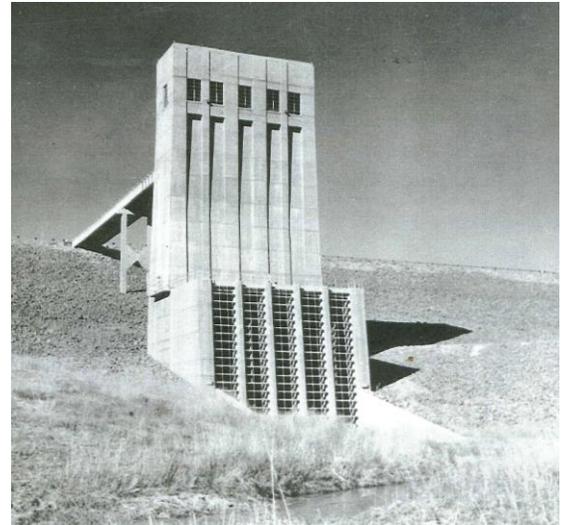




Cherry Creek Dam Pressure Flushing Case Study 2017-2018

Description

Cherry Creek Dam, operated by the Omaha District US Army Corps of Engineers (USACE), undertakes a pressure flushing event annually. This flush is done by the Tri-Lakes O&M staff to ensure that deposited sediment does not affect the operability of the discharge gates. This extended project will take advantage of the 2017 flush, partner with the Bureau of Reclamation (BoR) on a case study, and include the 2018 flush in a comprehensive review of the benefits and impacts of reservoir flushing in the context of Regional Sediment Management. The flush in May 2017 (250 cfs discharge) was instrumented and monitored by a joint research team from USACE, BoR, and the US Geological Survey (USGS). Data was collected and analyzed. During the winter, BoR began the process of building a 3-Dimensional model of the flush. USACE provided sediment and flow data, and will use all the data to develop a sediment budget for both flushes. The 2018 flush is scheduled for 23 May 18 and is expected to have discharges of 1300 cfs.



Cherry Creek Outlet Works pre-filling 1952

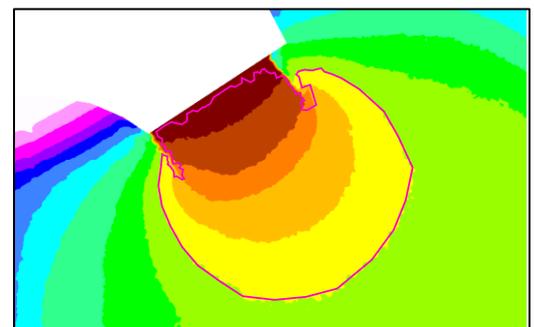


Cherry Creek Outlet Flushing Discharge

The overall goal of the project is to determine if a model of the flush can help better understand and predict the physics of sediment entrainment during a pressure flush and develop guidelines for the application of pressure flushing for maintenance at other facilities.

Issue/Challenge To Address

Hydrosurveying in the area of the outlet works was done before and after the 2017 flush. Based on comparisons of the surveys, the volume of sediment scoured and flushed from the reservoir was small, with changes of up to 2.5 feet in elevation maximum. When using surveying equipment accurate to +/- 0.5 feet, a significant amount of the measured change may be within the estimated error of the survey. This is not expected to be as significant a concern during the 2018 flush as much higher discharge.



Scour Zone from Previous Flush



US Army Corps
of Engineers®
Engineer Research and
Development Center

National Regional Sediment Management Program Omaha District (NWO):



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During the 2017 flush, downstream data collection was centralized at a bridge at the Kennedy Golf Course, approximately ½ mile below the outlet works. The five fold increase in discharge for the 2018 flood will require relocation of the data collection site. A suitable site has not yet been determined.

Successes Lessons Learned

Two multibeam hydrosurveys, sediment concentration, discharge, and channel geometry were collected during and around the 2017 flush. The data collection methodology was a success, and will be replicated during the 2018 flush.

This analysis showed that far from the intake tower, the effect of flushing was minimal and the resulting elevation difference ranged from -1ft to 1ft. In the vicinity of the intake tower, the resulting scour reached depth of up to 2.5ft. The total amount of eroded sediment within the given boundary was 137ft³. The sediment budgets will be completed post-2018 flush.

Expected Products

- Sediment Budget for each flush
- Joint agency report on the flush with transport vs. discharge curves to be applied at other dams
- BoR led 3-D Hydrodynamic model of the outlet works and downstream channel, calibrated to the two flushes.
- RSM Technical Note summarizing all findings

Stakeholders/Users

USACE Districts, US Bureau of Reclamation, NRCS, State Dam Managers

Projected Benefits Value Added

Many reservoirs in the US experience impacts on the ability to operate the project due to sedimentation. In some cases sediment has deposited on the face of gates or tunnel bulkheads which prevent their normal operations. Where these impacts have been identified, and where possible to do so, pressure flushing can be a low risk, low cost management option. In some cases, pressure flushing has not been attempted due to the uncertainty of the outcome. This study will document the impacts of this pair of flushes and attend to make some general determinations of the magnitude of impacts and benefits from pressure flushing.

Leveraging Opportunities

The US Bureau of Reclamation was just beginning a research unit on pressure flushing about the time the concept for this RSM project was developed. The two agencies are splitting the cost of the project approximately 50/50, and will both benefit from the results.

Points of Contact

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Related articles:

<http://www.nwo.usace.army.mil/Media/News-Releases/Article/1185088/annual-sediment-flushing-exercise-scheduled-at-cherry-creek-reservoir/>

<https://www.denverpost.com/2016/05/31/big-dirt-flush-through-denver-designed-to-clear-cherry-creek-dam-gates/>

Participating Partners

USACE Tri-Lakes Project Office, Denver, CO

US Bureau of Reclamation, Technical Service Center, Sedimentation and River Hydraulics

USGS Lakewood, CO Field Office