ROUND VALLEY INDIAN TRIBES
A Sovereign Nation of Confederated Tribes

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LOCATION: ON STATE HWY 162
ONE MILE NORTH OF COVELO
IN ROUND VALLEY
TRIBAL TERRITORY SINCE TIME BEGAN

ROUND VALLEY INDIAN RESERVATION ESTABLISHED 1856

September 10, 2026

Electronically Filed

Debbie-Anne A. Reese
Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, D.C. 20426

Re: FERC Project No. 77-332: Scoping Document 1

Dear Secretary Reese:

Pursuant to the Notice issued on July 2024, 2026, extending the scoping comment period, the Round Valley Indian Tribes (Tribes) submit the attached technical memorandum to assist the Federal Energy Regulatory Commission (Commission) in conducting an accurate and thorough analysis of the effects associated with the surrender and decommissioning of the Potter Valley Hydroelectric Project. The Tribes are grateful to the Commission's staff for preparing the scope of the environmental reviews to be conducted in this surrender and decommissioning proceeding. The Tribes have reviewed Scoping Document 1 (SD 1) from the perspective that a critical part of the human environment under the National Environmental Policy Act that must be assessed is the Eel River that runs through the heart of the Tribes' ancestral and reservation lands, and on which the Tribes have depended for millennia for their culture, subsistence and religion. On behalf of the Tribes, I as Tribal Council President, provided oral comments and suggestions on particular sections of SD 1 at the June 24, 2026 Scoping Meeting in Ukiah, CA.

To supplement that testimony, attached is a technical memorandum prepared by the Tribes' consultant, Applied River Sciences, that analyzes the unimpaired flows above Lake Pillsbury at measured continuous streamflow gages operated by the Tribes since 2020 (in collaboration with PG&E). The memorandum is responsive specifically to FERC's request for existing information and data that would help describe "the past and present actions and effects of the project and other developmental activities on environmental and socioeconomic resources" (SD 1 at pg. 21). It is also information that will "help characterize existing environmental conditions and habitats," as well as the effects of dam removal on Eel River hydrology. SD 1 at pgs. 22, 15).

Thank you for considering this information. We look forward to working with the Commission and its staff in assuring that the effects of the decommissioning and removal of the Project on the human environment are fully and thoroughly evaluated.

Sincerely yours,

Parker

Joseph Parker
President

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UNIMPAIRED LOW-FLOW ANALYSIS OF THE UPPER EEL RIVER ABOVE LAKE PILLSBURY

Prepared for: *Round Valley Indian Tribes*
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September 10, 2026

1 INTRODUCTION

The Upper Eel River watershed above Lake Pillsbury is very remote, and the high winter flows, associated frequent channel changes due to winter storms, and beaver dams in the summer make accurate streamflow data collection challenging. Pacific Gas and Electric (PG&E) monitors stage, storage, and outflow at Lake Pillsbury; from this information (with reservoir evaporation assumptions), inflow can be calculated using a mass balance approach based on changes in reservoir stage (storage), releases, and evaporation. However, during late summer and fall when air temperatures and evaporation are highest, inflows are lowest, and errors in reservoir stage are sensitive to storage changes, computed inflows to Lake Pillsbury can be zero or negative. Combining measured stream gage data above Lake Pillsbury with PG&E's inflow computations provides a clearer understanding of unimpaired flows over the entire water year. In particular, there is a recurring public misunderstanding about the actual unimpaired low flows in the Eel River in the summer and fall, which has implications on future water management on the Eel River during and after the Potter Valley Project Decommissioning. Therefore, the purpose of this technical memorandum is to summarize streamflow data for low-flow conditions in late summer and early fall for tributaries in the Upper Eel River watershed above Lake Pillsbury that reflect accurate estimates of unimpaired summer and fall low flows for different water year (WY) types.

In 2019, PG&E installed stream gages on the Upper Eel River and Rice Fork in support of their Federal Energy Regulatory Commission (FERC) relicensing process, and these gages were abandoned when PG&E withdrew their license application. Since 2020, the Round Valley Indian Tribes (RVIT) has been monitoring streamflow and maintaining these two stream gages just upstream of the upper extent of the reservoir full pool elevation and upstream of sediment deltas at the head of the reservoir. Applied River Sciences (ARS) has provided technical assistance, monitoring support, and computations of streamflow records to RVIT for these stream gages since their re-installation in 2020. Monitoring includes operation and maintenance of the real-time gages, which collect continuous data including water temperature, streamflow (discharge), and turbidity. Streamflow records for each gage are computed annually. Figure 1 shows the locations of the Rice Fork and Upper Eel River gages.

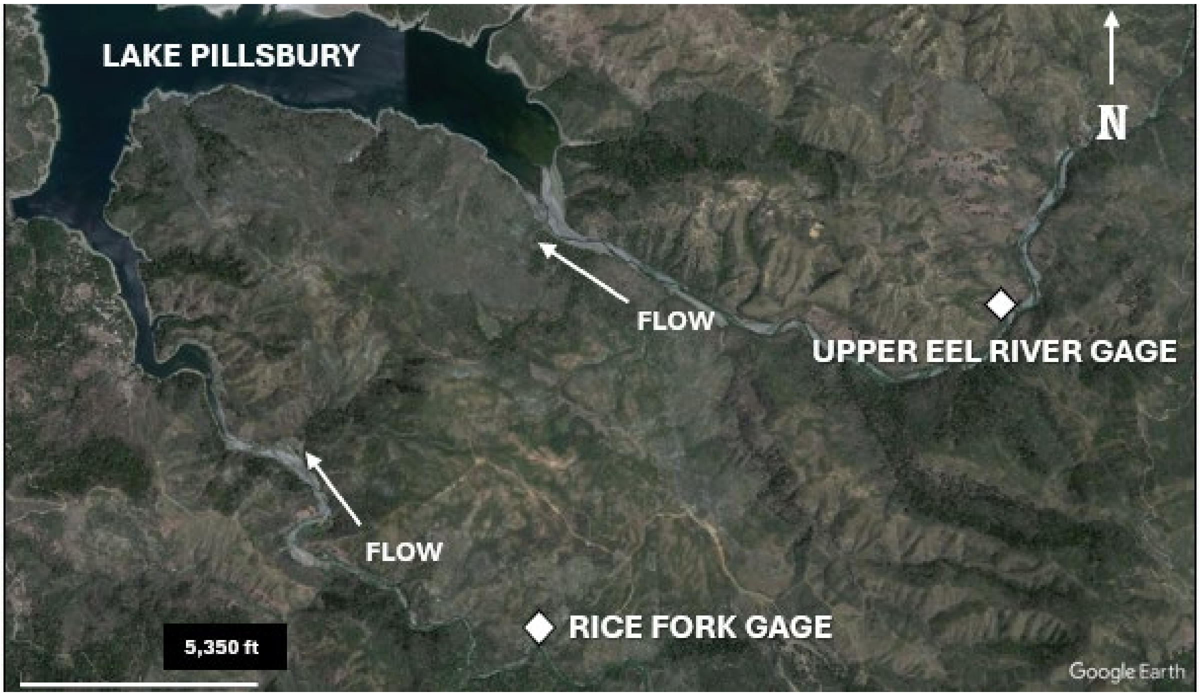

Figure 1. Map showing locations of the Rice Fork and Upper Eel River stream gages above Lake Pillsbury.

2 COMPUTED STREAMFLOW AND CALCULATED INFLOW COMPARISON

Annual low flows in the Upper Eel River watershed generally occur in late summer or early fall, typically September or October in the absence of precipitation. Since the lowest flows of the year sometimes occur in October, this analysis considers the entire calendar year such that low flow values are associated with the preceding year's winter/spring WY classification. This analysis uses the PG&E Potter Valley Project's WY types for the Eel River, which include Very Dry, Dry, Wet and Very Wet, and are based on the cumulative winter and spring inflow to Lake Pillsbury from October 1-May 15 of each year. ARS conducts monitoring and computes annual streamflow records for the Upper Eel River and Rice Fork gages above Lake Pillsbury, which includes collecting a minimum of four and up to ten discrete streamflow measurements at each gage during each WY. At least one discrete streamflow measurement is taken at each gage during the low-flow period to inform the stage-discharge rating and confirm low-flow accuracy. Individual station reports prepared for each gage provide additional details including site descriptions, data collection and analytical methods, and results for each WY. Appendix A provides an example of a station report for the Upper Eel River for WY 2024.

During the summer and fall low flow periods, all minor tributaries downstream of the gages entering Lake Pillsbury are dry, and thus the combined Rice Fork and Upper Eel River mean daily flow values are very accurate computatoins of unimpaired low flows in the Eel River in the vicinity of Lake Pillsbury. The combined Rice Fork and Upper Eel River flows were also compared with the mean daily inflow to Lake Pillsbury computed by PG&E via mass balance approach, as shown in Figure 2. During high-flow periods and into the spring recession, the combined Upper Eel River and Rice Fork flow underestimates inflow to Lake Pillsbury, largely because the two gages miss 22% of drainage area around the lake when these tributaries are flowing. However, during the late summer and early fall low-flow period, these tributaries around the lake are dry and do not contribute flow from the additional 22% drainage area. Since this analysis is focused on low-flows, Figure 2 shows the combined mean daily Upper Eel River and Rice Fork flows without adding any scaling factor to account for the 22% drainage area that is not captured by these two gages. Furthermore, since PG&E uses a mass balance approach to calculate inflow, their calculated mean daily inflow during the hot, low-flow periods may include zero values or even negative inflows due to reservoir stage change measurement uncertainties and/or computed evaporation losses in Lake Pillsbury.

In summary, during winter and spring runoff periods, the non-scaled combined Upper Eel River and Rice Fork mean daily flow underestimates actual inflow to Lake Pillsbury due to differences in drainage area between the lake and the gaging locations. Conversely, during the summer and fall low-flow periods, the the combined flow of the Upper Eel River and Rice Fork gages provides a more accurate estimate for actual inflow to Lake Pillsbury during low-flow periods.

