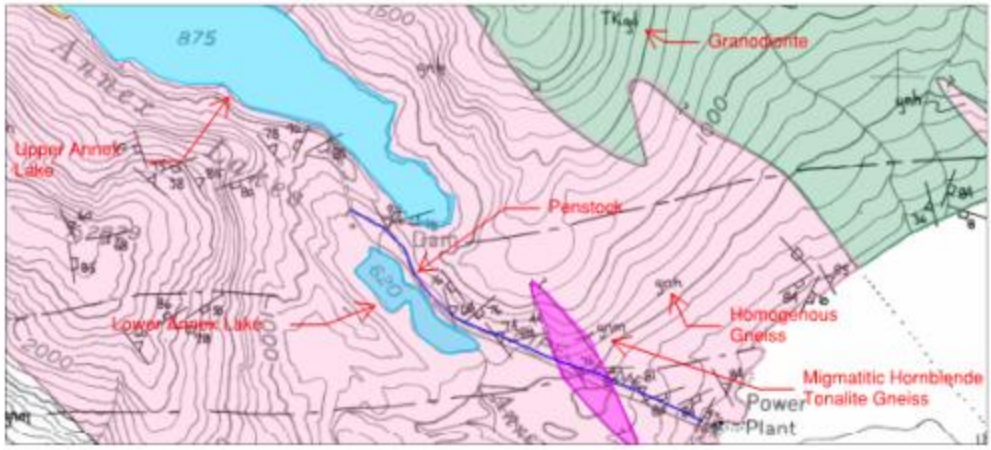


Figure 5-2. Geologic Map of Annex Development

(after Brew and Ford 1977)

Observed site conditions were consistent with those mapped by Brew and Ford (1977). McMillen Jacobs observed several outcrops along the existing penstock displaying gneissic texture (Figure 5-3). Where exposed, the rock was strong to very strong, predominantly fresh, and generally massive to blocky. Discontinuities were typically moderately to very widely spaced, tight and rough. Typical rock exposures are consistent with very good surface conditions and blocky structure when classified in accordance with Hoek's Geologic strength index (Hoek et al., 2013).

Figure 5-3. View of Typical Rock Observed along Penstock

(McMillen Jacobs 2019)

The area surrounding the Annex Lakes has been extensively glaciated. As a result, overburden materials have been scoured from much of the area. Overburden soils are typically confined to slopes along the upper penstock alignment and depressions and low-lying areas in the lower penstock alignment. Where present along the upper alignment, overburden is expected to be present in relatively thin layers, consisting of lateral moraine deposits and glacial-colluvial soils. The limited occurrences of overburden along the lower penstock alignment are expected to consist of thin layers of organic soil overlying glacial deposits that are limited in size and depth.

McMillen Jacobs observed the alignment of the penstock on May 30, 2019 to evaluate the geologic conditions along the right-of-way. Observations indicated that the alignment is in relatively good shape, with few signs of geologic hazards. No signs of large-scale or deep-seated landslides along the right-of-way were observed. No significant sites of instability were observed in the penstock subgrade or adjacent fill slopes. Further, no active avalanche chutes were observed along the penstock alignment.

Some limited areas of instability were observed along the penstock alignment consisting of minor rock falls and sloughing. Where present, these instabilities were limited in scale and did not appear to have had a significant impact on the integrity of the penstock. Table 5-1 presents a summary of these observed locations. Figures 12 through 16 present photographs of the identified instabilities. No signs of significant flooding or other geologic hazards were observed along the penstock alignment.

Table 5-1. Powerhouse physical and equipment characteristics, Annex Creek Development

Start (Station)	End (Station)	Description	Notes
26+75	27+50	Rockfall from Cut Slope	Figure 5-4
30+50	31+25	Debris from Slope Above Penstock	Figure 5-5, Fallen Trees along Penstock
56+75	57+75	Rockfall from Cut Slope	Large material similar to Figure 5-4
60+75	62+25	Rockfall from Cut Slop	Smaller material similar to Figure 5-4
67+75	69+50	Sloughing from Slope Above Penstock	Figure 5-6

Figure 5-4. View of Rockfall Debris Observed near STA 26_75 to 27+50

(McMillen Jacobs 2019)

Figure 5-5. View of Timber Fallen near STA 30+50 to 31+25 (McMillen Jacobs 2019)

Figure 5-6. View of Sloughing Soil Accumulated behind the Penstock near STA 67+75 to 69+50

(McMillen Jacobs 2019)

5.2.2. Environmental Effects

During the penstock replacement project, there will be ground disturbing activities which could result in soils erosion. As part of the Proposed Action, AEL&P will prepare an Erosion Control Plan in conjunction with ADF&G and the USFS and approved by the FERC Portland Regional Office.

After the penstock replacement is complete, the previously experienced effects of the Project on geology and soils would continue. Continued operation of Project facilities would not result in any changes to areas of exposed soils and would therefore not affect the frequency or severity of erosional processes or landslides. Continued operation would not affect mineral exploration or mining because these activities do not occur in the Project area at the present time and are not anticipated to occur in the future. No long-term changes to Project facilities are proposed other than routine activities required for maintenance purposes; therefore, no direct, indirect, cumulative, or unavoidable adverse effects on geology and soils are anticipated as a result of the Proposed Action.

5.2.3. Proposed Measures to Address Project-Related Effects

AEL&P is proposing that an Erosion Control Plan be prepared in conjunction with the agencies and approved by the FERC Portland Regional Office. AEL&P is not proposing any long term environmental measures to address the effects of the Proposed Action on geology and soils.

5.3. Water Resources

5.3.1. Affected Environment

5.3.1.1. Introduction

The Annex Creek watershed includes two natural lakes: Upper and Lower Annex lakes. Upper Annex Lake, the larger of the two (about 264 acres), drains 6.2 square-miles of mountainous terrain and serves as the reservoir for the Annex Creek hydroelectric facility. AEL&P has a water right for use of 74 cfs dating back to 1915 (ADL 45781). The principal tributary to Upper Annex Lake, upper Annex Creek, flows into the north end of the lake. A timber buttress dam is located at the outlet of Upper Annex Lake, and a combination tunnel and penstock conveys water to the powerhouse. During high water the dam's spillway discharges via a short, steep stream (0.15-mile long) into Lower Annex Lake. Lower Annex Lake, in turn, is drained by lower Annex Creek, which exits the south end of the lake and runs 0.5 mile over very steep terrain into Taku Inlet.

During the 2019 field work by McMillen Jacobs, observed surface water along the upper penstock right-of-way (Station [STA] 27+00 to 70+31) was limited and primarily confined to Annex Creek and small amounts of water released from penstock air relief valves. Similar to the upper penstock, the majority of the surface water along the lower penstock right-of-way (STA 0+00 to 27+00) appeared to be the result of relief valves with one notable exception of a small unnamed stream near STA 18+00. Naturally occurring seeps were uncommon and small. Outside the existing right-of-way, surface water was common. The right-of-way borders Lower Annex Lake for much of the upper portion. Numerous marshes, ponds, and streams were noted on either side of the penstock.

5.3.1.2. Flows During Construction

Like most storage projects in Alaska, Upper Annex Lake is at a minimum level in the spring and then fills due to snow melt and summer precipitation. This construction work will start in the late spring when Upper Annex Lake is at a minimum. With the penstock out of service, it is projected that the lake will fill much faster than during a typical year which will result in water spilling over the dam by mid-summer. Due to the steep gorge at the outlet of the Upper Lake, this should not present any hazards to project personnel during construction. Replacement of the penstock bridge will be scheduled prior to spill and after spill extra safety precautions will be taken when working in this area. Equipment will be staged on either side of the outlet to minimize travel through this zone.

Figure 5-7. Upper Annex Lake Outlet, Penstock Bridge

5.3.1.3. Existing and Proposed Water Uses

The only measured and recorded use of Annex Creek waters is generation of hydroelectric power at the Annex Creek Powerhouse near the mouth of Annex Creek. Annex Creek is also used as a drinking water source for plant operators, with high pressure water removed from the penstock upstream of the turbines. AEL&P has a water right for use of 74 cfs dating back to 1915 (ADL 45781).

During the project construction, drinking water will not be available from the penstock, so AEL&P is proposing to run a temporary water line to Annex Creek with a small storage tank staged in the camp to supply water to the camp area. The existing treatment system would still be utilized with added pumps, the temporary system would be completely removed at the end of the project.

5.3.1.4. Impact on Water Quality

Working in close proximity to Lower Annex Lake, precautions will be taken to prevent sediment filled run-off from disturbed areas entering the lake. AEL&P will prepare an Erosion Control Plan in conjunction with ADF&G and the USFS to be approved by the FERC Portland Regional Office which will outline the measured to be taken when working in this sensitive area.

5.3.2. Environmental Effects

Under the Proposed Action Alternative, after the penstock replacement is complete, the Project would operate in the same way that it operates currently. Any ongoing effects of the Project on water resources would continue. Continued operation of Project facilities would not result in any changes to drainage basin hydrology, streamflow, water use, water quality, or water temperature. No changes to Project facilities are proposed other than routine activities required for maintenance purposes; therefore, no direct, indirect, cumulative, or unavoidable adverse effects on water resources are anticipated as a result of the Proposed Action.

5.3.3. Proposed Measures to Address Project-Related Effects

No changes to Project facilities or operations are proposed, and no effects on water resources are anticipated. Therefore, AEL&P is proposing no new long-term environmental measures to address the effects of the Proposed Action on water resources.

5.4. Fish and Aquatic Resources

5.4.1. Introduction

Aquatic habitats within the Annex Creek drainage can be divided into three primary developments: (1) Upper Annex Lake, a remote mountain lake of about 264 acres; (2) Lower Annex Lake, a smaller lake of about 25 acres that receives inflow from Upper Annex Lake; and (3) Annex Creek, which empties Lower Annex Lake and flows through very steep, incised terrain into Taku Inlet. The penstock replacement project will not impact Upper Annex Lake.

The information presented in this section is from the Final License Application submitted by AEL&P in August 2016. There are no changes from that information presented.

5.4.2. Existing Fish and Aquatic Communities

Limited fish and aquatics information exists for the Annex Creek drainage. The lack of road access and very difficult terrain have discouraged visits from recreational fishermen or hikers. No known formal studies were conducted prior to 2012, and little anecdotal information is available.

UPPER ANNEX LAKE

No historical information is known to exist regarding fish presence in Upper Annex Lake prior to the 1916 completion of the Annex Lake Hydroelectric Project. In 1917, 60,000 eastern brook trout fingerlings were stocked into Upper Annex Lake by the Gastineau Mining Company (AEL&P 1985). Early records are sparse but there is an indication that some recreational angling occurred on the lake in the 1960s with reported catches of large brook trout (AEL&P 1985). Intermittent angling prior to 1985 by AEL&P staff met with varied catch success (AEL&P 1985). Recreational angling on Upper Annex Lake is currently extremely light to nonexistent.

The reconnaissance conducted by AEL&P in 2012 confirmed the presence of brook trout in the lake. Three eastern brook trout were caught in approximately 3 man-hours of angling (AEL&P 2012a). The captured fish ranged in length from 198 to 308 millimeters (mm) (8-13 inches). Baited fish traps were unsuccessful at catching fish. Several brook trout fry were observed adjacent to the shoreline. Brook trout were the only species observed in Upper Annex Lake. Since brook trout have persisted in Upper Annex Lake for almost 100 years, the population is obviously self-sustaining. However, population density, age and growth characteristics, and general life history of brook trout in the lake are currently unknown. Brook trout normally spawn in the fall in October and November, and brook trout living in lacustrine environments may spawn either in the lake or tributary streams (Behnke 2002). Upper Annex Lake has a substantial winter drawdown, which would occur while eggs were incubating. Consequently, shallow reservoir spawning would likely not be successful. Spawning would need to occur at depths greater than 139 feet in the reservoir or within tributary streams having year-round flow. Since brook trout have existed in Upper Annex Lake for nearly 100 years, the species has obviously developed a successful reproductive strategy allowing the fish to cope with the changing conditions that occur under the existing operating regime.

Habitat in Upper Annex Lake is limited by topography. Much of the shoreline is very steep abutting mountain slopes on all sides of the lake except at the north end, where a substantial stream enters the lake and has created an extended alluvial fan, providing an expanse of littoral habitat. The inlet stream and its delta provide some additional habitat variability. This stream is likely where most of the brook trout spawning occurs. Small, steep mountain streams contribute to the lake around the perimeter. Rock slides and avalanche debris probably provide cover and contribute to habitat diversity along the steep shoreline. The water is extremely clear and overall productivity can be assumed to be low. The dam at the outlet regulates the lake's maximum elevation with an annual drawdown of up to 139 feet. During drawdown, much of the littoral habitat becomes unavailable to fish when much of the north end is dry.

LOWER ANNEX LAKE

As with the upper lake, there is no historical information regarding fish presence prior to construction of the hydroelectric facility. In 1917, 28,000 juvenile brook trout were stocked in Lower Annex Lake (AEL&P 1985). Some recreational fishing may have occurred in the lake over the years, but there is no known documentation of success. Recreational angling on Lower Annex Lake is currently nonexistent.

The reconnaissance investigation conducted by AEL&P in 2012 confirmed the presence of brook trout in the lake. The lake was sampled using a variety of methods. Two juvenile brook trout were caught in minnow traps (78 and 88 mm). Approximately 4 man-hours of angling resulted in 11 brook trout ranging in size from 205 to 330 mm (8–13 inches). All fish captured by hook and line sampling were caught at the north end of the lake adjacent to the inlet stream. It was clear that fish were concentrating at the confluence of the inlet and the lake. Approximately 30 minutes of electroshocking along the shoreline at the shallow, south end of the lake caught an additional five brook trout ranging in size from 42 to 240 mm. The very limited angling data suggest that the density of fish in Lower Annex Lake is substantially higher than in Upper Annex Lake. Lower Annex Lake probably supports a self-sustaining population of

brook trout. However, it is not known whether the trout currently present are descendants of the original stocking or whether they are the result of fish moving out of Upper Annex Lake via the short connecting stream. Upstream movement from the lower lake to the upper lake is not possible because of significant waterfalls, but downstream movement has likely occurred. Population size, age and growth characteristics, and general life history of brook trout in Lower Annex Lake are currently unknown.

Habitat in Lower Annex Lake is limited by its small size and possibly by changing seasonal conditions driven by operation of the hydroelectric facility. When Upper Annex Lake is drawn down below the spillway elevation, all of the upper lake outflow is diverted into the hydroelectric penstock. Under those conditions there is no major source of inflow to Lower Annex Lake. The lake consists of a northern and a southern lobe that appear to have somewhat different characteristics. The south end of the lake is shallow, portions of which may become exposed at low water levels, whereas the north end is deeper and receives water from the primary inlet as well as from some smaller mountainside streams. Habitat is more varied in the northern lobe including substantial littoral habitat adjacent to the inlet and other shoreline areas.

ANNEX CREEK

Annex Creek exits the south end of Lower Annex Lake and flows 0.5 miles over very steep terrain to tidewater. Several significant waterfalls are present including one at the sea cliff just above tidewater, which blocks access by anadromous fish. The very steep, incised terrain has prevented historical or present-day recreational use of the stream. No sampling occurred on Annex Creek during the AEL&P 2012 reconnaissance study because of hazardous conditions and lack of suitable fish habitat. While the creek likely contains brook trout originating from Lower Annex Lake, it is believed to have extremely limited suitable fish habitat.

5.4.3. Federally Designated Habitats

The only federally designated habitats possibly pertaining to aquatic resources in the proposed Project area are those portions of streams and marine areas considered to be Essential Fish Habitat (EFH). EFH is defined under the Magnuson-Stevens Fishery Conservation and Management Act (PL 104-267) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NOAA's National Marine Fishery Service (NOAA Fisheries) is responsible for designating EFH. In the case of anadromous fish streams (principally salmon), NOAA Fisheries has designated the anadromous fish maps prepared by the Alaska Department of Fish and Game (ADF&G [2012c]) as the definition of EFH within freshwater habitats. No portion of Annex Creek is considered to be EFH. A steep falls immediately above tidewater prevents anadromous fish from accessing Annex Creek. Additionally, no intertidal spawning has been observed at the mouth of Annex Creek.

Marine environments of Taku Inlet adjacent to the mouth of Annex Creek likely provide EFH for several species of Gulf of Alaska marine fish. A query of the NOAA Habitat Conservation Mapper (NOAA 2015) indicates that EFH species potentially present include big skate, longnose skate, octopus, sharks, and the shallow water flatfish complex. However, spatial data do not currently exist for managed species in the

area. No Habitat Areas of Particular Concern (HAPC) or EFH Areas Protected from Fishing (EFHA) were identified in Taku Inlet in the vicinity of the Project.

5.4.4. Environmental Effects

Under the Proposed Action Alternative, after penstock replacement the Project will operate in the same way that it operates currently. Any ongoing effects of the Project on fish and aquatic resources would continue. Continued operation of Project facilities would not result in any changes to fish presence or population size, fish passage, spawning, or habitat. No changes to Project facilities are proposed other than routine activities required for maintenance purposes; therefore, no direct, indirect, cumulative, or unavoidable adverse effects on fish and aquatic resources are anticipated as a result of the Proposed Action.

5.4.5. Proposed Measures to Address Project-Related Effects

No changes to Project facilities or operations are proposed, and no effects on fish and aquatic resources are anticipated. Therefore, AEL&P is proposing no new environmental measures to address the effects of the Proposed Action on fish and aquatic resources.

5.5. Wildlife and Botanical Resources

The Project area lies wholly within the Temperate Coastal Unified Ecoregion, which is comprised of the Alexander Archipelago and Boundary Ranges ecoregions (Figure 5-8) (Nowacki et al. 2001). The Project area also is within the USFS designated Northern Coast Range Biogeographic Province (Figure 5-9) (USFS 2008b). These ecological designations refer to areas characterized by rugged, glaciated coastal mountains with a maritime climate and high levels of precipitation. There is little or no vegetative cover at higher elevations and hemlock-Sitka spruce forests at lower elevations. USFS describes the Northern Coast Biogeographic Province as having little maritime influence compared to other Tongass National Forest biogeographic provinces; rugged and glaciated topography; major river systems – Taku and Whiting rivers – extending into Canada; and yellow-cedar plant associations in addition to hemlock-Sitka spruce. The ecoregions that encompass the Annex Creek development host at least 37 species of mammals, 114 species of birds, and 5 species of amphibians that have the potential of occurring in the Project area.

The information presented in this section is from the Final License Application submitted by AEL&P in August 2016. There are no changes from that information presented.

5.5.1. Affected Environment

5.5.1.1. Introduction

The Annex Creek Development lies within both the Alexander Archipelago and Boundary Ranges ecoregions and therefore includes habitats ranging from barren alpine to coastal hemlock-Sitka spruce forests. Upper Annex Lake, at a normal water surface elevation of 844.3 feet (MSL), is surrounded by

rocky peaks (maximum elevation 4,170 feet), which transition to alpine, shrub, and forest habitats as the elevation decreases to the powerhouse on the shore of Taku Inlet (sea level).

