15 March 2017

Holbrook Mutual Irrigating Company Reservoir #1's Outlet Flow Measurement Upgrade, Phase 1, 2 Stage Concrete Weir Completion Report

The Current Overview:

The Holbrook Reservoir #1 is located in Otero County and is just north and east of Swink, Colorado and was constructed around the year 1897. The reservoir's principal spillway outlet had a 10-foot concrete parshall flume which had been repaired and raised in elevation several feet over its life span. The old parshall flume was incapable of accurately measuring water flows less than 14 cubic feet per second (cfs) and was in need of repair. The reservoir currently needs the capability to accurately measure low exchange water flows which are less than 14 cfs. In order to recapture reservoir lost storage capacity the 2 Stage Weir's invert (bottom elevation) was lowered one (1) foot below the existing floor of the old 10-foot parshall flume.

The Activities:

1st Thing Accomplished was the approval of the 2 Stage concrete weir hydraulics by the State of Colorado's Division 2 Engineer's Lead Hydrographer which occurred on 19 April 2016 when I received an email from Joey Talbott, P.E. The approved 2 Stage Weir dimensions are: a one (1) foot high by six (6) foot wide low stage with a 14 foot wide (7 foot on both the left and right side of the low stage) by an at least 2.5 foot high (including freeboard) second stage.

2nd Thing Accomplished was the concrete design for the 2 Stage Weir dimensions approved by Mr. Talbott. The concrete design consisted of a 5,000 pounds per square inch (psi) concrete mix with a 5-inch slump and #5 (5/8 inch) rebar spaced on 1-foot centers each way (both horizontal and vertical). The concrete footer base was designed to be one (1) foot high, 28 feet long by two (2) foot wide and six (6) feet below the invert (bottom) of the low stage weir. The new low stage weir invert (floor) elevation is one (1) foot below the top elevation of the old parshall flume.

3rd Thing Accomplished was the development of a complete design with items of work to include a quantities estimate and an engineer's cost estimate.

4th Thing Accomplished was to apply for funding from the Colorado Water Conservation Board's (CWCB) Water Supply Reserve Fund (WSRF). The two (2) objectives of Phase 1 were: (1) Install a 2 stage broad crested concrete weir just upstream of the existing parshall flume and (2) Manage the project through construction to completion, with a final report submitted to the funding agencies. The Arkansas Basin Round Table approved a $10,000 funding request at their May Meeting on 11 May 2016 and the Colorado Water Conservation Board (CWCB) approved a $20,000 funding request on 22 September 2016 at their September Board Meeting in Edwards, Colorado. The Holbrook Mutual Irrigating Company agreed to provide a $2,000 cash match and the Recovery Of Yield Group agreed to provide a $8,150 cash match. The Total Budget amount was $40,150. The following five (5) project tasks were identified:

- Task 1. Work with the State of Colorado Water Division 2 Lead Hydrographer to obtain approval of the 2 Stage Broad Crested Weir Flow Discharge Table; identify and install the updated Telemetry Building with all the necessary telemetry equipment, sump, and water flow verification foot bridge; and make it all work together according to the Colorado State Water Engineer's requirements.
- Task 2. Dewater the construction site, install a coffer dam, place the necessary dewatering pumps with sumps, concrete saw cut and remove the existing parshall flume, and place the necessary riprap as directed by the Engineer.

- Task 3. Excavate, construct, and place the necessary concrete forms, with properly spaced rebar, for the complete installation of the 2 Stage Weir as planned utilizing the necessary manpower and excavation equipment.
- Task 4. Pour, vibrate, finish, and properly cure the planned concrete to the line and grade planned. Remove the concrete forms, backfill, reshape, grade and finish the site as directed by the Engineer.
- Task 5. Manage the complete project, develop and submit the Project Management's Final Report.

5th Thing Accomplished was when the Notice to Proceed was received on 27 October 2016. Construction activities started soon after that date which included the necessary excavation provided for access to the planned 2 Stage Weir location and placement of the dewatering pumps with sumps.

6th Thing Accomplished was the first pour of concrete which put the 2 Stage Weir footer in place on 16 November 2016.

7th Thing Accomplished was when the fourth and final pour of concrete completed the placement of the 2 Stage Weir on 12 December 2016.