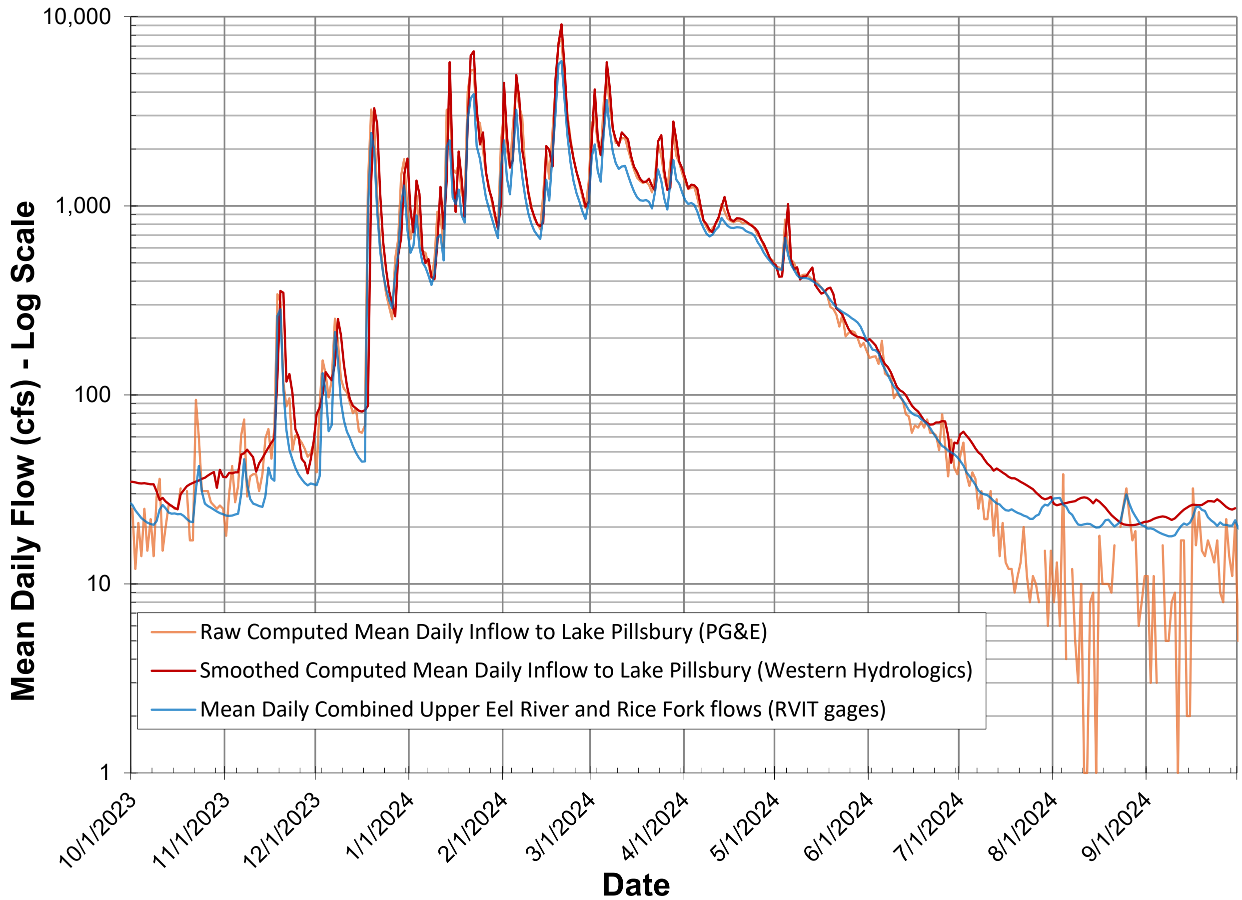

Figure 2. Map showing hydrographic comparison between combined Upper Eel River and Rice Fork mean daily flow, PG&E computed mean daily inflow to Lake Pillsbury, and Western Hydrologics (2026) smoothed daily inflow for water year 2024, a Wet year. The sum of the Upper Eel River and Rice Fork gaging stations under-estimates inflows in the winter and spring due to unsampled tributaries entering Lake Pillsbury, yet the sum of the two gages provides an accurate portrayal of unimpaired inflows into Lake Pillsbury in the summer and fall months before precipitation for the new water year begins.

3 UNIMPAIRED LOW FLOW ANALYSIS

The following analyses are based on ARS' computed streamflow records for Upper Eel River and Rice Fork gages. Table 1 summarizes the lowest mean daily flow in cubic feet per second (cfs) and the date that flow occurred at each gage from 2020 through 2025. The combined flow of both Rice Fork and Upper Eel River was also calculated, and the resulting lowest mean daily combined flow is shown on Table 1. As mentioned above, this combined flow represents nearly 100% of the inflow to Lake Pillsbury during the summer and fall low-flow periods, as other smaller tributaries around Lake Pillsbury have become dry by late spring.

From 2020 through 2025, the lowest annual mean daily flow for combined Upper Eel River and Rice Fork flows has ranged from 2.2 cfs to 20.5 cfs. Very Dry WYs (2020 and 2021) ranged from 2.2 to 5.3 cfs, with WY 2021 being the third driest water year over the WY1911-2024 period of record analyzed (114 years) by Western Hydrologics (2026), with only the WY 1924 and WY1977 drought years being drier than WY 2021 (Figure 3). The only Dry WY (2022) was 7.9 cfs, and Wet WYs (2023-2025) ranged from 11.9 to 20.5 cfs. Since WY 2020, the Upper Eel River and Rice Fork have never been observed as being dry at the gaging locations during site visits. Note that the lowest flow at each gage does not necessarily occur on the same day, so the combined mean daily low flow is not the exact sum of each individual gage's lowest annual mean daily flow value.

Table 1. Lowest mean daily flow for each calendar year at Upper Eel River gage, Rice Fork gage, and combined flow of the two gages. Water Year (WY) type is noted in parentheses next to each year

Calendar Year	Upper Eel Low Flow (cfs)	Upper Eel Low Flow Date	Rice Fork Low Flow (cfs)	Rice Fork Low Flow Date	Combined Low Flow (cfs)	Combined Low Flow Date
2020 (Very Dry)	1.7	10/11/2020[1]	2.9	9/29/2020	5.3	10/7/2020[1]
2021 (Very Dry)	1.7	8/11/2021	0.5	8/17/2021	2.2	8/16/2021
2022 (Dry)	6.6	9/10/2022	1.3	9/10/2022	7.9	9/10/2022
2023 (Wet)	13.9	10/21/2023[1]	6.4	10/7/2023[1]	20.5	10/8/2023[1]
2024 (Wet)	11.7	10/11/2024[1]	4.6	9/7/2024	16.8	10/9/2024[1]
2025 (Wet)	8.3	9/3/2025	3.5	9/4/2025	11.9	9/3/2025

[1] Low flow for calendar year occurred in October at the beginning of the following WY; calendar year was chosen for comparisons so that low flow values represent the low flow period associated with that year's previous winter/spring WY type.

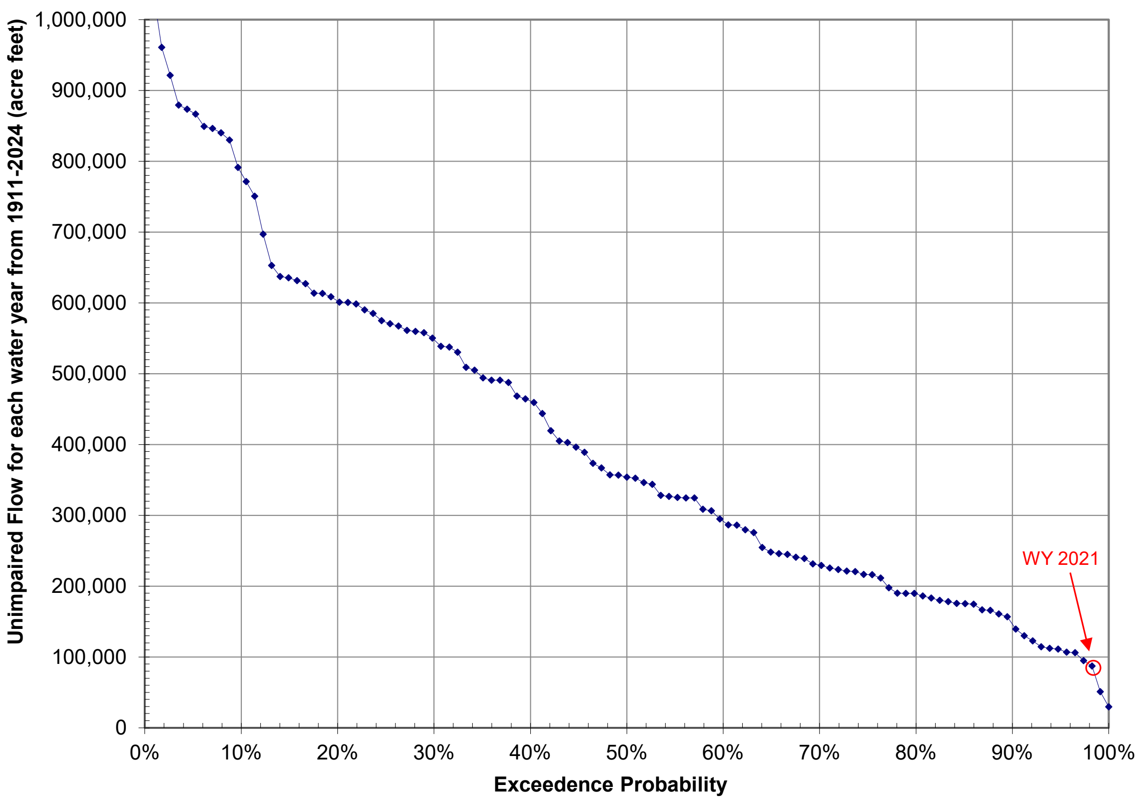

Figure 3. Computed unimpaired water yield for the Upper Eel River at Scott Dam, sorted and ranked for the WY1911-2024 period of record (Western Hydrologics, 2026), showing WY2021 unimpaired flows being the 3rd driest over the 114-year period of record.

Figure 4 through Figure 9 show the mean daily flow at each gage, as well as the combined flow, during the typical low-flow period from July 1 to November 1 for each calendar year used in this analysis. During low flow periods, flow at the Rice Fork gage is between 40-60% of the flow at the Upper Eel River gage.

4 SUMMARY

For the 6 years (WY2020-2025) of highly accurate summer/fall low flow data collected by the RVIT gaging stations of unimpaired flows immediately upstream of Lake Pillsbury, low flows on the driest years in the 2020-2025 record can get as low as 2.2 cfs, and low flows on the wetter years can exceed 17-20 cfs. Since WY 2020, neither the Rice Fork nor the Upper Eel River have ever been observed as dry, including WY2021 (3rd driest year for the 114-year record) based on both the WY2020-2025 gaging station data computations and field observations. These gaging stations will continue to be operated by the RVIT until the Potter Valley Project is decommissioned.

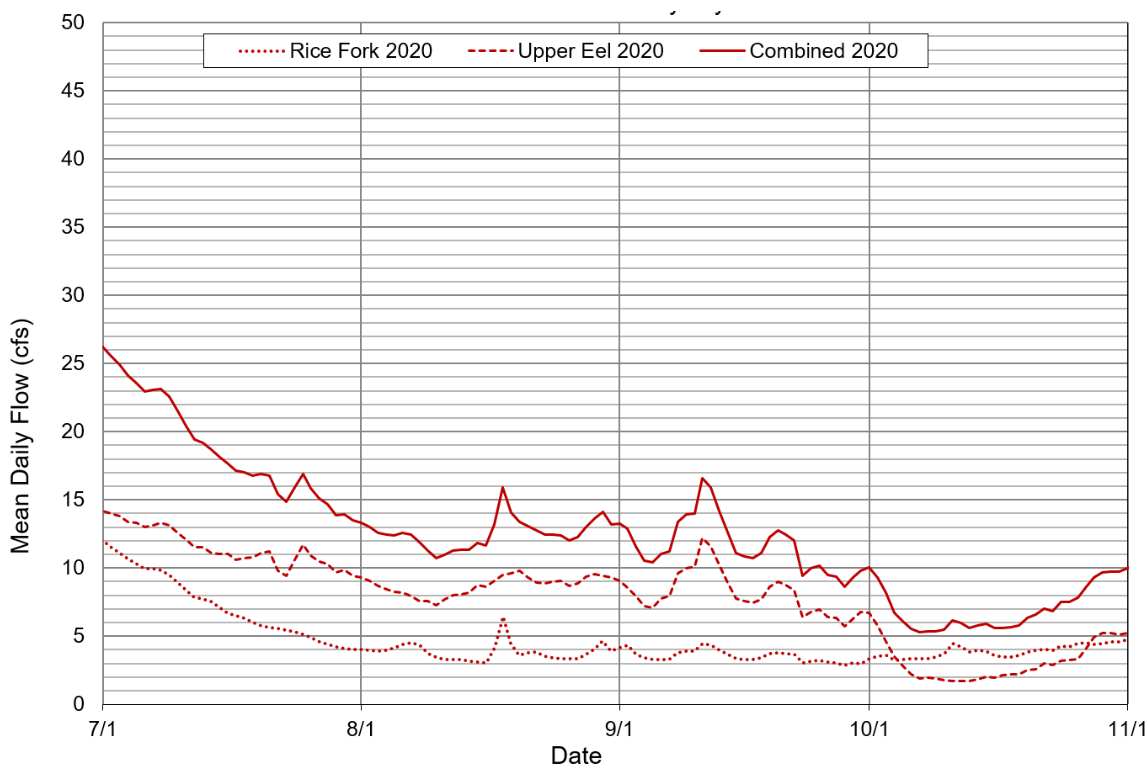

Figure 4. Mean daily flow at gages above Lake Pillsbury for summer/fall of calendar year 2020, a Very Dry WY. The "Combined" flow is the sum of Upper Eel River and Rice Fork mean daily flows, and represents a lower limit of unimpaired Eel River flows under Potter Valley Project decommissioning.

