Potter Valley Project Ad Hoc Committee

Water Supply Summary Outcomes

27 September 2019

Contents

Document Purpose and Outcomes

The purpose of this document is to capture the work of the Potter Valley Project Ad Hoc Committee's Water Supply Working Group to evaluate options for operations of the Potter Valley hydroelectricity project. The goal of the working group is to identify water supply issues and viable potential futures for the Potter Valley Project for Congressman Jared Huffman's Ad Hoc Committee to inform discussions for a two-basin solution for the Eel and Russian River watersheds. This document is a summary of an extensive body of work available in a compiled report of Results of Initial Water Supply Modeling for Potter Valley Project and Russian River Alternatives developed in May 2019 for the Water Supply Working Group.

This document consists of three major sections: 1) an overview of the objectives and water supply scenarios considered; 2) water supply scenarios that appear viable for a two-basin solution; and 3) other water supply scenarios that the work group evaluated but did not appear viable for a two-basin solution.

Section 1 | Water Supply Overview

Objectives

In spring 2017, Congressman Jared Huffman convened the Potter Valley Project Ad Hoc Committee for the purpose of identifying possible areas of agreement among a diverse group of stakeholders concerning the Potter Valley Hydroelectric Project in advance of the April 2017 start for the project's Federal Energy Regulatory Commission (FERC) relicensing process. Ad Hoc participants include representatives from the project-owner Pacific Gas & Electric Company; local, state, and federal agencies; local water districts; tribes; and non-governmental organizations.

The Congressman introduced goals and principles for a two-basin solution**,** which focuses on crafting a future for the Potter Valley Project that encompasses interests of both the Eel River and Russian River basins. The Ad Hoc Committee's goal is to agree on potentially viable water supply and fish passage scenarios for the future of the project that build on technical working groups' recommendations and the associated opportunities and impacts of the scenarios. In addition to the Water Supply Working Group, a Fish Passage Working Group has also been assessing fish passage technology options.

The charge of the Ad Hoc Committee's Water Supply Working Group is to identify water supply issues on the Eel and Russian Rivers, identify viable near- and longer-term solutions, and inform potential futures for the Potter Valley Project. The Water Supply Working Group's objectives are to:

- Address water supply needs and demands across both basins
- Consider future hydrographs
- Articulate existing constraints (costs)
- Maximize benefits of coordinating operations, timing, and flow regimes along with biological considerations for flow release timing, water quality, and water temperature
- Evaluate a small number potential scenarios that consider fish passage to inform Ad Hoc decision making

The Water Supply Working Group established objectives; developed and reached consensus on a water and operations model (HEC-ResSim) to use for comparing consequences of different project operating scenarios; conducted many iterations of model calibration, review, and recalibration; and ran the model to evaluate several key scenarios, described below.

The **Water Supply Modeling Subgroup**, a subset of the Water Supply Working Group, spent substantial time on the modeling approach and analyses. The subgroup informed and consulted with the full working group on key parameters, including modeling assumptions, validation, and scenario development. Members of the subgroup included:

- Craig Addley, PG&E Consultant
- Chris Delaney, Sonoma Water
- Jared Emery, PG&E Consultant
- Michelle Lent, PG&E Water Management
- Scott McBain, Round Valley Indian Tribes Consultant
- John Mendoza, Sonoma Water
- Peter Pyle, Round Valley Indian Tribes Consultant
- Don Seymour, Sonoma Water
- Andres Ticlavilca, National Marine Fisheries Service Contractor.

This document summarizes the modeling results for each of the water supply scenarios. As needed, please refer to the glossary of terms at the end of this document.

Water Supply Scenarios Summary

The Water Supply Working Group identified a number of scenarios for consideration and then narrowed to five "scenarios" to model and evaluate: Potter Valley Project decommission under current operations (scenario 1), run-of-the river (scenario 2), Potter Valley Project Decommission with Lake Mendocino operating with Forecast Informed Reservoir Operations (FIRO) and draft Fish Flow EIR Operations (scenario 3), Potter Valley Project revised operations (scenario 4), and Potter Valley Project Decommission with Coyote Dam Raising (scenarios 5A, 5B, and 5C).

Summary Matrix

This matrix provides a summary of the water supply scenarios that the working group explored as part of this process.

Modeling Scenarios		**Russian River & Lake Mendocino Alternatives**		
		Current Operations	Lake Mendocino FIRO (Hybrid) with Fish Flow EIR Operations[5]	Raise Coyote Valley Dam[6]
Potter Valley Project Alternatives	Current Operations[1]	Baseline: Existing Climate (n=1)		
		Baseline FC: Future Climate (n=4)		
	PVP Revised Operations[2]	Scenario 4: Existing Climate (n=1)		
	Run-of-the-River[3]		Scenario 2: Existing Climate (n=1)	
			Scenario 2FC: Future Climate (n=4)	
	PVP Decommission[4]	Scenario 1: Existing Climate (n=1)	Scenario 3: Existing Climate (n=1)	Scenario 5A, 5B, and 5C: Preliminary analysis with Existing Climate

Scenarios 2 & 4 show promise in meeting two-basin water supply goals

GREEN boxes are scenarios that are run using existing (historic) hydrology (WY1911-WY2017). Green boxes (scenarios) will be compared with each other.

Pink boxes are scenarios that are run using hydrology developed from 4 future climate models and are run into the future (CY2006-CY2099) rather than historical. At this point, the only comparisons will be 1) Baseline Future Climate (FC) with Baseline, and 2) Scenario 2FC with the Scenario 2 (no other scenarios modeled for climate change except Baseline and Scenario 2).

[1] Current operations: Scott Dam and Cape Horn Dam stays in place, flows and diversions based on 2002 Biological Opinion RPA flows, maximum diversion=170 cfs based on model calibration mass balance. Russian River flows based on 2008 Biological Opinion RPA and 1986 Decision 1610, existing flood control rule curve (no FIRO).

[2] PVP Revised Operations Assumptions: 1) allow discretionary PVP diversions when Scott Dam is spilling up to 170 cfs, 2) reduce Eel River minimum instream flow "floor" by up to 50 cfs in winter and spring, and 3) reduce minimum flows on the East Fork Russian River year-round by different amounts for different water year types.

