

# **OROVILLE DAM CITIZENS ADVISORY COMMISSION**

**Meeting 14  
July 7, 2023**

**Hosted by the California Natural Resources Agency**



Note: some backgrounds and colors have been changed from the original in order to improve visual accessibility.

# ITEM 1

## WELCOME AND COMMISSION UPDATES

# ROLL CALL

- Commissioner Bateman
- Supervisor Connelly
- Supervisor Conant
- Secretary Crowfoot
- Senator Dahle
- Sargent Evans
- Supervisor Flores
- Supervisor Fuhrer
- Assemblyman Gallagher
- Director Ward
- Supervisor Kimmelshue
- Deputy Licon
- OES Manager Marin
- Director Nemeth
- Mayor Pittman
- Vice Mayor Smith
- Director Quintero
- Lieutenant Spear
- Lieutenant Commander Stokes

# ACTION ITEM TRACKER PROCESS

At the end of each meeting, the Secretary will:

- Summarize action items raised at the meeting.

Following each OCAC meeting, Resource Agency staff will:

- Email Commissioners with new action items and those that were addressed and can be marked as complete.
- Ask Commissioners to comment with any revisions/amendments to those items before a specified date.
- Update the Action Item Tracker with the new action items and note potential timing that they will be addressed, and update progress made on prior items and as appropriate, move them to the “completed” tab.

# AGENDA DEVELOPMENT PROCESS

- During each meeting, Resource Agency staff will share proposed agenda topics based on relevant topics that may be time sensitive and pending items in the tracker.
- Commissioners will be invited to provide input on these topics.
- Resource Agency staff will circulate a more refined agenda after the meeting and again request Commissioner feedback by a specified date.
- The Action Item Tracker will contain a tab that features potential agenda topics over a longer horizon.

# BAGLEY-KEENE OPEN MEETING ACT

- Intended to ensure the public has a seat at the table to witness and provide feedback on the deliberations of a public body.
- Key provisions include:
  - Noticing the meeting time, location, and agenda 10 days before the meeting;
  - Posting meeting agendas in public locations;
  - Making Commissioners physically available to the public even if the Commissioners themselves are meeting virtually;
  - Providing time for public comment; and
  - Ensuring that any convening (including serial meetings and email; and correspondence) of a quorum of the body's members follows the above provisions.

**ITEM 2**  
**DAM FACILITY SITE VISIT RECAP**

# Commissioner Oroville Site Visit



## Facilities Viewed:

- Hyatt generating/pumping plant
- Top of Dam and Spillway





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WATER RESOURCES



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WATER RESOURCES



**ITEM 3**  
**OROVILLE DAM FACILITIES UPDATE:**  
**EXPECTED EXPENDITURES**

# **State Water Project Budget & Annual Planning**

Oroville Citizens Advisory Commission Meeting

July 7, 2023

Hong Lin, Financial Manager, State Water Project

California Department of Water Resources

# SWP Financial Overview

- Annual Revenue over \$1 Billion
  - 29 SWP Contractors, Cost-share (i.e. Bureau of Reclamation), Power Revenue, Davis-Dolwig (State General Fund)
- Use of Funds
  - SWP Operation & Maintenance, Debt Service, Capital Projects
- Capital Project Planning \$~300 million
- Financial Management Enhancement



# Contract Extension Amendments

- Extend the term in each Contract to December 31, 2085
- Implement new billing provisions
- Increase the SWP's operating reserves and establish additional accounts for SWP management
- Facilitate improved coordination

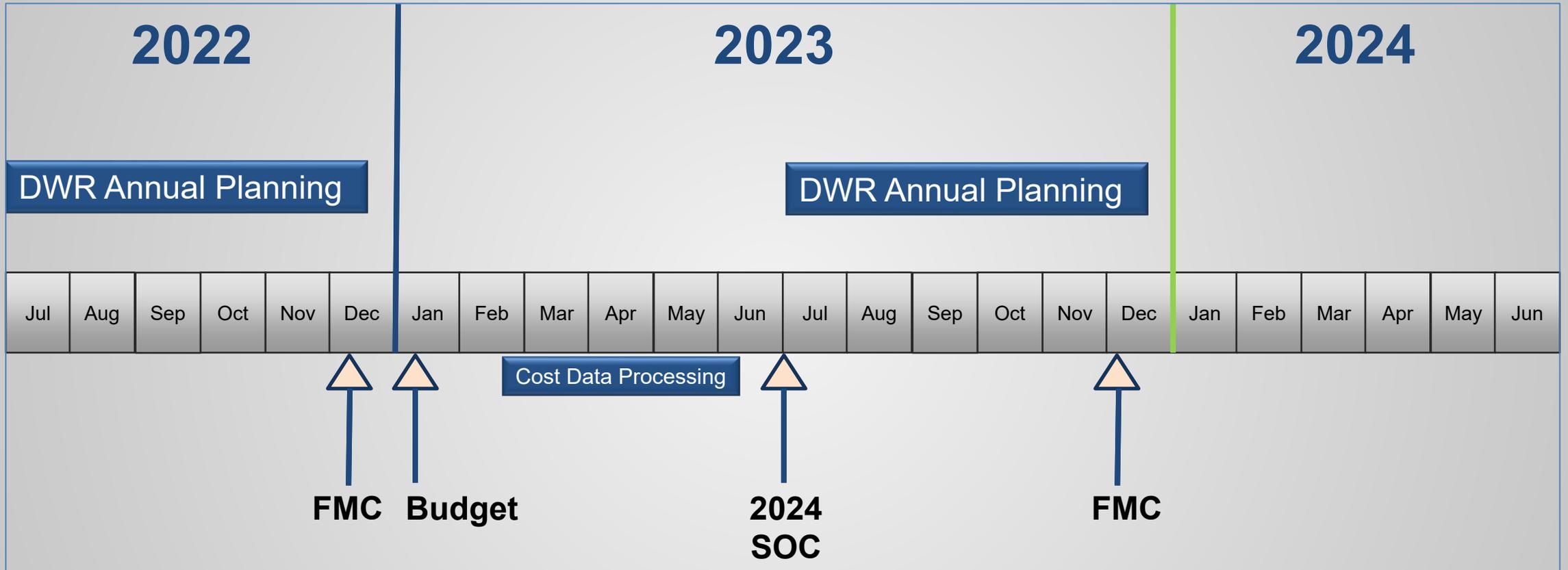


# SWP Financial Management Enhancement

- SAP Budgeting and Planning
  - State Budget Process
- Portfolio, Project, and Resource Management
  - Identify, plan, prioritize, and allocate resources
  - Risk-informed project ranking
- Cost Allocation and Billing
  - Allocate costs across reaches, project purposes, cost components, and Contractors
  - Include the new billing methodology under Contract Extension Amendment
- Business Intelligence and Cross Modular Reporting



# Planning Timeline



- State Water Project Financial Management Conference (FMC)
- Budget – Annual budget approval for SWP
- Statements of Charges (SOC) – Bills to the SWP Contractors



# Oroville Expenditures

Expense Type	Actual Expenditures				Planned Expenditures	
	CY2019	CY2020	CY2021	CY2022	CY2023	CY2024
Annual Operations & Maintenance (O&M)	\$47.2M	\$46.2M	\$53.0M	\$60.7M	\$52.7M	\$58.4M
Capital Projects	\$50.9M	\$46.3M	\$45.3M	\$41.5M	\$48.8M	\$36.9M
<b>TOTAL</b>	\$98.1M	\$92.5M	\$98.2M	\$102.2M	\$101.5M	\$95.3M

Note: Excludes costs for Oroville Spillways Emergency and Reconstruction



# Summary

- Contract Extension Amendment is currently effective.
- SWP is continuing enhancing its financial management through implementation of new systems, program management, and risk-informed prioritization.
- SWP maintenance management and asset management programs will provide valuable data to improve SWP capital planning and financing.
- SWP will continue communicating with public (i.e. update to California Water Commission) on SWP planning and financial management.



**ITEM 4**  
**DAM SAFETY PROJECT UPDATE**

# Oroville Dam Safety Project Updates

- **2023 Spillway Performance**
- **River Valve Outlet System Rehabilitation**
- **Director's Safety Review Board/Part 12D Periodic Inspection**
- **Coreblock and Grout Gallery Piezometers**
- **Palermo Canal Lining & Maintenance**
- **Oroville Dam Seismic Stability/Deformation Analysis Update**
- **Paleoflood Analysis and Stochastic Flood Analysis**
- **Parish Camp Saddle Dam Raise**
- **Flood Control Outlet (FCO) Projects**
- **Emergency Spillway Erodibility Study**
- **ARkStorm 2.0 Comparison to Probable Maximum Precipitation**

