Gerle Creek Fish Passage Plan

Sacramento Municipal Utility District

Hydro License Implementation • July 2015

Upper American River Project

FERC Project No. 2101

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1.0 Introduction

This Gerle Creek Fish Passage Plan (Plan) is required by Article 402 set forth in the Federal Energy Regulatory Commission (FERC) Order Issuing New License to Project No. 2101 (License) issued July 23, 2014 (FERC 2014) for the Upper American River Project (UARP or Project), owned and operated by the Sacramento Municipal Utility District (SMUD). Information related to the requirement for this Plan is presented in **Appendix A**.

The UARP is located on the Rubicon River, Silver Creek, and South Fork American River within El Dorado and Sacramento counties, primarily within lands of the Eldorado National Forest. The Project uses water drained from the western slope of the Sierra Nevada Mountains. The UARP consists of three major storage reservoirs—Loon Lake, Union Valley and Ice House (with a combined capacity of approximately 379,000 acre-feet), eight smaller regulating or diversion reservoirs, and eight powerhouses. The UARP has an authorized installed capacity of 637.3 megawatts (MW). The UARP includes recreation facilities containing approximately 700 campsites, five boat ramps, hiking paths, and bicycle trails at the reservoirs.

2.0 Plan Overview

The broad components of the Gerle Creek Fish Passage Plan include:

- A description of the potential fish passage issue,
- Analyses to define the issue and identify conditions that will maintain fish passage,
- A reservoir operation plan,
- Provisions to modify Gerle Creek delta, and
- A schedule for implementing the Plan.

The approach followed to prepare this Plan was consistent with the requirement in License Article 402 to develop the plan in consultation with the U.S. Forest Service (USFS), the California Department of Fish and Wildlife (CDFW), the U.S. Fish and Wildlife Service (USFWS). The Plan considers current conditions and unknown future conditions, so while it represents a best estimate of how (1) analyses will occur, (2) coordination and consultation will be handled, and (3) decisions will be made, the Plan is subject to effects of uncertainty and may require refinement as the Plan is implemented. Revisions to the Plan will follow consultation with the State Water Resources Control Board (SWRCB), USFS, CDFW, and USFWS, and will be implemented following FERC approval.

3.0 Potential Fish Passage Issue

The Final Environmental Impact Statement (FEIS) prepared for the UARP identified Gerle Creek as an important and unique brown trout fishery by sports anglers who recreate in the Crystal Basin (FERC and USFS 2008). This FEIS states that brown trout residing in Gerle Creek Reservoir travel upstream to Gerle Creek to spawn in October and November. To reach the spawning grounds, the brown trout have to travel over the delta formed where Gerle Creek flows into Gerle Creek Reservoir (**Figures 1** and **2**). As shown in these figures, riffles are present at low flows on the delta at the head of Gerle Creek Reservoir.

CDFG (2015) identifies riffles as habitat units in streams with relatively shallow depth and swiftly flowing, turbulent water, which makes riffles particularly sensitive to factors that can change water depth. This analysis states that such changes in depth could limit the connectivity of instream habitats, creating a potential barrier to upstream passage for trout. The depth over the riffles on the Gerle Creek delta can be affected by three factors (1) the water-surface elevation (stage) in Gerle Creek Reservoir, (2) flow over the riffles, and (3) the morphology of the riffle.

Regarding the first factor, the *Fish Passage Barriers Technical Report* (DTA and Stillwater Sciences 2004) noted that although a passage barrier out of Gerle Creek Reservoir had been reported, the reservoir levels maintained under previous License operations prevented exposure of any migration barrier. Gerle Creek Reservoir serves as the re-regulating afterbay for the Loon Lake powerhouse as well as the forebay for the intake of the Gerle Creek canal, which conveys water into Robbs Peak Reservoir. Thus, water levels fluctuate daily as the reservoir provides the re-regulation function for which it was designed. Since the riffles on the delta are within the backwater influence of the reservoir, water-surface elevations of the reservoir can influence depth at the riffles and the extent of passable stream sections.

Regarding flow, the current License requires minimum instream flows in Gerle Creek for July through November under the Critically Dry Water Year type which are less than the minimum flow requirement under the previous License [i.e., 8 cfs as measured at the U.S. Geological Survey (USGS) stream gaging station (USGS Gage No. 11429500) located approximately 0.3 miles downstream of Loon Lake Dam]—thus, the reduced flow could create a depth barrier. The current License requires minimum instream flows that vary by Water Year type, as determined by the Water Year forecast of unimpaired runoff in the American River below Folsom Lake published near the beginning of each month from February through May in the California Department of Water Resources (DWR) Bulletin 120 *Report of Water Conditions in California*. The May forecast is used to establish the final Water Year type for the remaining months of the Water Year and the month of October.

Figure 1. **Upstream View of Delta in Gerle Creek Reservoir, November 1, 2006, Pool Elevation of 5,224.6 feet (NGVD 29), Loon Lake Dam Release of 8.6 cfs.**

Figure 2. **Downstream View of Delta in Gerle Creek Reservoir, November 1, 2012, Pool Elevation of 5,224.8 feet (NGVD 29), Loon Lake Dam Release of 10 cfs.**

Regarding the third factor, the current License requires pulse flows in Gerle Creek below Loon Lake Dam that could mobilize and transport additional sediment to the delta at the head of Gerle Creek Reservoir. Resulting sedimentation could change riffle morphology and associated flow depth over the riffle, potentially creating barriers for upstream passage of brown trout.