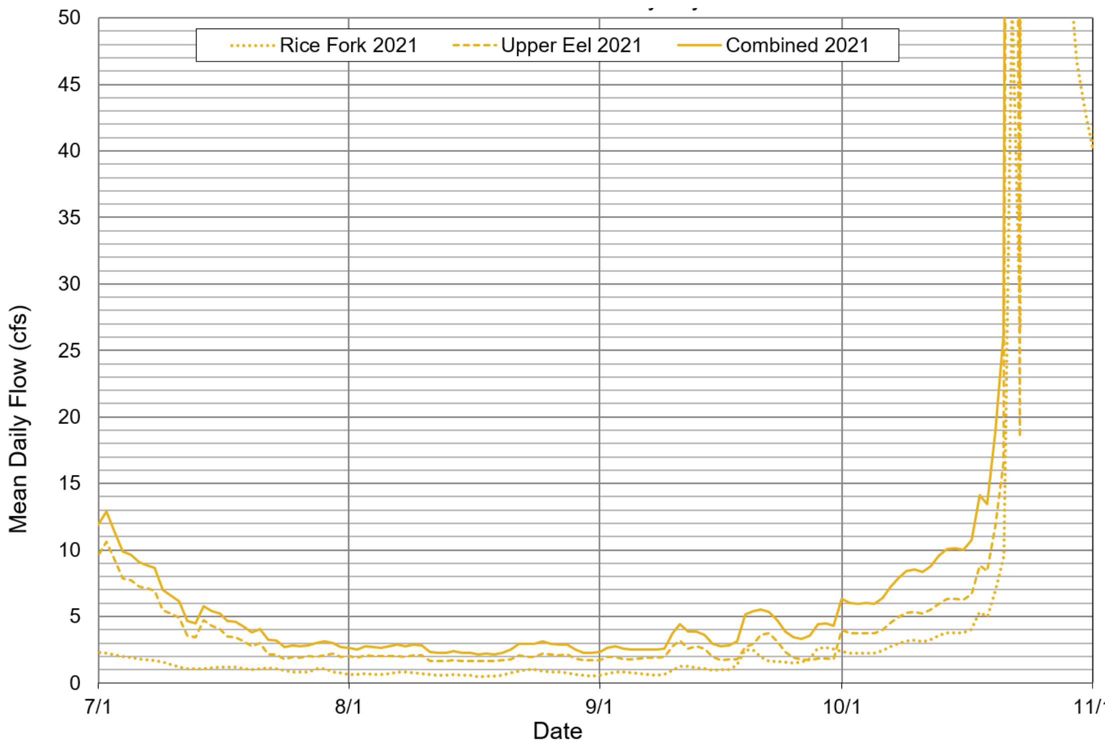

Figure 5. Mean daily flow at gages above Lake Pillsbury for summer/fall of calendar year 2021, a Very Dry WY. The "Combined" flow is the sum of Upper Eel River and Rice Fork mean daily flows, and represents a lower limit of unimpaired Eel River flows under Potter Valley Project decommissioning.

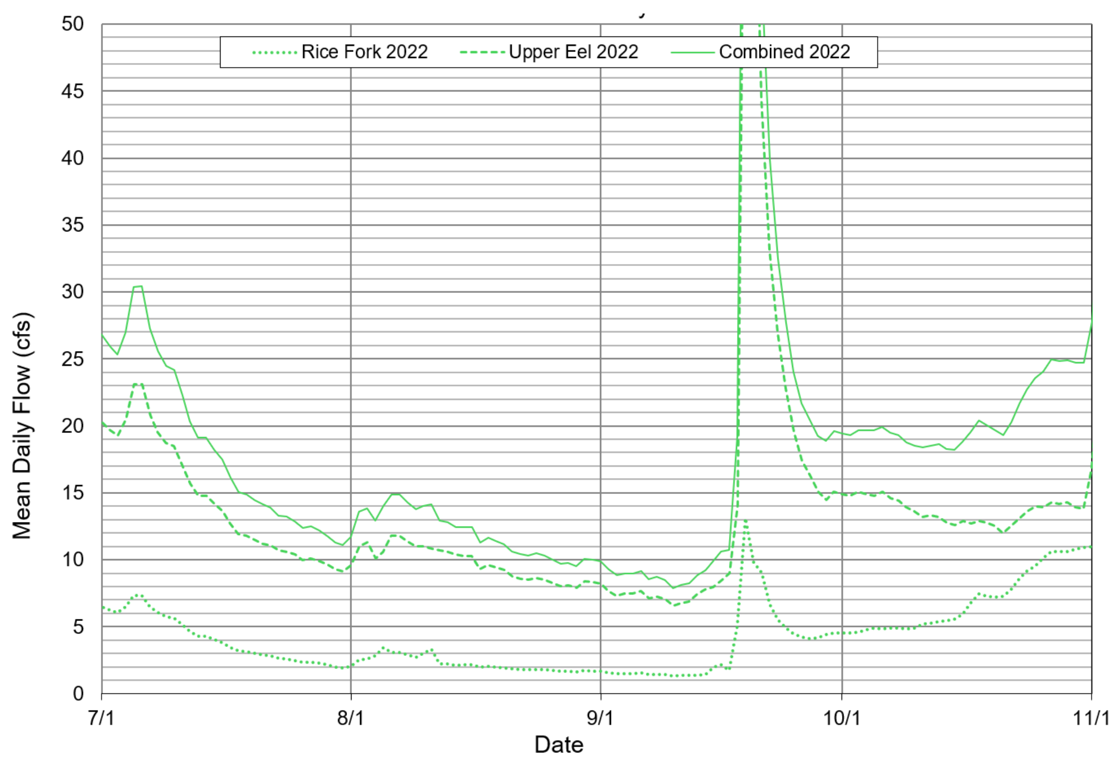

Figure 6. Mean daily flow at gages above Lake Pillsbury for summer/fall of calendar year 2022, a Dry WY. The "Combined" flow is the sum of Upper Eel River and Rice Fork mean daily flows, and represents a lower limit of unimpaired Eel River flows under Potter Valley Project decommissioning.

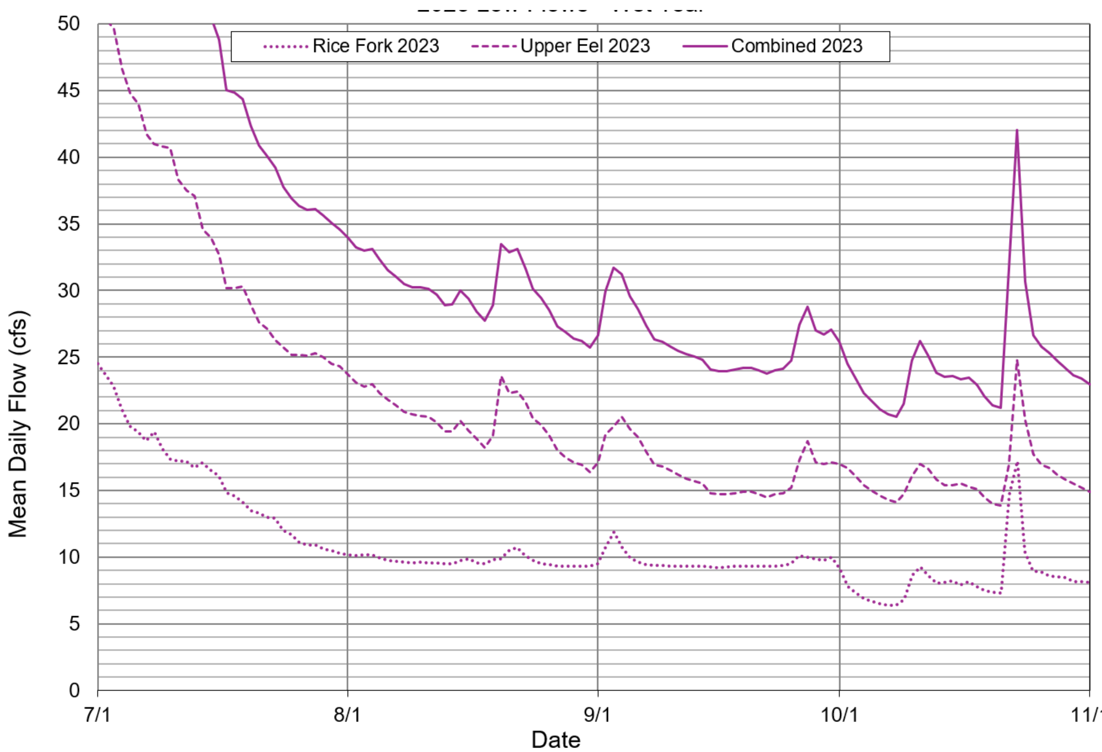

Figure 7. Mean daily flow at gages above Lake Pillsbury for summer/fall of calendar year 2023, a Wet WY. The "Combined" flow is the sum of Upper Eel River and Rice Fork mean daily flows, and represents a lower limit of unimpaired Eel River flows under Potter Valley Project decommissioning.

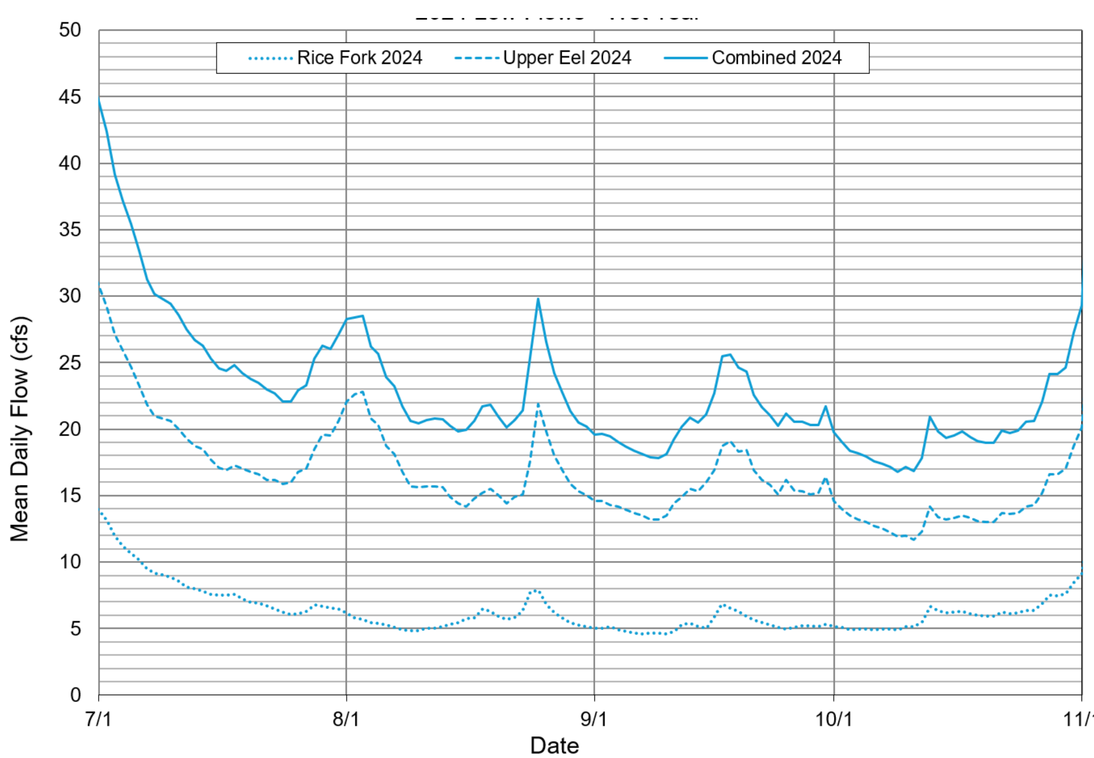

Figure 8. Mean daily flow at gages above Lake Pillsbury for summer/fall of calendar year 2024, a Wet WY. The "Combined" flow is the sum of Upper Eel River and Rice Fork mean daily flows, and represents a lower limit of unimpaired Eel River flows under Potter Valley Project decommissioning.

