

# **Folsom Dam Water Control Manual Update**

## ***Joint Federal Project, Folsom Dam***

**Public Workshop**

**October 29, 2015**

**Sterling Hotel**

**1300 H Street, Sacramento, CA**



**US Army Corps of Engineers**  
**BUILDING STRONG®**

# WELCOME & INTRODUCTIONS



# PURPOSE OF MANUAL UPDATE

- Revise operation rules for Folsom Dam to reduce flood risk based on the capabilities of the Folsom Joint Federal Project (JFP).
- Reflect operational capabilities created by improved weather forecasts.
- Potentially reduce the volume of flood control reservation in Folsom Reservoir at any particular time by comparison to the operations that have been in effect since '95



# OBJECTIVES OF MANUAL UPDATE

- Pass the Probable Maximum Flood while maintaining 3 feet of freeboard below the top of dam to stay within the dam safety constraints of the U.S. Department of Interior, Bureau of Reclamation.
- Control a 1/100 annual chance flow (“100-year flood”) to a maximum release of 115,000 cubic feet per second as criteria set by the Sacramento Area Flood Control Agency to support Federal Emergency Management Agency levee accreditation along the American River.
- Control a 1/200 annual chance flow (“200-year flood”) as defined by criteria set by the State of California (State) Department of Water Resources to a maximum release of 160,000 cubic feet per second, when taking into account all the authorized modifications within the American River Watershed.



# TODAY'S DISCUSSION

- Project Milestone Schedule
- Timeline for Close of Stakeholder Feedback prior to Draft NEPA / CEQA public release
- Present & Discuss Modeling Results and Effects of Alternatives, with Focus on:
  - Basin Wetness Alternative (Alt #2)
  - Forecast Alternative (Alt #3)



# PROJECT MILESTONE SCHEDULE

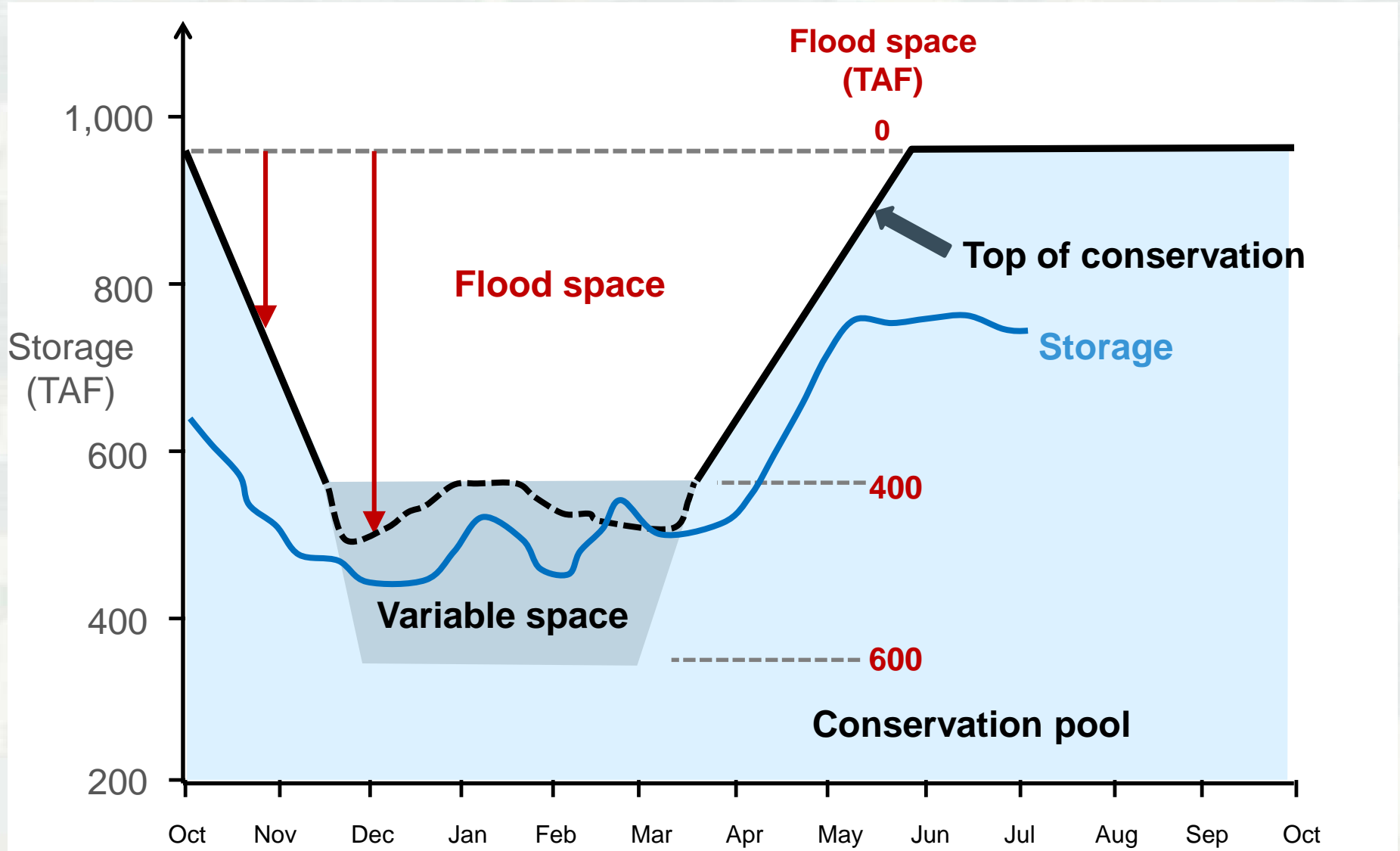
JANUARY 2016	TECHNICAL WORKSHOP: IN-BASIN MODELING RESULTS AND EFFECTS  USACE COMPLETES ENGINEERING REPORT
FEBRUARY 2016	PUBLIC WORKSHOP: TENTATIVELY RECOMMENDED ALTERNATIVE
FEBRUARY – JUNE 2016	USACE/PARTNER REVIEW; USACE-REQUIRED INDEPENDENT SAFETY ASSURANCE REVIEW  USACE COMPLETES DRAFT NEPA / CEQA DOCUMENTS
MAY – SEPTEMBER 2016	OBTAIN BIOLOGICAL OPINION (135-DAY REVIEW)
JUNE – AUGUST 2016	PUBLIC REVIEW OF <b>DRAFT</b> NEPA / CEQA DOCUMENTS
DECEMBER 2016 – JANUARY 2017	PUBLIC & ENVIRONMENTAL AGENCIES' REVIEW OF <b>FINAL</b> NEPA / CEQA DOCUMENTS



# BRIEF RECAP OF ALTERNATIVES

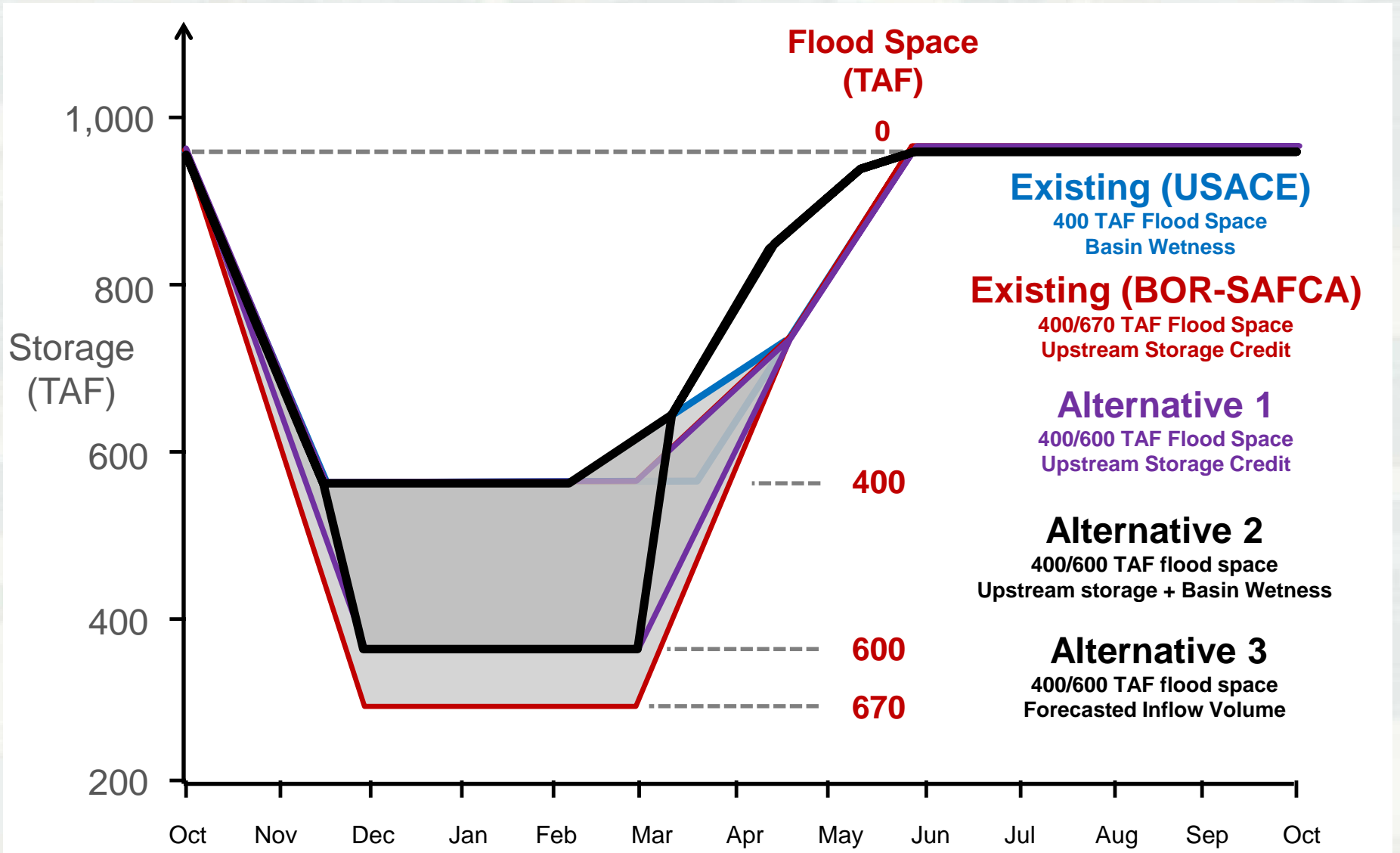


# “Generic” Water Control Diagram

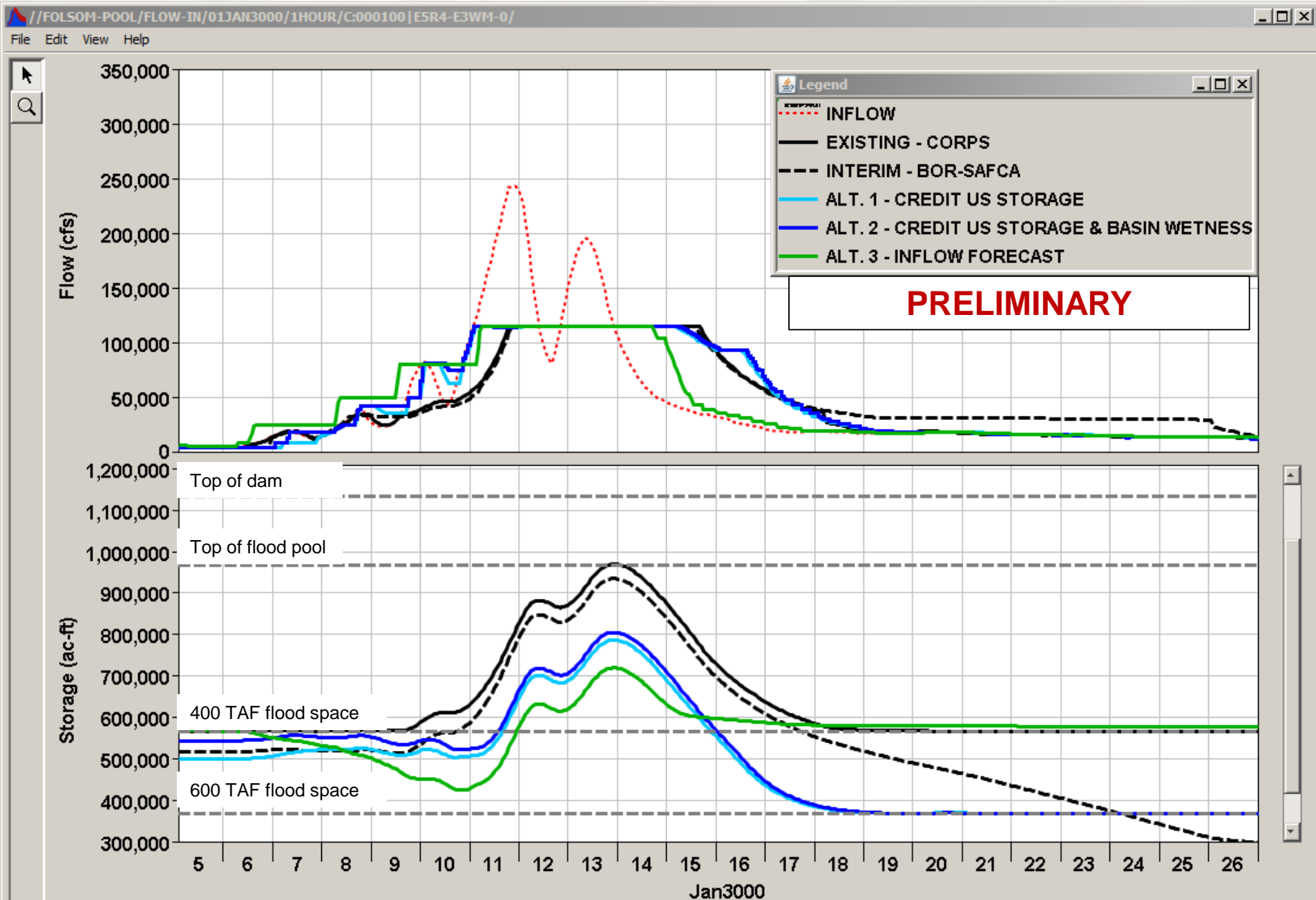




# 2 Baselines and 3 Alternatives



# 100-YR, 1986 PATTERN, EXISTING AND ALTERNATIVES



# Forecast Alternative Refinement

- More storm patterns
- Seasonal events
- Forecast variability
- Emergency Spillway Release Diagram (ESRD)