8th Thing Accomplished was the submittal of a Progress Payment Request for $15,514.07 on 5 January 2017. Note – the requested payment was received a couple weeks later.

9th Thing Accomplished was the installation of the new Telemetry building with all the required appurtenances to correctly transmit 'real time' measured flows from the newly installed concrete 2 Stage Weir. Items installed were: stilling well with two (2) separate piped water inlets; the Telemetry building with concrete pad, antenna, and transmitting equipment; and the water measurement verification footbridge.

10th Thing Accomplished was an on site visit by Derek Johnson, P.E., Water Project Loan Program Finance Section of the CWCB WSRF on 22 February 2017 where he met Donny Hansen, Board President of the Holbrook Mutual Irrigating Company, Bob Barnhart, Superintendent of the Holbrook Mutual Irrigating Company, and Nick Koch, P.E., Agricultural Engineer of the Holbrook Mutual Irrigating Company.

11th Thing Accomplished was the necessary final excavation, grading, shaping, and riprap placement, as directed by the Engineer, to complete the project tasks.

12th Thing Yet to be Accomplished is the submittal of the final payment request along with this Completion Report.

The Heavy Construction Items Were:

1st - Site preparation construction activities consisted of the following:

1. Grading and shaping an access road into the site on the left side and earth fill placement in the Little Ditch to provide a crossing along with other excavation, grading, and shaping operations on the right side of the reservoir water outlet channel.
2. Excavation, filling, and shaping the work site to provide for the complete installation of the concrete 2 Stage Weir.

2nd - Concurrent dewatering activities utilizing wet sumps, trash pumps, and outlet piping with concrete footer wet excavation, and concrete saw cutting, chipping, and jack hammering operations to begin the removal of the old 10 foot concrete parshall flume.

3rd - #5 rebar placement in the excavated footer area.

4th – FIRST POUR. Two (2) loads of 5,000 psi concrete poured, one truck on the left side and one truck on the right side of the reservoir outlet channel. The excavated footer width was 4 foot, 28 foot long, and approximately a 3 feet depth of concrete was poured. A total of 12 cubic yards of concrete was placed, rodded, and leveled side to side and upstream to downstream.

See the 16 Nov 2016 picture below for the first pour of concrete.

5th – Wooden concrete forms were placed for the planned SECOND POUR with the #5 rebar spaced on one foot spacing each way. The picture below is a work in progress; it shows the concrete forms being placed up to the bottom or invert of the six-foot wide by one-foot long low stage weir and to the bottom of the second stage of the weir. Note the work accomplished on the removal of the old 10-foot concrete parshall flume.

The first following picture was taken on 17 Nov 2016 to show the work in progress preparing for the second concrete pour.