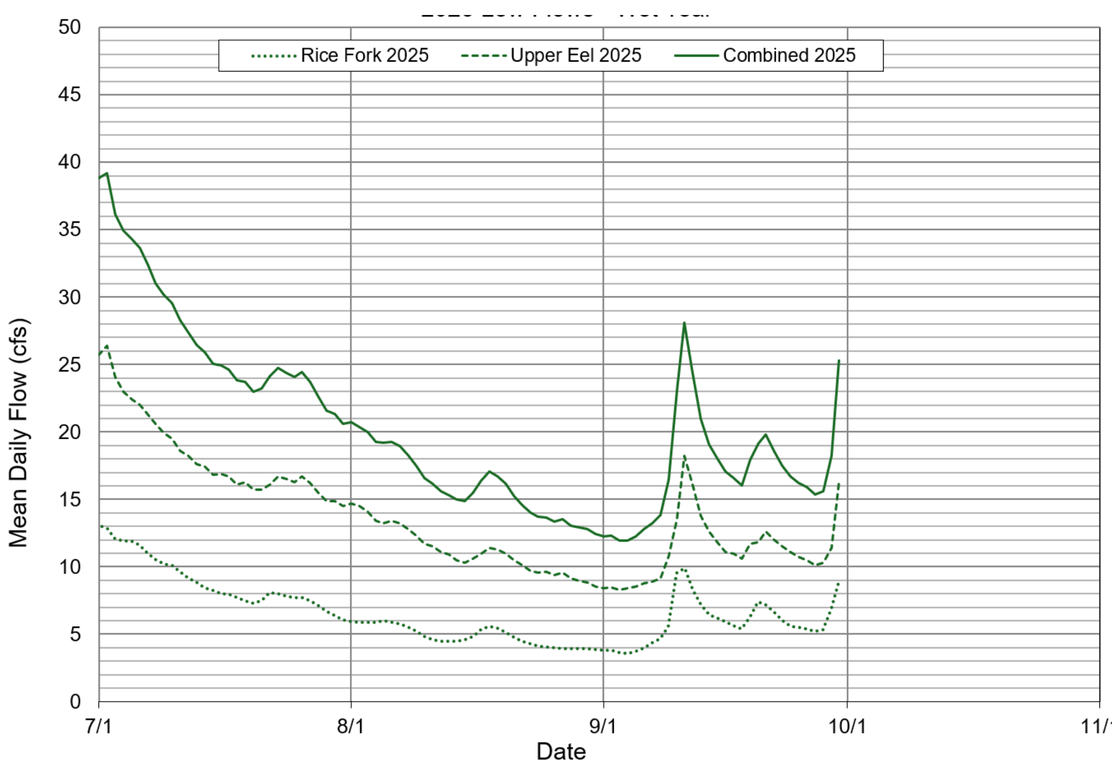

Figure 9. Mean daily flow at gages above Lake Pillsbury for summer/fall of calendar year 2025, a Wet WY. The "Combined" flow is the sum of Upper Eel River and Rice Fork mean daily flows, and represents a lower limit of unimpaired Eel River flows under Potter Valley Project decommissioning.

APPENDIX A: UPPER EEL RIVER GAGE STATION REPORT FOR WY 2024

APPENDIX A
Upper Eel River above Lake Pillsbury, California
Water Year 2024
Gaging Station Annual Report

Prepared for:

Round Valley Indian Tribes
77826 Covelo Rd.
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Prepared by:

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Final

February 19, 2025

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1 INTRODUCTION

The purpose of this Station Report is to present the Station Analysis and supporting photographs, tables, and figures for the Upper Eel River above Lake Pillsbury gage (Upper Eel River gage) for Water Year (WY) 2024. Additional background and methods are presented in the technical memo of which this report is an appendix. The foundation of this report is the Station Analysis (Section 2) which follows the standard US Geological Survey (USGS) format. To promote readability, site photographs are provided at the end of the report.

2 STATION ANALYSIS FOR UPPER EEL RIVER ABOVE LAKE PILLSBURY, CALIFORNIA

Computational Period: Water Year 2024: October 1, 2023, to September 30, 2024

Records: River Stage, Streamflow (Discharge), Water Temperature, and Turbidity.

2.1 Site Description and Location

The gage is in a pool along the mainstem of the Eel River, approximately 1.25 miles upstream of Lake Pillsbury, at the confluence of Thistle Glade Creek (Latitude 39°23'45.70"N, Longitude 122°52'55.08"W). Thistle Glade Creek enters the mainstem Eel River at the gaging pool (Figure 1). The precise elevation of the gage datum is not known as of this writing, but the general elevation of the site is approximately 1,830 feet MSL and the drainage area above the gage is approximately 140 mi^2 (USGS StreamStats). The Eel River is largely or entirely unregulated at this station, and upstream diversions are unknown and are considered minimal.

2.2 Site History

In October 2018, a PG&E contractor constructed the original gage in a bedrock pool 500 feet upstream of the current gage location. The original gage was destroyed during extremely high flows that same year. In February 2020, Applied River Sciences (ARS, formerly McBain Associates) and Round Valley Indian Tribes installed a temporary stage and temperature recorder at the current, more suitable gaging location. In June 2020, permanent water temperature and turbidity monitoring equipment were added and in August 2020, the permanent stage recorder was installed. Additional upgrades were made in 2024 and are described in Section 2.3.1.

2.3 Equipment

Gaging stations are equipped with the following components:

- A data collection platform (DCP) that receives the data from the instruments, interfaces with a data transmission system, and in some cases provides backup data storage.
- A transmission system, in this case a satellite radio.
- Peripheral instruments that collect the data, typically pressure transducers (often referred to as “inside recoding gages”), turbidimeters, and water temperature sensors.
- Station infrastructure that includes the gage house, staff plates, conduit and power systems (e.g. a solar powered 12V battery system).

At the Upper Eel River gaging station, these components were upgraded over time, as explained in the following sections.

2.3.1 Data Collection Platform

The gage is housed in a 1/8-inch steel box approximately 20 feet above the river at low flow. The DCP is housed in a 1/16-inch thick, steel box located 16 feet above the river at low flow. Power is provided from a 12V deep cycle battery maintained by an 85-watt solar panel and a Pro-Star PS15M charge controller. The original DCP was a satellite telemetry station, designed and operated by Picovale Services, Incorporated (Picovale). It transmitted continuous (30 minute) stage, water temperature and turbidity data. Due to inherent latency in satellite communication, data were not transmitted precisely at 30-minute intervals but typically every 25 to 35 minutes. Data were not stored on board with this platform, only transmitted. The original Picovale stations provided poor stage height resolution (e.g., up to 0.04 foot "jumps" occurred during steady stage conditions), and in 2024, we improved the stage resolution by upgrading the DCP and the pressure transducer.

Stage height resolution is the product of the combined resolution of the DCP and the output of the pressure transducer. The original Picovale station had a 10-bit resolution which equated to a 0.04-foot stage-step over the 35-foot range of the 15 PSIG pressure transducer (see Section 2.3.2). To improve upon this 0.04-foot resolution, we removed the Picovale DCP on June 12, 2024, and replaced it with a WaterLOG Storm 3 on August 15, 2024. We also reduced the recording interval to 15 minutes. The Storm 3 and the new pressure transducer now provide a 0.01-foot resolution. The Picovale satellite telemetry system continues to operate as the data transmission platform and is now transmitting data every 15 minutes. Continuous stage, water temperature and turbidity data are also stored on the Storm 3.

2.3.2 Inside Recording Gage

River stage is monitored with a Seametrics PS9800 vented pressure transducer with a 15 PSIG (pounds per square inch-gage) range and a typical accuracy of +/- 0.1% FSO (Full Scale Output, or full scale of the pressure range). The full scale of this pressure transducer is 35 feet. The original Picovale stations had a 10-bit resolution which equated to 0.04 feet per step in the original Picovale DCP. Using this same pressure transducer, the new Storm 3 DCP provides 0.01-foot resolution in the continuous gage height record. Connection is via a 2 wire 4-20mA cable. The transducer is housed in a perforated 2-inch galvanized pipe bolted to bedrock.

Figure 1. Aerial photographs showing the location of the Upper Eel River gaging station. The date of the photos is June 2, 2021June 2, 2021, and discharge was 21 cfs.

2.3.3 Outside Staff Gage

Two USGS Style C staff gages are mounted to redwood backing attached to aluminum channel, bolted to a bedrock face in the gaging pool. Staff plate range is 0.00 feet to 6.66 feet.

2.3.4 Turbidity Monitoring Equipment

A Forest Technology System, Inc., DTS-12 turbidimeter (Accuracy 0 to 499.99 NTU ± 2%, 500 to 1600 NTU ± 4%) is installed in an aluminum and Schedule 80 PVC protective enclosure. It is mounted to the same bedrock outcrop as the stream gage and staff plate. The DTS-12 is located approximately 16 feet from the right bank. The turbidity sensor lens is oriented toward (orthogonal to) the stream bed adjacent to the main flow in the channel, four feet above the bed. The turbidity sensor lens has a self-cleaning silicone wiper which activates before each measurement to minimize bio-fouling.

2.3.5 Water Temperature Monitoring Equipment

The DTS-12 is fitted with an encapsulated thermistor with a range of 32 degrees F to 104 degrees F, and an accuracy of ± 0.36 degrees F.

2.3.6 Backup Data

The backup pressure transducer is an Onset Hobo U20 that records pressure and water temperature and has a depth range of 13 feet while providing 0.01-foot resolution for stage measurements. The U20 is installed in a perforated 1.25-inch galvanized pipe housing bolted to bedrock in the gaging pool, next to the primary gage. The U20 is a non-vented pressure sensor and requires barometric compensation to produce pressure changes related to changes in water depth. A second Hobo U20 is installed in the gage house to provide barometric compensation data. Another barometric U20 is installed at the Rice Fork gage, 2.4 miles away and can provide backup barometric data for the Upper Eel River gage if needed. The U20 provides a 0.01-foot resolution compared to 0.042-feet for the former primary gage (Section 2.3.2), so we typically use the U20 to compute discharge records as it creates a smoother hydrograph. Once the new Storm 3 DCP was installed at the gage on August 15, 2024, the primary pressure transducer data resolution improved and is now nearly as smooth as the U20.

2.4 Gage Height Records

Gage height, discharge measurement, and discharge records are stored and/or computed within the WISKI database system of hydrologic software from Kisters, Inc., following standard USGS protocols (Rantz, 1983) Primary gage height data were collected on a 30-minute time step, or 48 measurements per day. The backup U20 pressure transducer was set to a 15-minute recording interval. In WY2024, the backup gage provided a superior gage record (smoother than both primary gage height records) and was utilized for the entire computational period.

2.4.1 Time Zone

All times in the gage height time series are reported in UTC-8 (Coordinated Universal Time minus 8 hours), and in military format. Staff height observations and discharge measurements that were collected during Daylight Savings Time (UTC-7, before November 3, 2023, at 02:00 and after March 10, 2024, at 02:00) were adjusted in WISKI to UTC-8.

2.4.2 Level Surveys, Datum and Datum Corrections

Local reference marks and the staff gage were leveled to an arbitrary datum during the initial installation in 2020 and again on December 11, 2024. The stage height of the primary benchmark (bolt in the gaging pool rock face) is 4.30 feet, with an arbitrary elevation of 100 feet. No cross section has been surveyed. No datum corrections were required.