4.0 Analyses

SMUD will carry out the analyses described below to more clearly define the potential for depth barriers to impede upstream passage of brown trout from Gerle Creek Reservoir into Gerle Creek during the period from August through October. Once this potential is defined, the analyses will provide the necessary information for SMUD to maintain brown trout passage from August through October by means of either imposing a minimum pool elevation in Gerle Creek Reservoir or modifying the morphology of the Gerle Creek channel through the delta.

4.1 Topographic Survey

Stillwater Sciences surveyed the Gerle Creek delta on November 1, 2006, to develop a topographic surface (**Figure 3**). Stillwater Sciences set local control and used water-surface elevations coupled with SMUD's pool elevation measurements to tie the local elevations to the National Geodetic Vertical Datum of 1929 (NGVD29). This survey is about 9 years old; therefore, SMUD will resurvey the delta during the summer of 2015 to establish current morphology. This survey will provide a baseline of delta morphology, and will be compared to the 2006 survey.

Based on the Water Year forecast of unimpaired runoff in the American River below Folsom Lake (DWR 2015) and current License guidance, 2015 will be a Critically Dry Water Year type, so it is expected that only the minimum instream flows will be in the channel at the time of the summer 2015 survey. These low-flow conditions will facilitate identification of riffles on the delta. Based on the topographic survey and the surveyed riffle morphology, the critical riffle(s) will be identified. SMUD will establish permanent monuments on either side of the critical riffle(s) so that a level and survey rod can be used in the future to re-survey the riffle morphology and determine any geomorphic changes. SMUD will inform the SWRCB, USFS, CDFW, and USFWS of the identified critical riffle(s) and provide an opportunity for a field visit to confirm the critical riffle(s), the survey alignments, and the locations of the monuments.

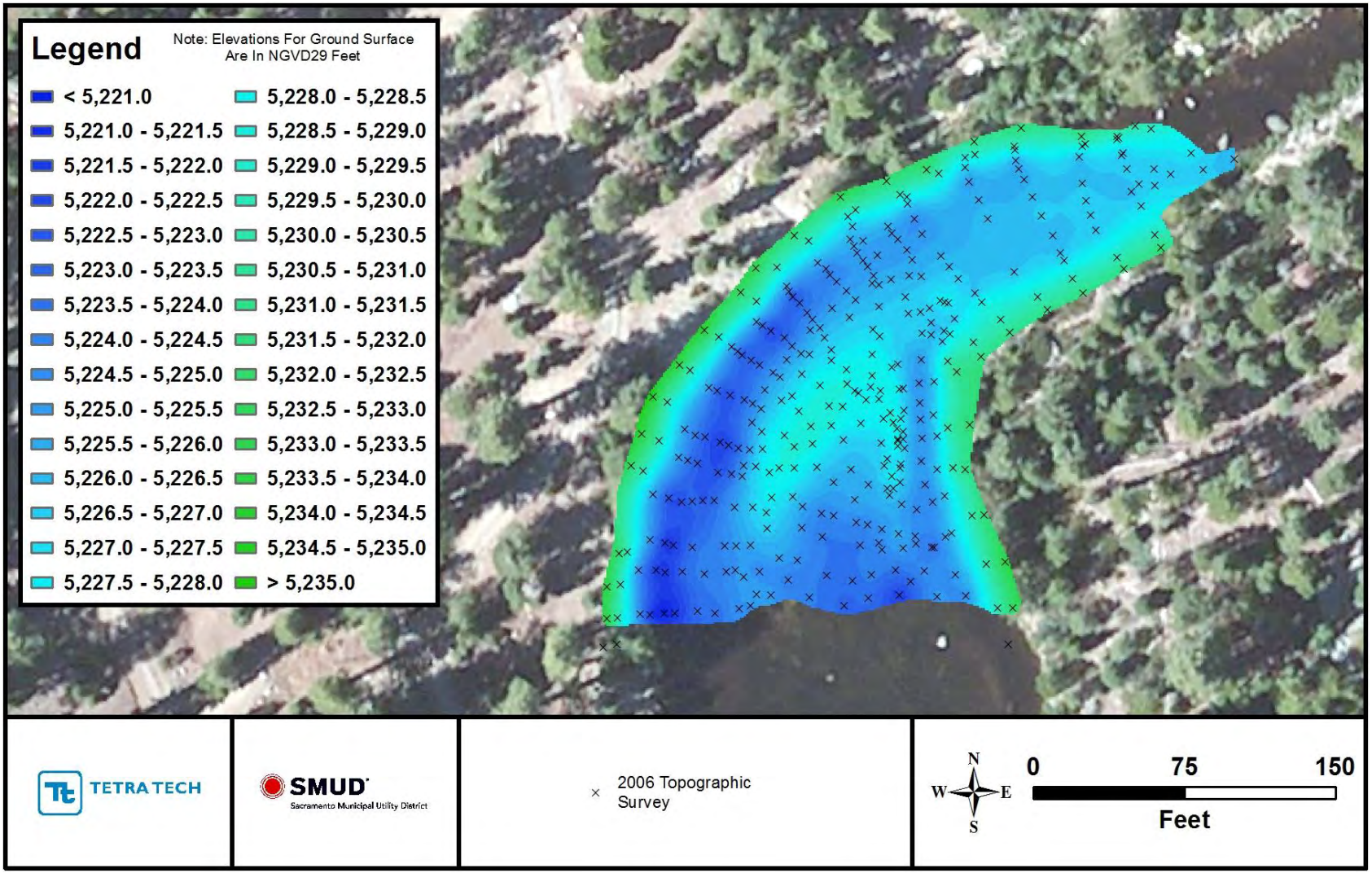

Figure 3. November 1, 2006 Topographic Survey of the Delta at the Head of Gerle Creek Reservoir.

