



Cal OES
GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

2017 FEBRUARY OROVILLE SPILLWAY INCIDENT After Action/Corrective Action Report



November 2019

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2017 FEBRUARY OROVILLE SPILLWAY INCIDENT

After Action / Corrective Action Report

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Prepared by the Cal OES Preparedness Branch

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TABLE OF CONTENTS

Foreword	1
Executive Summary.....	2
Description of Events.....	9
Response Activities	11
Initial Recovery Activities	16
Summary of Successes	17
Areas of Concern	17
Corrective Action Recommendations.....	18
Attachment A – List of Acronyms	A1
Attachment B – Issues and Corrective Action Matrix	B1
Attachment C – Summary of Response and Recovery Activities	C1

FOREWORD

In accordance with the *Emergency Services Act, Article 9.5, Government Code Section 8607(f)*, the California Governor's Office of Emergency Services (Cal OES) shall, in cooperation with involved state and local agencies, complete an After Action Report after each gubernatorial proclaimed disaster. This report shall provide a review of public safety response and disaster recovery activities and shall be made available by Cal OES within 120 days of the close of incident to all interested public safety and emergency management organizations.

An After Action/Corrective Action Report serves the following important functions:

- Provides a source for documenting response and early recovery activities
- Identifies problems and successes during emergency operations
- Analyzes the effectiveness of the different components of SEMS
- Describes and defines a plan of corrective action for implementing recommended improvements to existing emergency response efforts

If you are a representative of a public safety or emergency management organization, a copy of this report can be acquired by submitting your request to: SharedMail.CalAAR@CalOES.ca.gov.

EXECUTIVE SUMMARY

A series of severe storms affected a large portion of the State of California in the months of January and February 2017. The storms brought large amounts of precipitation in the form of rain and snow. Records indicate the snowpack was 180 percent of normal in some mountain locations making it the ninth wettest January on record.

After five years of significant drought throughout California, the ground was not able to absorb the rain which quickly filled creeks, rivers, and reservoirs beyond capacity. Lake Oroville reservoir formed by Oroville Dam also filled during these storms. Accordingly, officials opened the flood control spillway gates to reduce the water level behind the dam to make room for the continued reservoir inflow.

On February 7, 2017, officials noticed an unusual flow pattern in the flood control spillway and closed the spillway gates to determine the origin and extent of the problem. They discovered a 250-foot-wide by 50-foot-deep crater that had formed in the lower chute of the spillway. On February 8, 2017, after careful consideration and due to higher than forecasted inflows, moderated water releases reinitiated to lower the water level behind the dam.

As heavy rains continued, reservoir inflows continued to exceed forecasts. As a consequence, dam operators needed to release more water than projected. On February 11, 2017, with flows on the flood control spillway reduced to mitigate further damage to the spillway, water began to flow over the emergency spillway weir for the first time since the completion of the dam's construction in 1968. The gated emergency spillway was designed to prevent overtopping of the main dam embankment. As the flow of water over the emergency spillway increased, officials noticed that significant erosion was occurring on the hillside below the base of the emergency spillway weir structure, causing concern that it could fail.

Prior to the increased inflows of the Oroville Dam, the State Operations Center (SOC) was activated to support regional and local jurisdictions during the flood-causing rains. On February 12, 2017, the SOC deactivated at approximately 1400 hours after the SOC Director determined that the situation was stabilized and SOC support was no longer needed. Two hours later, the California State Warning Center (CSWC) received an automated message from the Department of Water Resources (DWR) stating that severe erosion at the emergency spillway could lead to failure of that structure, which would result in an uncontrolled release of flood waters from Lake Oroville. At this point, the SOC was activated at its highest level. At approximately 1700 hours, the Butte County

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

Sheriff issued mandatory evacuation orders for residents of Oroville and low-lying areas of Butte County. Sutter and Yuba counties also ordered mandatory evacuations for downstream areas within the established inundation zones. In all, approximately 188,000 people in the path were evacuated. DWR increased flows through the flood control spillway which, within a matter of hours, lowered the reservoir level to the point that overtopping of the emergency spillway weir ceased.

In the SOC, an executive-level group consisting of representatives from several key State agencies reported for duty at the request of the Director of Cal OES. Shortly thereafter, a Unified Coordination Group (UCG) was established.

The UCG set overall incident priorities and objectives for the SOC and the DWR Department Operations Center (DOC). This ensured the appropriate allocation of scarce resources to those jurisdictions most in need. The UCG included Cal OES, the Federal Emergency Management Agency (FEMA), and other key state officials.

Cal OES in coordination with the response stakeholders formed a shelter task force, an advance planning team, and a critical issues team. In addition, FEMA deployed two Incident Management Assistance Teams (IMATs) to the SOC in anticipation of a potential catastrophic event. DWR activated a DOC at Cal OES' headquarters where the SOC resides to improve and streamline critical information flow regarding the status of the Oroville Dam Spillway Incident.

At the field level, a significant number of law enforcement personnel deployed to the evacuation area to enforce mandatory evacuation orders. The evacuation involved the movement of people not only from the general population but from hospitals, care facilities, and jails. Other critical facilities such as Emergency Operations Centers (EOCs) and 911 dispatch centers had to be relocated while maintaining their ability to carry out their respective emergency and disaster-related functions. In spite of the urgent need to evacuate more than 188,000 people in a matter of hours, not a single injury or death was reported.

