Flexing the System: CVFPP Reconnaissance Reservoir Analysis

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Flexing…

Like this? Or this?
Overview

- Objectives and scope
- Past and ongoing studies
- CVFPP Basin-Wide Feasibility Study (BWFS) Reservoir Analysis Approach
A Stressed System, the Need for Action

• Central Valley people, property and assets at risk

• Current flood risk management path unsustainable

• Lack of funding for capital works and for ongoing operations and maintenance of existing infrastructure

• In 2008, the Legislature enacted the Central Valley Flood Protection Act, which authorized and required development of the Central Valley Flood Protection Plan (CVFPP) to address these issues
2017 Update to the CVFPP

- CVFPP is a dynamic, programmatic plan, updated in five year cycles – CVFPP first adopted in 2012, first “Update” in 2017
- 2017 Update has same goals 2012 CVFPP
- The planning horizon is the 30 years
- Refines and updates the State Systemwide Investment Approach (SSIA)
- Adds specificity about recommended near and longer-term investment and financing approach
- Provides broad guidance about more resilient risk management
- Coordinated and aligned with other major flood management efforts
Technical Work to Support CVFPP Goals

- Technical analyses (including BWFS) informing a reasonable, balanced and cost-effective approach

- Emphasis on sustainable, integrated flood management

- Diverse array of actions to improve flood protection

- CVFPP Public Draft December 2016

CVFPP GOALS

Primary Goal: Improve flood risk management

- Reduce the chance of flooding
- Reduce damages once flooding occurs
- Improve public safety, preparedness, and emergency response

Supporting Goals

- Improve Operations and Maintenance
- Promote Ecosystem Functions
- Promote Multi-benefit Projects
- Improve Institutional Support
Objectives and Scope

- What are we trying to achieve?
- What were the analysis limitations?
San Joaquin River BWFS Objectives

• Primary
  – Improve Flood Risk Management

• Supporting
  – Promote Ecosystem Functions
  – Promote Multi-Benefit Projects
System Improvements

- Additional flood storage
  - Existing reservoir
  - Transitory storage
- Conjunctive use and groundwater storage
- Operational changes
  - Coordinated reservoir operations through enhanced application of forecast data
This analysis is:

- At reconnaissance level
- For watersheds of San Joaquin River Basin
- To reduce downstream flood risk
- To understand scale of performance
- To support BWFS screening and formulation, and thus inform the 2017 CVFPP update
This analysis is:

- **NOT** prescriptive
- **NOT** for implementation
- **NOT** to exclude any future opportunities
Future analysis will need:

- Extensive coordination with reservoir owners and operators
- Expanded stakeholder involvement
- Alignment with various agencies
- The best available tools and data
Past and Ongoing Efforts

• What has been studied?
• What is our starting point?
Highlights of Reservoir Studies/Programs

• 2002 Sacramento and San Joaquin River Basins Comprehensive Study
  – Operational changes at New Don Pedro, Friant, and New Exchequer dams

• 2012 CVFPP Reservoir Study
  – Multipurpose reservoirs with gross pool over 100 TAF

• Central Valley Hydrology Study (CVHS) and Central Valley Flood Evaluation and Delineation (CVFED) Program
  – Standardized approach to develop full range of existing hydrology
  – Data and tools (e.g. HEC-ResSim)

• San Joaquin Forecast-Coordinated Operations Program
  – Multi-agency partnership at federal, State, and local level
Limited Flood Storage for Large Events

<table>
<thead>
<tr>
<th>Reservoir Flood Storage Capacity (TAF)</th>
<th>3-Day Tributary Unregulated Runoff (TAF)</th>
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<tbody>
<tr>
<td>New Hogan Reservoir</td>
<td>165</td>
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<tr>
<td>New Melones Reservoir</td>
<td>450</td>
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<td>Tuolumne River</td>
<td>513</td>
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<td>Stanislaus River</td>
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<td>Calaveras River</td>
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<td>Merced River</td>
<td>299</td>
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<td>Upper San Joaquin River</td>
<td>332</td>
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<tr>
<td>New Don Pedro Reservoir</td>
<td>1,188</td>
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<td>Lake McClure</td>
<td>361</td>
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<td>Millerton Lake</td>
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</table>

