



MEMORANDUM
JULY 5, 2018

TO: BOARD OF DIRECTORS
ANDREW MUELLER, GENERAL MANAGER
PETER FLEMING, ESQ. GENERAL COUNSEL

FROM: RAY TENNEY, P.E. & DON MEYER, P.E.

SUBJECT: OPERATIONS OF ELKHEAD AND WOLFORD MOUNTAIN RESERVOIRS

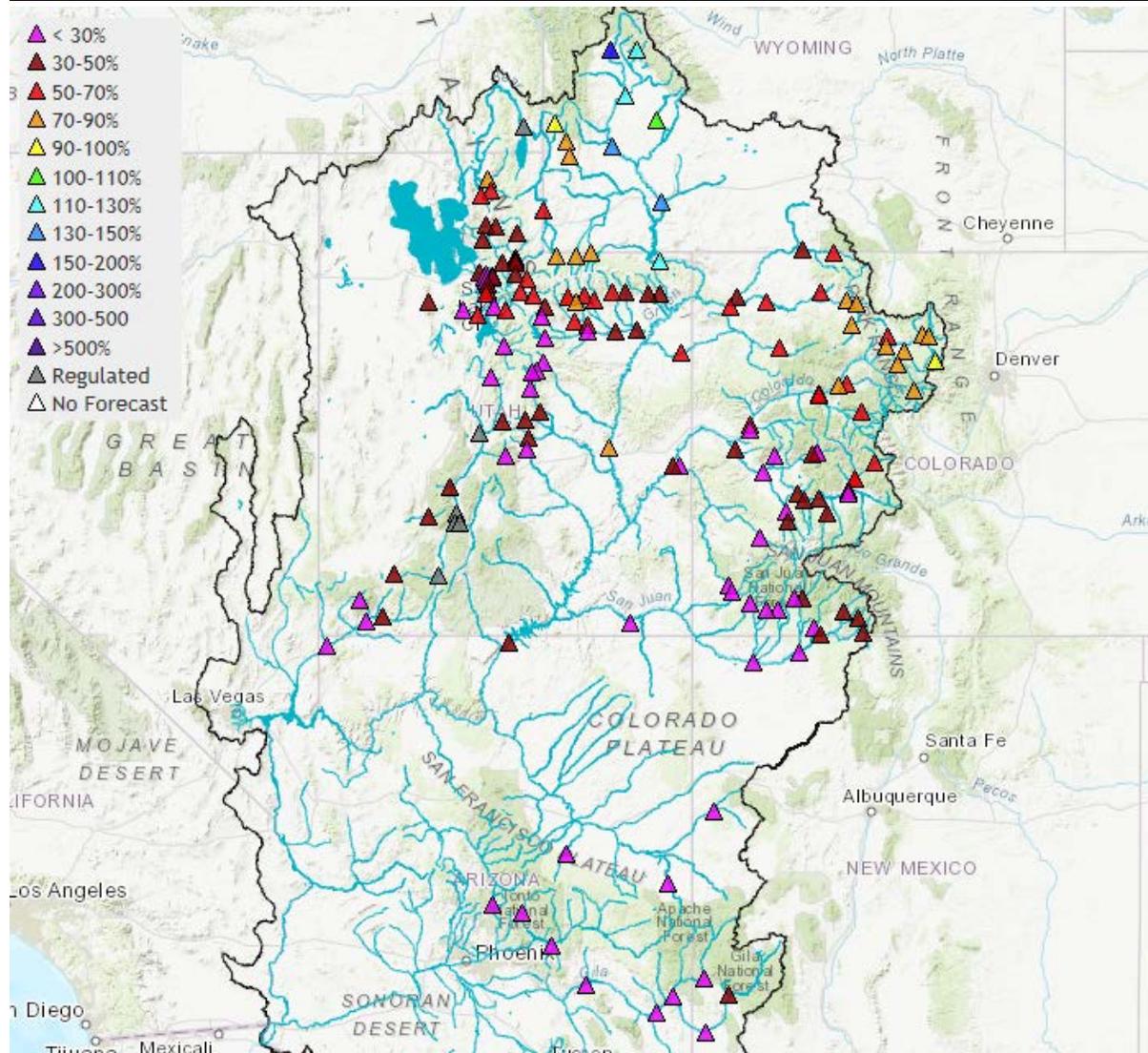
REQUESTED BOARD ACTIONS:

