

# Oroville Spillway Recovery: Plans Under Design

**APRIL 6, 2017**

## Recovery Plan Overview

Since the damage to the flood control spillway at Lake Oroville became apparent on February 7, the primary objectives of the Department of Water Resources (DWR) have been and continue to be 1) ensuring public safety and 2) ensuring the integrity of the dam and its associated structures. DWR has performed constant inspections and is regularly evaluating changing conditions such as the weather and the reservoir water elevation. DWR will continue adjusting plans and operations based on the most recent information. This includes continued use of the Hyatt Powerplant and occasional use of the gated flood control spillway to release reservoir inflow until DWR can be confident the structure is not needed during the late spring or summer months.

The objective for the recovery is to get systems in place by November 1 that can safely pass whatever Mother Nature throws at the Feather River watershed and Lake Oroville next winter. DWR will be working non-stop with its partner agencies to meet that objective.

The objective of the recovery project is to return both the gated flood control and emergency spillways to original design capacity of passing the possible maximum flood at Lake Oroville. The complete recovery or replacement of both damaged structures will need to be done in multiple phases due to the enormity of the project and time



limitations of the construction season. The plan is to restore the gated flood control spillway to a capacity almost twice its highest historical outflow in order to help prevent use of the emergency spillway. The proposed design will allow approximately 270,000 cubic feet per second (cfs) through the gated flood control spillway, well above its historical maximum flow of 160,000 cfs.

Since there is still uncertainty in the spring weather, and until construction schedules can be confidently determined, DWR will pursue more than one design alternative. A design and contingency design have been chosen for the gated flood control spillway. These approaches will be complementary, so that Lake Oroville can be managed safely next winter no matter what the weather brings. If DWR is hit with a delay, the contingency designs will meet the objective of passing 270,000 cfs, but further work would still be required in future construction season(s). The emergency spillway recovery design alternatives will allow construction work to continue beyond November 1.

All of the alternative designs take into account long-term solutions.

“No regrets” work like road construction and slope stabilization in and around future work areas will be done regardless of the spillway recovery design decisions.

## Recovery Projects Under Design

### **Gated Flood Control Spillway: *Upper Chute Area***

The current recovery plan is to remove and replace portions of the upper, intact part of the gated flood control spillway. This includes replacing the drains, slabs and walls as necessary, and could require removal of minimal to moderate amounts of foundation rock to ensure the new deck or slab is placed on adequate foundation. The design will be completed to meet modern standards and be approved by the regulatory agencies.

The contingency schedule plan is to replace as much of the spillway slab in the upper section as possible in one season and provide additional repairs and/or protective measures to any remaining slabs or walls. Protective measures may include rock bolts and anchors to increase spillway reliability and meet the objective of passing 270,000 cfs.

**Gated Spillway: Potential Remedial Measures for Upper Chute Area**

Replace as much of the Upper Chute as possible by November 1, 2017 with modern, robust design. Anchor any remaining slabs and walls until replacement during next construction season.



### **Gated Flood Control Spillway: Lower Chute Area**

The damaged spillway structure downstream of the severely eroded area will be demolished and replaced, including reinforcement of adjacent slopes. The spillway structure in this area will be constructed to meet modern standards. The exact plan will depend upon the rate of construction progress this summer. Decision points within the schedule will dictate which plan moves forward.