4.2 Critical Riffle Analyses

SMUD will use critical riffle analysis (CRA) to establish current passage conditions. CDFG (2015) presents a standard operating procedure (SOP) for CRA to identify flows that support physical movement of salmon and trout through critical riffles. The CRA SOP defines critical riffles as shallow riffles that are particularly sensitive to changes in stream flow due to diminished water depth. The CRA SOP (CDFG 2015) focuses on field-based measurements of depth along a riffle's shallowest course from bank to bank, with the depth solely a function of flow and riffle morphology. The SOP requires a minimum of three to six measurements over a range of discharges that adequately bracket expected passage flows. The measurements are compared to the following two depth criteria:

1. At least 10 percent of the entire length of the transect must be contiguous for the minimum depth established for the target fish, and
2. A total of at least 25 percent of the entire transect length must be at least the minimum depth established for passage for the target fish.

The flow that provides depth satisfying both criteria is the passage flow for the targeted fish at the critical riffle site. Brown trout is the target fish, so the depth passage criterion of 0.4 feet for adult trout is based on a literature review conducted by R2 Resources (2008) and is intended to provide protective conditions for passage (CDFG 2015).

One limitation of the CRA as applied to the Gerle Creek delta is that it presumes depth at a riffle is solely a function of flow and riffle morphology; at the critical riffle(s) on the Gerle Creek delta, reservoir pool elevation, flow, and riffle morphology can all influence depth. Since the CRA does not consider potential backwater effects (e.g., a downstream reservoir), SMUD will implement the CRA with the following minor modification: within one year of plan approval, SMUD will collect depth measurements at the identified critical riffle(s) over at least three flows that adequately bracket expected passage flows. The reservoir pool elevation during these measurements will be low enough that no backwater influence from the reservoir is visible at the critical riffle site(s) (i.e., a downstream riffle is observed indicating that the riffle and not the pool elevation controls the depth at the critical riffle). SMUD will follow the CRA SOP to identify the passage flow. SMUD will compare the identified passage flow to the minimum instream flows required in the current License for the months of August through October. If the passage flow is less than the required minimum instream flows, SMUD will not need to impose a minimum reservoir pool elevation from August through October to maintain upstream passage of brown trout.

However, if the passage flow exceeds the minimum instream flow requirements, within one year of plan approval, SMUD will collect depth measurements at the identified critical riffle(s) for the minimum instream flow over a range of reservoir pool elevations. The CRA SOP will be followed to identify the passage pool elevation instead of the passage flow by modifying the approach to identify the minimum pool elevation that meets the two depth criteria. The passage pool elevation will be the minimum water-surface elevation SMUD will need to impose (if channel modification is not pursued to

satisfy the minimum depth criteria) in Gerle Creek Reservoir from August through October in Water Year types when the required minimum instream flows are less than the identified passage flow.

Another limitation of the CRA is that the identified passage flow and passage pool elevation are valid for the morphology of the critical riffle(s) as it existed during the measurements. If the morphology of the critical riffle(s) changes appreciably in the future (caused by sedimentation or channel degradation), the depths at the critical riffle(s) may change. Depending on the magnitude of change, a modified passage flow and passage pool elevation could be needed to maintain brown trout passage from August through October. SMUD may not be able to complete future CRAs to determine how to modify these conditions because of the required minimum instream flows, so an alternative approach is needed to evaluate the influence of morphologic change at the critical riffle(s).

4.3 Hydraulic Analyses

SMUD will carry out hydraulic analyses to establish how the passage flow and passage pool elevation should change in the event of appreciable morphologic change at the critical riffle(s). The hydraulic analyses will include (1) development of a numerical hydraulic model (e.g., HEC-RAS) using the results of the 2015 topographic survey, and (2) calibration of the model using the measurements collected during the CRA (e.g., instream flow as measured at the USGS gaging station below Loon Lake Dam, reservoir pool elevation as monitored by SMUD, and water-surface elevation profiles surveyed during the CRA). The calibration of the model to the current conditions will confirm it can be used to provide the same passage flow and passage pool elevation calculated by following CDFG's (2015) CRA SOP.

The calibrated hydraulic model will be used to evaluate how changes in delta morphology (i.e., average topset aggradation of 0.5, 1.0, 1.5 and 2.0 feet, and average topset degradation of 0.5 and 1.0 feet) affect the passage flow and passage pool elevation. The inflows and reservoir pool elevations will be maintained from the current CRA measurements, but potential changes in delta morphology will be simulated by changing the elevations of the geometric inputs to the model.