# QUESTIONS?

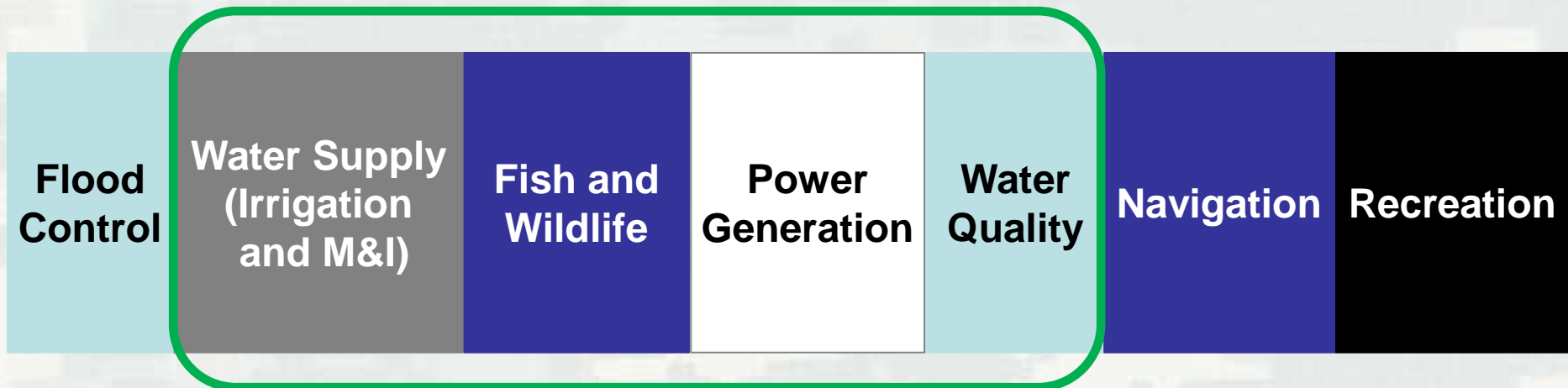


# ENVIRONMENTAL EFFECTS



# Environmental Effects Analysis

- Environmental effects analyses are centered around effects flood management operations alternatives would have on the other Folsom Dam Project purposes:



# Two Levels of Analysis

## Screening-Level Effects Analysis

- Compares 'with-project' alternative to baseline conditions CalSim II period of record outputs
- Monthly flood storage reserve requirement in Folsom is feature of an operation scenario that is incorporated into CalSim II
- Screening level comparison of SWP/CVP beneficial uses of project water (focus on key system indicators)

## Detailed Effects Analysis

- Evaluate other system effects that CalSim II cannot simulate
- Comparison of alternatives to baseline conditions
  - ▶ Long-term average values and sorted by water year type (period of record)
- Closer evaluation of effects in Lower American River (and other locations, as needed)



# With-Project Alternatives

## ALTERNATIVE 2: BASIN WETNESS ALTERNATIVE (J602P)

- 400,000/600,000 AF Flood Storage
- Auxiliary Spillway Complete
- 3-2-4 temperature control device (TCD) shutter configuration
- Folsom Flood Storage Requirements Based on Basin Wetness Parameters and upstream storage credit

## ALTERNATIVE 3: FORECAST ALTERNATIVE (J602F)

- 400,000/600,000 AF Flood Storage
- Auxiliary Spillway Complete
- 3-2-4 TCD shutter configuration
- Folsom Flood Storage Requirements Based on Forecasted Inflows





# Baseline Conditions

## EXISTING CONDITIONS/ CURRENT OPERATIONS (E504)

- 400,000/670,000 Acre-Feet (AF) Flood Storage
- No Auxiliary Spillway
- 3-2-4 TCD shutter configuration
- 2004 Operation Rules

## FUTURE WITHOUT PROJECT/ NO ACTION (J604)

- 400,000/670,000 AF Flood Storage
- Auxiliary Spillway complete; used in emergencies only
- 3-2-4 TCD shutter configuration
- 2004 Operation Rules

## CUMULATIVE EFFECTS

**Past** – 400,000 AF (Fixed) flood space; no JFP; 1-1-7 TCD shutter configuration; 1987 WCD (E503p ResSim Model)

**Future** – 400,000/600,000 AF flood space; Authorized 3.5-ft Dam Raise; JFP; 7(1)-2 TCD shutter configuration; 2017 WCD updated for Dam Raise (R702 ResSim Model)



# Resources to be Evaluated

- Water Supply (Storage and Delivery)
- Water Quality
- Power Generation
- Fisheries (far-field and Lower American River)
- Hydrology
- Hydraulics
- Terrestrial Resources (Veg and Wildlife)
- Special Status Species
- Recreation
- Cultural Resources



# WATER STORAGE



# Water Storage Model & Parameters

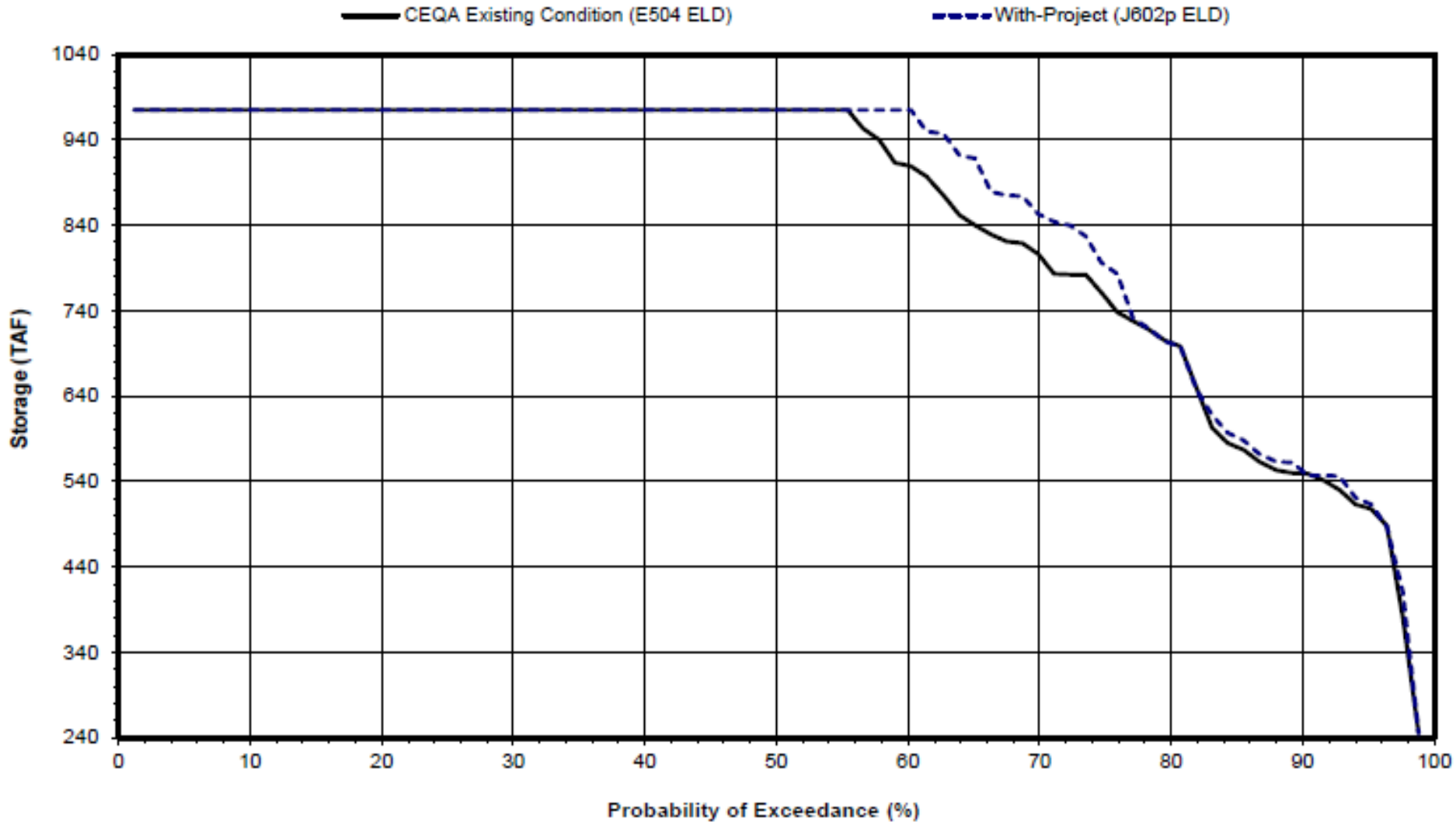
- CalSim II Outputs
- Model Parameters
  - ▶ End-of-May Storage: Folsom, Shasta, Oroville Reservoirs
  - ▶ End-of-September Storage: Folsom, Shasta, Oroville Reservoirs



# Folsom Reservoir End-of-May Storages Basin Wetness Alt (Alt. 2) vs. 400/670 Baseline

Folsom Reservoir End of Month Storage

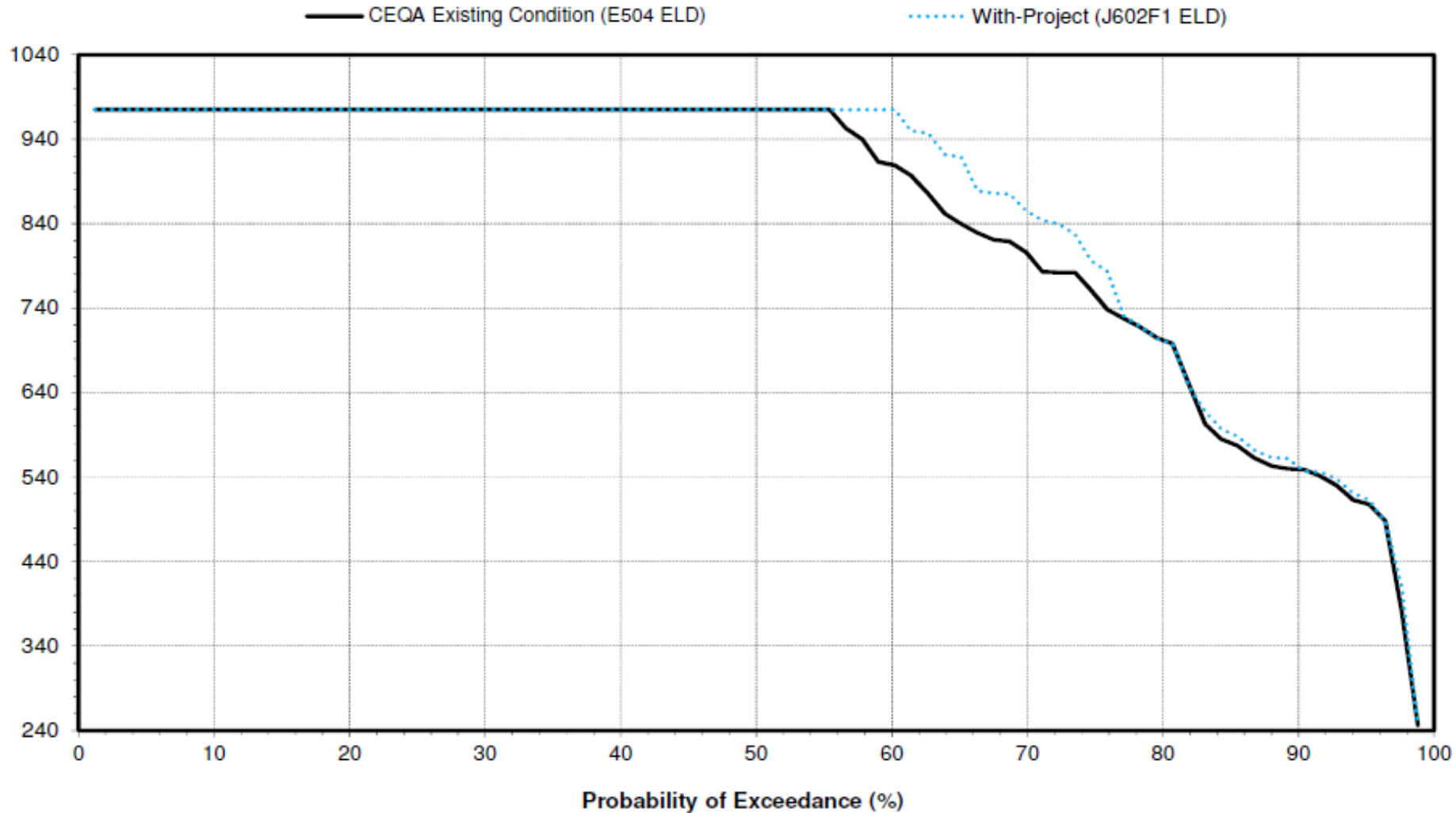
May



# Folsom Reservoir End-of-May Storages Forecast Alternative (Alt. 3) vs. 400/670 Baseline

Folsom Reservoir End of Month Storage

May



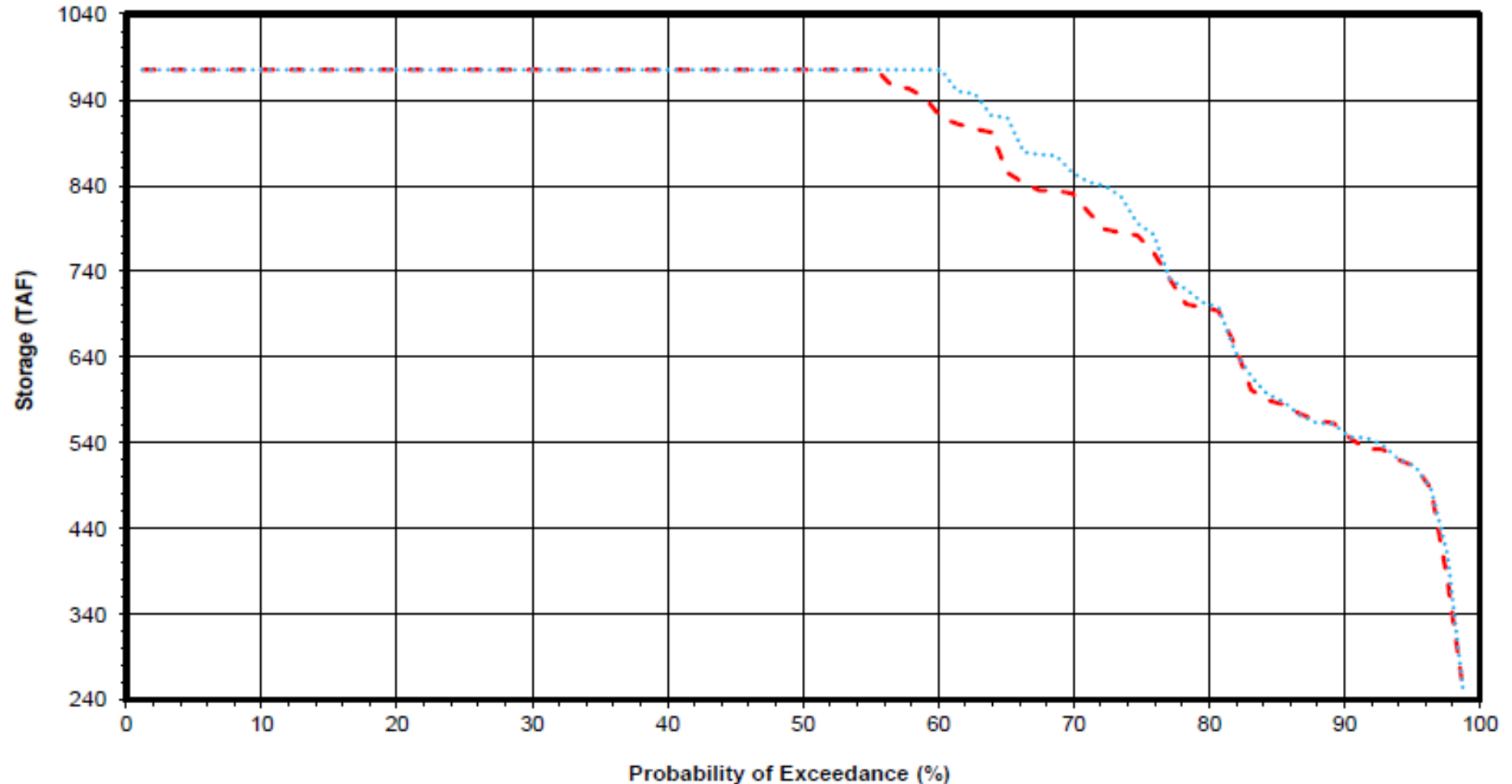
# Folsom Reservoir End-of-May Storages Forecast Alternative (Alt. 3) vs. 400 Fixed Baseline

