Natural Resources Department
END OF PROJECT REPORT

POGGI1 PDAA 201700000875 **Repair and Rehabilitation of Montezuma Valley Irrigation Company Flume No.6- McElmo Creek Flume –Flume #6**

PDAA 2500 WSRF Grant Montezuma County to Fund McElmo Rehab
Effective date: 04/11/17 **Rollover date: 5/8/18** **Expiration date: 04/30/1**
Recommended by: SW Basin Roundtable

Grant Recipient: Montezuma County Colorado.

Project Coordinator: Montezuma County Natural Resources Department,
James Dietrich (970) 565-7402

Colorado Water Board Conservation
1313 Sherman Street, Room 718
Denver, CO 80203

Dear Water Conservation Board,

We are pleased to report that the Montezuma County Repair and Rehabilitation of the McElmo Flume No. 6 in now 100% complete. This has been an exciting and challenging project to say the least. This portion of the project is the fifth and final phase of a five phase concept to create an interpretative stop and parking area off of Highway 160. Montezuma County administered the SHF (phase three) and the Federal Highways Administration (FWHA) project (phase four) concurrently so that the public could gain access to the site roughly at the same time the rehabilitation efforts are completed. This approach was highly successful as many individuals stopped in the interpretative site to watch as the final phase of the rehabilitation proceeded.

This project has already been a great tool for raising awareness of the importance of preserving, maintaining, and interpreting our local heritage. Though Montezuma County is famous for its richness in Ancestral Puebloan archaeological resources, most notably Mesa Verde, Montezuma County also has wealth of historic resources that are often overshadowed by Puebloan archaeology and forgotten about. This project has raised awareness for a chapter of history that is fast disappearing from our landscape, and it has demonstrated the urgency of preserving some of these remaining features for future generations.

As previously reported Montezuma County has worked in close partnership with the Colorado State Historic Fund, and the Colorado Department of Transportation since it was discovered that approximately ½ of the structure lies within CDOT ROW. This unique situation triggered additional environmental clearances as well as special permitting through CDOT. These clearances and permits were secured during the previous phase of the project which helped pave the way for this final phase to move forward more smoothly.

Again as will all projects of this nature there are challenges. Funding was one of our main challenges much as it was during the first four phases. As we were closing in on the fifth and final phase we were apprehensive as we had already had so much support form organizations such as CWCB, however we once again approached many of the agencies that had provided past support, and once again everyone very willing to help. This time we also solicited help from private donors and were successful in raising the last $8,000 from private contributions.

Once funding was secure were able to proceed with the final funding from the State Historical Fund which provided over $181,000 towards the completion of the project. With the final funding in place Montezuma County released an invitation to bid in August of 2017.

Montezuma County received bids from three interested contractors and the Montezuma County Board of County Commissioners selected RAMCO Developments LLC who was the lowest bidder. The Board of County Commissioners selected RAMCO in part because they were a local contractor and the owner had supervised the work on the foundation and steel phase for Western Triad.

Despite being the lowest bidder the estimated cost exceeded the project amount and necessitated the concurrence of the contractor by the State Historic Fund and the approval of the use of the contingency funds. This process took several months. Contracts for both the Contractor and the Engineering consultant were approved in February 2018 and work on the Flume commenced in early March 2018, when the wooden superstructure was disassembled, inspected and meticulously labeled for rehabilitation or replacement. Each par for reassembly so that as many original parts could go back into the same location they originally came from.

Photos showing the disassembly process

Parts being labeled for reassembly

Work then began on the splicing of wooden parts that had deteriorated badly enough to require replacement. In many cases new wood that matched the old wood was "spliced" into the existing pieces using a "Dutchman" splice. These splices are essentially an inlay technique that treats a localized area of deterioration by cutting out the decayed wood and carefully carving and installing a matching plug or "splice".

Figure 8. Dutchman repair at sill. Deteriorated wood removed to sound material. Pocket to be filled with new lumber.

Figure 6. View of repair work at sills.

Figure 2. View of splice repair at segments.

Figure 8. Moisture readings at stringers. Moisture content varies from approximately 17% to 20%.