[3] Run-of-the-River Assumptions: Remove Scott Dam; continue Van Arsdale diversions with a maximum PVP diversion of 300 cfs; achieve unmet Potter Valley Irrigation District (PVID) demands (up to 15,320 ac-ft) via PVID pump back from Lake Mendocino.

[4] PVP Decommission Assumptions: Scott Dam, Cape Horn Dam, and PVP Diversion would be completely removed, no water diversions from Eel River to Russian River, Eel River flows would be unimpaired.

[5] Lake Mendocino FIRO and Fish Flow EIR Assumptions: Maximum allowed reservoir elevation during November-March flood reserve space raised from 68,400 ac-ft to 80,050 ac-ft. Reduces Lake Mendocino releases in all years except driest year by up to 80 cfs. Achieve unmet Potter Valley Irrigation District (PVID) demands (up to 15,320 acre-feet) via PVID pump back from Lake Mendocino.

[6] Three analyses conducted: (1) Analysis of implementing the current design raise of Coyote Valley Dam (35 ft) under existing release requirements, (2) analysis of implementing the current design raise of Coyote Valley Dam (35 ft) under Fish Flow EIR and FIRO releases, and (3) a preliminary analysis of needed storage to avoid draining the reservoir during series of drought years, assuming historic Lake Mendocino inflow (with no PVP diversions), Fish Flow EIR demands from Lake Mendocino, no Lake Mendocino flood control reserve space, and achieve unmet Potter Valley Irrigation District (PVID) demands (up to 15,320 ac-ft) via PVID pump back from Lake Mendocino.

Results

- **Scenarios 2 and 4** show promise in meeting two-basin solution water supply goals
- **Scenario 1** does not appear to meet two-basin solution water supply goals
- **Scenario 3** improves upon Scenario 1, but still does not appear to meet two-basin solution water supply goals
- **Scenario 5** requires much more storage in Lake Mendocino to meet two-basin solution water supply goals
- **Climate Change Scenarios** show higher winter flows, lower spring and summer flows, and greater reservoir depletion frequency.

The two scenarios that show promise in meeting the two-basin solution water supply goals are summarized here. Modeling results of other scenarios are captured in Section 3: Other Water Supply Scenarios.

Run-of-the-River Scenario 2 – Brief Description

Scenario 2 assumes removal of Scott Dam and maintains transbasin diversion at Cape Horn Dam and that diversions to the Russian River are limited to run-of-the-river (a seasonal diversion in the winter and early spring when water is more abundant in the Eel River). Russian River operations use the preferred alternative in the draft Fish Flow EIR (instead of Decision 1610). The diversion does not occur during low flow periods (e.g. summer and fall). The scenario assumes a substantial capital improvement project to provide water supply from Lake Mendocino to the Potter Valley Irrigation District (pumpback). The maximum PVP diversion amount assumed in the HEC-ResSim model increases from 170 cfs up to 300 cfs.

Modeling indicates average flows below Scott Dam would generally be higher in winter, spring, and late fall; flows during summer and early fall months would be unimpaired and generally lower that baseline operations (minimum RPA flows). Lake Mendocino would experience a 3% increase in annual inflows, and storage depletion and low points are the same as the baseline scenario. Russian River average summer and fall flows decrease due to draft Fish Flow EIR release requirements being lower than baseline operations.

Revised Operations Scenario 4 – Brief Description

Under Scenario 4, the Potter Valley Project stays in place, but refines minimum flow requirements and diversions. Scott Dam releases and PVP diversion are updated to allow more discretionary diversions when Scott Dam is spilling, reduces minimum flow requirements below Cape Horn Dam (E-11) in winter, and reduces minimum instream flow requirements in the East Branch Russian River year-round.

Modeling indicates increased average and minimum end-of-the-year storage at Lake Pillsbury due to reduced water demands below Cape Horn Dam at E-11 and reduced flows on the East Branch Russian River. This scenario predicts a small reduction in spring Eel River flows. Lake Mendocino has annual inflow increases of 4% and storage depletion is nearly the same as baseline conditions. The Russian River experiences virtually no changes in summer and fall flows. Average Potter Valley Project diversions increase by about 7%, but minimum annual diversions decrease by 11%. Potter Valley Irrigation District May-October shortfalls are the same, and years with May-October deliveries falling below 15,000 acre-feet decreases from 2 years to 1 years over the 1911-2017 period of record.

Understanding the Model

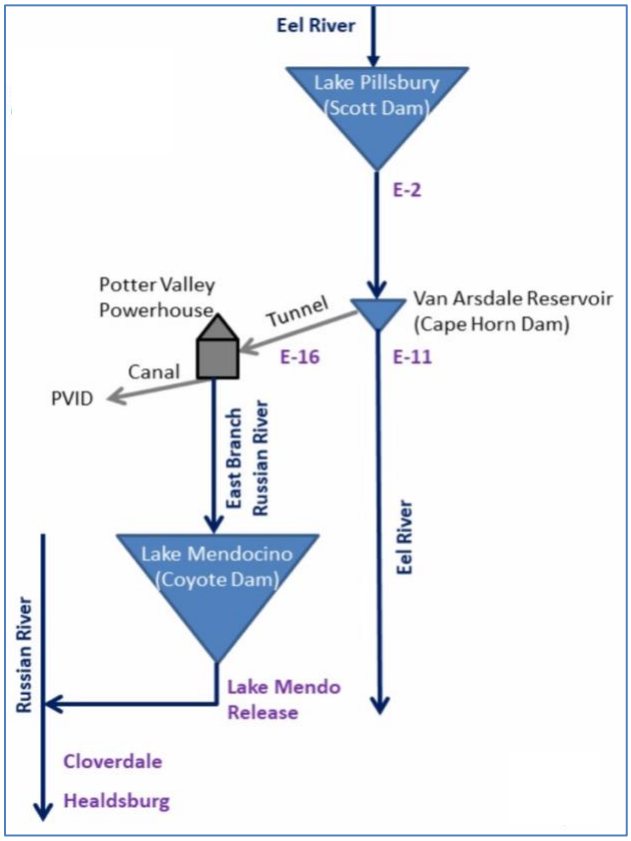
Model Validation

The Water Supply Modeling Subgroup performed a model validation to ensure that the model accurately portrays performance metrics under existing operational conditions. As a result, the Water Supply Working Group has confidence that the model accurately portrays the scenarios to a level outputs can be used for water supply and ecological evaluations on both the Eel River and Russian River basins.