Because Southeast Alaska is isolated by a combination of marine waters and high mountains with glaciers and ice fields, there are a number of endemic species, subspecies, or lineages (Dawson et al. 2007; ISLES 2012). However, there are no threatened or endangered wildlife or plant species in the Project area and area habitats are ubiquitous throughout the region. Nonetheless, there are a number of species that have special designations and/or protection. For a discussion of species with special status, see Section 5.8.

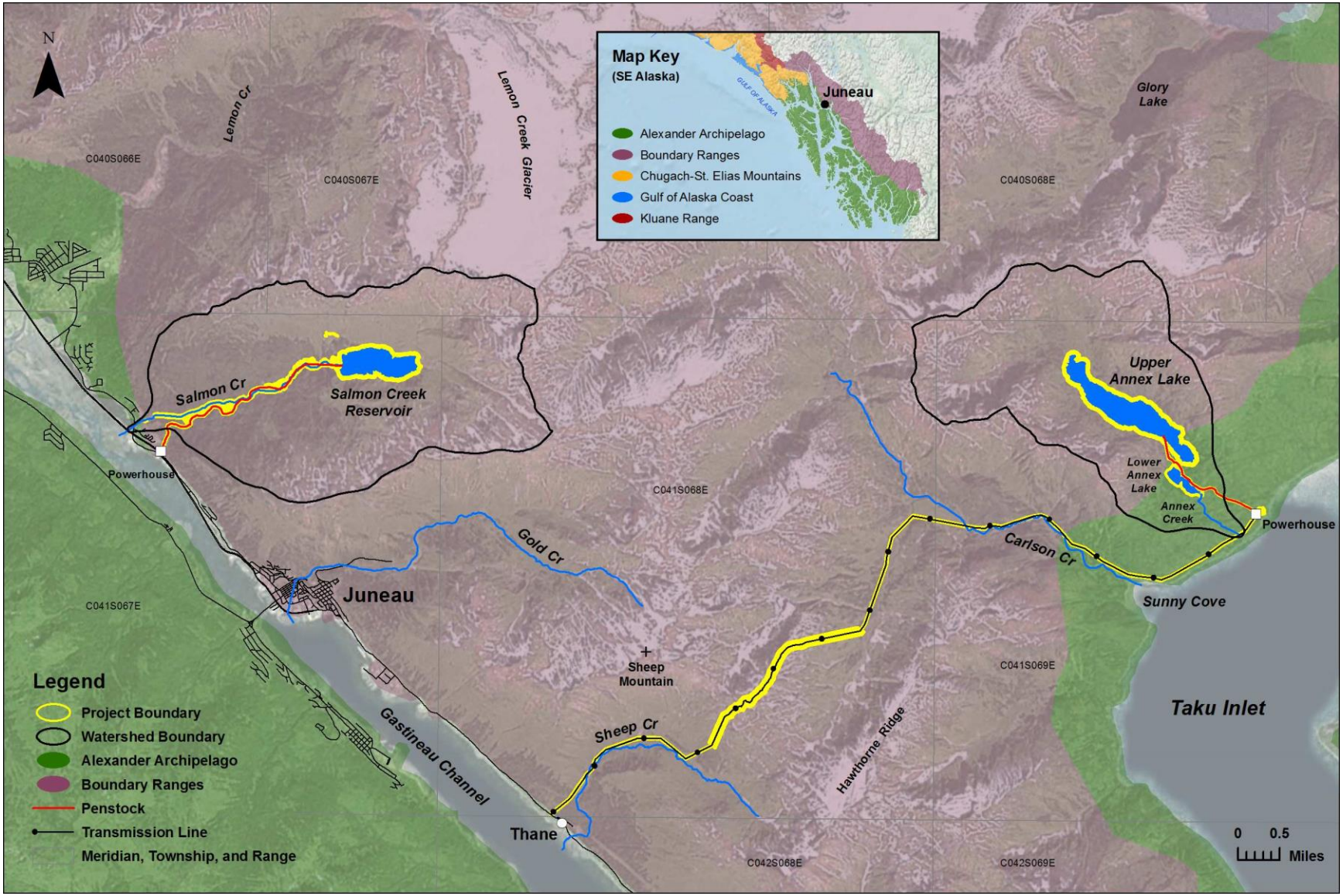


Figure 5-8. Unified ecoregions of Alaska

(Nowacki et al. 2001)

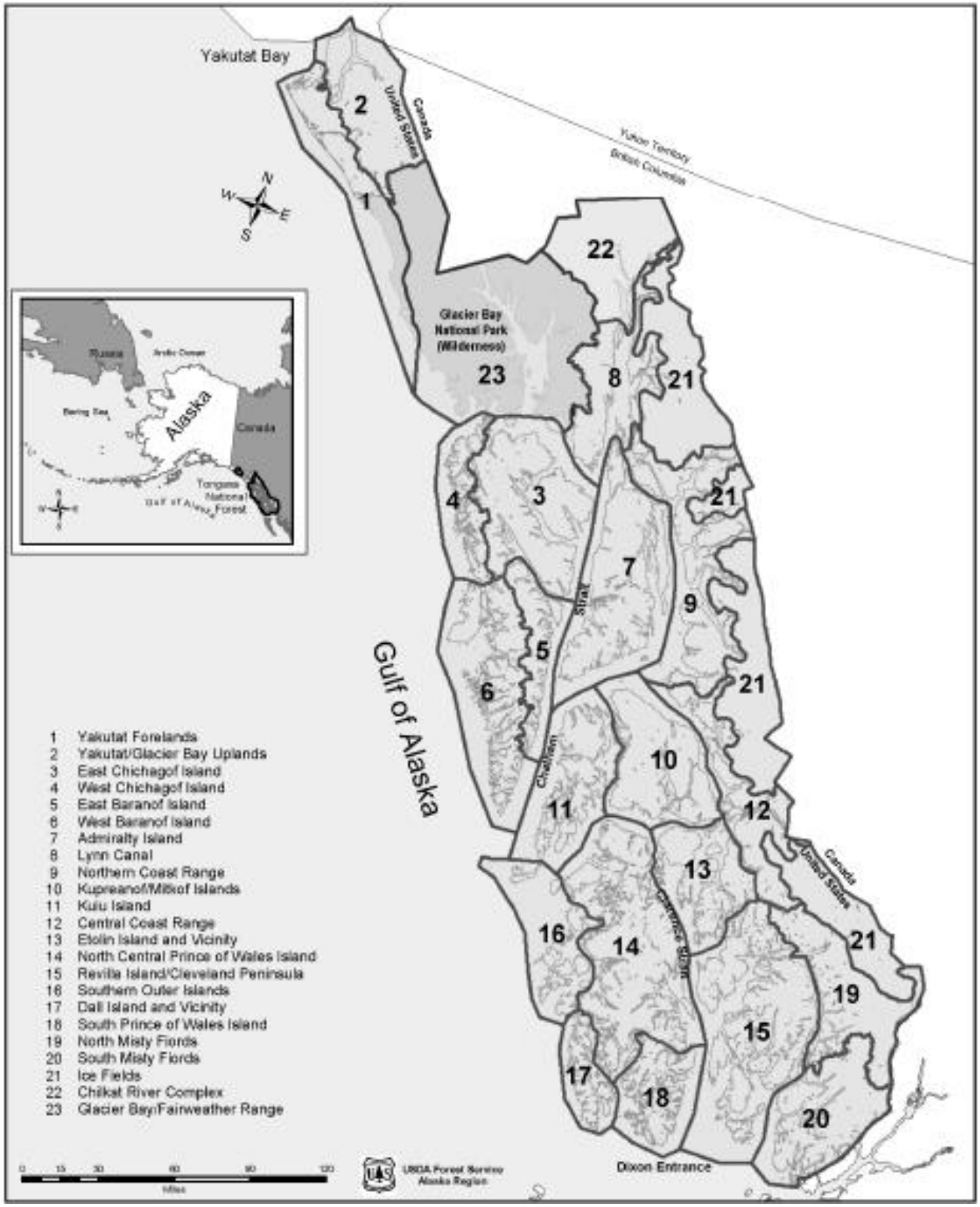


Figure 5-9. Biogeographic provinces of Southeast Alaska

(USFS 2008b)

5.5.1.2. Wildlife – Descriptions of Wildlife Populations and Habitat Use

Several entities, including local government, resource agencies, academic programs, and environmental advocacy groups, provided information on wildlife and their habitats in the region or general Project vicinity. Valuable information was obtained from documents published by CBJ, ADF&G, Glacier Bay National Park (National Park Service), Tongass National Forest, USGS, Alaska National Heritage Program (AKNHP), and The Nature Conservancy.

MAMMALS

There are at least 37 mammal species that may occur in the vicinity of the Annex Creek Development (Table 5-2).

Table 5-2. Mammals that may occur in the Project area

Common Name	Scientific Name
Masked Shrew	*Sorex cinereus*
Dusky Shrew	*Sorex monticolus*
Northern Water Shrew	*Sorex palustris*
Wandering Shrew	*Sorex vagrans*
Keen's myotis Bat	*Myotis keenii*
Little Brown Bat	*Myotis lucifugus*
Snowshoe Hare	*Lepus americanus*
Northern Flying Squirrel	*Glaucomys sabrinus*
Hoary Marmot	*Marmota caligata*
Red Squirrel	*Tamiasciurus hudsonicus*
American Beaver	*Castor canadensis*
Deer Mouse	*Peromyscus maniculatus*
Keen's Mouse	*Peromyscus keeni*
Bushy-tailed Woodrat	*Neotoma cinerea*
Northern Red-backed Vole	*Clethrionomys rutilus*
Long-tailed Vole	*Microtus longicaudus*
Tundra Vole	*Microtus oeconomus*
Meadow Vole	*Microtus pennsylvanicus*
Common Muskrat	*Ondatra zibethicus*
Northern Bog Lemming	*Synaptomys borealis*
Meadow Jumping Mouse	*Zapus hudsonicus*
Common Porcupine	*Erithizon dorsatum*
Coyote	*Canis latrans*
Gray Wolf	*Canis lupus*
Red Fox	*Vulpes vulpes*
Black Bear	*Ursus americanus*

Common Name	Scientific Name
Brown (Grizzly) Bear	*Ursus arctos*
American Marten	*Martes americana*
Ermine	*Mustela erminea*
Least Weasel	*Mustela nivalis*
Mink	*Mustela vison*
Wolverine	*Gulo gulo*
Northern River Otter	*Lontra canadensis*
Canada Lynx	*Lynx canadensis*
Moose	*Alces alces*
Sitka black-tailed deer	*Odocoileus hemionus*
Mountain Goat	*Oreamnos americanus*

Sources: ADF&G 2006; AEL&P 1985; AKNHP 2012; NPS 2012; Smith et al. 2001; USFS 2008a

The Boundary Ranges Ecoregion habitats—predominantly barren rock, alpine tundra, and low shrubs with some low scrub communities and hemlock-Sitka spruce in lower elevation drainages—support a limited number of mammals (ADF&G 2006). Mammals such as mountain goats and hoary marmots live in the alpine regions. The forests of the Alexander Archipelago Ecoregion provide habitats for a more diverse range of mammal species such as moose, brown and black bears, coyote, lynx, wolverine, otters, beavers, gray wolves, and rodents and shrews (ADF&G 2006). ADF&G keeps records of animals harvested in Game Management Unit (GMU) 1C, which encompasses the Project area.

Moose. Moose are not common in the Project area. Reports support their migrating into mainland Southeast Alaska from Canada along major river systems, such as the Taku River, sometime in the early 1900s (Scott 2010b). They would occur in the Project area where forage (e.g., willow) is present, and in the winter where there is refuge from deep snow, generally lower elevations. Preferred habitats would be shrubs, open forest, and meadows (NPS 2012).

Mountain goats. Mountain goats occur throughout Southeast Alaska, including some areas of the Annex Creek Development specifically in the Sheep Creek and Carlson Creek drainages. They spend the summer months in the peaks and move to lower elevations in winter to avoid deep snow (Scott 2010c). ADF&G considers the mountain goat population to be healthy throughout GMU 1C (Scott 2010c). Recent aerial surveys, which included the Lemon Glacier and Lake Dorothy areas near the Project, indicate populations densities are medium to high compared to historical numbers (Scott 2010c).

Black and brown bears. Black and brown bears in Southeast Alaska share ranges in the major river valleys, such as the Taku River (Scott 2011). The forested portion of the Annex Creek Development of the Project, with its opportunities for shelter and forage, would provide the best habitat for bears. Black and brown bears eat primarily vegetation and berries and salmon during spawning runs, although they may prey on moose calves and Sitka black-tailed deer fawns in the spring. Alpine meadows and forest openings would be the types of habitats most likely used by bears foraging for plants and berries in the Project area. There are no anadromous fish runs in the Annex Creek Development to provide bears with

this important food source for storing winter fat. There have been no direct studies of either brown or black bear populations in the Project area (Scott 2009 and 2010a). However, bear populations appear to be stable to slightly increasing and habitat to be stable in GMU 1C and in the Project area (Scott 2009 and 2011). Based on estimates for similar habitats in western Washington, ADF&G believes black bear density to be slightly above 1.4 bears per 1 square mile (Scott 2011). A study of home range sizes of black bears in the Sheep Creek drainage (at the western end of the transmission line) was estimated at 2.3 square-miles. Both black and brown bears are Management Indicator Species (MIS) for USFS (USFS 2008a).

Wolves and coyotes. Although wolves and coyotes are distributed throughout GMU 1C, ADF&G reports that wolves primarily inhabit the major river drainages of the Taku River and Berners Bay (Barten 2009). ADF&G staff considers wolves common in the unit in which the Project occurs, but there is no information on actual population numbers. What was considered the entire pack of seven wolves was trapped from Douglas Island in 2001-2002 (Barten 2009). Wolf predation may be responsible for the low mainland deer densities (Barten 2009).

Coyotes were once considered almost nonexistent in the Juneau vicinity. However, sightings along the road system have increased, especially in the areas of the Mendenhall Glacier Visitor Center and Lena Point, and on Thane Road (Scott 2010a).

Furbearers. Furbearers include martens, mink, weasels, fisher, wolverines, otters, lynx, and beavers. With the exception of wolverines, which can be found at higher elevations, furbearers use mainly forested, riparian habitats where they find prey, forage, and shelter. No specific population status or trend information is available for furbearers near the Project area. ADF&G, however, believes their populations to be stable (Scott 2010a). Martens are the most sought after furbearer in Southeast Alaska. They are common in the mainland drainages throughout GMU 1C, which would include the Project area (Scott 2010a). Anecdotal evidence suggests that mink are fairly abundant in most areas of suitable habitat in GMU 1C (Scott 2010a). Weasels also are considered fairly common. Fishers have only been documented in the Juneau area since 1996, but it appears that a small population may exist. Most of the accounts of fishers come from cabin owners on the Taku River (Scott 2010a). Although most wolverines are trapped north of Juneau in Berners Bay or on the west side of Lynn Canal, some are found in drainages crossed by the Juneau road system (Scott 2010a). River otters are considered most common on inlets and bays of the mainland coast. Lynx are uncommon, and because the density of hares is low, will probably remain so (Scott 2010a). Where the stream and riparian habitat is suitable along the coastal mainland, beavers exist at moderate levels according to ADF&G (Scott 2010a).

Small mammals. There is no small mammal information available that is specific to the Project area. However, USFS conducted a survey in 1997 of seven research natural areas in Southeast Alaska, one of which was on Limestone Inlet near Taku Inlet and the Annex Creek Development. The research natural area at Limestone Inlet was chosen because the investigators felt it was representative of habitat conditions in northern mainland Southeast Alaska (Smith et al. 2001). The small mammal trapping effort at Limestone Inlet resulted in six species captured: masked shrew, dusky shrew, Keen's mouse, northern red-backed vole, long-tailed vole, and northern bog lemming (Smith et al. 2001). Captures were all in

forested habitats because sampling was biased toward old-growth forests and logistics concentrated sampling nearer the shore. Alpine areas were not sampled at all (Smith et al. 2001).

BIRDS

There are at least 120 bird species that may occur in the vicinity of the Annex Creek Development (Table 5-3). Their occurrence varies from year-round residents, such as the bald eagle and chestnut-backed chickadee, to migratory birds that breed in the area, such as spotted sandpipers and tree swallows, to migrants that pass through in the spring and fall, or winter in Southeast Alaska, such as some Canada geese.

Table 5-3. Birds that may occur in the Project area

Common Name	Scientific Name
Red-throated loon	*Gavia stellata*
Pacific loon	*Gavia pacifica*
Common loon	*Gavia immer*
Horned grebe	*Podiceps auritus*
Red-necked grebe	*Podiceps grisegena*
Trumpeter swan	*Cygnus buccinator*
Snow goose	*Chen caerulescens*
Canada goose	*Branta canadensis*
Green-winged teal	*Anas crecca*
Mallard	*Anas platyrynchos*
Northern pintail	*Anas acuta*
Northern shoveler	*Anas clypeata*
Gadwall	*Anas strepera*
American widgeon	*Anas americana*
Harlequin duck	*Histrionicus histrionicus*
Long-tailed duck (oldsquaw)	*Clangula hyemalis*
Black scoter	*Melanitta nigra*
Surf scoter	*Melanitta perspicillata*
White-winged scoter	*Melanitta fusca*
Common goldeneye	*Bucephala clangula*
Barrow's goldeneye	*Bucephala islandica*
Bufflehead	*Bucephala albeola*
Common merganser	*Mergus merganser*
Red-breasted merganser	*Mergus serrator*
Osprey	*Pandion haliaetus*
Bald eagle	*Haliaeetus leucocephalus*
Golden eagle	*Aquila chrysaetos*
Sharp-shinned hawk	*Accipiter striatus*

Common Name	Scientific Name
Northern goshawk	*Accipiter gentilis*
Red-tailed hawk	*Buteo jamaicensis*
Rough-legged hawk	*Buteo lagopus*
American kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine	*Falco peregrines pealei*
Willow ptarmigan	*Lagopus lagopus*
Rock ptarmigan	*Lagopus mutus*
White-tailed ptarmigan	*Logopus leucurus*
Blue grouse	*Dendragapus obscurus*
Great blue heron	*Ardea herodias*
Sandhill crane	*Grus canadensis*
Semipalmated plover	*Charadrius semipalmatus*
Greater yellowlegs	*Tringa melanolueca*
Wandering tattler	*Heteroscelus incanus*
Least sandpiper	*Calidris minutilla*
Spotted sandpiper	*Actitis macularia*
Long-billed dowitcher	*Limnodromus scolopaceus*
Common snipe	*Gallinago gallinago*
Bonaparte's gull	*Larus philadelphia*
Mew gull	*Larus canus*
Herring gull	*Larus argentatus*
Glaucous-winged gull	*Larus glaucescens*
Thayer's gull	*Larus thayeri*
Arctic tern	*Sterna paradisaea*
Rock dove	*Columba livia*
Marbled murrelet	*Brachyramphus marmoratus*
Great gray owl	*Strix nebulosa*
Great horned owl	*Bubo virginianus*
Barred owl	*Strix varia*
Northern pygmy-owl	*Glaucidium gnoma*
Western screech-owl	*Megascops kennicottii*
Northern saw-whet owl	*Aegolius acadicus*
Mourning dove	*Zenaida macroura*
Rock dove	*Columba livia*
Rufous hummingbird	*Selasphorus rufus*
Belted kingfisher	*Ceryle alcyon*
Hairy woodpecker	*Picoides villosus*
Red-breasted sapsucker	*Sphyrapicus ruber*