Folsom Reservoir End of Month Storage

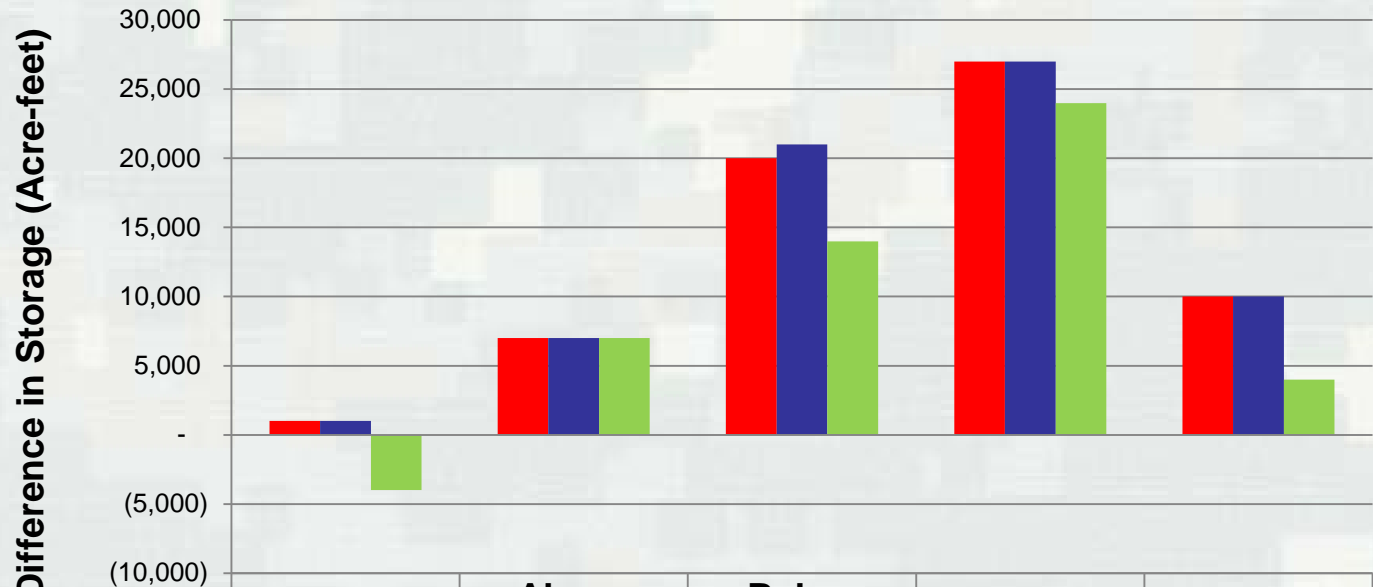
May

— 400-fixed Existing Condition (E503p ELD)

..... With-Project (J802F1 ELD)



# Differences in Folsom End of May Storage by Water Year Type



	Wet	Above Normal	Below Normal	Dry	Critical
■ Basin Wetness Alt (Alt 2) vs 400/670 Baseline	1,000	7,000	20,000	27,000	10,000
■ Forecast Alt (Alt 3) vs 400/670 Baseline	1,000	7,000	21,000	27,000	10,000
■ Forecast Alt (Alt 3) vs 400 Fixed Baseline	(4,000)	7,000	14,000	24,000	4,000

Water Year Type

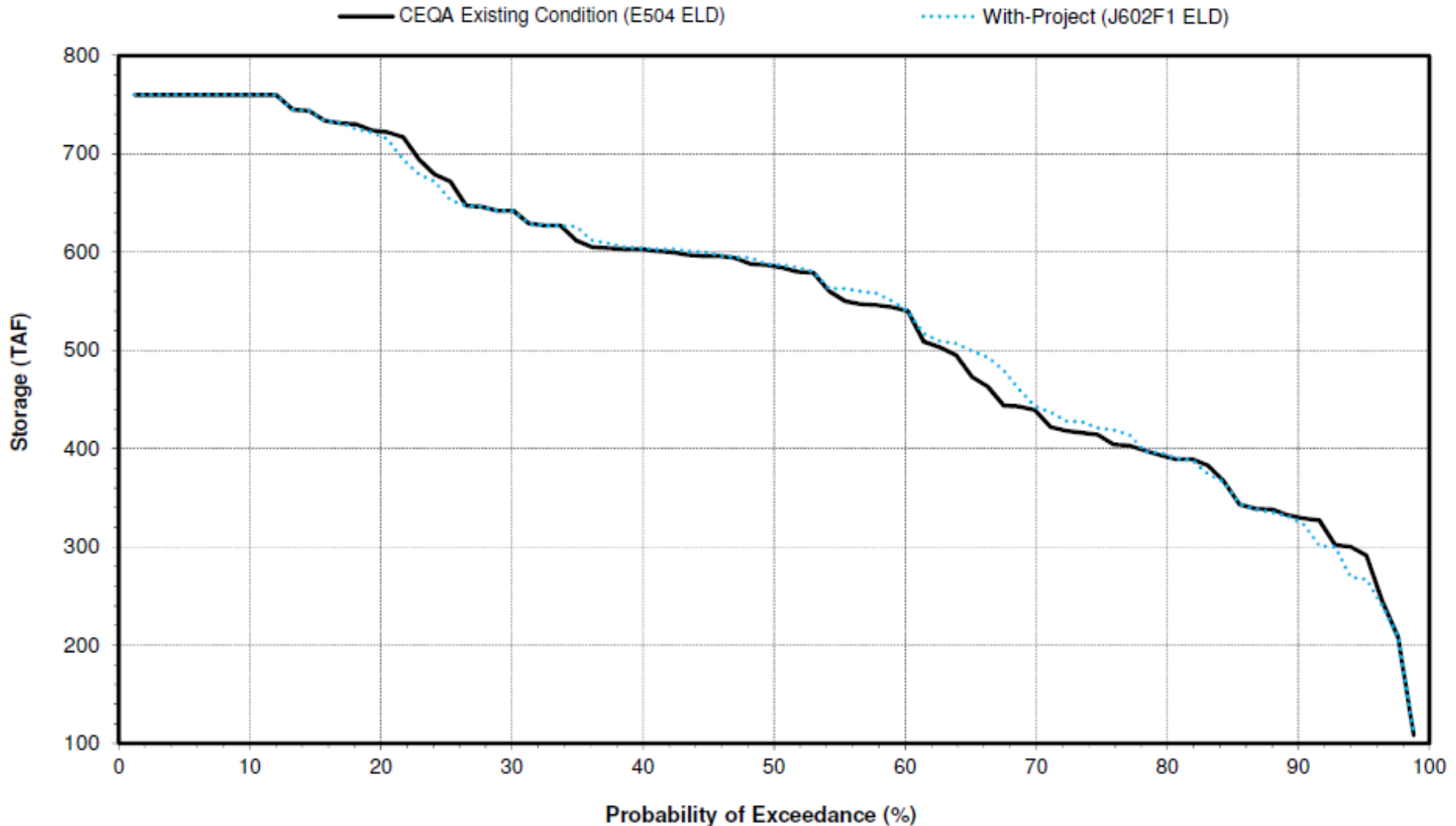




# Folsom Reservoir End-of-September Storages Forecast Alternative (Alt. 3) vs. 400/670 Baseline

Folsom Reservoir End of Month Storage

September



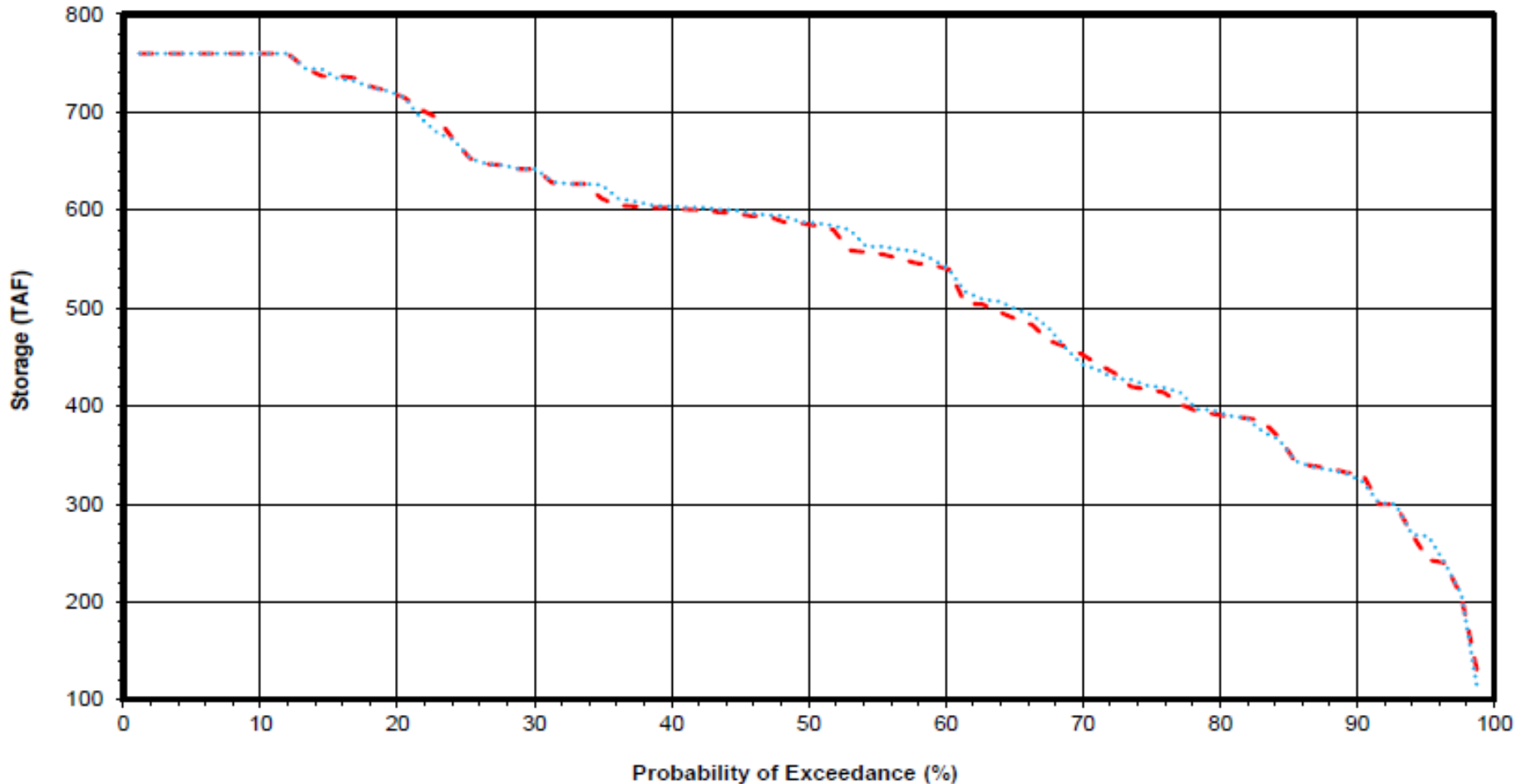
# Folsom Reservoir End-of-September Storages Forecast Alternative (Alt. 3) vs. 400 Fixed Baseline

Folsom Reservoir End of Month Storage

September

400-fixed Existing Condition (E503p ELD)

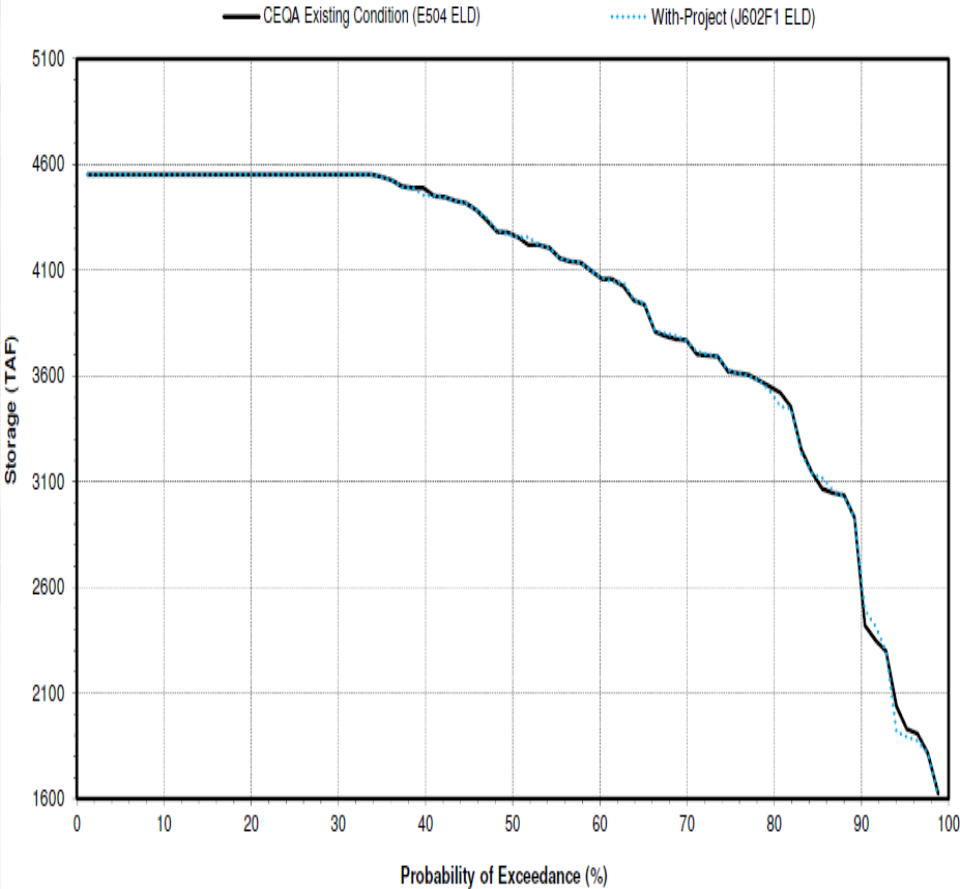
With-Project (J602F1 ELD)



