Bear River Hydroelectric Project
FERC No. 20

Oneida Development
Water Quality Monitoring Plan

Prepared for:

PacifiCorp

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TABLE OF CONTENTS

1.0 INTRODUCTION

The major objective of this Water Quality Monitoring Plan (WQMP) is to develop and implement a quantitative water quality monitoring program which accurately defines the existing water quality conditions below the Oneida Hydroelectric Plant. Secondarily, the implemented plan will help determine the project's contribution to any violations of water quality criteria as set forth in the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02). The following sections will describe the location, frequency, water quality parameters, quality assurance/quality control requirements, and the reporting of the data and conclusions of the study.

2.0 MONITORING LOCATIONS

There will be one sampling location in the Oneida WQMP. The location can be seen in Figure 1 and is described below.

BR01: Located on the Bear River below the Oneida Hydroelectric Project at the county bridge at 3600 South. This site represents the cumulative effects of potential project impacts and land uses from the Oneida Powerhouse to the Utah/Idaho border.

3.0 MONITORING FREQUENCY

The Oneida WQMP will last for an 18-month period starting in May 2004 and ending at the end of October 2005. A continuous monitoring probe (YSI Model 6920) will collect dissolved oxygen, temperature, turbidity and specific conductance at hourly intervals for the entire 18-months.

In addition to the continuous electronic data, water quality "grab" samples will be collected by technicians from Ecosystems Research Institute (ERI) and returned to the ERI laboratory for determining the concentration of selected nutrients and total suspended solids (parameters are described in the following section). From March to September (runoff through summer baseflow/irrigation season), grab samples will be collected every two weeks. The frequency will be reduced to monthly sampling from October to February (winter baseflow). This schedule will be followed in order that water quality samples collected for total suspended solids (TSS) and other parameters will be taken during the range of flows representing the normal hydrograph, which is between 150 cfs and 2000 cfs.

