FUNDING OPPORTUNITY
BOR-DO-21-F001
FOR
WATERSMART GRANTS:

WATER AND ENERGY EFFICIENCY GRANT APPLICATION
FOR

Phase 4: Concrete Lining of the Remaining Half of the Acoma Lateral and Decommissioning of the Titsing Sub-Main with New Pipeline from Acoma to Increase Efficiency and Effectiveness of our Water our Distribution System

Submitted To:

Bureau of Reclamation Mail Services
Attn: Mr. Ned Weakland
Denver Federal Center
Bldg 67, Rm 581
6th Avenue and Kipling Street
Denver, Colorado 80225
303/445-3757
nweakland@usbr.gov

Submitted By:

NICK BAHR
GENERAL MANAGER
Bard Water District
1473 Ross Road
Winterhaven, CA 92283
760-572-0704
bardwater@outlook.com

SEP 17 '20 AM11:06

September 16, 2020

Table of Contents

1. Technical Proposal and Evaluation Criteria

1.1 Executive Summary

This application is being submitted by:
Bard Water District (BWD) 1473 Ross Road, Winterhaven, Imperial County, California 92283

The Bard Water District has selected a project under to accomplish the goals established for the USBR WaterSMART: Water and Energy Efficiency Grant (WEEG) Program. This project is entitled, **Phase 4: Concrete Lining of the Remaining Half of the Acoma Lateral and Decommissioning of the Titsing Sub-Main *with New Pipeline from Acoma to Increase Efficiency and Effectiveness of Water Distribution*.** The Bard Water District is submitting this application for constructing conveyance improvements: concrete lining for the remaining section **(4,250 LF + 1,300LF)** of the Acoma Lateral (Bard Unit, Area F) for better water management and installation of a new 36 inch diameter pipeline (2,700LF) from the Acoma to deliver water to former Titsing water users. This project was identified during the *USBR Reservation Division System Evaluation Project conducted in January 2017; Technical Memorandum No. 35-RDE-8150-STY-2016-02.* After careful review by BWD in consultation with the USBR, BWD has updated their priority levels for the Acoma Lateral and Titsing Sub-Main to a **Priority 1**. The components of this project will include Construction Project Management (Design/Engineering /Testing), Excavation, Fill and Compaction, and finally the Concrete Lining and new pipeline installation. All construction work will be completed by Bard Water District. The Acoma Lateral's bottom width is 2 ft, with 5 ft sidewalls (1 to 1.5 slope ratio). The concrete lining will be 2.0 to 2.5 inches thick for the sidewalls and the bottom.

This complies with new 2020 Water Conservation 5-Year Plan and has been a priority to us for the last 3 years. However, as a small rural water district, lining the entire 2.5 mile Acoma lateral and installing a 2,700LF pipeline would cause undue financial hardship and limit our existing resources utilized for water delivery operations and O & M. Therefore, we have planned to complete the project in four phases. Three phases were completed in August 2020 with funding from three USBR grants 1) Engineering/Design, 2) Lining 2,125 LF, and 3) Lining an additional 2,125 LF. BWD also utilized some Capital Improvement funds to replace the Head Gate. Environmental Compliance was also completed for the Acoma Lateral with a Class III Cultural Survey. The concrete lining of this lateral would conserve approximately 343 acre feet per year of seepage (or 1,160 acre feet for 20 years-length of time for use of concrete before its deterioration). We will accomplish the goals established for the WaterSMART Water and Energy Efficiency Program by conserving water and increasing efficiency of our system.

The lining of the Acoma Lateral would be completed in four months and the installation would begin in the spring 2022 (April – July). Since the primary use of the water is agricultural and late spring produce crops are durable and more flexible to handle water outages for construction this is the best time interval and because there is less demand (quantity and time). Bard would schedule work to accommodate the demand, with by-pass flows, for water during this time-period.

This project **is** located on a Federal facility.

