DRAFT GIBSON RESERVOIR AND SUN RIVER WATER QUALITY MONITORING

DRAFT STUDY PLAN FOR 2005-2007

Gibson Dam Hydroelectric Project, FERC No. 12478

Gibson Dam Hydroelectric Corporation

July, 2005

INTRODUCTION

This study plan describes proposals for temperature monitoring for Gibson Reservoir and portions of the Sun River near Augusta, Montana from 2005 through 2007. The plan describes studies to be performed in support of licensing for the Gibson Dam Hydroelectric Project, FERC No. 12478 (Project), under a Preliminary Permit issued by the Federal Energy Regulatory Commission (FERC) to Gibson Dam Hydroelectric Corporation (GDHC, Applicant) which expires in April, 2007.

BACKGROUND

GDHC has begun the required study planning process Project. As part of the consultation process required by FERC regulations, GDHC distributed an Initial Consultation Document (ICD) in April, 2005. In response, several resource agencies provided study recommendations including those for monitoring of Gibson Reservoir and Sun River water quality parameters, including water temperature, dissolved oxygen and total dissolved gasses. This Draft Plan is in response to the requests for temperature studies. Similar Draft Plans for other water quality parameters

PROPOSED WATER QUALITY STUDIES

STUDY OBJECTIVES

The objective of the proposed water quality studies is to obtain water temperature, dissolved gas and other parameter data of sufficient resolution to:

1) Serve as a baseline for the various state and federal environmental documents necessary for Project licensing;
2) Support analyses of how various Project operations might change existing water quality in the subject water bodies;
3) Serve as a basis for refining proposed Project operations to optimally meet both developmental and non-developmental needs.

GENERAL STUDY PLAN

In this Plan, GDHC describes proposed water quality monitoring in two primary categories:

1) **Reservoir and stream temperature;**
2) **Dissolved gasses; and**
3) **Other water quality parameters, as determined.**

Under each study category, we describe:

- Proposed Study Area;
- Sampling Equipment and Methods;
- Sampling Time Periods;
- Data Retrieval and Processing; and
- Reporting.

RESERVOIR AND STREAM TEMPERATURE

Proposed Study Areas

Gibson Reservoir

Gibson Reservoir water temperature surveys will be conducted in three primary locations: 1) at the reservoir surface near the Project spillway, to help relate reservoir temperatures with Sun River stream temperatures during periods when the reservoir is spilling; and 2) at various depth levels near the upstream dam face, to determine water temperatures at depths from which water may be drawn, depending on which of the dam's outlets is used for hydropower generation.

Each temperature monitoring point will be assigned a unique identifier and located on the a Gibson Reservoir topographic/bathymetric map, to a resolution suitable to re-emplace monitors if they need to be removed and reinstalled.

To the extent possible, temperature monitoring locations will be held consistent with locations for monitoring other water quality parameters, such as dissolved oxygen and other gasses, to assure analytic comparability among all parameters.

Sun River

Sun River water temperatures will be continuously measured at several locations downstream of Gibson Dam. Exact locations of temperature monitoring points will be determined after field agreement among GDHC and resource agency personnel. Generally, we propose to monitor Sun River water temperatures intensively from the base of Gibson Dam to a point about 1 mile downstream of the US Forest Service (USFS)

boundary near the mouth of Sun River Canyon. Downstream of that point, we propose less intensive monitoring, to be determined in the field.

In the intensive monitoring area, we propose to install continuous temperature monitoring devices in areas meeting the following conditions:

- Just below points of significant inflow from tributaries, overland flow, irrigation canals, irrigation return flow and groundwater; and

- At intervals along uniform stream reaches sufficient to document longitudinal temperature increases (exact locations to be determined in the field).

In the stream reaches downstream from the intensively measured area, thermograph placement will be determined in the field.

As with Gibson Reservoir temperature monitoring, all sampling sites will be located on the Project map to a resolution sufficient to re-emplace monitors if they need to be removed and reinstalled.

Sun River temperature monitoring locations will be held consistent with locations for monitoring other water quality parameters, such as dissolved oxygen and other gasses, to assure analytic comparability among all parameters.

Sampling Equipment and Methods

All continuous water temperature measurements in both Gibson Reservoir and the Sun River will be monitored using Onset Computer "Optic StowAway" model WTA08 loggers with 8 kilobyte ("k") memory capacity. Specifications for these loggers may be reviewed at Onsetcomputer.com.

Loggers will be set to record temperature every two hours. With 8k memory capacity, this interval supports monitoring for 661 days before the need to download data.

Gibson Reservoir Temperature-at-Depth Monitoring

To continuously monitor Gibson Reservoir water temperature from bottom to surface, an array of 8 loggers will be attached to a line suspended down the side of a vertical rock face extending into the lake. A weight attached to the bottom of the line will keep the line taught. The array will be positioned far enough from the intake to minimize effects of water being drawn from the lake either over the spillway or through the intake. Loggers will be spaced every 15 ft, starting from the highest expected lake level, about three feet above the bottom of the spillway. The loggers will be set below this elevation at -15, -30, -45, -60, -75, -90, -105, and –120 ft. Access to the loggers will be by boat.

Gibson Reservoir Surface Water Temperature Monitoring

To monitor surface temperature a single logger will be placed near the dam, at about 18" underwater. The surface logger will be place between the dam and any logboom or debris control structures, to prevent contact with floating material.

Sun River Temperature Monitoring

Temperature loggers will be emplaced in the Sun River with consideration given to:

- Visibility (both to facilitate retrieval and to reduce vandalism);
- Freedom from stream bed material movement and sediment deposition;
- Accordance with placement criteria (relative to various inflows) listed above.