The next challenge after the evacuation was establishing enough shelters for evacuees in an extremely short time frame. That effort included ensuring shelters could accommodate people with Access and Functional Needs (AFN). Fairgrounds in surrounding unaffected areas served as the primary location for shelters. In some cases, fairground officials opened their facilities for sheltering purposes without notification because they recognized the need to help. A significant number of pets and livestock also required shelter and feeding.

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

Despite the use of fairgrounds for shelters, a significant number of people congregated in spontaneous shelters, which created an additional challenge to ensure that evacuees had the support and resources that they needed to survive. In Butte County alone, 31 spontaneous shelters opened and needed support. In addition to the challenge of supporting many spontaneous shelters near the Oroville Dam but out of the inundation zone, many cities such as Chico, Paradise, Orland, Grass Valley, Citrus Heights, Sacramento, Sutter, Marysville, Wheatland, Brownsville, Roseville, and Elk Grove also opened shelters for evacuees. In Sutter, at the Sutter High School the evacuee shelter count on one particular night was 280 people but the population of people who chose to stay in their cars in the parking lot of this shelter was estimated at between 300 to 500 people, all of whom needed to be fed.

In the end, DWR's actions prevented both the emergency and the main spillways from failing. Nonetheless, noteworthy issues with policy, plans, and procedures of all agencies involved were identified during the response to the potential emergency spillway failure. The following is a list of the areas identified that were considered in need of review for after action and corrective action purposes. The numbering does not indicate any order of priority but serves to align the areas in need of improvement with the corrective action recommendations discussed later in this report:

1. Alert and Warning
2. Evacuation
3. Care and Shelter
4. On-site Coordination
5. State agency roles

Statistical Summary

Number of Persons Evacuated: Approximately 188,000

Incident Period

02/01/2017 – 02/23/2017

Declarations and Proclamations

Local

Butte County – 02/13/2017

Yuba County – 02/13/2017

Sutter County – 02/13/2017

State of Emergency

02/12/2017

Federal

04/01/2017 – DR-4308 – Presidential

Summary of Successes

Contributors highlighted the following successes:

- The incident allowed emergency managers to test key elements of the Northern California Catastrophic Flood Response Plan (NCCFRP). The test validated the phases of the Plan, the assumptions, and planning factors identified for a catastrophic flood event.
- The advance planning team created a robust advance plan for potential spillway failure in record time thanks, in part, to the work done during the development of the NCCFRP and other catastrophic plans.
- There was excellent State and federal Incident Action Planning (IAP) integration under the catastrophic disaster model (SOC, DWR, and FEMA).
- Mutual aid provided for the stabilization of the emergency spillway was very robust and immediate.
- The use of law enforcement mutual aid was very effective during the evacuation phase with more than 188,000 people moved to safety in a matter of hours.
- Not a single injury or death was reported, in spite of the urgent need to evacuate such a large number of people in a matter of hours.
- Very effective and seamless continuity of operations was demonstrated by Butte County when they had to relocate their EOC, jail, and law and fire dispatch centers as part of the overall evacuation process.
- The first activation of the UCG in its current form, a process that has been improved upon and replicated in numerous events since.

Summary of Areas Needing Improvement

Overall, emergency personnel managed the incident effectively, as evidenced by the outcome. First responders and support personnel provided vital resources. However, SEMS provides the opportunity to improve disaster response. The improvement process enhances California's future disaster responses. Improvements can be applicable to all five SEMS levels (Field, Local, Operational Area, Regional and State). Report contributors identified the following deficiencies:

- 1) Alert and Warning
 - a. Inconsistent public messaging left emergency managers and the public

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

confused about the potential severity of the incident during the early stages of the mandatory evacuations.

- b. There was no process in place to confirm directly with dam officials the validity of an automated message sent to the CSWC from DWR warning of potential failure of the emergency spillway structure.
- c. The notification of State agency representatives needed in the SOC was not consistent with the established process normally used in SOC activations. This was due to the executive-level personnel participating in the UCG requesting their own agency representatives to report to the SOC when that responsibility lies with the SOC Director in coordination with the Operations Section Chief to avoid duplication of effort.

2) Evacuation

- a. Mandatory evacuation notifications were not coordinated among the three jurisdictions downstream of the Oroville Dam. Two of the three jurisdictions immediately began evacuations while a third jurisdiction experienced a delay because no avenue for positive contact existed for the decision-makers of that jurisdiction (i.e., a message was left on an answering machine with no confirmation of receipt).
- b. A lack of a unified command between local law enforcement caused evacuees to get caught in inundation areas due to road closures and detours.

3) Care and Shelter

- a. Some State agencies and private non-profit organizations were excluded from the task force.
- b. There is no clarity on who leads this task force, Cal OES or CDSS.
- c. The shelter task force had no procedures in place.
- d. The shelter managers were receiving calls from too many different directions requesting more frequent shelter counts.
- e. Many simple aspects of sheltering were not sufficiently addressed and pre-identified during the preparedness phase (i.e. execution checklists, shelter locations, shelter capacities, shelter capabilities, AFN needs, etc.). Instead, they were addressed during the response phase.
- f. Shelter boards in the Cal OES emergency response system, CalEOC, do not have all of the required fields.

4) On-Site Coordination

- a. Local jurisdiction site-specific plans for dam failure evacuations are outdated or non-existent.

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

- b. There is a significant lack of understanding of resource ordering by personnel in the field. This caused duplication of effort as well as the duplication of resource ordering.
- 5) State agency roles
- a. Confusion remains about the role of an agency representative versus an Emergency Support Function (ESF) representative.