- 1. Grant of a 10 year driveway license agreement to the Myers for use of their agricultural driveway adjacent to Elkhead Dam. Discussion below.*
- 2. Authorization for Staff to enter into an agreement for installation of erosion protection on the Malburg Pond embankment and restore the work area as public parking spaces, with Moody Construction & Sons, Inc. in the amount of \$36,560.23. Discussion below.*
- 3. Authorization for Staff to enter into an agreement for repair of the Elkhead Reservoir spillway concrete with B&RW Construction Co. Inc in an amount not to exceed \$30,000. Discussion below.*

STRATEGIC INITIATIVE(S): None Applicable to Operations and Facility Maintenance

Water Supply Outlook

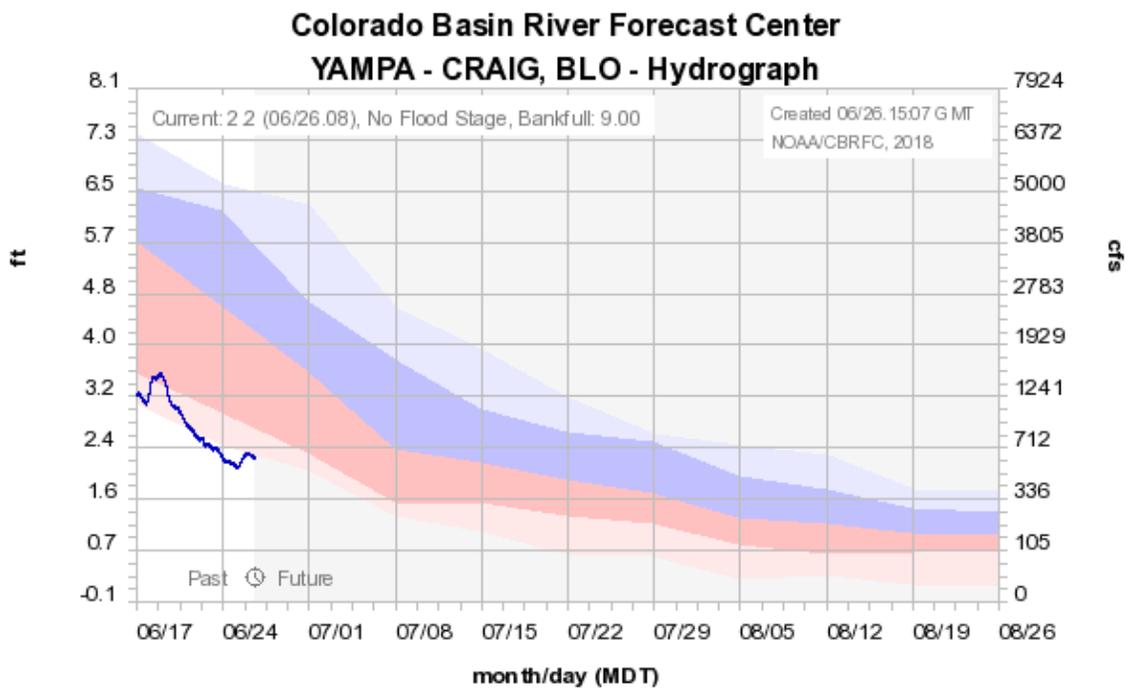
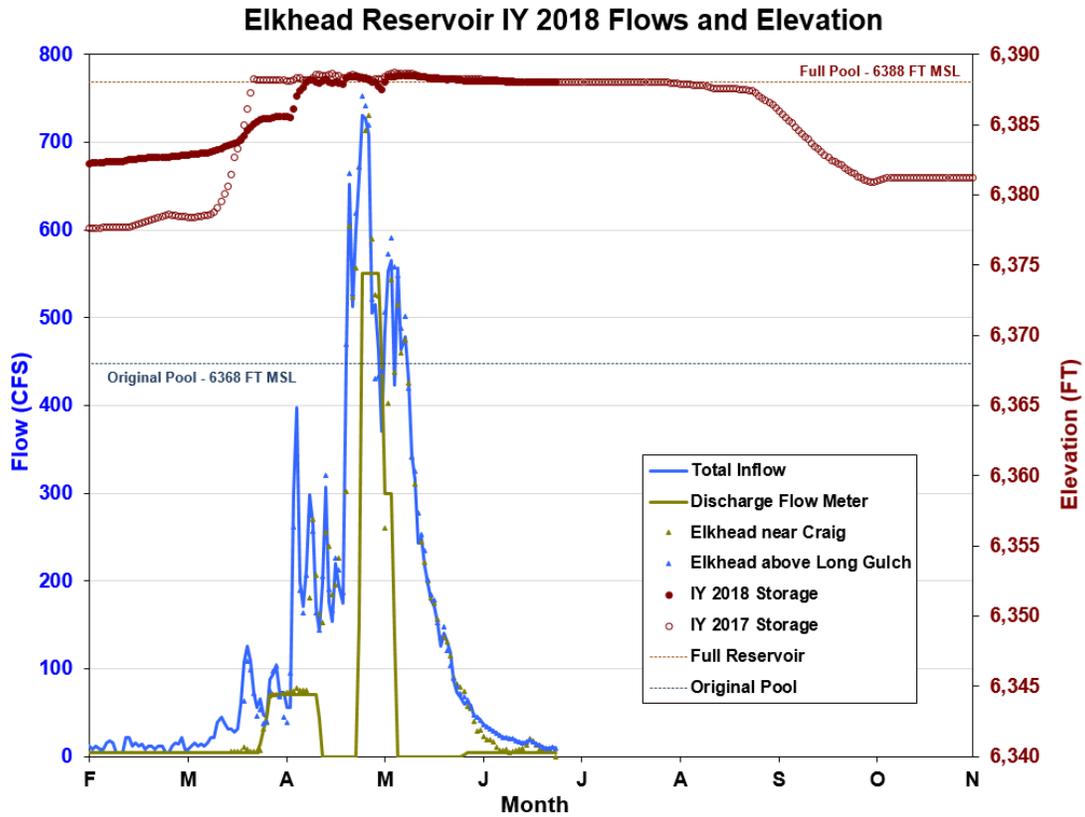
The July 1 Colorado Basin River Forecast Center (CBRFC) April – July Most Probable Runoff Forecasts at various locations in the Colorado River Basin are shown in the map below. La Nina winter conditions played out as expected, with more precipitation in northern Colorado and less in southwestern Colorado. The most probable inflow forecast for Lake Powell has decreased from 42 percent of average in April to 37 percent of average in July.



