Black Canyon Hydroelectric Project
FERC Project No. P-14110
Revised Noise Study Plan
January 2013

Prepared for
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1 INTRODUCTION

Black Canyon Hydro, LLC, (BCH) ultimately plans to file an application for an original license for the Black Canyon Hydroelectric Project (Project), FERC Project Number P-14110, and associated facilities on the North Fork Snoqualmie River (North Fork), approximately 4 miles northeast of North Bend in King County, Washington. The Project has a proposed generation capacity of 25 megawatts (MW) and would be located entirely on private lands.

Intake Alternative A

Alternative A would consist of the following new facilities: (1) an 8-foot-high, 162.4-foot-long inflatable rubber diversion with an associated water intake structure; (2) a natural or roughened fish passage channel; (3) a variable pooling area behind the diversion with a normal water surface elevation of 971 feet above mean sea level and a maximum pooling of 2.83 acres; (4) a power conduit tunnel consisting of an approximately 450-foot-deep vertical tunnel into an approximately 8,350-foot-long, 9-foot-diameter horizontal tunnel and penstock; and (5) for access, Alternative A would utilize an existing logging road to minimize disturbance, and require only 825-feet of additional road.

Intake Alternative B

Alternative B would consist of the following new facilities: (1) a control sill to maintain a consistent river bottom elevation, which would allow water, fish, sediment, large woody debris, and whitewater recreationists to pass unimpeded, with an associated water intake structure; (2) a power conduit tunnel consisting of an approximately 450-foot-deep vertical tunnel into an approximately 9,175-foot-long, 9-foot-diameter horizontal tunnel and penstock; and (3) for access, Alternative B would utilize an existing logging road to minimize disturbance, and require only 500-feet of additional road.

Powerhouse

The power conduit tunnel and penstock from either Alternative A or B would terminate at the powerhouse proposed upstream of Ernie's Grove. Initially, the PAD described the powerhouse as being a metal building approximately 60-feet-wide by 100-feet-long. However, as a result of construction from the power conduit tunnel, an underground powerhouse of similar dimensions may be feasible. Tailrace dimensions have also been revised from a 60-foot-wide by 100-foot-long tailrace, to a 24-foot-wide by 200-foot-long tailrace. Whether above or below ground, the powerhouse would include two Francis turbine generator units, one rated at 16 MW and the other rated at 9 MW, as well as appurtenant facilities (switchyard, maintenance building, etc.). Additionally, a

temporary, 2,600-foot-long construction access road would extend from the powerhouse to the North Fork Road (while avoiding Ernie's Grove).

Transmission

As presented in the PAD, transmission would consist of a 4.2-mile-long, 115-kilovolt overhead transmission line that transmits project power to the regional grid (transmission line would be an over-build of an existing transmission line with only approximately 0.65 miles of new transmission). However, an additional option, depending on minimum instream flow requirements, land use designations, and cost, may be to have the Project connect to the existing 34 kV transmission line running from the existing Black Creek Hydroelectric Project to Snoqualmie Falls. A transmission line could be run from the powerhouse back through the power conduit to the intake structure. From the intake structure a buried or overhead transmission line would only have to travel approximately 6,745-feet along an existing logging road through clear cuts.

The project would operate in run-of-river mode. The combined maximum hydraulic capacity of the two project turbines would be 900 cubic feet per second (cfs). The project would divert water from a 2.6-mile-section of the North Fork Snoqualmie River.

BCH filed a Notice of Intent (NOI) and the associated Pre-Application Document (PAD) to commence the FERC Integrated Licensing Process on March 27, 2012. In response to the subsequent study requests filed by FERC staff and other stakeholders and as detailed in 18 CFR 5.11, BCH is required to submit relevant resource study plans. This includes a study of noise near the Project Reach which follows the requirements of 18 CFR 5.11(b)-(e).

2 STUDY DESCRIPTION AND OBJECTIVES

In accordance with 18 CFR §5.11(d)(1), this section describes the goals and objectives of the study and the information to be obtained. The goal of the noise assessment is to determine whether noise from construction and operation of the project, including project facilities and transport and staging areas, might affect area residents, private property owners, recreational users, cultural resources, and noise-sensitive wildlife species in the vicinity of project. The study will be designed to address the following specific goals:

- Characterize existing ambient noise levels within the audible range of the project;
- Estimate noise levels that would be generated by construction activities (e.g., transport of equipment, materials, and personnel; blasting; use of heavy equipment);

- Predict project-related sound levels;
- Determine if construction activities and operation of the project would be audible to sensitive wildlife, area residents, recreational users, or other sensitive receptors in the vicinity of the project; and
- Propose measures, as needed, to reduce, avoid, or mitigate noise impacts.