Organizations Contributing to this Report

State agencies

California Governor's Office of Emergency Services (Cal OES)
California Department of Transportation (Caltrans)
California Department of Forestry and Fire Protection (CALFIRE)
California Environmental Protection Agency (Cal EPA)
California Geologic Survey (CGS)
California Department of Public Health (CDPH)
California Department of Social Services (CDSS)
California Department of Toxic Substances Control (DTSC)
California Highway Patrol (CHP)
California National Guard (CNG)
Department of Water Resources (DWR)
Emergency Medical Services Authority (EMSA)

Local Agencies

Butte County
Sutter County
Yuba County

DESCRIPTION OF EVENTS

Background

As a result of the record-breaking rain and snowfall during the months of January and February 2017, the SOC activated to support regional and local jurisdictions during various localized flood incidents. After five years of severe drought in the State of California, small streams and rivers quickly swelled beyond flood stage. Reservoirs nearly emptied by years of drought also filled to capacity in a matter of weeks. Local, state and federal water managers, dam operators, and water districts harbored significant concerns about the State's water-management infrastructure due to an overabundance of water.

Oroville Dam, the tallest dam in the country at 770 feet, is located near the city of Oroville in Butte County, California. Lake Oroville provides flood protection to downstream communities and water for millions of Californians. In its vicinity, nearly 200,000 people live and work within the dam's inundation zone. On February 7, 2017, as water released from the flood control spillway gates, DWR employees noticed an unusual flow pattern in the spillway. To investigate the nature and scope of the problem, officials temporarily closed the gates to stop the water flow which revealed a sizeable crater in the lower chute of the spillway.

After consultation with the United States Army Corps of Engineers (USACE), State and federal regulatory partners, and other dam safety experts, DWR authorized to reopen the gates to release water from the reservoir. Despite the opening of the gates, water flow into the reservoir continued to exceed what DWR forecasted. On February 11, 2017, water began to flow over the emergency spillway weir and down the emergency spillway for the first time in the facility's history. As the flow of water over the emergency spillway increased, officials noticed that significant erosion was occurring on the hillside below the emergency spillway weir, causing concern that erosion would continue up hill and threaten the integrity of the emergency spillway monoliths

As mentioned earlier, the SOC activated on February 8, 2017, to support local response efforts to the heavy rain and snow plaguing the State. On February 12, 2017, the SOC deactivated at approximately 1400 hours after the SOC Director determined that the situation was stabilized and SOC support was no longer needed. Two hours later, the SOC was fully activated when news of the imminent failure of the emergency spillway was received due to erosion occurring near the base of the emergency spillway weir structure. Local law enforcement officials immediately called for mandatory evacuations of more

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

than 188,000 people in the potential path of the water in the event the emergency spillway failed.

Immediately, an executive-level group from several key State agencies reported to the SOC at the request of the Director of Cal OES. Soon after, a UCG formed according to the model described in the Catastrophic Incident Base Plan of 2008. The UCG consisted of representatives from Cal OES, FEMA, DWR, and other key State agencies that jointly set overall incident priorities and incident objectives.

In addition to the UCG, a sheltering task force, an advance planning team, and a critical issue team were also formed. As the incident grew in complexity, FEMA deployed two IMATs to the SOC. DWR activated a DOC at Cal OES headquarters, where the SOC resides, to improve and streamline critical information flow regarding the status of the Oroville Dam's spillway.

At the field level, a significant number of law enforcement personnel deployed to the evacuation area to enforce mandatory evacuation orders should the emergency spillway fail. The evacuation involved moving people not only from the general population, but from hospitals, care facilities, and jails. In spite of the urgent need to evacuate more than 188,000 people in a matter of hours, not a single injury or death was reported.

The next challenge after the evacuation was establishing enough shelters for evacuees in an extremely short time. That included ensuring that shelters could accommodate people with Access and Functional Needs (AFN). One of the primary locations for shelters was fairgrounds in surrounding unaffected areas. In some cases, fairground officials opened their facilities for sheltering purposes without notification because they recognized the need to help. A significant number of pets and livestock also required shelter and feeding. Those who did not seek shelter at a fairground, found shelter in one of many spontaneous shelters that opened. These spontaneous shelters required all the support that official shelters needed such as food, water, bathrooms, and security. It was estimated that as many as 30 or more spontaneous shelters opened in Butte County alone all of which required support.

In the end, DWR's actions prevented the emergency spillway from failing, but some noteworthy issues with policy, plans, and procedures for all participating agencies identified during the response to the potential emergency spillway failure. The following is a list of the areas identified that were considered in need of review for after action and corrective action purposes:

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

1. Alerting and Warning
2. Evacuation
3. Care and Shelter
4. On-Site Coordination
5. State agency Roles

RESPONSE ACTIVITIES

State agencies

Governor's Office of Emergency Services (Cal OES)

Cal OES activated the SOC, Inland Region Emergency Operations Center (REOC), Law EOC and Fire EOC in support of the response to the Oroville emergency spillway issue. Additionally, all three branches deployed personnel to the ICPs and County EOC to support operations.

Cal OES also assembled and hosted a UCG for several weeks. The UCG was comprised of executive-level representatives from the Governor's Office, DWR, CALFIRE, Cal OES, California Natural Resources Agency (CNRA), CNG, and FEMA.