Focal Model Junctions

These junctions represent critical data points in the model. Results and findings may often refer to these junctions.

1. Lake Pillsbury
2. Below Scott Dam (E-2)
3. Below Van Arsdale Reservoir (E-11)
4. Potter Valley Powerhouse
5. Lake Mendocino
6. Lake Mendocino Release
7. Russian River at Cloverdale
8. Russian River at Healdsburg



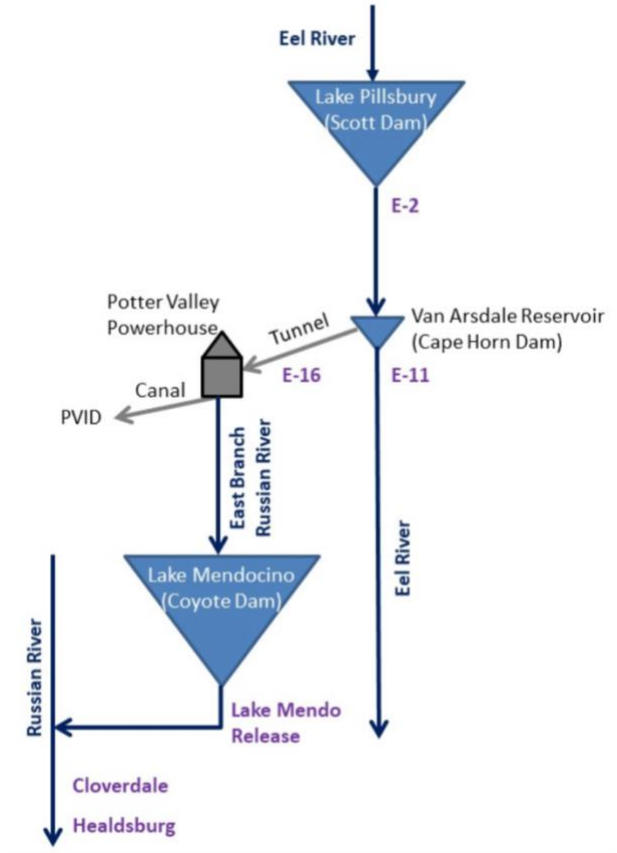
Section 2 | Scenarios Indicating Viability for Two-Basin Solution

Baseline Scenario

The baseline condition can be used to compare to other scenarios.

Conditions

- Current operations on the Russian River
- Current Operations on the Eel River



Key Assumptions

Eel River

- Current minimum instream flows based on 2002 PVP Biological Opinion RPA flows.
- Historical Cardno hydrology for Lake Pillsbury inflow (no climate change).
- Cardno 2018 estimates of daily unimpaired tributary accretion between E-2 and E-11.
- 2017 Block Water hydrograph released from slide gate, triggered when E-11 flows drop below 250 cfs after April 1.
- Maximum PVP diversion capacity = 170 cfs to best represent historical simulated volumetric mass balance for discretionary power generation diversions (full capacity is 300 cfs; current maximum rated capacity is 240 cfs).
- Regression equation used for the timing of Scott Dam gate closure.
- Drought, maintenance, and testing flow variances excluded.
- Storage based on Lake Pillsbury 2016 bathymetric survey (water supply storage capacity is 76,876 ac-ft).
- Based on the model verification, the PVP model may exhibit some bias in accretions between Scott Dam and Cape Horn dam in the spring of some years due to downstream gage error- this translates into over/under estimate of flows below Van Arsdale (E-11) that is consistently applied to all scenarios.
- Buffers for minimum instream flows range from 5 cfs to 20 cfs below E-11 (Van Arsdale), depending on the magnitude of the minimum instream flow. Flow buffer for meeting minimum instream flows on the East Fork Russian River at the E-16 PVP diversion are always 5 cfs. These flow buffers are for all scenarios where applicable.
- Calpella reach demands, which includes PVID demands, are approximately 8,600 acre-feet annually.

Russian River

- Flow source to Lake Mendocino = Unimpaired Flows + modeled PVP diversions – Calpella reach loss.
- Historic unimpaired flows computed using USGS Basin Characterization Model.

- Storage based on Lake Mendocino 2001 bathymetric survey (maximum water supply storage capacity is 111,000 ac-ft).
- Minimum instream flow below Lake Mendocino based on the 2008 Russian River Biological Opinion RPA and 1986 Decision 1610.
- Minimum flood control releases based on existing ACOE rule curve (no FIRO).
- Hydrologic index used for minimum flow releases based on 1986 Decision 1610 (cumulative inflow to Lake Pillsbury).
- Assumptions for losses in the East Branch Russian River include 8,600 ac-ft loss from E-16 to Calpella and none from Calpella to Lake Mendocino.
- Buffer for minimum instream flows below Lake Mendocino range from 5 cfs to 20 cfs, depending on the time of year and river reach, and are consistently used for all scenarios.