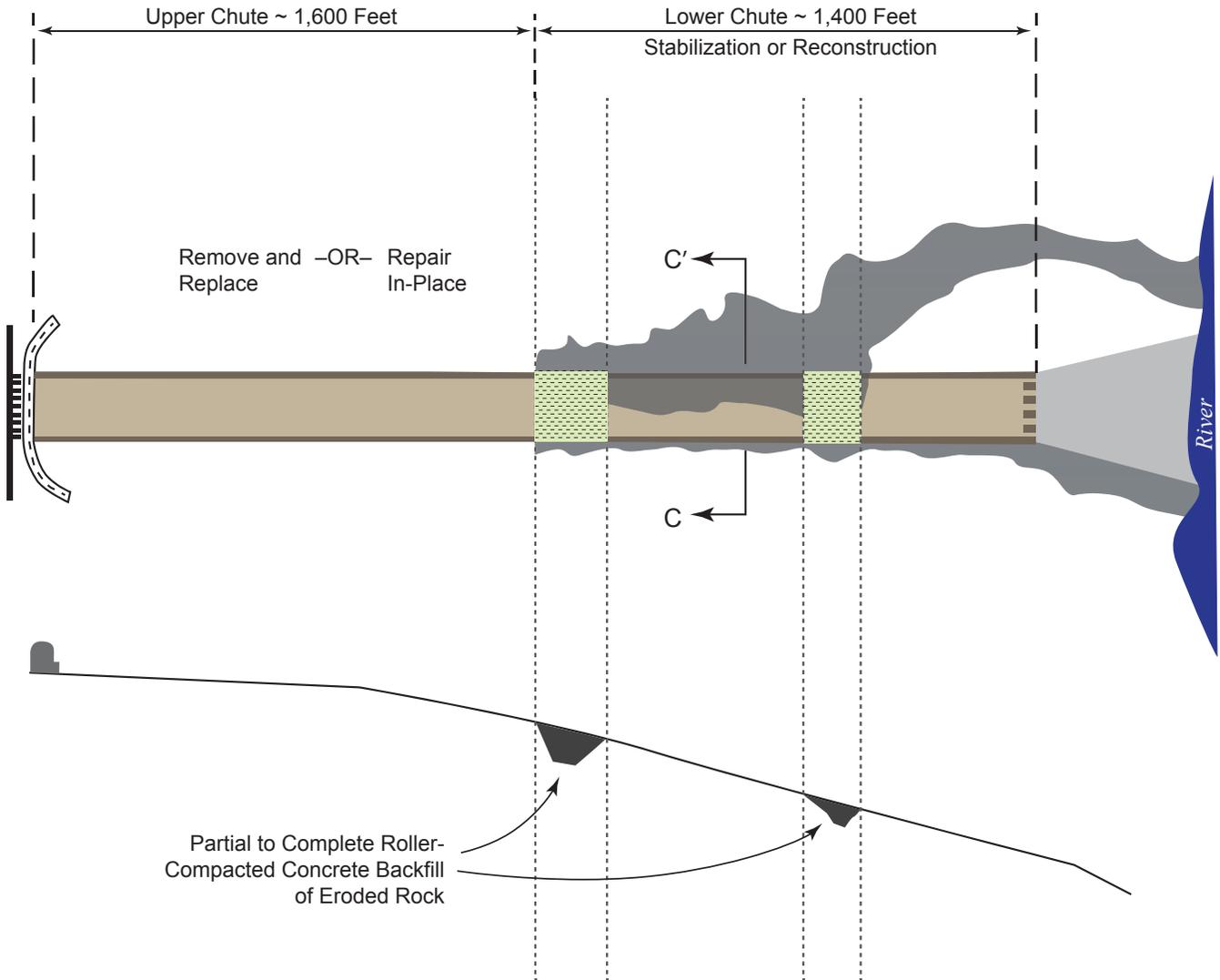
The current chosen plan is to return the lower part of the gated flood control spillway to the geometry that existed before the incident. This would involve placing concrete and roller compacted concrete (RCC) in areas where severe erosion has occurred to allow construction of a reinforced concrete spillway stronger than existed before the incident and designed to meet modern standards.

RCC is commonly used in dam construction, as it can be placed much more quickly than conventional concrete. RCC is a drier concrete mix and is placed using large compacting equipment.

The contingency plan will be to buttress the end of the damaged upper chute spillway with roller compacted concrete and reinforce a plunge pool in the eroded area. Areas that are deemed safe for continued use through next winter will be leveraged and reinforced, such as the left gully, so that more robust permanent features can be built later. If this option is pursued, final construction on the remaining unfinished portions would be completed in the summer of 2018.

**Gated Spillway Remediation Concepts: Lower Chute Area**

The following graphic provides a plan view of both the upper and lower chute portions of the gated flood control spillway.



**Note**

Lower Chute has two concepts: temporary stabilization by November 1, 2017 or permanent reconstruction by November 1, 2017.

