1.0 DRAFT HYDRAULIC MODELING STUDY PLAN ANNOTATED OUTLINE

1.1 PROJECT NEXUS AND RATIONALE FOR STUDY [§ 5.9(B)(4)-(5)]

The Hydraulic Modeling Study Plan (Study Plan) will be used to evaluate the existing hydraulic conditions of the Cutler Hydroelectric Project (Project) as well as assess the feasibility and potential impacts that may result from the potential change in operations as described in the Pre-Application Document (PAD).

A detailed hydraulic model of the Project has not yet been created. Proposed changes in the operation of the Project will fundamentally change the way in which the system functions hydraulically; potentially affecting inundation boundary, flow patterns, sediment transport capacity, and other hydraulic behaviors of the Cutler Reservoir. Therefore, it is important to create a tool that can be used for discussions with stakeholders regarding the evaluated operating scenarios.

To assess any potential hydraulic impact from changes in operation, a baseline or existing conditions hydraulic model must be established.

1.2 STUDY GOALS AND OBJECTIVES [§ 5.9(B)(1)]

The purpose of the Study Plan is to develop a 1-dimensional (1D) hydraulic model of the Cutler Hydroelectric Project area to be used for hydraulic and sediment transport analysis. This includes portions of the Bear River upstream and downstream of the reservoir. Having a calibrated hydraulic model will provide a tool that can be used to predict impacts to the hydraulics and sediment transport for any plans involving future changes to project operation.

1.3 RELEVANT RESOURCE MANAGEMENT GOALS AND PUBLIC INTEREST CONSIDERATIONS [§ 5.9(B)(2)]

This Study Plan will (1) review and incorporate existing information related to any spatial, terrain, hydrologic and sediment data, and hydraulic modeling that has been previously completed within the Project Area; and (2) propose a hydraulic model to be used to address questions related to the impact of proposed changes in Project operations on water quality and quantity, as well as sediment transport and mobilization. In addition to informing the Fish & Aquatic Study Plan and the Sedimentation Study Plan, the results of this modeling effort will inform discussions regarding potential impacts on water quantity and water delivery in the Project Area and below Cutler Dam in the Bear River.

Reviewed data will be incorporated into the proposed hydraulic model, as appropriate. The following is an initial, but not necessarily complete list of data sources to be analyzed as part of this Study Plan (if available):

- Hydraulic Models of the Cutler Hydroelectric Project Area.
- Most recent LiDAR and bathymetric surveys.
- Bridge and hydraulic infrastructure data.
- U.S. Geological Survey (USGS) gage data.
- Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) data.
- Most recent hydrological data or reports.

1.4 STUDY AREA

The study area for the hydraulic modeling effort will include all facilities within the current Project Boundary, as well as portions of the Bear River downstream of Cutler Dam and upstream of the confluence with the Cutler Reservoir. The length to which the modeled area may be extended, both downstream and upstream of Cutler Dam, will be based on final model output deliverables and initial modeling results. In addition to those areas, this Study Plan will also include detailed evaluation of hydrologic data gathered from surrounding USGS stream gages and their associated drainage basins.

1.5 METHODS [§ 5.9(B)(6)]

To accomplish the goals and objectives of this study, PacifiCorp is proposing a variety of data collection to compile structural, spatial, terrain, and hydrologic data sets for the Project. Specific details on the methodology, timing and execution of the data collection effort will be found in the Elevation Data Acquisition Plan (EDAP) for the proposed 2019 drawdown. Details on the methodology, timing, and execution of the sediment data collection can be found in the Cutler Sedimentation Plan. Once compiled the data sets will be used as inputs into a U.S. Army Corps of Engineers (USACE) HEC-RAS hydraulic model. Once constructed, this model will be calibrated with available hydrologic and sediment data, used to develop an understanding of the existing hydraulic conditions, and then used to estimate the impacts of changes to dam operation to the hydraulic conditions, sediment transport capacity, and water quality as well as answer questions posed by other proposed studies.

1.5.1 DATA COLLECTION

- Collect LiDAR, structure data, bathymetry, aerial imagery, time lapse photos, sediment core samples, USGS stream gage data, and depth to bedrock (where feasible).
- More details in the Sediment Plan.

1.5.2 MODEL CONSTRUCTION

- Using updated LiDAR and bathymetry, construct both one dimensional (1D) and 2D hydraulic models of the Project and necessary surrounding reaches.

1.5.3 MODEL CALIBRATION

- Leverage available USGS gage data along with stage and operations data to calibrate the model.

1.5.4 MODEL IMPLEMENTATION

- Use the calibrated model to develop an improved understanding of the existing hydraulic, sediment transport, and water quality conditions.
- Use the calibrated model to estimate the impacts of potential changes to dam operation on hydraulics, sediment transport capacity, and water quality.
- Use the calibrated model to answer questions posed by other proposed studies, as applicable.

1.6 ANALYSIS AND REPORTING

Hydraulic modeling of the Study Plan report will be prepared documenting the results of the hydraulic, sediment transport, and water quality evaluations. The report will include a summary of all collected information and discussion of the analyses. The report will address the topics below.

Data Collection

- What was collected.
- Why it was collected.
- When it was collected.
- How it was collected.
- How it was used in the modeling effort.

Model Construction

- Model geometry.
  - 1D HEC-RAS model creation and application.
  - 2D HEC-RAS model creation and application.
  - Manning's roughness values (a representation of the conveyance areas resistance to flow. An increased Manning's roughness will decrease velocities across that section.)
  - Digital Terrain data set.
  - Structure data used in the model.

Model Calibration

- What data was used for calibration.
- Calibration results.

Model Implementation

- Existing conditions (operation) results.
- Proposed operation results and impacts to reservoir hydraulics.
- Propose operation impacts to other topics (to be determined).

1.7 SCHEDULE, PERIODIC REPORTING, AND ONGOING CONSULTATION

This schedule is based on obtaining stakeholder agreement on the general goals, objectives, and methods of the study, with the understanding that additional details may be resolved during Study Plan meetings. As well, there are additional decisions and ongoing consultation needs throughout the implementation of the study.

An Initial Study Report (ISR) will be prepared following the initial survey year. This report will be submitted to PacifiCorp for review and filed with the Federal Energy Regulatory Commission (FERC). The Initial Study Report will be consulted upon by stakeholders. If no additional information is warranted, the ISR will identify why no second year of surveys are warranted and that an Updated Study Report (USR) will not be filed. A letter will be filed with FERC in lieu of the USR identifying the lack of need for a second year of studies. If additional information is warranted, an USR would be filed following a survey in year 2. All study reports will be submitted to stakeholders for review and filed with FERC.

1.8 LEVEL OF EFFORT

To be determined.

1.9 REFERENCES

Universities Space Research Association. 2013. Cover page photo of the Bear River Meander Belt from Above. Ronald L. Parker. Accessed June 14, 2019. https://epod.usra.edu/blog/2013/11/bear-river-meander-belt-from-above.html.