8.9 Whitewater Boating Flow Study for Slab Creek Reach
(Note: Above Chili Bar)

8.9.1 Pertinent Issue Questions

The Whitewater Boating Flow Study addresses the following recreational resource questions:

1a. Is it possible to have consistent and regular releases that support boating in the reach between Slab Creek Dam and Chili Bar Reservoir?
2. What are the optimal and minimum boating flows between Slab Creek Dam and Chili Bar, for all crafts, and all classes of boating?
3a. What are the effects of potential boating flows on water levels of Project reservoirs?
6. What maximum and minimum flow regimes are required for whitewater boating in stream reaches affected by the Project, including upper Rubicon River?
19. Can there be a flow management hydrology model (unimpaired hydrograph) built with a whitewater filter that estimates flows assuming UARP/Chili Bar presence and absence?
68. What is the need for, and feasibility of, whitewater boating in the reaches below Project dams?

8.9.2 Background

The objectives of the Whitewater Boating Feasibility Study included:

- Identify and describe reaches where there are existing or potential whitewater opportunities
- Quantify how the Project affects these opportunities (i.e., flows, boatable days, season of use, access)
- Characterize whitewater opportunities affected by Project operations based on physical characteristics, existing information and interviews (e.g., gradient, length, access, channel characteristics, flows, reservoir storage and diversion capacity)
- Determine current and future demand for whitewater boating on Project reaches
- Develop a range of possible flows to provide other TWG's before conducting additional studies
- Describe and assess the adequacy and availability of existing flow information
- Recommend additional studies needed for whitewater resources (e.g., Single Flow Feasibility Study or Controlled Flow Study)

Reconnaissance conducted as part of the Whitewater Boating Feasibility Study was completed in 2002 and a presentation of the methods and results was made to the Recreation TWG on January 22, 2003. Subsequent documentation of the reconnaissance was presented to the Recreation TWG on February 5, 2003. Helicopter reconnaissance of South Fork Rubicon below Robbs Forebay and Silver Creek below Junction Reservoir was conducted on June 11, 2003. Based on the presentation, documentation and field reconnaisance the Recreation TWG participants determined that additional investigation including flow studies are warranted at the Slab Creek and Ice House reaches in order to have enough information to address all of the pertinent issue questions relating to these reaches. A study plan for both of these reaches was developed and approved by the TWG February 26, 2003. The TWG subsequently asked to prepare separate study plans for each reach. The study plans were presented to the Aquatics TWG in August for review and comment. The Aquatics TWG did not have concerns with the range of flows proposed in the study plan. They also agreed that the whitewater flow study for the Slab Creek reach could be initiated as soon as November 2003.

8.9.3 Study Objectives

The objectives of this study include:

- Identify current and potential boating opportunities on the Slab Creek reach. Opportunities may vary by craft, skill level, or preferences for different types of whitewater conditions.
- Identify flow-related attributes for each of those opportunities, including a description and classification of key rapids.

- Develop relationships between flow levels and quality of whitewater experience for the Slab Creek Reach. Resulting "flow evaluation curves" will identify minimum and maximum acceptable flows and optimum flow ranges for each reach for a variety of watercraft.
- Determine the whitewater difficulty using the International Scale of Whitewater Difficulty (American Whitewater 1963) for the reach within the range of test flows.
- Determine what types of watercraft are suited for the reach within the range of test flows.
- Characterize the whitewater resource in the reach in terms of quality of the opportunity and suitability for whitewater boating.
- Determine what operational challenges may exist in providing flows in the boatable range.
- Quantify how the Project has affected the frequency and timing of boatable days available in this reach.

8.9.4 Study Area and Sampling Locations

The study area is defined as the Project reach directly downstream of Slab Creek Dam (between Slab Creek Dam and White Rock Powerhouse).

8.9.5 Information Needed From Other Studies

Hydrology data to determine the annual number of days and timing of boatable flows that occur under regulated and unimpaired conditions in this reach.

Provide timing, duration and magnitude of test flows as soon as practical to other TWG's.

8.9.6 Study Methods And Schedule

The Whitewater Boating Flow Study requires that a team of boaters paddle a given stream reach multiple times in succession while the independent variable, flow, is changed. The objective is to record how changes in flow alter the quality of the experience for individual participants and the group. The group of participants paddle each pre-selected flow then individually complete a single flow survey questionnaire querying them on a number of whitewater characteristics specific to that flow. Upon completion of all the test flows participants complete the comparative survey form enabling them to evaluate one flow over another for specific characteristics. Focus group discussions structured with specific questions are conducted at the conclusion of each single flow and upon completion of the comparative evaluations.