# Shasta Reservoir End-of-Month Storages Forecast Alternative (Alt. 3) vs. 400/670 Baseline

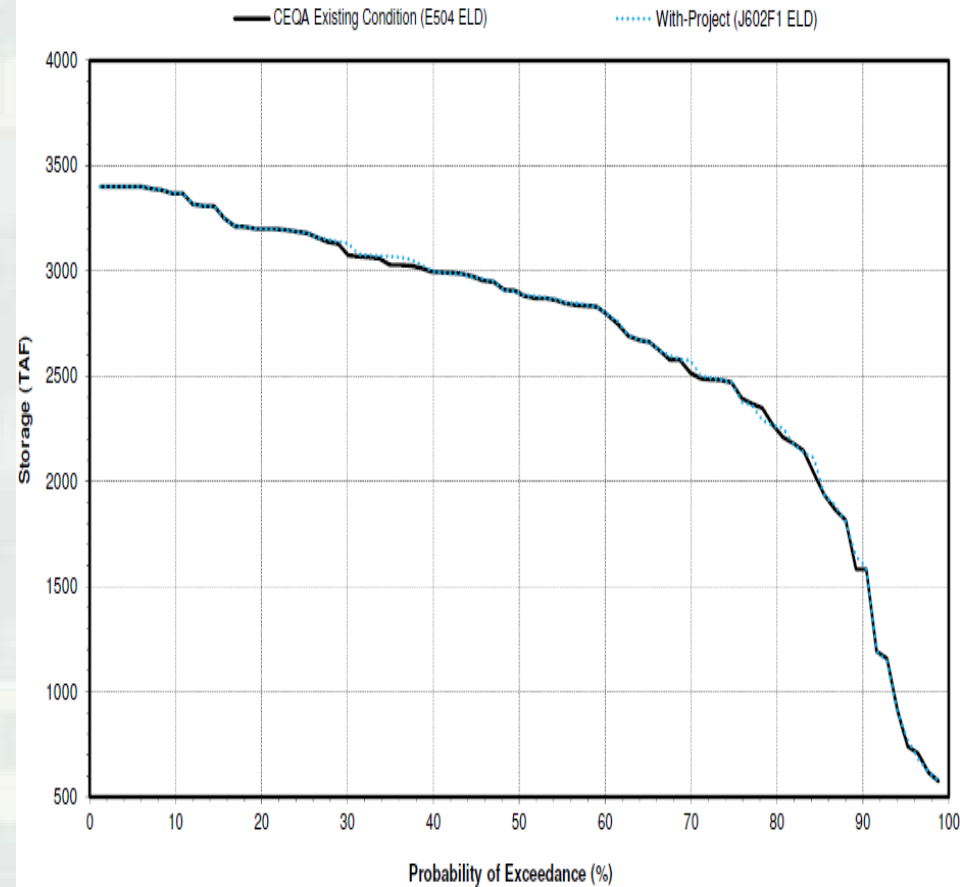
Shasta Reservoir End of Month Storage

May



Shasta Reservoir End of Month Storage

September

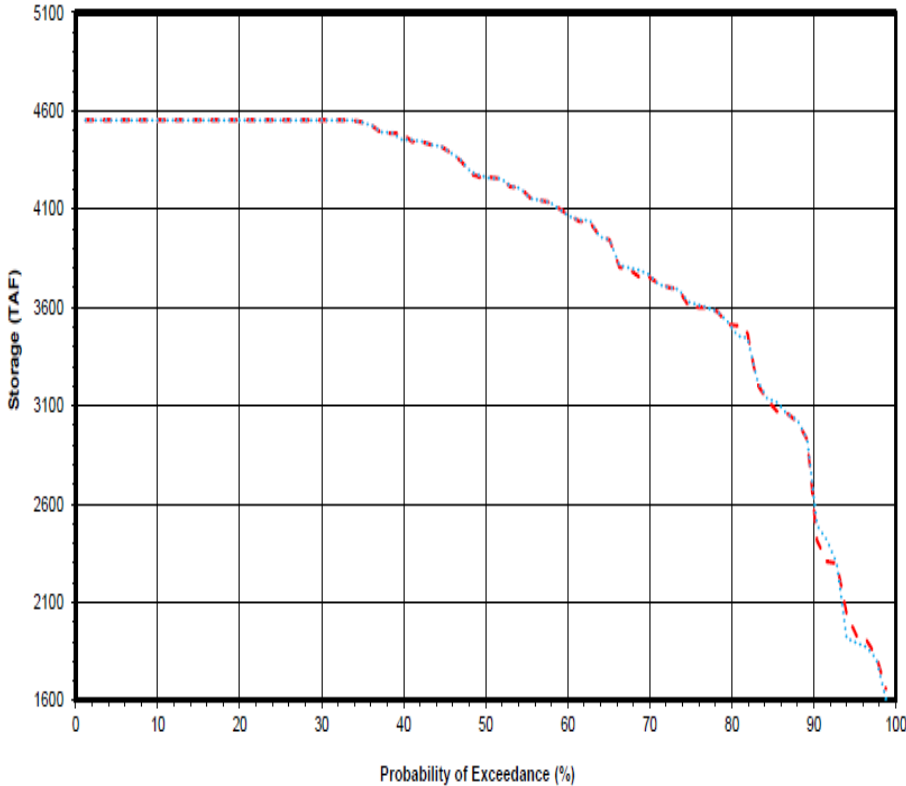


# Shasta Reservoir End-of-Month Storages Forecast Alternative (Alt. 3) vs. 400 Fixed Baseline

Shasta Reservoir End of Month Storage

May

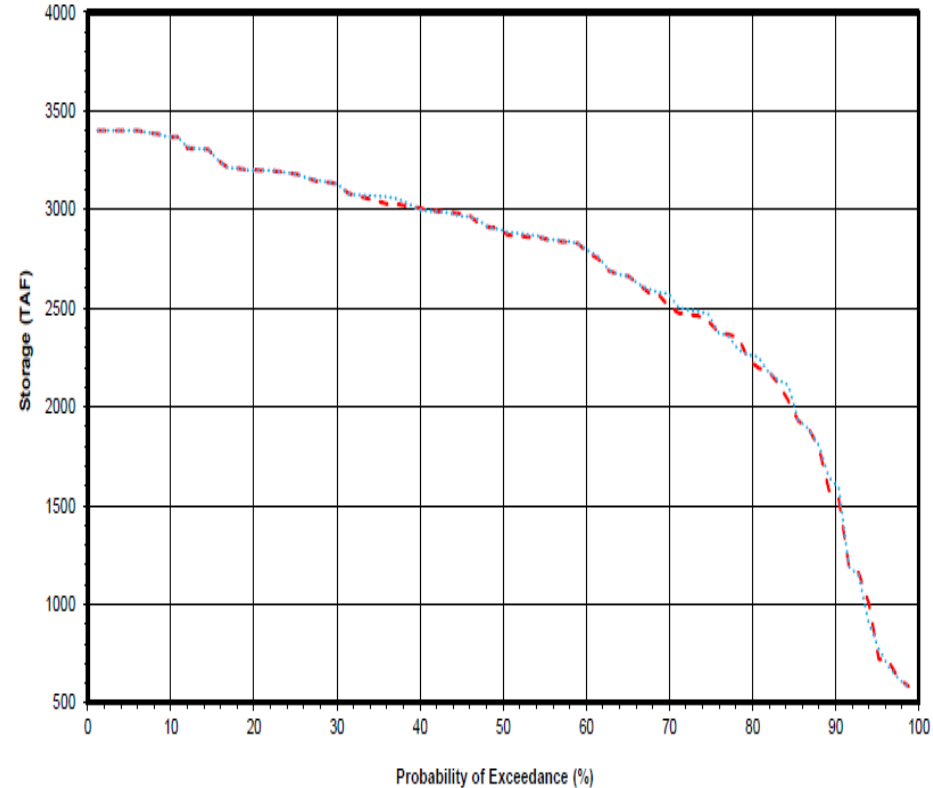
--- 400-fixed Existing Condition (E503p ELD)      ..... With-Project (J602F1 ELD)



Shasta Reservoir End of Month Storage

September

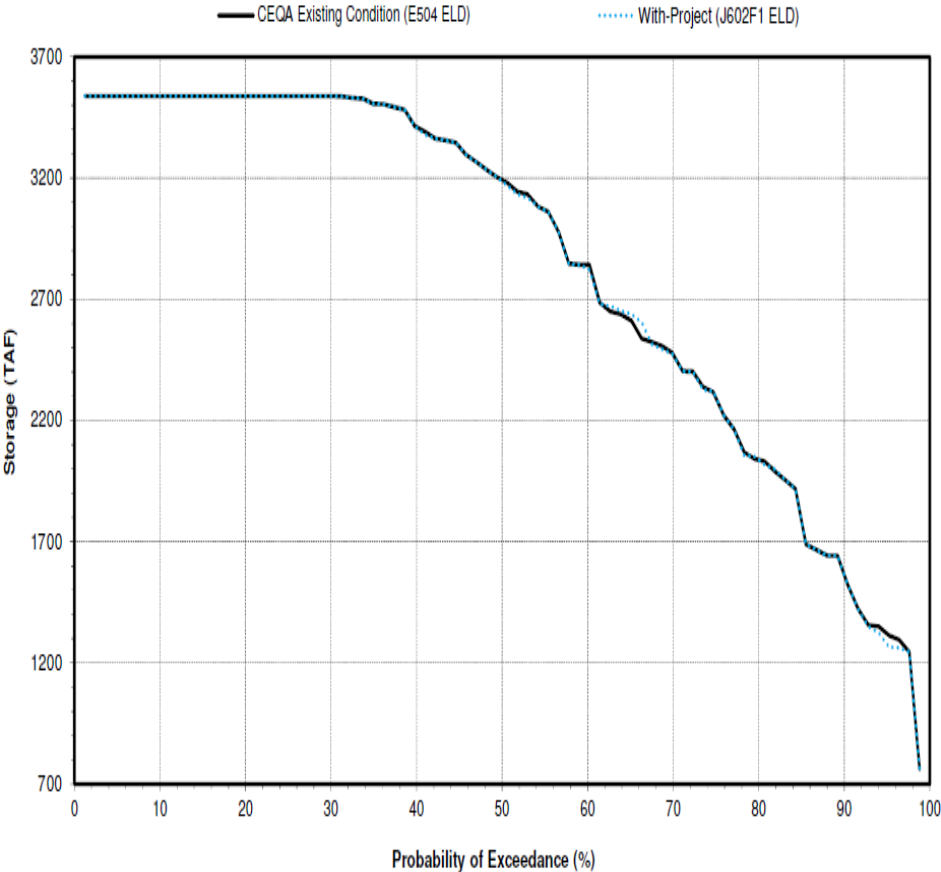
--- 400-fixed Existing Condition (E503p ELD)      ..... With-Project (J602F1 ELD)