The UCG established an effective cycle of activities that occurred throughout the day every day until the UCG was demobilized.

The cycle was a road map for coordination, public information dissemination, prioritization, and objective setting. The road map ensured the UCG was in possession of the best information possible for informed decision-making.

Cal OES staff deployed to the following field locations:

- One Cal OES Inland Emergency Services Coordinator (ESC) deployed to Nevada County for Yuba County.
- Three Cal OES Inland Region ESCs deployed to Butte County.
- One Cal OES Inland Region Senior ESC deployed to Butte County.
- Two Cal OES Inland Region ESCs deployed to Sutter County EOC.
- One Cal OES Inland Region Deputy Regional Administrator (DRA) deployed to Butte County.
- One Cal OES Inland Region DRA deployed to Chico area.
- One Cal OES Inland Regional Administrator deployed to Butte County.
- One Cal OES Coastal Region DRA deployed to Butte County.
- One Cal OES Coastal Region Sr. ESC deployed to Butte County.
- One Cal OES Coastal Region ESC deployed to Sutter County.

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

- One Cal OES Southern Region Sr. ESC deployed to Butte County.
- Two Cal OES Southern Region ESCs deployed to Butte County.
- One Emergency Management Coordinator assigned to DWR DOC.

Cal OES LAW Enforcement Mutual Aid Coordinated and Deployed:

- Sixty-seven Sacramento County Sheriff's Deputies.
- Eighteen Sacramento Police Officers.
- Fifteen Folsom Police Officers.
- Ten El Dorado County Sheriff's Deputies.
- Five Citrus Heights Police Officers.
- Four Elk Grove Police Officers.
- Two Sacramento County Park Rangers.
- One Hundred CHP Officers.
- Thirty Fish and Wildlife Rangers.
- Twenty-Seven State Park Rangers.
- Twenty Shasta County Sheriff's Deputies.
- Twenty Tehama County Sheriff's Deputies.
- Four Lassen County Sheriff's Deputies.
- Four Trinity County Sheriff's Deputies.
- Ten Stanislaus County Sheriff's Deputies.
- Ten San Joaquin County Sheriff's Deputies.
- Eight Roseville Police Officers.
- Thirty Placer County Sheriff's Deputies.

Cal OES Fire Mutual Aid Coordinated and Deployed:

- Thirteen Swift Water Teams.
- Two Engine Strike Teams.

Cal OES Office of Access and Functional Needs (OAFN) performed the following activities:

- Informed the Care and Shelter Taskforce of AFN considerations and resource needs as required.
- Coordinated with American Red Cross.
- Worked with disability stakeholders to provide situational awareness and evacuation information.
- Organized a daily disability stakeholder call that took place at 10:00 AM on February 13, 14, 15, and 16, 2017.

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

- Provided AFN messaging resources to Cal OES Public Information Officer (PIO) related to evacuation and sheltering.
- Coordinated with CDPH and EMSA to maintain situational awareness about fulfillment of medical and health resources requests.

Air Coordination Group (ACG):

The ACG was activated in the SOC and they coordinated the potential use of 53 rotary wing aircraft and two fixed wing aircraft provided by seven local, state, and federal agencies as well as one private sector entity (Pacific Gas & Electric (PG&E)). The breakdown of aircraft available was as follows:

California National Guard (CNG)

- Five UH-60 helicopters from Mather.
- Three unknown type helicopters from Hemet.
- Five CH-47 helicopters from Stockton.
- One CH-47 helicopters from Fresno.
- Four UH-72 helicopters from Stockton.

Placer County Sheriff

- One unknown type of helicopter.

United States Customs and Border Patrol (CBP)

- Three unknown types of helicopters – one from San Diego, two from Tucson.

Unmanned Aerial System (UAS)

- One MQ-9 Reaper Unmanned Aerial Vehicle (UAV) from US Northern Command (USNORTHCOM).

California Highway Patrol (CHP)

- Five AS-350B3 helicopters.
- Two G-A8 Airvans.

United States Coast Guard (USCG)

- Two HH-65 Dolphin helicopters from San Francisco.
- Two HH-65 Dolphin helicopters from Humboldt.
- One C-27J Fixed Wing aircraft from McClellan Business Park.

PG&E Helicopter Operations

- One helicopter at Oroville Dam.

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

California Highway Patrol (CHP)

CHP provided an agency representative to the SOC. CHP also provided 100 officers through law enforcement mutual aid to Butte, Yuba, and Sutter counties to assist with enforcing mandatory evacuation orders.

California Department of Public Health (CDPH)

CDPH provided agency representatives to the SOC. CDPH also provided cots for shelters.

California Department of Social Services (CDSS)

CDSS provided agency representatives to the SOC. CDSS also provided staff to participate in the Care and Shelter Task Force.

California National Guard (CNG)

CNG provided agency representatives to the SOC. CNG also had the following resources readied for deployment if needed:

- Four UH-60 helicopters at the Chico staging area.
- Two CH-45 heavy lifter helicopters deployed.
- Five CH-45 heavy lifters helicopters were made available.
- Two CH-47 heavy lifter helicopters.
- One UH-72 helicopter for dignitary transport.
- One UH-72 helicopter (to hoist and search).
- Four High-Water vehicles.

California Department of Forestry and Fire Protection (CALFIRE)

One CALFIRE Incident Management Team (IMT) Type 1 assigned (Team 3) responded to the Oroville Dam Incident Command Post (ICP). Four CALFIRE Assistant Chiefs were assigned to the Fire EOC.