Elkhead Reservoir

Operations

Below is a graph of recent 2018 Elkhead Reservoir operations. The reservoir is full, releasing 5 cfs. The Recovery Program has expressed an interest in leasing an additional 2000 acre-feet to help bolster flow at Maybell this summer, although at this juncture only committed to 500 acre-feet. The second graph below shows flows on the Yampa River near Craig are in the 90 percent exceedance range and are expected to decrease such that augmentation releases from Elkhead are likely to begin mid- to late-July. The first Yampa River Flow Coordination teleconference meeting is scheduled for July 11th.



Observed —

Historical Exceedance Probability (USGS): 90-75% 75-50% 50-25% 25-10%

Elkhead Spillway Fish Barrier Net Update

Colorado Parks and Wildlife (CPW) has taken over ownership and maintenance of the net. The remaining River District obligation is to have Pacific Netting Products (PNP) complete the second of two warranty inspections and adjustments this July or August.

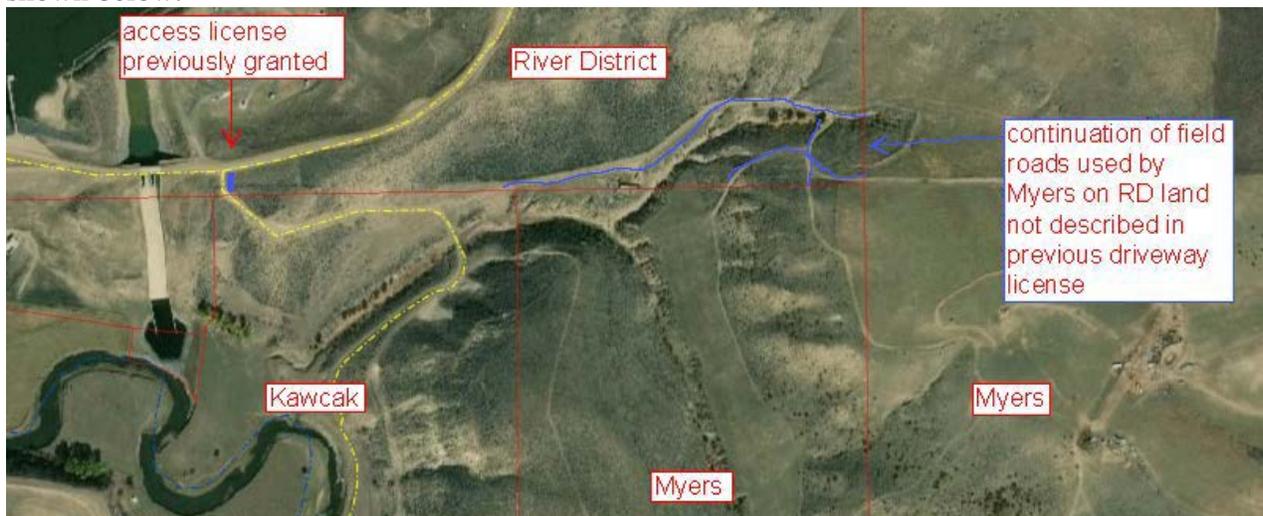
The net accumulates algae which collects silt and grows in place to clog the net. CPW has a dive team they have used for cleaning the Highline net (also built by the River District for CPW) for many years. This dive team is learning what effort, equipment, and at what frequency net cleaning is required at Elkhead, a much bigger and deeper net. This spring when runoff ramped up to about 650 cfs daily average the net which is designed for 2,500 cfs, overtopped. Field examination of the net suggested clogging may have been a significant contributor to the net overtopping. PNP made a site visit and with River District assistance examined the net in the field to the extent possible with runoff water clarity.

Fast action by the City of Craig staff to ramp up outlet works operation reduced the flow on the net and stopped the overtopping event in a couple of hours. Due to the low runoff this year the outlet works was able to handle enough of the flow to keep the net from overtopping again. An average year spring flow may not have allowed this operation.

Additional evaluation of the net buoyancy and cleaning will be made and if necessary PNP will add additional buoyancy to the net.

Myers Driveway License

The Myers have lands to the south east of Elkhead Dam and have historically accessed these lands via a driveway from the dam crest road, dating back to when the Colorado State Land Board owned this land. To allow for the Myers continuing access to their adjacent land the River District in 2008 granted a 10 year license for use of the driveway. The driveway license is up for renewal in 2018. While the language in the original grant allows for use of the license to access agricultural lands in Section 21 to the east the legal description does not include those field road segments shown below.



Staff recommends granting another 10 year driveway license to the Myers which would include the field roads used to access the lands in Section 21 for \$50 per year paid 10 years up front for a total of \$500.

Malburg's Pond Embankment Protection

The replacement Malburg's Pond was constructed by the Elkhead Reservoir Enlargement Project to compensate the owners of Malburg's Pond for inundation of the existing pond as a result of the enlargement of Elkhead Reservoir. A Fencing and Pond agreement, signed on May 31st, 2005, obligates the River District to maintain the pond berm.