# Oroville Reservoir End-of-Month Storages Forecast Alternative (Alt. 3) vs. 400/670 Baseline

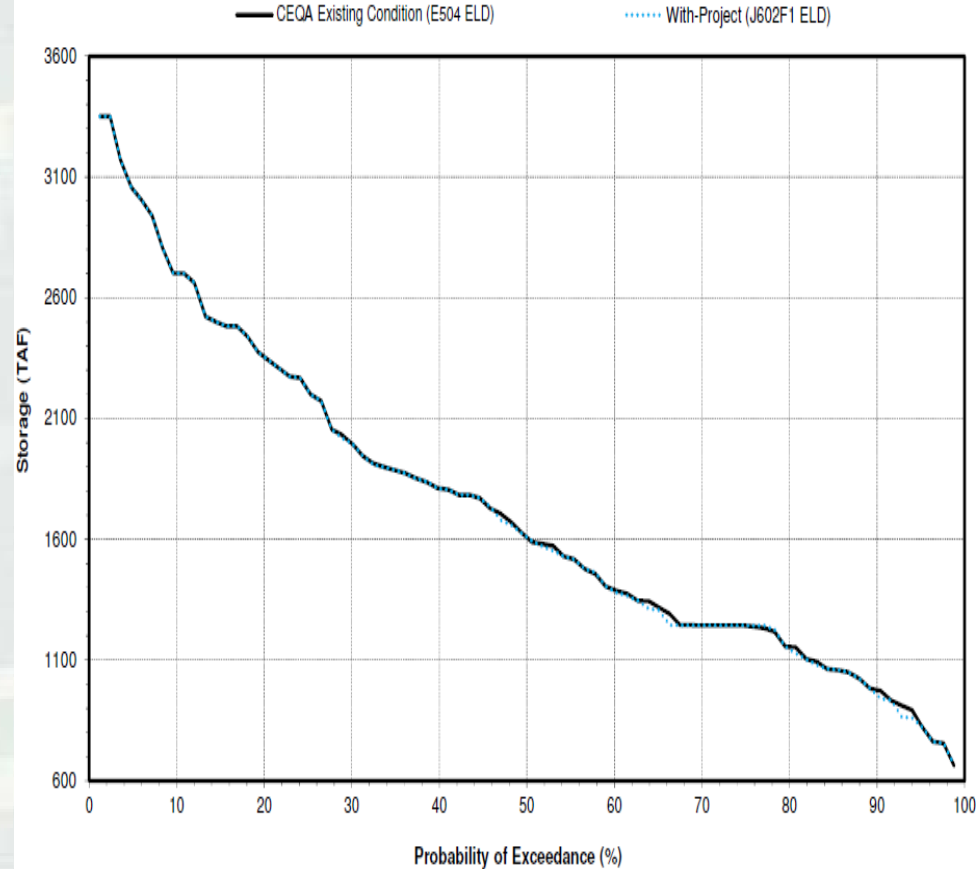
Oroville Reservoir End of Month Storage

May



Oroville Reservoir End of Month Storage

September

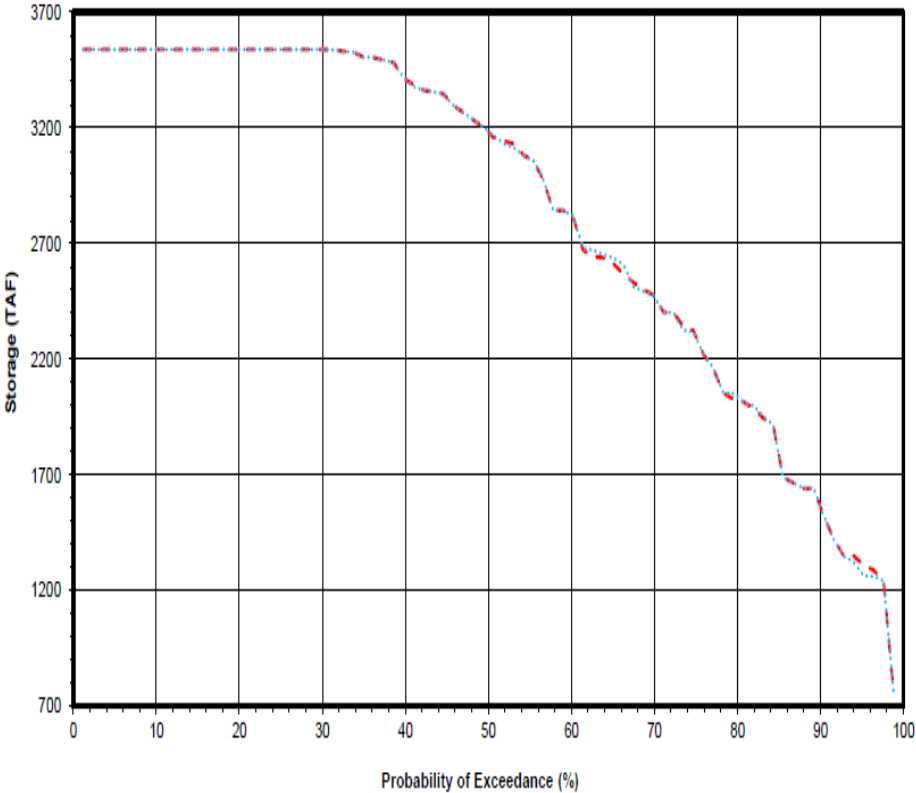


# Oroville Reservoir End-of-Month Storages Forecast Alternative (Alt. 3) vs. 400 Fixed Baseline

Oroville Reservoir End of Month Storage

May

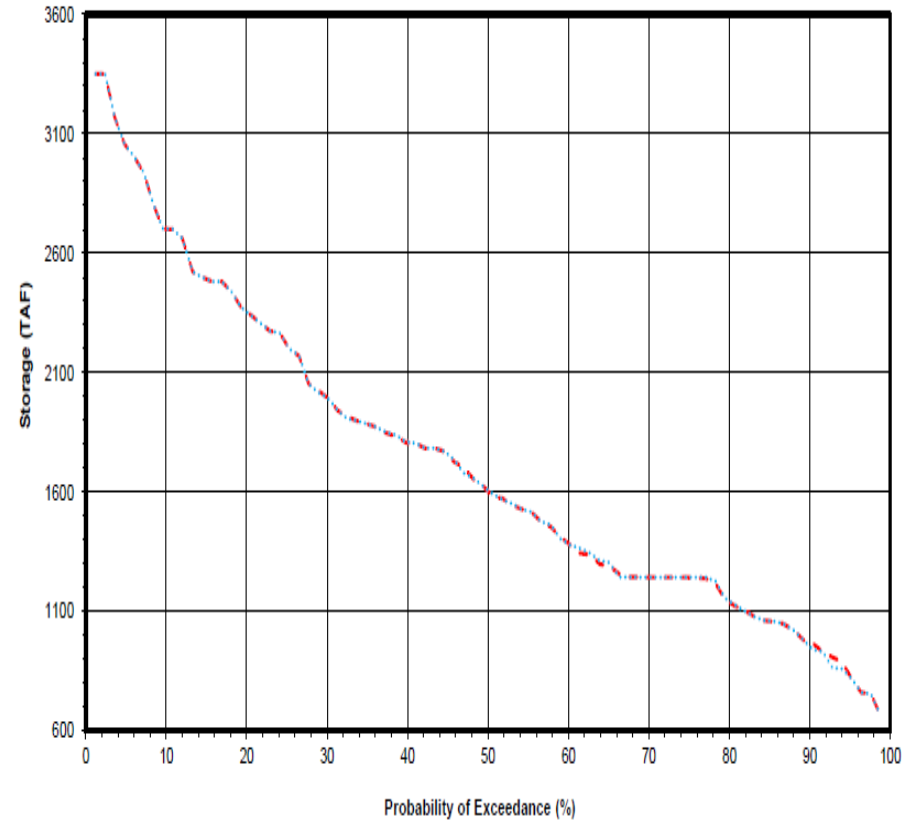
--- 400-fixed Existing Condition (E503p ELD)      ..... With-Project (J802F1 ELD)



Oroville Reservoir End of Month Storage

September

--- 400-fixed Existing Condition (E503p ELD)      ..... With-Project (J802F1 ELD)



# Percent Difference in Long Term Average Storage

Reservoir Storage	Basin Wetness Alternative (Alt 2)	Forecast Alternative (Alt 3)	
	vs. 400/670 Baseline	vs. 400/670 Baseline	vs. 400 Fixed Baseline
Folsom (end-of-May)	+1.4	+1.5	+1
Folsom (end-of-Sep)	+0.4	+0.3	0
Shasta (end-of-May)	0	0	0
Shasta (end-of-Sep)	+0.2	+0.2	0
Oroville (end-of-May)	-0.1	0	0
Oroville (end-of-Sep)	-0.2	-0.2	0



# Storage Outcomes of Both Alternatives

- Improved flood risk management operations
- Slightly improved end of May Folsom storage
- CalSim II results overall have indicated no substantial changes to system-wide performance
  - ▶ CalSim II represents conservation operations. Does not capture operator discretion.





# Delta Water Quality



# Delta Water Quality Model and Parameters

- CalSim II Artificial Neural Network (ANN) computes salinity based on water operations
- Salinity dynamics in the Delta addressed at a screening level
  - Changes in X2
  - Total Delta inflow/outflow
  - Export/Inflow ratio



# X2 – Differences in Count of Occurrences East of Control Points

Water Year Type	Control Point	Feb			Mar			Apr			May			Jun		
		Alt 2 (BW) vs 400/670	Alt 3 (F) vs 400/670	Alt 3 (F) vs 400 Fixed	Alt 2 (BW) vs 400/670	Alt 3 (F) vs 400/670	Alt 3 (F) vs 400 Fixed	Alt 2 (BW) vs 400/670	Alt 3 (F) vs 400/670	Alt 3 (F) vs 400 Fixed	Alt 2 (BW) vs 400/670	Alt 3 (F) vs 400/670	Alt 3 (F) vs 400 Fixed	Alt 2 (BW) vs 400/670	Alt 3 (F) vs 400/670	Alt 3 (F) vs 400 Fixed
Wet	81 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	75 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	64 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	81 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	75 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	64 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	81 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	75 Km	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
	64 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	81 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	75 Km	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	64 Km	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
Critical	81 Km	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	75 Km	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	64 Km	0	0	0	-1	-1	-1	1	1	1	0	0	0	0	0	0



**Both Alternatives had the same number of occurrences east of 81 Km as all baselines for all water year types**



# Delta Outflow Objectives

Month	Minimum Delta Outflow (cfs)
January	4,500 (6,000 if eight river index is >800 TAF)
February-June	X2 Standard
July	8,000 for wet and above normal years 6,500 for below normal years 5,000 for dry years 4,000 for critical years
August	4,000 for wet, above normal, and below normal years 3,500 for dry years 3,000 for critical years
September	3,000
October	4,000 for all except critical years 3,000 for critical years
November-December	4,500 for all except critical years 3,500 for critical years

**Both Alternatives met all Delta Outflow Standards and were consistent with all baseline conditions.**



# Delta Export/Inflow Ratio

- 65 percent (0.65/1 ratio) for July through January, 35 percent (0.35/1 ratio) for February through June

	<b>Alt 2 (BW) vs. 400/670</b>	<b>Alt 3 (F) vs. 400/670</b>	<b>Alt 3 (F) vs. 400 Fixed</b>
<b>Largest difference in average annual value</b>	0.2 for March (1% difference vs baseline)	0.2 for March and Sep (1% difference vs baseline)	0.3 for March (1.5% difference vs baseline)
<b>Water year-type max negative change</b>	-1.2 in January of critical years (-3.5% difference vs baseline)	-1.3 in January of critical years (-3.8% difference vs baseline)	-1.4 in January of critical years (-4.1% difference vs baseline)
<b>Water year-type max positive change</b>	0.5 in March of critical years (2.3% difference vs baseline)	0.5 in March of critical years (2.3% difference vs baseline)	0.4 in March of wet years (2.6% difference vs baseline)

**Both Alternatives met all standards during all water year types.**



# Delta Water Quality Effects Summary

- X2 – No Effect
- Delta Outflow – No Effect
- Delta Export/Inflow – No Effect



# HYDROELECTRIC POWER



# Hydroelectric Power Models and Parameters

- CalSim II reservoir storages and releases applied to LTGen and SWPGen models
- Evaluation of:
  - Total capacity, quantity and timing of energy production
  - Any changes in Project use
  - Net capacity and energy at load center
  - Effects to timing of peaking operations at Folsom Dam





# Hydroelectric Facilities

## SWP

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### Power

Oroville  
Thermalito  
San Luis  
Alamo  
Mojave  
Devils Canyon  
Warne  
Castaic

### Pumping

Banks  
San Luis  
Dos Amigos  
Buena Vista  
Teerink  
Chrisman  
Edmonston  
Pearblossom  
Oso  
South Bay  
Del Valle  
Las Perillas  
Badger Hill

## CVP

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### Power

Trinity  
Lewiston  
Carr  
Spring Creek  
Shasta  
Keswick  
Folsom  
Nimbus  
New Melones  
San Luis  
O'Neill

### Pumping

Tracy  
Contra Costa  
O'Neill  
San Luis  
San Felipe  
Dos Amigos  
Folsom  
Corning  
Red Bluff  
San Luis  
DMC  
Tehama



# Long-Term Average Power and Pumping Basin Wetness Alt (Alt 2) vs 400/670 Baseline

## Central Valley Project Facilities

Capacity (MW)	0% (same)
Energy Generation (GWh)	0% (same)
Energy Use (GWh)	0% (same)
Foregone Energy (GWh)	0% (same)
Transmission Losses (GWh)	0% (same)
Net Generation (GWh)	0% (same)

## Basin Wetness Alt (Alt 2) vs 400/670 Baseline

## State Water Project Facilities

Capacity (MW)	0% (same)
Energy Generation (GWh)	0% (same)
Energy Use (GWh)	0% (greater than baseline condition)
Foregone Energy (GWh)	1% (greater than baseline condition)
Transmission Losses (GWh)	0% (same)
Net Generation (GWh)	0% (same)

## Basin Wetness Alt (Alt 2) vs 400/670 Baseline

Long Term is the average quantity for the calendar years 1922-2002.

Load Center is the geographical area where energy is delivered, in this case the Western Area Power Administration's Tracy transmission area.

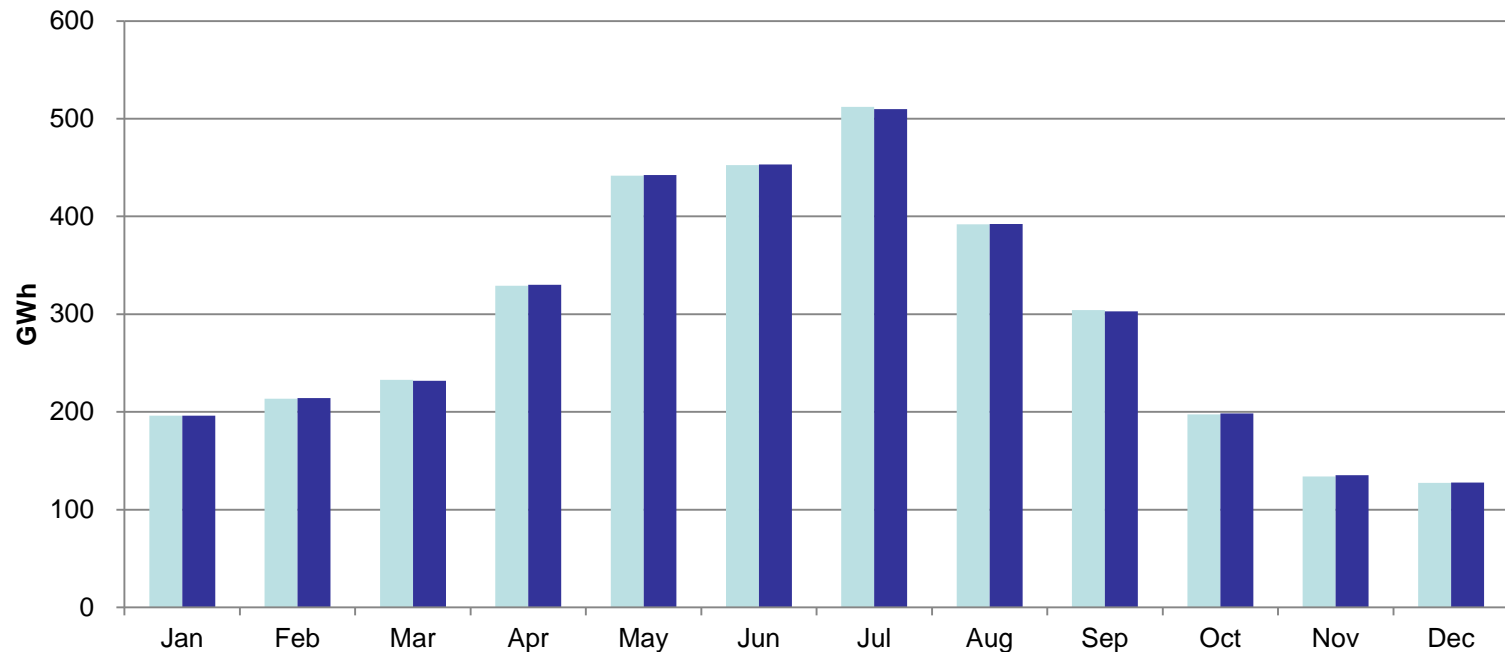
Foregone Energy is the difference in the reservoir release and the powerplant release; as a function of plant head requirements and energy factors.

Net Generation is the difference between energy generation and energy use at pumping facilities.