3 STUDY AREA

The proposed study area for this analysis includes lands and waters within and adjacent to the Project boundary which are within audible range of the project, including the residential areas of Ernie's Grove. More specifically, the study area consists of those areas within audible range of the project area from and adjacent to the proposed intake structure (including the pooling area), along the tunnel, and to the powerhouse, including the tailrace. It also includes locations within audible range of existing roads within and local access roads providing access to the project area as well as proposed new or extended roads, including the proposed intake access road and proposed powerhouse access road. The initial phase of the Noise Study will more accurately define the boundaries of the study area based on review of maps of the project vicinity.

4 RESOURCE MANAGEMENT GOALS

In accordance with 18 CFR §5.11(d)(2), this section describes resources management goals of agencies or Indian tribes with jurisdiction over the resources to be studied.

BCH is not aware of any applicable resource management goals of agencies or Indian tribes with jurisdiction over noise within the vicinity of the Project. Additionally, none were indicated by the FERC in their Noise Assessment Study Request. However, BCH would appreciate any stakeholder input on this subject.

5 EXISTING INFORMATION

In accordance with 18 CFR §5.11(d)(3), this section describes existing information on noise at the Project, and the need for additional information.

The project reach between the intake diversion structure and the powerhouse is approximately 2.6 miles long. The project area is zoned for forestry and has historically been managed as a commercial tree farm. Extensive commercial forestry operations are one significant source of noise in the area. The Project is also located adjacent to the

Mount Si Natural Resources Conservation Area (NRCA), with the Project Reach adjacent to the NRCA boundary.

Recreational users are common, particularly hunters, river kayakers, and holders of access permits issued by Hancock Forest Management (HFM). These access permits allow recreational access to lands owned by HFM and also allow collection of firewood. Ernie's Grove, an unincorporated community, is located immediately downstream of the proposed project area.

Completion of the Noise Study will require the following additional information:

- Existing ambient noise levels;
- Noise levels generated from construction and operation of the proposed Project;
- Potential sensitive noise receptors, including key habitat for noise-sensitive wildlife, within the study area; and
- Potential measures to reduce, avoid, or mitigate noise impacts, if necessary.

6 NEXUS TO PROJECT

In accordance with 18 CFR §5.11(d)(4), this section describes any nexus between Project operations and effects of noise.

Noise generated during construction and operation of the proposed project could adversely affect area residents, private property owners, and recreational users in the vicinity of the project and associated staging and construction areas. Although the project would be located several miles from the nearest city (North Bend), the associated infrastructure, the need for tunnel excavation, and material hauling could have potential noise effects on residents of Ernie's Grove, nearby private property owners, recreational users, and wildlife. The results of this study will help define the effects of the project and will inform the potential need to reduce, avoid, or mitigate noise impacts.

7 METHODS

In accordance with 18 CFR §5.11(d)(1) and §5.11(d)(5), this section provides a detailed description of the proposed study methodology, including data collection and analysis techniques, or objectively quantified information, sampling strategy, and a schedule including data collection and analysis techniques, or objectively quantified information, sampling strategy, and a schedule including appropriate field season(s) and the duration (see "Schedule" heading below for schedule).

7.1 Characterize Existing Ambient Noise Levels within the Audible Range of the Project

To accomplish this goal, BCH must first evaluate the acoustical footprint of the proposed project during both the construction and operational phases. With the area of potential impacts defined, BCH will measure and characterize the noise environment at receptors considered to be sensitive to project-related noise. Because traffic during construction and operation will pass residential locations and other sensitive receptors, traffic noise is an important element of the project. To evaluate noise generated by project-related vehicle traffic, hourly peak and average vehicle data and standard traffic mix estimates from the Washington State Department of Transportation (WSDOT) will be necessary. BCH will use the data generated during this evaluation to characterize existing ambient noise levels in the study area. Additional noise sources that may be characterized include ambient river noise and periodic noise as a result of logging activity and other area resource extraction activities.

7.1.1 Define Extent of the Boundary for the Noise Assessment

BCH will review maps in computer-aided design (CAD) format of the proposed Project site and of the construction areas, including staging and transportation routes. BCH will review publically available zoning and land-use data as well as digital topographic maps, information on existing sound sources (including vehicular traffic), and details of nearby land ownership to define the extent of potential impacts related to Project construction and operation. BCH anticipates noise-sensitive receptors will include nearby locations where quiet is germane to a receptor's use. These areas include (but are not limited to) residential areas, parks, churches, cemeteries, schools, critical wildlife habitat (identified through "Wildlife, Vegetation, and Sensitive Habitats Study Plan), and sites of cultural significance to Native Americans.