California Department of Transportation (Caltrans)

Caltrans provided agency representatives to the SOC.

California Department of General Services (DGS)

DGS provided agency representatives to the SOC. DGS also activated its Emergency Response Team and provided facility and procurement support to the incident.

Department of Toxic Substances Control (DTSC)

DTSC provided agency representatives to the SOC. No DTSC or Cal Recycle offices were in the impacted area.

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

Emergency Medical Services Authority (EMSA)

EMSA provided agency representatives to the SOC. EMSA also activated four ambulance strike teams to transport evacuees from hospitals and care facilities.

Department of Water Resources (DWR)

In response to the emergency, DWR activated four EOCs and two ICPs comprised of more than 1,100 DWR staff (about 375 exempt and 725 rank-and-file) over the course of the response. A \$275 million contract was awarded to Kiewit Infrastructure West Co. (Kiewit) to initiate repair of the damaged spillways.

The DOC facilitated resource prioritization and allocation, and communication between the multiple EOCs and ICPs. The DOC also provided logistical and administrative support, and reported pertinent information to Cal OES, the Governor's Office, and FEMA.

The following lists other response activities in which DWR engaged:

- Clearing and grubbing of trees and brush was performed below the emergency spillway weir to lessen any debris flow into the Diversion Pool.
- Assisted the Department of Fish and Wildlife (DFW) with moving millions of fish from the Feather River Fish Hatchery to an annex facility as a precautionary protective measure.
- Sandbagging and other flood protection measures were employed at Hyatt Power Plant and the area around the emergency spillway to fortify and reinforce the emergency spillway as a contingency for the remainder of winter.
- Dredging was conducted to clear the tailrace channel.
- A high-voltage electrical tower was relocated.
- Safety monitoring was conducted.
- The Flood Operations Center (FOC) responded to more than 60 incidents at the height of the emergency, including Oroville.
- The State Water Project (SWP) EOC coordinated with other EOCs to manage the operations of the SWP.
- The Division of Safety of Dams (DSOD) provided review of technical items relevant to dam safety.

Operational Areas

Butte County

Butte County activated their EOC, staffed all ICS positions, and brought in representatives from other organizations as well. The total number of people activated was 149. The Butte County Sheriff also activated an ICP in the field to

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

deal with flood and public safety issues. A CALFIRE IMT supported this ICP. A second CALFIRE IMT supported the ICP established by DWR that dealt with dam issues only. Local law enforcement in coordination with CHP conducted mandatory evacuations. No further information provided.

Sutter County

Sutter County activated their EOC in support of the Oroville Emergency Spillway issue. The county used volunteer agencies for shelter operations. The county conducted public alerts and warnings and coordinated public safety and incident information with the media. Local law enforcement, in coordination with CHP, conducted mandatory evacuations. No further information provided.

Yuba County

Because the Yuba County EOC was in the inundation zone, staff had to evacuate and relocate EOC operations to the Ruud Center in Nevada County. The relocation was smooth and all EOC operations were able to continue away from the existing threat. The move took approximately 1.5 hours to complete and stood up the EOC as fully operational. Yuba County Council provided early proclamations and ratification. Public information staff functioned well during the dissemination of information and in dealing with media inquiries. No further information provided.

INITIAL RECOVERY ACTIVITIES

By February 14, 2017, the water levels behind the emergency spillway fell to the point where the water was no longer overtopping the emergency spillway weir structure. Emergency repairs were immediately underway on a 24-hour-a-day basis. Helicopters were used to drop rock in the damaged area of the emergency spillway. DWR awarded an initial \$275 million contract in April 2017 to Kiewit to immediately plan and mobilize crews and equipment to begin construction in May 2017. It is important to note that this budget was not viewed as a total project cost, but was to allow Kiewit to begin necessary work while the project design was complete. Officials estimated that the full scope of repairs would take two years to complete, and that timeline is being met. Initially the Oroville Dam emergency spillway incident received a Presidential Emergency Declaration (EM-3381). But eventually, the emergency spillway incident was rolled into the Major Disaster Declaration (DR-4308) the President of the United States declared for the February 2017 Storms.

SUMMARY OF SUCCESSES

Contributors highlighted the following successes:

- The incident allowed emergency managers to test key elements of the NCCFRP. The test validated the phases of the plan, the assumptions, and planning factors identified for a catastrophic flood event.
- The Advance Planning Team created a robust advance plan in record time thanks, in part, to the work done during the development of the NCCFRP.
- Effective State and federal IAP integration under the catastrophic model (SOC, DWR DOC, and FEMA).
- Mutual aid provided for the stabilization of the emergency spillway and the emergency spillway was very robust.
- The use of law enforcement mutual aid was very effective during the evacuation phase with more than 188,000 people moved to safety in a matter of hours.

AREAS OF CONCERN

Areas of concern are numbered to align with the corrective action recommendations below. The numbering does not indicate a priority of one issue over another.

1. Alert and Warning
 - a. Inconsistent public messaging left emergency managers and the public confused about the potential severity of the incident during the early stages of the mandatory evacuations.
 - b. The notification of State agency representatives needed in the SOC was not consistent with the established process normally used in SOC activations. Members of the UCG were calling in State agency representatives instead of letting the SOC Director in coordination with the Operations Section Chief decide how the SOC should be staffed.
2. Evacuation
 - a. Mandatory evacuation notifications were not coordinated among the three jurisdictions downstream of the Oroville Dam. Two of the three jurisdictions immediately began evacuations while a third jurisdiction experienced a delay because no avenue for positive contact existed for the decision-makers of that jurisdiction (i.e. a message was left on an answering machine with no confirmation of receipt).