Common Name	Scientific Name
Three-toed woodpecker	*Picoides tridactylus*
Northern flicker	*Colaptes auratus*
Downy woodpecker	*Picoides pubescens*
Pacific-slope flycatcher	*Empidonax difficilis*
Alder flycatcher	*Empidonax alnorum*
Olive-sided flycatcher	*Contopus borealis*
Western wood-pewee	*Contopus sordidulus*
Hammond's flycatcher	*Empidonax hammondii*
Tree swallow	*Tachycineta bicolor*
Violet-green swallow	*Tachycineta thalassina*
Barn swallow	*Hirunda rustica*
Northwestern crow	*Corvus caurinus*
Common raven	*Corvus corax*
Steller's jay	*Cyanocitta stelleri*
Chestnut-backed chickadee	*Parus rufescens*
Black-capped chickadee	*Poecile atricapillus*
Red-breasted nuthatch	*Sitta canadensis*
Brown creeper	*Certhia americana*
American dipper	*Cinclus mexicanus*
Winter wren	*Troglodytes troglodytes*
Golden-crowned kinglet	*Regulus satrapa*
Ruby-crowned kinglet	*Rugulus calendula*
Swainson’s thrush	*Catharus ustulatus*
Hermit thrush	*Catharus guttatus*
American robin	*Turdus migratorius*
Varied thrush	*Ixoreus naevius*
American pipit	*Anthus rubescens*
Bohemian waxwing	*Bombycilla garrulus*
Northern shrike	*Lanius excubitor*
European starling	*Sturnus vulgaris*
Warbling vireo	*Vireo gilvus*
Orange-crowned warbler	*Vermivora celata*
Yellow warbler	*Dendroica petechia*
Yellow-rumped warbler	*Dendroica coronata*
Townsend's warbler	*Dendroica townsendi*
Northern waterthrush	*Seiurus noveboracensis*
Common yellowthroat	*Geothlypis trichas*
Wilson’s warbler	*Wilsonia pusilla*
American redstart	*Setophaga reticilla*

Common Name	Scientific Name
Rusty blackbird	*Euphagus carolinus*
Red-winged blackbird	*Agelaius phoeniceus*
Western tanager	*Piranga ludoviciana*
Savannah sparrow	*Passerculus sandwichensis*
Fox sparrow	*Passerella iliaca*
Song sparrow	*Melospiza melodia*
Lincoln's sparrow	*Melospiza lincolnii*
Golden-crowned sparrow	*Zonotrichia atricapilla*
Dark-eyed junco	*Junco hyemalis*
Pine grosbeak	*Pinicola enucleator*
Rosy finch	*Leucosticte arctoa*
Common redpoll	*Carduelis flammea*
Pine siskin	*Carduelis pinus*
Red crossbill	*Loxia curvirostra*
White-winged crossbill	*Loxia leucoptera*

Sources: ADF&G 2006; AKNHP 2012; NPS 2012; Smith et al. 2001; USFS 2008a

The temperate hemlock-Sitka spruce rainforest of the Alexander Archipelago Ecoregion provides the most productive habitats for birds in the Project area. Table 5-4, adapted from Smith (Smith et al. 2001), describes habitat use on the Tongass National Forest by common breeding landbirds.

Forested habitats could also provide breeding and foraging opportunities for hawks, falcons, and owls. A northern saw-whet owl was recorded during the survey of breeding birds in nearby Limestone Inlet Research Natural Area (Smith et al. 2001). Bald eagles, which are common in Southeast Alaska, could likely nest in suitable trees near streams that have anadromous fish runs, for example, Carlson Creek (Anadromous Stream #111-32-10130, ADF&G 2012b), which is anadromous for approximately 1 mile upstream of its mouth. However, to-date, no eagle nests have been identified in this area.

Riparian and open water habitats in the Annex Creek Development area could provide both foraging and breeding habitat for various waterbirds and shorebirds. Harlequin ducks and dippers especially favor high-gradient streams such as those that drain the Project area. The Project reservoirs and lakes could provide breeding and foraging habitat for water birds such as diving ducks and loons and shorebirds such as the spotted sandpiper. Because of the steep, rocky shorelines around Upper Annex Lake, suitable habitat is limited.

Birds such as ptarmigan, rosy finch, golden-crowned sparrow, and cliff-dwelling raptors could use alpine tundra and low shrub habitats at higher elevations in the Project area (AEL&P 1985).

Table 5-4. Common breeding landbirds among mature forest seral stages, Tongass National Forest[a]

(Adapted from Smith et al. 2001)

	Old-growth		Seral Stage			
Species	**Tall closed[b]**	**Medium open[c]**	**20 years[d]**	**11-17 years[e]**	**9 years[f]**	**<5 years[g]**
Rufous hummingbird	X	X	X	X	X	
Red-breasted sapsucker	X	X	X	X		
Hairy woodpecker	X	X	X	X		r
Northern flicker		X	X			
Pacific-slope flycatcher	X	X	X	X		
Tree swallow		X	X	X		X
Steller's jay	X	X	X	X	X	X
Northwestern crow	X					
Common raven	X		X			r
Chestnut-backed chickadee	X	X	X	X	X	
Brown creeper	X	X				
Winter wren	X	X	X	X	X	X
Golden-crowned kinglet	X	X	X	r		
Swainson's thrush	r	X	X	X		
Hermit thrush	X	X	X	X	X	X
American robin		X	X	X		r
Varied thrush	X	X	X	X	X	
Orange-crowned warbler	X	X	X	X	X	r
Townsend's warbler	X	X	X	r	X	
Wilson's warbler	r		X	r	X	
Fox sparrow		r	X	X	X	r
Song sparrow			X			
Lincoln's sparrow		X				
Dark-eyed junco	X	X	X	X	X	X
Red crossbill	X		X			
White-winged crossbill	X					
Pine siskin	X	X	X	X		

a X = commonly present; r = present only rarely.

b Closed-canopy forest dominated by large-diameter hemlock/spruce associations.

c Open forest, primarily muskeg habitat, dominated by shorepine and mixed-conifer associations.

d Hemlock-spruce associations, trees <55 cm diameter at breast height (DBH).

e Hemlock/spruce saplings <13 cm DBH, deciduous shrubs

f Similar to above but trees < 2.5 cm DBH.

g Dense hemlock/spruce seedlings; deciduous shrubs and forbs.

AMPHIBIANS

There are five amphibians (Table 5-5) that may be found in the Annex Creek Development of the Project (ADF&G 2006). Amphibians would live in or near wet habitats such as open forest with muskeg and open water wetlands, and riparian areas.

Table 5-5. Amphibians that may occur in the Project area

Common Name	Scientific Name
Long-toed salamander	*Ambystoma macrodactylum*
Roughskin newt	*Taricha granulosa*
Western toad	*Bufo boreas*
Wood frog	*Rana sylvatica*
Columbia spotted frog	*Rana luteventris*

Sources: AKNHP 2012 and ADF&G 2006

INVASIVE ANIMALS

There currently is no information on the presence of invasive animal species occurring in the Annex Creek Development of the Project. Table 5-6 lists the five invasive animal species that could be found in the area (ADF&G 2012a).

Table 5-6. Invasive animals potentially occurring in the Project area

Common Name	Scientific Name
Gypsy moth	*Lymantria dispar*
Norway rat	*Rattus norvegicus*
Red-legged frog	*Rana aurora*
Rock dove	*Columba livia*
European starling	*Sturnus vulgaris*

The gypsy moth larvae feed on the leaves of alder, birch, aspen, poplar, willow, hemlock, larch, and fir trees. Alder, willow, and hemlock occur in the Project area. Juneau is known to have a breeding population of Norway rats (ADF&G 2012a). The Norway rat is mostly found in association with humans and otherwise prefers damp environments such as riparian areas and wetlands. Red-legged frogs live in coastal areas, preferring shallow, slow-moving streams, ponds, or marshes. There are ponds in the Project area, but the streams tend to be high-gradient and swift. More commonly known as pigeons, rock doves nest on cliffs and ledges, foraging on the ground for seeds and grain. Although there are cliffs and rocky outcrops in the Project area, appropriate foraging habitat is not available. European starlings

are largely urban, eating mainly insects and some fruit. They nest in trees mid-canopy in cavities and compete with native species for available nesting sites.

5.5.1.3. Botanical Resources

The Project area is divided between the Boundary Ranges and Alexander Archipelago ecoregions (Nowacki et al. 2001). Much of the higher elevations are barren of vegetation with low mat-forming or dwarf shrub communities where vegetation does occur. Species present in the alpine plant community are crowberry, heather, blueberry, willow, nagoonberry, salmonberry, and alpine azalea (AEL&P 1985). Alpine tundra and barren rocky habitats exist above 2,500–3,000 feet in the Annex Creek watershed (AEL&P 1985). Some needleleaf forests grow in the bottom of high elevation drainages. Vegetation at lower elevations closer to the coast is comprised of needleleaf, broadleaf, and mixed forests; and tall shrub swamps, low shrub bogs, wet graminoid herbaceous communities, and wet forb herbaceous communities on wet sites (ADF&G 2006). The western hemlock-Sitka spruce forest generally has an understory of shrubs such as alder, willow, salmonberry, blueberry, Devil's club; and ground cover that includes deer cabbage, skunk cabbage, bunchberry, ferns, moss and lichens (AEL&P 1985 and 2012b). Forests in the Annex Creek Development reach an elevation of about 1,500 feet, where an alpine transition zone extends to about 2,500 feet. Figure 5-10 (extracted from the AEL&P 1985 License Application) shows the approximate boundaries of the dominant habitat types that are described for the ecoregions of the Annex Creek and Salmon Creek developments of the Project.

In summer 2012, AEL&P initiated botanical resources surveys of the Annex Creek Development of the Project by investigating a portion of lands directly affected by Project operations (AEL&P 2012b). These studies continued in 2013 (AEL&P 2013b) and 2014 (AEL&P 2015a). The 2012 survey area included the powerhouse grounds and approximately 3 miles of the transmission line corridor from the powerhouse, along the shore of Taku Inlet, and inland along Carlson Creek. The 2013 survey was performed along the transmission line corridor between Camp Number 6 and the southwest shoulder of Powerline Ridge. The 2014 survey focused on two areas located within the Tongass National Forest, Annex Lake, the penstock, the valvehouse, and dam; and the transmission line corridor between the 2012 and 2013 study areas (Figure 5-11).

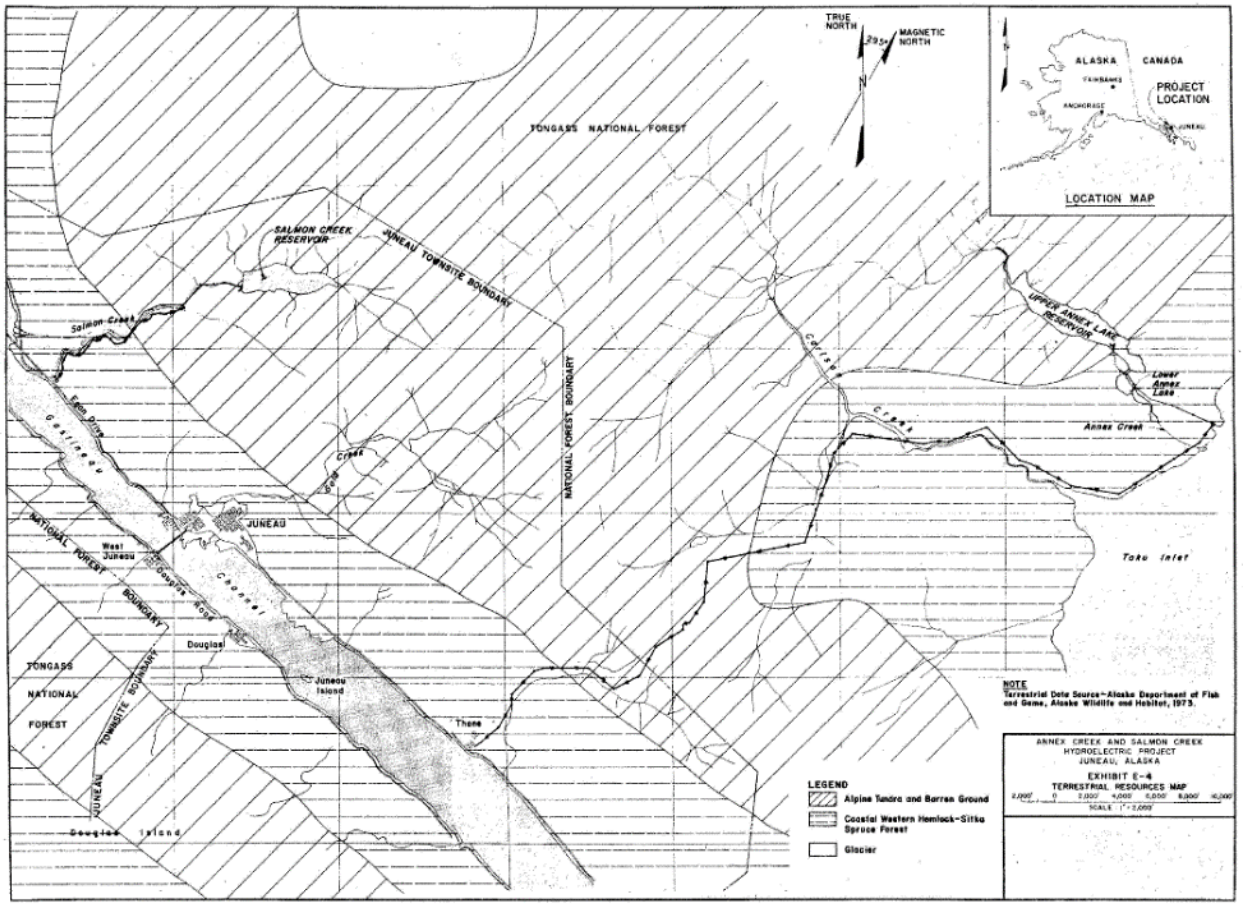
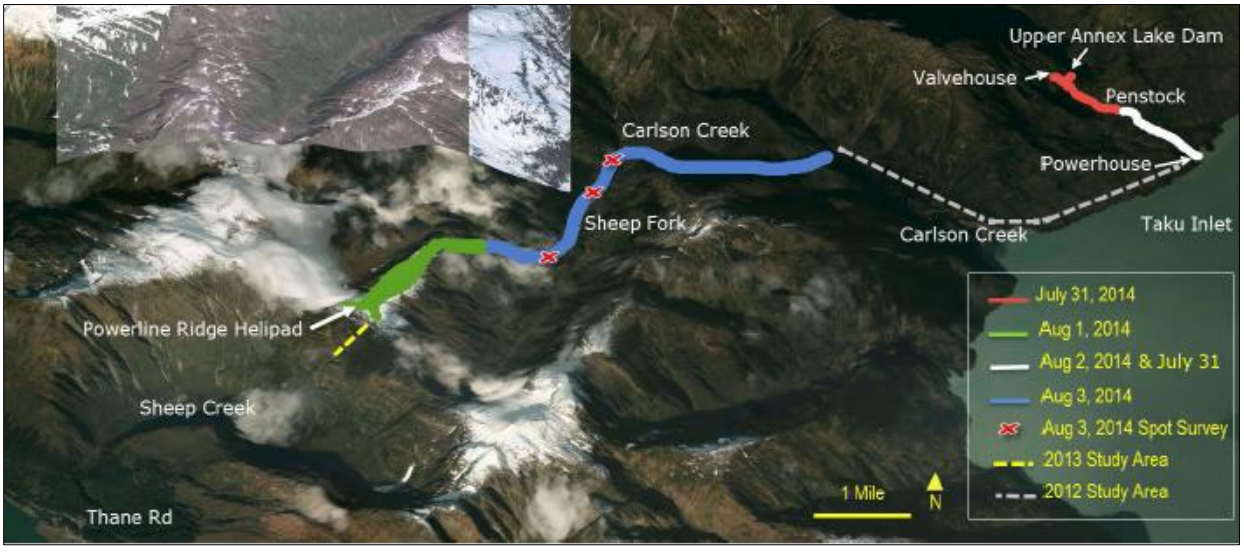


Figure 5-10. Dominant habitat types, alpine tundra, and barren ground and coastal western hemlock-Sitka spruce forest, corresponding to the Boundary Mountains and Alexander Archipelago ecoregions of the Project vicinity

(Source: AEL&P 1985)



Source: AEL&P 2015a

Figure 5-11. Plant survey areas, 2012–2014

2014 SURVEY

The 2014 study area intercepted a diverse array of habitats, from alpine tundra to lower elevation coniferous forests, including bogs, meadows, a large seep wetland, streamsides, and a dynamic floodplain. Two hundred ten vascular plant species were identified. Figure 5-12 shows the survey along the penstock corridor.

Figure 5-12. Survey along the penstock corridor

Non-native species were observed at two locations, both of which showed signs of human disturbance. The populations of these species are currently small and the species are rated only modestly to weakly invasive. These factors suggest eradication of these populations from the 2014 study area would still be feasible. All non-native species observed in the 2014 study area were documented previously in the Annex Creek Powerhouse Yard (AEL&P 2015a).

5.5.2. Environmental Effects

Under the Proposed Action Alternative, after the penstock replacement is complete, the Project would operate in the same way that it operates currently. Any ongoing effects of the Project on wildlife and botanical resources would continue. Continued operation of Project facilities would not result in any changes in the Project's effects on mammals, birds, or amphibians and their habitats. Ongoing Project operations would not affect botanical resources; AEL&P would continue to conduct annual brushing at Project facilities as part of normal operations and maintenance activities and follow the Invasive Plant Management Plan required as part of the FERC license issued in 2018.

During the penstock replacement, there will be potential adverse effects on wildlife and botanical resources. The penstock corridor is frequently travelled by Black Bears, with regular sightings made by AEL&P personnel. It is reasonable to assume that there will be bear-human interactions during the project construction.

The second potential effect would be introduction of non-native species due to the use of equipment and materials imported from outside of the project area.

5.5.3. Proposed Measures to Address Project-Related Effects

After the penstock replacement, there should be no ongoing effects on wildlife and botanical resources. During penstock replacement, AEL&P and all contractors will follow the Invasive Plant Management Plan required by the 2018 FERC license to limit the effect on botanical resources. Therefore, AEL&P is proposing no new environmental measures to address the effects of the Proposed Action on botanical resources.

During the penstock replacement, there will be potential adverse effects on wildlife. The penstock corridor is frequently travelled by black bears, with regular sightings made by AELP personnel. To try to ensure that interactions between bears and workers are as safe as possible, AEL&P will prepare a Bear Safety Plan in consultation with ADF&G and the USFS. All crews working in the area will receive training on the plan which will include details on proper food and waste management as well as how to handle bear encounters.