Figure 6. View of repair work at sills.

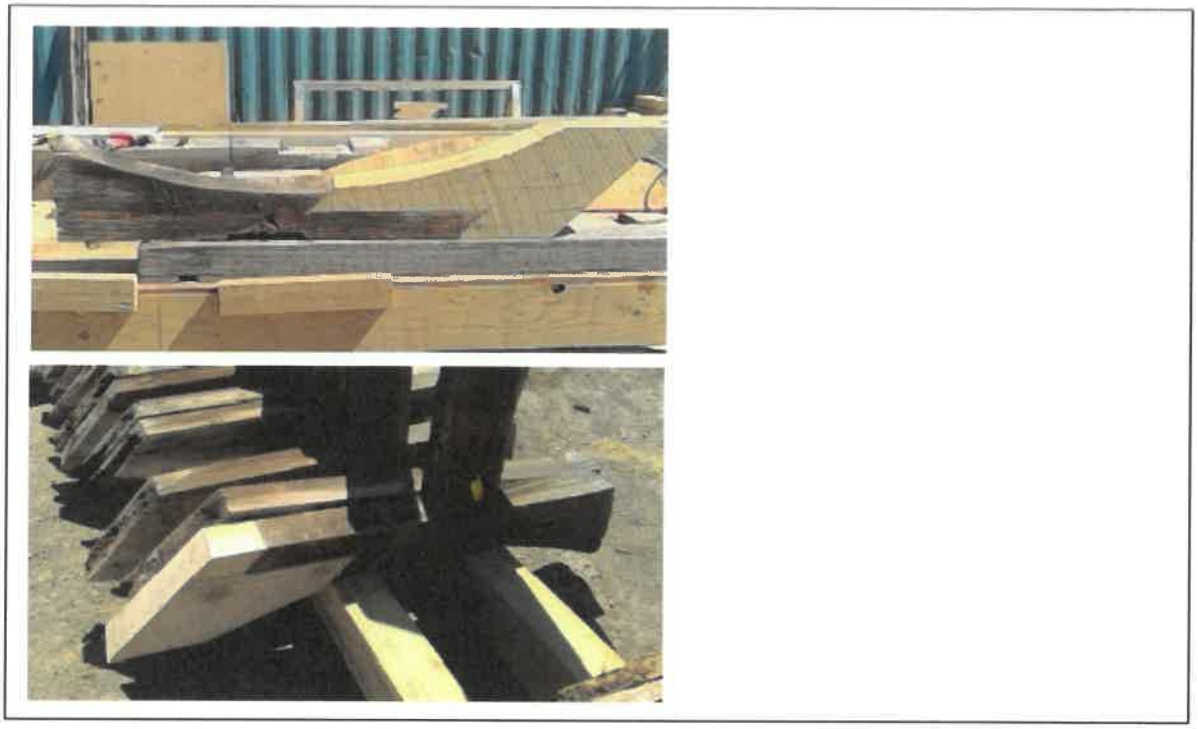

Figure 3. View of repair work at segments.

Controlling moisture content was a very important element of this project because matching pieces of new wood with old wood could result in cracking and shrinkage if the moisture content of both pieces of wood were not relatively close. Most pieces of wood were stored on site in a shipping container to dry until the moisture content had been reduced to around 20%.

The drying process added a great deal of time to the project and during this process one of the tool trailers was broken into and all of the contractors tools were stolen. Luckily none of the wood was taken as the thieves did not seem to realize the value of the timber. Despite having surveillance video at the entrance of the fairgrounds not enough information could be gathered to determine who took the tools. While the theft did not cause any additional delay to the project we did come to realize how vulnerable a project like this can be when located in a semi remote setting. Therefore counter measures including fencing and trail cameras were installed.

As work progressed many of the staves were found to need complete replacement. The original staves themselves were the wood that carried the water and were a higher grade of wood than the sills and bents. In order to match the wood as closely as possible RAMCO had to special order wood from Washington State. The wood ordered had to be milled so that it would form a half barrel when it was installed. The milling process went very quickly but again moisture content was very important and therefore a careful drying process was required. In addition the staves had to fit together nearly perfectly and any warpage or cracks would not have been suitable for National Historic Preservation Standards. In this case the drying process took several months in carefully controlled climatic conditions. After the drying process ended we also had to have the product shipped from Washington which also took several weeks.