7.1.2 Sound Level Measurements

Once the extent of the noise assessment boundary has been defined (anticipated boundary is ½ mile radius around both intake and powerhouse sites), BCH will conduct sound-level measurements to characterize the existing ambient noise levels at selected receptor locations. BCH anticipates sound level measurements will be required in Ernie's Grove near the powerhouse location and near the two possible intake locations (up to a maximum of five measurement locations if additional locations are determined necessary). The "Wildlife, Vegetation, and Sensitive Habitats Study Plan" may identify particular species of concern which may necessitate additional noise sampling (or modeling). Measurements will be conducted by field technicians trained in deployment

and operation of sound level measurement instruments and in collecting data measurements from these instruments. BCH will collect sound-level measurements at each identified measurement site four times. Measurements will be collected at each site once in the fall (defined as September, October, and November), once in the winter (defined as December, January, and February), once in the spring (defined as March, April, and May), and once in the summer (defined as June, July, and August). Further, when taking the four sound-level measurements, BCH will collect data once in the morning, once in the afternoon, once in the evening, and once at night.

Measurements will be taken with International Electrotechnical Commission Standard 61672-1-2003-compliant Type 1 integrating sound-level meters capable of recording and storing sound level metrics suitable to comparison with applicable King County noise criteria (KCC 12.88). Further, the collected sound level data will be sufficient to characterize the ambient noise environment relative to sound-level frequencies (defined over the audible range of human hearing) and types of existing noise sources (i.e., traffic, birds, residential noises, etc.). The ultimate goal of ambient sound level measurements will be to provide a basis for developing quantitative and qualitative conclusions regarding the potential for noise impacts following predictive noise modeling.

BCH will deploy sound-level meters during periods of dry, calm weather. Should inclement weather disrupt or interfere with sound-level data, repeat measurements or extended measurement periods may be required.

7.2 Estimate Noise Levels That Would Be Generated by Construction Activities

Construction noises are expected to include on-site construction activities, staging area activities, transportation of materials to and from staging and construction areas, and blasting. Activities in the construction and staging areas could include operation of heavy construction equipment, including excavators, bulldozers, loaders, cranes, pneumatic drills, rock-breakers, compressors, hand-tools, and other machinery. To estimate noise levels from these activities, BCH will use a combination of techniques based on the types of construction source being evaluated. Noise estimates will be completed for the noise-sensitive locations identified during the analysis described in Section 7.1.1.

Noise from typical construction equipment will be estimated using the Federal Highways Administration (FHWA) Roadway Construction Noise Model (RCNM). The RCNM contains a data base of typical noise levels from standard construction equipment and

allows the user to predict noise levels based on receptor distances and equipment usage. Although this model was developed to estimate noise levels from roadway construction, it is often used to estimate noise levels generated during other construction projects.

Noise levels from construction equipment that are not defined in RCNM but that are expected to be used as part of the construction of this Project, and that are expected to be acoustically significant, will be further assessed using alternate methods. These alternate methods may include predictive noise modeling using equipment manufacturer data combined with predictive noise modeling using the CadnaA noise model (defined below).

Blasting noise will be evaluated through literature review of typical blasting noises and/or predictive noise modeling using CadnaA.

Noise related to transportation of materials to and from the active construction and staging areas will be estimated using the FHWA Traffic Noise Model (TNM) version 2.5. TNM allows for consideration of vehicle mixes (i.e., volume of heavy trucks, medium trucks, or light-duty vehicles), vehicle speeds, topography, and other parameters. TNM also allows for assessment of traffic noise levels at multiple noise-sensitive receptors. Topographical information collected as part of the review described in Section 7.1.1 will be used to construct the TNM model.

The noise modeling area can be determined via preliminary noise modeling runs using worst-case assumptions of meteorology, surface reflectivity and vegetation, significant construction and operation equipment noise sources, and traffic.

Noise levels during the construction and operational phases will be calculated for the entire noise modeling domain using the CadnaA noise model, Version 4.0.135, based on the International Standards Organization (ISO) guidance for noise modeling ISO 9613-2. The CadnaA noise model is a comprehensive noise prediction tool that allows for consideration of multiple noise sources and multiple noise receptor locations. Further it allows for consideration of complex topography, intervening ground type, vegetation, intervening structures such as buildings, meteorology, receptor locations, and other parameters. The model accounts for terrain and allows for assessment of both point and linear sources, such as roads. Blasting is an impulse noise that is also handled by the model, but ground-borne vibration is not included. The model accounts for increases in roadway grades where noise generated by traffic, especially heavy trucks, would be expected to be higher.