5.6. Wetlands, Riparian, and Littoral Habitat

No wetland delineations or mapping have been conducted specific to either the Annex Creek or Salmon Creek development and the 1985 License Application did not identify any wetlands in the Project area; however, subsequent to the 1985 application for a new license, the U.S. Fish and Wildlife Service (USFWS) completed the National Wetland Inventory (NWI) for Southeast Alaska. It is available in digital format and that information is included in the sections below. In addition, the 2012–2014 water resources and botanical resource studies provide information that can be used to describe Project area wetland, riparian, and littoral habitats.

The information presented in this section is from the Final License Application submitted by AEL&P in August 2016. There are no changes from that information presented.

5.6.1. Affected Environment

5.6.1.1. Introduction

The Annex Creek watershed, which contains Upper and Lower Annex lakes, Annex Creek, and most of the Annex Creek Development facilities, ranges in elevation from 4,170-foot-high Annex Peak to sea level. The transmission line traverses an alignment that extends beyond the Annex Creek watershed from the powerhouse at sea level, along Taku Inlet, inland along Carlson Creek, and over Powerline Ridge to the Thane Substation on Gastineau Channel. Within the watershed and Project area are a number of wetland, riparian, and littoral habitats that are described below.

5.6.1.2. Wetlands and Water of the U.S.

The NWI mapping effort conducted by USFWS identified four wetland types in the Annex Creek watershed and along the transmission line alignment (USFWS 2012a). The wetland types and the classes of wetlands identified within the types mapped within or near the Annex Creek Development are listed in Tables 5-7 and 5-8, below.

Table 5-7. Annex Creek watershed: types and acres of wetlands mapped by NWI

USFWS 2012a

NWI Map Attribute	Wetland Type	System/Subsystem; Class/Subclass; Modifiers	Acres
L1UBH	Lake	Lacustrine/limnetic; unconsolidated bottom/ permanently flooded	277.8
PEM1/SS1B	Freshwater Emergent Wetland	Palustrine; emergent/ persistent, scrub shrub/ broad-leaved deciduous; saturated	7.5
PEM1/SS4B	Freshwater Emergent Wetland	Palustrine; emergent/ persistent, scrub shrub/ needle-leaved evergreen; saturated	32.5
PEM1/USC	Freshwater Emergent Wetland	Palustrine; emergent/ persistent, unconsolidated shore; seasonally flooded	2.3
PEM1C	Freshwater Emergent Wetland	Palustrine; emergent/ persistent; seasonally flooded	1.8
PFO4/EM1B	Freshwater Forested/Shrub Wetland	Palustrine; forested/ needle-leaved evergreen, emergent/persistent; saturated	156.5
PSS1/4B	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ deciduous broad-leaved, needle-leaved; saturated	3.7
PSS1/EM1A	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ deciduous broad-leaved, emergent/ persistent; temporarily flooded	4.1
PSS1/EM1B	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ deciduous broad-leaved, emergent/ persistent; saturated	11.9
PSS4/EM1B	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ needle-leaved evergreen, emergent/ persistent; saturated	45.9
PUBF	Freshwater Pond	Palustrine; unconsolidated/ bottom; semi-permanently flooded	0.01
PUBH	Freshwater Pond	Palustrine; unconsolidated/ bottom; permanently flooded	4.5

Table 5-8. Annex Creek Development transmission line: wetlands potentially crossed by (in bold type) or in the vicinity of the transmission line right-of-way between Taku Inlet and Thane

USFWS 2012a

NWI Map Attribute	Wetland Type	System/Subsystem; Class/Subclass; Modifiers	Acres
PEM1C	Freshwater Emergent Wetland	Palustrine; emergent/persistent; seasonally flooded	1.3
PEM1/SS1A	Freshwater Emergent Wetland	Palustrine; emergent/ persistent, scrub shrub/ broad-leaved deciduous; seasonally flooded	8.9
PEM1/SS1B	Freshwater Emergent Wetland	Palustrine; emergent/ persistent, scrub shrub/ broad-leaved deciduous; saturated	54.5
PEM1/SS1Cb	Freshwater Emergent Wetland	Palustrine; emergent/ persistent, scrub shrub/ broad-leaved deciduous; seasonally flooded, beaver	3.5

NWI Map Attribute	Wetland Type	System/Subsystem; Class/Subclass; Modifiers	Acres
PEM1/UBFb	Freshwater Emergent Wetland	Palustrine; emergent/ persistent, unconsolidated bottom; semi-permanently flooded, beaver	0.9
PFO4B	Freshwater Forested/Shrub Wetland	Palustrine; forested/ needle-leaved evergreen; saturated	0.9
PFO4/EM1B	Freshwater Forested/Shrub Wetland	Palustrine; forested/ needle-leaved evergreen, emergent/persistent; saturated	417.8
PFO4/SS1A	Freshwater Forested/Shrub Wetland	Palustrine; forested/ needle-leaved evergreen, scrub-shrub/persistent; temporarily flooded	5.2
PSS1A	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ deciduous broad-leaved; temporarily flooded	27.9
PSS1/4B	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ deciduous broad-leaved, needle-leaved; saturated	7.5
PSS1B	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ deciduous broad-leaved; saturated	5.3
PSS4/1B	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ needle-leaved evergreen, persistent; saturated	4.4
PSS1/EM1B	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ deciduous broad-leaved, emergent/ persistent; saturated	43.5
PSS4/EM1B	Freshwater Scrub-Shrub Wetland	Palustrine; scrub shrub/ needle-leaved evergreen, emergent/ persistent; saturated	41.0
PUB	Freshwater Pond	Palustrine; unconsolidated bottom	13.2
LUB	Lake	Lake; unconsolidated bottom	44.3
R3US/UB	Riverine	River; unconsolidated substrate	20.0
E2EM1P	Estuarine Intertidal Wetland	Estuarine/intertidal; emergent/persistent; irregularly flooded	8.8

Variations on the freshwater forested/shrub wetland type cover the greatest area in the vicinity of the Annex Creek Development, 580.4 acres, mostly in the vicinity of the transmission line. Upper and Lower Annex lakes are the next largest wetland type in the Annex Creek Development: 277.8 acres. Figure 5-13 shows the NWI mapping for the Annex Creek watershed. Plants identified during the rare and invasive plant surveys and found in palustrine forested /shrub/emergent vegetation wetlands include *Pinus contorta, Tsuga mertensiana, Kalmia polifolia, Nephrophyllidium crista-galli, Eriophorum angustifolium, Lysichiton americanus*, orchids (e.g., *Platanthera dilatata, Platanthera stricta*), *Drosera rotundifolia*, and abundant sedges (*Trichophorum caespitosum, Carex pluriflora, Carex pauciflora*) (AEL&P 2012b). These bogs (also known as sphagnum bogs or muskeg) can also contain *Chamaecyparis nootkatensis, Empetrum nigrum, Vaccinium ugliginosum, V. vitis-idaea, V. caeispitosum, Andromeda polifolia, Rubus chamaemorus, Ledum groenlandicum, Cornus suecica*, and *Fauria crista-galli* and often feature some standing water (AEL&P 2012b, ADF&G 2006, and USFS 2012a).

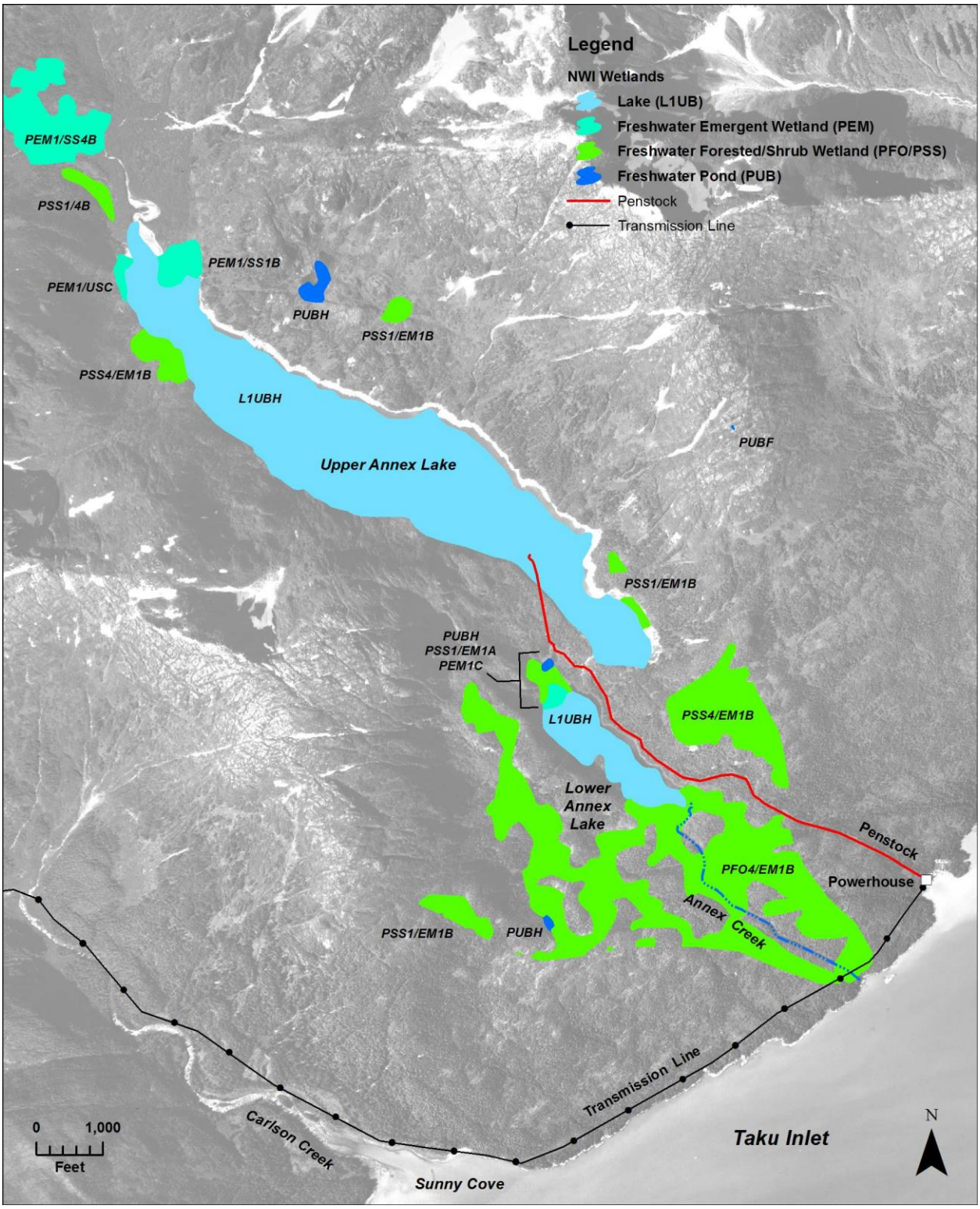


Figure 5-13. Wetlands mapped in the area of the Annex Creek Development for the NWI

USFWS 2012a

Birds that may nest in palustrine wetlands and meadows include greater yellowlegs, Lincoln's sparrow, common yellowthroat, and waterfowl if open water is present (ADF&G 2006 and USFS 2012a). Some wetlands are used by olive-sided flycatchers, song sparrows, tree swallows (where dead trees are present), and rusty blackbirds for foraging and nesting if shrubby or edge habitats are nearby. Deer and moose may browse on shrubs; bears feed on berries, grasses, and forbs; and wolves, coyotes, and mustelids may find prey. Amphibians could be present including the long-toed salamander, roughskin newt, western toad, wood frog, and Columbia spotted frog.

No populations of invasive or non-native plants were located in wetland habitats during the surveys completed by AEL&P in 2012–2014. AKEPIC does not note any detection of non-native plants in the Annex Creek Development (AKEPIC 2012).

5.6.1.3. Riparian and Littoral Habitat

Annex Creek is relatively short (3,432 feet) and steep; therefore, most of the riparian and littoral habitat in the Annex Creek Development is associated with Upper and Lower Annex lakes: 23,996 feet and 6,660 feet, respectively. For short distances, the transmission line intersects riparian and littoral habitats along Taku Inlet, Carlson Creek, and Sheep Creek. The lengths of riparian and littoral habitat in the Annex Creek Development are listed in Table 5-9.

Table 5-9. Lengths of riparian and littoral habitat in the Annex Creek Development

Location	Length or Perimeter (Ft)
Annex Creek between Upper and Lower Annex Lakes	792
Annex Creek between Lower Annex Lake and Taku Inlet	2,640
Upper Annex Lake	23,996
Lower Annex Lake	6,660
Taku Inlet	1,000
Carlson Creek	1,480
Sheep Creek	200

Much of the riparian and littoral habitat in the Annex Creek Development is steep and rocky (Figure 5-14). The vegetation typically is either forested communities with a shrub understory or medium-tall shrub communities. Species generally encountered in the forested communities are typified by those found in the Carlson Creek floodplain during the 2012 rare and invasive plant surveys: *Tsuga heterophylla* (hemlock), *Picea sitchensis* (Sitka spruce), *Menziesia ferruginea, Vaccinium alaskense, Oplopanax horridus, Athyrium filix-femina* and *Streptopus amplexifolius* (AEL&P 2012b). Typical medium to tall shrub communities encountered in the Carlson Creek floodplain in 2012 were composed of *Rubus spectabilis, Alnus viridis, Oplopanax horridus, Salix barclayi, Salix sitchensis*, and *Athyrium filix-femina* (AEL&P 2012b). At the head of Upper Annex Lake the cobble and gravel delta, formed where upper

Annex Creek flows into the lake, supports an early successional community dominated by *Epilobium* sp. (fireweed). Lower Annex Lake shorelines are a combination of steep, rocky, forested habitats and muskeg bogs.

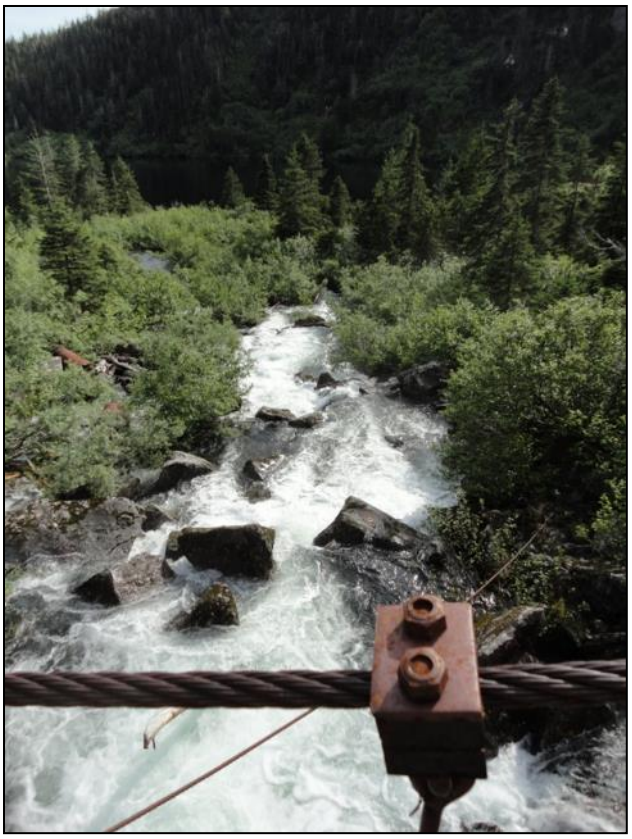


Figure 5-14. Annex Creek riparian and littoral habitat, predominantly medium-tall shrub, August 2012

Habitats along Annex, Carlson, and Sheep creeks could host bank-nesting birds such as dippers and harlequin ducks. Forested and shrubby (e.g., alder and willow) riparian habitats could be home to orange-crowned, Wilson's, and yellow-rumped warblers; dark-eyed juncos; ruby-crowned kinglets; alder flycatchers; fox sparrows; and hermit thrushes. Where cottonwoods occur in riparian areas, yellow warblers, warbling vireos, and red-breasted sapsuckers may reside. Stands of large trees near streams could be home to the varied thrush, Steller's jay, chestnut-backed chickadee, golden-crowned kinglet, brown creeper, pine siskin, common redpole, pine grosbeak, and white-winged and red crossbills (USFS 2008b and 2012a). Mammals such as Sitka black-tailed deer, moose, brown and black bears, wolves and coyotes, marten, mink, ermine, river otters, beavers, other small mammals could forage for browse, berries, and prey or just use the stream habitats as a travel corridor. Amphibians could be present including the long-toed salamander, roughskin newt, western toad, wood frog, and Columbia spotted frog.

The 2014 botanical resources survey noted the presence of wetlands along the penstock corridor and bordering the west edge of the valvehouse helipad (AEL&P 2015a).

5.6.2. Environmental Effects

Under the Proposed Action Alternative, after the penstock replacement is complete, the Project would operate in the same way that it operates currently allowing the local environment to return to pre-construction condition. Any ongoing effects of the Project on wetlands and riparian and littoral habitat would continue. Continued operation of Project facilities would not result in any changes in the amount of wetland acreage, wetland habitat, or wetland types. Continued operation would also not affect the amount or quality of riparian and littoral habitat. No changes to Project facilities are proposed other than routine activities required for maintenance purposes; therefore, no direct, indirect, cumulative, or unavoidable adverse effects on wetlands and riparian and littoral habitat are anticipated as a result of the Proposed Action.

5.6.3. Proposed Measures to Address Project-Related Effects

No long-term changes to Project facilities or operations are proposed, and no long-term effects on wetlands and riparian and littoral habitat are anticipated. Therefore, AEL&P is proposing no new long-term environmental measures to address the effects of the Proposed Action on wetlands and riparian and littoral habitat.

5.7. Rare, Threatened, and Endangered Species

5.7.1. Affected Environment

5.7.1.1. Designated Threatened or Endangered Species and Critical Habitats

AEL&P consulted with USFWS regarding the potential presence of threatened or endangered species and/or designated critical habitat in the Project area (USFWS 2015). No plant or animal species are listed by federal or state governments as threatened or endangered or their habitats listed as critical within the Project area (USFWS 2015 and 2012b; ADF&G 2006 and 2012b). The Kittletz's murrelet is currently a candidate species for threatened listing (ANHP 2012). The breeding range for this rare bird overlaps the Annex Creek watershed. While nesting habits are poorly known, it is thought that the birds prefer high mountain talus slopes within reasonable flight distance of marine environments. Such habitats may be found within the Annex Creek watershed but likely would be well outside the Project area.

Bald eagles are common in the Project area, but no eagle nests are known to be present within the Annex Creek area. Even though the bald eagle has been delisted under the ESA, it is specifically protected by the American Bald and Golden Eagle Protection Act of 1940 (as amended in 1962), which prohibits the take, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16 U.S.C. 688(a); 50 CFR 22). The Migratory Bird Treaty Act also prohibits the take of migratory birds, including bald eagles. USFWS (2007) has established national management guidelines for bald eagles that provide recommendations for avoiding disturbance at nest sites and at foraging areas and communal roost sites, as well as activity-specific guidelines. If nests are discovered during the license

term, AEL&P will comply with USFWS guidelines regarding proximity to nest sites and other limitations to disturbance.

5.7.1.2. Sensitive, Rare, and Listed Species

USFS maintains lists of sensitive plant and animal species present or potentially present within the national forests. Species of concern in the Tongass National Forest are listed in Table 5-10. Additionally, the Alaska Natural Heritage Program (ANHP) makes recommendations regarding species of concern. Rare plant species known to be found within 20 miles of Juneau are listed in Table 5-11 (AEL&P 2012b; ANHP 2012).