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

3. Care and Shelter
 - a. Some State agencies and private non-profit organizations were excluded from the task force.
 - b. There is no clarity on who leads this task force, Cal OES or CDSS.
 - c. The shelter task force had no procedures in place.
 - d. The shelter managers were receiving calls from too many different directions requesting more frequent shelter counts.
 - e. Many simple aspects of sheltering were not sufficiently addressed and pre-identified during the preparedness phase (i.e. execution checklists, shelter locations, shelter capacities, shelter capabilities, AFN needs, etc.). Instead, they were addressed during the response phase.
 - f. Shelter boards in CalEOC do not have all of the required fields.
4. On-Site Coordination
 - a. Local jurisdiction site-specific plans for dam failure evacuations are outdated or non-existent.
 - b. There is a significant lack of understanding of resource ordering by personnel in the field. This caused duplication of effort as well as the duplication of resource ordering.
5. State agency roles
 - a. Confusion remains about the role of an agency representative versus an Emergency Support Function (ESF) representative.

CORRECTIVE ACTION RECOMMENDATIONS

1. Alert and Warning
 - a. When an incident requiring immediate evacuation of multiple jurisdictions occurs, coordinated notification must be a priority so that the evacuation process can be effective and efficient. A process must be put in place that includes the ability to ensure positive contact with the proper authorities or decision-makers simultaneously no matter the day of the week or the time of day. With the passage of Senate Bill 92 (SB92) which requires dam owners to develop and submit EAPs to Cal OES, coordinated notification and evacuation processes are an integral part of the EAPs for dam incidents.
 - b. To reduce duplication of effort, increase accountability, and ensure that the appropriate resources are maintained in the SOC, a process must be put in place to bridge the needs of the SOC with the decisions of the UCG as it relates to staffing.

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

2. Evacuation

- a. A regional Dam Spillway Failure Emergency Response Plan for evacuation did not exist during the initial response, a plan was written during the initial days of the event and through the development of this AAR. Also, California enacted (SB 92), which set forth new requirements focused on dam safety.
- b. Statewide Law Enforcement working group drafted the "Evacuation Terminology" that standardizes the use of common terminology to be used by law enforcement agencies for evacuation order, evacuation warning, and shelter in place.

3. Care and Shelter

- a. Several corrective actions are already underway to improve capabilities, coordination between care and shelters partners, and the flow of information to the UCG.

The corrective actions include but are not limited to augmenting the budget of CDSS, the development of new memoranda of understanding (MOUs) between Cal OES, CDSS, and ARC, and the creation of a dedicated Cal OES mass care position. These actions should reduce or eliminate all of the issues regarding care and shelter identified earlier.

4. On-site Coordination

- a. During the development of this AAR California passed (SB 92), which set forth new requirements focused on dam safety. As part of this legislation, owners of dams, except dams classified as low hazard-potential, must now submit inundation maps to DWR. It is important to note that because the Oroville Dam is a dual-regulated facility, inundation maps were already required prior to this legislation. After the maps are approved, dam owners must submit an emergency action plan (EAP) to Cal OES. All dam owners, except dams classified as low hazard-potential, must submit both updated plans and inundation maps every 10 years, or sooner under certain conditions. SB92 also requires dam owners to conduct an EAP notification exercise with local public safety agencies once each year.

Because the legislation requires dam owners to submit inundation maps and EAPs to DWR's DSOD and Cal OES, Cal OES created a new unit called the Dam Emergency Action Planning Unit. The unit's function is to review and approve the EAPs. This legislation also set forth additional provisions for emergency action plans that include compliance

AFTER ACTION REPORT
2017 FEBRUARY OROVILLE
SPILLWAY INCIDENT

requirements, exercises of the plan, and coordination with local public safety agencies.

- b. Provide to the appropriate response personnel from all SEMS levels the opportunity to participate in on-going resource management training. This will help emergency management personnel responsible for resource management to better understand the resource ordering process set forth by SEMS.
5. State agency roles
- a. Development and training of the ESF concepts must occur on a continual basis for all State agencies.

LIST OF ACRONYMS

AAR	After Action Report
AFN	Access and Functional Needs
ARB	Air Resources Board
ARC	American Red Cross
CALFIRE	California Department of Forestry and Fire Protection
Cal OES	California Governor's Office of Emergency Services
Caltrans	California Department of Transportation
CDA	California Disaster Assistance Act
CDPH	California Department of Public Health
CDSS	California Department of Social Services
CNG	California National Guard
CNRA	California Natural Resources Agency
CSTI	California Specialized Training Institute
CSWC	California State Warning Center
CUEA	California Utilities Emergency Association
DOC	Department Operations Center
DF&W	Department of Fish & Wildlife
DGS	Department of General Services
DRA	Deputy Regional Administrator
DSOD	Division of Safety of Dams
DTSC	Department of Toxic Substances
DWR	Department of Water Resources
EMSA	Emergency Medical Services Authority
EOC	Emergency Operations Center
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
FMAG	Fire Management Assistance Grant
IA	Individual Assistance
IAP	Incident Action Plan
ICS	Incident Command System
IDE	Initial Damage Estimate
IMAT	Incident Management Assistance Team
IOF	Initial Operating Facility
JFO	Joint Field Office
JIC	Joint Information Center
LAC	Local Assistance Center
MAC	Multi-Agency Coordination
MOU	Memorandum of Understanding
NCCFRP	Northern California Catastrophic Flood Response Plan
OA	Operational Area
OES	Office of Emergency Services

