ALASKA HYDROPOWER DEVELOPMENT & OPTIMIZATION WHILE ENHANCING ENVIRONMENTAL RESOURCES

AN ALASKAN DEVELOPMENT APPROACH FOR THE SWEETHEART LAKE HYDROELECTRIC FACILITY

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The Challenges of Dams in Cold Climates
Design, Construction, Permitting and Environmental Issues

Fall 2017 Workshops and Field Tours

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An Alaskan hydropower developer perspective to develop and operate a Federal Energy Regulatory Commission (FERC) licensed Southeast Alaska hydropower facility while striving to enhance environmental resources and attributes through the licensing process. Development of hydropower resources either competes or synergizes in varying degrees with environmental resources. This is a challenging task, but the strategies and steps a developer implements in the hydropower development process can help obtain compatibility with a goal of enhancing and harmonization with resources. These strategies affect the design, efficiency of the hydropower resource, as well as project costs but ultimately determines the success of a hydropower project in an Alaskan environment.
BACKGROUND AND HISTORY
SWEETHEART LAKE HYDROELECTRIC FACILITY

33 air miles
South of Juneau
Alaska

19.8 MW
capacity

116,000 MWh
generation

20% new
Capacity

25% new
Generation
PROVIDING ENERGY SECURITY FOR JUNEAU

PROVIDING ENERGY FOR GROWTH AND PROSPERITY

ENHANCING OUR LOCAL ENVIRONMENT

COMMUNITY VALUES DRIVEN DEVELOPMENT
Located within the City and Borough of Juneau and in the Juneau Ranger District of the Tongass National Forest

Project encompasses 2,058.24 Federal acres
131.18 State of Alaska acres

License Issued September 8, 2016
View from Gilbert Bay looking north toward Port Snettisham Transmission Line and Juneau.

State of Alaska Snettisham Transmission Line

Snettisham Transmission Avalanche Chute Area

Powerhouse
US Forest Service high altitude aerial photo of Sweetheart Lake

5.4-mile-long, 0.6-mile-wide, glacially-formed lake

New maximum water surface elevation of 636 feet and surface area of 1,702 acres, impounding 128,019-acre-feet of water
View of Sweetheart Lake looking East towards Canada
Aerial View of Gilbert Bay- Sweetheart Creek and Falls

Barrier Falls
HISTORY OF SWEETHEART LAKE HYDROELECTRIC FACILITY PROJECT

- Sweetheart Creek first prospected by Frank Cook, discoverer of the Jualin Mine
- 1906 Sweetheart Lake first identified as a hydro resource
- 1915 to 1927 USGS gauged Sweetheart Creek
- 1929 Project selected by US Government as a Federal Power Site Classification Site in Public Land Order 221 May 14, 1929.
- 1952 Interior Secretary reports to Congress on Sweetheart Lake
- 1958 USGS Plan for Dam site
- 1983 Alaska Power Authority Plan
- 1983 Environmental Impact Assessment for Gilbert Bay
- 2009 FERC Permit filed-development and studies commenced
- 2014 FERC License Filed
- 2015 October EIS and License Process
- 2016 Final EIS issued-May 31, 2016
- 2016 FERC License issued-September 8, 2016
- 2016 Army Corps of Engineers 404 Permit issued
- 2017 ADNR Tideland Lease Permit and Easement issued
- 2017 ADNR Water Rights issued
DEVELOPMENT AND STRATEGY PROCESS
Old School Hydropower Development-

- Head, Site Control, Extract

New School Hydropower Development-

- Head, Site Control, Harmonize - a balance between environmental enhancement and full utilization of water resource

**Hydropower Environmental Nirvana**  
Enhance surrounding environment while achieving project viability

**JUNEAU HYDROPOWER’S DEVELOPMENT STRATEGY...**
From which end of the telescope are we viewing?
INTERACTION OF COMPATIBLE AND COMPETING INTERESTS ARE COMPLEX AND REQUIRE A 360° ENGAGEMENT
HYDROPOWER DEVELOPMENT ENVIRONMENTAL OBJECTIVES

Enhance, Harmonize, Avoid, Minimize, Mitigate

AIM FOR THE BULLSEYE
- **Enhance** - Improve improve in value, quality, desirability, or attractiveness Environmental Resource(s)

- **Harmonize** - Symbiotic (MUTUAL BENEFIT) with Environment Resource(s)

- **Avoid** - Maintain Environment... as is

- **Minimize** - diminish Environment as little as possible

- **Mitigate** - ON PAPER, but...