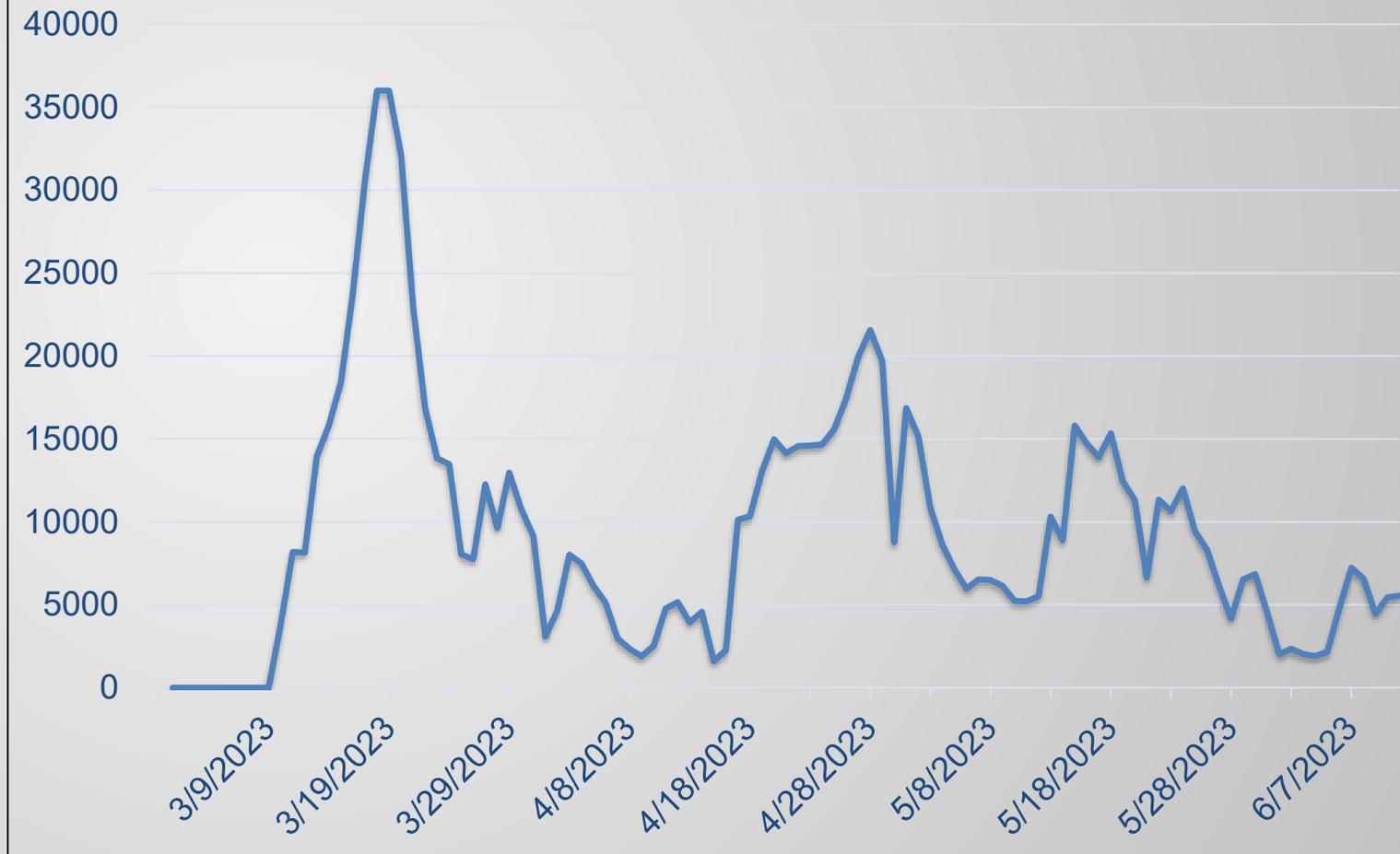
**Oroville Citizens Advisory Commission**  
**July 7, 2023**

Presented by:  
David Sarkisian, PE, CEG  
Manager, Dam Safety Services  
Division of Operations and Maintenance

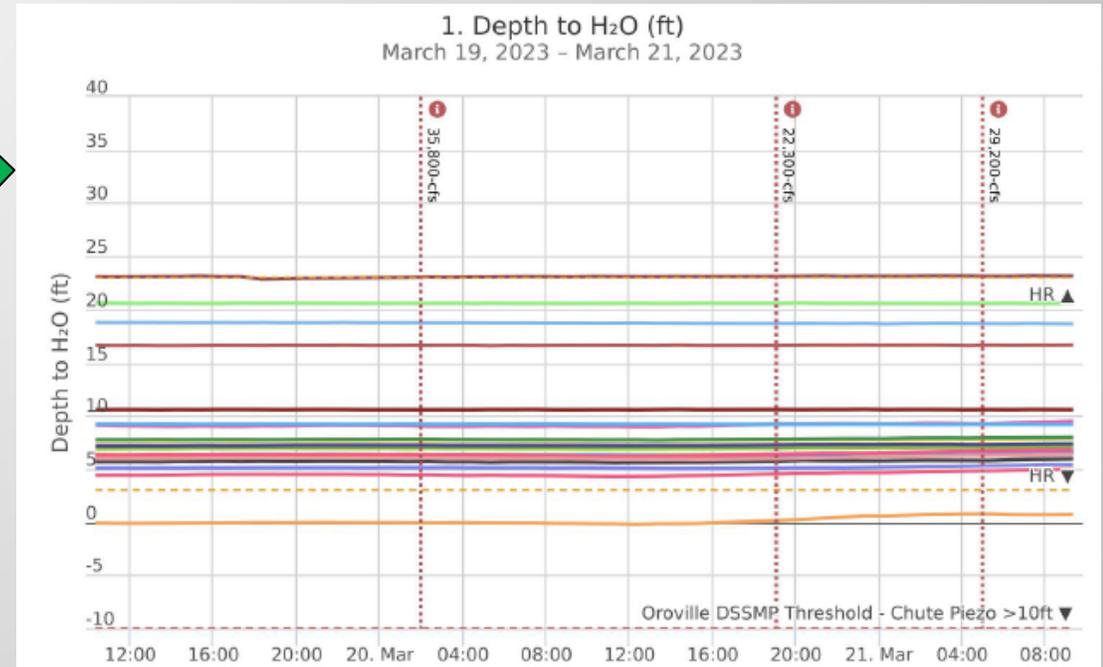
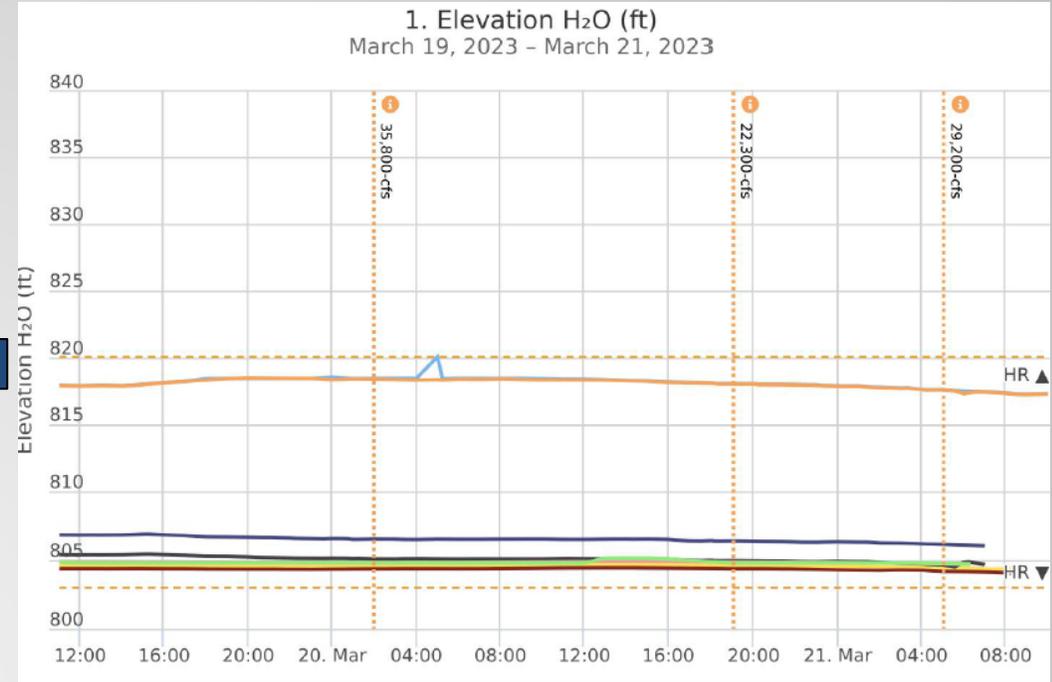
# 2023 Spillway Performance

- Spillway releases initiated on March 10<sup>th</sup> to manage flood conservation pool.
- High Flow Operations (> 20,000 cfs release to Feather River)
  - March 15 – 22
  - April 27 – May 2
- Maximum Release of 36,000 cfs occurred on March 18 & 19<sup>th</sup>.
- > 730,000 acre-feet conveyed through spillway as of June 12<sup>th</sup>

## Average Daily Spillway Release (cfs) Oroville Flood Control Outlet - 2023



# 2023 Spillway Performance



# River Valve Outlet System Rehabilitation

- Consists of installation of two new 72-inch diameter spherical valves to improve system reliability and allow for safe long-term maintenance of the dam's low-level outlet.
- Multi-year design effort that included a Technical Review Board to review the design and construction schedule.
- Favorable 2023 Hydrology and DSOD/FERC approvals allowed for "Go Decision" for Phase 2 construction.
- Hyatt Powerplant and spillway operations will vary to allow for construction and maintain flows to Feather River.
- Construction anticipated to complete in late 2024.