1. Technical Proposal and Evaluation Criteria

1.2 Project Location

Quechan Indian Reservation, Bard and Winterhaven CA

Located West of Colorado River

East of Arizona Border (1 mile) and North of Mexican Border (2 miles)

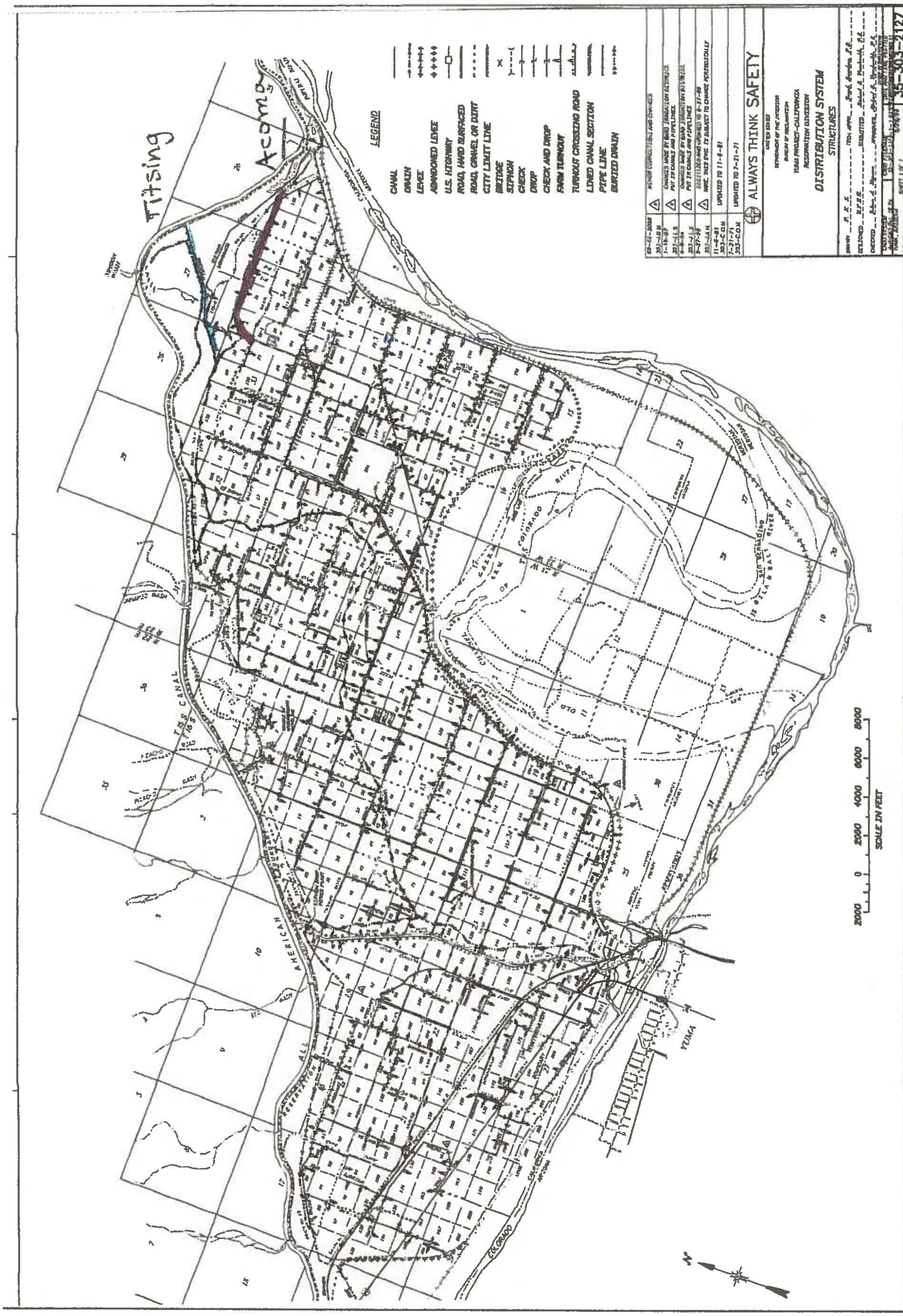
A map of the Bard Water District Conveyance systems and a map of the project area have been provided on the following pages.