4.4 Develop Nomograph

The results of the topographic survey, CRA, and the hydraulic modeling will be compiled to generate a nomograph that shows how the passage flow and passage pool elevation would need to change to maintain the minimum 0.4-foot passage depth (CDFG 2015) for different amounts of geomorphic variation. The nomograph is envisioned to be a plot of reservoir pool elevation against discharge. A family of curves will be plotted with each curve representing an amount of geomorphic change (with zero change representing current conditions). The nomograph will show the passage pool elevations corresponding to a range of flows for incremental amounts of geomorphic change; used in reverse, the nomograph will show the passage flow corresponding to a range of pool elevations for incremental amounts of geomorphic change. The nomograph will provide discrete relationships, but interpolation between these relationships will provide a continuous range of solutions across the domain of expected conditions.

The key advantage of the nomograph is that it provides in advance the information needed to determine whether geomorphic change at critical riffle sites requires modified passage pool elevations or modifications to the channel geometry to maintain brown trout passage from August through October. This is needed because the minimum instream flows from August through October required by the current License are not known for certain until early May when DWR publishes its Water Year forecast of unimpaired runoff in the American River below Folsom Lake. That means the time available to determine whether a modification to the passage pool elevation or a modification to the riffle morphology is needed is limited to mid-May through the end of July. If a new CRA were to be implemented in this period, and SMUD needs the results prior to determining whether the operational change to maintain a modified passage pool elevation is feasible, it is likely that insufficient time would be available to consult with the agencies on a channel modification plan, secure necessary permits, and construct the channel modifications.

5.0 Reservoir Operation Plan

Article 402 of the License, WQC Condition 5.D, and USFS 4(e) Condition 34 require SMUD to maintain the Gerle Creek Reservoir at an elevation sufficient to provide fish passage from August through October. The results of the analyses described within this Plan will be used to establish [using criteria in CDFG (2015)]:

1. The potential for depth barriers at critical riffle(s) under current conditions to impede upstream fish passage.
2. The passage flow and passage pool elevations needed under current conditions to maintain upstream fish passage.
3. The passage flow and passage pool elevations needed to maintain upstream fish passage under future geomorphic conditions that differ appreciably from current conditions.

If the analyses determine passage pool elevations are required because instream minimum flows are less than the passage flow, SMUD will consider (1) whether their operations can accommodate the resulting passage pool elevations from August through October, or (2) whether a modification of channel morphology is needed.

When the passage flow is compared to the required minimum instream flows, it will be apparent which Water Year types could produce depth barriers to upstream passage of brown trout. If the May DWR Water Year forecast of unimpaired runoff in the American River below Folsom Lake corresponds to one of these Water Year types, SMUD will survey the monumented critical riffle(s), after the forecast is available and field conditions permit safe access. The survey will be compared to the baseline survey (or in future years to the previous survey) to assess the magnitude of average geomorphic change so that the nomograph can be used to determine whether modifications to reservoir operations are needed. If such modifications are needed, the nomograph will provide the basis for the magnitude of the modification.

Spawning migration of adfluvial salmonids (i.e., salmonids that live in lakes and migrate into rivers or streams to spawn, such as the brown trout in Gerle Creek Reservoir) has not been as extensively studied as for anadromous salmonids, and only a few studies have focused on adfluvial brown trout (Saraniemi et al. 2008). Rustadbakken et al. (2004) noted that salmonids with spawning runs over several months should be less correlated with daily fluctuations in environmental factors than species that undertake their spawning run over a few weeks. Arnekleiv and Kraabøl (1996) monitored upstream migration of adfluvial brown trout and observed stops for preferred flow conditions lasting from a few hours to 10 days. Thus, SMUD will strive to maintain passage pool elevations in Gerle Creek Reservoir to provide brown trout passage into Gerle Creek from August through October, but to account for natural variability in environmental factors and to allow for operational and maintenance flexibility, episodic excursions below the minimum elevations are to be expected. Given the observations cited above, SMUD anticipates that its reservoir operations will not impact overall spawning success due to these ephemeral impediments to upstream passage.

6.0 Provisions to Modify Gerle Creek Delta

Article 402 of the License requires that this Plan, to the extent needed, includes provisions to modify the stream channel within the Gerle Creek delta to maintain passage for brown trout. If adjustments to the reservoir pool elevations cannot logistically be used to achieve minimum depth criteria for upstream passage of brown trout from August through October, the channel geometry could be mechanically modified to mitigate depth barriers.

Such modification will occur at the location of the current critical riffle(s), or at other locations on the delta where new deposition appreciably alters the delta morphology and affects depth in a way that impedes upstream passage of brown trout from August through October. If the stream channel within the Gerle Creek Delta requires modification, SMUD will coordinate and consult with the SWRCB, USFS, CDFW, and USFWS. Any proposed changes to the channel shall be approved by the SWRCB, USFS, CDFW, and USFWS.

After this consultation and the appropriate approvals described above, SMUD will mechanically modify the morphology of the channel to allow fish passage at the potential barrier location. Mechanical intervention may include changing the channel geometry through excavation or simply adding, moving, or removing boulders that create hydraulic diversity in the channel. The numerical hydraulic model may be used to guide the design of the desired channel geometry to ensure flow depths provide sufficient conditions for passage.