2.4.3 Site Visits

This gage is in an extremely remote location and cannot be accessed by road during wet periods or during big storms. Water Year 2024 was very stormy, and we could not access the gage via road from October 2023 until June 2024. The last site visit before winter high flows was on October 25, 2023. The next gaging trip was conducted on January 22, 2024, via jetboat from Lake Pillsbury during which a high-flow discharge measurement was collected near the mouth of the Eel River where it enters Lake Pillsbury. The gage was not visited during this trip, though this trip is included under "site visits," as vital gaging information was collected. Two site visits were conducted by helicopter on January 30, 2024, and April 11, 2024. On June 12, 2024, a site visit was conducted to remove the existing Picovale DCP in preparation for gage upgrades. On August 15, 2024, a site visit was conducted to install the new Storm 3 DCP and relaunch the real-time gage. In total, six site visits were conducted in WY 2024. All site visit dates correspond with the discharge measurements discussed in Section 2.5.1.

2.4.4 Surrogate Data

No surrogate discharge data were required.

2.4.5 Control/Ice

Ice was not an issue at this site. The hydraulic control for the primary gage is a gravel/cobble riffle. A downstream beaver dam has periodic, significant effects on stage height. In WY2024, the beaver dam began to influence gage height beginning September 4, 2024, at 14:30 (see Section 2.4.6).

2.4.6 Gage Height Corrections

Instrument output can vary over time and is known as "drift." The first step in the discharge record computations is to correct the gage height record for instrument drift. Recorded pressure transducer stage (gage height) is corrected to observed staff plate stage (stage height) using an offset. A comparison of staff plate stage observations made during routine field trips to the electronic gage height record provides the offsets, which are pro-rated over time periods (from row to row), as shown in Table 1. The maximum drift in the backup gage record used in the WY2024 computation was 0.10 feet (Table 1). Note that drift-correction times may not correspond to computational period time-boundaries (e.g. water years), as gage height records typically span longer intervals.

Table 1. Drift in the backup gage raw gage height record corresponding to observed stage heights during site visits. "Drift %" is calculated by dividing "Drift" by the FSO of the gage, 13 feet in this case.

Date	Time	Observed Stage Height (ft)	Recorded Gage Height (ft)	Offset (ft)	Drift (ft)	Drift %
7/27/2023	14:30	2.79	1.56	1.23	0	0.0%
10/25/2023	9:25	2.68	1.49	1.19	0.04	0.3%
1/30/2024	12:50	4.77	3.61	1.16	0.07	0.5%
4/11/2024	11:25	4.71	3.52	1.19	0.04	0.3%
6/12/2024	12:45	3.05	1.84	1.21	0.02	0.2%
8/15/2024	9:55	2.66	1.49	1.17	0.06	0.5%

A beaver dam began to influence gage height beginning September 4, 2024, at 14:30 and stage height steadily increased through the time of the next site visit on October 14, 2024. On this date, the beaver dam was notched, and the true stage height was determined (0.72 feet lower) and this correction was pro-rated from zero to its full value from September 4, 2024, at 14:30 through October 14, 2024, at 09:00.

2.4.7 Maximum/Minimum Gage Height

The maximum gage height of 10.40 feet occurred February 20, at 12:45. The minimum gage height of 2.56 feet occurred on October 8, 2023, at 15:15.

2.5 Rating

2.5.1 Discharge Measurements

Six discharge measurements were made during the computational period, ranging from 14.0 cfs to 2,660 cfs (Table 2). All measurements were rated “Good,” (assumed to fall within five percent of the actual discharge). All but one of the measurements utilized conventional wading techniques with either a Price AA mechanical current meter or a Flow Tracker 2 acoustic Doppler velocimeter. The high flow measurement, collected on January 22, 2024, utilized a Sontek M9 acoustic Doppler current profiler (ADCP), deployed from a riverboard using a jetboat just upstream of where the Eel River flows into Lake Pillsbury and approximately 1.7 miles downstream of the primary gage (see Site Photographs).

2.5.2 Ratings

The first discharge measurement of the year, #2024-01, collected on October 25, 2023, plotted on the existing rating (#2023.01) and this rating was held through the December 19, 2023, peak flow at 10:45. After this peak, discharge measurements diverged from the 2023 rating and a new rating (#2024.1) was developed from the remaining five measurements (Figure 2) and applied through the remainder of the water year.

Table 2. Water Year 2024 Discharge Measurement Summary (Table 9-207)

Measurement Number	Date	Cross section area (ft^2)	Stream width (ft)	Mean depth (ft)	Mean velocity (ft/s)	Begin staff height (ft)	End staff height (ft)	Staff height change (ft)	Discharge (cfs)	Method	Begin time (GMT-8)	Measure-ment rating	% Diff. Rating 2024.1
2024-01*	10/25/2023	29.2	55.0	0.53	0.59	2.68	2.68	0.00	17.4	Wading	9:25	Good	-8.0%
2024-02**	1/22/2024	957	207	4.62	2.78	8.74	8.64	-0.10	2,660	ADCP	11:15	Good	0.0%
2024-03	1/30/2024	163	69.0	2.36	3.00	4.77	4.77	0.00	488	Wading	12:53	Good	0.3%
2024-04	4/11/2024	170	80.5	2.11	3.19	4.71	4.70	-0.01	542	Wading	11:25	Good	16%
2024-05	6/12/2024	50.4	59.0	0.85	1.26	3.05	3.05	0.00	63.7	Wading	12:45	Good	4.3%
2024-06	8/15/2024	30.4	54.0	0.56	0.46	2.66	2.66	0.00	14.0	Wading	09:55	Good	-7.8%

*Percent difference calculated from Rating #2023.1.

**This measurement (2,740 cfs) was collected via jet boat 1.7 miles downstream of the gaging station and was adjusted down (-3%) using the decrease in drainage area from the measurement location to the gage.

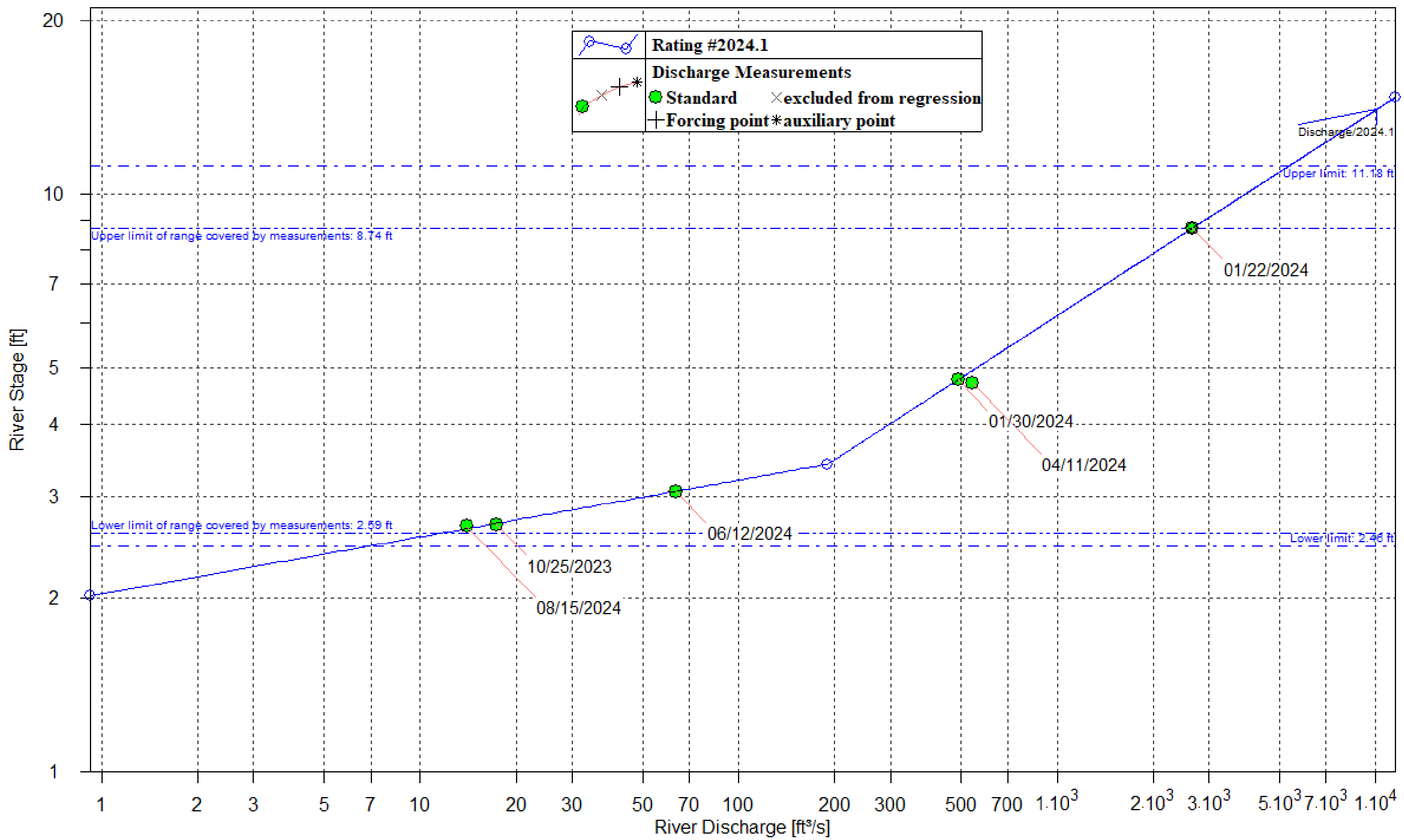

Figure 2. Upper Eel River Rating Curve #2024.1 and Water Year 2024 discharge measurements.

2.5.3 Rating curve shifts

When discharge measurements plot off the rating curve, the gage height record is adjusted to compute the correct discharge (Sauer 2002). Shifts were applied to the WY2024 gage height record as described in Table 3. Shifts are pro-rated between time periods, from row to row.

Table 3. Rating curve shifts applied to the Upper Eel River WY2024 gage height record.

Date	Time	Shift (ft)
January 30, 2024	12:53	0.00
April 11, 2024	11:25	0.25
June 12, 2024	12:45	0.01
August 15, 2024	09:55	-0.02
October 14, 2024	09:00	-0.03

2.6 Computed Discharge

The two ratings were applied to their respective time periods as described in Section 2.5. The hydrograph is presented below with the y-axis in arithmetic scale (Figure 3) and in logarithmic scale (Figure 4). A period of significant diurnal fluctuation beginning in July 2024 was identified and carefully inspected, and determined to be accurate. A similar phenomenon was observed in WY2022 and WY2023, where during dry periods, the Upper Rel River may increase/decrease its flow by up to 50 percent each day.

2.6.1 Estimates

No estimated discharge records were required.

2.6.2 Hydrographic Comparison

We performed a hydrographic comparison with the Rice Fork gage (Figure 5). The storm periods and individual peak events align well, and Rice Fork is nearly always lower than Upper Eel River. Interestingly, for some of the smaller storms, where the ratings are more accurate, Rice Fork peaks are higher than Upper Eel River. During dry periods, the Upper Eel River is always higher than Rice Fork, usually about 50 percent higher.