# Long-Term Average Power and Pumping Basin Wetness Alt (Alt 2) vs 400/670 Baseline

## Average Monthly CVP Net Project Generation at Load Center



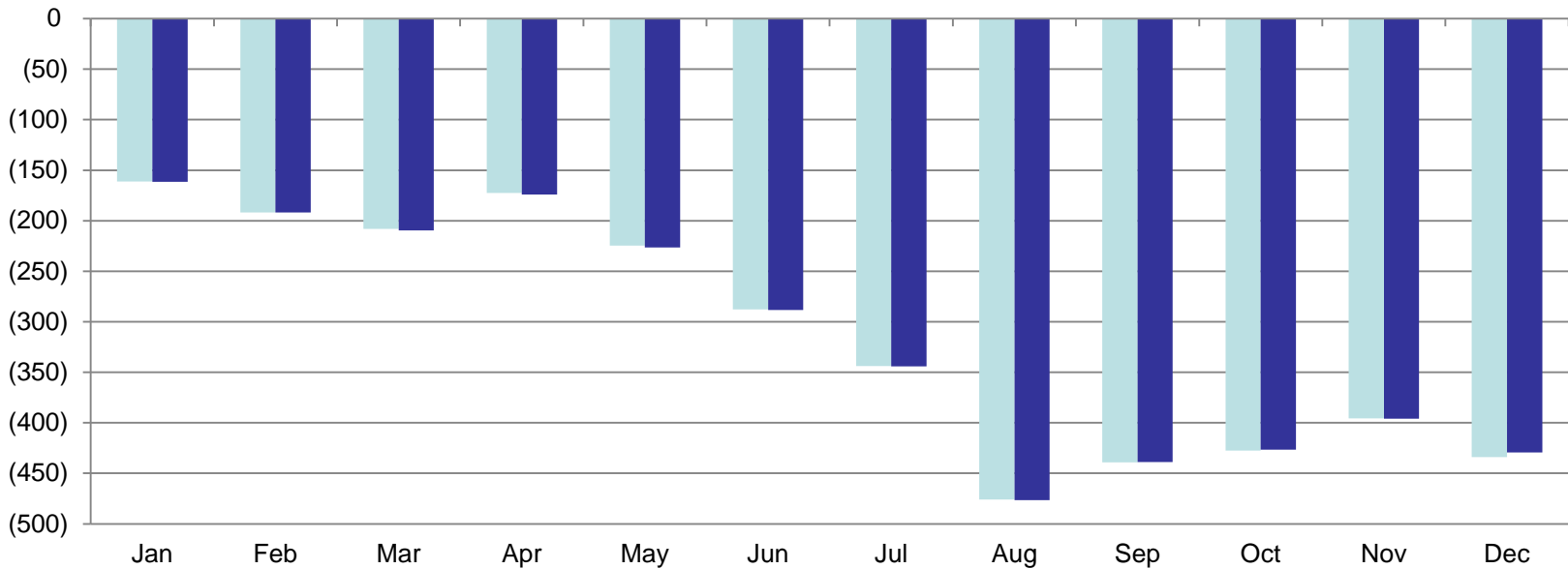
■ Existing BOR/SAFCA 400/670 TAF Flood Space Operations with Upstream Credit Storage (E504 ELD)

■ Alternative 2 400/600 TAF Flood Space Operations with Upstream Credit Storage and Basin Wetness (J602p ELD)



# Long-Term Average Power and Pumping Basin Wetness Alt (Alt 2) vs 400/670 Baseline

## Average Monthly SWP Net Project Generation at Load Center



■ Existing BOR/SAFCA 400/670 TAF Flood Space Operations with Upstream Credit Storage (E504 ELD)

■ Alternative 2 400/600 TAF Flood Space Operations with Upstream Credit Storage and Basin Wetness (J602p ELD)



# Long-Term Average Power and Pumping Forecast Alt (Alt 3) vs 400/670 Baseline

## Central Valley Project Facilities

Capacity (MW)	0% (same)
Energy Generation (GWh)	0% (same)
Energy Use (GWh)	1% (greater than baseline condition)
Foregone Energy (GWh)	1% (less than baseline condition)
Transmission Losses (GWh)	0% (same)
Net Generation (GWh)	0% (same)

## Forecast Alt (Alt 3) vs 400/670 Baseline

## State Water Project Facilities

Capacity (MW)	0% (same)
Energy Generation (GWh)	0% (same)
Energy Use (GWh)	1% (greater than baseline condition)
Foregone Energy (GWh)	1% (greater than baseline condition)
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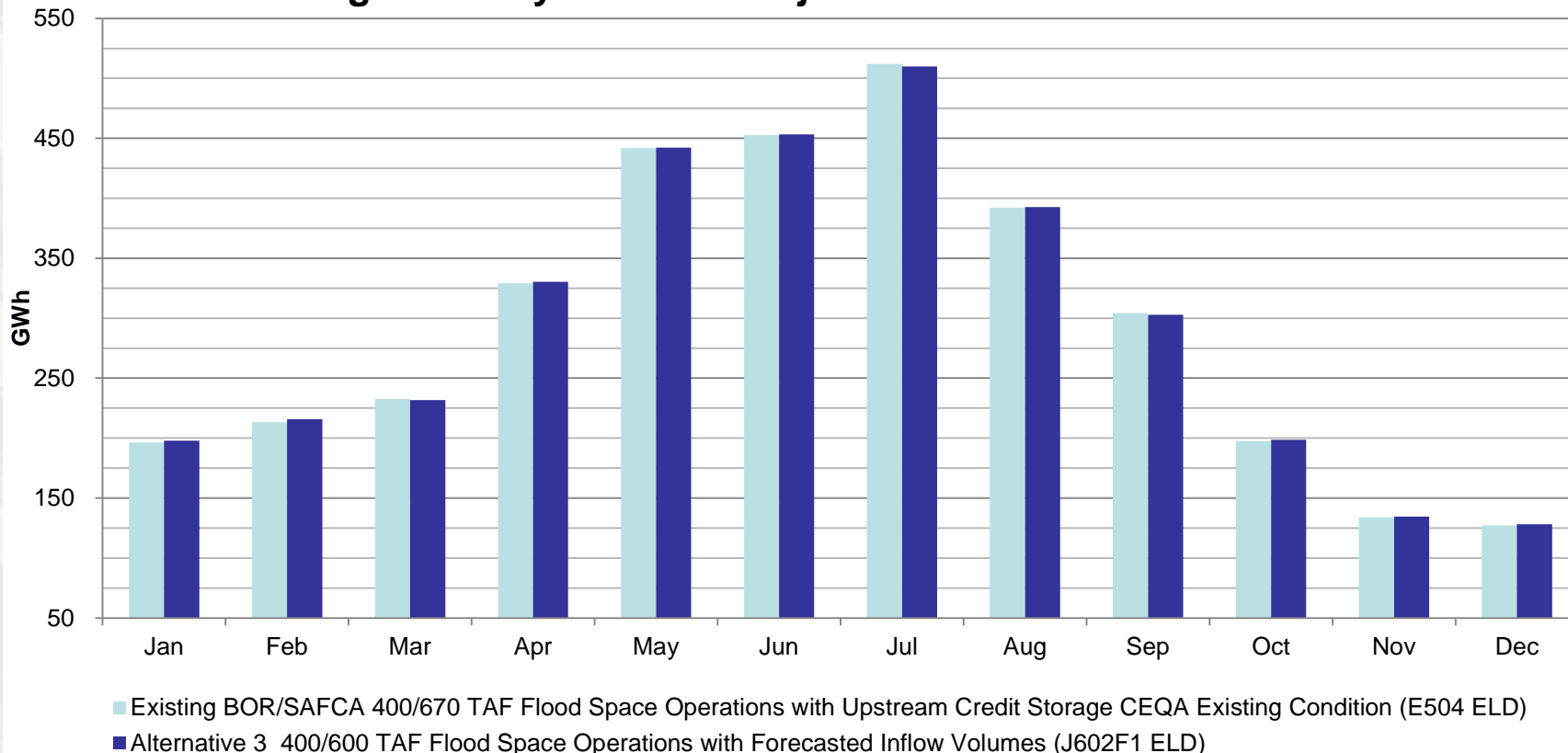
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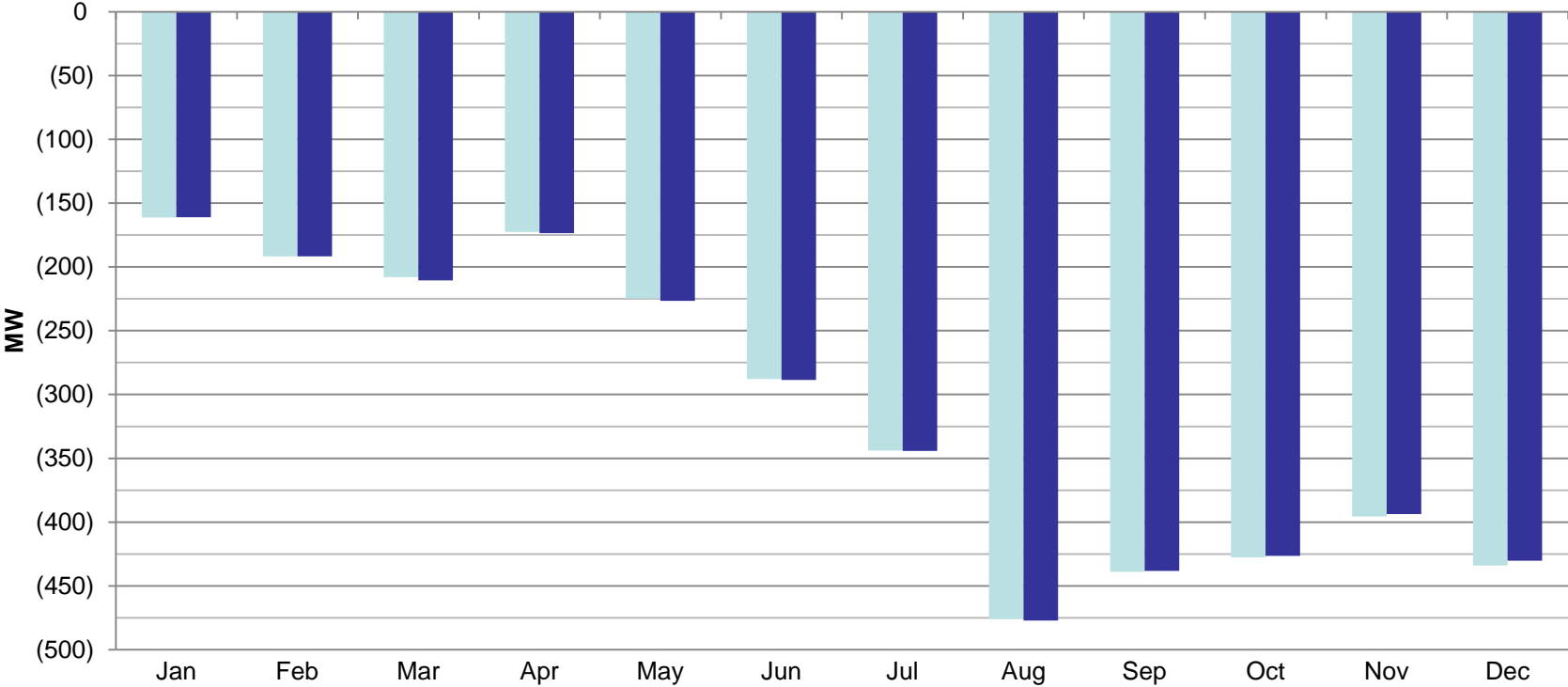
# Long-Term Average Power and Pumping Forecast Alt (Alt 3) vs 400/670 Baseline

Average Monthly CVP Net Project Generation at Load Center



# Long-Term Average Power and Pumping Forecast Alt (Alt 3) vs 400/670 Baseline

Average Monthly SWP Net Generation at Load Center



■ Existing BOR/SAFCA 400/670 TAF Flood Space Operations with Upstream Credit Storage CEQA Existing Condition (E504 ELD)  
 ■ Alternative 3 400/600 TAF Flood Space Operations with Forecasted Inflow Volumes (J602F1 ELD)



# Long-Term Average Power and Pumping Forecast Alt (Alt 3) vs 400 Fixed Baseline

## Central Valley Project Facilities

Capacity (MW)	0% (same)
Energy Generation (GWh)	0% (same)
Energy Use (GWh)	0% (same)
Foregone Energy (GWh)	1% (greater than baseline condition)
Transmission Losses (GWh)	0% (same)
Net Generation (GWh)	0% (same)

## Forecast Alt (Alt 3) vs 400 Fixed Baseline

## State Water Project Facilities

Capacity (MW)	0% (same)
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Energy Use (GWh)	0% (same)
Foregone Energy (GWh)	1% (greater than baseline condition)
Transmission Losses (GWh)	0% (same)
Net Generation (GWh)	1% (less than baseline)

## Forecast Alt (Alt 3) vs 400 Fixed Baseline

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Foregone Energy is the difference in the reservoir release and the powerplant release; as a function of plant head requirements and energy factors.