Run-of-the-River (Scenario 2)

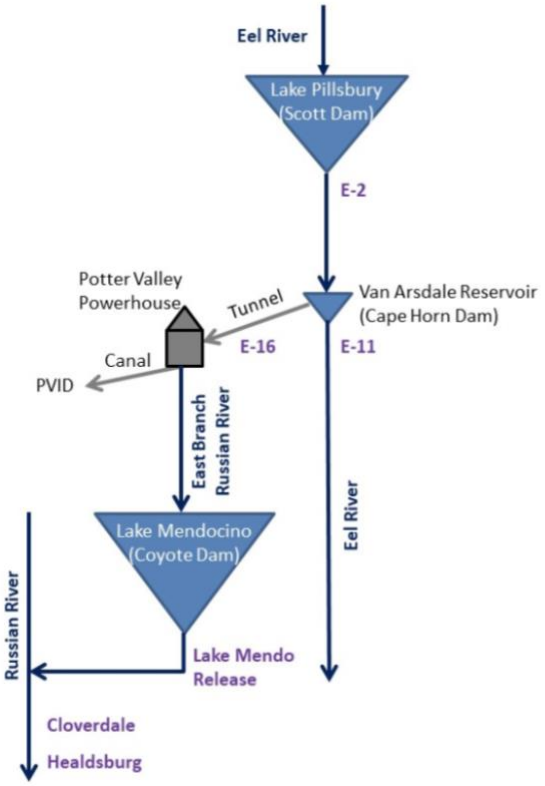
Conditions

- Scott Dam is removed and PVP diversions to the Russian River are limited to run of river (seasonal diversions in winter and early spring when flows on Eel River are higher).
- Russian River Operations utilize preferred alternative presented in the Fish draft Flow EIR instead of D1610.
- The PVP diversion remains at the Cape Horn Dam location.
- The PVP diversion only occurs when existing RPA minimum instream flows are being met below Cape Horn Dam (e.g. summer and fall).
- The modeled PVP diversion amount is increased from 170 cfs up to 300 cfs under the assumption that capital projects have been implemented to optimize and improve the reliability of the diversion.
- A significant capital project would be constructed to provide water supply from Lake Mendocino to the Potter Valley Irrigation District. This would require a pump station built at Lake Mendocino and booster pumps along a 13-14 mile pipeline that would be constructed to pump water upstream to Potter Valley during the irrigation season. (Note: Cost estimates for this capital improvement project have not been calculated.)

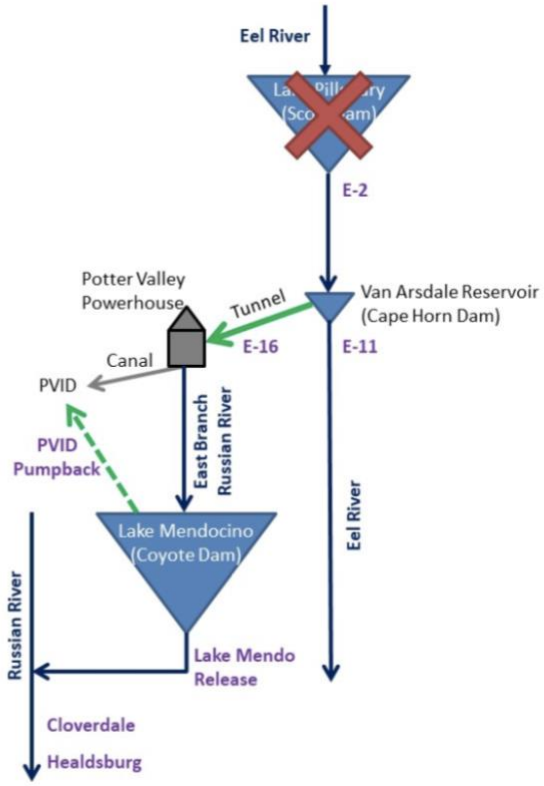
Results Overview

- Flow below Scott Dam would generally be higher in winter, spring, and late fall; flows would be lower during summer and early fall months (unimpaired) compared to baseline operations (existing RPA minimum flows), dipping as low as 10 cfs in September under median conditions.
- Flow below Cape Horn Dam flows are slightly lower than Scenario 1 (decommissioning) in winter months due to an increased PVP diversion (most typically 130 cfs), then slightly lower in late spring and summer months once the PVP diversion ends due to unimpaired flow conditions often being lower than existing minimum RPA flows.
- Lake Mendocino average annual inflow increases by 3%.
- Lake Mendocino years where storage depleted is the same (1 year), and average low point storage is the same.
- Russian River average summer and fall flows decrease due to Fish Flow EIR flows.
- Increased average PVP diversions (6%), but minimum PVP diversions decrease by 64%.
- PVID May-October water shortfalls increase, but years with May- October deliveries less than ~15,000 ac-ft is the same.
- Scenario 2 shows promise in meeting two-basin water supply goals.

Baseline:



Scenario 2 – Run of River+ Re-Op Lake Mendocino:



Key Assumptions

Eel River

Same assumptions as Baseline, except:

- Zero storage capacity at Lake Pillsbury (Scott Dam is removed); Cape Horn dam remains in the model.
- No Block Water hydrographs released because Scott Dam is removed.
- Maximum PVP diversion capacity applied is 300 cfs, which assumes full tunnel capacity can be used. Assumes major infrastructure improvements would be made to the diversion facility to increase PVID diversion capacity.
- The PVP diversion flows can range from 30 cfs - 300 cfs when occurring. PVP diversions occur when flows at Cape Horn Dam are greater than [E-11 minimum flow] + [5 cfs buffer] + [30 cfs diversion threshold]. They are equal to [Flows at Cape Horn Dam] – [E-11 minimum flow] – [5 cfs buffer] or 300 cfs, whichever is less.

Russian River

Same assumptions as Baseline, except:

- Potter Valley Irrigation District (PVID) water needs partially met by increased seasonal PVP diversion capacity of 300 cfs.
- Rule set applied to PVID diversions: PVID water needs not met by seasonal PVP diversions and local runoff are provided via pump back from Lake Mendocino up to 15,320 ac-ft, ranging from 0 cfs to 70 cfs between April 15 and October 15 (based on 2016 PVID reported total demand). If Lake Mendocino storage is less than 15,000 ac-ft, the model does not allow pump back to occur.

- Russian River flows are based on the draft Fish Flow EIR, which analyzed a lower minimum flow compared to the D1610 flow regime. The difference in D1610 and Fish Flow EIR flow regimes varies by month and water year condition, ranging from a difference of 0 cfs to 80 cfs. The greatest differences occur in the wettest year types during summer months. Both flow regimes have a floor of 25 cfs during critical water supply year types.
- Maximum conservation storage of Lake Mendocino is assumed to be equal to the flood pool encroachment (FIRO guide curve) that was approved for the water year 2019 FIRO major deviation to the Water Control Manual, which allows for additional winter and fall water supply storage (68,400 -80,050 ac-ft). Modeling does not simulate forecast based operations therefore storage levels, releases and downstream flows could differ from the simulation results.