Figure 1. New staves stored on site.

Figure 2. Overall progress on site.

Since some of the staves were suitable for reinstallation RAMCO proceeded with the project as far as they could go without the new staves on hand. Since part of the project concept was to use as much of the original wood as possible the decision was made to use as much original wood as possible on the north end where it was most visible to the public. The remaining original staves were placed at the bottom of the flume.

At about this point in the project our contractor received a call from the Sheriff Department who had located all of the stolen tools when the thieves attempted to sell the tools at a pawn shop in order to buy methamphetamine. While this really did not affect the progress of the project we felt good that the

perpetrators were caught. Since were working on a flume everyone had a good time kidding about taking a "water board" to the culprit, but luckily the culprit was dealt with pretty severely by our justice system. Kudos go to our Sheriff's Department for a very thorough investigation.

Once the staves were on site work progressed very quickly.

Figure 3. Grain structure and profile of new staves closely matches the original material.

Figure 4. An example of a new stave with large end split.

Our consultant engineer did an outstanding job of keeping the project on track and construction up to the quality required to meet the National Historic preservation standards. Our contractor was very diligent and easy to work with. Any discrepancies were corrected immediately without any conflicts.

This project required precision work and our consultant was very meticulous in inspections and corrections.

Figure 5. Misaligned staves, leaving large gaps in the half-pipe.

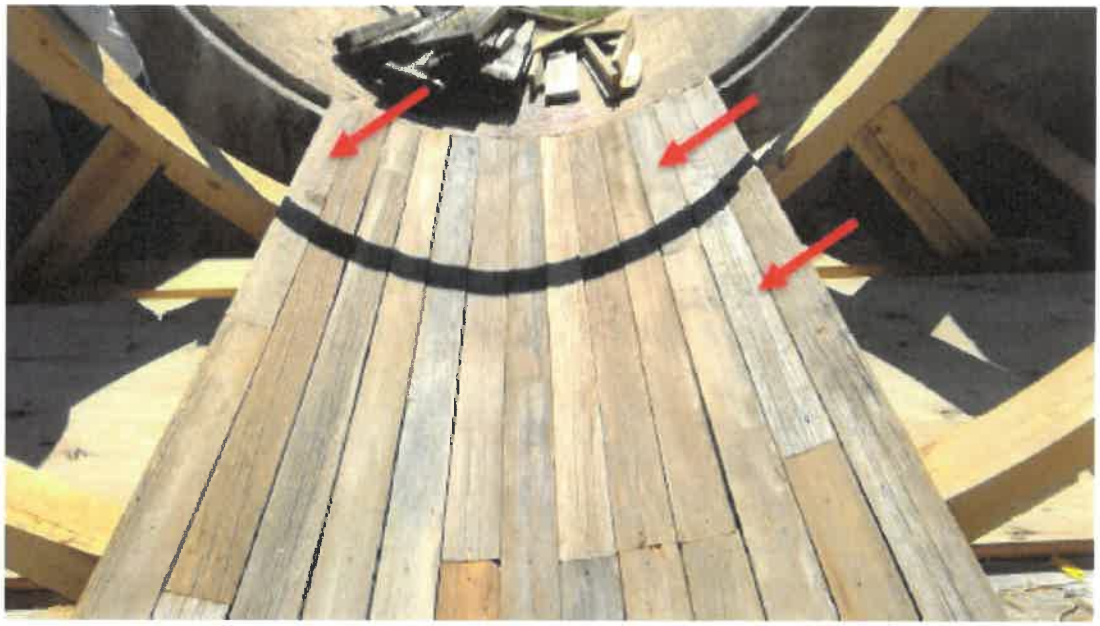

Figure 6. Short staves installed at the southeast end of the Flume. These staves will need to be removed and replaced by longer staves, spanning at least across two bends.