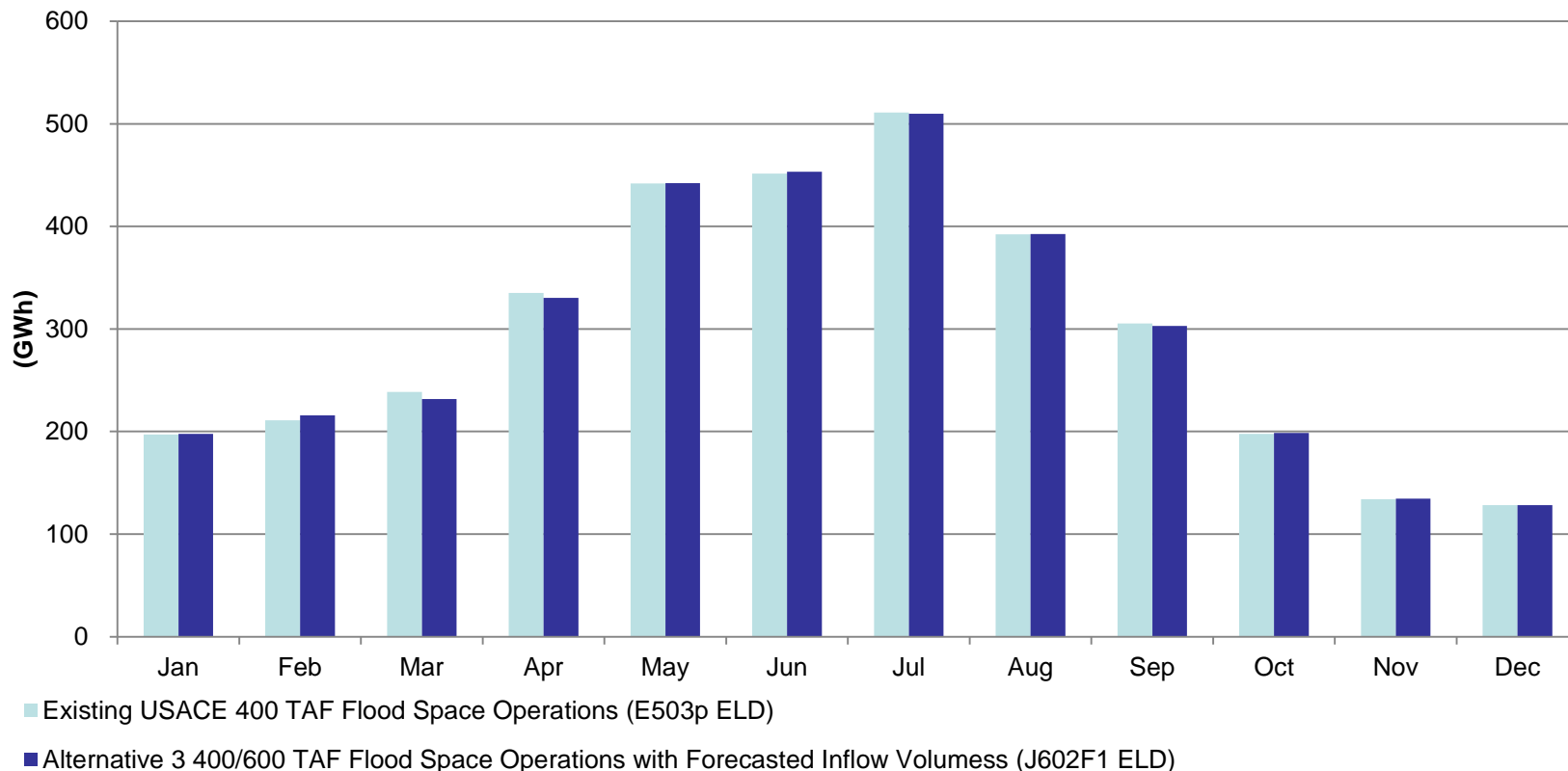
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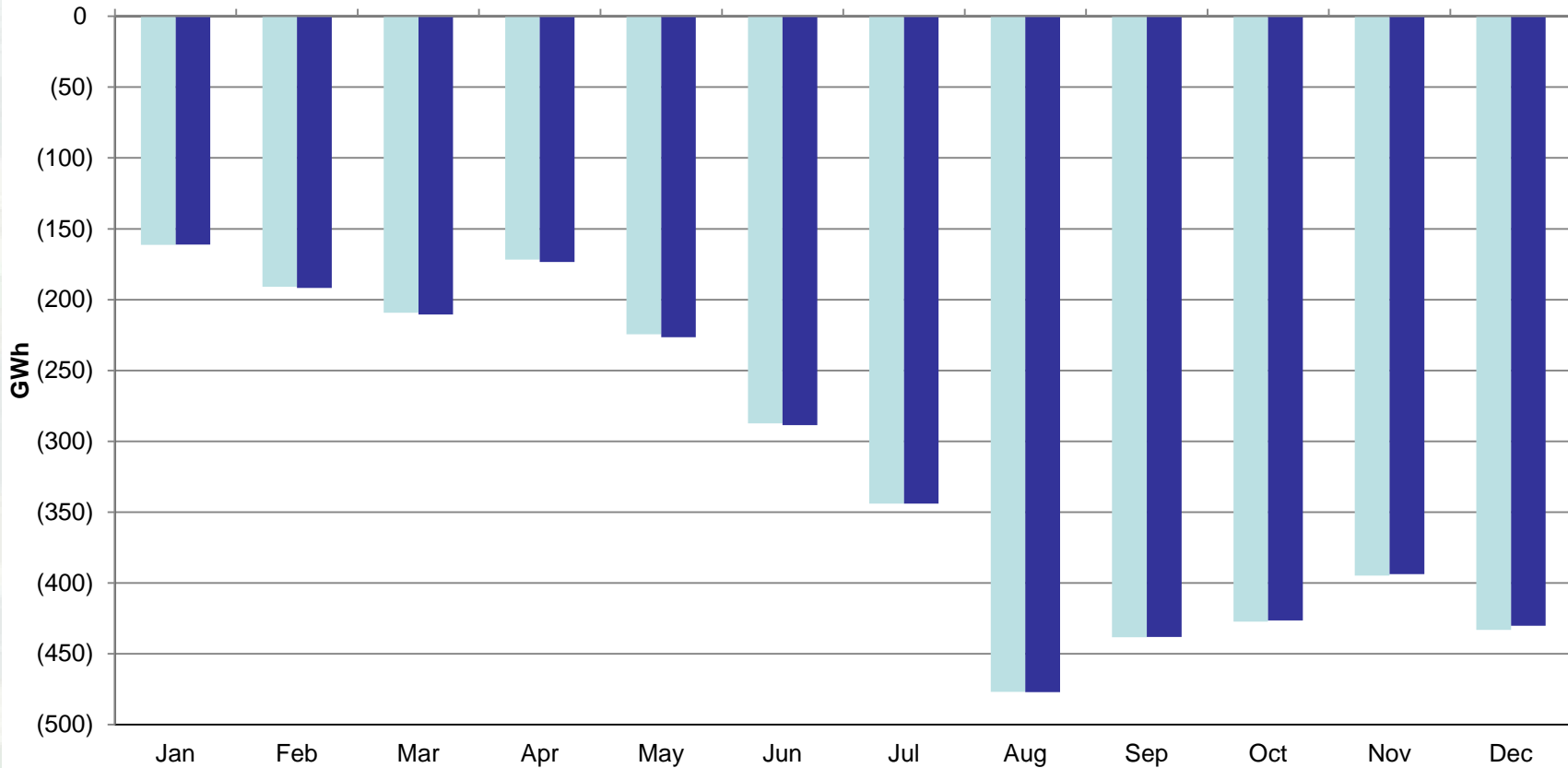


# Long-Term Average Power and Pumping Forecast Alt (Alt 3) vs 400/670 Baseline

## Average Monthly CVP Net Project Generation at Load Center



# Average Monthly SWP Net Project Generation at Load Center



Existing USACE 400 TAF Flood Space Operations (E503p ELD)

Alternative 3 400/600 TAF Flood Space Operations with Forecasted Inflow Volumess (J602F1 ELD)



# FISHERIES FAR-FIELD EVALUATION



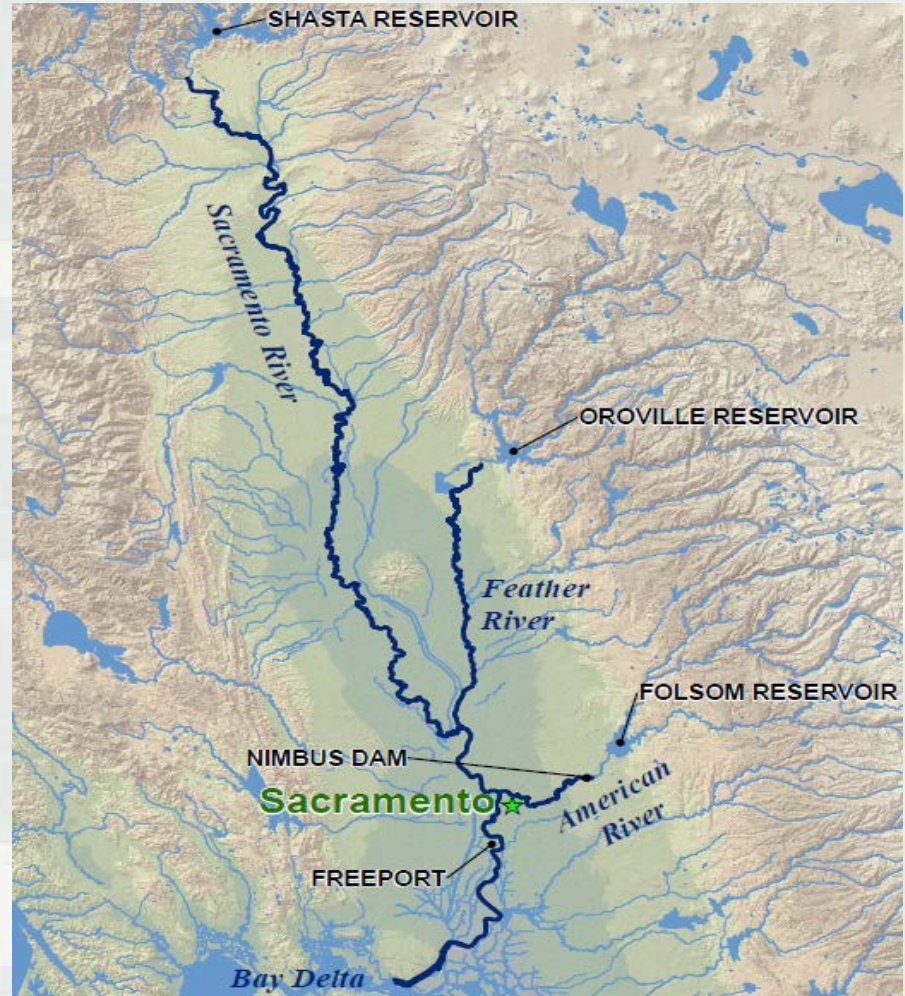
# Fisheries Far-Field Evaluation Models and Parameters

- CalSim II and U.S. Bureau of Reclamation Temperature Model
- Effects analysis based on river flows, lake levels, water temperature modeling, and X2 location.
- Special-status fish species (i.e., steelhead, Chinook salmon, delta smelt, green sturgeon, etc.) and recreationally important species (e.g., striped bass and American shad).



# Fisheries Evaluations

- Species-specific
  - ▶ By lifestage
    - Temporal distribution
    - Spatial distribution
  - ▶ Flow
  - ▶ Water temperature
  - ▶ Spawning habitat
  - ▶ Delta parameters



# Fisheries Far-Field Evaluation Locations

## ▪ Sacramento River

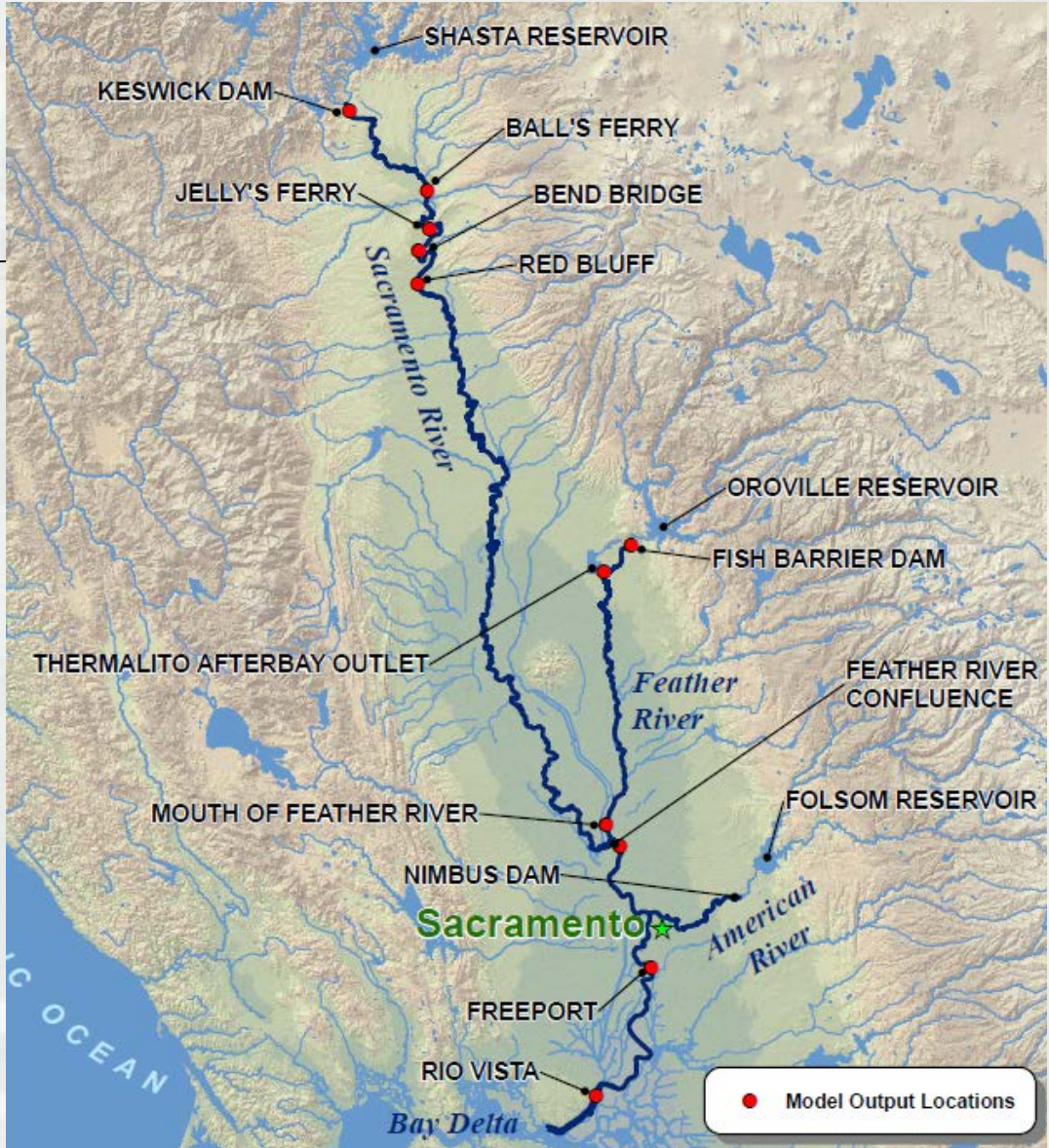
- ▶ Below Keswick Dam (F, T)
- ▶ Ball's Ferry (T)
- ▶ Jelly's Ferry (T)
- ▶ Bend Bridge (F, T)
- ▶ Red Bluff (F, T)
- ▶ Feather River confluence (F, T)
- ▶ Freeport (F, T)
- ▶ Rio Vista (F)

## ▪ Feather River

- ▶ Below Fish Barrier Dam (F, T)
- ▶ Below Thermalito Afterbay (F, T)
- ▶ Mouth of Feather River (F, T)

## ▪ Yolo Basin

## ▪ Delta



F = Flow  
T = Water Temperature



# Fisheries Far-Field Evaluations

- Riverine Flow & Water Temperature Outputs
  - ▶ Long-term average & average by WYT summary tables
  - ▶ Exceedance distributions
  - ▶ Species-specific summaries
  
- Riverine Spawning Habitat Outputs
  - ▶ Long-term average and average by WYT summary tables
    - Difference in % maximum Weighted Usable Area (WUA)
  - ▶ Exceedance distributions