Sampling Time Periods

Water temperature monitoring of both Gibson Reservoir and the Sun River will generally begin in August, 2005, and will continue to end of the licensing period. After initial data evaluation, it may be advantageous to add to or detract from the initial set of monitoring locations or to change the overall monitoring time interval at certain locations.

All changes in monitoring location or time period will be approved among consulting agencies and GDHC.

Data Retrieval and Processing

Data Downloading

Data from each logger will be transferred in the field to an Onset Optic Shuttle. The Shuttle utilizes an "Optic Coupler" which holds the shuttle and logger with their optic communications windows aligned. This optical connection is immune to weather conditions and functional even underwater. Data is downloaded to a computer in the office by connecting the Optic Shuttle to an Optic Base Station, again using the Optic Coupler.

Data Processing and Operational Software

Computer processing of logger data will be done using Box Car Pro 4.3 for Windows. This software allows data export to an Excel format file or delimited text file, allowing analysis by almost any data processing program.

DISSOLVED GASSES

Monitoring of dissolved gasses will generally follow plans for the temperature monitoring surveys, with certain exceptions as noted below. Specifically, this study component will be directed toward gathering information on dissolved oxygen and total dissolved gasses.

Dissolved Oxygen (DO)

The purpose of the DO surveys will be to determine DO levels at various levels in Gibson Reservoir and to relate those DO concentrations, during various seasons and Project operations, with DO levels in the Sun River.

Total Dissolved Gasses (TDG)

The purpose of the TDG studies will be primarily to determine whether the conditions at the Gibson Dam spillway might promote supersaturation of dissolved gasses, particularly nitrogen, which might be harmful to downstream aquatic resources. This survey will be more limited in scope that those for temperature and DO.

Proposed Study Area

DO

The DO study areas in Gibson Reservoir and the Sun River will generally be the same as those for temperature monitoring. It is expected that DO samples will be taken at the surface and temperature-at-depth montiring locations in the reservoir and at each of the temperature monitoring locations in the Sun River.

TDG

TDG will only be monitored at the base of the Gibson Dam spillway, and for a distance downstream sufficient to assess how supersaturation (if documented) persists.

Sampling Equipment and Methods

DO and TDG

DO and TDG will be measured using a Hydrolab probe to a resolution of 0.1 ppm. Exact equipment and measurement procedures will be agreed upon among GDHC and consulting resource agencies both before the start of the studies, and as necessary after review of initial results.

Sampling Time Periods

DO

DO will be measured at the Gibson Reservoir and Sun River stations approximately on a quarterly basis, with adjustment in frequency agreed upon among GDHC and consulting resource agencies.

TDG

TDG will only be monitored below the spillway during periods of spill. Since these periods vary each year, exact monitoring times cannot be stated. Researchers, however, will know the general spill time period and may coordinate with USBR operators to generally determine when spill will occur each year. Once spill has commenced, the objective will be to measure TDG during low-, medium- and high-flow regimes at the base of the spillway. Depending on the dissolved gas concentrations relative to saturation, TDG concentration will be measured at various points downstream to determine the rate and distance over which concerning conditions exist.

Data Retrieval and Processing

Data for dissolved gasses will be downloaded and/or recorded after each measurement. To the extent that the data recording process may be automated, under approved procedures, GDHC will reduce the potential for data loss and transcription errors.

OTHER WATER QUALITY PARAMETERS

These parameters will be determined during study planning, but generally include parameters do be monitored during and after Project construction to aid in determining water quality standard compliance. These parameters generally include:

- Turbidity
- Total dissolved solids;
- Heavy metals;
- Petroleum distillates;
- Pesticides an PCB's; and
- Total Suspended Sediment.

In most areas, the agency responsible for water quality certification and standards compliance develops a "suite" of parameters which address all relevant constituents and measurement techniques.

Proposed Study Area

Other water quality parameters will be measured in both Gibson Reservoir and the Sun River. Gibson Reservoir data will be taken primarily near the dam face, and will be useful to determine starting conditions, when taken in association with Sun River measurements.

Study Area in the Sun River will generally correspond to the sites at which temperature and dissolved oxygen are sampled, with sampling intensity reduced downstream of the USFS boundary.

Sampling Equipment and Methods

Other water quality parameters will be measured using equipment and process approved among GDHC and consulting resource agencies. Generally, direct monitoring equipment, such as that provided by Hydrolab instrumentation will be used, although certain parameters in the "suite" may require sending samples to an analytical lab. In such cases, the sampling taking and fixing technique, chain of custody and analytic lab selected will all be approved among GDHC and consulting resource agencies.

Sampling Time Periods

Other water quality parameter sampling time periods will generally follow those for dissolved oxygen except when spills, floods, droughts or other man-made or natural or human-related events prompt additional measurements. In such cases, GDHC and consulting resource agencies will agree on changes to the sampling time period protocol.

Data Retrieval and Processing

As with dissolved gasses sampling, data will be retrieved and processed as taken in most cases. Automation will be used to the extent deemed desirable. In the case of analytic lab processing, the lab will be asked to provide complete reporting on methods and results for all parameters tested for.

REPORTING

Reports for the Gibson Reservoir and Sun River water quality monitoring studies will be prepared annually and distributed as drafts to interested parties in the Project mailing list. The annual reports will describe monitoring methods and locations, and present results for all water quality sampling during the applicable report period. The current proposal is for draft reports to be distributed no later than February 28 of each applicable year.

Reports will be in standard technical format, including:

Introduction
Material and Methods (to include sampling locations, dates, equipment and procedures)
Results
Discussion
Conclusions (If and when appropriate).