The original construction of the flume was completed using toe nails to fasten members together. While this technology worked well for the time period, we realized that much of the deterioration of the flume was now associated with large wind events and lacking regular maintenance a better fasting system was recommended to be used to help protect against wind loading. Therefore Headlok screw were used for reassembly. The new anchoring plan is shown below.

Figure 9. Typical toe-nail connections at Flume bent.

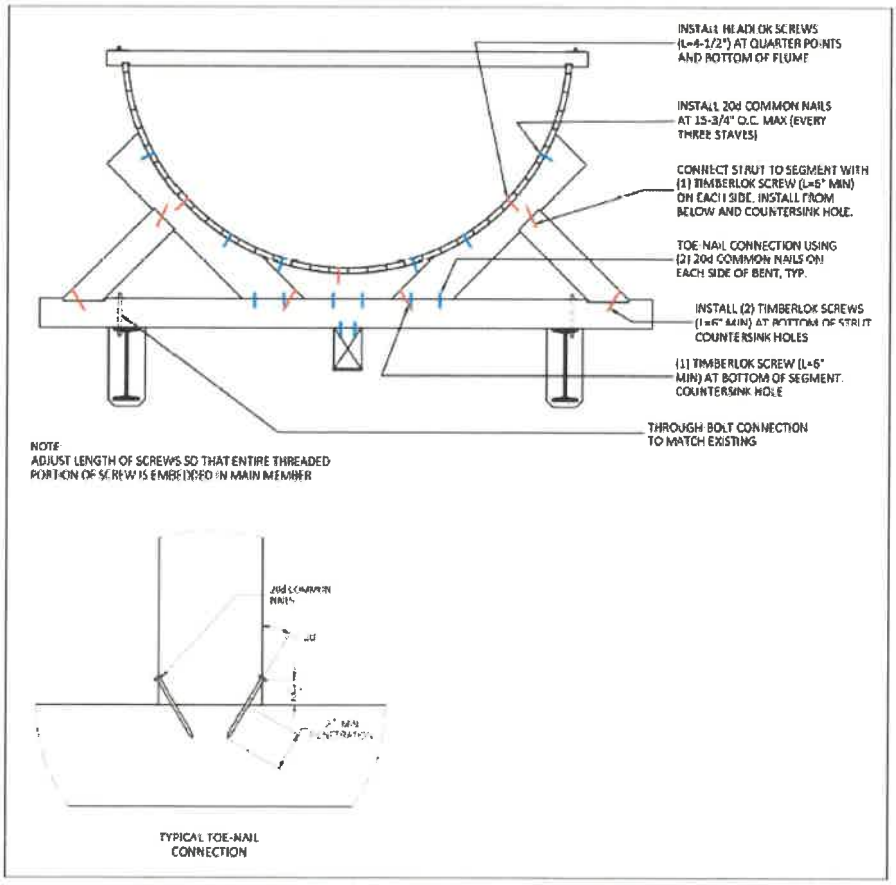

Figure 10. Recommended fastener pattern to be used for the Flume reassembly.

The use of Headlok screws increased the materials and labor costs substantially, therefore we did have to use the contingency allocated in the original budget. However the project still came in within the overall project budget and within the scheduled timeframe approved by the State Historical Fund. We did of course ask for an extension from the Water Conservation Board to allow extra time due to the difficulties in the original fundraising. However we are within our scheduled timeframe for completion of the project for CWCB as well.

On November 9th, 2018 our consulting engineer conducted a site visit and signed off on the completed flume rehabilitation project.

Figure 1. Overall view of northeast elevation of the Flume.

Figure 2. Overall view of southwest elevation of the Flume.

Figure 3. Closeup view of northeast elevation of the Flume from southeast abutment.

Figure 4. Top view of the Flume from southeast abutment.

Figure 5. Interior view of half-pipe from southeast abutment.

Figure 6. Closeup view of splice repair at spreader's end.

Everyone including the State Historic Fund is thrilled with the final product. Within a couple of years the new wood should oxidize to a silvery greay color which will match the historic wood. We feel we have a very successful project. Whew!