This area is in the far Northeastern tip of the Bard Water District. It is one of the less developed areas as shown in the project area map. The old Yuma Canal) I just below its was abandoned years ago, much of the surrounding terrain is hilly. The area identified as the "Potholes" was created from early miners digging shallow pits and later was used for testing all-terrain vehicles during WWII. The area served by the Titsing Sub-Main is closer to the Acoma Lateral. There are several large date farms as well as fields used for year-round farming.

Latitude N 32° 48' 51.76" **to** N 32° 48' 54.43"

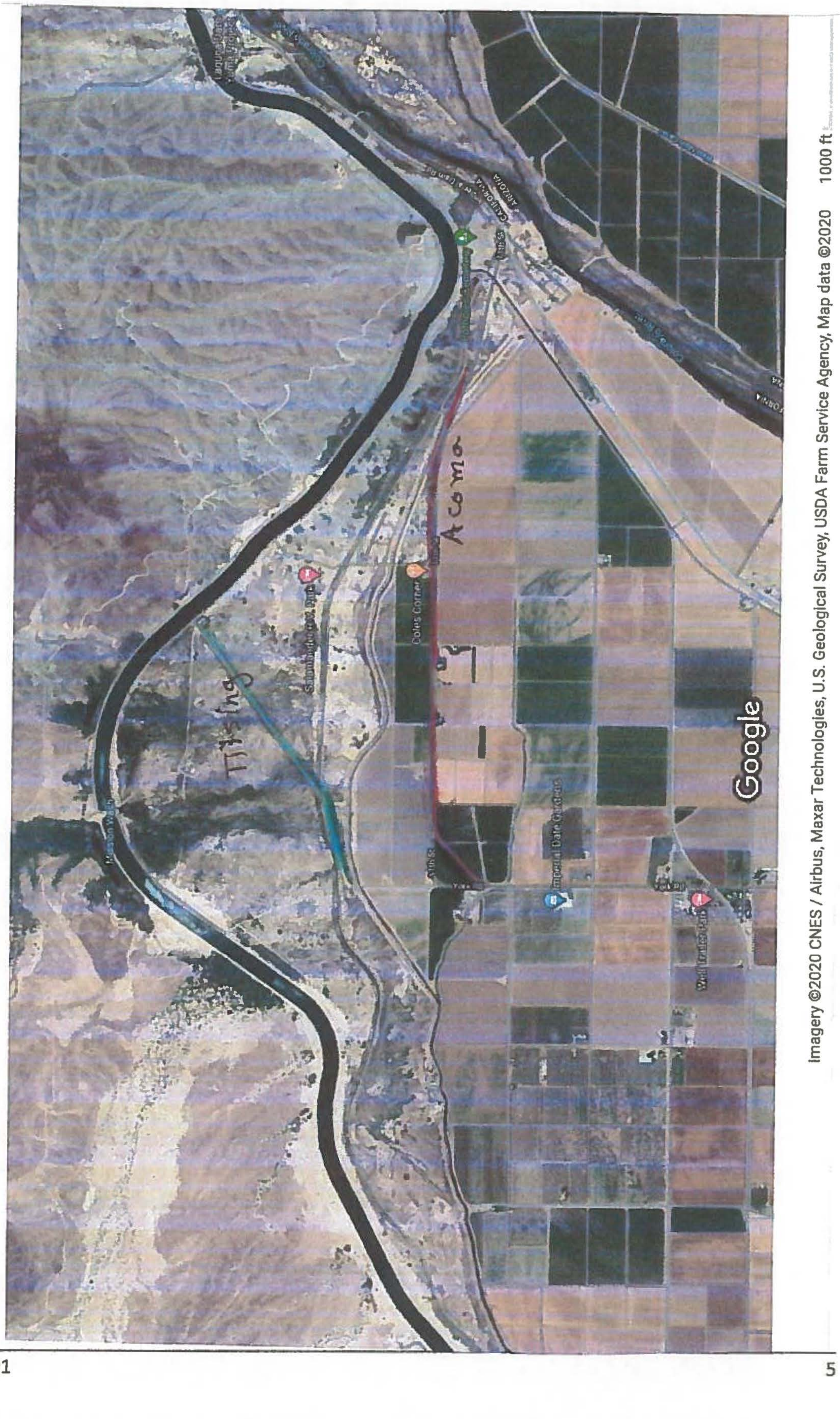
Longitude W 114° 31' 4.88" to W 114° 33' 6.93"