Table 5-10. Sensitive plant and animal species listed by the U.S. Forest Service in the Alaska Region

Alaska Region Sensitive Species List
Approved February 2009
Replaces 2002 List

Common Name	Scientific Name	Occurrence	
		CNF	TNF
Plants			
Eschscholtz's little nightmare	*Aphragmus eschscholtzianus*	Y*	S
Moosewort fern	*Botrychium tunux*	S	Y
Spatulate moonwort fern	*Botrychium spathulatum*	S	Y
Moonwort, no common name	*Botrychium yaaxudakeit*	S	Y
Edible thistle	*Cirsium edule* var. *macounii*		Y
Sessileleaf scurvygrass	*Cochlearia sessilifolia*	S	
Spotted lady's slipper	*Cypripedium guttatum*	Y	
Mountain lady's slipper	*Cypripedium montanum*	S	Y
Large yellow lady's slipper	*Cypripedium parviflorum* var. *pubescens*	S	Y
Calder's loveage	*Ligusticum calderi*	S	Y
Pale poppy	*Papaver alboroseum*	Y	S
Alaska rein orchid	*Piperia unalascensis*	S	Y
Lesser round-leaved orchid	*Platanthera orbiculata*		Y
Kruckeberg's swordfern	*Polystichum kruckebergii*		Y
Unalaska mist-maid	*Romanzoffia unalaschcensis*	Y	Y
Henderson's checkermallow	*Sidalcea hendersonii*		Y
Dune tansy	*Tanacetum bipinnatum* subsp. *huronense*	S	Y
Lichen			
Lichen, no common name	*Lobaria amplissima*	S	Y
Animals**			
Queen Charlotte goshawk	*Accipiter gentilis laingi*		Y
Dusky Canada goose	*Branta canadensis occidentalis*	Y	
Black oystercatcher	*Haematopus bachmani*	Y	Y
Aleutian Tern	*Sterna aleutica*	Y	Y
Kittlitz's Murrelet	*Brachyramphus brevirostris****	Y	Y

* Y indicates known occurrence and S indicates suspected occurrence on the Chugach National Forest (CNF) and Tongass National Forest (TNF).

** No fish or mammals are designated as sensitive.

*** Also a U. S. Fish & Wildlife Service Candidate Species.

Table 5-11. Rare plant species tracked by the Alaska Natural Heritage Program and occurring within 20 miles of Juneau, Alaska

Family	Scientific Name	[2]Global/State Ranking	Frequency
Asteraceae	*Lactuca biennis* (Moench) Fernald	G5/S2S3	2
	Saussurea americana D. C. Eaton	G5/S2S3	1
Brassicaceae	*Rorippa curvisiliqua* (Hooker) Bessey ex Britton	G5/S1S2	2
Cyperaceae	*Carex athrostachya* Olney	G5/S1*	1
	Carex bebbii Olney ex Fernald	G5/S1S2*	1
	Carex interior L. H. Bailey	G5/S3*	1
	Carex stipata Muhl. ex Willd. var. *stipata*	G5/S2*	2
Dryopteridaceae	*Polystichum setigerum* (K. Presl) K. Presl	G3/S3*	1
Fabaceae	*Oxytropis tananensis* Jurtz.	GNR/S3S4Q	1
Gentianaceae	*Gentianella propinqua* ssp. *aleutica* (Cham. & Schltdl.) J. M. Gillett	G5T2T4/S3*	4
Juncaceae	*Juncus tenuis* Willd.	G5/S2*	1
Ophioglossaceae	*Botrychium tunux* Stensvold & Farrar	G2G3/S2	1
Orobanchaceae	*Castilleja hyetophila* Pennell	G4G5/S2S3*	3
Poaceae	*Festuca viviparoidea* Krajina ex Pavlick ssp. *viviparoidea* or ssp. *krajinae* Pavlick	G4G5/SU	1
	Festuca viviparoidea ssp. *krajinae* Pavlick	G4G5/SU	1
	Podagrostis humilis (Vasey) Bjorkman	G5/S3	1
Polygonaceae	*Polygonum fowleri* B. L. Robinson ssp. *fowleri*	G5TNR/S3S4	2
Potamogetonaceae	*Zannichellia palustris* L. ssp. *palustris*	G5/S3S4*	1
Ranunculaceae	*Ranunculus orthorhynchus* Hook. var. *orthorhynchus*	G5T5/S2S3	1
Saxifragaceae	*Mitella nuda* L.	G5/S1*	1
Violaceae	*Viola selkirkii* Pursh ex Goldie	G5?/S3S4*	6

[1] Source: AKNHP data request May 2012. The population locations in the AKNHP geodatabase have been moved randomly up to 1 km to obscure the precise locations of tracked species populations.

[2] AKNHP ranks plants with a code that describes their population status on a global (Gx) and on a statewide (Sx) level, where "x" represents a rank from 1 to 5. A rank of 5 indicates a common plant with demonstrably secure populations, and 1 indicates a critically imperiled plant whose populations are vulnerable to extirpation or extinction. Species with a state rank level below "S4" are considered rare and are tracked by the AKNHP. If the rank is uncertain, it is described as a range between two numbers (for example, S2S3). Applicable definitions: G2: Imperiled and at high risk of extinction due to a very restricted range, very few populations, steep declines or other factors. G3: Vulnerable and at moderate risk of extinction G4: Apparently secure, uncommon but not rare; some cause for long-term concern due to declines or other factors G5: Secure, common, widespread, and abundant though it may be uncommon in some portions of its range, especially at the periphery. S2: Imperiled in the state because of rarity (6-20 occurrences), or because of other factors making it very vulnerable to extirpation from the state. S3: Rare or uncommon in the state (21-100 occurrences). The letter "Q" is used to indicate taxonomic uncertainty and the letter "T" indicates the subsequent rank describes the status of a subspecies or variety. The combination of "GNR" indicates the global rank has not been assessed. An asterisk indicates a preliminary ranking under review by AKNHP.

PLANTS

Botanical investigations initiated by AEL&P in 2012 and continuing in 2013 and 2014 specifically targeted the sensitive and rare plant species listed in Tables 5-10 and 5-11. No sensitive plant species from either list were observed in 2012, 2013, or 2014 (AEL&P 2012b, 2013b, 2015a).

No rare plant species were observed in 2012. In 2013, 1 of the 315 species tracked by AKNHP, alpine saxifrage alpine saxifrage (*Micranthes tolmiei*), was documented in the study area. Within Alaska, alpine saxifrage has been designated a rarity status of S2S3, i.e., rare or imperiled within the state and of moderate to high risk of extirpation because of limited range or other factors (AKNHP 2012). It has not been assigned a global conservation rank. Alpine saxifrage is found in arctic and alpine tundra throughout western North America, including Alaska, British Columbia, Washington, Idaho, Montana, Oregon, California, Nevada, and Utah. A review of species occurrence data compiled by the AKNHP indicates this species has been documented at least 15 times in Southeast Alaska, including one observation on Sheep Mountain approximately 5 air miles from the 2013 study area, and another observation on nearby Douglas Island (AEL&P 2013b).

In 2014, biologists observed three species tracked by AKHNP (AEL&P 2015a): *Micranthes* cf. *porsildiana* (tentative identification), *Micranthes tolmiei*, and *Mimulus lewisii* (Figure 5-15). *Micranthes tolmiei* and *Mimulus lewisii* also are listed in the Tongass National Forest Monitored Species Matrix, along with three additional species observed during the survey: *Equisetum scirpoides* Michx, *Listera convallarioides*, and *Micranthes* cf. *porsildiana.*

Source: AEL&P 2015a

Figure 5-15. *Mimulus lewisii* and habitat

ANIMALS

Of the listed animals present in the Tongass National Forest, only the Queen Charlotte goshawk and the Kittlitz's murrelet have a range that potentially includes the Annex Creek watershed (ANHP 2012). Either of these uncommon birds could nest in the Project area.

Goshawk Survey

In 2014, AEL&P wildlife resource studies included a survey for Northern Goshawk (*Accipiter gentilis*), the recognized subspecies of the Queen Charlotte Goshawk (*Accipiter gentilis laingi*) in Southeast Alaska (AEL&P 2015a). USFS, Alaska Region, characterizes the Queen Charlotte Goshawk as a sensitive species for which population viability is a concern (USFS 2008a; Goldstein et al. 2009). USFS policy currently requires evaluation of proposed management actions that may take place on potential goshawk habitat as well as documentation of findings (Woodbridge and Hargis 2006). The Queen Charlotte goshawk has also been designated as a species of special concern by the Alaska Department of Fish and Game (Iverson et al. 1996).

Surveyed areas included the Annex Creek penstock corridor from the powerhouse to the entrance underground and the Carlson Creek transmission line corridor starting from the mouth of the creek and continuing west into the valley. The survey took place in June and July 2014. While vegetation structure, prey availability, and topography associated with the Northern Goshawk exist in the survey area, no indication of current or past goshawk presence was evident in any of the surveyed areas (AEL&P 2015a).

5.7.2. Environmental Effects

Under the Proposed Action Alternative, the Project would operate after the penstock replacement in the same way that it currently operates. Any ongoing effects of the Project on rare, threatened, or endangered species and their habitats would continue.

The potential exists for rare, threatened, or endangered species to occur in the Tongass National Forest, in the Project watersheds, and thus in the Project area. As described above, botanical investigations initiated by AEL&P in 2012, 2013, and 2014 observed a small number of plant species in the Annex Creek area that are tracked by AKNHP and/or are listed in the Tongass National Forest Monitored Species Matrix. However, none of these species are listed by federal or state agencies as rare, threatened, or endangered. The AEL&P-initiated goshawk survey conducted in 2014 found no indication of current or past goshawk presence in the surveyed areas. Bald eagles, now delisted under the ESA but protected under federal law, are common in the Project area, but no eagle nests are known to be present.

5.7.3. Proposed Measures to Address Project-Related Effects

Due to the limited area of disturbance during the penstock replacement and the prior surveys completed, no impacts to threatened, or endangered species or their habitats are anticipated. Therefore, AEL&P is proposing no new environmental measures to address the effects of the Proposed Action on rare, threatened, or endangered species and their habitats.

5.8. Land Use, Recreation, and Aesthetics

5.8.1. Affected Environment

5.8.1.1. Land Use

LAND OWNERSHIP

The Annex Creek Development is located on the Taku Inlet approximately 11 air miles from Juneau. The Project is accessible only by boat or aircraft. The Project facilities are located mostly in the Tongass National Forest. AEL&P has a Special Use Permit from USFS authorizing use of forest lands in the vicinity of Annex Creek and the Taku River (USFS 2018). There are also several private land holdings farther upstream from Annex Creek on the Taku River. These are accessed primarily via boat from Juneau. Figures 5-16 shows land ownership in the vicinity of the penstock corridor of the Annex Creek Development.

LAND USE DESIGNATIONS AND LAND USE PLANNING

Figure 5-17 shows the land use designations in the Project vicinity.

ADJACENT LAND USES

Adjacent land use around the Annex Creek Development is generally consistent with land use within the Project boundary; that is, a Semi-Remote Recreation Land Use Designation (LUD) (discussed below), as well as scenic viewshed LUD.

SHORELINE BUFFER ZONES

The Project does not include any shoreline buffer zones. The transmission line follows the shore of Taku Inlet for approximately 2 miles before turning up Carlson Creek valley. Throughout this segment, the transmission line is located 100 to 400 feet from the shoreline.

NON-RECREATIONAL LAND USE

No non-recreational land uses are present in the Project area or vicinity. Taku Inlet is a heavily used commercial fishing area between June and September. The area is used by gillnetters as well as by long-liners. The areas fished are south of the powerhouse location. The shallow tidal flats in front of the powerhouse make the area unsuitable for fishing.

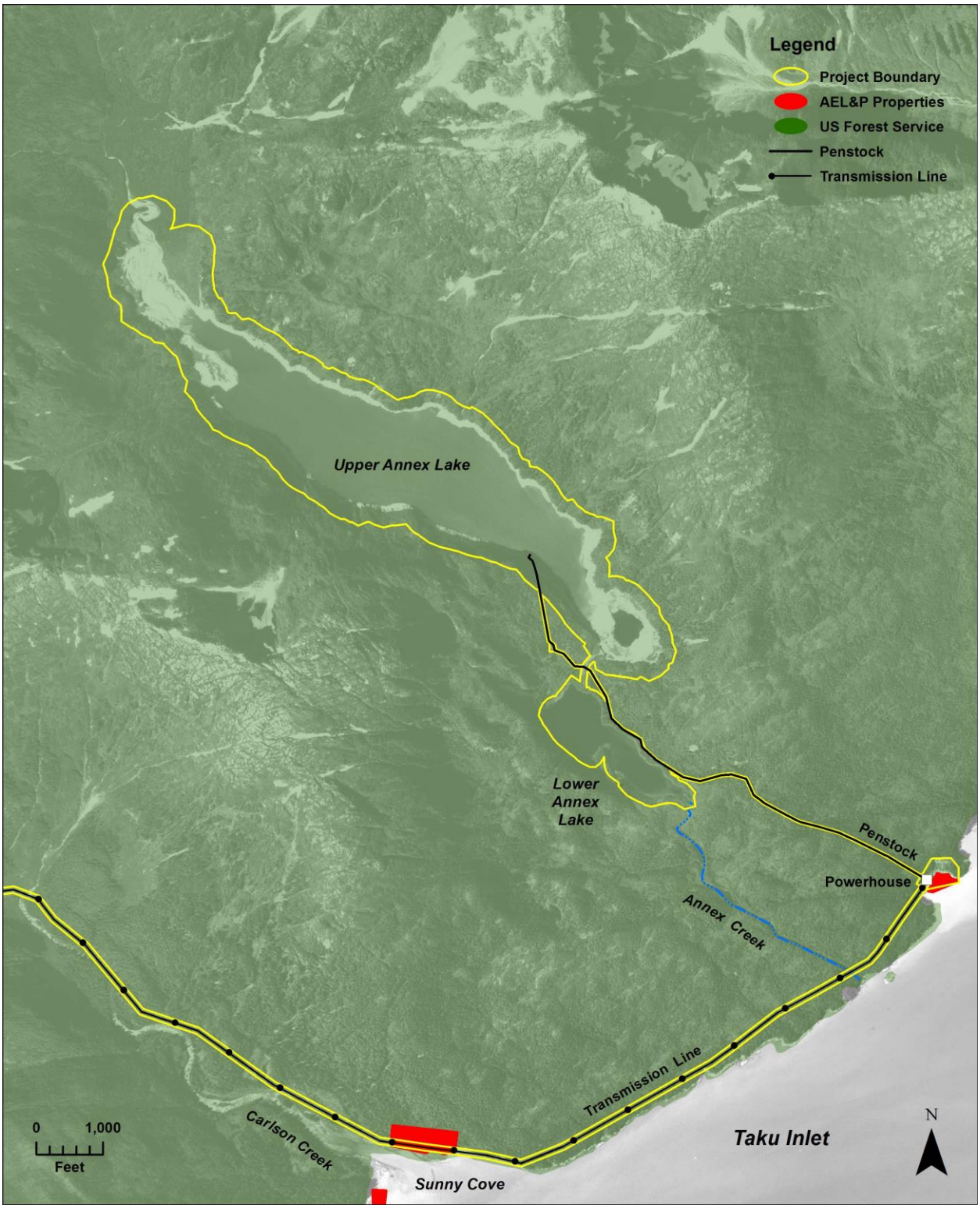


Figure 5-16. Land ownership in the Annex Creek Development vicinity

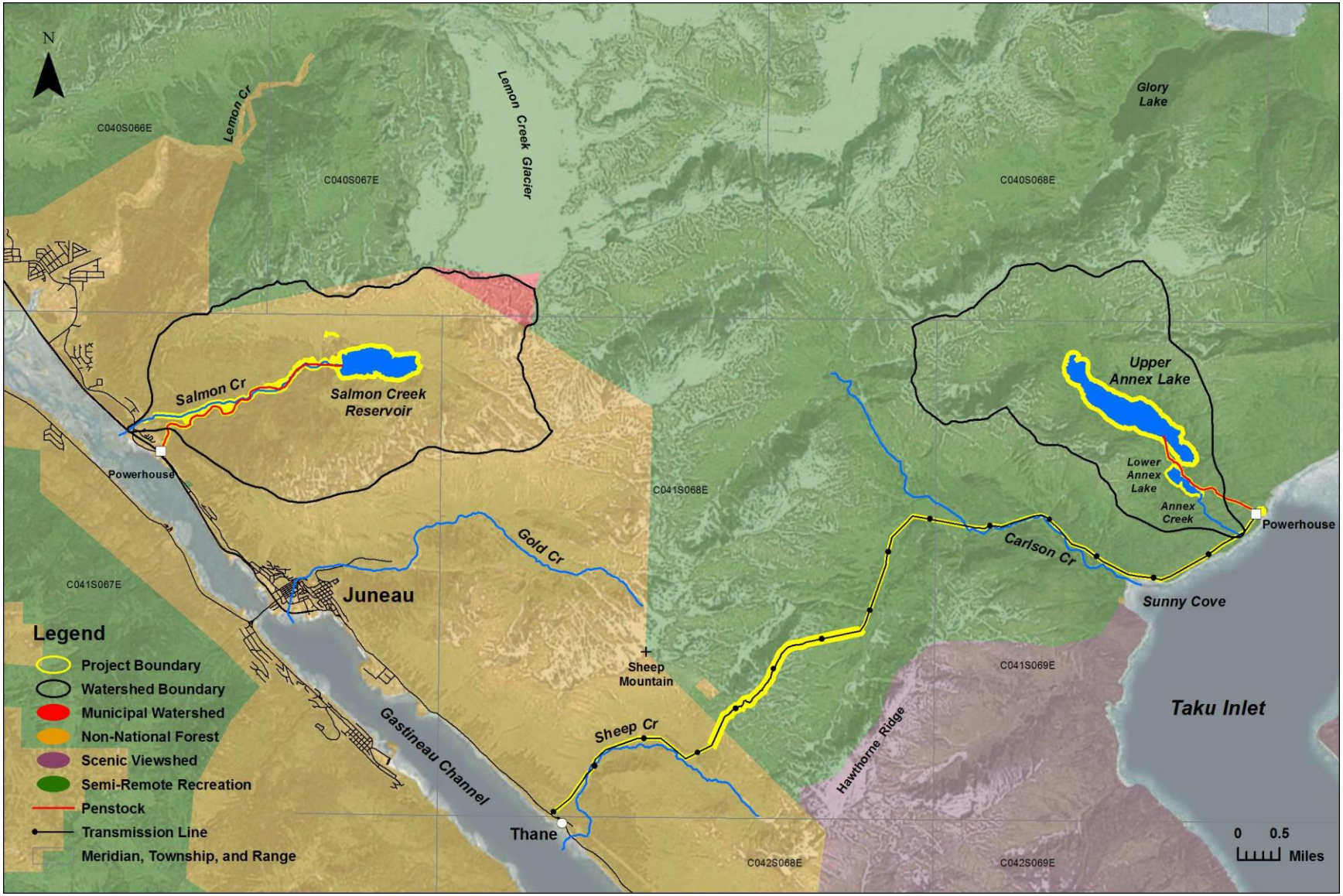


Figure 5-17. Land use designations in the Project vicinity

5.8.1.2. Recreation

EXISTING RESOURCE FACILITIES

The only recreational facilities associated with the Annex Creek component are two of the Transmission Line Camp cabins which are available for public use. These are warming shelters and available on a first come first use basis.

