

CASCADE CREEK HYDRO PROJECT FERC# 12495-002

Final Hydrology Study Plan

Cascade Creek LLC, March 2010

BACKGROUND

In February, 2008, Cascade Creek Limited Liability Corporation (“CCLLC”) received a Preliminary Permit (“Permit”) for the Cascade Creek hydroelectric Project (FERC No. 12495-002, “Project”) from the Federal Energy Regulatory Commission (FERC) in Washington D.C. The Project would be located approximately 15 miles N.E. of Petersburg, Alaska, and would affect Swan Lake, Falls Lake and Cascade Creek. The Project is described in detail in Scoping Document 1 (SD1, CCLLC May, 2009) prepared by CCLLC.

Generally, the Project would consist of an intake structure and an outlet control structure at Swan Lake, a power conduit consisting of a mostly unlined 12 foot diameter tunnel and steel penstock leading to a powerhouse located at tidewater on Thomas Bay. Installed capacity of the Project would be approximately 70 megawatts (MW). The current operational proposal is to draw water from Swan Lake in such a way as to minimize un-natural lake level fluctuations, with final drawdown prescriptions determined based on further economic and environmental considerations.

During Initial Consultation and Scoping, Project Stakeholders including Alaska state and federal resource agencies indicated concern for Project effects on hydrology resources relative to Swan Lake (primarily due to seasonal drawdown), Falls Lake (due to inflow changes and effects on lake level) and Cascade Creek, due to dewatering. Other concerns included changes in lake and stream water temperature regimes and effects of construction on water quality. This study plan intends to respond to study requests made during the Project review process and is the final step in developing a study plan approved by all consulting parties.

PROJECT APPROACH

Task 1- Stream Gaging Requirements.

1.1 Cascade Creek LLC (CCLLC) met with agency staff of Alaska Department of Fish & Game (ADF&G) and the U.S. Forest Service (USFS) on 7/23/08 to determine that there would be four stream gaging sites located as follows:

- 1) The mouth of Cascade Creek upstream of the lowest falls at the prior USGS gaging site. *(This gage has been installed.)*
- 2) At the outlet of Falls Lake. *(This gage site was subsequently moved to the midpoint of*

Falls Lake to provide safer physical access in proximity to a helicopter landing and has been installed.)

3) At the outlet of Swan Lake. *(This gage site was subsequently moved to the east end of Swan Lake to provide safer physical access in proximity to a helicopter landing and avoid potential ice flows that accumulate near the outlet. This gage has been installed.)*

4) At the inlet of upper Cascade Creek where it enters Swan Lake. *(This gage has been installed approximately 1500' upstream of Swan Lake on the Cascade Creek inlet.)*

1.2 Gages will incorporate materials, equipment, installation techniques, calibration, monitoring, maintenance and reporting methods that are compliant with USGS stream gaging protocols.

1.3 CCLLC will make a good faith effort to accomplish the gage installations in the least invasive manner possible, being placed on or within rock substrate whenever feasible, avoiding vegetation removal or soil disturbance to the extent possible and comply with all agency permit conditions.

1.4 CCLLC will provide a site map indicating specific gage locations. The Alaska Department of Fish & Game and US Forest Service shall approve all final stream gaging locations and plans via applicable permit mechanism or letter of authorization.

1.5 Gage installation, calibration, monitoring and reporting shall be performed by personnel with demonstrated abilities and credentials appropriate for the tasks.

1.6 CCLLC will provide a photo record of each completed installation for agency review.

1.7 Gages are anticipated to be established and maintained for an indefinite period of time sufficient to determine natural resource management stream flow and hydropower operational parameters. Gages may be ordered to be moved, modified or removed at any time at agency discretion as may be necessary to protect natural resources and/or the public interest.

1.8 Each gage and related equipment will otherwise be removed when it is determined that the use and benefit is no longer needed, or as may be ordered by the agencies. CCLLC will be responsible for all work to remove equipment and restore each site as may be necessary to a natural condition.