7.0 Schedule

The current License was issued July 23, 2014; therefore the schedule (**Table 1**) follows from this date and accounts for timelines provided in the License.

Table 1. Schedule	
2015	
June 10	Release draft of Plan for Consultation Group review
July 10	Receive Consultation Group comments on Plan
July 10 - 22	Address Consultation Group comments and finalize Plan
July 23	File final Plan with FERC
August – September[1]	Carry out topographic survey of Gerle Creek delta
	Identify and monument critical riffle(s)
	Initiate critical riffle analyses (CDFG 2015)
Fall 2015 – Spring 2016[1]	Continue critical riffle analyses at greater flows, conditions permitting
2016	
January[1]	Develop and calibrate numerical hydraulic model
February[1]	Develop nomograph
March[1]	Consult with SWRCB, USFS, CDFW, and USFWS on current passage flow and passage pool elevation
May[1]	Review DWR *Bulletin 120* to determine Water Year type
May - July[1]	Implement reservoir operation plan, consult with SWRCB, USFS, CDFW, and USFWS if modifications needed
2017 – 2064	
May[1]	Review DWR *Bulletin 120* to determine Water Year type
May - July[1]	Implement reservoir operation plan, consult with SWRCB, USFS, CDFW, and USFWS if modifications needed

Note:
[1] Pending FERC approval of this Plan

Literature Cited

Arnekleiv, J.V, and M. Kraabøl. 1996. *Migratory behavior of adult fast-growing brown trout (*Salmo trutta, L.*) in relation to water flow in a regulated Norwegian river.* Regulated Rivers: Research & Management, v. 12, pp. 39-49.

CDFG. 2015. *Critical Riffle Analysis for Fish Passage in California.* California Department of Fish and Game (CDFG), Water Branch, Instream Flow Program, Standard Operating Procedure DFG-IFP-001. Published October 2012, updated February 2015. Sacramento, California. 24 p. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=93986

DTA and Stillwater Sciences. 2004. *Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC Project No. 2155) Fish Passage Barriers Technical Report*. Prepared by Devine Tarbell & Associates, Inc. (DTA) and Stillwater Sciences. Prepared for Sacramento Utility District and Pacific Gas and Electric Company. August. 120 p.

DWR. 2015. *Water Conditions in California.* State of California, The Resources Agency, Department of Water Resources, California Cooperative Snow Surveys, Bulletin 120, May. 16 p.

FERC. 2014. *Order Issuing New License (Issued July 23, 2014).* Issued to Sacramento Municipal Utility District Project No. 2101-084. 242 p. http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=13600126

FERC and USFS. 2007. Draft Environmental Impact Statement for Hydropower License, Upper American River Hydroelectric Project FERC Project No. 2101-084, California, and Chili Bar Hydroelectric Project FERC Project No. 2155-024, California. FERC/FEIS 0216D. Prepared by Federal Energy Regulatory Commission (FERC), Office of Energy Projects, and U.S. Forest Service (USFS). September. 676 p. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=11612294

FERC and USFS. 2008. Final Environmental Impact Statement for Hydropower License, Upper American River Hydroelectric Project FERC Project No. 2101-084, California, and Chili Bar Hydroelectric Project FERC Project No. 2155-024, California. FERC/FEIS 0216F. Prepared by Federal Energy Regulatory Commission (FERC), Office of Energy Projects, and U.S. Forest Service (USFS). March. 676 p. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=11612294

R2 Resource Consultants, Inc. 2008. *Appendix G Approach for Assessing Effects of Policy Element Alternatives on Upstream Passage and Spawning Habitat Availability* to North Coast Instream Flow Policy: Scientific Basis and Development of Alternatives Protecting Anadromous Salmonids, Task 3 Report Administrative Working Draft. Prepared for the California State Water Resources Control Board

Division of Water Rights. Prepared by R2 Resource Consultants, Inc. August 6, 2007 updated March 14, 2008. 28 p.

Rustadbakken, A., L'Abee-Lund, J.H., Arnekleiv, J.V., and M. Kraabøl. 2004. *Reproductive migration of brown trout in a small Norwegian river studied by telemetry.* Journal of Fish Biology, v. 64, pp. 2-15.

Saraniemi, M., Huusko, A., and H. Tahkola. 2008. *Spawning migration and habitat use of adfluvial brown trout,* Salmo trutta*, in a strongly seasonal boreal river.* Boreal Environment Research, v. 13, pp. 121-131.

SMUD. 2007. *Comments of the Sacramento Municipal Utility District on the Draft Environmental Impact Statement, Project No. 2101-084 Upper American River Project.* Filed with FERC November 13. 37 p. http://elibrary.ferc.gov/idmws/common/OpenNat.asp?fileID=11503693

SMUD et al. 2007. *Relicensing Settlement Agreement for the Upper American River Project, FERC Project No. 2101 and Chili Bar Hydroelectric Project, FERC Project No. 2155.* Prepared by Sacramento Municipal Utility District and Settlement Parties. January. 265 p.

APPENDIX A – Background

During the FERC relicensing of the UARP, SMUD and the Settlement Parties agreed on proposed license Article 1-8, Fish Passage at Gerle Creek (SMUD et al. 2007), which states, "*The reservoir level at Gerle Creek Reservoir shall be maintained at an elevation that provides fish passage into Gerle Creek from August through October*."