1. Technical Proposal and Evaluation Criteria



1. Technical Proposal and Evaluation Criteria

1.2 Project Location



1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Work to be Accomplished and Approach

This project was discussed during the USBR Reservation Division System Evaluation Project conducted in January 2017; Technical Memorandum No. 35-RDE-8150-STY-2016-02. After careful review by BWD in consultation with the USBR, BWD has updated their priority levels for the Acoma Lateral and Titsing Sub-Main to a **Priority 1** and proposes to line the remaining 5,550 linear feet of the Acoma Lateral and the decommissioning of the Titsing Sub-Main (2.5 Miles) and the installation a 36 inch diameter pipeline (2,700 LF) to provide water to the Titsing water users (Bard Unit, Area F). In order to fund the Acoma Lining and Titsing Pipeline project, we have taken a phased approach as discussed below.

In 2018, BWD submitted a WEEG application to line 2.5 miles of the Acoma lateral but **were unsuccessful**. During the de-briefing, it was recommended that we apply under the Small-Scale Water Efficiency Program or Field services program. This required us to significantly reduce the section to be lined from 2.5 miles to 4,250 LF, then this was further reduced to 2,125 linear feet, submitting two applications: Phase 1 and Phase 2 . Now that the Small Scale Program no longer allows, two grant submittals, we are trying to receive funding from the WEEG to complete this project because of the high costs for concrete lining and pipeline projects and the length of time it will take (4-5 years) with small grants to complete this project.

Also, by adding this new component, the decommissioning of the nearby Titsing Sub-Main (2.5 Miles), BWD can better and more efficiently serve those water users with an extension/diversion pipeline from the Acoma Lateral. This also **increases** our water conservation quantity for the overall project. The Titsing Sub-Main is the least used and most deteriorated in our system.

In 2019, we also received funding from USBR for the Engineering and Design (Phase 3) the remaining half that this funding request is for. Also, to leverage our resources, we partnered with the USBR archaeologist conducting all the field work and preparing report for the Class III Cultural Survey for the entire Lateral.

1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Work to be Accomplished and Approach

Engineering/Design Work Required for Project (6 months) *Allow for plenty of time for review*

This will be performed by George Cairo Engineering – is providing professional services for engineering and design for the last half and a quote for this project (Acoma/Titsing) has been provided in Appendix (Costs for each phase/component have been delineated).

This will include the following components:

Site Field Survey – Elevations/Staking

Preliminary Design, Hydraulic Analysis, Alternative Material Analysis

Final Design, Plan and Specifications

Pre-Construction/Site Preparation for Project (1 Month)

Subcontractor Selection and Vendor Procurement and Award for

Engineering/Design (Completed and approved)

Materials/Supplies (Order Concrete and pipe/connectors/boxes)

Final planning, measurements, scheduling, mobilization of equipment, complete all non-construction activities to be ready for construction.

Project Manager/Water Master Coordinate/schedule with affected water user(s) for Dry-out

Dry-out notification to producers/growers - BWD

Survey – Elevations/Staking

Adjustments/Alterations Gates and appurtenances as required (Concrete Tie-Ends) - BWD

On-site support/final planning and meetings – Cairo and BWD

Begin pre-casting or ready to cast in place any concrete tie-ends for structures (Sidewalls, Aprons, and Appurtenances) – BWD

Order additional Concrete as needed

Construction and Installation (2 months)

Coordinate/schedule with affected water user(s) – BWD

Dry-Out - BWD

Final Site Preparation – Vegetation Removal and Prism Trimming/Fill/Compaction - BWD

Concrete Supplier – Concrete Contractor

Concrete Foundation/Tie-Ends (Sidewalls and aprons) - BWD and Cairo (Oversee)

Required construction, especially near gates, road/pedestrian crossings - BWD

Trencher and Concrete Installation/Attach to concrete structures - BWD

Pipeline Design Concrete

New Turnout/Junction Box, Tie-Ends

1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Work to be Accomplished and Approach

Post-Construction:

Cleanup and Testing for leaks

Closeout/Reports

As required (Progress Reports - Quarterly or Semi-Annual).
Documentation – Photos
Final report with documentation

The pictures (Figure 1-13) provided on pages 9-16 are examples of the work to be accomplished and our approach. They show the various activities/components BWD used Phases 1 and 2 of the Acoma Concrete lining projects. These represent same activities concrete lining activities that will take place for this project. By carefully leveraging funding and resources we are finally ready to proceed with this large-scale undertaking to complete the final improvements and modification of the Acoma Lateral and nearby Titsing Sub-Main systems that serves the far Northwestern section of the Bard Water District conveyance systems.