Not Evaluated in BWFS Reservoir Analysis
BWFS Reservoir Analysis Approach

**Increase in Objective Releases**
- 

**Forecast Coordinated Operations**
- 

**Additional Flood Storage**
- Pre-release before storm arrival through Forecast Informed Operations (FIO)
- Convert portion of conservation pool to flood pool through conjunctive use

**HEC-ResSim**
Reservoir Model: CVHS HEC-ResSim

• System network:
  – Local flows
  – Operation points

• Physical reservoir features:
  – Storage-elevation-area
  – Release capacity

• Reservoir operation rules:
  – Flood/conservation pool designation
  – Maximum and minimum releases
  – Max rate of change Modifications
  – Emergency spillway release diagram (ESRD)

• Simulate/route an event through the system
BWFS Reservoir Analysis Approach

**Increase in Objective Releases**
- HEC-ResSim
- Identify release options
- System Configurations
  - Cost estimate: Flowage easement
  - Levee improvements

**Forecast Coordinated Operations**
- HEC-ResSim
- Future Study
- System Configurations

**Additional Flood Storage**
- Pre-release before storm arrival through Forecast Informed Operations (FIO)
- HEC-ResSim
- Identify pre-release amount/trigger
- System Configurations

**Maintain the Same Water Supply**
- CalSim-II & Conjunctive Use Spreadsheet Model
- Formulate Conjunctive Use Operations
- Cost estimate: new overland recharge facilities

**BWFS Reservoir Analysis for Flood Operations**
- Convert portion of conservation pool to flood pool through conjunctive use
- Identify additional flood storages
- System Configurations

2017 ROADMAP
### Analysis Examples (Draft):
**Tuolumne River Watershed**

#### Don Pedro Reservoir Operational Changes: 1997 115 Percent Event

<table>
<thead>
<tr>
<th>Objective Release for Modesto Gage</th>
<th>FCO for 46,000-cfs Vernalis Flow?</th>
<th>Pre-Release/Additional Flood Storage</th>
<th>Peak Flow Rate Change at Modesto Gage (Base = 86,000 cfs)</th>
<th>Peak Flow Rate Reduction at Vernalis (Base = 126,000 cfs)</th>
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<tr>
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<td>Yes</td>
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<td>↓ 1,000 cfs</td>
<td>↓ 1,000 cfs</td>
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</table>
Analysis Examples (Draft): Tuolumne River Watershed

Representative HEC-RAS Cross-Section: Tuolumne River at Station 2.4081
Analysis Examples (Draft): Tuolumne River Watershed

HEC-RAS Simulated River Stage Change

Simulated Change in Peak Water Surface Elevation for 1997 115%
New Don Pedro Dam 25,000-cfs Objective Release

San Joaquin River

Tuolumne River

River Miles

French Camp Slough
Old River
Whitehall Slough
Stanislaus River
Confluence with San Joaquin River
Modesto
BWFS Reservoir Analysis Findings
• Recognized the need for future study
• Screened options were incorporated into different BWFS system configurations and State Recommended Plan (SRP)
• SRP is reflected in 2017 CVFPP Update
The Path Forward

- Need to change how we think about flood risk management
- 2017 Update will refine the 2012 CVFPP and provides a holistic path forward to a different approach
- The refined SSIA enables the State to integrate and prioritize investments in multi-benefit flood risk reduction projects
- CVFPP will take 30 years to implement
Questions?
Formulate Conjunctive Use Operations to maintain the same water supply

- Downstream constraints for avail. water
  - X2 position
  - Vernalis flow rate
  - UWFE state
- Shoulder capacity of existing conveyance
- Overland recharge rate
- Groundwater loss rate
- GW avail. for borrowing

Identify change in water supply

System Configurations