We also compared our summed Rice Fork and Upper Eel River mean daily discharge values with the inflow to Lake Pillsbury (estimated by PG&E us a mass balance approach) (Figure 6). The two gages account for 78% of the drainage area above Lake Pillsbury, so we adjusted the sum by adding 22% to account for the increase in drainage area between our gages and the lake. The theoretical hydrographs align well, with the timing of hydrograph component (peaks, shoulders, recessional and base flow periods) appearing similar. Peak flow magnitude appears greater in the PG&E computed record, perhaps due to uncertainty in our ratings and/or seasonal variations in basin runoff. For example, the lower elevations may produce more than a 22% increase during periods of intense rainfall. The increase in gaged inflow over PG&E computed inflow in the spring and summer is likely due to the snowmelt signature in the Rice Fork and Upper Eel River discharge records. During snowmelt, the snow-free lower elevations are not contributing their commensurate 22% increase in runoff. During summer, the lower elevation tributaries are dry and are likewise failing to contribute the additional 22%. Lastly, the PG&E calculation may include zero values if evaporation exceeds inflow and is therefore less sensitive to changes in streamflow during the hot, dry summer months.

This analysis could be further adjusted (up in winter, down in spring/summer) using the assumptions listed above, but the point is not to make these hydrographs match exactly, rather it is to use PG&E computed inflow as a “bookend” to check the relative magnitude of the gage-computed flows.

2.6.3 Peak Streamflow

The peak streamflow for the computational period was 4,430 cfs and occurred on February 20, 2024, at 12:30. This value is well within the extrapolated range of the rating which has an upper limit of 5,320 cfs. A very similar peak of 4,020 cfs occurred on January 13, 2024, at 19:15.

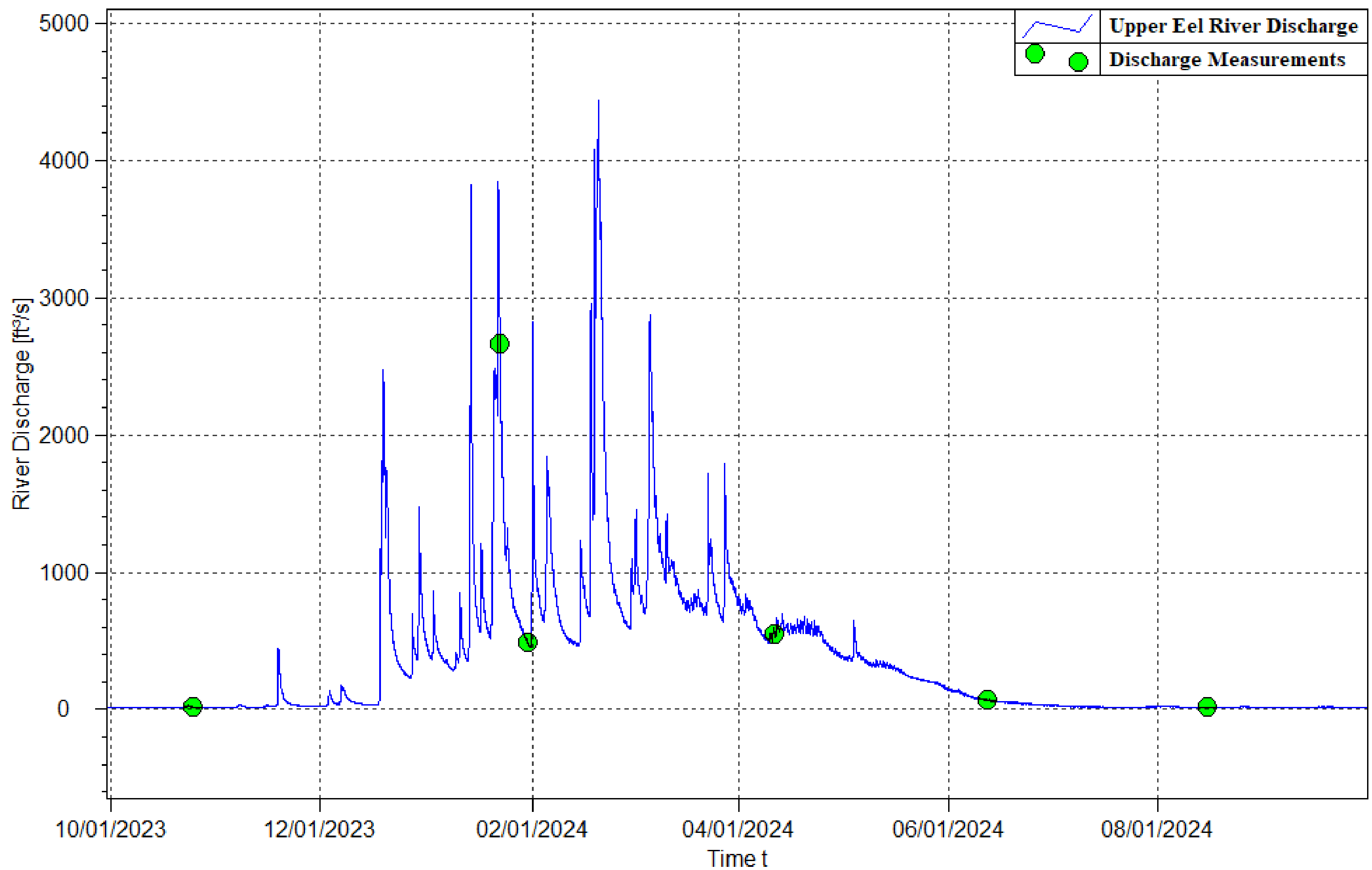

Figure 3. Water Year 2024 hydrograph for Upper Eel River, arithmetic scale.

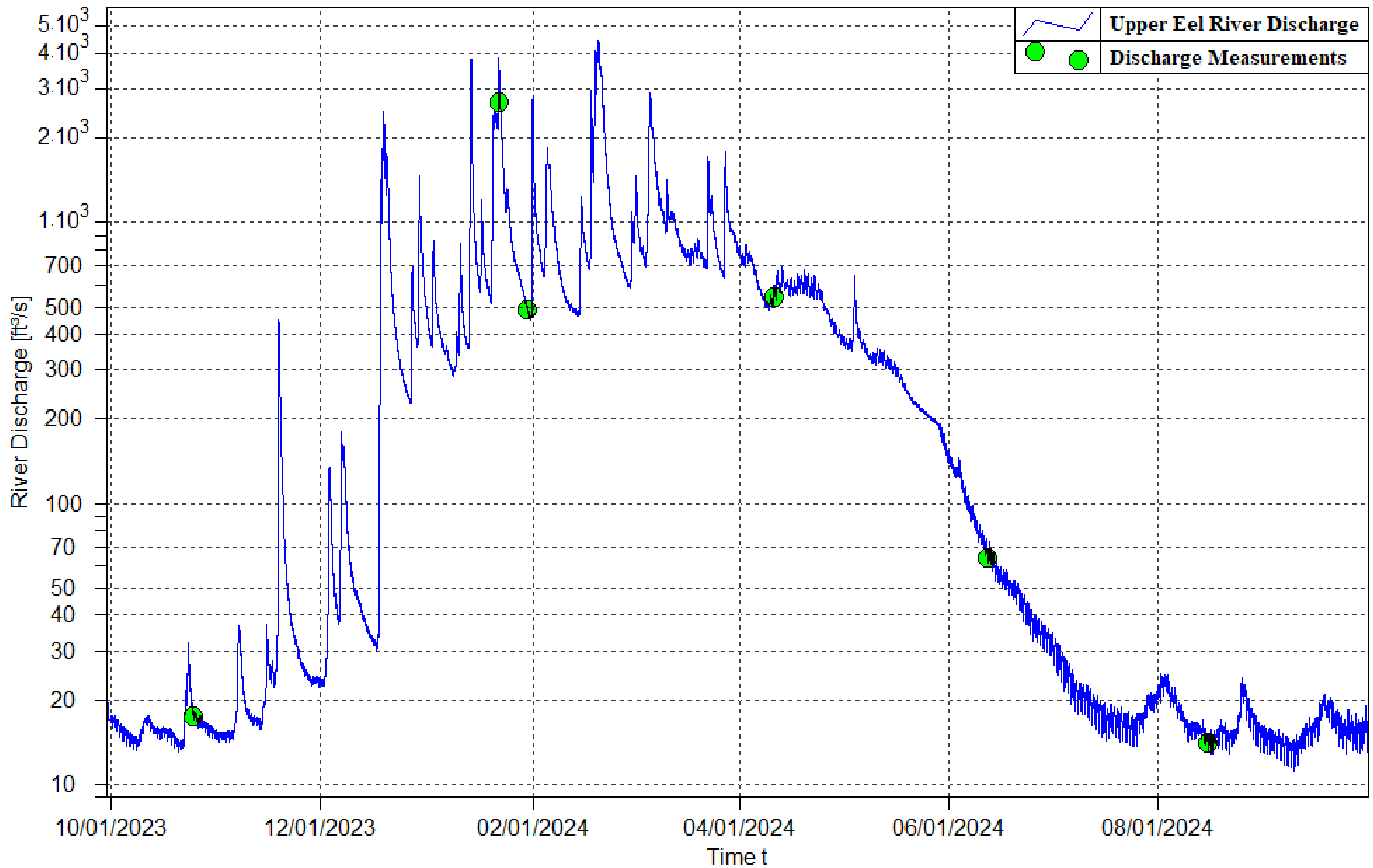

Figure 4. Water Year 2024 hydrograph for Upper Eel River, logarithmic scale.

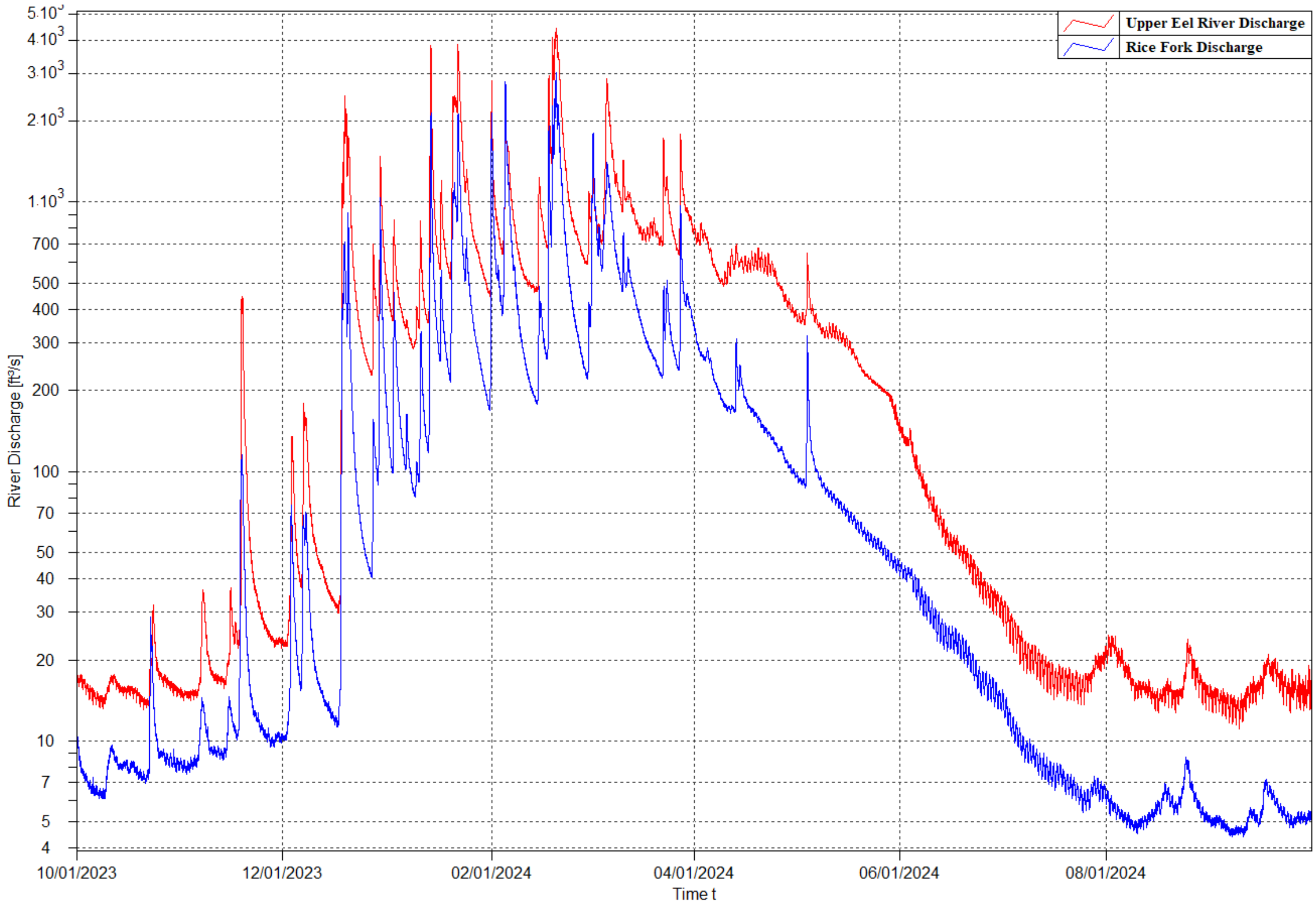

Figure 5. Hydrographic comparison between Rice Fork and Upper Eel River computed discharge hydrographs, log scale.