OAFN	Office of Access and Functional Needs
PDA	Preliminary Damage Assessment
PG&E	Pacific Gas & Electric
PIO	Public Information Officer
REOC	Regional Emergency Operations Center
SBA	U. S. Small Business Administration
SEMS	Standardized Emergency Management System
SOC	State Operations Center
UAS	Unmanned Ariel System
UAV	Unmanned Ariel Vehicle
USCBP	Unites States Customs & Border Patrol
USFS	United States Forest Service

ISSUES AND CORRECTIVE ACTION MATRIX

Issue #	Reporting Agency	EF	Category	Problem Statement/Issue	Corrective Action / Improvement Plan	Responsible Jurisdictions
1a	Cal OES	15	Alert and Warning	Inconsistent public messaging left emergency managers and the public confused about the potential severity of the incident during the early stages of the mandatory evacuations.	Since the development of this AAR, the California Legislature submitted and approved a bill (SB92) which was signed into law by the Governor. The new law requires dam owners to develop and submit an EAP which includes standard alert and warning messaging. Statewide Law Enforcement working group drafted the "Evacuation Terminology" that standardizes the use of common terminology to be used by law enforcement agencies for evacuation order, evacuation warning, and shelter in place.	Butte, Yuba, and Sutter Counties, Cal OES Region personnel, Cal OES Dam Safety Planning, Cal OES Law Enforcement

ISSUES AND CORRECTIVE ACTION MATRIX

Issue #	Reporting Agency	EF	Category	Problem Statement/Issue	Corrective Action / Improvement Plan	Responsible Jurisdictions
2a	Butte County	5,15	Evacuation	Mandatory evacuation notifications were not coordinated among the three jurisdictions downstream from the Oroville Dam. Two out of the three jurisdictions immediately began evacuations while a third jurisdiction experienced a delay because no avenue for positive contact existed for the decision makers of that jurisdiction (i.e. a message was left on an answering machine with no confirmation of receipt).	During the writing of this AAR, a dam failure response plan was created that will foster immediate multi-jurisdictional coordination. In addition, SB92 was signed by the Governor that requires dam operators to develop EAPs. The EAPs will further enhance multi-jurisdictional coordination in the event of a dam failure. Statewide Law Enforcement working group drafted the "Evacuation Terminology" that standardizes the use of common terminology to be used by law enforcement agencies for evacuation order, evacuation warning, and shelter in place.	Butte, Yuba, and Sutter Counties, Cal OES Region Personnel, Cal OES Dam Safety Planning, Cal OES Law Enforcement

ISSUES AND CORRECTIVE ACTION MATRIX

Issue #	Reporting Agency	EF	Category	Problem Statement/Issue	Corrective Action / Improvement Plan	Responsible Jurisdictions
3a	CDSS	6	Care and Shelter	Some state agencies and private non-profit organizations were excluded from the task force.	Recommend that during development of shelter task force procedures all key participants are identified and included in the procedures.	CDSS, Cal OES
3b	CDSS	6	Care and Shelter	There is no clarity on who leads the Care and Shelter task force, Cal OES or CDSS.	Corrective actions are already underway. MOUs are under development between Cal OES, CDSS, and ARC. Also, a new Cal OES mass care position has been created to improve the flow of information between the task force and the UCG.	CDSS, Cal OES
3c	CDSS	6	Care and Shelter	The shelter task force had no procedures in place.	Corrective are underway. MOUs are under development between Cal OES, CDSS, and ARC. CDSS has developed procedures.	CDSS, Cal OES

ISSUES AND CORRECTIVE ACTION MATRIX

Issue #	Reporting Agency	EF	Category	Problem Statement/Issue	Corrective Action / Improvement Plan	Responsible Jurisdictions
3d	CDSS	6	Care and Shelter	Shelter managers were getting calls from too many entities requesting more frequent shelter counts.	Recommend that the time of the daily shelter count be placed on the SOC schedule and also placed in the situation report as a footnote so everyone becomes aware that shelter counts are done once a day at midnight.	CDSS
3e	CDSS	6	Care and Shelter	Many simple aspects of sheltering were not sufficiently addressed and pre-identified during the preparedness phase (i.e. execution checklists, shelter locations, shelter capacities, shelter capabilities, AFN needs, etc.).	Corrective are underway. MOUs are under development between Cal OES, CDSS, and ARC. CDSS has developed procedures.	CDSS
3f	CDSS		Care and Shelter	The role of the Cal OES region in shelter coordination and operations needs to be better defined.	Recommend investigating this issue more to determine to what extent the issue was occurring and why before a solution can be proposed.	CDSS, Cal OES
3g	CDSS	6, 5	Care and Shelter	Shelter boards in CalEOC do not have all of the required fields.	Modify shelter boards in CalEOC with that includes all the required reporting fields.	Cal OES, CDSS

ISSUES AND CORRECTIVE ACTION MATRIX

Issue #	Reporting Agency	EF	Category	Problem Statement/Issue	Corrective Action / Improvement Plan	Responsible Jurisdictions
4a	Butte County	5	Response Planning	Site specific plans for dam failure evacuations are outdated or non-existent.	SB 92 has addressed this issue as well by requiring all dam operators to develop Dam specific EAPs	All counties potentially affected by dam failures, Cal OES Dam Safety Planning, and DWR
4b	Butte County	7	Resource Management and Ordering	There is a significant lack of understanding of resource ordering by personnel in the field.	Provide appropriate personnel the opportunity to participate in resource management training.	Butte, Sutter, and Yuba Counties, Cal OES and its three Administrative Regions, and the California Specialized Training Institute (CSTI).