We also have the following technical reports provided by USBR, NCRS and BWD for this project

USBR Reservation Division System Evaluation Project conducted in January 2017; Technical Memorandum No. 35-RDE-8150-STY-2016-02 (Provided upon Request)

Conservation Implementation Strategy for Bard, CA Imperial County, Irrigation Improvement Project, Steve Reddy – District Conservationist, NRCS Yuma, AZ (Appendix A)

2020 Water Conservation Plan – BWD (Provided upon Request)

Current Agricultural and Environmental Situation in the Bard Water District, Charles Sanchez, Ph.D University of Arizona.

Ten-Year Capital Improvement Plan – BWD (Oversized sheets, but can be provided upon Request)

1. Technical Proposal and Evaluation Criteria (Continued)

1.3 Technical Project Description

Figure 1: BWD Cleared Debris and Vegetation

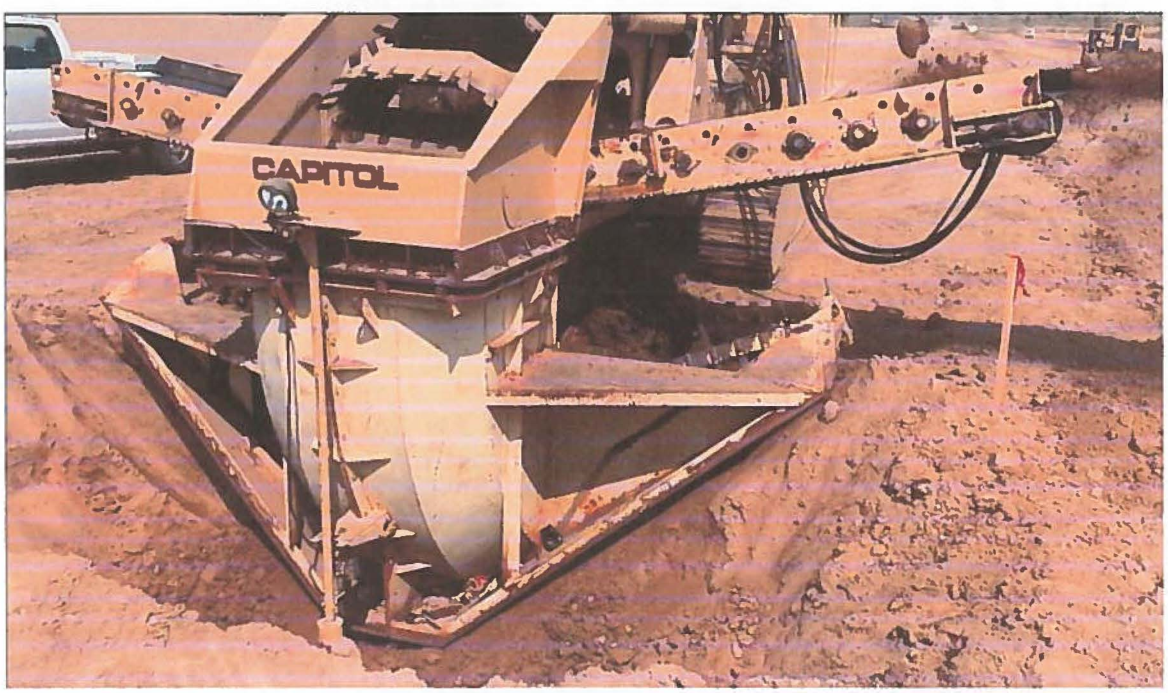
Figure 2: Trencher Creates Prism

1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Figure 3: Sideview of Trencher/Prism