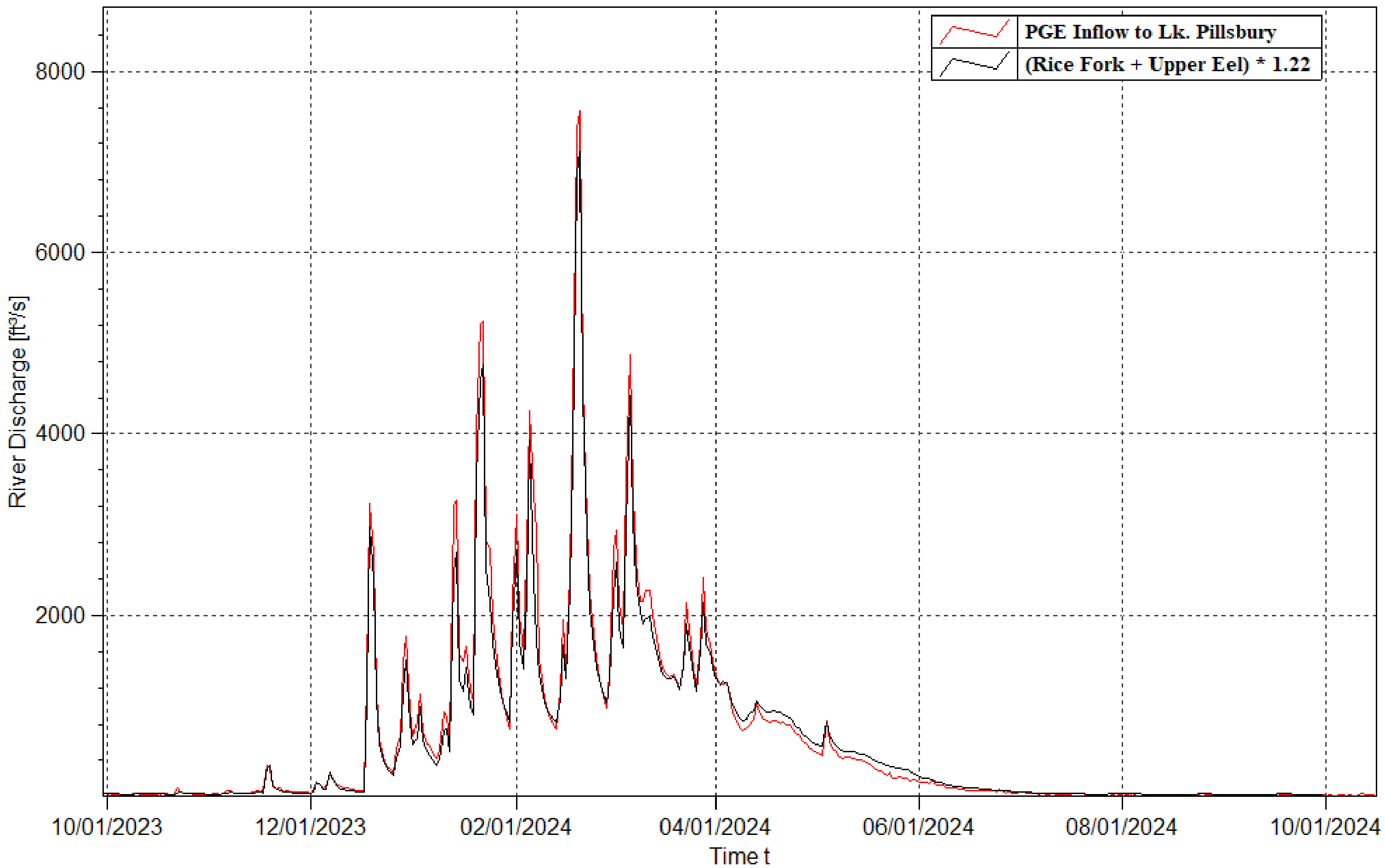

Figure 6. Hydrographic comparison between summed Rice Fork and Upper Eel River mean daily discharge and PG&E computed mean daily inflow to Lake Pillsbury for WY2024, arithmetic scale.

2.6.4 Rating Curve Quality Ranges

Computed discharge values that fall within the range of discharge measurements are considered "Validated." Common practice is to extrapolate ratings 100% above and below the highest and lowest measurements (Rantz 1983), so twice the magnitude of the highest measurement and half the magnitude of the lowest measurement. Other methods exist for extrapolation (e.g., on the low end, the rating can be forced through the point of zero flow). However, since computed streamflow never approached zero, we deemed the 100% method appropriate for this year's computation.

Computed values within these 100% ranges are "Extrapolated," and values beyond the extrapolated range are "Estimated." Rating #2023.1 was expanded using the 2,660 cfs ADCP measurement, so in WY2024, computed discharge did not exceed the Extrapolated range of the ratings.

2.6.4.1 Rating #2023.1

- Validated Limits: 2.79 feet to 8.74 feet (27.0 cfs to 2,660 cfs).
    - Within the range of measured values, tagged as "WR" in the continuous record, for "Validated Within Rating."
- Extrapolated Range:
    - Lower: 2.58 to 2.79 feet (13.5 cfs to 27.0 cfs)
    - Upper: 8.74 to 11.18 feet (2,660 cfs to 5,320 cfs).
    - Both are tagged as "EX" in the continuous record, for "Extrapolated up to 100% above or below Validated Limits."
- Beyond Extrapolated Range (less than 13.5 cfs, greater than 5,320 cfs)
    - Tagged as "BL" in the continuous record, for "Beyond Rating Limits, Estimated."

2.6.4.2 Rating #2024.1

- Validated Limits: 2.59 feet to 8.74 feet (13.2 cfs to 2,660 cfs).
    - Within the range of measured values, tagged as "WR" in the continuous record, for "Validated Within Rating."
- Extrapolated Range:
    - Lower: 2.46 to 2.59 feet (6.6 cfs to 13.2 cfs)
    - Upper: 8.74 to 11.18 feet (2,660 cfs to 5,320 cfs).
    - Both are tagged as "EX" in the continuous record, for "Extrapolated up to 100% above or below Validated Limits."
- Beyond Extrapolated Range (less than 6.6 cfs, greater than 5,320 cfs)
    - Tagged as "BL" in the continuous record, for "Beyond Rating Limits, Estimated."

2.6.5 Special Computations

None were required.

2.7 Turbidity

The turbidimeter sensor face was cleaned during each site visit, and the silicone wiper blade was replaced on October 25, 2023. Turbidity data were collected on a 30-minute interval, from October 1, 2023, to August 15, 2024, at which point the new Storm 3 DCP was installed, and 15-minute interval turbidity was collected through the end of the water year. Turbidity data are stored raw in the WISKI database and if any edits are made to the data, they occur in a separate time series ("Edited"). Turbidity data are carefully examined for spikes related to debris fouling the optics (bio-fouling), and the hydrograph is overlain over the turbidity graph to visually examine turbidity increases relative to streamflow increases. Lastly, if appropriate (as in comparing Rice Fork and Upper Eel), turbidity graphs are overlain atop one another.

The DTS 12 turbidimeter reported normally except for instances when sporadic 2-4 hour data gaps occurred during periods of very low (1-2 NTU) turbidity (Figure 7). The 2-4 hr gaps were filled with linear interpolation for the following periods:

- October 25, 2023, at 13;30 to November 06, 2023, at 21:00
- May 30, 2024, at 15:00 to June 12, 2024, at 13:00

Several small turbidity spikes, assumed to be caused by bio fouling of the sensor, occurring over a single recording interval and during low flow periods, were removed.

During spring snowmelt (late March through late April 2024) daily diurnal swings of up to 40 NTU occur, which are correlated with fluctuations in streamflow. From May 2024 into the low flow period in the summer and fall, the turbidity signal shows a regular diurnal fluctuation of 2 to 3 NTU, trending downward to near-zero NTU in June 2024. A gap exists in the turbidity record from June 12, 2024, through August 15, 2024, when the primary gage was removed for maintenance as described in Section 2.3.1.

2.8 Water Temperature

Water temperature data for the Upper Eel River gage were collected on a 15-minute time step, or 96 measurements per day. Kisters' WISKI database software was used to store the raw water temperature data, perform automated Quality Control (QC) checks, and output a finalized data set. QC was conducted to check for anomalous values that could indicate potential errors in the record. The QC routine incorporated into WISKI follows the US Environmental Protection Agency EPA (2014) methodology. The recorded temperature data were checked against water temperatures measured at or near the thermistor during field visits.

The period of record for WY 2024 Upper Eel River gage water temperature data is from October 1, 2023, to September 30, 2024, with no long-term data gaps. Water temperature data from the U20 backup water pressure transducer was used for the water temperature record from October 1, 2023, to August 15, 2024. Water temperature data collected using the DTS-12 turbidimeter was used from August 15, 2024. All overlapping temperature data from the two sensors were very closely aligned. The maximum 15-minute interval water temperature for the period of record was 80.0 °F and occurred on July 11, 2024, at 16:00, and the minimum 15-minute interval water temperature was 37.3 °F on January 8, 2024, at 05:00. Upon completion of the QC checks, a final time series of 15-minute interval and daily average water temperature values were generated from data that passed the QC procedure (Figure 8). Most data met QC standards and the few that did not were from when the data logger was temporarily removed from the water for download.