Climate Change Scenario (Scenario 2FC)

The run-of-the-river scenario was modeled under both historical hydrology (Scenario 2) and hydrology developed under four projected future climate conditions (Scenario 2FC). Climate change projections include wetter winters, drier springs, and less snowmelt, resulting in slightly reduced summer inflows and greatly increased winter inflows on both rivers.

Run-of-the-river scenario in future climate conditions (Scenario 2FC) versus historical hydrology (Scenario 2):

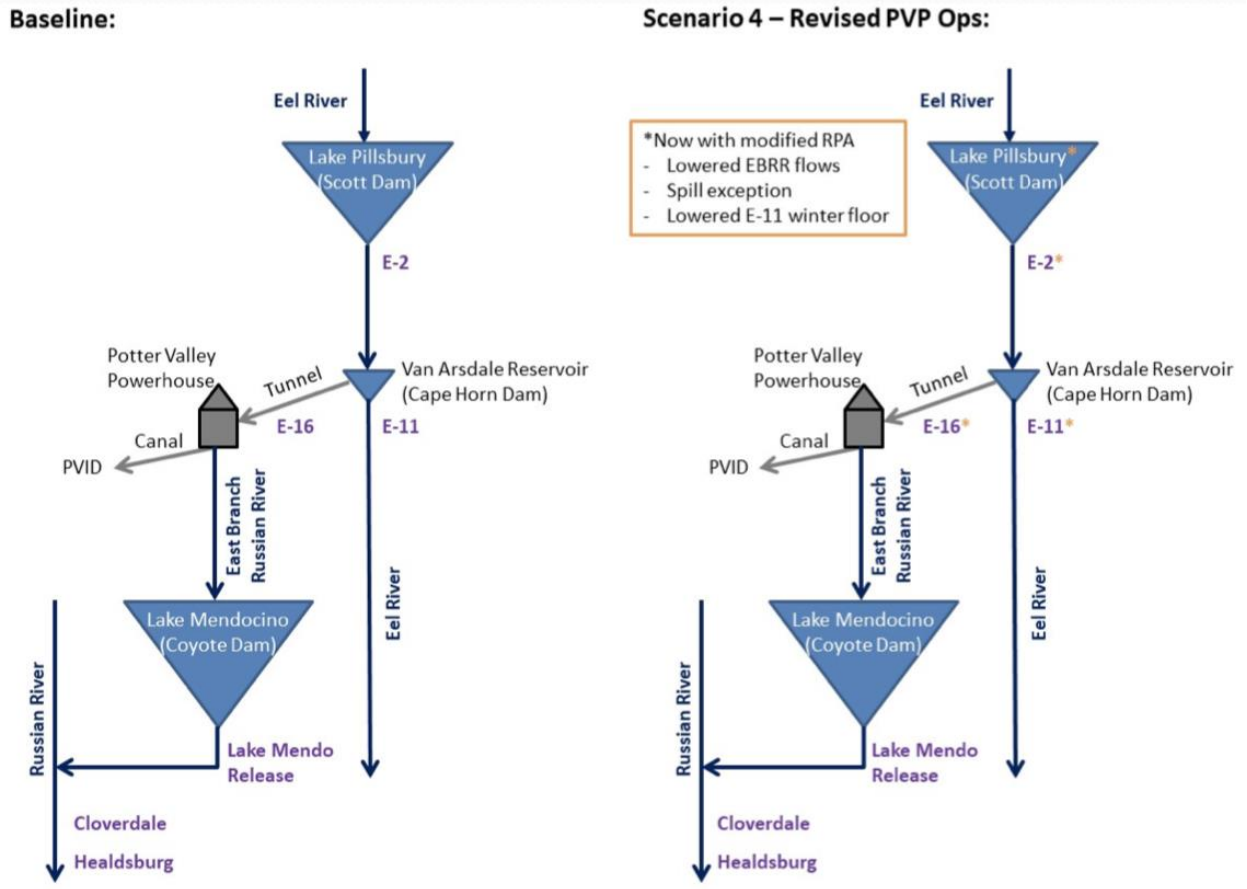
- Average Eel River summer flows at E-11 decrease from 5% to 28% (lower spring runoff and summer baseflows).
- Average Eel River fall flows at E-11 increase from 41% to 135% (larger winter storms).
- Lake Mendocino average low point decreases from 30% to 34%.
- Lake Mendocino depletion frequency is greater (from 1 year to 1-5 years depending on the four climate change conditions).
- PVID diversions decrease from 7% to 10%.

While climate change projections shift the magnitude and timing of runoff, and thus reduces reliability of water supply, the differences are modest enough that climate change can likely be accommodated in future scenario evaluations that can meet two-basin water supply goals.

Potter Valley Project Revised Operations (Scenario 4)

Conditions

- PVP remains in place with modified minimum flow requirements and diversion rules.
- Scott Dam releases and PVP diversions are updated to reflect 1) more discretionary diversions in winter when Scott Dam is spilling (more winter diversion releases from Scott Dam), 2) lower E-11 floor in winter (lower winter releases from Scott Dam to meet minimum Eel River instream flow requirements), and 3) lower instream flow requirements in the East Branch Russian River year-round (lower releases from Scott Dam to meet EBRR flow requirements).



Results Overview

- Increased average and minimum end of the year storage at Lake Pillsbury due to reduced demands from E-11 and EBRR minimum flows, reservoir depletion no longer occurs (5 years to 0 years)
- Small reduction in spring flows in Eel River flows, slight decrease in average release volume
- Lake Mendocino average annual inflow increases by 4%
- Lake Mendocino years where storage depleted is nearly the same (1 year to 2 years), and minimum end of the year storage is nearly the same (+2%)
- Virtually no change in Russian River average summer and fall flows
- Increased average PVP diversions (7%), but minimum PVP diversions decreased by 11%
- PVID May-October water shortfalls are the same, and years with May- October deliveries less than ~15,000 ac-ft decreases from 2 to 1

- Scenario 4 shows promise toward meeting two basin water supply goals but would require fish passage at Scott Dam.