Figure 4: Front view of Trencher/Prism



1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Figure 5: Prism Complete

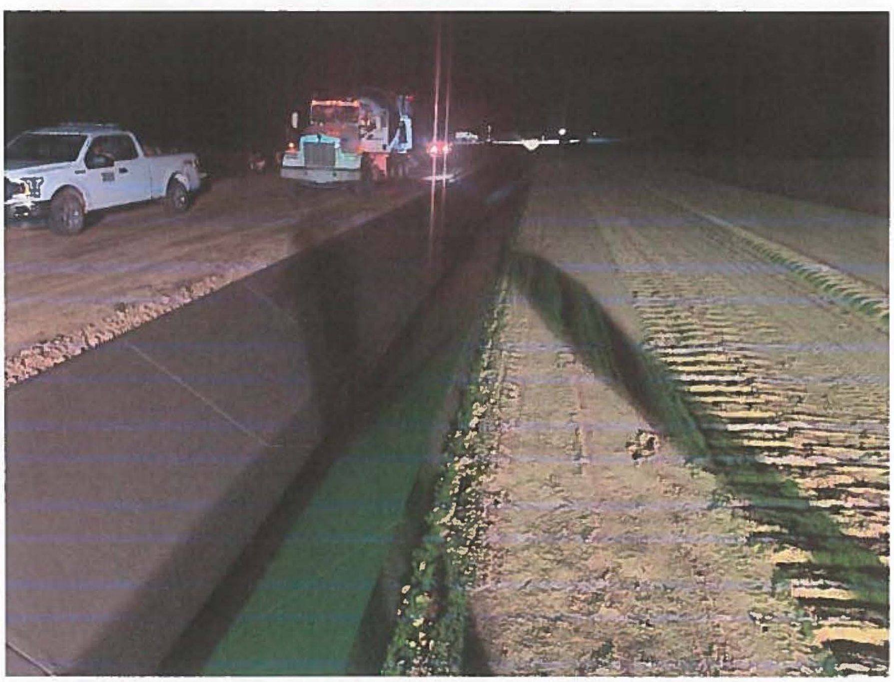
Figure 6: Concrete Installation

1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Figure 7: Concrete Poured In-Place for Gate