## Emergency Spillway

All efforts are being made to allow 100 percent of next year's flood flows to pass through the gated flood control spillway and to prevent future flows down the emergency spillway.

The work already completed on the emergency spillway is considered temporary and will be improved.

The current design being pursued for the emergency spillway:

- Place a concrete wall beneath the ground and deep into rock downstream of the existing weir. This type of construction is common in dam engineering and is usually referred to as a cutoff wall to prevent "head-cutting" erosion at the base of the concrete weir if the emergency spillway had to be used.
- Place RCC against the existing weir. This is common to dam engineering and normally referred to as buttressing the dam to ensure the structural integrity of the weir under flood flows and future possible seismic loading conditions.
- Place RCC downstream of the weir to convey flood flows downstream. This is commonly referred to as an RCC apron used to prevent erosion of the bedrock.

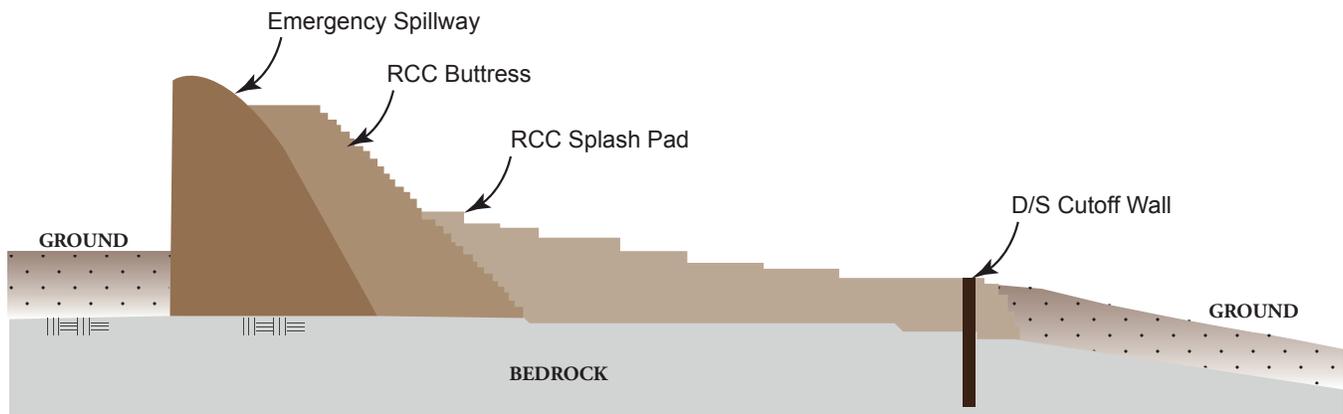
The construction schedule has been developed to ensure that the concrete cutoff wall, the most critical component, will be completed by November 1.

Construction of the remaining components will start in the summer of 2017 and can continue past November 1 if necessary, as all flows will be conveyed through the Hyatt Powerplant and, if required, through the gated flood control spillway.

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### Emergency Spillway Remediation Concepts

The following graphic provides a profile view of an emergency spillway recovery concept including the RCC buttress and splash pad and the downstream cutoff wall.



## **Recovery Schedule**

DWR already has issued a notice to proceed to its contractors to allow construction of certain “no regrets” preliminary projects that will be necessary regardless of the design plan ultimately implemented. These projects include:

- Construction of or improvements to access roads
- Development of construction staging areas
- Stabilization of slopes adjacent to damaged flood control spillway
- Design modeling for emergency spillway.

## **Major Construction Contract(s)**

DWR has been moving fast to design and prepare for recovery construction activities this spring and summer. Bid documents which contain design details were released to qualified contractors on March 31 for the main portions of the restoration. A pre-bid job walk was conducted onsite and the bid deadline is April 12. Because sensitive design details are included in the contents of the bid documents, the bids are considered critical energy/electrical infrastructure information (CEII) and cannot be made public.

DWR expects to issue a notice to begin work to contractors on April 17 for the main portions of the recovery. Early work associated with this contract will include mobilization of the contractor to the staging and construction sites and other up-front work the contractor can do in anticipation of the major construction work within the spillway areas in the coming months.