# Director's Safety Review Board and Part 12D Inspections

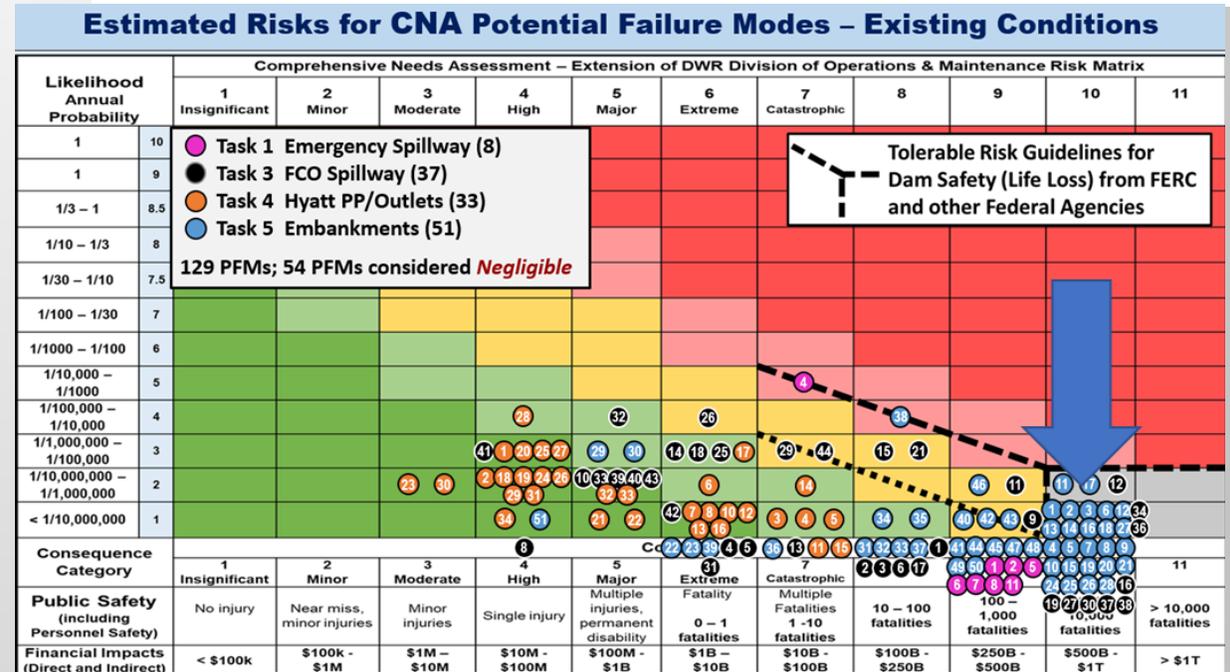
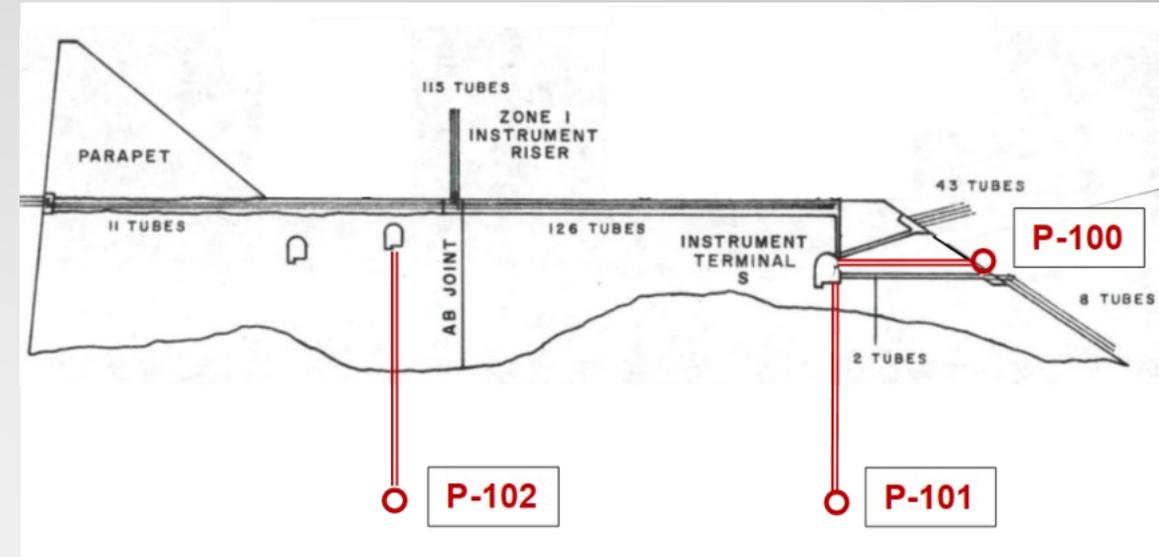
- 2022 - Request for Qualifications issued to solicit Independent Consultants and Subject Matter Experts to fulfill five-year Director's Safety Review Boards (DSRBs) and Part 12D Inspections
- Director's Safety Review Boards – Required by California Water Code, involves Division of Safety of Dams
- Part 12D Process – Required by Federal Energy Regulatory Commission (FERC)
  - New FERC process: Periodic Inspection vs Comprehensive Assessment
  - Submit Part 12D Reports by July 15, 2024.

Dams	Type of Part 12D	Includes Risk Assessment?
Oroville, Parish Camp Saddle, Bidwell Bar Canyon, Fish Barrier, and Thermalito Diversion Dams	Periodic	No
Thermalito Forebay and Thermalito Afterbay Dams	Comprehensive Assessment	Yes



# Oroville Dam Coreblock and Grout Gallery Piezometers

- Eight piezometers planned, as well as improvements to seepage weir instrumentation.
- Instrument locations prepared for specialized drill rig, power cables installed.
- Installation in Fall 2022 prevented by high lake condition; approved plan calls for installation when Lake Oroville is at or below 780 feet.
- Next opportunity – Fall 2023 ??



# Palermo Canal Lining Improvements

Improve canal lining to reduce leakage and potential for landslides/instability above the Hyatt Powerplant switchyard and other facilities.

- ✓ Final Drawings, Specifications, and Quality Control and Inspection Plan submitted to FERC on March 20, 2023.
  - New Liner for 130-foot unlined portion
  - Cleaning and maintenance of existing liner
- Construction planned for Late 2023/Early 2024 – Contingent on FERC approval.