Figure 8: Continue Concrete Work



1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

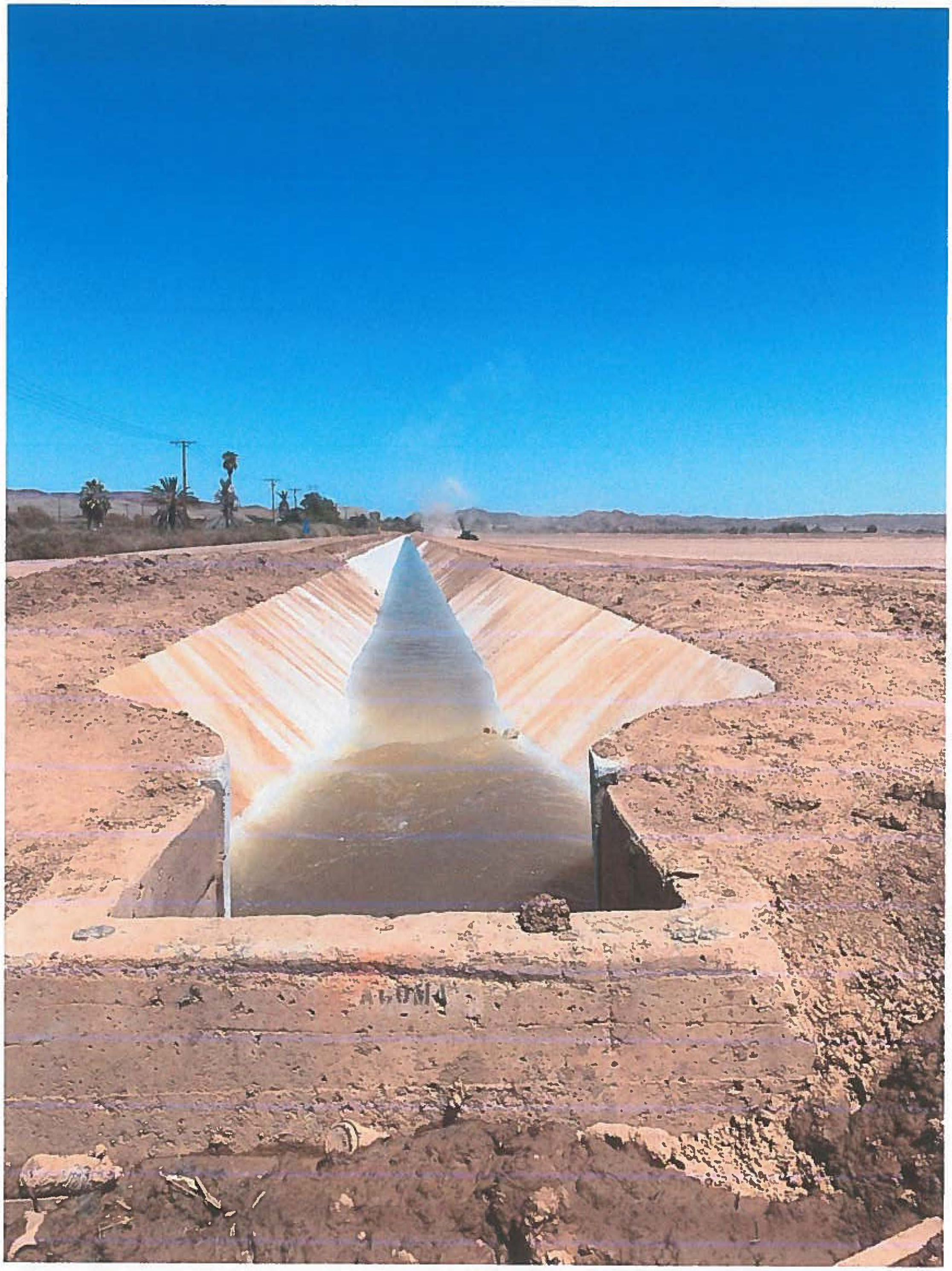
Figure 9: Tie-Ends/Aprons for Gates

Figure 9: Culvert for Road Crossing

1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Figure 10: Beginning of Acoma Lateral (Facing West)

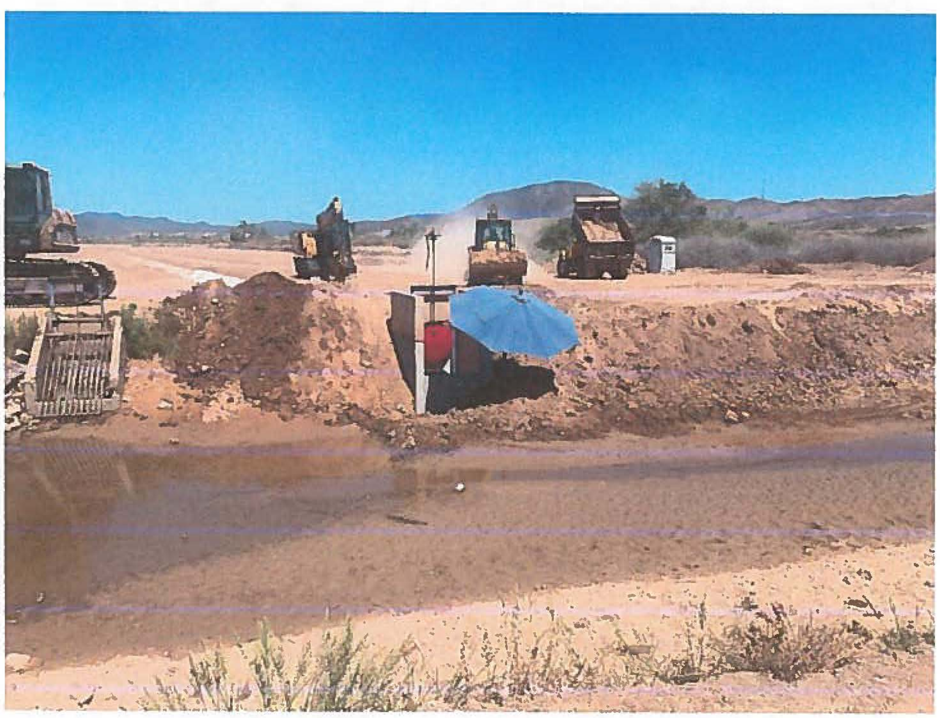


1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Figure 11: New Head Gate Installation for Acoma Lateral