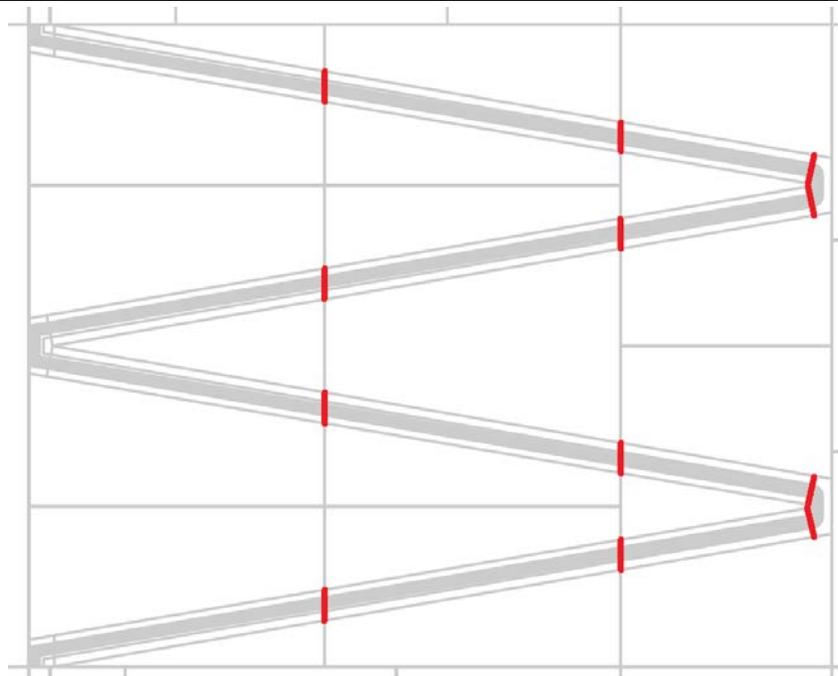
The downstream berm face has slowly eroded since the enlargement of Elkhead Reservoir due to wave action. In order to prevent continued erosion of the berm and eventual overtopping of the berm, staff is recommending installation of riprap erosion protection. Secondly, staff is recommending reclamation of the work area include four parking spaces to accommodate public access to the area. Staff received three quotes for the work (\$36,560.23 from Moody Construction & Sons, Inc., \$43,654.90 from Precision Excavating, Inc., and \$67,812.00 from Anson Excavating and Pipe). Staff recommends that the Board consider entering into an agreement for the work with the low bidder, Moody Construction & Sons, Inc. As the Malburg's Pond replacement is an enlargement project cost the Recovery Program will share in the expense, and the River District's portion of the work will be about 58 percent.

Labyrinth Weir Concrete Repairs

The Labyrinth Spillway at Elkhead Reservoir has developed leaks and concrete spalling at the concrete construction joints. A previous attempt by the City of Craig to fix the cracks using surficial applied grout was unsuccessful. The most recent Dam Safety Inspection Report lists this as an item *requiring action by the owner to improve the safety of the dam*. The proposed work will address the Dam Safety Office concerns and will prevent further freeze thaw damage.

The repairs will consist of saw cutting the surface of the construction joints, filling the sawn cut with a temporary sealant, drilling diagonal holes behind the temporary seal to intercept the crack, and injecting to fill the crack. The contractor will then remove the temporary seal, and apply permanent grout in its place.