As part of the relicensing process, FERC and the U.S. Forest Service (USFS) agreed to participate as cooperating agencies in the preparation of the Environmental Impact Statement (EIS). A draft EIS was released in September 2007 (FERC and USFS 2007) to solicit comments for consideration in preparation of the final EIS. As part of the FERC and USFS analyses of the proposed minimum streamflow schedule for Gerle Creek below Loon Lake Dam, the agencies noted the following (FERC and USFS 2007):

> *Currently, Gerle [Creek] Reservoir levels below 5,228 feet have been found to block passage of brown trout upstream to spawning grounds in Gerle Creek. Gerle Creek has been identified as in important and unique brown trout fishery by sports anglers that recreate in the Crystal Basin. By ensuring that fall reservoir elevation levels stay above 5,228 feet between August and October, the brown trout using the reservoir would be able to access Gerle Creek for their spawning run.*

On November 13, 2007, SMUD filed comments with FERC (SMUD 2007) regarding the text above copied from the draft EIS. Specifically, SMUD noted that FERC and USFS changed the text proposed in the *Settlement Agreement*, Proposed License Article 1-8, Fish Passage at Gerle Creek to specifically require the reservoir level be maintained at an elevation at or above 5,228 feet from August through October. SMUD stated that this change (1) was contrary to the intent of the Settlement Parties, (2) was not supported in the draft EIS by data or information, and (3) would create significant maintenance and operational constraints. SMUD recommended FERC and the USFS exclude this change in the final EIS, and allow SMUD and the Settlement Parties to examine this issue further before establishing a minimum water-surface elevation requirement for fish passage as provided in the Settlement Agreement.

In the final EIS, as part of the FERC and USFS analyses of the proposed minimum streamflow schedule for Gerle Creek below Loon Lake Dam, the agencies revised the draft EIS text as follows (FERC and USFS 2008):

> *Gerle Creek has been identified as an important and unique brown trout fishery by sports anglers who recreate in the Crystal Basin. Brown trout residing in Gerle [Creek] Reservoir travel upstream to Gerle Creek for their October and November spawning. The confluence of Gerle Creek with Gerle [Creek] Reservoir is marked by an alluvium delta deposit in the stream channel, which varies in location and depth due to the ongoing geomorphic processes. Recent information (letter from SMUD to FERC dated November 13, 2007) indicates that this alluvium deposit, consisting of mostly boulders and cobbles, is located mostly on the left side of the*

channel and currently does not have the potential to pose a migration barrier for brown trout. However, SMUD also indicates in its letter than cobble and boulders deposited at the head of the delta extends well upstream of the reservoir to an elevation of 5,231 feet. SMUD notes that this sediment deposit is caused by sediment falling out of the water as the stream slows due to the backup of water at Gerle Creek Reservoir.

In streams such as Gerle Creek that are capable of carrying large sediments, these deposits can progressively work their way upstream as the sediments that are deposited at the head of the delta act to extend the backwater effect of the reservoir farther and farther upstream. Passage conditions in these areas can be altered substantially by flood events, which may alter the shape of the channel through the deposit or increase the size of the deposit by contributing large volumes of new material from upstream. Changes in the size and shape of the delta that could cause possible passage barriers are hard to predict and would vary in the future depending on sediment load, flood events, reservoirs levels, and other factors and may require measures such as channel modifications by SMUD to ensure continued upstream passage of brown trout into Gerle Creek.

License Article 402 *Fish Passage in Gerle Creek* states:

> Within 1 year of license issuance, the licensee shall file with the *Commission for approval, a Gerle Creek fish passage plan. In addition to the requirements in the Water Quality Certification Condition 5 (Appendix A) and U.S. Forest Service (Forest Service) 4(e) Condition 49*[1] *(Appendix B) for maintaining Gerle Creek reservoir at a level sufficient to provide fish passage from August to October, the plan shall, to the extent needed, include provisions to modify the stream channel within the Gerle Creek Delta to maintain passage for brown trout.*
>
> *The licensee shall develop the plan after consultation with the Forest Service, the California Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service.*
>
> *With the final plan, the licensee shall include documentation of consultation, copies of agency comments and recommendations, and a description of how the agency comments are accommodated by the plan. Before filing the plan with the Commission, the licensee shall provide copies of the plan to the agencies, and allow a minimum of 30 days for the agencies to comment and make recommendations. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.*

[1] Condition 34 specifically addresses fish passage at Gerle Creek; Condition 49 does not, but it more generally describes reservoir levels in Gerle Creek Reservoir.