Camp 6 is located on Powerline Ridge near the Tongass National Forest boundary, it is a modern cabin that is accessible from the Sheep Creek Trail which originates near Thane Substation. It is a moderate to strenuous hike.

Camp 4 is the original cabin located in the Sheep Fork of the Carlson Creek basin, it is the original cabin and in fair condition. AELP crews perform minor maintenance and stock the cabin with firewood when performing transmission line maintenance in the area.

CURRENT RECREATIONAL USE OF THE PROJECT VICINITY

The Tongass National Forest Plan (USFS 2008a) designates the area around the Annex Development as being part of its Semi Remote Recreation LUD. Its management goal for the area is to "provide for recreation and tourism in natural-appearing settings where opportunities for solitude and self-reliance are moderate to high." Areas in the Semi-Remote Recreation LUD are characterized by generally unmodified natural environments. Ecological processes and natural conditions are only minimally affected by past or current human uses or activities. Users have the opportunity to experience a moderate degree of independence, closeness to nature, solitude, and remoteness, with some areas offering motorized opportunities and others non-motorized opportunities (except for the traditional uses of boats, aircraft, and snowmachines). Interactions between users are infrequent. Facilities and structures may be minimal or occasionally may be larger in scale, but will be rustic in appearance, or in harmony with the natural setting.

Beyond this LUD, no identified recreation areas are present within the Project boundary or vicinity. The Taku River is a highly used recreational area during the summer and fall months. A remote lodge is located on the Taku River. It is operated as a "salmon bake" through the summer months and is serviced by float planes several times a day. Glaciers located at the mouth of the Taku River are part of float plane and helicopter sightseeing tours throughout the summer months. Due to this tourist activity, a significant amount of air traffic occurs over the Project between May and September.

The powerhouse is located in a tidal area (Figure 5-18) south of the mouth of the river. The main river channels are located on the opposite side of the inlet, so most of the boat traffic does not pass close to the Project. Additionally, the mud flat in front of the powerhouse becomes dry at low tide, making access to the shore difficult.

There are no National Trails System or Wilderness Area Lands within the Project boundary. However, a trail to Turner Lake, where two USFS cabins are available as rentals, is located approximately 5 miles

east across Taku Inlet. This area is used throughout the summer by hikers, campers, and fishermen. Most people access the area by floatplane or by boat, anchoring near the mouth of Turner Creek. The Annex Creek operator provides assistance when necessary to boaters in trouble. There is no cell phone coverage in Taku Inlet, so people stop at the Annex Creek facilities to call or to seek assistance.

Figure 5-18. Annex Creek tidal area

MANAGEMENT PLANS AND FUTURE GOALS AND NEEDS

The following agency management plans were reviewed and no needs for the Project area were identified.

- Recreation Facility Analysis, 5 Year Action Plan, Tongass National Forest, September 2005
- Alaska Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2016-2021
- Juneau Parks and Recreation Comprehensive Plan, July 1996 (Chapter 8, Revised, December 2007)

5.8.1.3. Aesthetics

The existing Annex Creek Dam is located at the southeast end of Upper Annex Lake reservoir. Water flows southwest from the upper lake outlet into Lower Annex Lake (Figure 5-19). The existing timber buttress dam and the 264-acre reservoir are surrounded by forest lands. No other existing developments are within or near the vicinity of the Annex lakes.

Figure 5-19. Upper and Lower Annex Lakes (center of photo) looking north from Taku Inlet

The penstock extends 7,097 feet from the Upper Annex Lake reservoir to the powerhouse, traversing a steep valley of dense forest dominated by western hemlock and Sitka spruce. The Annex Creek Powerhouse and switchyard are located on Taku Inlet at the base of precipitous mountains. The plant and adjacent permanent buildings are situated on the shore of a small cove (Figure 5-20). The existing powerhouse building is the original structure built in 1915 and is of steel frame construction covered with corrugated galvanized steel. The powerhouse discharges into a tailrace directly in front of the powerhouse. Approximately 0.5 miles southwest of the powerhouse, the outlet of Annex Creek cascades steeply into Taku Inlet.

The switchyard is located on the east end of the powerhouse. The 23-kV transmission line extends 12.5 miles from the switchyard, along the southeast shore of Taku Inlet through a forested area, and continues northwest across sparsely vegetated, precipitous mountain ridges into Thane.

There are no designated scenic or protected river segments located within the Project boundary; however, the area is governed by the Tongass National Forest Plan (USFS 2008a), which notes that Taku Inlet could be used by small boats and mid-sized tour boats touring Stephen's Passage, and is therefore a Visual Priority Route. The extent of the Scenic Viewshed LUD stops just south of the Annex Creek Development, outside the FERC boundary.

Figure 5-20. Annex Creek facilities

5.8.2. Environmental Effects

Under the Proposed Action Alternative, the Project would operate after the penstock replacement in the same way that it operates currently. Any ongoing effects of the Project on land use, recreation, and aesthetics would continue. In the short term, there would be visible ground disturbance in the penstock corridor which would be visible from both the air and water. Over time, the penstock corridor would return to a condition similar to present conditions. Long term, there would be no negative direct, indirect, cumulative, or unavoidable adverse effects.

During the heavy-lift helicopter operations, AEL&P will provide notice to all air based tourism operators who travel regularly past the project so they are aware of the increased hazard present.

5.8.3. Proposed Measures to Address Project-Related Effects

AEL&P is proposing no new environmental measures to address the effects of the Proposed Action on land use, recreation or aesthetics.

5.9. Historic and Cultural Resources

5.9.1. Affected Environment

5.9.1.1. Background

PREHISTORIC

At least as early as 11,000 years ago, human groups migrated into Southeast Alaska with the end of the Wisconsin glaciation of the last ice age. These early cultures, like later ones, likely exploited resources associated with the sea. As a result, most early sites are expected to be found in coastal areas; however, because the relative sea level fluctuated over time, sites may be found in inland areas at higher elevations as well. "The earliest archaeological sites in the region contain assemblages dominated by small stone tools called microblades that were manufactured from prepared wedge-shaped cores. Sites exhibiting this technology have been found at various locations in Southeast Alaska including Baranof Island, Prince of Wales Island, Heceta Island, Kupreanof Island and Ground Hog Bay in Glacier Bay" (Pipkin 2015a). The Glacier Bay site, located just 31 miles west of present-day Juneau, has a component radiocarbon dated to 10,180 ± 800 years before present (Pipkin 2015a).

Between 6,500 and 4,000 years ago, Southeast Alaska's archaeological record shows a gradual shift in tool technology emphasis from flaked tools to ground stone tools, similar to the pattern in British Columbia and to the north along littoral regions of the Gulf of Alaska, and "[t]he last 1,000 years saw the development of a society that was very similar to that of the Tlingit, who occupied the region at the time of Euro-American contact. Larger structures, similar to clan houses, became more common, as did large winter villages" (Pipkin 2015a). Sources cited by Pipkin (2015a) report that Tlingit oral tradition suggests that between 750 and 300 years ago, the various clans entered the region from the Tsimshian peninsula and from the interior via the Skeena, Nass, Stikine, and Taku rivers.

ETHNOGRAPHIC

The area around Annex and Carlson creeks was in the traditional territory of the Taku Kwaan Tlingit (Pipkin 2015b). The 1946 Goldschmidt and Haas study (republished in 1998) reports that the Taku people had villages and habitation areas at several sites on Taku Inlet. One of these sites was on Carlson Creek on the north shore of Sunny Cove. One informant stated that this area had been used solely by Taku Natives until his grandfather sold his cabin at the mouth of Carlson Creek at the beginning of the twentieth century.

HISTORIC

Early Euro-American incursions into Southeast Alaska began in the late eighteenth century and involved traders from Russia, Britain, and the United States, trading Western goods for furs. Other early industries included logging and salmon canneries (Alaska Humanities Forum, n.d.1). In 1869, the first recorded gold discovery in the vicinity of Juneau occurred at Powers Creek and Windham Bay (Conley 2015). In 1880, Joe Juneau and Richard Harris discovered both placer and lode gold deposits at the mouth of Gold Creek in what is now the city of Juneau, setting off a rush of prospectors to the Juneau

area (Pipkin 2010, Conley 2015). The area became known as the Juneau Goldbelt, a swath of land approximately 100 miles long by 10 miles wide extending southeast of Juneau to Windham Bay and northwest of Juneau to Berners Bay (Pipkin 2010). "[B]etween 1880 and 1944 this area was the scene of extensive gold prospecting and mining operations, some [of] which rivaled in size and scope the largest in the world" (Pipkin 2010).

To supply power for mining and milling gold as well as power to towns in the area, the largest mining companies in the Juneau Goldbelt constructed six major hydroelectric facilities in the area (including the Annex Creek and Salmon Creek developments) between 1893 and 1916 (Pipkin 2010, Conley 2015). However, "War Production Limitation Order L-208 forced "non-essential" mines across Alaska [and] [m]ines throughout the United States to close in 1942" (Conley 2015). After the war, high operating costs made mining less profitable, and hydroelectric facilities were sold to AEL&P.

As noted above, the salmon cannery industry made significant contributions to the history and economy of Southeast Alaska beginning in the late eighteenth century. "Initially, owners hired Alaska Natives….As the industry expanded and more workers were needed, cannery owners began to hire recent Chinese immigrants in Seattle or San Francisco. These new workers were transported to the canneries in the spring….When the salmon season ended, the imported workers were transported back to their home port…By the 1890s, the cannery industry hired about 10,000 workers annually" (Alaska Humanities Forum, n.d.2).

5.9.1.2. Completed Investigations

In 2008, AEL&P commissioned Walking Dog Archaeology to conduct an archaeological survey of the Annex Creek Development. "This was a pedestrian survey in which the areas around the dam at the outlet of Upper Annex Lake, the route of the penstock pipeline, and the area around the powerhouse and the employee housing and the area around the facility's dock were physically examined. The route of the power transmission line was examined from the air via helicopter overflight. Landings were made at the line shacks and on-ground physical inspections were made around these structures" (Pipkin 2016b). For safety reasons, the shoreline buffers of Upper Annex Lake and Lower Annex Lake were not surveyed by foot; the terrain in these shoreline buffer areas is steeply sloped, access is very difficult, and it was judged unlikely that prehistoric or historic sites were present in these locations.

5.9.1.3. Study Results

PREHISTORIC ARCHAEOLOGICAL SITES

No prehistoric remains were discovered during the 2008 survey, and "[t]here are no known prehistoric archaeological sites in the immediate vicinity of Annex or Carlson Creeks reported on the Alaska Heritage Resource Survey maintained by the State of Alaska Office of History and Archaeology" (Pipkin 2015b).

ANNEX CREEK HYDROELECTRIC COMPLEX HISTORIC DISTRICT, JUN-1097

The historic remains documented during the 2008 survey were identified as elements of a historic district associated with hydroelectric operation and some abandoned features that are no longer functioning but were associated with construction and maintenance of the facilities. A Determination of Eligibility for Inclusion on the National Register of Historic Places for the Annex Creek Hydroelectric Complex Historic District, JUN-1097, was completed in 2012 (Pipkin 2012). The Determination of Eligibility identified 16 elements associated with the Annex Creek Hydroelectric Complex Historic District (Figure 5-21). These 16 elements are described below. (NOTE: This information is extracted directly or paraphrased from Pipkin 2012.)

- **JUN-175, Annex Creek Hydroelectric Plant.** This concrete and steel hydroelectric plant (Figure 5-22) is located on the shore of Taku Inlet at the outlet of the penstock pipeline. The building has a concrete foundation, supporting a girder frame consisting of riveted steel I-beams. The building has an open interior and two-tiers of windows on three sides of the building. The building is covered with a corrugated, galvanized steel skin and a gabled metal roof. Inside are two generator units, numerous electrical panels and storage areas, and a bridge crane mounted on I-beams. Water to turn the generators enters through the penstock pipeline and exits from a concrete tailrace. This structure was built in 1915.

- **JUN-1098, Annex Creek Hydroelectric Complex Dam.** This framed timber buttress, plywood-faced dam is situated across the outlet of Upper Annex Lake. The initial structure was a 15-foot-high temporary dam that, prior to the finishing of the tunnel, channeled water over the spillway and through a flume to the hydroelectric generators located at the powerhouse. In July 1935 the dam broke after being hit by a floating log and was not repaired until the spring of 1936 when a new dam approximately 5 feet higher than the original was constructed. In 1966, the dam was found to be in a state of disrepair and was partially replaced the following year (Figure 5-23).

- **JUN-1099, Annex Creek Hydroelectric Complex Tunnel.** The concrete-lined tunnel transports water from the bottom of Upper Annex Lake to the valvehouse located between Upper and Lower Annex lakes (Figure 5-24). Construction of the tunnel began in April 1915 with the lake being tapped on February 14, 1916. This tunnel taps into the bottom of the lake and represents the first time that a lake had been tapped by tunneling into its bottom.

- **JUN-1100, Annex Creek Hydroelectric Complex Valvehouse.** The original concrete valvehouse was replaced in 2014 (see discussion under National Register Eligibility below).

- **JUN-1101, Annex Creek Hydroelectric Complex Penstock Pipeline.** The riveted steel penstock pipeline (Figure 5-25) carries the water coming from the tunnel under Upper Annex Lake to the powerhouse located on the shore of Taku Inlet. The majority of the penstock is the original pipe that was installed in 1915.

- **JUN-1102, Annex Creek Hydroelectric Complex Penstock Pipeline Bridge.** The steel girder and cable suspension bridge that supports the penstock pipeline (Figure 5-25) is located where the penstock pipeline crosses the gorge of the original channel of Annex Creek between Upper Annex Lake and Lower Annex Lake. The bridge was constructed using steel horizontal I-beams and vertical

steel I-beam risers. Suspended on either side from the vertical risers are steel cables that support the horizontal I-beams. On either end of the bridge are concrete buttresses, atop of which lies the penstock pipeline. The concrete buttresses are wide enough to accommodate the second penstock pipeline to Carlson Creek that was never built. The bridge was constructed in 1915, although it appears that there may have been some modifications to the structure since its initial construction.

- **JUN-1103, Annex Creek Hydroelectric Complex Blacksmith/Carpentry Shop.** The single story, blacksmith/carpentry shop (Figure 5-26) is located adjacent to the dock to the northwest of the powerhouse. This is one of the buildings that dates to the original construction of the complex. A 1915 map and historic photographs of the complex show this building at this location. While this building has a sign over the door saying that it is the blacksmith shop, the 1915 map shows a smaller blacksmith shop in another location. This is a wood frame building covered with corrugated galvanized steel sheets. It has a gable roof that is covered with newer metal sheeting. In the interior are numerous electrical insulators and switches that appear to date from the initial construction of the building. It has a wooden plank floor, and interior walls are covered with diagonal, tongue-and-groove wooden siding.

- **JUN-1104, Annex Creek Hydroelectric Complex Caretaker's House.** The caretaker's house (Figure 5-26) is located to the northeast of the powerhouse. This single story, wood frame building was originally built in 1915. It has two bedrooms, a dining room, a living room, a bathroom, and a laundry room. The laundry room and the porch are in a small wing at the east side of the building. It has a skirted wood frame foundation that doubles as a storage area. The exterior walls are covered with horizontal, tongue-and-groove wooden siding. The house has a metal roof that appears to be relatively new. The interior is well maintained and has been extensively modernized. JUN-1105, the employee's house (see below) has an identical floorplan and construction. A 1915 map indicates that originally there were three of these identical houses in a row, whereas now only two remain.

- **JUN-1105, Annex Creek Hydroelectric Complex Employee's House.** The employee's house (Figure 5-26) is located directly west of the caretaker's house. This single story, wood frame building was originally built in 1915. It has two bedrooms, a dining room, a living room, a bathroom, and a laundry room. The laundry room and the porch are in a small wing at the east side of the building. The house has a skirted wood frame foundation that doubles as a storage area. The exterior walls are covered with horizontal, tongue-and groove wooden siding. The house has a metal roof that appears to be relatively new. The interior is well maintained and has been extensively modernized.

- **JUN-1106, Annex Creek Hydroelectric Complex Dock.** The wooden dock is built on pilings that front Taku Inlet on the east end of the powerhouse complex. Maps and historic photographs from 1915 show a dock in this same location, although it had a somewhat different outline and configuration. The deck is covered with modern treated lumber, and it appears that many of the original pilings have been replaced (Figure 5-27). There are two modern plywood and sheet metal buildings on the dock that are used as a boathouse and for storage. There is a modern crane on the far east end of the dock.

- **JUN-1108, Annex Creek Hydroelectric Complex Cable Aerial Tramway.** The aerial cable tramway was used in the construction of various components that make up the Annex Creek Hydroelectric Complex. As construction progressed, this was in part replaced by a locomotive-driven, tracked tramway. Part of the cable and some large pulleys that made up this aerial tramway are still standing approximately 50 feet west of the lower portions of the penstock pipeline.

- **JUN-1109, Annex Creek Hydroelectric Complex Locomotive-driven, Tracked Tramway.** During the latter stages of construction of the Annex Creek Hydroelectric Complex, the locomotive-driven, tracked tramway extended from a float adjacent to the wharf on Taku Inlet to a terminal near Lower Annex Lake. Historic photographs indicate that it was located approximately 50 feet west of the penstock pipeline, and that the railway was supported for its entire route on a structure built of milled timbers. Nothing of this railway still exists except a short section of articulated steel tracks and disarticulated rail sections found near JUN-1102 (penstock pipeline bridge).

- **JUN-1110, Annex Creek Hydroelectric Complex Camp 2 Line Shack.** Camp Number 2 (Figure 5-28) is a line shack on the Annex Creek to Thane power transmission line. It is adjacent to Carlson Creek, approximately 1.3 miles northwest of Sunny Cove. This is a single story, framed cabin with a wooden floor made up of planks, and interior and exterior walls made from wood boards. It has a gabled roof made of galvanized, corrugated steel sheets. Its front porch has collapsed and is in a state of general disrepair. While the precise date of its construction is unknown, it likely was built at the same time as the construction of the Annex Creek to Thane power transmission line in 1915–1916.

- **JUN-1111, Annex Creek Hydroelectric Complex Camp 4 Line Shack.** Camp Number 4 (Figure 5-29) is a line shack on the Annex Creek to Thane power transmission line near Carlson Creek, approximately 4.5 miles northeast of Thane. This is a single story, framed cabin with a wooden floor made up of planks, and interior and exterior walls made from tongue-and-groove wooden sidings. It has a gabled roof made of galvanized, corrugated steel sheets. While the precise date of its construction is unknown, it likely was built at the same time as the construction of the Annex Creek to Thane power transmission line in 1915–1916.