1.9 CCLLC will provide periodic reports or information updates to the agencies as determined by the ADF&G and the USFS.

Task 2-Acquisition of Permits.

2.1 CCLLC will make application for a USFS Special Use Permit inclusive of the Stream Gaging Study Plan and all necessary plans & exhibits to adequately describe the gaging facilities, their installation and operation. *(A Special Use Permit Application has been made and approved, now subject to the revision of the Swan Lake outlet site #3 being moved to the east end of Swan Lake.)*

2.2 Presently it is not anticipated that a field reconnaissance for archeological/historical/cultural resources will be necessary due to the minimal surface area impacted and the primary placement on rock substrate wherever feasible. No significant disturbance of the ground surface would occur as a result of installation of stream gages.

2.3 CCLLC will verify with ADF&G and ADNR whether any field permits are required for establishment of stream gaging stations and comply accordingly.

Task 3-Selection and Acquisition of Field Equipment.

3.1 CCLLC has selected bubbler type pressure transducers, gage shelters, and hardware that will be owned by the project and dedicated to the stream gaging program. The important benefit of a bubble type pressure transducer is the actual transducer remains dry in the gage house and is not subject to damage caused by long term or repeated freezing in the stream. CCLLC has found that wet pressure transducers exposed to freezing water could become unreliable and often subject to either inaccurate stage measurements or destruction of the transducer membrane. CCLLC has purchased Design Analysis H350 XL instrumentation that includes a bubbler, pressure transducer and data logger.

Task 4-Transport.

4.1 All materials, equipment and personnel will be transported by air when feasible and by boat when necessary. Winter conditions may prevent access to some of the sites until sufficient visibility and other conditions allow. No alteration or disturbance of the landscape is anticipated as a result.

4.2 Trip frequency will be based on 3-5 days for initial equipment installation, up to 9 scheduled monitoring visits per year, plus 2-3 additional visits that may occur when there is the probability of rare or extreme discharge events.

Task 5-Placement of Stream Gages.

5.1 CCLLC has installed all 4 gages.

5.2 CCLLC will establish a photo record and field notes of each installation for review by the agencies as may be desired.

Task 6-Monitoring, Maintenance, and Data Processing.

6.1 Gage monitoring and maintenance will be completed at appropriate intervals for a period of at least 3 years following gage installation. The field staff will always be accompanied by another person. These visits will be to perform observation, recording and maintenance and to take high flow discharge measurements. Discharge measurements during mid and low flows will generally be taken by wading with a current meter. During high flow, staff will use an Acoustic Doppler Current Profiler (ADCP) to safely and accurately measure discharge.

6.2 Tasks during gage servicing will include:

- 1) Take an accurate measurement of the stream flow with a current meter or ADCP
- 2) Download all data from data logger
- 3) Program the data logger after download
- 4) Read all staff gages and recorder to ensure gage height match
- 5) Check instrument and intakes for proper operation
- 6) Check for debris or scour on the hydraulic control

6.3 CCLLC will compile discharges and stage data for each station, compute rating curves, and plot discharges against existing rating to check for minor and major shifts. Stage data may be adjusted for such things as backwater from debris or ice. Shift adjustments and new or revised rating curves will be applied to the stage data as warranted. All adjustments and shifts to the data will be clearly noted. Discharge data from each gage will be collected and kept on file.

6.4 Options that may be completed dependant on time & budget could include:

- 1) Install solar panels at each station. This will enhance battery life and reduce the time and problems during monitoring. It is possible that this will save data during the winter months when delays can be expected due to prolonged bad weather.
- 2) Install a GOES communication system at one or more sites. This will allow remote access to site data and give real-time updates of stream conditions while verifying that the instrumentation is functioning as expected. The result will reduce the likelihood of lost data and to time field visits when the desired flow conditions are occurring.

Task 7- Results

7.1 Data Reports will be made available to requesting agencies as soon as possible upon collection and processing. Data results summaries will be posted on the www.thomasbayhydro.com public information website.