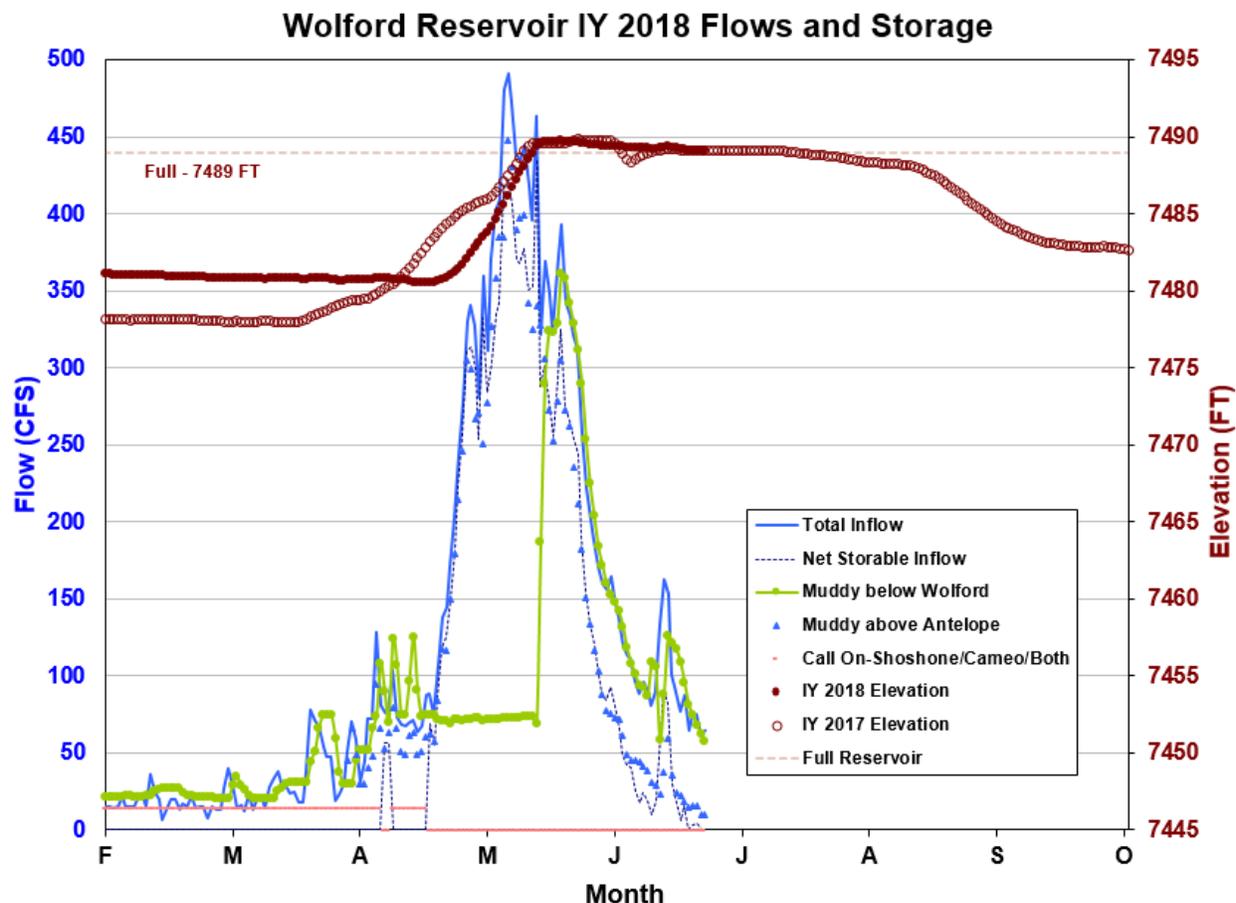
In order to allow for flexibility in the work, staff recommends using a time plus materials not to exceed contract. Staff received quotes from two contractors, B&RW Construction Co Inc., and Mays Construction Specialties, Inc. While the quotes were similar in unit cost, Staff received more favorable feedback and no negative comments on B&RW Construction and are therefore recommending enter into a contract with them. Because this is an operational expense, our project partners (Yampa Participants, Tri-State, City of Craig, and Recovery Program) will reimburse the River District for about 80% of the project cost.



Labyrinth weir drawing highlighting construction joints.

Wolford Mountain Reservoir

Below is a graph of recent Wolford Reservoir operations. The Shoshone Junior Call came on June 28th requiring the reservoir to bypass inflow, replace for contracts and wetlands mitigation diversions. There are two maintenance projects planned at Wolford this summer. The crest will be rehabilitated to design height and width, gaining back lost freeboard due to settlement. The second project is removal of two instrumentation fills on the upstream face of the dam constructed in 2012 to monitor upstream shell deformation. These instruments measured very little settlement in the upstream shell and are not considered critical. The USACE permit under which these instrumentation fills were placed requires removal when the purpose has been served. Protection of these fills to prevent erosion might have approached \$100,000. The instrumentation fill removal requires a drawdown to 20 feet below full pool by September 1st, beginning July 15th, at a rate of about 300 cfs. Part of these releases will meet obligations for bypass of inflow, contracts and releases from the 6 KAF Fish pool. The balance of the releases will be protected to the 15 Mile Reach by DWR for use by endangered fish. Water surface elevation is expected to be near 7467 feet MSL (22 feet below full pool) by November 1st.



