11.1 Iowa Hill Fish Entrainment Potential Study Plan

This study is designed to assess the likelihood of fish entrainment at the intake structure located in Slab Creek Reservoir associated with the proposed Iowa Hill Pumped Storage Development. As identified in the Iowa Hill Pumped Storage Development (IHPSD) project description, the intake/outlet facility in Slab Creek Reservoir will consist of a multi-port intake, approximately 80 feet below the Slab Creek Reservoir maximum water level elevation of 1,850 feet. In the pumping mode, the estimated discharge capacity of the intake would range between 3,600 and 4,200 cfs. This study will consist of a species at risk assessment and intake/screen design phase. The species at risk analysis will examine the species composition in Slab Creek Reservoir and their distribution within the reservoir, both laterally and vertically within the water column. Working from information on species distribution, the design evaluation phase will bring engineers and biologists together into a collaborative setting to discuss options for design of the intake and appurtenant screen facilities.

11.1.1 Pertinent Issue Questions

This IHPSD entrainment study plan addresses the following fisheries and engineering design questions:

- What fish species are found in varying portions of the water column in the vicinity of the proposed Iowa Hill pump intake?
- Which fish species and life stages are found in various locations at all shallow edges of the reservoir (reservoir margins and upstream end of the reservoir) and what effects would daily water fluctuations from Iowa Hill have on those species and life stages?
- Are hardhead distributed throughout the reservoir, or concentrated in shallower areas and/or at the upstream end?
- What design options exist for the intake/outlet structure to avoid or minimize entrainment of species at risk?
- Is a fish screen needed as part of the final design of the intake/outlet structure, and if so, what are the design features of the screen?

11.1.2 Background

The Iowa Hill Pumped Storage Project is proposed as an addition to UARP facilities at Slab Creek Reservoir. The reservoir is known to support hardhead, a large minnow species of special concern. Hardhead are not generally considered to be a pelagic species that would be evenly distributed throughout the reservoir, but their distribution within Slab Creek Reservoir has not been fully documented. Previous studies of species composition were performed as part of the UARP relicensing studies. The species at risk phase of this study will build off of the UARP relicensing study foundation. This study focuses on the distribution of hardhead within the reservoir, in order to provide data for assessment of potential entrainment risk.

11.1.3 Study Objectives

The objective of this study is to identify species at risk to entrainment of the intake by describing the occurrence and distribution of hardhead and other fish species between the deeper, center portion of Slab Creek Reservoir and other areas of the reservoir (particularly the upstream end and shallow edges on the sides). Once this information has been developed, the second phase of the study will involve a design assessment of the intake structure, with the objective of developing a intake and/or screen design that avoids or minimizes entrainment of species that are determined to be at risk.

11.1.4 Study Area

The study area will include Slab Creek Reservoir.

11.1.5 Information Needed From Other Studies

Information needed from other studies includes: 1) the fish species that occur in Slab Creek Reservoir from the UARP relicensing Fish Surveys Study 2) Reservoir Habitat Study; 3) Water Quality Study; 4) Water Temperature Study.

11.1.6 Study Methods And Schedule

The study will be conducted in two phases, each of which is described below.

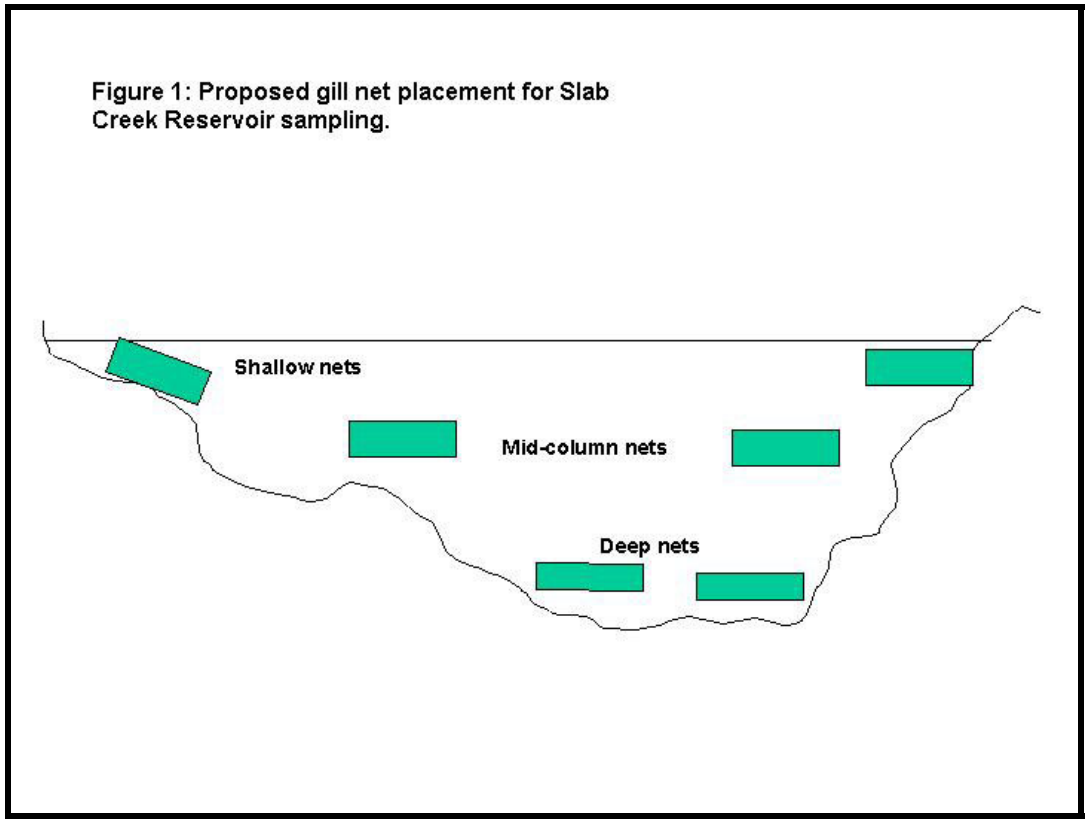
Phase 1 – Field Studies to Identify Distribution of Fish Species in Slab Creek Reservoir