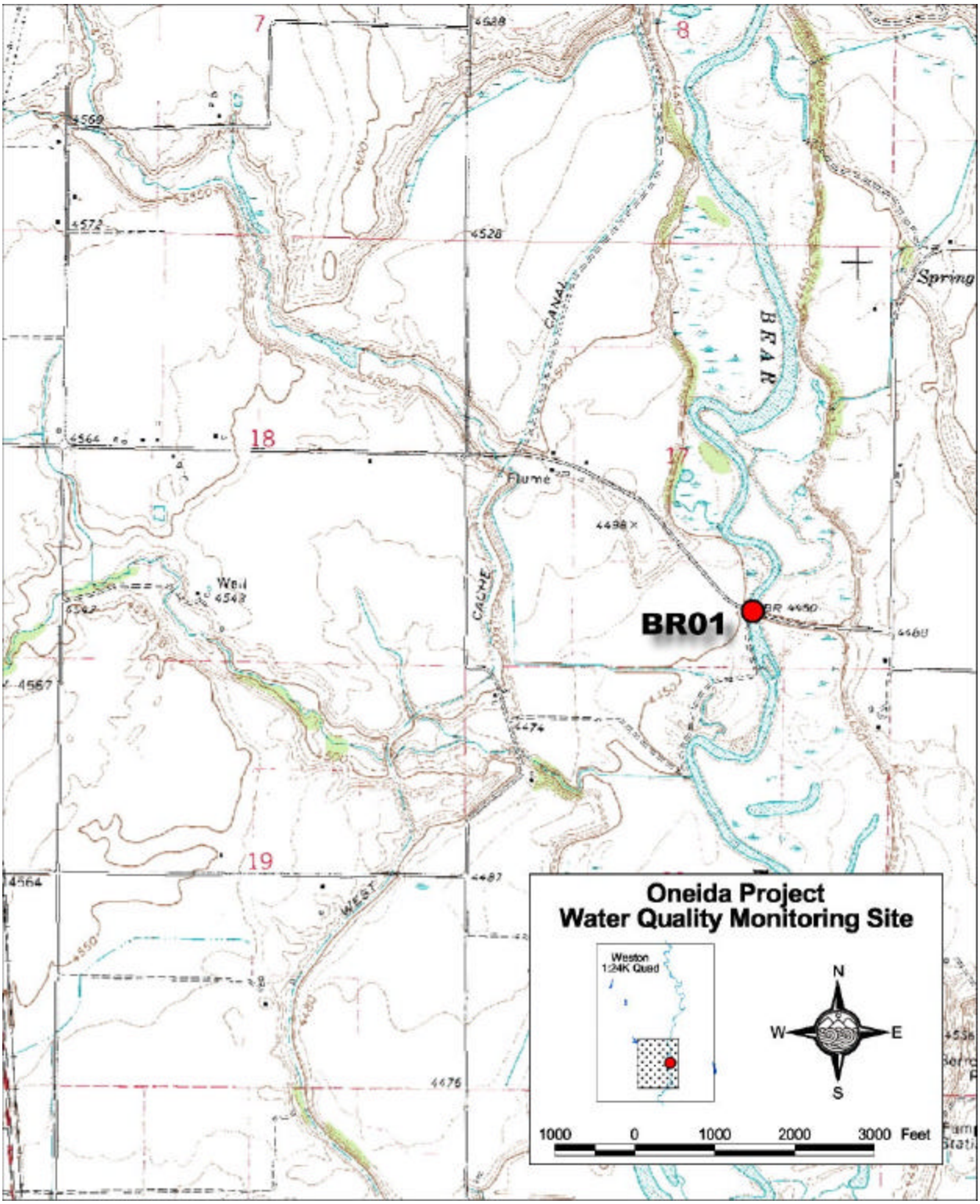

Figure 1. The location of the monitoring site for the Oneida WQMP.

4.0 MONITORING PARAMETERS

As noted above, two separate data sets will be collected as part of the Oneida WQMP. The parameters are defined below.

4.1 Continuously Monitoring Probes

YSI Model 6920 probes will be installed by ERI at each of the four sites and will be set to collect data at an hourly time step. Parameters will include:

1) specific conductance (:mhos/cm);

2) temperature (°C);

3) dissolved oxygen (mg O_2/L);

4) turbidity (NTU); and,

5) stage (ft).

4.2 Instantaneous Sampling

Grab samples will be collected 30 times during the 18-month sampling period. Samples will be analyzed by ERI's EPA and state of Utah certified laboratory and will include:

1) total phosphorus (mg P/L);

2) orthophosphorus (mg P/L);

3) total suspended solids (mg/L); and,

4) turbidity (NTU).

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

Ecosystems Research Institute laboratory is certified by the Utah Division of Epidemiology and Laboratory Services (DELS) for the analysis of ammonia, nitrate, nitrite, all forms of phosphorus, BOD_5, conductivity, total suspended solids, total dissolved solids and turbidity.

This section will be confined to the quality assurance of sampling, sample handling, field techniques, field analyses, and data treatment from the time samples are collected until the samples are submitted to the laboratory and after the results are reported until they are permanently stored. The procedures for calibration, maintenance, and downloading of the YSI Model 6920, used for the continuous monitoring task of this project, will also be included in this section.

The measurement of data should provide adequate precision and accuracy for the program objective, which is to:

1) Characterize water quality conditions in the Bear River from the Oneida powerhouse to the Utah-Idaho border; and,

2) Help determine the project's contribution, if any, to violations of water quality criteria as set forth in the Idaho Water Quality Standards and Wastewater Treatment Requirements, IDAPA 53.01.02 (Water Quality Standards).

All data generated will be reported in units consistent with data generated by other organizations reporting similar analyses to allow comparability of data among organizations. Specific data quality objectives for accuracy precision and completeness for laboratory analyses are discussed in Ecosystems Research Institute Laboratory Quality Assurance Operations Manual and Standard Operating Procedures (ERI 2003). Specific data quality objectives for accuracy and precision of sampling are for measurements to fall within a 95 percent confidence interval around the true value. The confidence interval for each parameter is based on prior knowledge of the measurement system and is generated from the EPA publication "Estimation of Generic Acceptance Limits for Quality Control Purposes for Use in a Water Pollution Laboratory" (May 1991).

5.1 Continuously Monitoring Probes

A YSI Model 6920 monitoring probes will be installed in the Bear River at the Weston Bridge. A backup probe will be available in the case any problems are encountered with the equipment. A custom steel box will be built in order to house, conceal and protect the probe. The probe will be calibrated for each parameter according to the manufacturer's specifications (YSI 2004) before being placed in the field. Data will be downloaded at the end of each continuous 7-day monitoring period using a laptop computer and the software EcoWatch for Windows. Each time the monitoring field crew is at the site, a grab sample will be taken and analyzed for turbidity in ERI's lab. This sample will assist in verifying the probe's readings. The probe will be cleaned and calibrated in the field and a measurement taken in situ to verify drift of turbidity, dissolved oxygen and conductance. This measurement is necessary in order to qualify the data according to the criteria in Table 1. The data quality rating will be recorded and stored in the master database. Rejection of any data will be according to the USGS maximum allowable criteria limits outlined in Table 2To further assist in the calibration of turbidity, turbidity standards will be run each time the probe is downloaded (weekly).

5.2 Instantaneous Sampling

On each monitoring run, the site will be sampled for total and orthophosphorus, total suspended solids, and turbidity. The sample will be integrated both vertically and horizontally. Field temperature, dissolved oxygen, pH, conductivity and turbidity will be measured with an In Situ TROLL 9000 multiparameter water quality instrument.