Although the model allows for determination of noise shielding provided by vegetation, model runs with and without vegetation may be needed to provide a worst-case assessment of noise in the event portions of the study area are logged or burned by wildfire.

The CadnaA model has been proposed in lieu of the SPreAD noise prediction tool suggested by FERC to provide a more comprehensive and dynamic approach to assessing noise levels and responding to changes in project design. Unlike the SPreAD tool which calculates levels from a single source at a single receiver, CadnaA allows the user to evaluate multiple noise sources and multiple receivers built into a 3-dimensional model that accounts for topography, various ground cover types, meteorological conditions, and various other elements that may affect noise transmission. Once built, the model can be easily manipulated to assess changes in design or source/receptor locations. In addition, sound level isopleths can be generated to visually assess the range extent of noise from specific equipment or scenarios. The level of effort required to evaluate noise levels through a limited number of CadnaA runs is comparable if not more cost effective than defining multiple SPreAD scenarios.

7.3 Predict Project-Related Sound Levels

Sound levels generated during the operational phase of the project will be estimated using noise level details of each source of equipment proposed as part of Project operations (i.e., generators, compressors, cooling towers, turbines, etc.) and the geographical location of each noise source within the proposed Project site layout. Noise modeling will be completed using the CadnaA noise model, version 4.0.135 or later, based on ISO 9613-2 guidance (Section 7.2). Noise estimates will be completed for the noise-sensitive locations identified during the analysis described in Section 7.1.1.

The CadnaA model will be developed using sound level data of equipment and activities proposed for the Project, as well as details about geographic location and operating extents of all equipment. The model will include detailed terrain information for the entire project site as provide by the project developers. The model will use the topographical data for the project vicinity (i.e., extending out toward noise-sensitive receptors) to be collected as described in Section 7.1.1.

Sound level information for operation equipment shall be made available in 1/1 or 1/3 octave sound pressure levels at a specified distance or sound power levels. For sound

source data that are not available for inclusion in the noise model, BCH proposes taking sound level measurements of representative sources (e.g., measurements at a facility similar to the proposed Project). As an example of a representative source, the Twin Falls project, a small 24 MW hydroelectric facility located on the South Fork Snoqualmie River, approximately five miles southeast of North Bend, Washington, might be selected. Major project features include: (a) a 65-foot long, 9-foot high collapsible steel diversion weir; (b) two 450-foot long by 8-foot diameter vertical intake shafts conveying water to an underground powerhouse; (c) a 3,820-foot long outlet tunnel; (d) two 12,000 kilowatt (kW) generating unites with a combined hydraulic capacity of 710 cfs; and (e) a 1.1-mile long project bypass reach. Twin Falls might be used as a representative source because it is similar in size, operates in a run-of-river mode, includes long vertical shafts to deliver water to an underground powerhouse, and uses a collapsible diversion structure.

7.4 Determine if Construction Activities and Operation of the Project Would Be Audible to Area Residents, Recreational Users, or Other Sensitive Receptors in the Vicinity Of The Project

Results of the construction noise estimates and operational noise modeling assessments will be tabulated and compared with applicable King County sound level limits for construction and facility operation, respectively. Results will be tabulated for the noise-sensitive locations identified based on the evaluation described in Section 7.1.1.

Further, predicted construction and operational noise levels will be compared with the ambient sound level measurement data collected at each noise-sensitive receptor location. Conclusions on the potential for perceived sound level impacts and audibility of operation and construction will be based on estimated increases over ambient levels. In general, sound levels that are 3 to 5 decibels (A-weighted scale) (dBA) greater than ambient conditions can be expected to be audible at noise-sensitive locations. The severity of perceived impacts will be based on the time of day during which the sound level are estimated, and the overall level of ambient noise (i.e., very quiet rural environments are typically more sensitive to extraneous noise sources).

Conclusions on adherence to the King County limits and perceived impacts will be made for each receptor during all four calendar seasons.

Potential noise impacts on wildlife will also be taken into consideration when conducting the noise analysis. The project area is actively managed as timberlands, has been frequently altered by human activities, and may have diminished use as habitat for

sensitive wildlife species. However, active management of timberlands does not rule it out as habitat for sensitive species, especially common raptors and nocturnal species (peregrine falcons, ospreys, Northern Goshawks, and bats for example). Also, the nearby Mount Si NRCA contains areas of old growth forest that may provide habitat for a variety of sensitive wildlife species, including the peregrine falcon, marbled murrelet, and spotted owl, and portions of the adjacent Mt. Baker-Snoqualmie National Forest also may lie within audible range of the project. The noise study will include an evaluation of potential noise effects on wildlife species within the project area and on other lands within audible range of the project. The Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service also maintain species specific recommendations for disturbance buffers, which may be used for species of concern identified in the "Wildlife, Vegetation, and Sensitive Habitats Study Plan."