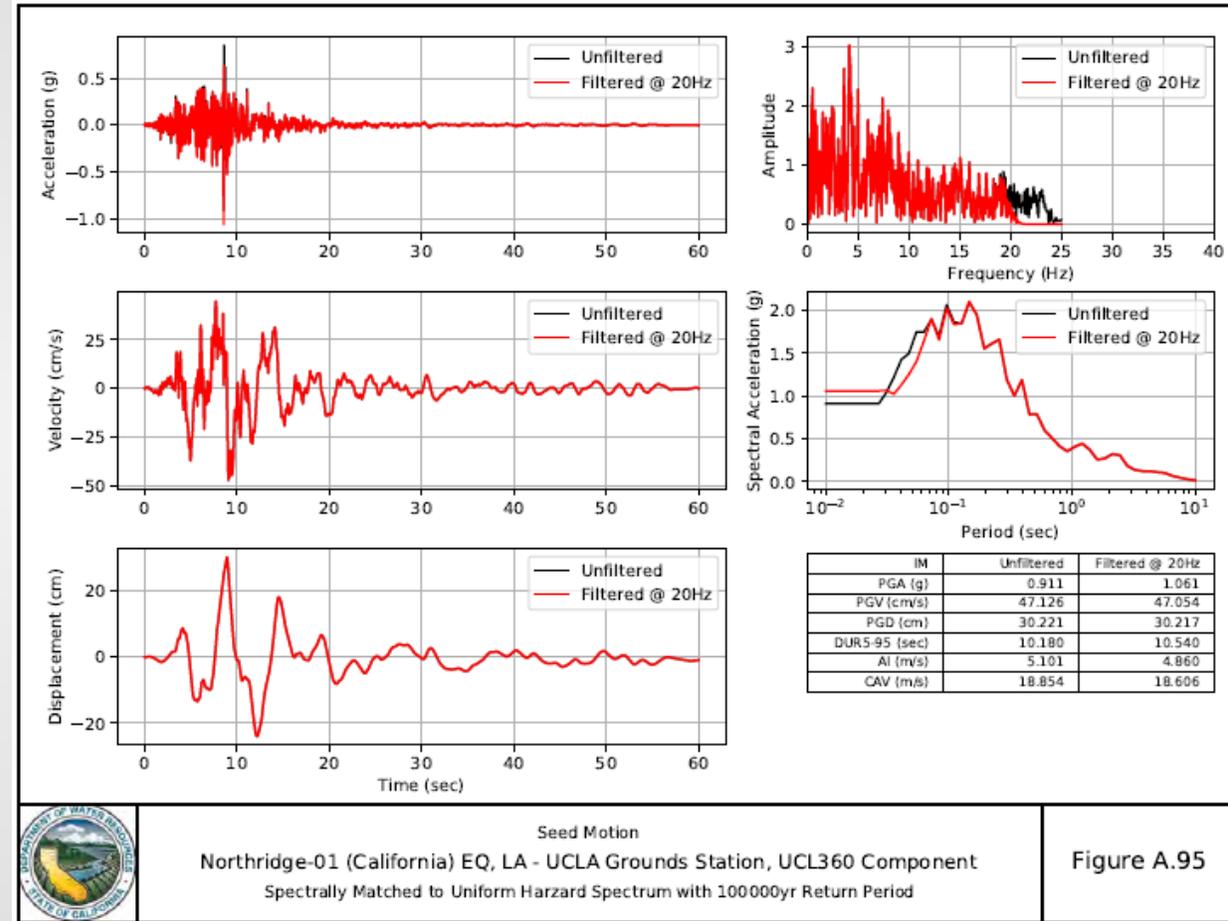
*Photo by Florence Low, DWR*



# Oroville Dam Seismic Stability/Deformation Analysis

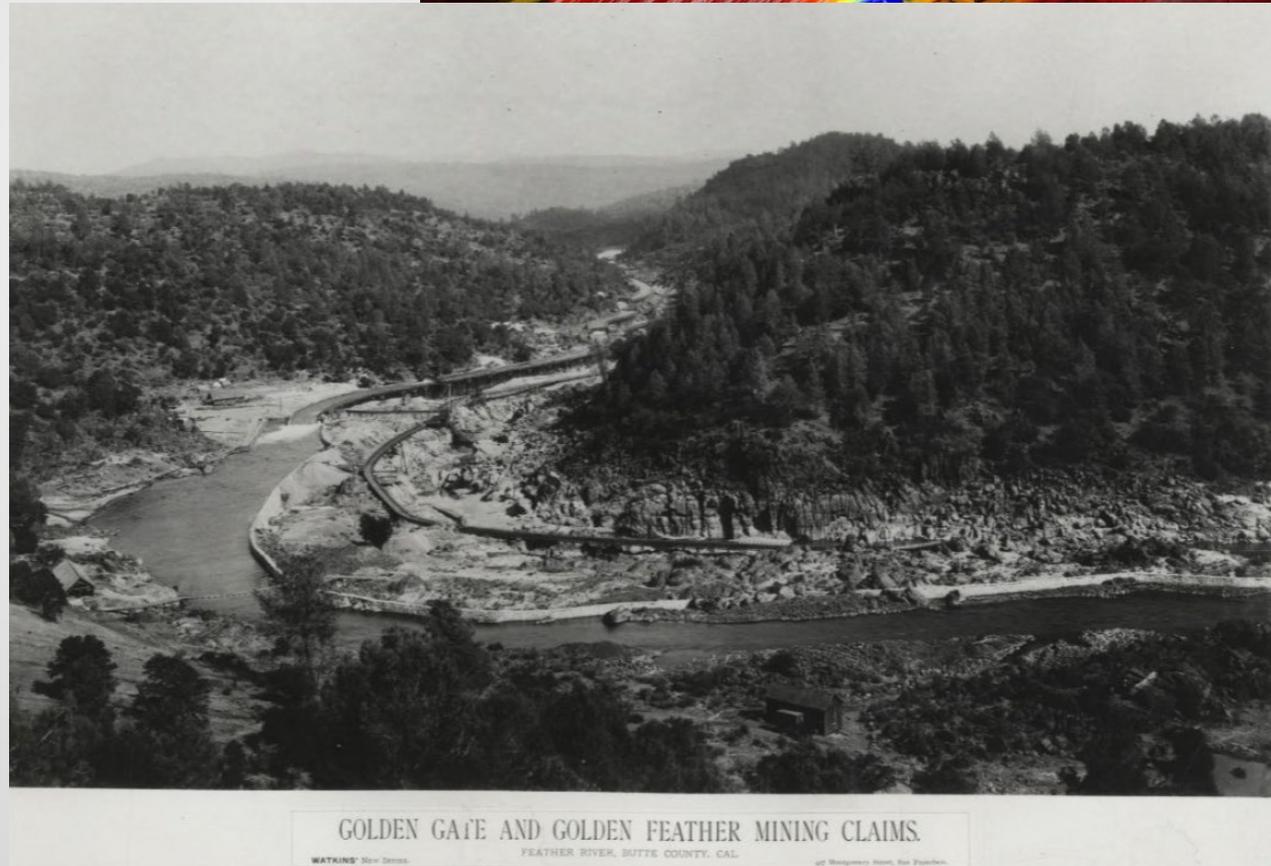
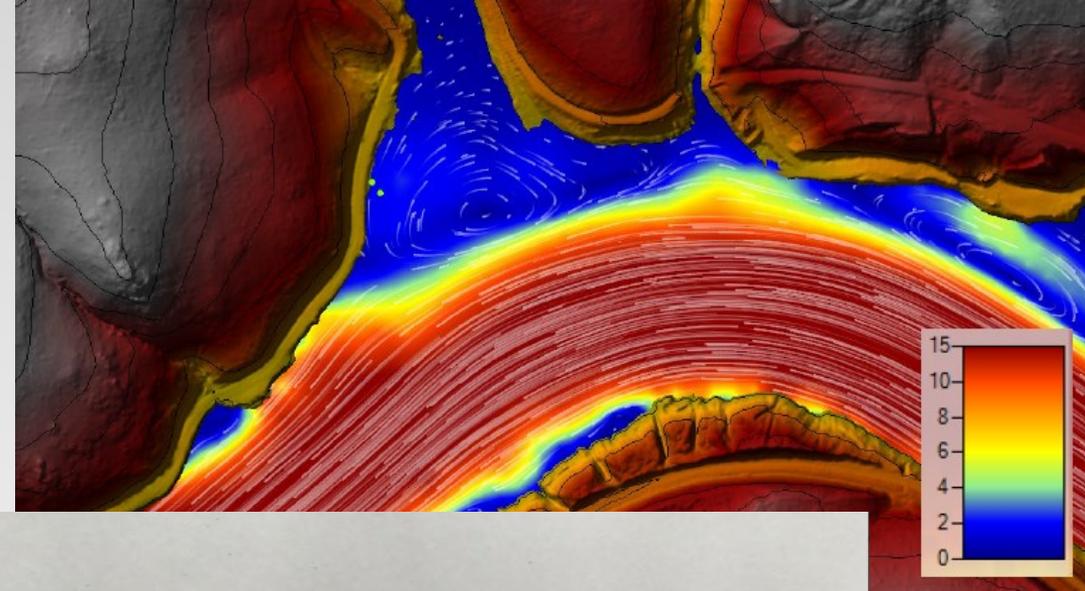
The analysis will further inform the performance of the dam under a wide range of earthquake loading and reservoir conditions and greatly improve risk estimates related to seismic performance of the dam moving forward (2029 Part 12D Comp. Assessment).

- ✓ Work Plan finalized.
- ✓ Material and Loading Characterization Technical Memorandum completed.
  - Scope expanded, resulting in schedule extension and greater funding needs.
  - Study anticipated to be completed in 2026.



# Paleoflood Analysis

- Utilizing a combination of historical data, hydraulic modeling, and geologic investigation to “reconstruct” and estimate the magnitude and frequency of past floods on the Feather River.
- Data is limited due to mining history along the Feather River
- Reduce uncertainty in the hydrologic hazard curve – inform the frequency of extreme floods
- Anticipate completion in 2023.



# Stochastic Flood Analysis

- Computer simulation of flood modeling considering hydro-meteorological and watershed input parameters as variables rather than fixed values.
- *"The Board recommends that DWR perform a stochastic flood event modeling study to improve the estimates of flood hazard with uncertainty bounds and consideration of inputs from regional precipitation analysis and paleohydrology, as appropriate, for use in future risk assessments."*
- Monte Carlo or other random sampling procedures are used to allow input parameters to vary in accordance with that observed in nature.
- Probability plots are used to describe the flood magnitude-frequency relationships.
- January 2024 – June 2026

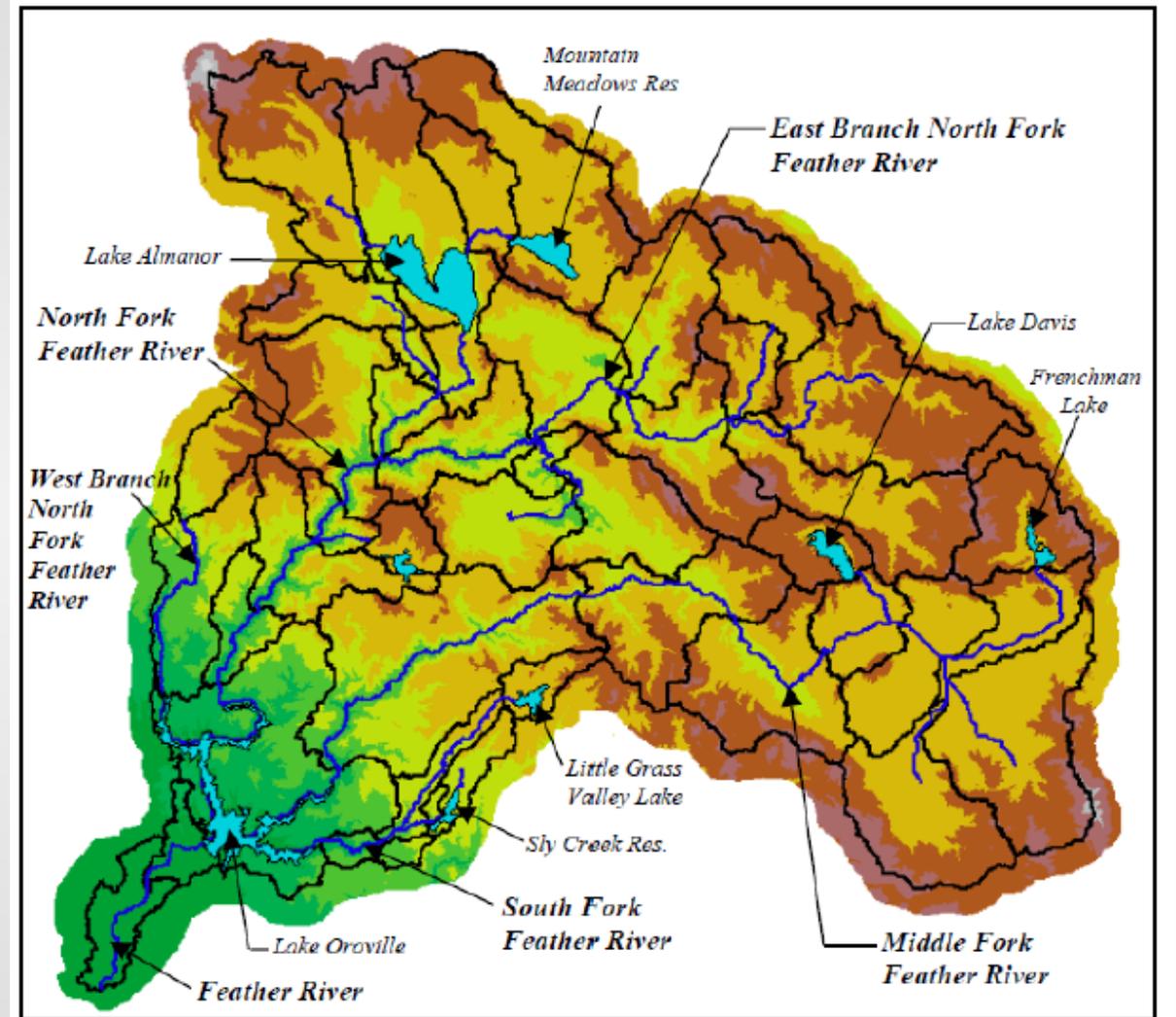


Figure 4. Map of the Feather River watershed above Lake Oroville (not to scale, top is north) (USACE 2001)



# Parish Camp Saddle Dam Raise

Raise Parish Camp Saddle Dam to reduce potential for overtopping during very extreme flood events.

- ✓ Geotechnical Exploration Plan re-submitted to FERC on March 2, 2023, with reduced scope of work to focus on Part 12D recommendations
- FERC requires further justification for the “raise”, assessment of potential of risk transfer, and reduction of uncertainty associated with the “Greater than Probable Maximum Flood”.
- Path Forward:
  - Complete Paleoflood Analysis
  - Perform Stochastic Flood Analysis
  - Perform investigation and evaluate erodibility of dam and foundation
  - Re-evaluate risk (potential failure modes)



# Flood Control Outlet (FCO) Projects

- Continue Radial Gate Phase 3 Maintenance Repairs as reservoir levels allow (2022-2030)
- FCO Monolith 25 & 26 Seismic Retrofit Alternatives Analysis
  - 2023 piezometer data during high reservoir conditions.
  - Task Order in progress to re-engage consultant with modeling.
- Post-Spill Radial Gate Inspection
- Spillway Maintenance Repairs