The site will be monitored 30 times during the 18-month sampling period. The integrated sample will be split immediately into two bottles with acid preservative for the total phosphorus analyses, and one unpreserved bottle for the suspended sediment and orthophosphorus sample. The bottles will be kept cool and dark from the moment of collection until delivery to the laboratory. The sample will be analyzed at ERI's laboratory, which maintains state and EPA certification for all parameters in this study (Table3). The unpreserved sample will be filtered immediately upon return to the laboratory. All analyses will be conducted within the required holding times. Certification for a specific parameter includes a rigorous quality assurance and quality control program. This includes a set of standards for standard curve generation for each

analysis run, and spikes, spike duplicates, check samples and blanks analyzed within each sample run (a minimum of one set of QA/QC samples for every 20 field samples). In addition, a field and trip blank will be collected during each sample trip to identify any contamination occurring during the sampling process, and at least one field duplicate will be collected.

All samples will be kept dark and at 4°C while being transported back to the laboratory.

Sample sheets (sampling records and chain of custody forms) will be filled out in the field, and each bottle will be identified with a unique sample number, location, date and time.

Samplers will adhere to sampling and preservation techniques presented in the Quality Assurance and Standard Operating Procedures Manual for ERI. Samplers will prepare and complete all forms before samples will be delivered to the laboratory.

All QAQC sampling used in verifying and qualifying the continuous monitoring probes will be done with the same instrument used in collecting the week's data unless a malfunction has been detected in the probe

5.3 Data Validation and Usability

Validation and Verification Methods

Field Data: Field data will be assessed continuously. If a pH value less than 6.5 or greater than 9.0 is measured, an immediate calibration of the instrument will be required and the site re-analyzed. If a specific conductance value greater than 10 times or less than 1/10 the standard is measured, an immediate calibration of the instrument with a standard of proper magnitude will be required and the site re-analyzed. Field data for the entire run will be assessed by the quality assurance coordinator and quality assurance officer. All data will be assigned a data quality rating according to the criteria outlined in Table 1. The data quality rating will be recorded and stored in the master database. Rejection of any data will be according to the USGS maximum allowable criteria limits outlined in Table 2. **Routine Laboratory Data:** Laboratory reports are reviewed by the quality assurance officer for accuracy and completeness.

Duplicate Sample Data: After all duplicate sample data are received from the laboratory, the duplicate measurements will be compared to a 95% confidence interval generated around the original site value. The 95% confidence interval is generated from regression equations published in the EPA document "Estimation of Generic Quality Control Limits for Quality Control Purposes in a Water Pollution Laboratory" will be used. If statistics are not available in the document, the document from the EPA entitled "Estimation of Generic Quality Control Limits for Quality Control Purposes in a Drinking Water Laboratory" will be used. If statistics are not available in either document, the DELS QAPP quality assurance goals will be used. In any case, the most current documentation available will be used. The data will be collected and evaluated quarterly and reported to the quality assurance coordinator in writing before the end of the following quarter.

Table 1. Rating continuous water quality records (Source: USGS, 2000. WRIR 00-4252, Table 9).

Measured physical property	Ratings			
	Excellent	Good	Fair	Poor
Water temperature	= ± 0.2 ° C	> ± 0.2 to 0.5 ° C	> ± 0.5 to 0.8 ° C	> ± 0.8 ° C
Specific Conductance	= ± 3 %	> ± 3 to 10 %	> ± 10 to 15 %	> ± 15 %
Dissolved oxygen	= ± 0.3 mg/L	> ± 0.3 to 0.5 mg/L	> ± 0.3 to 1.0 mg/L	> ± 1.0 mg/L
PH	= ± 0.2 unit	> ± 0.2 to 0.5 units	> ± 0.5 to 0.8 units	> ± 0.8 units
Turbidity	= ± 5 %	> ± 5 to 10 %	> ± 10 to 15 %	> ± 15%

Table 2. Rejection criteria for continuous water-quality monitoring sensors.

Constituent	Manufacturer's Specifications[a]	Maximum Allowable Limits (USGS) [b]
Water temperature	> ± 0.15 ° C	> ± 2.0 ° C
Specific Conductance	> ± 0.5 %	> ± 30 %
Dissolved oxygen	> ± 0.2 mg/L or ± 2%, whichever is greater	> ± 2.0 mg/L or ± 20%, whichever is greater
PH	> ± 0.2 units	> ± 2.0 units
Turbidity	> ± 5% or 2 NTU whichever is greater	> ± 30%

Notes:

[a] YSI Incorporated. 6-Series Environmental Monitoring Systems Operations Manual
[b] USGS, 2000. WRIR 00-4252, Table 8.

Table 3. Laboratory procedures and detection limits at ERI's water lab.