We assume the applicable analysis would include an evaluation of how noise from the project would affect lands in the Mt. Baker-Snoqualmie National Forest under the Northwest Forest Plan. BCH will evaluate how noise emitted by the various phases of the project may potentially affect resources and sensitive receptors.

7.5 Propose Measures, as Needed, to Reduce, Avoid, or Mitigate Noise Impacts

If significant noise impacts are predicted (i.e., noise levels exceed King County limits or ambient conditions by at least 3 dBA), noise mitigation may be considered. Noise mitigation may include equipment substitutions, soundproofing enclosures, barrier walls, and restrictions on operational periods. Potential mitigation for construction activities will be based on a qualitative review of the expected effectiveness of noise-mitigation techniques, such as mufflers, equipment enclosures, alternative back-up alarms, adjustments to seasonal-timing, time of day, etc. The expected mitigating effect of operational noise mitigation will be estimated using the CadnaA noise model.

8 PROGRESS REPORTING

In accordance with 18 CFR §5.11(b)(3), this section describes provisions for periodic progress reports, including the manner and extent to which information will be shared; and the time allotted for technical review of the analysis and results.

Study reports will be submitted as required by the FERC Integrated Licensing Process (ILP). The most recent schedule, issued by FERC in Appendix B of Scoping Document 1, includes a number of opportunities for progress reports, exchange of analysis and results between stakeholders, and information sharing. After proposed study plans are

filed with FERC there will be a study plan meeting and comment period before a revised study plan is filled and a comment period passes. Once studies begin, the ILP also has deadlines for an Initial Study Report to be submitted, an Initial Study Report Meeting, and an Initial Study Report Meeting Summary. However, this schedule is subject to change by FERC staff and should not necessarily be relied upon. It is BCH's understanding that any changes to the ILP plan and schedule will be noticed by FERC staff.

Prior to the completion of the Initial Study Report, BCH will provide an opportunity for technical review of the draft study results and analysis. When the draft version of the Initial Study Report has been completed, it will be posted to the project website (www.blackcanyonhydro.com) and BCH will send notice of its availability by e-mail to contacts included on the mailing list identified in the "Revised Communication and Information Protocol" (filed electronically with the FERC on November 27, 2012). Stakeholders will have 15-days from the issuance of this notice to provide written comments to BCH through the project website's "Contact" tab.

9 SCHEDULE

In accordance with 18 CFR §5.11(b)(2), the schedule for conducting the study is provided in Table 1 below.

Table 1. Resource Study Schedule

Component	Completion Date*
Define Boundary	Early 2013
Sound Level Measurements	2013 (one sampling during each season)
Draft Report	Late 2013
Draft Initial Study Report Notice & Informal Comment Period	Winter 2013
Initial Study Report filed with FERC	February 6, 2014

*Dates based on schedule created and presented by FERC in Scoping Document 1 and subject to change.

10 LEVEL OF EFFORT AND COST

In accordance with 18 CFR §5.11(d)(6), the anticipated level of effort and cost are provided in Table 2 below.

The estimated cost of this work is approximately $56,590 depending on the extent of the impact area and the number of sites studies. One or two technicians would be expected to

conduct the assessment, evaluate impacts, propose measures, and draft and finalize maps and reports.

Table 2. Level of Effort and Cost

Task	Labor and Expenses
Existing Conditions (SLM) Data Collection	$11,290
SLM Data Analysis	$10,400
Construction Noise Impacts Assessment	$7,600
Project Noise Impacts Assessment	$5,500
Noise Mitigation Assessment	$4,400
Technical Report, Meeting, & Revision	$13,400
Draft Report	$4,000
Total	$56,590

11 REFERENCES

King County. 2012. "King County Code, Title 12, Public Peace, Safety and Morals, Chapter 12.88 Environmental Sound Levels." http://www.kingcounty.gov/council/legislation/kc_code/15_Title_12.aspx#_Toc322610558. Accessed August 7, 2012.

USFS (US Forest Service). 1990. "Mt. Baker-Snoqualmie National Forest land and resource management plan." Department of Agriculture, Seattle, Washington. June 1990. pp. E 217 223.

USDA and USDOI (U.S. Department of Agriculture/U.S. Department of the Interior), 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. April 13, 1994.

12 APPENDIX A: Anticipated Assessment Boundary & Measurement Locations