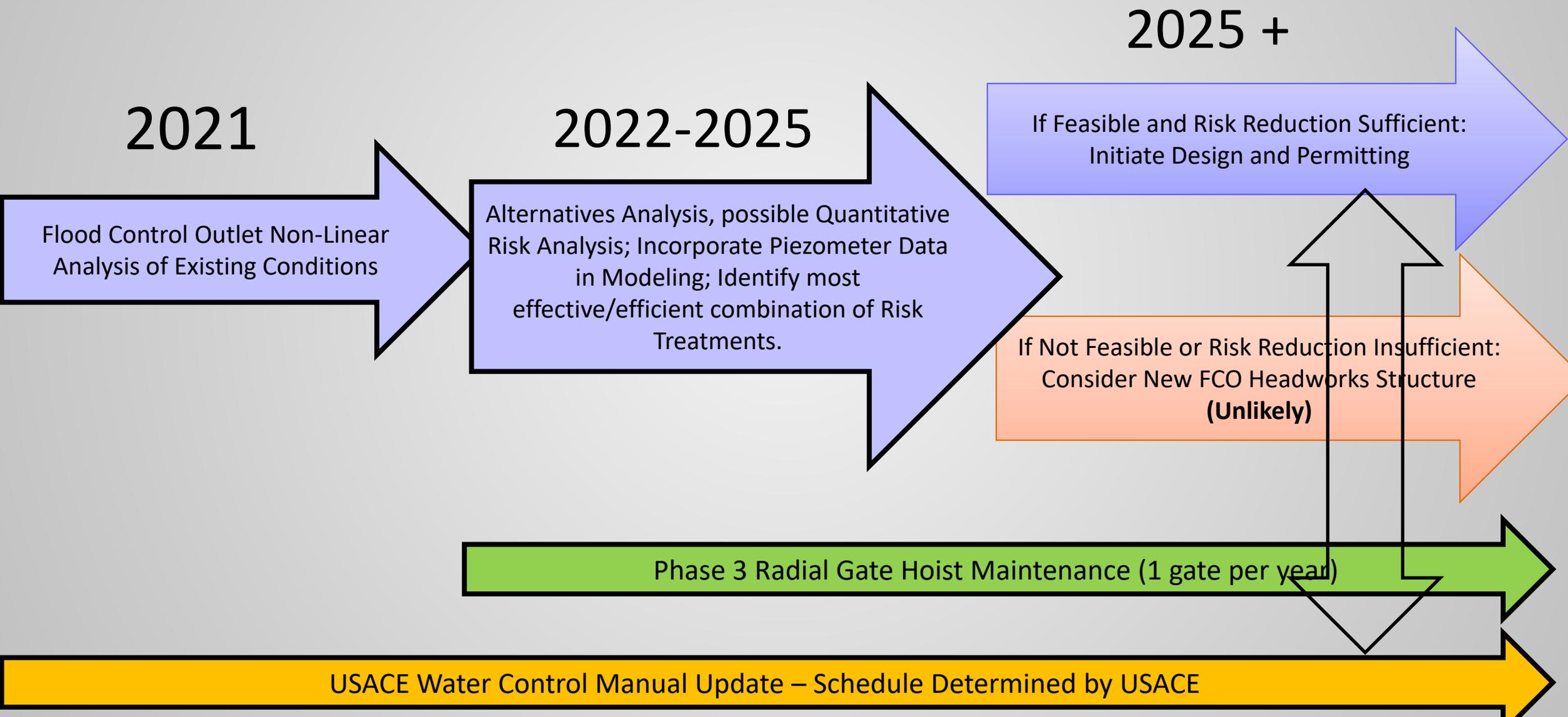


*March 10, 2023, Initiation of Spillway Release*

*Photo by F. Greaves, DWR PAO*



# Relationship between FCO Studies and Forecast Informed Reservoir Operations/Water Control Manual Update





# ARkStorm 2.0 Comparison to 2017 Lake Oroville Probable Maximum Precipitation

- Downloaded ARkStorm 2.0's 30-day duration hourly *historical* (ARkHist) and *future* (ARkFuture) scenario precipitation data and then extracted that portion of data over the Lake Oroville watershed.
- Computed the 72-hour (maximum) cumulative and 30-day precipitation.
- Compared against the 2017 Probable Maximum Precipitation, which is the basis for the Probable Maximum Flood.

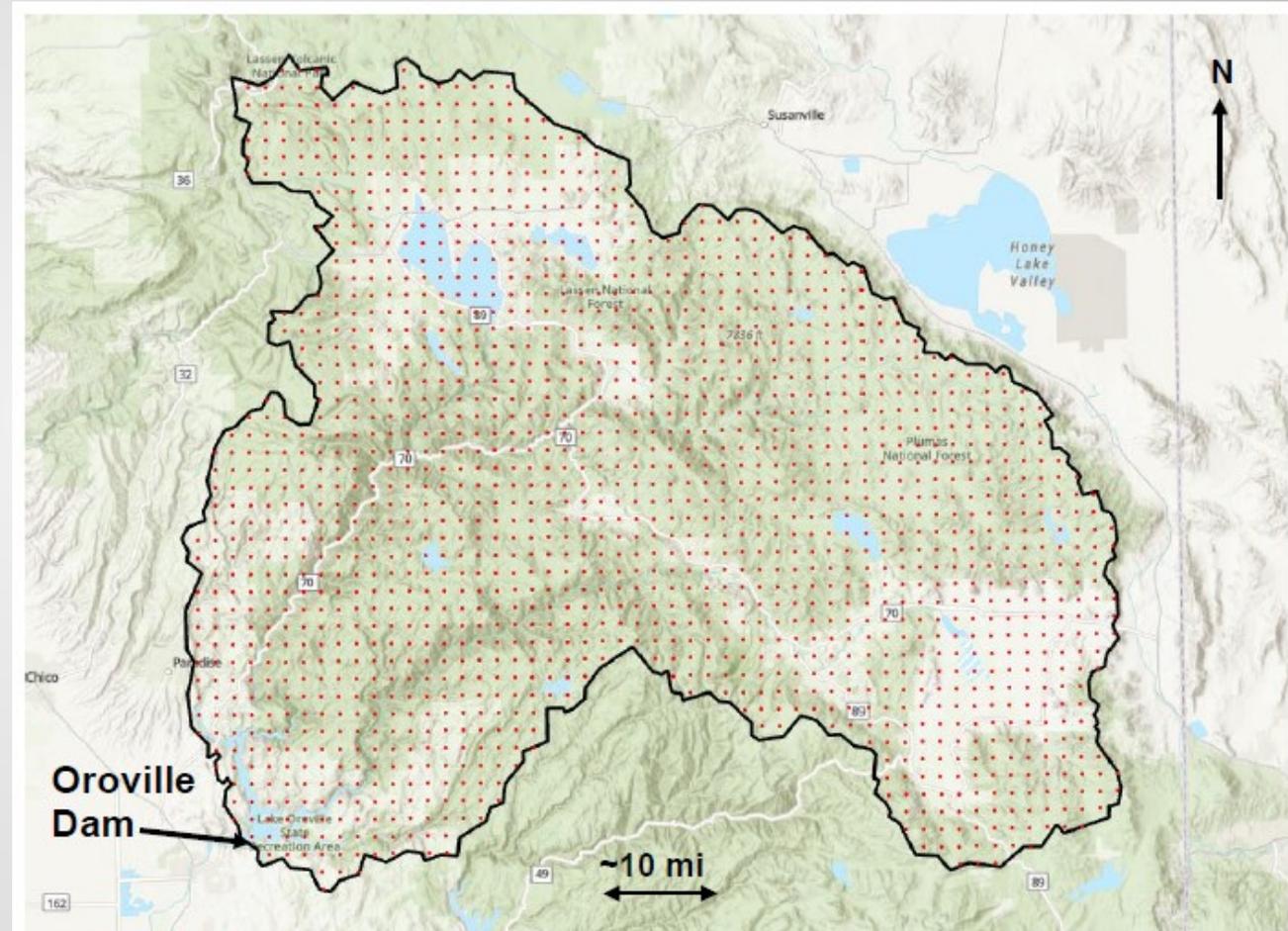


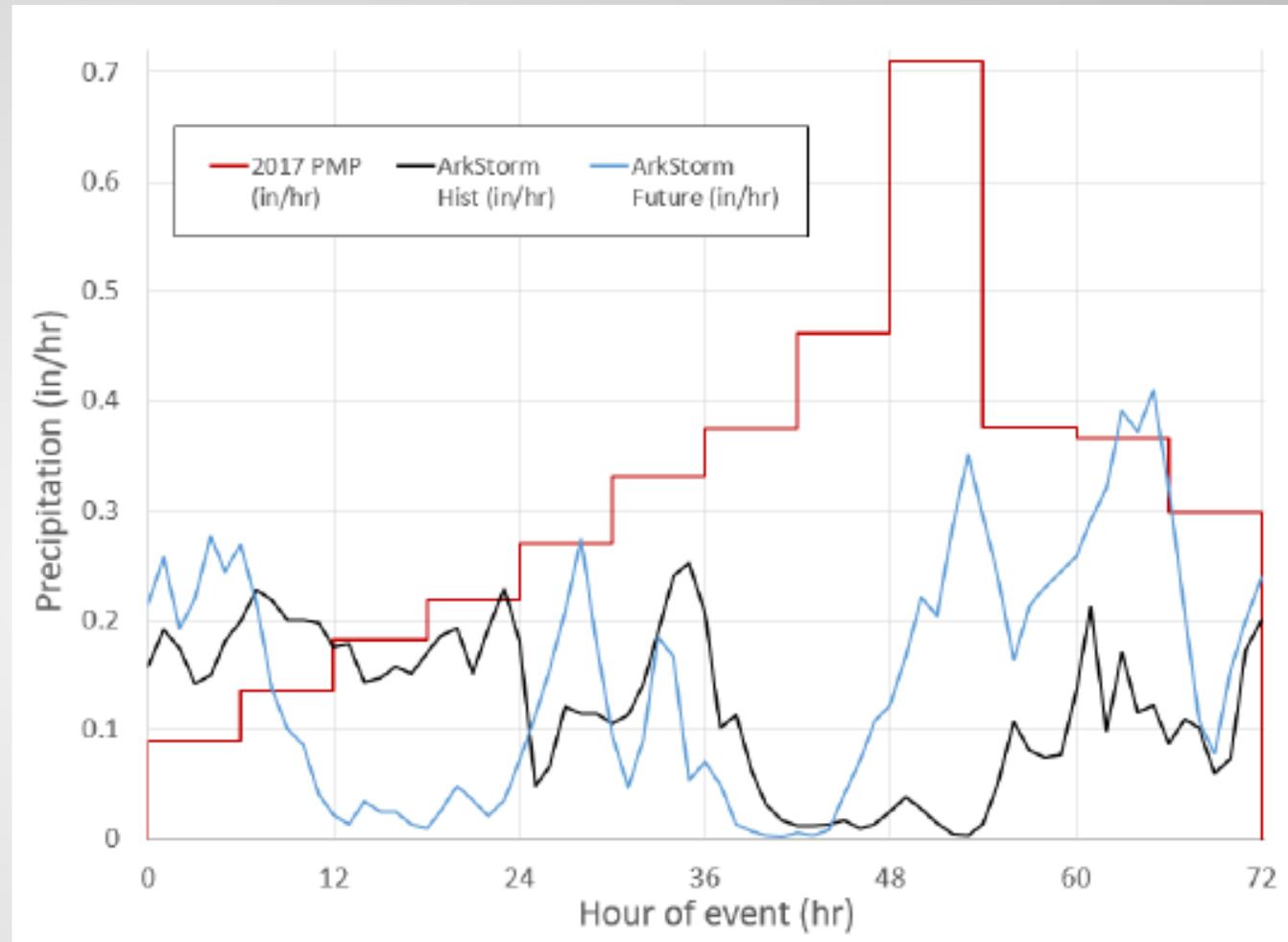
Figure 1. ARkStorm 2.0 precipitation data points within the Feather River watershed above Lake Oroville. The Lake Oroville watershed is approximately 3,600 mi<sup>2</sup> with 1,648 precipitation points.