Due to changes in the Engineering supervision, additional construction expense associate with a small amount of additional wood, extra ironwork on the turnout gate, and the use of the Headlok screw fastening system, we did ask the State Historic Fund for a budget reallocation between tasks and the use of the contingency fund.

Our original project budget is shown below;

Montezuma County **Exhibit B**
Rehabilitation of Montezuma Valley Irrigation Company Flume #6 - McElmo Creek Flume – Flume #6
Project #: 2017-01-032

PROJECT BUDGET

TASK	AMOUNT
A. Numbering of staves	$26,940
B. Repair of concrete and steel at the top of concrete-encased steel girders	$4,190
C. Assessment and repair of steel girders	$3,300
D. Repair and replacement in-kind of deteriorated stringers and sills	$58,860
E. Repair of curved framing bents	$43,800
F. Installation of salvaged staves	$50,400
G. Supervision and construction management	$13,000
CONSTRUCTION SUBTOTAL	**$200,490**
H. General conditions	$19,030
PROJECT SUBTOTAL*	**$219,520**
Contingency†	*$21,952*
PROJECT TOTAL	**$241,472**
Grant Award (75.00%)	**$181,104**
Cash Match (25.00%)	**$60,368**

*Grant payments will be based off **Project Subtotal** amount. Total payments will be Grant Award percentage of **Project Subtotal** up to a maximum of the Grant Award Amount.

† Contingency - Must receive written approval from SHF Staff prior to use.

The following is our revised budget;

Project Budget Task	Total
A.) Numbering of Staves	$29,500
B.) Concrete and Steel Repair	$6,505
C.) Steel Girders	$12,000
D.) Stingers and Sills	$57,304
E.) Framing Bents	$43,500
F.) Salvage Staves	$59,252
G.) Supervision	$13,000

H.) General Conditions	$20,391
Remaining Contingency Funds	$20
Total Project Budget	**$241,472**

We would like to stress that our total project budget of $241,472 has not changed, and all of our requested budget reallocations are justified and approved by the State Historic Fund. We have attached the final financial report to the State Historic fund which includes a detailed task by task itemization of the work competed, copies of invoices, and copies of the cancelled checks to validate payment. Also included are copies of the engineering reports from site visits, and the plans and specifications.

FUNDING PARTNERS

Montezuma County is very pleased to have a successful project and we believe a great deal of the success is due the great partners that we have had during this process. Our funding partners included;

Primary funding partner	**SHF Budgeted amount (Exhibit B)**
2014 State Historic Fund	**$ 181,104.00**

Grant Request	**75%**	**$ 181,104.00**
Local Agency Cash Match Required	**25%**	**$ 60,368.00**

Local Agency matching fund partners	
Ballantine Family Fund	$ 2,500.00
Montezuma County	$ 718.00
Cortez Historic Preservation Board	$ 150.00
Southwest Water Conservancy District	$ 15,000.00
Ute Mountain Ute Tribe	$ 3,500.00
Dolores State Bank	$ 250.00
First National Bank	$ 100.00
National Trust for Historic Preservation	$ 10,000.00
Private Donations	$ 8,150.00
SW Basin Roundtable	**$ 20,000.00**
Total Local Agency Matching Funds	**$ 60,368.00**

WSRA INVOICE/ FINAL PAYMENT REQUEST:

Because cash-flow for a project of this size is not a problem for the County, Montezuma County has opted to invoice CWCB at the completion of the project rather than to request any interim payments.

The Repair and Rehabilitation of McElmo Flume No. 6 is finally 100% completed and accepted by Montezuma County. Montezuma County therefore respectfully makes the final financial request/invoice in the amount of **$20,000.00** for the WSRF Grant originally approved April 11th, 2017, amended on May 8, 2018.

We would like to thank the Colorado Water Conservation Board for their contribution to this project. It is difficult to understate the value of financial support from CWCB for this project. The financial commitment from CWCB provided not only the resources for implementation but more importantly provided the required matching funds to move the project forward.

This project could not have happened without your generous financial support. On behalf of the Montezuma County Board of County Commissioners and TOTA we thank you again!

Sincerely,

James Dietrich 3/6/14

James Dietrich
Montezuma County Project Coordinator