- As a first step, the Licensee will conduct an intensive gill-netting and electrofishing and/or seining surveys of the reservoir to characterize the locations of greatest fish activity in spring (May), summer (July-August), and late fall (November).
- Two primary sampling zones will be established: 1) the upstream end of the reservoir, including shallow areas, and 2) the deepwater zone of the reservoir, including the the shallower reservoir margins, in the vicinity of the proposed intake.
- Each zone will be sampled with six variable-mesh gill nets, each 100 feet long and typically 8 feet deep. Each net will have four panels with mesh sizes ranging from 1 or 1.25 to 2 inches (either 1, 1.5, 1.75, and 2 inch mesh panels, or 1.25, 1.5, 1.75, and 2 inch mesh panels). Two nets in each zone will be set near the shoreline to sample shallow water. Two nets will set further away from shore, and suspended so that they sample the mid-water column. Two nets will be set in the deepest water, and suspended to sample near the bottom.
- Sampling will occur over three days, and will include portions of three daytime and two nighttime sampling periods.
- Additional mid-water sampling will be conducted, using a modified otter trawl or similar sampling gear, in an attempt to additionally characterize use of mid-water areas by various species and life stages (in addition to the mid-water column sampling by gill net).
- Gill nets will be serviced as often as possible but at least once per day or at least every eight hours during daylight hours to minimize mortality of sampled fish.
- Figure 1 presents a conceptual net placement approach for the sampling.
- Interim results will be presented to the TWG for discussion/evaluation following the spring sampling event. The results will be presented as interim in-progress draft technical reports after each sampling event and provided to the TWG as the study progresses.

Phase 2 –Intake/Screen Conceptual Design

- Engineering staff and biologists, working with results of species at risk and with CDFG fish screening criteria, will identify alternative designs and vertical locations of intake structure.
- Alternative designs will be evaluated relative to their level of protection for the species at risk, engineering and construction feasibility, and cost, to determine a preferred alternative design for inclusion in the license application.
- The Phase 2 design will be an iterative process, with discussion between engineers, biologists, and the TWG regarding intake structure alternatives and issues.

It is anticipated that Phase 1 field studies will occur in late fall (November-December) of 2003, spring (May) 2004, and summer (July-August) 2004. Phase 2 will occur between August-December of 2004.



11.1.7 Analysis

Fish distribution data analysis will include quantifying and describing the catch at each location, including an approximate catch per unit effort, the time period when fish were captured, and the distribution of species and sizes. Distribution of different species and life stages at all the sampling points will be presented.

11.1.8 Study Output

A preliminary presentation of Phase 1 species at risk study results will be made to the Aquatics TWG in June 2004. A draft written report including the issues addressed, objectives, description of study area and sampling locations, methods, results, discussion and conclusions will be presented to the Aquatic TWG. A final written report will be prepared for inclusion in the license application. The intake/screen design assessment will generate a preferred conceptual design for the IHPSD intake facility, based on an iterative assessment process that includes input from various resource experts. This design will be presented in the license application.

11.1.9 TWG and Plenary Group Endorsement

This study plan was given provisional approval at the December 4, 2003 TWG meeting, pending review of how comments were incorporated into the final version of the study plan. The proposed final study plan was sent out December 9, 2003, requesting any additional agency/NGO comments be submitted by December 12, 2003. No further comments on the proposed final study plan were received by December 12.

The study plan was submitted to the Plenary Group and approved on January 7, 2004. The participants at the meeting who said they could "live with" this study plan were the U.S. Forest Service, American River Recreation Association & Camp Lotus, El Dorado County Water Agency, El Dorado County, El Dorado Irrigation District, El Dorado County Citizen's for Water, National Park Service, U.S. Bureau of Land Management, Placer County Water Agency, City of Sacramento, California Outdoors, California Department of Fish and Game, Friends of the River,

State Water Resources Control Board, and SMUD. None of the participants at the meeting said they could not "live with" this study plan.

11.1.10 References

None.