- The ARkStorm 2.0 scenarios are longer storms with lesser 72-hour volumes...and would result in lower peak outflow, but longer spillway outflows for Oroville Dam.

Scenario	Cumulative Precipitation	
	72-Hour (Max.)	30-day
2017 PMP	22.8	n/a
ARkHist	8.6	30.6
ARkFuture	10.5	45.0

Scenario	Comparison of 72-Hour Volumes to the 2017 PMP
ARkHist	37.8%
ARkFuture	46.1%



**Comparison of 2017 Probable Maximum Precipitation (red) against maximum 72-hour precipitation from ARkHist (black) and ARkFuture (blue)**



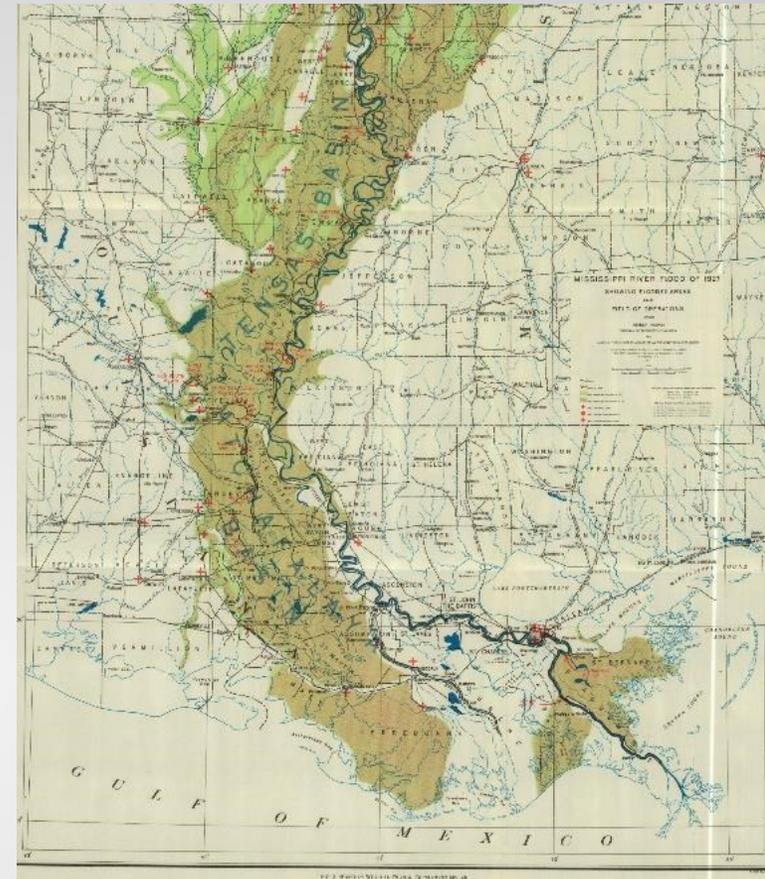
Thank you....Questions?



# ITEM 5 INUNDATION MAPS

# Overview of Inundation Modeling / Mapping

Oroville Citizens Advisory Commission



**Image:** Flood inundation map of the Great Flood of 1927. Prepared shortly after flood based on observations.

Michael Mierzwa, P.E., State Floodplain Manager  
CA Dept. of Water Resources, Division of Flood Management

Michael Bessette, P.E.  
Sutter Butte Flood Control Agency

# Pre-Meeting Agenda

## May 18, 2023

- ★ 1. Uses of Inundation Maps
- ★ 2. Revisiting FEMA FIRMs
  - a. Looking at the FIRMs for Oroville
  - b. Purpose of FIRMs
  - c. Process for updating FIRMs
- 3. Recap of different types of inundation maps (Flood Study Assumptions Table)
- 4. Recap of SB-92 dam inundation map requirements
- 5. Discussion on DWR-SWP Oroville dam inundation maps
  - a. Looking at the maps again (hard copies)
  - b. Comparing with the FEMA FIRMs

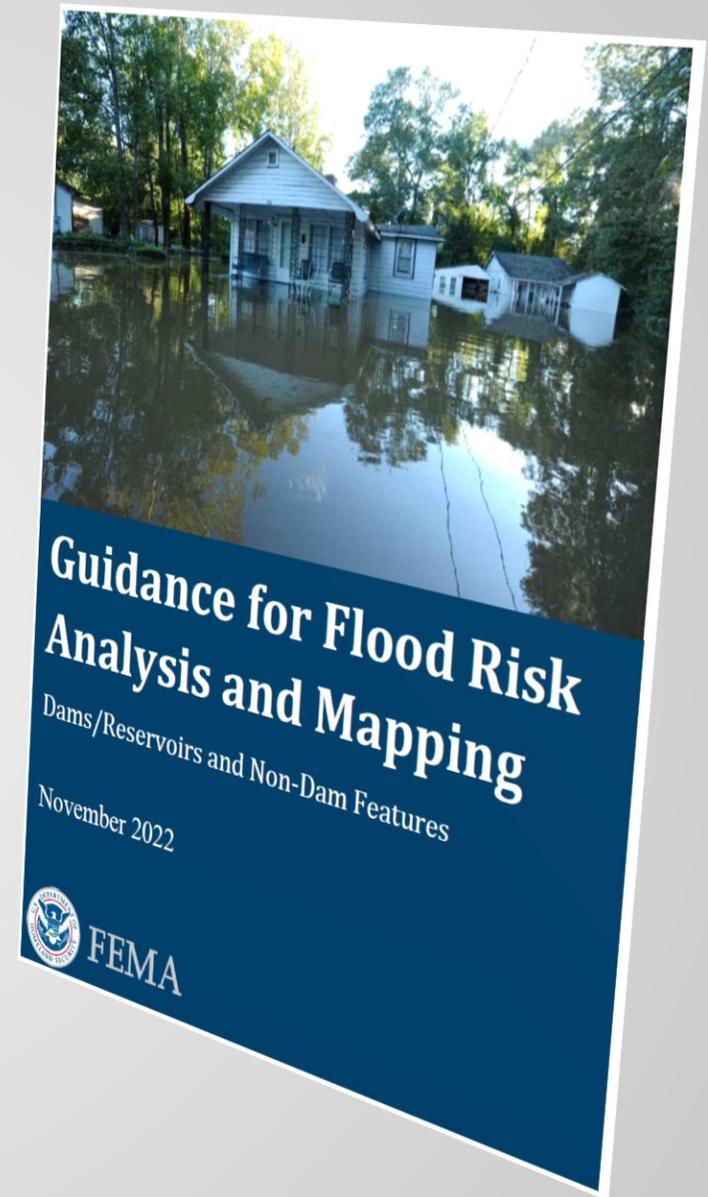


Image: FEMA's "Guidance for Flood Risk Analysis and Mapping: Dams / Reservoirs and Non-Dam Features"



# Flood Inundation Maps

“Floods occur naturally and can happen almost anywhere. They may not even be near a body of water, although river and coastal flooding are two of the most common types. Heavy rains, poor drainage, and even nearby construction projects can put you at risk for flood damage.

Flood maps are one tool that communities use to know which areas have the highest risk of flooding. FEMA maintains and updates data through flood maps and risk assessments.”

source: FEMA website, 2023

Communities use the data in their maps to plan development and make infrastructure improvements. With flood risk data and maps available, communities can decide how to reduce their risk in ways that work best for all.

People within a community use flood maps to make informed decisions about where to live, what to build, and how to protect their family, homes, and businesses.