The methodology to complete the Whitewater Flow Study will include an organized boating trip the Project reach. Boating teams of between six to 12 boats, including both rafts and kayaks on the Slab Creek reach will be organized to make runs of the reach at the following target flows:

Slab Creek Reach: 1,000, 500 and 1,500 cfs (in that order)

The actual flows may be adjusted, within this range, while the study is in progress based on results of single flow responses and focus group discussions.

The existing information about the whitewater resource on the Slab Creek run indicates that current boating opportunities are constrained by the high flows that occur with spill events. The target flows for this run are selected to gain information about the entire range of boatable flows however the study will focus on safely gaining information about the highest flows that will provide reasonable whitewater boating opportunities in this reach.

The boating team members will have the skills necessary to boat the reach and will commit to participate in the entire test flow series. Boating participants will be selected by interested TWG participants. Each boater will sign a waiver of liability prior to participating in the study. The primary data for this study will consist of the boaters' responses to questionnaires that they will complete at the conclusion of each run. The questionnaire will include a section to gather data for a comparative flow evaluation for each reach. A draft of the questionnaire has been prepared and is attached to this study plan (***The questionnaire was distributed at the 2/26/03 Recreation TWG meeting)***. Comments and changes to the questionnaire will be incorporated prior to initiating the study. The type of

data to be collected include: 1) boatability, 2) quality of the reach, 3) suitability of the run for different crafts and boater skill levels, 3) quality of the put-in/take-out locations, 4) boater's opinion of the class of difficulty of the run, 5) comparison of each run at its different flows, 6) quality and length of the shuttle, 7) any safety concerns or hazards, 8) scenic quality, 9) number and difficulty of portages, 10) availability of play areas, and 11) boater's opinion of the flows that would represent the general paddling public preference.

The study methods will include videotaped recordings and/or photographs taken at key locations on the run with the focus on participants and issues surrounding recreation. The post-run discussion among the boaters (after the team has completed the questionnaires) will also be recorded on videotape. The questions for the focus group discussion will be developed with interested TWG participants during the process of reviewing and finalizing the questionnaires that will be used in the study.

The schedule for conducting the Whitewater Boating Flow Study will depend on the type of water year and the timing of snowmelt. The schedule will need to be flexible to respond to these climatic conditions however for planning purposes, the estimated schedule for conducting the flow study for the reach is listed below:

Slab Creek Reach: October 31, 2003 to June 30, 2004
(Tentative dates are Oct. 31-Nov. 2 and alternate dates are Nov. 7-9)

This is an approximate schedule that will be revisited and updated based on hydrologic events in the coming months. Although the Licensee has every intention of completing this study by 2004, this study plan needs to include a contingency for the occurrence of a dry water year, unforeseen power generation needs or because of biological concerns raised by the Aquatics TWG. The Licensee would like to accomplish the study plan in this reach in the fall or winter months during a period of the year when the flows necessary for the study would occur within the natural hydrograph. However, recognizing that the Aquatics TWG may have concerns with this study, the schedule for conducting this study has a broad window extending from October 2003 to June 2004.

8.9.7 Analysis

The information developed in this study will be used to describe the whitewater boating opportunities on this reach, quality of the runs, ease of the shuttle (in terms of time, distance, quality of route), access at both put-ins and take-outs, scenic quality, class of difficulty and boatability. The data collected will be summarized and analyzed for frequencies of responses and general trends that may exist in the data. The questionnaire responses will be used to estimate the minimum and maximum acceptable boating flows and optimum boating flow for the reach that is within the normal peaks of the natural hydrograph. These definitions (Whittaker et al. 1993) are:

Minimum Acceptable Flow: the lowest flow at which 50% of the survey respondents will return to paddle.

Maximum Acceptable Flow: the highest flow at which 50% of the survey respondents will return to paddle.

Optimum Flow: The flow level that provides the best combination of flow conditions for a whitewater opportunity. The optimum flow is the peak of the flow preference curve.

Flow Preference Curve: the graphic relationship between flow (horizontal axis) and survey responses (vertical axis).