> *The Commission reserves the right to require changes to the plan. The plan shall not be implemented until the licensee is notified that the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.*

Water Quality Certification (WQC) Condition 5.D *Reservoir Levels in Gerle Reservoir* in Appendix A of the License states:

> *The Licensee shall make every reasonable effort to maintain the water surface in Gerle Reservoir at as high an elevation as practicable, and with a minimum of fluctuation, from May 1 to September 10 of each year in order to provide maximum recreational benefits, including accessibility and the ability to fish from the fishing pier. If the Licensee anticipates the reservoir will be drawn down below 5,225 feet during this time period, the Licensee shall consult with USFS, State Water Board, USFWS, and CDFW following the direction in Condition 5.H (Interim Modifications).*
>
> *In addition, the reservoir level at Gerle Creek Reservoir shall be maintained at an elevation that provides fish passage into Gerle Creek from August through October.*

USFS 4(e) Condition 34 *Fish Passage at Gerle Creek* in Appendix B of the License states:

> *The reservoir level at Gerle Creek Reservoir shall be maintained at an elevation that provides fish passage into Gerle Creek from August through October.*

License Article 402 specifically requires the development of this *Gerle Creek Fish Passage Plan*; WQC Condition 5.D and USFS 4(e) Conditions 34 and 49 do not require development of this Plan, but Article 402 requires SMUD to develop the Plan after consultation with the USFS, CDFW, and USFWS. The analyses described in this Plan and the accompanying provisions directly address the requirements of License Article 402.

152 FERC ¶ 62,089
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Sacramento Municipal Utility District Project No. 2101-114

ORDER MODIFYING AND APPROVING GERLE CREEK FISH PASSAGE PLAN PURSUANT TO ARTICLE 402

(Issued August 5, 2015)

1. On July 23, 2015, Sacramento Municipal Utility District (licensee) filed its Gerle Creek Fish Passage Plan with the Federal Energy Regulatory Commission (Commission) pursuant to Article 402 of the Upper American River Project license.[1] The project is located on the Rubicon River, Silver Creek, and South Fork American River in El Dorado and Sacramento counties, California and occupies lands within the Eldorado National Forest.

REQUIREMENTS

2. Article 402 requires the licensee to file, for Commission approval, a Gerle Creek Fish Passage Plan (Plan) within one year of license issuance. Article 402 requires the Plan to include provisions to modify the stream channel within the Gerle Creek Delta to maintain upstream passage for brown trout. The Plan is related to the requirements specified in the project's Water Quality Certification (WQC), Condition No. 5 and the U.S. Forest Service (FS) 4(e) Condition No. 34, which require the licensee to maintain Gerle Creek Reservoir at a level sufficient provide fish passage from August through October of each year.[2] The licensee must develop the Plan in consultation with the FS, U.S. Fish and Wildlife Service (FWS), and the California Department of Fish and Wildlife (DFW).

LICENSEE'S PLAN

3. The licensee's Plan describes three factors that can affect the availability of upstream fish passage of brown trout in the Gerle Creek Delta (Delta), located between

[1] Order Issuing New License. 148 FERC ¶ 62,070 (issued July 23, 2014).

[2] The water quality certification and U.S. Forest Service 4(e) Conditions were incorporated into the project license via Appendices A and B, respectively.

Gerle Creek and Gerle Creek Reservoir. These three factors will be the targets of monitoring efforts to determine whether stream channel modifications in the Delta are needed to provide fish passage.

4. The first factor affecting fish passage is the backwater influence of Gerle Creek Reservoir on riffle habitat in the Delta. Gerle Creek Reservoir serves as the re-regulating afterbay for the Loon Lake Powerhouse as well as the forebay for the Gerle Creek Canal, which conveys water to Robbs Peak Reservoir, and thus, Gerle Creek Reservoir water surface elevations fluctuate daily. This impacts the depth of water in the riffle habitat in the Delta. The second factor affecting fish passage in the Delta is the minimum instream flow requirement for Gerle Creek for July through November during a Critically Dry Water Year type, as determined by the state of California. Under the minimum flow requirement for this water year type, flows through the Delta may be so low that they create a migration barrier. The final factor affecting fish passage in the Delta is the pulse flow that is required in Gerle Creek below Loon Lake Dam. Pulse flows have the potential to mobilize and transport sediment downstream and eventually result in sedimentation in the Delta.[3] This sedimentation could change the geomorphology of the Delta and the flow depth in the riffles, thus resulting in a migration barrier.

5. To clearly define the potential for depth barriers that impede upstream fish passage through the Delta from August through October when migration is occurring, the licensee proposes to conduct three analyses. One such analysis includes conducting a topographic survey to establish baseline data on the Delta's geomorphology. The survey would be conducted during 2015, which is defined as during a Critically Dry Water Year type. Because the minimum instream flow for this water year type is the lowest of all water year types, the timing of the survey would allow the licensee to identify critical riffles for fish passage[4] under a worst-case scenario. After identifying critical riffles, the licensee would conduct a critical riffle analysis (CRA) under three flow regimes. The CRA will establish current passage conditions that are independent of backwater influence from Gerle Creek Reservoir in the Delta and ultimately identify passage flow and passage depth. The licensee would conduct the CRA using DFW's standard operating procedure with one minor modification, which is explained in more detail in the Plan. Upon determining passage flow, the licensee would compare it to the minimum instream flow requirement from August to October period to determine whether a change in the Gerle Creek Reservoir surface elevation is necessary to maintain passage.

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[3] The pulse flow is required by WQC Condition No. 2 and FS 4(e) Condition No. 28.

[4] Critical riffles are defined by the DFW as shallow riffles that are particularly sensitive to changes in streamflow due to diminished water depth.