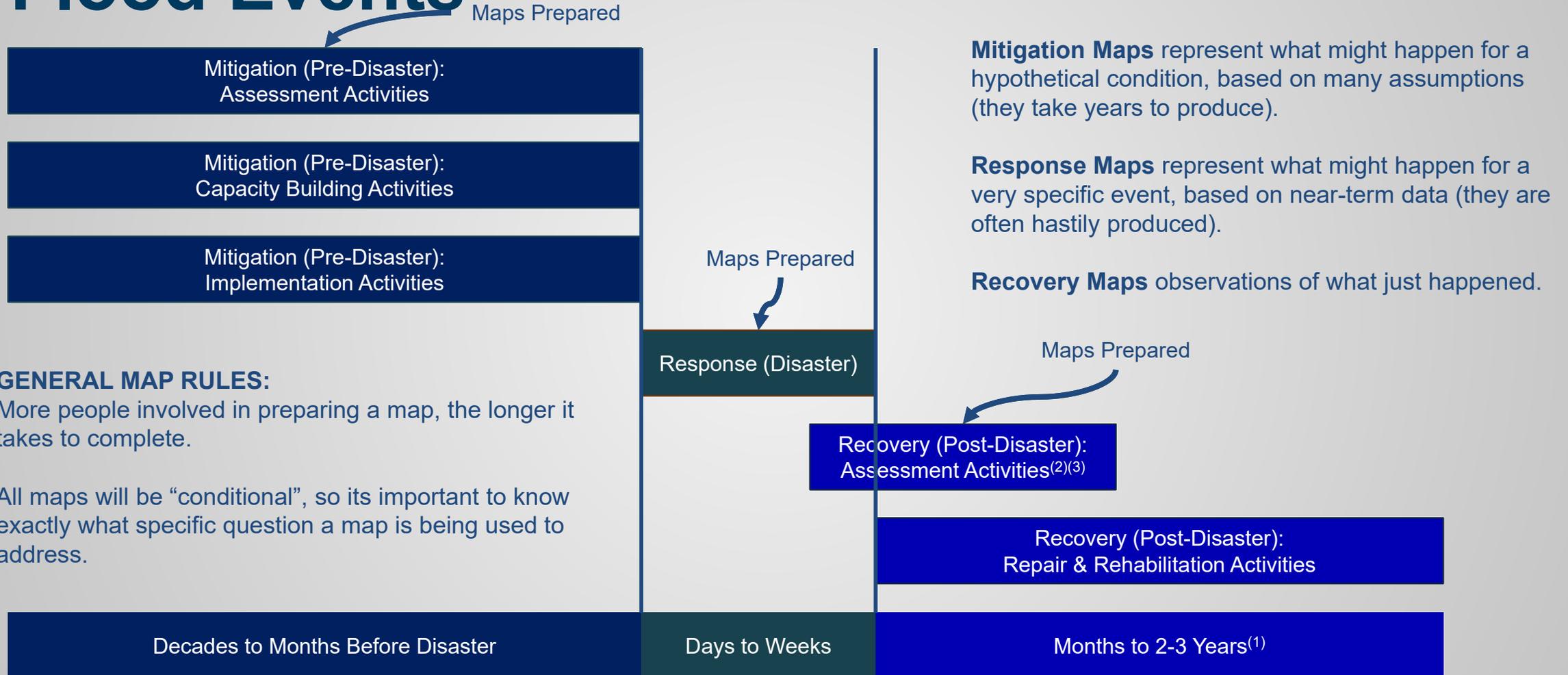


# Uses of Inundation Maps

- Land Use Planning
  - Zoning (where not to build or how effective land will be to support environmental restoration)
  - Building Codes (how high to build / resilient building design)
  - Insurance Requirements (also includes determinations of annual premiums)
  - Risk Notifications
- Flood Defense System Design
  - Levee Heights (requires extensive range of flow conditions & probabilities)
  - Floodway Restrictions
- Emergency Response
  - Emergency Measure Placement (hypothetical scenarios can identify assets at risk)
  - Staging of Emergency Response Assets (proximity to flood areas / access)
  - Reservoir / System Operation (consideration of downstream constraints)
  - Evacuation Planning (including sheltering)
- Flood Recovery
  - Insurance Claims (depth and duration of inundation needed)
  - Litigation



# Disaster Cycle Phases for Large Scale Flood Events



## GENERAL MAP RULES:

More people involved in preparing a map, the longer it takes to complete.

All maps will be “conditional”, so its important to know exactly what specific question a map is being used to address.



1. FEMA Public Assistance Recovery projects should take only 18 months to complete.
2. Previous PA projects trigger Loss Avoidance Studies (an additional assessment) for future disasters.
3. Recovery also triggers a Joint Mitigation Strategy which eventually leads to future mitigation funding.

# Examples of Three Different Maps for Kern River

## A. LAND USE EXAMPLE

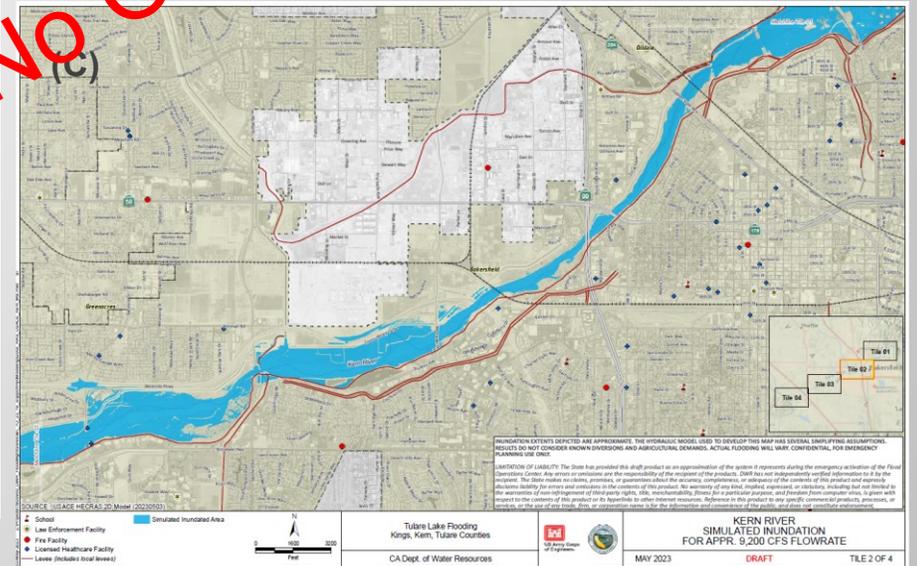
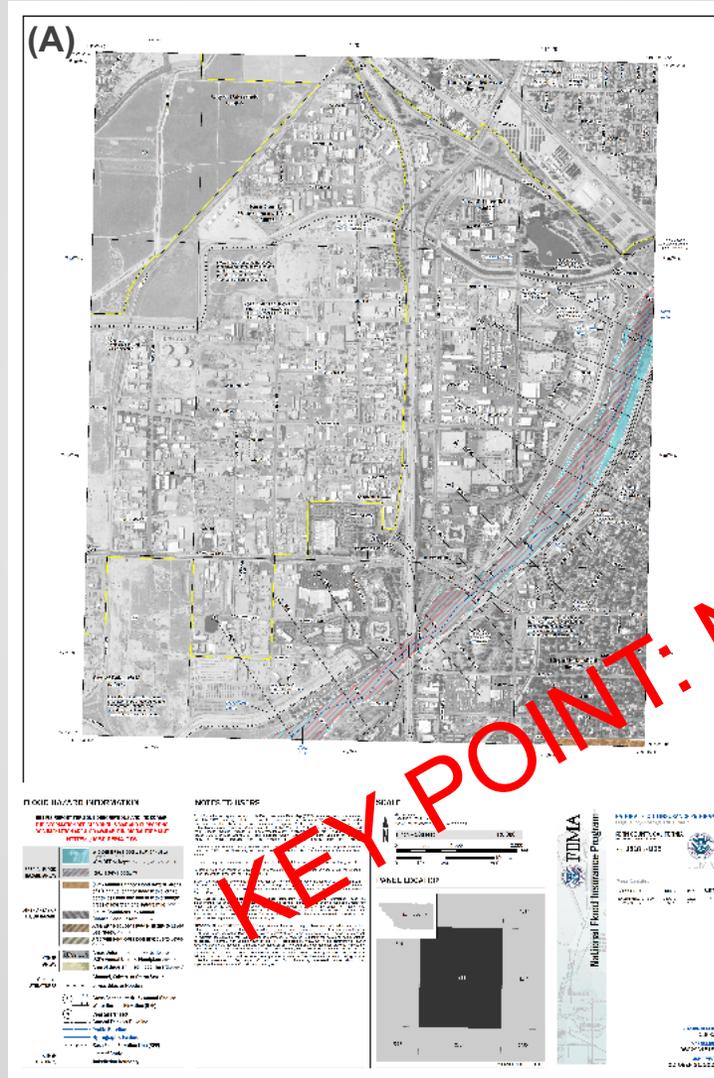
FEMA FIRM (1990s) showing no floodplain Bakersfield Heart Hospital

## B. FACILITY ER THRESHOLD EXAMPLE

DWR Height Above Nearest Drainage model prepared May 2023 showing Bakersfield Heart Hospital inundated at 10,000 cfs release

## C. RIVERINE WATER SURFACE ELEVATION EXAMPLE

USACE HEC-Riverine Analysis System (RAS) model prepared May 2023 showing no inundation at the Bakersfield Heart Hospital at 9,200 cfs