# Alternative 3 vs CEQA Existing Condition

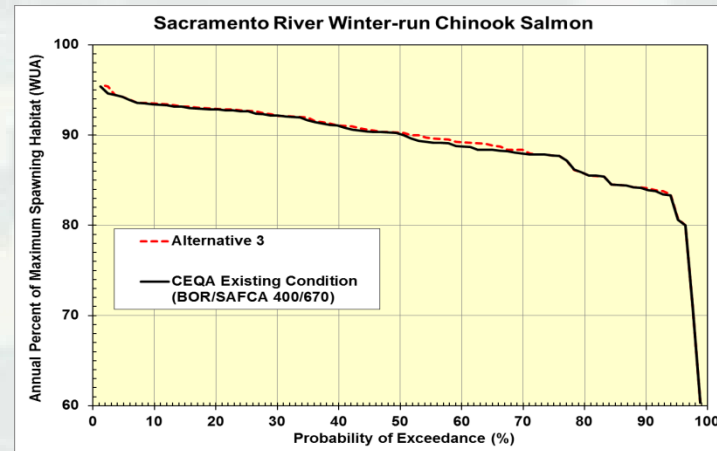
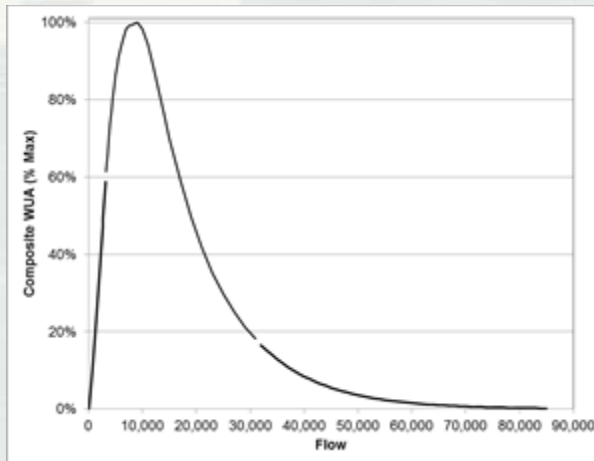
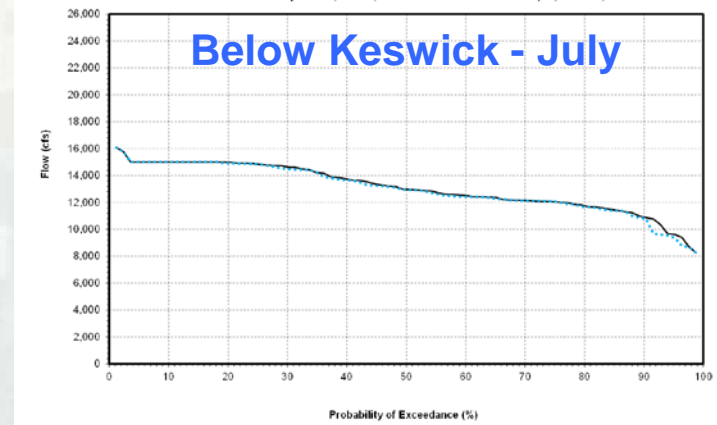
- Preliminary results of simulated flow and temperature-related fisheries evaluations in the Far-Field
  - Under Alternative 3 (Forecasted Inflow) relative to the CEQA Existing Condition (BOR/SAFCA 400/670)





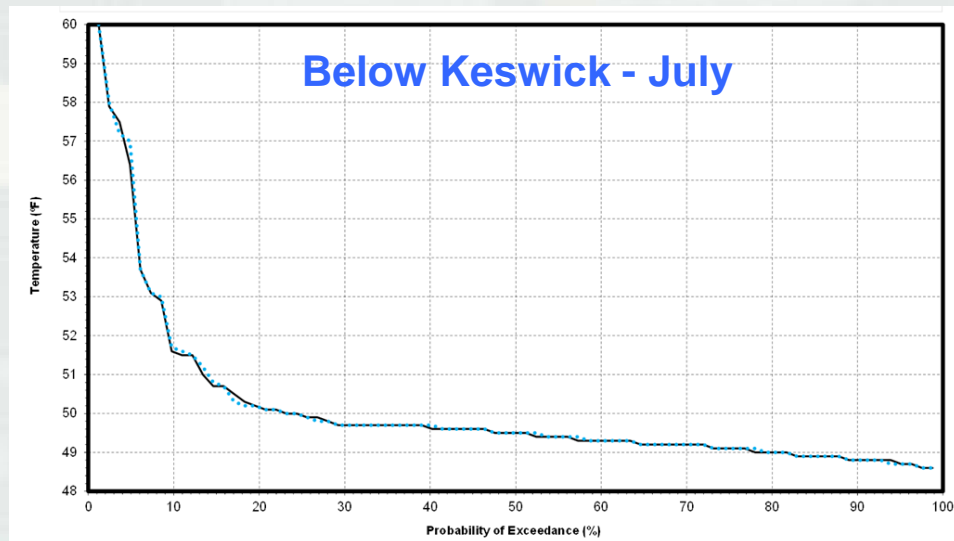
# Sacramento River - Flow

- Long-term average monthly flow
  - ▶ Essentially equivalent year-round
- Flow exceedance distributions
  - ▶ Very few changes of 10% or more
- Spawning habitat availability
  - ▶ Generally similar or equivalent



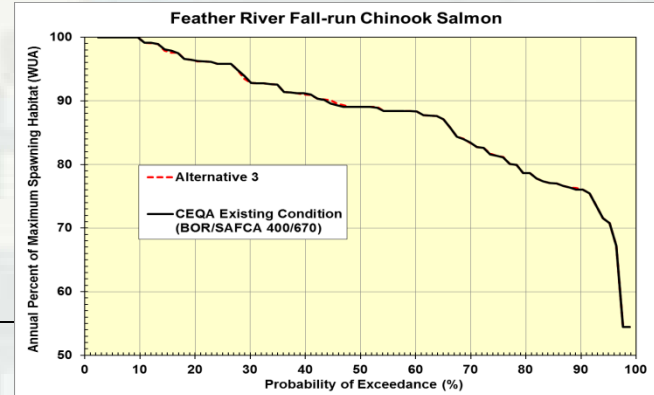
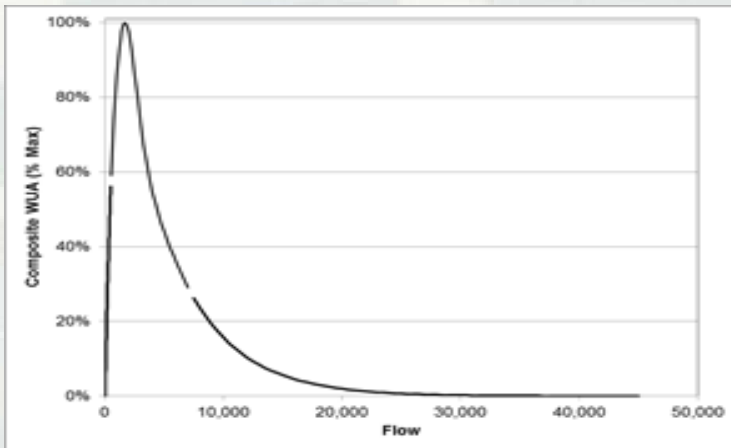
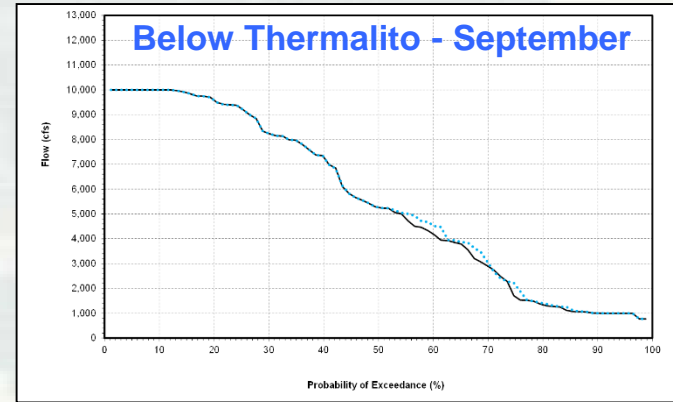
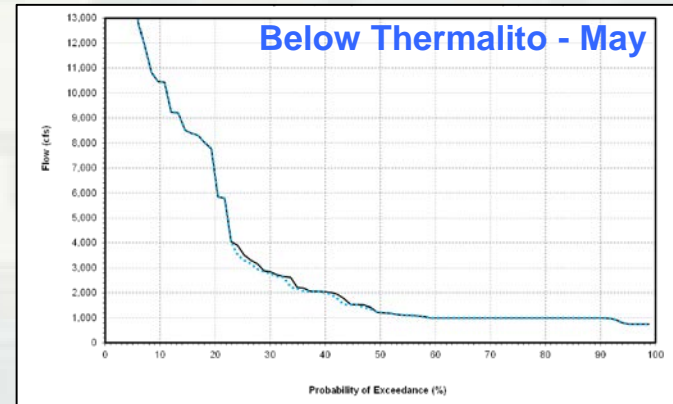
# Sacramento River – Temperature

- Long-term average monthly temperature
  - ▶ Essentially equivalent year-round
- Exceedance distributions
  - ▶ Maximum increase ( $1.3^{\circ}\text{F}$  – July)
  - ▶ Maximum decrease ( $0.8^{\circ}\text{F}$  – September)



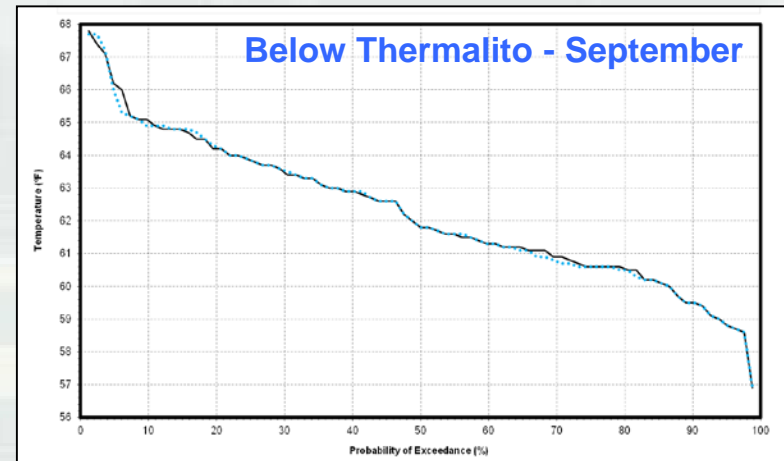
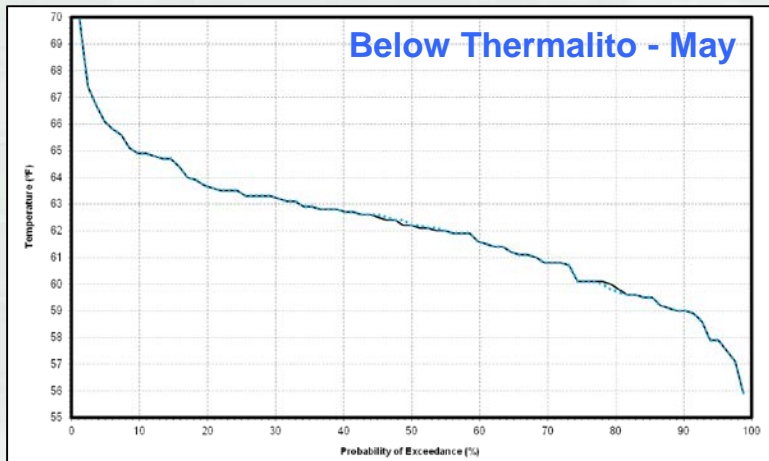
# Feather River - Flow

- Long-term average monthly flow
  - ▶ Essentially equivalent all months except September
    - 1.1% increase below Thermalito
- Flow exceedance distributions
  - ▶ Very few changes of 10% or more
- Spawning Habitat
  - ▶ Generally similar



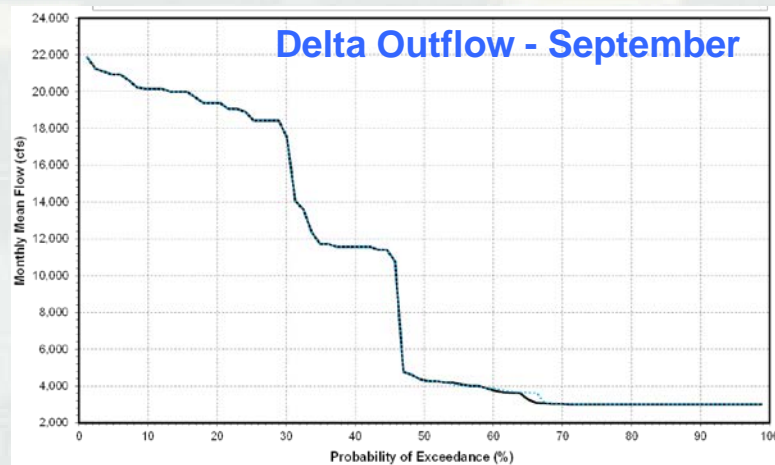
# Feather River - Temperature

- Long-term average monthly temperature
  - ▶ Essentially equivalent year-round
- Exceedance distributions
  - ▶ Maximum increase ( $0.6^{\circ}\text{F}$  – October)
  - ▶ Maximum decrease ( $0.7^{\circ}\text{F}$  – September)



# Delta Parameters

- Flows at Rio Vista, Delta Outflow, Old and Middle River Flows, Yolo Bypass Outflow, and X2 location
- Long-term average monthly values
  - ▶ Essentially equivalent most of the time
- Exceedance distributions
  - ▶ Generally similar, with slight increases and decreases in some species-specific parameters



# Far Field Species Evaluations

Common Name	Status
• Sacramento River winter-run Chinook salmon ESU	Federally and state endangered
• Central Valley spring-run Chinook salmon ESU	Federally and state threatened
• Central Valley fall-/late fall-run Chinook salmon ESU	Federal species of concern State species of special concern
• Central Valley steelhead DPS	Federally threatened
• Southern DPS of North American green sturgeon	Federally threatened State species of special concern
• Delta smelt	Federally threatened State endangered
• Longfin smelt	Federal candidate State threatened
• Hardhead	State species of special concern
• Pacific lamprey	Federal species of concern
• River lamprey	State species of special concern
• Sacramento splittail	State species of special concern
• White sturgeon	Recreational and/or commercial importance
• American shad	Recreational and/or commercial importance
• Striped bass	Recreational and/or commercial importance



# Alternative 3 vs. Existing Condition (USACE 400)

- Generally similar changes in flows and water temperatures as Alternative 3 relative to the CEQA Existing Condition
  - Slightly fewer flow reductions in the Sacramento River
  - Slightly fewer flow increases in the Feather River
  - Similar changes in Delta parameters



# Alternative 3 (Forecast) vs. Alternative 2 (Basin Wetness)

- Generally equivalent changes in flow, water temperature, and Delta parameters under Alternative 3 relative to Alternative 2





# Lower American River

- Detailed Evaluation
  - ▶ Sub-monthly timestep, by river mile
  - ▶ Flow
  - ▶ Water temperature
  - ▶ Spawning WUA
  - ▶ Redd dewatering



# Summary of Environmental Effects Analysis To Date

- Slightly improved end of May Folsom storage
- CalSim II results overall have indicated no substantial changes to system-wide performance
  - ▶ CalSim II represents conservation operations. Does not capture operator discretion.
- Next Steps: Detailed evaluation of American River effects



# DISCUSSION & QUESTIONS



OCT 2017