6. Because the geomorphology of the critical riffles could change as a result of upstream pulse flows, the licensee has proposed a third analysis, a hydraulic analysis, to evaluate the influence of geomorphic change on passage flow and depth at the critical riffles. The hydraulic analysis would include the development of a numerical hydraulic model using the results of the 2015 survey and a calibration of the model using measurements collected during the CRA. The calibrated hydraulic model would be used by the licensee to evaluate how changes in the Delta morphology affect passage flow and passage pool elevation.

7. The licensee would use the results of the topographic survey, CRA and hydraulic analyses to create a nomograph that shows how passage flow and passage pool elevation would need to change in the Delta in order to maintain the DFW's 0.4-foot passage depth under varying degrees of geomorphic change. The nomograph would plot reservoir elevation against discharge and include rating curves representing an amount of geomorphic change. In this way, the nomograph would show passage pool elevations corresponding to a range of flows for incremental amounts of geomorphic change, thus allowing the licensee to determine whether geomorphic change at critical riffles should be accomplished by modifying the pool passage elevations via the reservoir or by changing the channel geometry in the Delta, with priority given to reservoir elevation modification.

8. After conducting the analyses, if the analyses indicate that passage pool elevations are necessary, and if adjustments to the Gerle Creek Reservoir surface water elevations cannot achieve the minimum depth criteria for upstream passage from August through October, the licensee would then consider modifying the channel geometry in the Delta to mitigate depth-related migration barriers. The licensee states that if this were to occur, the modification(s) would take place at the critical riffles or at other locations in the Delta where new deposition appreciably alters the channel morphology and affects channel depth. The licensee would rely on the hydraulic model to guide the modification(s) and final channel design. Prior to completing any modification(s), the licensee would consult with and receive approval from the FS, FWS, DFW and California State Water Resources Control Board (SWRCB).

9. After the initial analyses are conducted and any necessary reservoir or channel modifications are completed, the licensee would transition to the annual operation component of its Plan. That is, every year, the licensee would examine the water year forecast to determine whether the water year type could result in a depth barrier to passage flows. If the water year type forecast indicates that the potential for a depth barrier exists based on the result of initial analyses described above, the licensee would survey the critical riffles and use the nomograph to determine whether modifications to Gerle Creek Reservoir operations are needed (i.e., changes in reservoir elevation between August and October) that year. If modifications are needed, the nomograph would dictate the extent and nature of the modification. If passage cannot be maintained by

raising the water surface elevation of Gerle Creek Reservoir, and channel modifications were deemed necessary to provide fish passage, the licensee would follow the same procedure for obtaining agency approval described above prior to making any modifications.

10. The licensee's Plan includes an implementation schedule for conducting the analyses and consulting with the resource agencies regarding the results. The licensee commits to completing the analyses within one year of receiving Commission approval of the Plan; however, according to the licensee's schedule, it would strive to complete the analyses in less time. Specifically, the licensee will strive to complete the topographic survey and CRA at varying flows in the fall of 2015, and develop and calibrate the numerical hydraulic model and develop the nomograph in early 2016. Following the analyses, the licensee would develop a findings report, which it would provide to the SWRCB, DFW, FS and FWS in March 2016, provided that the analyses had been completed in the timeframe described above. The licensee notes that if the analyses are delayed and it needs to use the full year to complete the work that it would meet with the resource agencies to discuss its findings shortly after the one-year mark.

AGENCY CONSULTATION

11. The licensee provided its Plan to the aforementioned agencies for review and comment on June 10, 2015. The FS and DFW provided comments, which the licensee incorporated into its Plan. The FWS did not comment on the Plan.

DISCUSSION AND CONCLUSIONS

12. The analyses described in the licensee's Plan should yield valuable information that will allow the licensee to determine whether modifications to the water surface elevation of Gerle Creek Reservoir and/or channel alterations in the Delta are necessary in order to provide upstream fish passage for brown trout between August and October in the Delta for the duration of the license.

13. As proposed, the Plan includes a provision to provide the agencies with a findings report following the completion of the analyses. As proposed, it is unclear if and when the licensee would file the report with the Commission. In order to keep the Commission apprised of activities taking place under the Plan, the licensee should be required to file the report with the Commission after it has provided the resource agencies sufficient time to review and comment on the report. Taking into account the licensee's proposed schedule, a reporting deadline of October 15, 2016 is appropriate. When filing the report with the Commission, the licensee should also include documentation of consultation with the resource agencies, and its response to agency comments. The Commission should reserve the right to require changes to the Plan based on the report.

14. Sacramento Municipal Utility District's proposed Gerle Creek Fish Passage Plan fulfills the requirements of Article 402, and as modified, should be approved.

The Director orders:

(A) Sacramento Municipal Utility District's (licensee) Gerle Creek Fish Passage Plan (Plan), filed on July 23, 2015, pursuant in part to Article 402 of the Upper American River Project (FERC No. 2101), as modified in paragraph (B), is approved.

(B) The licensee's findings report must be filed with the Commission by October 15, 2016. The report must include documentation of consultation with the Forest Service, U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife, and the licensee's response to any agency comments. The Commission reserves the right to require changes to the Plan based on the report.

(C) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 825*l* (2012), and the Commission's regulations at 18 C.F.R. § 385.713 (2014). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

(for) Thomas J. LoVullo
Chief, Aquatic Resources Branch
Division of Hydropower Administration
and Compliance

Document Content(s)