Parameter	Method Number	Reporting Limit	Units
Total Suspended Solids	EPA 160.2	1	mg/liter
Turbidity	EPA 180.1	1	NTU
Total Phosphorus, as P	EPA 365.2	0.006	mg/liter
Orthophosphorus, as P	EPA 365.2	0.001	mg/liter

Reconciliation with Data Quality Objectives

Corrective actions will be initiated as a result of the following quality assurance activities:

1. Daily field data assessment found to be beyond control limits.
2. Unacceptable results on performance evaluation audits.
3. Unacceptable performance found in system audits.
4. Previously reported results found to be in error.

It is imperative that early and effective corrective action be taken when control data fall outside acceptable limits. Since the samplers and laboratory are responsible for recording all quality assurance data on forms daily, they will be the first to determine that a method is out of control and will initiate the appropriate immediate corrective measures necessary to bring data within control limits. Corrective actions taken by samplers will include, but not be limited to, recalibration of field instrumentation. Any such corrective action will be documented and completed forms will be maintained by the quality assurance officer. Corrective action taken in the laboratory will include, but not be limited to, sample re-analysis for all necessary parameters. ERI laboratory corrective actions and documentation are detailed in the Quality Assurance Operations Manual and Standard Operating Procedures.

6.0 REPORTING

Summaries of results to date will be included in PacifiCorp's annual report to the FERC in March 2005. In January 2006, a final report will be prepared and submitted to Idaho Department of Environmental Quality. The report will contain a written description and analysis of the data collected during the entire 18-month study, as well as a comparison to relevant water quality standards or criteria. The data analysis will establish a statistical relationship between turbidity (NTU) and TSS (mg/L), as well as a relationship between turbidity (NTU) and phosphorous (mg P/L). An analysis of the effects of daily changes in flow (stage) and any potential correlations with water quality parameters will also be undertaken. The report will contain an electronic copy of all data collected, as well as QA/QC information. A summary of final results will be included in PacifiCorp's annual report to the FERC in March 2006.

7.0 LITERATURE CITED

Ecosystems Research Institute. 2003. Quality Assurance Operations Manual.122 pp.

U.S. Environmental Protection Agency. May 1991. Estimation of Generic Quality Control Limits for Quality Control Purposes in a Water Pollution Laboratory.

YSI Incorporated. YSI 6_Series Environmental Monitoring Systems Operations Manual. In website: http://www.ysi.com/environmental.htm. Downloaded February 13, 2004. 332 pp.

AGENCY CONSULTATION

The following contains Idaho Department of Environmental Quality's comments on PacifiCorp's Water Quality Monitoring Plan for Oneida. Responses by PacifiCorp are indented and **bolded.**

Oneida Plan

Section 2.0 – Change sampling location to 3600 S. county bridge over the Bear. Permission obtained from Franklin County 5 May 2004. Change the map of site location.

> **PacifiCorp response: We agree with this comment and have incorporated it into the final plan.**

Section 3.0 – This section needs to reflect that the wq samples taken for tss and other parameters will be taken during the range of flows representing the normal hydrograph, something on the order of 150 cfs to 2000 cfs.

> **PacifiCorp response: We agree with this comment and have incorporated it into the final plan.**

Section 4.1 – ERI is proposing to install a stage recorder at the site on the bridge. This should be satisfactory to monitor the 3 inch/15 minute ramping requirement.

> **PacifiCorp response: We agree. We have reviewed the rating data (stage) at the USGS station at the Idaho-Utah state line with the stage data at the 3600 county bridge site and have found a good correlation but a 4-hour delay.**

Section 4.2 – we recommend depth/spatially integrated samples. Not to add requirements but we would also recommend testing for total volatile solids (TVS) as well as total suspended solids (TSS) this will help differentiate between inorganic vs organic sediment and may prove invaluable as to source of sediment characterization.

> **PacifiCorp response: We also feel that using a spatially integrated sampler would improve the accuracy of quantifying the TSS passing a set transect in the river. However, the purpose of the "grab" sample is to develop a regression equation between the instantaneous water quality probe data (measured as NTU) and the quantitative concentration of suspended solids (measured as TSS mg/l) at the location of probe measurement. Using this regression, we can calculate the TSS instantaneously in the river over time. By integrating the sample across the river, we would be adding error to the regression analysis. We propose instead to use a Van Doren water sampler and collect the "grab" sample at the exact location (same depth) as the *in situ* probe thus accurately measuring what the probe is sensing.**

We also agree that measuring VTSS may improve the regression analysis by allowing us to "back out" biological turbidity from the data. We will preserve the VSS sample and if the regression equation (TSS vs NTU) is poor we will run the VSS samples.

Section 5.1, 5.2 and 5.3– recommend same data qualifiers as noted in the comments on the Grace/Cove plan.

PacifiCorp response: We agree with this comment and have incorporated it into the final plan.