Key Assumptions

Eel River

Same assumptions as Baseline, except the following two conditions.

(1) Additional PVP diversions are allowed to occur when the Lake Pillsbury water level is spilling, even when storage is below the Target Storage Curve. Under the current RPA (baseline operations), discretionary diversions from the Eel River to the Russian River cannot be made when Lake Pillsbury storage is below the Target Storage Curve (TSC) for the given water year type (Figure SC4-1a). Only the required minimum flow for the East Branch Russian River, PVID's contract amount and a 5 cfs buffer can be diverted under those circumstances. In Scenario 4, there would be an exception to this rule when Lake Pillsbury is spilling: discretionary diversions would be allowed during the spill even if the reservoir's storage is under the TSC. This would likely allow additional diversion in the spring of wetter water years, with limited impact to Eel River flows while delivering cold water to Lake Mendocino partially offsetting lower summer transfers due to reduced summertime minimum instream flow requirements in the East Fork Russian River.

(2) The Eel River below Cape Horn Dam minimum instream flow floor is lowered by up to 50 cfs in the spring and winter to better match natural flow patterns during drier years. Under baseline operations, aside from set summer flows, the required minimum Eel River flows below Van Arsdale (E-11) vary daily between a floor and a cap and are indexed to the calculated unimpaired flow at Van Arsdale. The winter/spring floor (Dec 1- May 15) on minimum Eel River flows below Van Arsdale (E-11) is 100 cfs in all water year types (Figure SC4-2a). In dry years, this can exceed inflows to Lake Pillsbury and deplete storage in the reservoir. Additionally, it does not mimic natural hydrology, setting an artificially high flow rate when unimpaired flows in the Eel River would be lower. In Scenario 4, the E-11 winter/spring floor would be reduced from 100 cfs to 50 cfs. The E-11 cap on required minimum flows would remain the same. While the E-11 floor spring recession would be modified slightly to account for the lower starting point, the summer flows would remain the same.

Russian River

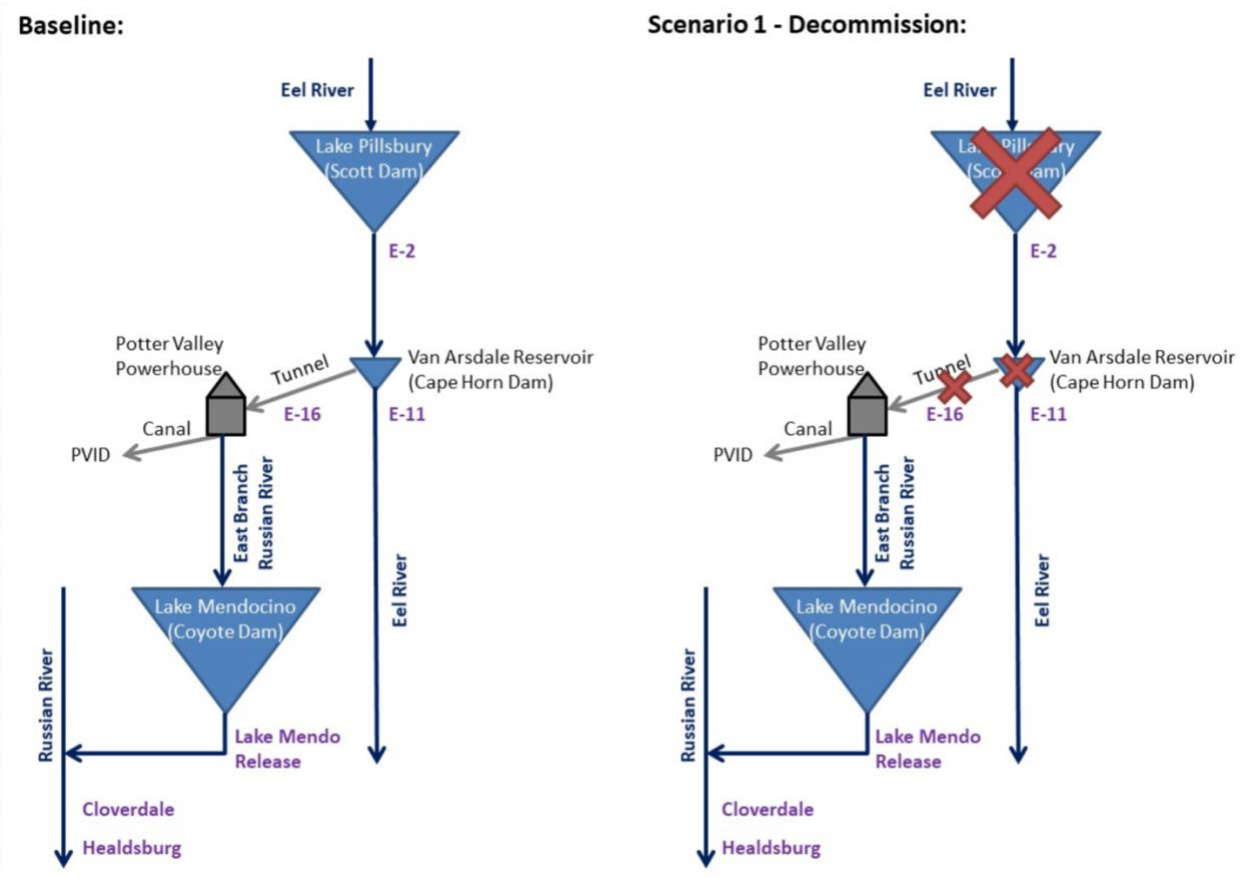
Same assumptions as Baseline, except: required releases to East Branch Russian River are lowered, which supports higher storage in Lake Pillsbury (the additional diversions allowed by the spill exception discussed earlier are expected to make up for some of the reduction, while not impacting storage). The required summer flows are reduced from 75 cfs to 35 cfs for the Normal year type and remain at 25 cfs for the Dry year type. In both Normal and Dry year types, the winter/spring required flows are reduced from 35 cfs to 20 cfs. The rarely triggered Critical water year type remains 5 cfs.