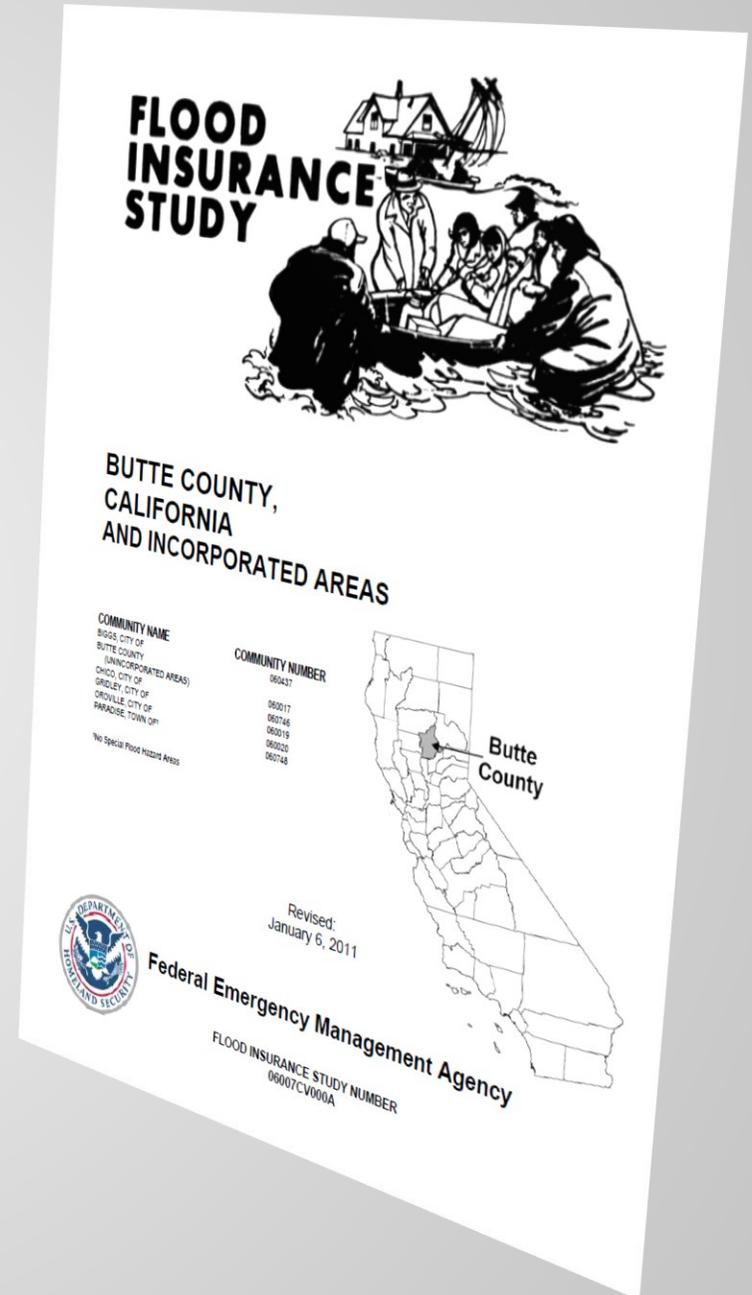


**KEY POINT: No One Map Is Right**



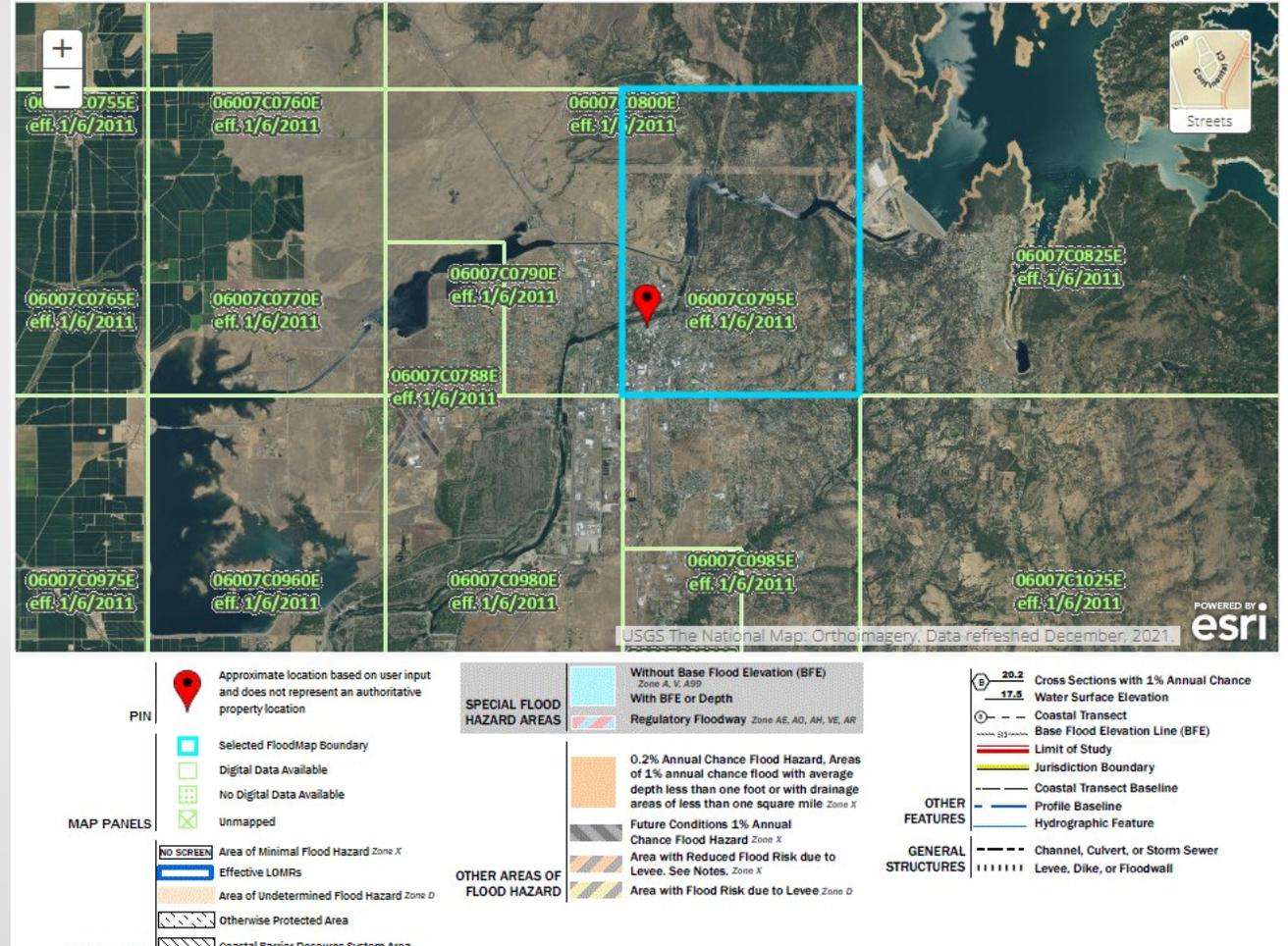
# FEMA Mapping Studies

- FEMA analyzes flood risk and documents the study and engagement in a Flood Insurance Study (FIS)
- The FIS identifies the key flood risks in the areas covered within the study (the Feather River was studied, but not considered the primary flood risk)
- Several models were used to support hydraulic routing and inundation including HEC-2, HEC-RAS, and FLO-2D
- Although Oroville was included in the study, its original mapping started in 1975 and became effective in 1984 (Table 10)
- Oroville has not been revised since



# Revisiting FEMA FIRMs

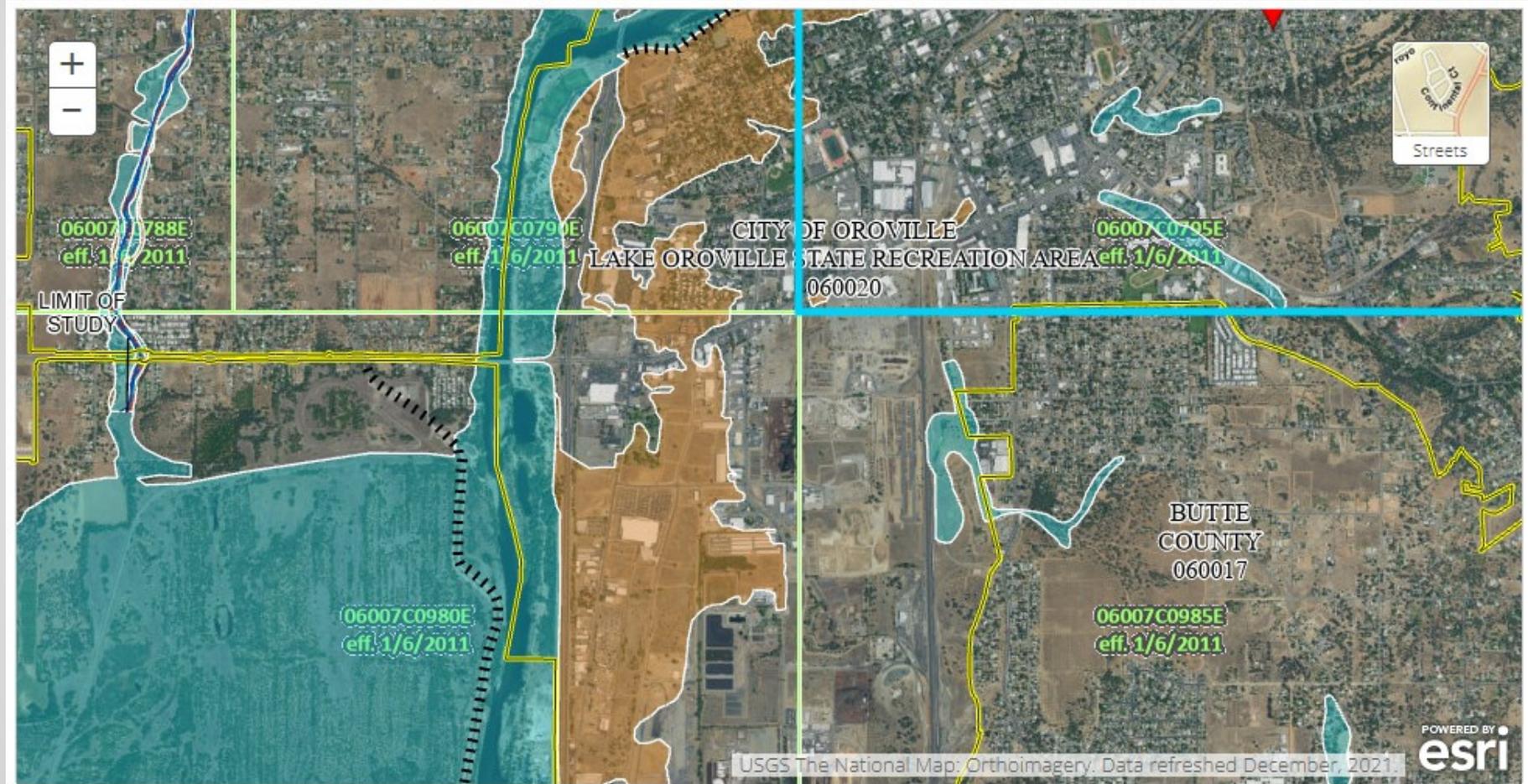
- FEMA's Map Service Center shows the effective date of the various "panels" near Oroville to be Jan. 6, 2011
- Original engineering study was performed April 20, 2000, per the FIS (but as noted Oroville is really based on 1980s data)
- FEMA develops Flood Insurance Rate Maps (FIRMs) through extensive local engagement; thus the final FEMA products will vary from community to community





# FIRMs Show Significant Local Topographic Effects Within Oroville

- Map confirms the effectiveness of a raised CA-70
- Per the FIRM there is potential for flanking flows where the levee ties into CA-70
- Further to the west Ruddy Creek has a floodway, detailed cross sections, and a steeper slope, suggesting that within the region there have been revisions or additional studies



# Contact Info

Michael Mierzwa, P.E., State Floodplain Manager

[Michael.mierzwa@water.ca.gov](mailto:Michael.mierzwa@water.ca.gov)

CA Dept. Water Resources



Image: Salinas River (Monterey County), Jan. 2023.



# MEETING 15 PROPOSED AGENDA

- **Weather Forecasting Modeling**
  - Types of extreme precipitation events
  - Uncertainty in long, mid, and short-range forecasts
  - How weather forecasting is used at the State for staging resources
  - ARkStorm 2.0: predictive capabilities, etc. and how this modeling is relevant to Oroville in terms of operations and emergency response
- **Forecast Informed Reservoir Operations**
  - Process update, including answers to FIRO Work Plan Chapter 10 questions
  - FIRO role in Water Control Manual Update Process

# **ITEM 5 PUBLIC COMMENT**

**The Oroville Dam Citizens Advisory  
Commission will now take public comment.**

**We appreciate your input.**

# **ITEM 6 ADJOURN**

**Thank you all for joining us today, our next Oroville Dam Citizens Advisory Commission meeting will be held virtually on November 3, 2023.**