- **JUN-034, Annex Creek Hydroelectric Complex Camp 6 Line Shack.** Camp No 6 is a line shack on the Annex Creek to Thane power transmission line, located south of Sheep Creek, approximately 2.4 miles northeast of Thane. The original structure had deteriorated to such an extent that it was destroyed in the early 1990s, after which it was replaced by a prefabricated cabin.

- **JUN-511, Annex Creek Hydroelectric Complex Power Line.** The Annex Creek Hydroelectric Complex Power Line (Figure 5-30) is a linear feature that extends from the Annex Creek Powerhouse to Thane. Most of the original towers and other associated features that were built in 1915–1916 have been replaced with wooden structures. The towers were approximately 40-feet tall, and constructed of angle iron. The total number of towers that held up the lines is not known, although maintenance records mention tower numbers in excess of 175.

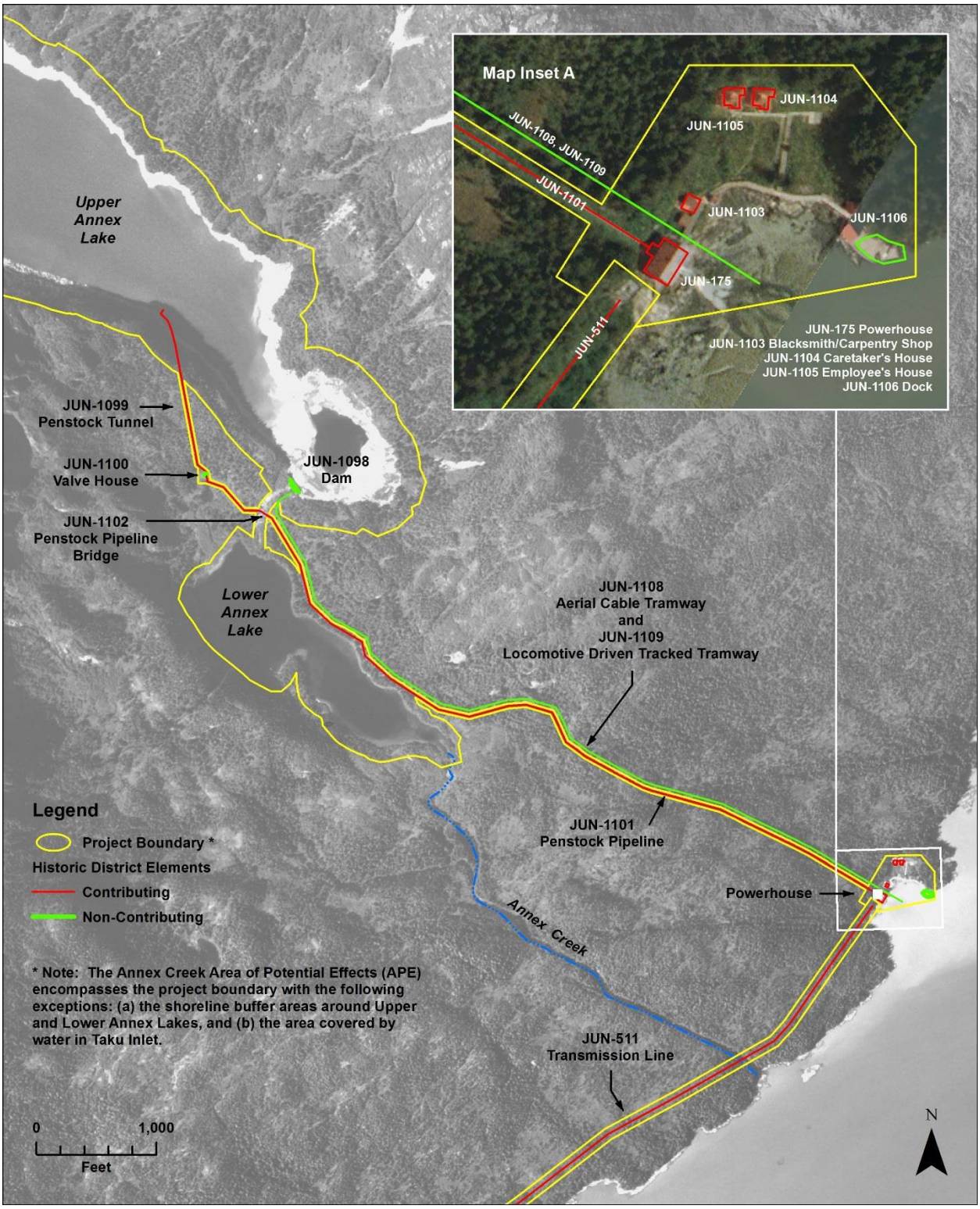


Figure 5-21. Annex Creek Development historic district elements (Page 1 of 2)

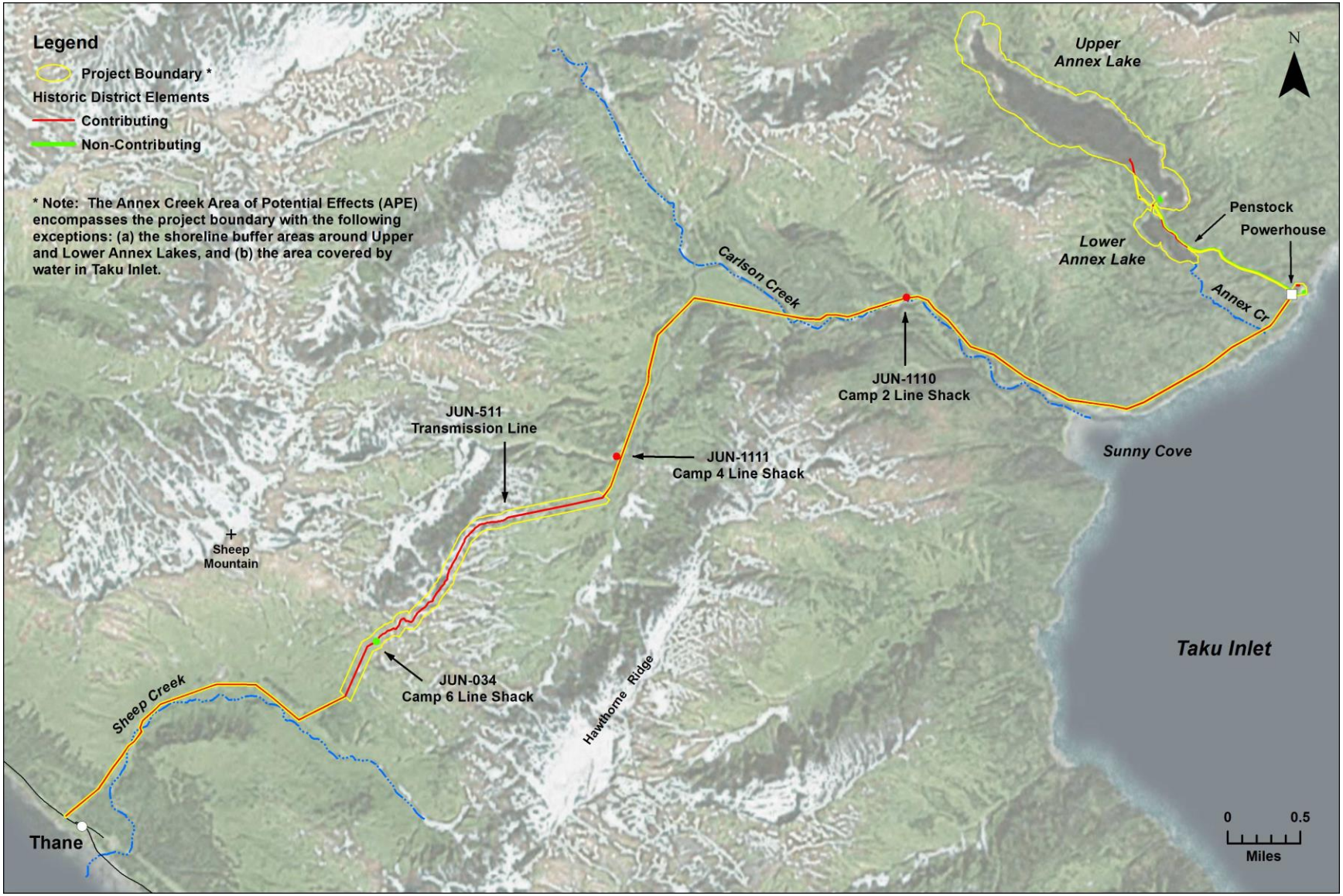


Figure 5-21. Annex Creek Development APE and historic district elements (Page 2 of 2)

Figure 5-22. JUN-175, Hydroelectric Plant

Figure 5-23. JUN-1098, Annex Creek Dam and Spillway

Figure 5-24. JUN-1100, Valvehouse (modern), located where JUN-1099, Tunnel Ends

Figure 5-25. JUN-1101 and 1102, Penstock Pipeline and Bridge

Figure 5-26. JUN-1103, Blacksmith/Carpentry Shop (far left); JUN-1104, Caretaker's House (rear right); JUN-1105, Employee's House (rear left)

Figure 5-27. JUN-1106, Dock (lower right)

Figure 5-28. JUN-1110, Camp 2 Line Shack

Figure 5-29. JUN-1111, Camp 4 Line Shack

Figure 5-30. JUN-511, Power Line, showing towers prior to replacement

National Register Eligibility – Annex Creek Hydroelectric Complex Historic District

The majority of the elements that contribute to the Annex Creek Hydroelectric Historic District maintain their original integrity and are independently eligible for inclusion on the NRHP (see Table 5-12). One of the district's components originally listed as a contributing element, the valvehouse, was replaced in 2014, and thus no longer retains its integrity. In consultation with the SHPO and USFS it was determined that AEL&P could mitigate the adverse effect resulting from its replacement by documenting the original structure with drawings and photographs, and by developing a webpage concerning the history of the Project that included photographs of the valvehouse and other structures: www.aelp.com/annexcreek/main.htm.

By letters dated June 30, 2010 and March 27, 2012, the SHPO concurred with the Determination of Eligibility for the Annex Creek Hydroelectric Complex Historic District (JUN-1097) and the tunnel (JUN-1099) under Criterion A and Criterion C.

Table 5-12. Elements of JUN-1097, Annex Creek Hydroelectric Complex Historic District

AHRS[1] Number	Name	Contributing Element	Retains Integrity	NRHP Eligibility and Applicable Criteria[2]
JUN-175	Annex Creek Hydroelectric Plant	Yes	Yes	Yes / A
JUN-1098	Annex Creek Hydroelectric Complex Dam	No	No - rebuilt in 1936 and 1967	No
JUN-1099	Annex Creek Hydroelectric Complex Tunnel	Yes	Yes	Yes / A & C
JUN-1100	Annex Creek Hydroelectric Complex Valvehouse	No	No	No
JUN-1101	Annex Creek Hydroelectric Complex Penstock Pipeline	Yes	Yes	Yes / A
JUN-1102	Annex Creek Hydroelectric Complex Penstock Pipeline Bridge	Yes	Yes	Yes / A
JUN-1103	Annex Creek Hydroelectric Complex blacksmith/carpentry shop	Yes	Yes	Yes / A
JUN-1104	Annex Creek Hydroelectric Complex caretaker's house	Yes	Yes	Yes / A
JUN-1105	Annex Creek Hydroelectric Complex employee's house	Yes	Yes	Yes / A

AHRS[1] Number	Name	Contributing Element	Retains Integrity	NRHP Eligibility and Applicable Criteria[2]
JUN-1106	Annex Creek Hydroelectric Complex Dock	No	No - extensively rebuilt and modified	No
JUN-1108	Annex Creek Hydroelectric Complex cable aerial tramway	No	No - extensive deterioration	No
JUN-1109	Annex Creek Hydroelectric Complex locomotive driven, tracked tramway	No	No - extensive deterioration	No
JUN-1110	Annex Creek Hydroelectric Complex Camp 2 Line Shack	Yes	Yes	Yes / A
JUN-1111	Annex Creek Hydroelectric Complex Camp 4 Line Shack	Yes	Yes	Yes / A
JUN-034	Annex Creek Hydroelectric Complex Camp 6 Line Shack	No	No - destroyed and replaced in 1990s	No
JUN-511	Annex Creek Hydroelectric Complex Power Line	Yes	Yes	Yes / A

[1]Alaska Heritage Resources Survey

[2]With SHPO concurrence by letters dated June 30, 2010 and March 27, 2012

Source: Pipkin 2012

5.9.1.4. Juneau Goldbelt

The Annex and Salmon Creek developments are part of a regionally-defined historic district, the Juneau Goldbelt Hydroelectric Power Development Historic District, JUN-1116 (see Figure 5-31), described in the Historical Context Investigation of the Establishment, Development, and Evolution of Hydroelectric Power in the Juneau Goldbelt Hydroelectric Power Development Historic District - JUN-1116 (Pipkin 2010). This thematic area includes a number of hydroelectric facilities and individual properties. While the broader district contains individual districts and properties that are listed on the NRHP, a determination of eligibility for the broader district has not been undertaken.

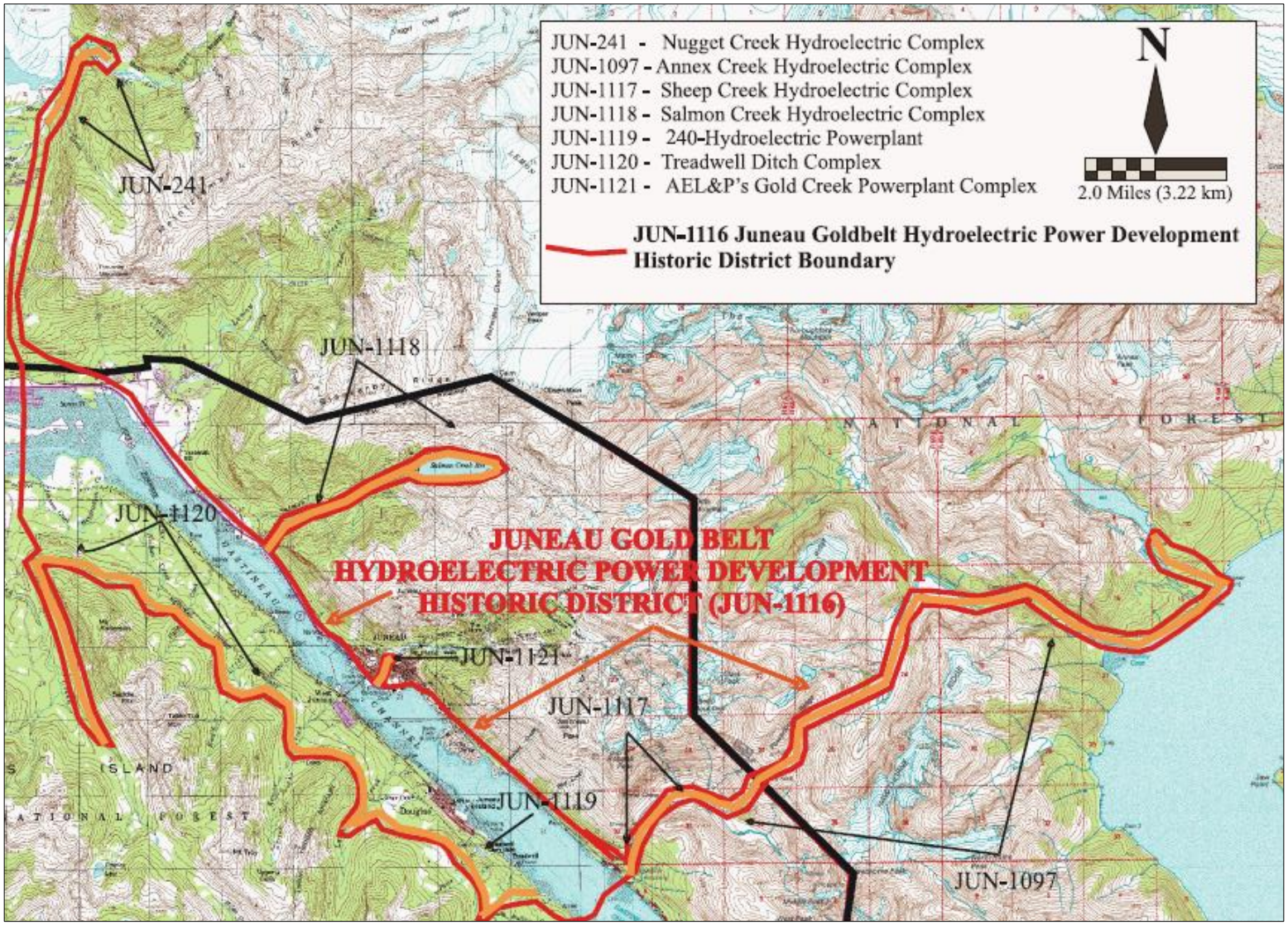


Figure 5-31. JUN-116, Juneau Goldbelt Hydroelectric Power Development Historic District

Source: Pipkin 2010

[This page intentionally left blank]

5.9.2. Environmental Effects

Under the Proposed Action Alternative two historic properties, the penstock, JUN-1101 and the penstock bridge, JUN-1102, will be removed and replaced with modern equivalents. AEL&P is following the Historic Properties Management Plan. A Qualified Professional has completed a Determination of Effect and the SHPO has concurred that the project will have a negative affect on the historic properties. A draft Mitigation Plan has been submitted to the signatories to the Programmatic Agreement for review.

5.9.3. Proposed Measures to Address Project-Related Effects

AEL&P is following the HPMP and working with a Qualified Professional on a Mitigation Plan in conjunction with the signatories to the Programmatic Agreement. The Mitigation Plan will outline any measures that AEL&P will take due to the Proposed Action Alternative.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Comparison of Alternatives

Table 6-1 provides a comparison of the anticipated effects under the No Action Alternative and the Proposed Action Alternative as described in Exhibit E.

Table 6-1. Comparison of effects under the No Action Alternative and the Proposed Alternative

Description	No Action Alternative	Proposed Action Alternative
Geology and Soils	In no action is taken, the project will become unsafe to operate and will need to be decommissioned which could result in more invasive ground disturbing activity.	This will be ground disturbing work, there will be the possibility of erosion. AEL&P will prepare an Erosion Control Plan which will be followed during construction.
Water Resources	In no action is taken, the project will become unsafe to operate and will need to be decommissioned which could result in more invasive ground disturbing activity.	The duration of the project will be 6 months, during that time it is likely that Upper Annex Lake will spill. This is a normal activity which should have no effect. The Annex Creek camp facility uses penstock water as the raw water supply, this will not be available. AEL&P is proposing to take water from Annex Creek for use in the camp during construction.
Fish and Aquatic Resources	In no action is taken, the project will become unsafe to operate and will need to be decommissioned which could result in more invasive ground disturbing activity.	Studies performed in 2012 confirmed Brook Trout presence in both Upper and Lower Annex Lake. The Upper penstock section follows the shoreline of Annex Lake so there could be the possibility of runoff entering the Lower Lake. AEL&P will prepare an Erosion Control Plan which will be followed during construction.