ISSUES AND CORRECTIVE ACTION MATRIX

Issue #	Reporting Agency	EF	Category	Problem Statement/Issue	Corrective Action / Improvement Plan	Responsible Jurisdictions
5	Cal OES	5	Emergency Support Functions	Confusion remains about the role of an agency representative versus an Emergency Support Function (ESF) representative.	Development and training of the ESF concepts must occur on a continual basis.	All stakeholders that are either ESF leads or have a support role of an ESF.

RESPONSE SUMMARY

State and local agencies response activities chart

The following chart summarizes the activities of local and state agencies/departments during the 2017 Oroville Dam Emergency Spillway Issue. It reflects the various mutual aid systems (fire and rescue, law enforcement, medical), as well as other state response capabilities.

Note: Agencies and organizations should provide specific information on personnel and equipment deployment if available. N/A= data not available or not submitted.

Agency/Dept.	Period of Commitment	Personnel	Equipment
Cal OES	N/A	See below	N/A
<p>Cal OES staff deployed to the following field locations:</p> <ul style="list-style-type: none"> • One Cal OES Inland Emergency Services Coordinator (ESC) deployed to Nevada County for Yuba County. • Three Cal OES Inland Region ESCs deployed to Butte County. • One Cal OES Inland Region Senior ESC deployed to Butte County. • Two Cal OES Inland Region ESCs deployed to Sutter County EOC. • One Cal OES Inland Region Deputy Regional Administrator (DRA) deployed to Butte County. • One Cal OES Inland Region DRA deployed to Chico area. • One Cal OES Inland Regional Administrator deployed to Butte County. • One Cal OES Coastal Region DRA deployed to Butte County. • One Cal OES Coastal Region Sr. ESC deployed to Butte County. • One Cal OES Coastal Region ESC deployed to Sutter County. • One Cal OES Southern Region Sr. ESC deployed to Butte County. • Two Cal OES Southern Region ESCs deployed to Butte County. • One Emergency Management Coordinator assigned to DWR DOC. • One Public Safety Communications Technician. 			

Agency/Dept.	Period of Commitment	Personnel	Equipment
CHP	02/12/2017 – 02/13/2017	100 Officers	Not reported

The CHP officers assisted with evacuations in the counties of Butte, Yuba, and Sutter. CHP also provided five AS-350B3 helicopters and two G-A8 Airvans

Agency/Dept.	Period of Commitment	Personnel	Equipment
EMSA	N/A	N/A	N/A

EMSA provided ambulance strike teams to transport people that were in hospitals and care facilities out of the evacuation zone. Four Ambulance Strike Teams (22 ambulances) deployed to Yuba County.

Agency/Dept.	Period of Commitment	Personnel	Equipment
CNG	N/A	N/A	See below

CNG provided agency representatives to the SOC. CNG also had the following resources readied for deployment if needed:

- Four UH-60 helicopters at the Chico Staging area.
- Two CH-45 heavy lifter helicopters deployed.
- Five CH-45 Heavy Lifters helicopters were made available.
- Two CH-47 heavy lifter helicopters.
- One UH-72 helicopter for dignitary transport.
- One UH-72 helicopter (To hoist and search).
- Four High-Water vehicles.

Agency/Dept.	Period of Commitment	Personnel	Equipment
DWR	February through March 2017	DWR staff Consultants/Contractors	Heavy Equipment - Excavators, Dozers, Concrete Trucks

Activities:
 Removed trees and vegetation from the area below the Emergency

Spillway in preparation for the possibility of an uncontrolled release over the Emergency Spillway. Placed rocks in areas affected by erosion.

Agency/Dept.	Period of Commitment	Personnel	Equipment
DWR	March 2017 to Ongoing	DWR staff Consultants/Contractors	Dredging equipment, barges
Activities:			
Dredged debris from the Thermalito Diversion Pool to allow water releases to flow down the Feather River.			

Agency/Dept.	Period of Commitment	Personnel	Equipment
DWR	February 2017	DWR staff Consultants/Contractors	Sandbags
Activities:			
Sandbagged and grouted around the Edward Hyatt Power Plant to protect equipment.			

Agency/Dept.	Period of Commitment	Personnel	Equipment
DWR	February 2017 to Ongoing	DWR staff Consultants/Contractors	N//A
Activities:			
Removed original high voltage power lines and towers threatened by spillway erosion; construct temporary alignment to allow resumption of power plant activities to move water from reservoir to the Feather River.			

Agency/Dept.	Period of Commitment	Personnel	Equipment
CDSS	N/A	N/A	N/A
Activities:			
CDSS provided agency representation in the SOC as well as representation on the care and shelter task force. CDSS also provided Functional Assessment Service			

Teams (FAST) that deployed to general population shelters to conduct functional assessments of people with access and functional needs as they arrive at the shelters. FAST members determined what resources were needed to accommodate them so they can remain at the shelter.