Section 3 | Other Water Supply Scenarios

Project Decommission under Current Lake Mendocino Operations (Scenario 1)

Conditions

- Current operations on Lake Mendocino and the Russian River
- Full decommissioning of Potter Valley Project, including all dams and diversions



Results Overview

- Unimpaired flows on Eel River, higher average summer flows (+38%), higher average fall flows (+39%), some years have lower summer and fall flows because unimpaired<RPA flow.
- Lake Mendocino average annual inflow decreases by 44%.
- Lake Mendocino years where storage depleted greatly increased (1 year 53 years).
- Russian River average summer and fall flows decrease dramatically due to depleted reservoir ceasing releases.
- Large PVID water shortfalls (all 107 years).
- **Scenario 1 does not meet two-basin solution water supply goals.**

Key Assumptions

Eel River

Same assumptions as Baseline, except:

- No Eel River storage.
- No Block Water hydrographs released due to full PVP decommissioning.
- Maximum Diversion Capacity = 0 cfs due to full PVP decommissioning (including Cape Horn Dam and Diversion).

Russian River

Same assumptions as Baseline, except:

- No Eel River diversions to East Fork of the Russian River.
- Potter Valley Irrigation District (PVID) demands met, to the extent possible, by local sources only (no pump back from Lake Mendocino).

Project Decommission with Lake Mendocino operating with FIRO and Draft Fish Flow EIR Operations (Scenario 3)

Conditions

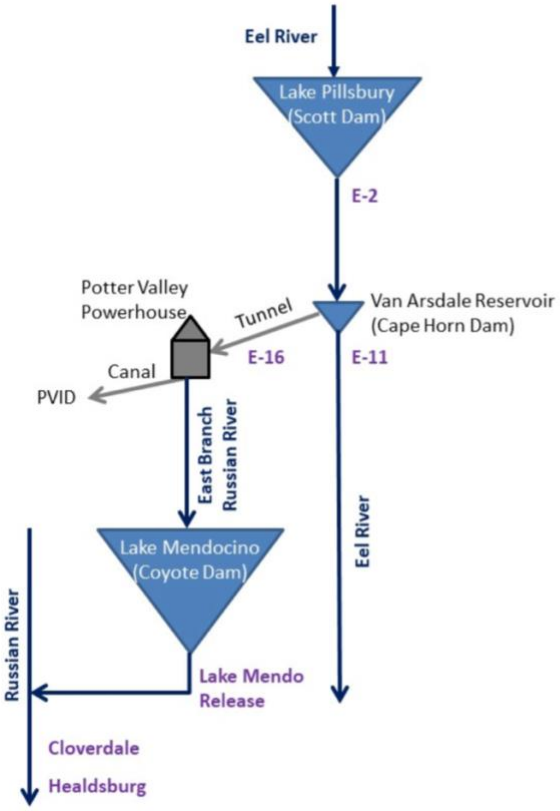
- Russian River operations updated to meet Lake Mendocino FIRO and draft Fish Flow Operations.
- Full decommissioning of Potter Valley Project, including all dams and diversions.

Results Overview

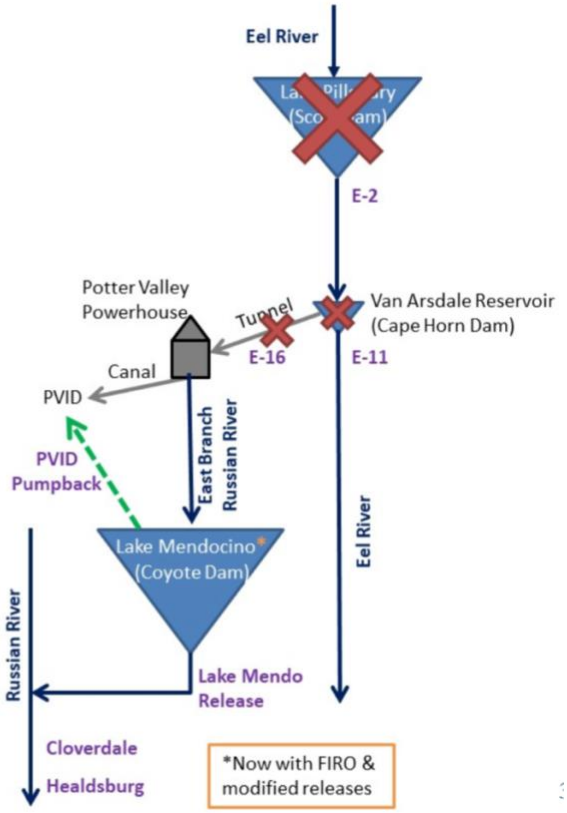
Eel River same results as Scenario 1, but:

- Lake Mendocino average annual inflow still decreases by 44%.
- Lake Mendocino years where storage depleted greatly increased (1 year 13 years), but not as much as Scenario 1 (53 years).
- Russian River average summer and fall flows still decrease dramatically due to depleted reservoir ceasing releases and lower Fish Flow EIR releases, even more than Scenario 1.
- Large PVID water shortfalls, 22 years where pump back is less than ~15,000 acre-feet.
- **Scenario 3 improves upon Scenario 1, but still doesn't meet two-basin water supply goals.**

Baseline:



Scenario 3 – Decommission + Re-Op Lake Mendocino:



Key Assumptions

Eel River

Same assumptions as Baseline, except:

- No Eel River storage.
- No Block Water hydrographs released due to full PVP decommissioning.
- Maximum Diversion Capacity = 0 cfs due to full PVP decommissioning.
- No RPA flow releases due to full PVP decommissioning.
- Note: Also the same as Scenario 1

Russian River

Same assumptions as Baseline, except:

- Potter Valley Irrigation District (PVID) diversions and/or storage from local runoff, with pump back from Lake Mendocino.
- Russian River flows are based on the draft Fish Flow EIR, which includes different flow ranges as compared to the D1610 flow regime. The difference in D1610 and draft Fish Flow EIR flow regimes varies by month and water year condition, ranging from a difference of 0 cfs to 80 cfs. The greatest differences occur in the wettest year types during summer months. Both flow regimes have a floor of 25 cfs during critically dry year types.
- Maximum conservation storage of Lake Mendocino is assumed to be equal to the flood pool encroachment (FIRO guide curve) that was approved for the water year 2019 FIRO major deviation to the Water Control Manual, which allows for additional winter (November 1 through March 1) water supply storage maximum from 68,400 ac-ft to 80,050 ac-ft. Modeling does not simulate forecast based operations therefore storage levels, releases and downstream flows could differ from the simulation results.