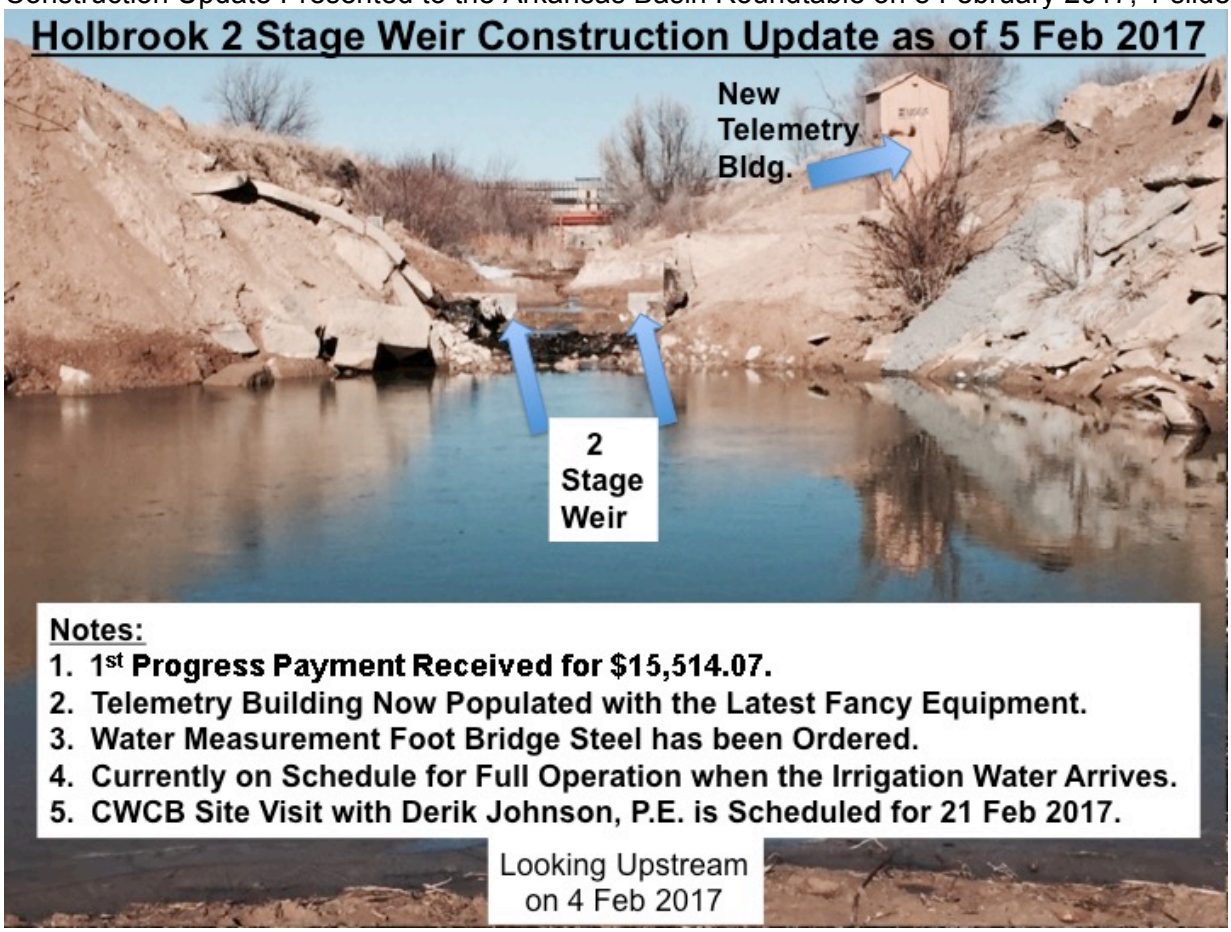
The second following picture was taken on 19 Nov 2016 and shows the work accomplished just prior to the second pouring of concrete.

Part of the installation process is communications to higher authorities and other interested parties.
Construction Update Presented to the Arkansas Basin Roundtable on 11 January 2017, 4 slides.


View on 6 Dec 2016
Old Telemetry Bldg.
Forms Stripped from 3rd Concrete Pour


View on 1 Jan 2017
New Telemetry Bldg.
Old Telemetry Bldg.
2 Stage Concrete Weir is Now in Place!
Any Questions?

Construction Update Presented to the Arkansas Basin Roundtable on 8 February 2017, 1 slide.



6th – Telemetry works of improvement consisted of the following:

1. Purchased and delivered a new building and secured it to a new concrete pad which has a new 24 inch stilling well installed with two horizontal inlet pipe.
2. Removed the useful electronic gear from the old building and installed it with the new upgraded electronics in the new building. This included the antenna.
3. Performed the necessary electronic checks and made the newly installed equipment function as intended and required.
4. Removed and disposed of the old telemetry building and it's associated unusable equipment.
5. Installed a staff gage to observe the water flow depth over the new 2 Stage Weir.

7th – Construct/weld and properly place the water flow measuring foot bridge.

8th – Riprap placement and earthwork to include grading and shaping the immediate area.

The following 2 slides were presented at the Arkansas Basin Roundtable on 8 Mar 2017.

Holbrook 2 Stage Weir Construction Update as of 5 Mar 2017

Final Budget Analysis:

The attached spreadsheet file 'Holbrook 2 Stage Weir Project Equipment, Personnel, & Material Costs Utilizing Weekly Time Sheets – FINAL as of COB on 1 Mar 2017, nfk' details all the work associated with this project. The grand total of the Project Work exceeds the budgeted amount and the monies above the budgeted amount shall be paid by the Holbrook Mutual Irrigating Company.

All the project work detailed for each of the five (5) assigned tasks shall be completed once this Completion Report is approved.