Hydrology data for the period of record (1975 to 2001) will be analyzed to display how often boatable flows, as identified by the boaters, including optimum flows, have occurred under unimpaired and regulated conditions. The analysis will also identify when these flows have occurred over the period of record (number of days with boatable days per month and water year type) under unimpaired and regulated conditions.

Other hydrologic factors that may affect boating opportunities will also be analyzed. These will include how quickly typical spill flows move through the boatable range and whether there other flow fluctuations that make it difficult to boat this reach under current operations.

8.9.8 Study Output

The study output will include a USGS quad map showing basic information about the runs including the location of the put-ins and take-outs, shuttle route, and locations of photographs or videotape recordings taken during the study. The study output will also include the summarized responses to the questionnaires, flow preference curves, photographs showing portions of the runs, put-ins and take-outs, and edited videotape of the run and post-run group discussion. The edited video will capture watercraft at each pre-selected rapid for each test flow. The output will also include graphical and tabular data to compare the number and timing of boatable days that occur under unimpaired and regulated conditions in this reach.

8.9.9 Preliminary Estimated Study Cost

8.9.10 Recreation and Aesthetic TWG Endorsement

This study plan was approved on February 26, 2003 by the following entities of the TWG: ENF, American River Recreation Association/Camp Lotus, NPS, El Dorado County Parks Dept., Chris Shackleton, Gold Country Paddlers, PCWA and SMUD. Subsequent to approval, the TWG asked that separate study plans be developed for the Slab Creek and Ice House reaches**.** At the August 27, 2003 TWG the study plan was revisited and the participants re-approved this study plan (Whitewater Boating Flow Study for Slab Creek Reach) which includes revised target flows. The Plenary Group approved the plan on September 9, 2003. The participants a the meeting who said they could "live with" this study plan were USFS, SWRCB, NPS, CDFG, El Dorado County, Taxpayers Association of El Dorado County, Teichert Materials, ARRA/Camp Lotus, El Dorado Irrigation District, SMUD, PCWA, City of Sacramento, FOR, and PG&E. None of the participants at the meeting said they could not "live with" this study plan.

8.8.11 Literature Cited

American Whitewater, 1963. International Scale of Whitewater Difficulty.

Whittaker et al. 1993. Instream Flows for Recreation: A Handbook on Concepts and Research Methods. U.S. Department of the Interior.

Addendum 1 to the WWB Study Plan
(as developed by the Aquatic TWG on 09-08-03)

Concurrent with the three whitewater boating flow releases and at four locations in the Slab Creek Dam Reach (immediately below Slab Creek Dam, upstream of Mosquito Bridge, preferably downstream from the Rock Creek confluence, above White Rock Powerhouse), the Licensee shall collect the information below. The Licensee shall make a reasonable effort to gather information on the up ramp.

- Water temperature (°F) (existing *hourly* recorders at above White Rock PH, below Slab Creek dam and SFAR at above Mosquito bridge), turbidity (NTU) and Total Suspended Solids (mg/l). Licensee will strive to obtain continuous recording devices for turbidity. The Licensee shall take TSS samples once every 2-3 hours during daylight hours and more frequently on the up ramp if possible. At least one sample of each should be taken the day prior to the first boating flow release.
- Once around midday at peak flow on each day and from a standard location at each site, a photo looking upstream, across the stream and downstream.
- Stage at all four sites at least every 15 minutes during the up ramp and down ramp through the full range of the highest flow as measured by a temporary staff gage installed by the Licensee prior to the first boating flow release. Take photos described above every 15 minutes.
- Prior to the boating releases, the Licensee will assess areas of high fish stranding potential in the reach. During the down ramp and to the extent possible, the Licensee will note any stranded fish in these areas. During the fish stranding survey (after the boating flows) the flagged bullfrog site (downstream of Rock Creek) would be checked for bullfrog tadpoles. [USFS]
- During the boating flow study, the Licensee will obtain 15-minute elevation data at Slab Creek Reservoir and 15-minute flow data at the USGS gage below Slab Creek Dam for comparison to readings at the downstream temporary gage readings.
- Inundation of bed form features (e.g., bars, riffles, floodplains) associated with aquatic habitat at the three peak flows, at least.

The ENF will identify locations where bullfrogs and foothill yellow-legged frogs have been recorded in the reach, and a boater will place pins at the water line at these sites and collect other observations when he rafts during the boating flow study.