Dam Crest Rehabilitation

Dam Crest Rehabilitation work is expected to commence with the bridge reset in July and the dam crest work in late August through September in a 5 week period, once the reservoir reaches the 20 foot draw down target for instrumentation fill removal. More schedule detail from Moody Construction & Sons, Inc. will be available by the Board meeting.

The 506 - 2 x 2 x 6 foot concrete blocks which will make up the edges of the dam crest rehabilitation are being cast at Meeker Sand and Gravel in Craig and the concrete test results to date are very good. Most block delivery to the site will be “just in time” for installation. Over the road legal trucks will need to off load some blocks on site to cross our spillway bridges so some stockpiling will occur in the western edge of the gravel parking area near the dam.

Outlet Works Main Gate Replacement

Outlet works main gate replacement alternatives were quoted by three manufacturers including Hydrogate (the manufacturer of the existing gate), Rodney Hunt, and Steel Fab. Critical to the success of any one of the gates is the design of the gate seals and the manufacturing quality control. Hydrogate quoted a cast iron gate similar to the original gate with upgraded seals. Hydrogate currently manufacturer’s its gates off-shore. Rodney Hunt quoted a cast stainless steel gate

manufactured off-shore. Steel Fab quoted a fabricated stainless steel gate manufactured in the U.S. Both stainless steel options quoted are about 3 times the cost of the cast iron gate option. Staff is working to firm up the quotes, and the commitment by Hydrogate to the quality and delivery schedule necessary for a long term successful project.

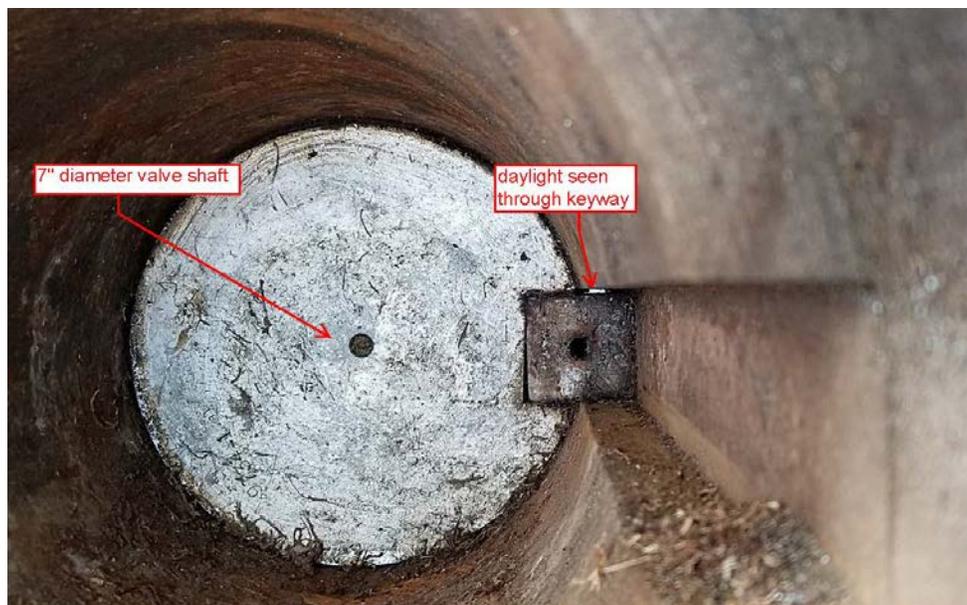
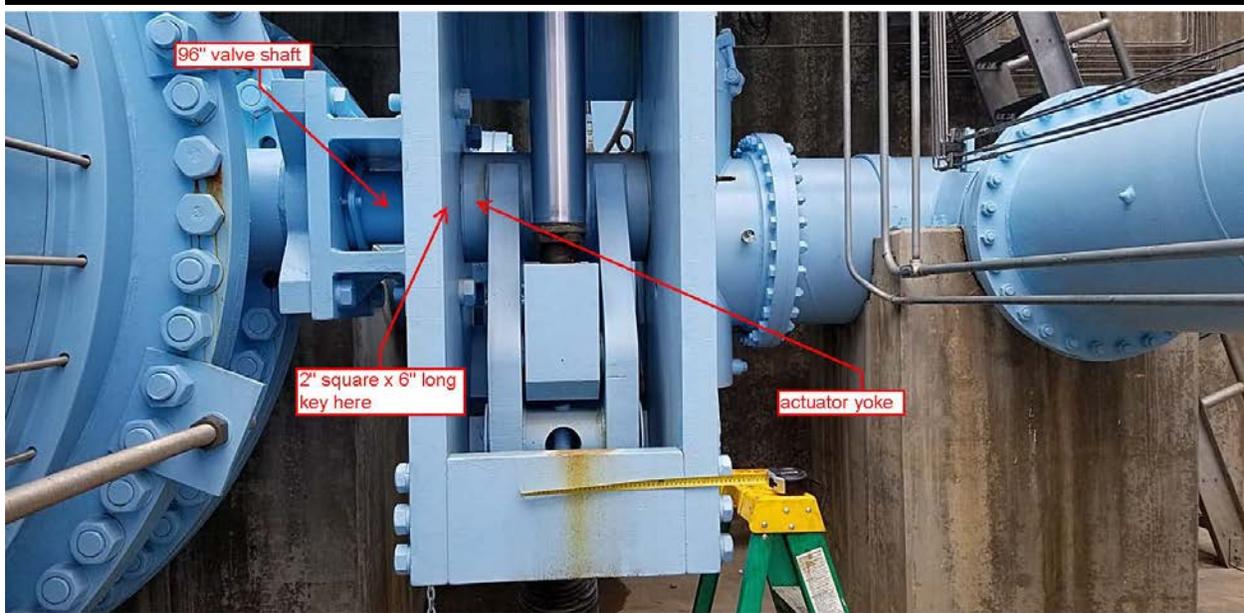
Lead time for the gates is in the neighborhood of eight months. Staff wants to install the gate in the early spring of 2019 to take advantage of the 2018 reservoir draw down and reduced depth which will reduce diving costs. Installation cost for the gate regardless of supplier may approach \$200,000 due to the amount, depth, and elevation of diving, the barge mounted crane, and other barges and equipment required.