Description	No Action Alternative	Proposed Action Alternative
Wildlife and Botanical Resources	In no action is taken, the project will become unsafe to operate and will need to be decommissioned which could result in more invasive ground disturbing activity.	The project area is frequented by Black Bears, the possibility of human-bear encounters during construction are high. AEL&P will prepare a Bear Safety Plan which will be followed during construction. All construction personnel will receive training on the plan. In 2014, the penstock corridor was surveyed for non-native, rare and invasive plants. None were found. As a condition of the 2018 FERC License, AELP prepared an Invasive Plant Management Plan in consultation with the agencies. This plan will be followed during construction.
Wetlands, Riparian, and Littoral Habitat	In no action is taken, the project will become unsafe to operate and will need to be decommissioned which could result in more invasive ground disturbing activity.	The project area has not had a specific wetland delineation. However, the National Wetland Inventory (NWI) shows wetlands adjacent to the project area. AEL&P will complete a wetland delineation for the penstock corridor during the 2020 field season.
Rare, Threatened, and Endangered Species	In no action is taken, the project will become unsafe to operate and will need to be decommissioned which could result in more invasive ground disturbing activity.	To obtain a new license, in 2014 AELP completed a Goshawk survey of the penstock corridor, which resulted in no indication of presence. The 2014 botanical survey discussed with invasive plants, included rare plants, no rare plant species were found in the penstock corridor. In 2015, AELP consulted with the USFWS regarding threatened or endangered species in the overall Project Area.
Land Use, Recreation, and Aesthetics	In no action is taken, the project will become unsafe to operate and will need to be decommissioned.	The area of ground disturbance will be visible, AEL&P will allow native plants to re-establish in the penstock corridor.
Historic and Cultural Resources	In no action is taken, the project will become unsafe to operate and will need to be decommissioned which would result in the remaining historic properties either being completely removed or no longer being maintained.	AELP has contracted with Walking Dog Archaeology to complete a Determination of Effect and develop a Mitigation Plan in conjunction with the SHPO and USFS as detailed in the HPMP. Construction will be supervised by the AELP HPMP Coordinator and a Qualified Professional. All construction personnel will receive training on the Historic Properties Management Plan.

6.2. Recommended Alternative

Based on AEL&P's review of and evaluation of the No Action Alternative and Proposed Action Alternative, AEL&P has selected the Proposed Action Alternative as the preferred and recommended alternative. AEL&P recommends this alternative because it will extend the useful life of the Project and increase project safety by replacing the penstock to restore the waterway to new condition and install automation for detection and isolation in the event of a penstock failure.

6.3. Unavoidable Adverse Impacts

There would be unavoidable adverse impacts under the Proposed Action Alternative. These include ground disturbing activities in the penstock alignment and removal of two historic properties. The project has been designed to minimize the footprint of disturbance and after the penstock is replaced, the Project will return to current operations which will allow the disturbed ground to return to native vegetation.

7. LITERATURE CITED

ASCE, 2012. ASCE Manuals and Reports on Engineering Practice No. 79 – Steel Penstocks, Second Edition.

ADEC (Alaska Department of Environmental Conservation). 2009. State of Alaska Water Quality Standards (18 AAC 70) – Amended as of September 19, 2009. http://www.dec.state.ak.us/water/wqsar/wqs/pdfs/18_AAC_70%20_Amended_September_19_2009.pdf.

ADEC. 2012. 2012. State of Alaska Water Quality Standards. http://www.dec.state.ak.us/water/wqsar/wqs/index.htm.

ADF&G (Alaska Department of Fish and Game). 1990. Mendenhall Wetlands State Game Refuge Management Plan. March 1990. http://www.adfg.alaska.gov/static/lands/protectedareas/_management_plans/mendenhall.pdf.

ADF&G. 2006. Our Wealth Maintained: A Strategy for Conserving Alaska's Diverse Wildlife and Fish Resources. Alaska Department of Fish and Game, Juneau, Alaska. Xviii+824 p.

ADF&G. 2012a. List of invasive terrestrial animals. http://www.adfg.alaska.gov/index.cfm?adfg=invasive.main. Accessed November 2012.

ADF&G. 2012b. State of Alaska Special Status Species. http://www.adfg.alaska.gov/index.cfm?adfg=specialstatus.akendangered.

ADF&G. 2012c. Atlas to the catalog of waters important for the spawning, rearing, or migration of anadromous fishes – Southeastern Region. ADF&G, Div. of Sport Fish, Anchorage, Alaska.

ADF&G. 2015. Draft 2015 Alaska Wildlife Action Plan. http://www.adfg.alaska.gov/static/applications/web/nocache/species/wildlife_action_plan/draft_alaska_wildlife_action_plan_2015.pdf045BC5697BB8479ECD7A7B747C94939E/draft_alaska_wildlife_action_plan_2015.pdf.

ADNR. 1993. Juneau State Land Plan. Alaska Department of Natural Resources, Division of Land, Resource Assessment and Development.

ADNR. 2016. Alaska's Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2016-2021. http://dnr.alaska.gov/parks/scorp.

AEL&P. 1985. Application for New License for the Annex Creek and Salmon Creek Hydroelectric Project, FERC Project No. 2307. October 1985.

AEL&P. 2012a. Aquatic Resource Studies – Annex Creek/Salmon Creek Hydroelectric Project (FERC Project No. 2307). Prepared by: Northern Ecological Services and Three Parameters Plus, Inc. for: Alaska Electric Light and Power Company, Juneau, Alaska.

AEL&P. 2012b. Botanical resource studies, Annex Creek/Salmon Creek Hydroelectric Project (FERC Project No. 2307). Prepared by Three Parameters Plus, Inc. for: Alaska Electric Light and Power Company, Juneau, Alaska.

AEL&P. 2013b. Application for Non-Capacity Related Amendment of License. October 2013. (Extension of underground portion of the transmission line for the Annex Creek Development.)

AEL&P. 2015a. Relicensing Update – 2015 (Final). April 2015.

AKEPIC (Alaska Exotic Plants Information Clearinghouse). 2012 and 2013. Alaska Exotic Plant Information Clearinghouse database. Alaska Natural Heritage Program, University of Alaska, Anchorage. Accessed December 2012 and March 2013. http://aknhp.uaa.alaska.edu/maps/akepic/.

AKEPIC. 2016. http://accs.uaa.alaska.edu/invasive-species/non-native-plants. Accessed July 2016.

AKNHP (Alaska Natural Heritage Program). 2012. Accessed November and December 2012. Zoology. http://aknhp.uaa.alaska.edu/zoology/

Alaska Humanities Forum. n.d.1. Southeast Alaska, Many Nations Challenge Tlingit Claims. www.akhistorycourse.org/articles/article.php?artID=70. Accessed December 2015.

Alaska Humanities. Forum. n.d.2. The Salmon Industry Requires Many Workers. http://www.akhistorycourse.org/americas-territory/alaskas-heritage/chapter-4-16-fishing-and-sea-hunting. Accessed July 2016.

ANHP (Alaska Natural Heritage Program). 2012. Informational website. http://aknhp.uaa.alaska.edu/.

Barten, N.L. 2009. Unit 1C wolf management report. Pages 17-23 in P. Harper, editor. Wolf management report of survey and inventory activities 1 July 2005—30 June 2008. Alaska Department of Fish and Game. Project 14.0. Juneau, Alaska.

Behnke, R. J. 2002. Trout and Salmon of North America. Chanticleer Press, N.Y. 359 pp.

Brew, David A. and Ford, Arthur B., 1977. Preliminary Geologic and Metamorphic – Isograd Map of the Juneau B-1 Quadrangle, Alaska. United States Geological Survey, Miscellaneous Field Studies, Map MF-846.

Carlson, M., I. Lapina, M. Shephard, J. Conn, R. Densmore, P. Spencer, J. Heys, J. Riley, and J. Nielsen. 2008. Invasiveness ranking system for non-native plants of Alaska. Alaska Region, Forest Service, U.S. Department of Agriculture. R10-TP-143. 218 p.

CBJ. 2013. Comprehensive Plan of the City & Borough of Juneau. Adopted November 2013, Ordinance 2013-26. http://www.juneau.org/cddftp/documents/Comp.Plan2013UpdateBook_Web121913.pdf.

Conley, M.E. 2015. Cultural Resource Reconnaissance of Mining-Related Sites in Sheep Creek Valley for Alaska Electric Light & Power Company (AEL&P). Office of History and Archaeology Report Number 159. October 2015.

Dawson, N.G., S.O. MacDonald, and J.A. Cook. 2007. Endemic mammals of the Alexander Archipelago. Chapter 6.7 in J.W. Schoen and E. Dovichin, editors. The Coastal Forests and Mountains Ecoregion of Southeastern Alaska and the Tongass National Forest: A conservation assessment and resource synthesis, March 2007. Audubon Alaska and The Nature Conservancy. Anchorage, Alaska.

FERC. 2015a. Correspondence: FERC to AEL&P granting a continuation of the Emergency Action Plan exemption for the Annex Creek Development. P-2307-02-AK. March 16, 2015.

FERC and ACHP (Federal Energy Regulatory Commission and Advisory Council on Historic Preservation). 2002. Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects. May 20, 2002.

Goldschmidt, W.R. & T.H. Haas. 1998. Haa Aani, Our Land: Tlingit and Haida Land Rights and Use. Seattle: University of Washington Press.

Goldstein, M.I., D. Martin, and M.C. Stensvold. 2009. U.S. Forest Service Alaska Region Sensitive Species List: Assessment and Proposed Revisions to the 2002 List. Juneau, Alaska. Available online: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_037658.pdf (accessed July 16, 2014).

Hoek, E., Carter, T. G., and Diederichs, M. S., 2013. Quantification of the Geological Strength Index Chart. American Rock Mechanics Association, 47h US Rock Mechanics and Geomechanics Symposium. San Francisco, CA, June 23 through 26.

Iverson, G.C.; Hayward, G.D.; Titus, K.; DeGayner, E.; Lowell, R.E.; Crocker-Bedford, D. C.; Schempf, P.F.; Lindell, J. 1996. Conservation assessment for the northern goshawk in southeast Alaska. Gen. Tech. Rep. PNW-GTR-387. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Johnson, J. and V. Litchfield. 2016. Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes – Southeastern Region, Effective June 1, 2016. Alaska Department of Fish and Game, Special Publication No. 16-04. March 2016.

Juneau Parks and Recreation. 1996. Comprehensive Plan, July 1996, Chapter 8 Revised, December 2007. http://www.juneau.org/parkrec/documents/Finalasrevised12-2007_000.pdf.

Nawrocki, T., H. Klein, M. Carlson, L. Flagstad, J. Conn, R. DeVelice, A. Grant, G. Graziano, B. Million, and W. Rapp. 2011. Invasiveness ranking of 50 non-native plant species for Alaska. Report prepared for the Alaska Association of Conservation Districts. Alaska Natural Heritage Program, University of Alaska Anchorage, Anchorage, AK. 253 pp.

NOAA (National Oceanic and Atmospheric Administration). 2015. NOAA Essential Fish Habitat Conservation Mapper. http://www.habitat.noaa.gov/protection/efh/habitatmapper.html. Accessed May 2015.

North Pacific Fishery Management Council. 2012. Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska. June 2012. Appendix A, Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC).

Nowacki, G., P. Spencer, T. Brock, M. Fleming, and T. Jorgenson. 2001. Ecoregions of Alaska and neighboring territory (map). U.S. Geological Survey Open-File Report 02-297 (map). U.S. Geological Survey, Reston VA.

NPS (National Park Service). 1983. The Secretary of the Interior's Standards and Guidelines [As Amended and Annotated], Archeology and Historic Preservation, Professional Qualifications Standards. Accessed July 2016. https://www.nps.gov/history/local-law/arch_stnds_9.htm.

NPS. 1995. The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings. https://www.nps.gov/tps/standards/four-treatments/treatment-guidelines.pdf.

NPS. 2012. Glacier Bay National Park: Mammals. http://www.nps.gov/glba/naturescience. Accessed November 2012.

OHA (Alaska Department of Natural Resources/Office of History & Archaeology). 2014. Laws and Protocols Pertaining to the Discovery of Human Remains in Alaska. http://dnr.alaska.gov/parks/oha/ahrs/humanremainshandout.pdf.

Pipkin, M.E. 2010. Historical Context Investigation of the Establishment, Development, and Evolution of Hydroelectric Power in the Juneau Goldbelt Hydroelectric Power Development Historic District – Jun -1116. Prepared for AEL&P by Walking Dog Archaeology. Anchorage, AK. November 2010.

Pipkin, M.E. 2012. Determination of Eligibility for Inclusion on the National Register of Historic Places for the Annex Creek Hydroelectric Complex Historic District, JUN-1097. Prepared for AEL&P by Walking Dog Archaeology. Anchorage, AK. February 2012.

Pipkin, M.E. 2015a. Determination of Eligibility for Inclusion on the National Register of Historic Places for the Salmon Creek Hydroelectric Complex Historic District, JUN-1118. Prepared for AEL&P by Walking Dog Archaeology. Anchorage, AK. October 2015.

Pipkin, M.E. 2015b. Ethnographic Background of the Annex and Carlson Creek Areas. Unpublished information prepared for AEL&P by Walking Dog Archaeology. Anchorage, AK. December 2015.

Pipkin, M.E. 2016a. Determination of Eligibility for Inclusion on the National Register of Historic Places for the Sunny Cover Cannery – JUN-916. Prepared for AEL&P by Walking Dog Archaeology. Anchorage, AK. July 2016.

Pipkin, M.E. 2016b. Correspondence from M. Pipkin, Walking Dog Archaeology, to C. Yearous, AEL&P; July 5, 2016.

Scott, R. 2009. Unit 1 brown bear management report. Pages 1-18 in P. Harper, editor. Brown bear management report of survey and inventory activities 1 July 2006-30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.

Scott, R. 2010a. Unit 1C furbearer management report. Page 30-38 in P. Harper, editor. Furbearer management report of survey and inventory activities 1 July 2006-30 June 2009. Alaska Department of Fish and Game. Project 7.0. Juneau, Alaska.

Scott, R. 2010b. Unit 1C moose management report. Pages 26-52 in P. Harper, editor. Moose management report of survey and inventory activities 1 July 2007-30 June 2009. Alaska Department of Fish and Game. Project. 1.0. Juneau, Alaska.

Scott, R. 2010c. Unit 1C mountain goat management report. Pages 34-45 in P. Harper, editor. Mountain goat management report of survey and inventory activities 1 July 2007-30 June 2009. Alaska Department of Fish and Game. Project 12.0. Juneau, Alaska.

Scott, R. 2011. Unit 1C black bear management report. Pages 34-50 in P. Harper, editor. Black bear management report of survey and inventory activities 1 July 2007-30 June 2010. Alaska Department of Fish and Game. 17.0. Juneau, Alaska.

Smith, W.P., M.J. Stotts, B.A. Andres, J.M. Melton, A. Garibaldi, and K. Boggs. 2001. Bird, mammal, and vegetation community surveys of research natural areas in the Tongass National Forest. Res. Pap. PNW-RP-535. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 44 p.

Swanston, D.M. 1972. Mass Wasting Hazard Inventory and Land Use Control for the City and Borough of Juneau: Report to the City and Borough of Juneau, Juneau, Alaska. From Geophysical Hazards Investigation for the City and Borough of Juneau, Alaska: Technical Supplement. October 1972. U.S. Forest Service, Forest Services Laboratory, Corvallis, Oregon.

USACE (U.S. Army Corps of Engineers). 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1, U.S. Army Waterway Experiment Station, Vicksburg, MS. 90 pp. + appendices.

USACE. 2007. Regional supplement to the Corps of Engineers wetland delineation manual: Alaska region version 2.0. Wetlands Regulatory Assistance Program, U.S. Army Engineer Research and Development Center, Vicksburg, MS. 72 pp. + appendices.

USDA (U.S. Department of Agriculture). 1983. Fish and Wildlife Policy. Departmental Regulation 9500-004. April 28, 1983.

USDA. 2007a. Exhibit 3: Table of Tongass National Forest High Priority Invasive Plants. FSM 2000 National Forest Resource Management Forest Service Handbook Chapter 2080 Noxious Weed Management R10 TNF-2000-2007-1.

USDA. 2007b. Japanese Knotweed. USDA Forest Service, Alaska Region. R10-TP-133. Revised August 2007.

USDA USFS Geodata (USDA Forest Service Geospational Service and Technology Center, FS Geodata Clearinghouse). 2012. http://fsgeodata.fs.fed.us/index.php. Accessed April 2012.

USFS. 2005. Recreational Facility Analysis, 5-Year Action Plan. Tongass National Forest. http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev3_069196.pdf.

USFS. 2006. Forest Service Handbook 2509.22 – Soil and Water Conservation Handbook. Amendment No. R-10 2509.22-2006-1. Region 10.

USFS. 2008a. Tongass National Forest land and resource management plan. Department of Agriculture, Ketchikan, Alaska. January 2008.

USFS. 2008b. Tongass land and resource management plan: final environmental impact statement, plan amendment. Volumes I and II. U.S. Department of Agriculture Forest Service, R10-MB-603c and R10-MB-603d. USDA Forest Service. January 2008. https://fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5367422.pdf.

USFS. 2012a. Fall colors the muskeg on Alaska's Tongass National Forest. http://blogs.usda.gov/2012/10/18/fall-colors-the-muskeg-on-alaska%E2%80%99s-tongass-national-forest. Accessed December 2012.

USFS. 2012b. National Best Management Practices (BMPs) for Water Quality Management on National Forest System Lands. April 2012.

USFS (U.S. Department of Agriculture, Forest Service). 2018. Special Use Permit, Licensed Project. Permit issued to AEL&P for the Annex Creek and Salmon Creek Hydroelectric Project, FERC Project No. 2307. August 7, 2018.

USFWS (U.S. Fish and Wildlife Service). 2005. Regional Seabird Conservation Plan, Pacific Region. Portland, Oregon. https://www.fws.gov/pacific/migratorybirds/PDF/Seabird%20Conservation%20Plan%20Complete.pdf.

USFWS. 2007. National Bald Eagle Management Guidelines. May 2007. http://www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf.

USFWS. 2009. Alaska Seabird Conservation Plan. Anchorage, Alaska. https://absilcc.org/science/Plans/Alaska%20Seabird%20Conservation%20Plan%20USFWS.pdf.

USFWS. 2012a. National wetlands inventory. http://www.fws.gov/wetlands/Wetlands-Mapper.html. Accessed November 2012.

USFWS. 2012b. Endangered Species Program. http://www.fws.gov/endangered. Accessed November 2012.

USFWS. 2015. Correspondence from USFWS to whom it may concern, providing a list of threatened and endangered species that may occur in the Salmon Creek and Annex Creek location and/or may be affected by the proposed project. June 10, 2015.

USGS. 2003. Distribution of Mineral Occurrences in the Juneau 1:250,000-Scale Quadrangle, Alaska. Alaska Resource Data File. Open-File Report 03-456.

USGS and AKDNR, 2019. Quaternary fault and fold database for the United States, accessed June 17, 2019, from USGS web site: https://earthquake.usgs.gov/hazards/qfaults/.

USGS, 2019. Advanced National Seismic System Composite Catalog. Hosted by Northern California Data Center, accessed June 18, 2019, from USGS website:https://earthquake.usgs.gov/earthquakes/search/

Woodbridge, B. and C. D. Hargis. 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service.