Project Decommission with Coyote Dam raised 35 feet (Scenario 5A and 5B) and raised 80-feet (Scenario 5C)

Conditions

The analysis addresses two questions: (1) what is the effect of implementing the current design raising of Coyote Valley Dam (35 ft) under existing releases (Scenario 5A) and Fish Flow EIR/FIRO (Scenario 5B), and (2) how much total storage would be needed in Lake Mendocino to prevent the reservoir from drying up under the worst sequence of drought years over the 1911-2017 period of record.

Results Overview (Scenario 5A)

- Unimpaired Eel River flows
- Lake Mendocino average annual inflow decreases by 44%.
- Lake Mendocino years where storage depleted greatly increased (1 year to 30 years).
- Russian River average summer and fall flows decrease dramatically due to depleted reservoir ceasing releases.
- Large PVID water shortfalls (increases from 2 to 38 years).
- **Scenario 5A does not meet two-basin solution water supply goals.**

Results Overview (Scenario 5B)

- Unimpaired Eel River flows
- Lake Mendocino average annual inflow decreases by 44%.
- Lake Mendocino years where storage depleted greatly increased (1 year to 25 years).
- Russian River average summer and fall flows decrease dramatically due to depleted reservoir ceasing releases.
- Large PVID water shortfalls (increases from 2 to 27 years).
- **Scenario 5B is better than Scenario 5A but does not appear to meet two-basin solution water supply goals.**

Results Overview (Scenario 5C)

- Unimpaired Eel River flows
- Assumptions are very simple; analysis only looks at reservoir storage as a metric
- Need to add more than 220,000 ac-ft of additional water supply storage (>80 ft dam raise, 336,000 ac-ft storage) to make Lake Mendocino reliable if no diversions from the Eel River
- Additional water supply needed is driven by long term droughts (1930s and 1990s); need to create a large enough reservoir that can provide multiple years of carry over storage
- Water Supply Subgroup analysis ignores additional flood storage space, such that 336,000 ac-ft is insufficient when flood control objective is included
- Meeting two basin solution goals would require substantially greater reservoir storage than existing storage (111,000 ac-ft to 336,000 ac-ft) and maximum design (186,000 ac-ft to 336,000 ac-ft), or 36 ft raise to ~80 ft total height

Glossary of Terms

2002 PVP Biological Opinion – Biological Opinion for the Potter Valley Project issued by the National Marine Fisheries Service (NMFS) to protect salmonids listed under the Endangered Species Act.

2008 Russian River Biological Opinion – Biological Opinion for Water supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers, the Sonoma County Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River watershed issued by NMFS.

ACOE – U.S. Army Corps of Engineers

Baseline operations – Current RPA flows, reservoir operations, diversions, and other conditions on both the Eel River and Russian River to meet the requirements of the respective 2002 and 2008 Biological Opinions.

BO TUC –Biological Opinion Temporary Urgency Change Petition, which SCWA is required to submit annually until Decision 1610 (see below) is permanently changed.

Block Water – 2,500 acre-ft of water to be released from Cape Horn Dam to the Eel River for fisheries purposes; established in the 2002 Biological Opinion.

Calpella Reach Losses – Water "losses" between E-16 and the USGS gage above Lake Mendocino due to PVP water use and other water losses.

CY – Calendar year (January 1 – December 31)

CVD – Coyote Valley Dam

D1610 (or 1986 Decision 1610) – State Water Resources Board decision that establishes minimum instream flow requirements in the Russian River and Dry Creek for fisheries and recreational purposes. These Russian River flows are higher than those in the draft Fish Flow EIR.

E-2 – Stream flow gaging location on Eel River immediately below Scott Dam; PGE operational compliance point.

E-11 – Stream flow gaging location on Eel River immediately below Van Arsdale Dam; PGE operational compliance point.

E-16 – Stream flow gaging location entering Potter Valley Powerhouse via the Eel River diversion; PGE operational compliance point.

FIRO – Forecast Information Reservoir Operations, relevant to Lake Mendocino flood control operations. In this report, FIRO is represented by a guide curve that is consistent with the 2019 Major Deviation to Lake Mendocino flood control operations.

Draft Fish Flow EIR – Draft Environmental Impact Report developed by the Sonoma County Water Agency to comply with the 2008 Russian River Biological Opinion (currently under review). Includes a proposed hydrologic index that relates minimum flows to cumulative inflow

and storage conditions at Lake Mendocino unlike the current index based on cumulative inflow into Lake Pillsbury. Proposed minimum flow schedule with flow rates generally lower than currently required.

Historical Cardno hydrology – Computation of Lake Pillsbury inflows and accretion between Scott Dam and Van Arsdale Dam by Cardno and Western Hydrology for the WY1911-2017 period of record

LM – Lake Mendocino

NMFS – National Marine Fisheries Service

PVID Pump back – Large pumps and pipeline from Lake Mendocino to (approx.) Potter Valley powerhouse to enable delivery of up to 15,140 ac-ft from Lake Mendocino to headgates of PVID canal system.

PVID – Potter Valley Irrigation District

PVP – Potter Valley Project

RPA – Reasonable and Prudent Alternative for the Potter Valley Project, which include Eel River flow requirements established in the 2002 Biological Opinion.

SCWA – Sonoma County Water Agency, now Sonoma Water

PVP Tunnel Capacity – maximum capacity is 320 cfs, maximum functional capacity is 240 cfs with fish screens, current operations model runs assume 170 cfs based on model calibration process, other scenarios assume various maximum diversion rates.

USGS -BCM hydrology – Unimpaired flow hydrology on the Russian River developed using the USGS Basic Characterization Model hydrologic model.

WRS – Warm Springs Dam

WY – Calendar year (October 1 – September 30)