Staff intends to bring a recommendation to the Board at the July meeting on the best gate to install at Ritschard Dam to meet a spring 2019 installation schedule.

Replacement of the Seal in the 96-inch Butterfly Valve in the Outlet Works

The 96-inch butterfly valve in the outlet conduit is used to shut down the main part of the outlet works during times of low releases which can be made through the 30-inch outlet piping, usually winter time. The 96-inch butterfly valve developed a leak in the seal which lead to outlet works freezing and ice bulging in 2016. Field technicians from Henry Pratt Company which manufactured the valve in 1993 came to Ritschard Dam to install a new seal after the work area was prepared and heated by River District staff. A new seal was installed and even with two trips by Pratt's field technicians cannot achieve a reliable water tight seal.

Investigation of the operation of the 96-inch butterfly valve revealed the valve was connected to the actuator by an incorrectly sized key (2-inch nominal) which Pratt's field technicians believe allows the valve to "rock" after a successful closure and release the upstream pressure. River District staff will assist Pratt with further investigations of the key and keyways to ascertain a fix for the incorrectly sized key in the attempt to get the butterfly valve to seal.



Dam Deformation Monitoring

Dam deformation monitoring continues with daily observations, monthly movement readings, periodic surveys, data reduction and evaluation, and results presentation to the State Engineer (SEO) and others via a portal on our website. In general the crest settlement and downstream movement in the maximum section of the dam embankment are continuing with rates and patterns similar to past behavior, with some slowing of the settlement detected in the most recent readings.

With two exceptions, which are vibrating piezometers constructed as part of vertical arrays placed in the clay core of the dam, bracketing the deformation zone. These two piezometers right in the

deformation zone showed elevated and increasing pore pressure levels when the reservoir was drawn down over the winter, and increasing response with the reservoir filling. The readings may be related to instrument failure, or the phenomena of increase of internal clay water pressure as stress builds we had hoped to monitor with the vertical arrayed piezometers.

Staff may recommend drilling and installing replicate piezometers to verify the performance of these two instruments. More information will be available by the Board meeting.