**AIM**
"Ecological engineering is the design of sustainable ecosystems that integrate human society with its natural environment for the benefit of both. It involves the design, construction and management of ecosystems that have value to both humans and the environment..."
A form of Environmental Sustainability Design?

What comes first?

Design based on Hydrology and Geology Consideration?

Or… Design based on Environmental Needs and Considerations?

 Mutually inclusive, Dynamic and Holistic
RESULTS
Results:
Coastal Road is on State Land - Low Wetlands;
New Recreation Trail;
Buried 138kV transmission avoiding Geese and Waterfowl.
Submarine cable outside of Dungeness Crab Grounds.
RECREATION FACILITY IMPROVEMENT PROGRAM

- Sweetheart Creek Bear Safety and Interpretive Displays
- Coastal Road/Trail and Hardened Trail System at Sweetheart Creek
- Mooring Buoys
- Visually Obscured Powerhouse and Switchyard Area
- Sockeye Collection and Transportation System
- Rocked Natural appearing tailrace
- Subsurface Transmission Lines
- Dock and Ramp Access
- Litter Control
Design considerations to lessen Scenic Impacts
RECREATIONAL FACILITIES NOTES

1. VISUAL LANDFORM BARRIER: will be constructed and vegetated, which will recreate users from sound and visual impacts of the powerhouse and switchyard. See typical section on sheet 2.

2. RAMP: will be installed at the dock area to allow non-commercial boat landings. See sheet 1.

3. DOCK: will be installed for limited non-commercial boat and floatplane landings. See sheet 1.

4. INTERPRETIVE SIGNS: will be installed at the beginning of the footpath trail to include boat safety, trail information, AFSP information, and USFS information. See sheet 2.

5. TRASH AND LITTER COLLECTION: will be collected along access road and trail at limited seasonal intervals. Public trash receptacles will not be provided. This is a "pack it in, pack it out" recreational area.

6. ACCESS ROAD/TRAIL: will be maintained in sufficient condition to allow both container truck access and non-motorized recreational user access. See typical section on sheet 4.

7. TRAILS: will be maintained in good condition and trees and weeds will be controlled as necessary. See sheet 2.

8. NON-COMMERCIAL MOORING BUOYS: will be maintained in good condition to allow temporary non-commercial small boat mooring. See sheet 1.

9. SNOW REMOVAL: will occur on the Access Road/Trail to ensure safe operational access to the powerhouse and switchyard. Snow removal will not be provided on the side trails.

10. ROCKED TAILRACE: the tailrace surfaces will be rock instead of concrete, which will enhance natural appearance and allow additional fishing area. Length from Point "S" to Point G is 300 feet. See sheet 2.

11. Sockeye Collection and Transportation System: a small re-entry pool will be located at the powerhouse site, which will allow fish acclimation before release into the tailrace. The fish collection and transportation systems have been designed in collaboration with Douglas Island Pink and Chum (DIPAC). See sheet 2.

12. GATED ACCESS: gates will be installed at the locations shown such that motorized use of the coastal road/train will be limited to the container. Recreational motorized use of the coastal road/train will not be permitted. See sheet 2.
No ROAD in Roadless Area

Tunnel provides means for material, labor and equipment and then becomes a water tunnel.
<table>
<thead>
<tr>
<th>Power Tunnel</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total length</td>
<td>9.621 ft.</td>
</tr>
<tr>
<td>Steel lined length</td>
<td>as required</td>
</tr>
<tr>
<td>Concrete lined length</td>
<td>as required</td>
</tr>
<tr>
<td>Horseshoe shape dimensions</td>
<td>15 ft. high X 15 ft. wide</td>
</tr>
<tr>
<td>Excavation method</td>
<td>drill-and-blast method (DBM)</td>
</tr>
</tbody>
</table>
NO Road in a Roadless Area
123 foot high roller compact concrete dam in WV.

Sweetheart Lake is smaller with only 111 feet and the length of dam is less.
Submarine Transmission segment
SUCCESSFUL LICENSE ISSUANCE

- Virtually no environmental opposition
- Optimized hydrologic value
- Strong Community, State and Federal support
“Sweetheart Lake in Southeast Alaska is an important source of water for potential production of hydroelectric energy”

Oscar L. Chapman 1952 Secretary of Interior Report to Congress.
Juneau District Heating is a subsidiary of Juneau Hydropower and we applied the same development and strategy process.
Typical Energy Transfer Station

District heating rigid and flex pipe

Clean, Sustainable, Smart
THANK YOU & QUESTIONS

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