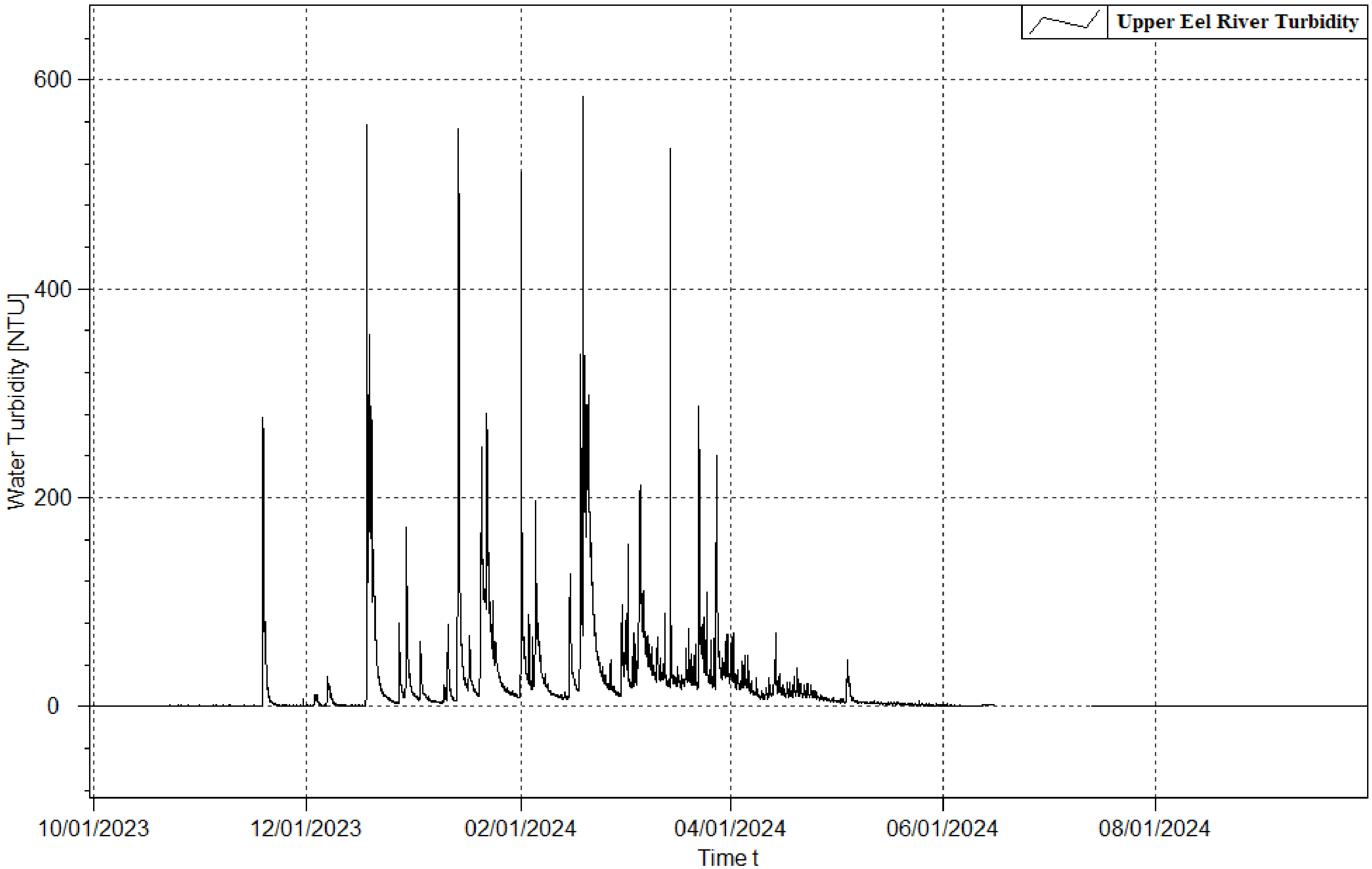

Figure 7. Water Year 2024 Upper Eel River turbidity. The data gap from mid-June to mid-August 2024 is due to the DCP being removed for a station upgrade.

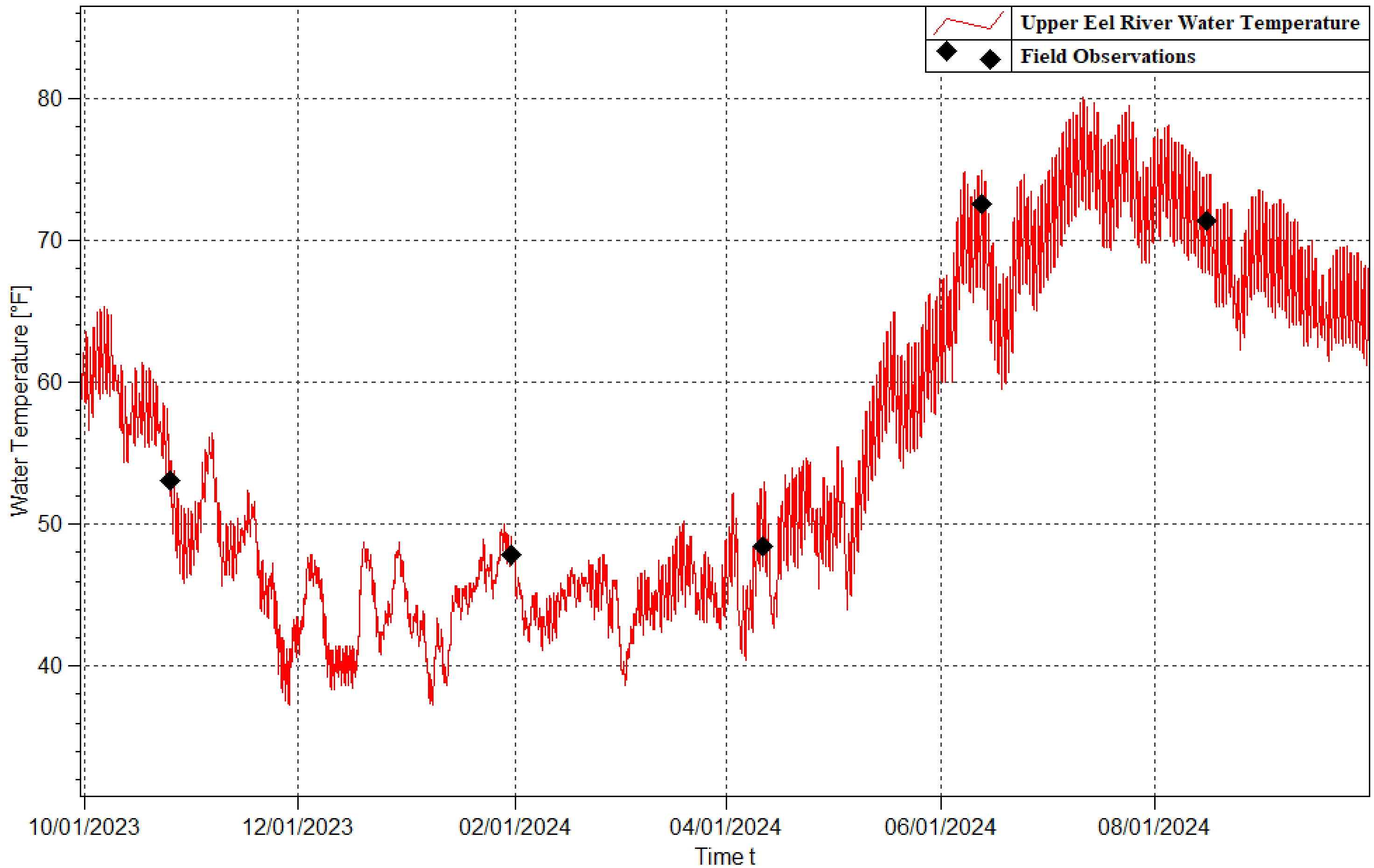

Figure 8. Water Year 2024 Upper Eel River water temperature.

2.9 Remarks

All discharge measurements used for this computation were "Good." Since the quality of the measurements indicates computed record quality, "Good" is the highest rating we can assign to any sub-periods within the computed record. All computed discharges beyond the extrapolated range of their ratings are considered "Estimated," though no periods exceeded the extrapolated range of the ratings in WY2024.

The water temperature record is considered "Good" for the entire period.

The turbidity record is considered "Good" for the entire period.

Discharge records computed by: S. Pittman (February 2025)

Water temperature records computed by S. Christie (December 2024)

Records reviewed by: G. Hales (February 2025)

Station report reviewed by: G. Hales (February 2025)

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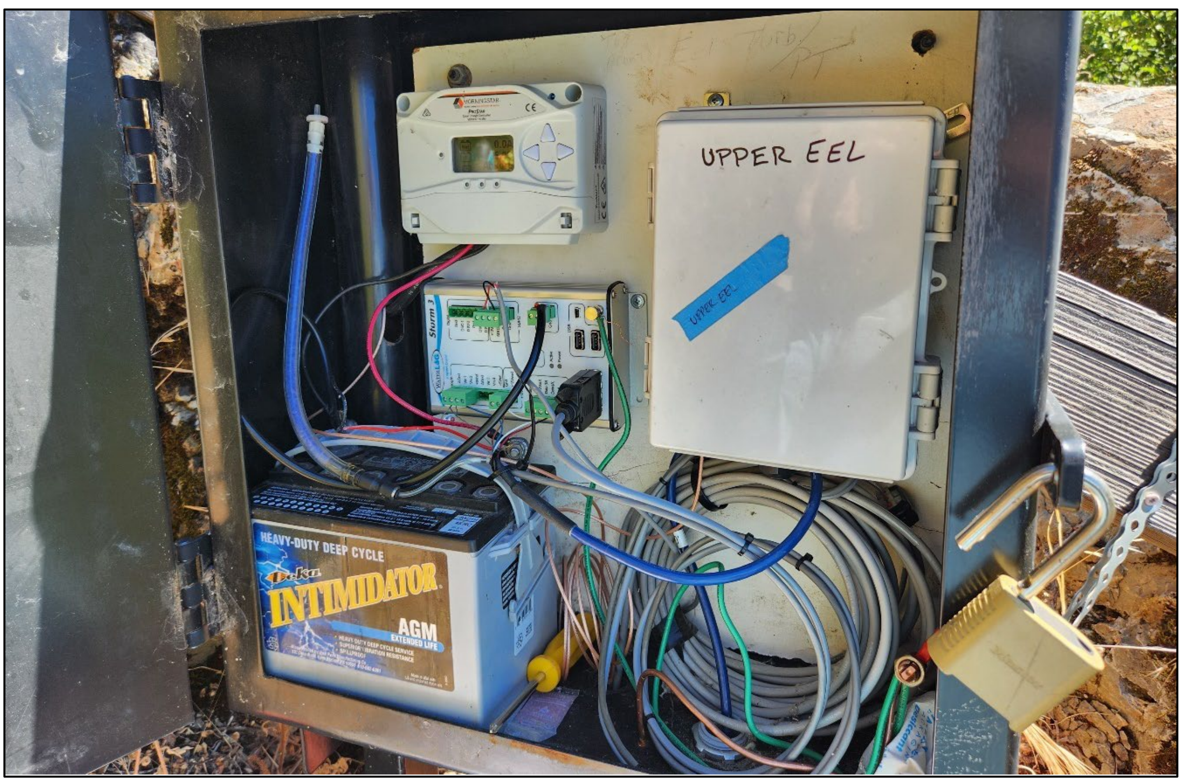
4 SITE PHOTOGRAPHS

Photograph 1. Downstream aerial view of the gaging pool on December 30, 2021 at a flow of approximately 425 cfs. The solar panel for the gage can be seen atop the bedrock outcrop along the right bank (white circle). The primary discharge measurement section is indicated by the orange line.

Photograph 2. Upstream view of the Upper Eel River primary gaging pool and the primary discharge measurement section. The orange arrow indicates the gage house solar panel. Photo date is May 11, 2023, Measured discharge was 401 cfs.

Photograph 3. Gage pool showing staff plate (yellow arrow), DTS-12 turbidity/temperature sensor (blue arrow) and primary and backup pressure transducers (red arrow). The gage solar panel can be seen above the rock outcropping. Photo taken on January 30, 2024, and flow was measured at 488 cfs.



Photograph 4. Inside the gage house showing new Storm 3 DCP (middle left), solar panel charge controller (upper left), Picovale satellite transmission box (right), and 12V battery hooked to solar panel (lower left).

Photograph 5. Beaver dam complex approximately 350 feet downstream from the gage. This dam is diverting flow to the left where it encounters several small riffles before reaching the next beaver dam complex approximately 600 feet further downstream. Photograph taken on August 15, 2024, and flow was measured at 14.0 cfs.

Photograph 6. The same beaver dam complex shown in the previous photograph on October 14, 2024, after being notched to record influence on stage in the gaging pool. Determining the amount that stage at the gage is influenced by the beaver dam provides vital information for correcting the gage height record. Flow was measured at 13.2 cfs on this day.

Photograph 7. On January 22, 2024, US Fish and Wildlife Service provided jet boat assistance to collect a high flow measurement using an ADCP mounted to a riverboard. Measured discharge was 2,740 cfs, later adjusted by drainage area to 2,660 cfs. This measurement was taken at approximately 1.7 miles downstream from the gage site.

Document Content(s)