Figure 12: New Round Red Metal Gate Installed



1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Figure 13: Completed Head Gate from Reservation Main to Acoma Lateral

1. Technical Proposal and Evaluation Criteria

1.3 Technical Project Description

Materials and Equipment to be Used

List of Materials:

Concrete/Tie-Ends, Junction Box, sections near gate reinforced with mesh and/or rebar
Rebar
Gravel
Forms/Traverses
Pipe for Extension/Diversion from Acoma (Replaces Titsing)

Safety Supplies:

Shade	Coolers
Water	Electrolytes
Gloves	Safety Glasses
Reflective Vests	Hard Hats
Steel-Toed Boots	Signage
Cones	Barricades

List of Equipment:

A list of Construction Equipment to be used for this project would include:

Trencher	
Front End Loader CAT 938G	Dump Truck – Kenworth
Rubber Tired Excavator CAT M318F	Water Truck – GMC
Service Truck 1 Ton 2000 Ford	Project Manager Truck

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

A. Quantifiable Water Savings

This complies with our new 2020 Water Conservation 5-Year Plan and has been a priority to us for the last 5 years. The water savings would be slightly less than the water losses provided in our 2020 Water Conservation Plan based on USBR measurements and calculations. Water Conserved has been calculated using the water loss data and multiplying by a factor of 0.80.

Acoma Lateral: Concrete lining of this last section (5,550 LF) would conserve approximately acre-feet annually from:

Seepage:	0.80 x 377 (Measured/Calculated Loss)	= 301.6
Transportation/Operational:	0.80 x 6 (Measured/Calculated Loss)	= 4.8
Transpiration	0.80 x 35 (NRCS)	= 28.0
Evaporation:	0.80 x 14 (Measured/Calculated Loss)	= 11.2
		345.6

Titsing Sub-Main: Decommissioning of the Titsing Sub-Main would conserve approximately and additional acre feet annually from:

Seepage:	0.80 x 380 (Measured/Calculated Loss)	= 304.0
transportation/Operational:	0.80 x 5 (Measured/Calculated Loss)	= 4.0
Transpiration	0.80 x 38 (NRCS)	= 30.4
Evaporation:	0.80 x 22 (Measured/Calculated Loss)	= 17.6
		356.0

Total Acre-Feet Conserved Annually: **701.6**

Percent from Acoma and Titsing Water Quantity: **701.6/3,600 = 20% Savings**

We will accomplish the goals established for the WaterSMART Water and Energy Efficiency Program by conserving water and increasing efficiency of our system. This project will have a positive impact to our entire system by reducing significant water loss of approximately 728 acre ft/yr (Based on type of crop and growth cycle, irrigation distribution method, and frequency and length of water delivery Improving water conservation and efficiency by reduction seepage contributing to the overall health of the surrounding fragile desert ecosystem. Positive impact to the local area by reducing overflows (which can also cause loss of entire crop) and waste of resources and water used to grow a replacement crop.

This project would ensure better efficiency, integrated control, reliable/constant flow, less water level fluctuations, quick detection/prevention of leaks or spillage, less time required for delivery (from initial request), improved coordination/collaboration with water users, improved response time for Orders (On and Off). All contributing to less water loss and decreased operating costs.

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

A. Quantifiable Water Savings

Estimated Water Savings:

Estimates of our water savings based upon taking a factor of 0.8 times the following water loss parameters that had real-time data compiled for our Water Conservation Plan in 2015. Evaporation has most likely increased because of climate change, but that value was not adjusted because it would have only a slight increase. Data and calculations are provided on the previous page.

Seepage: (Greatest Factor – dirt lining:
Operational/Transportation: Length of Conveyance/Time
Evaporation: Temperature, Length of Conveyance/Time
Transpiration: Invasive Plants – Frag Mighty

Total Acre-Feet Conserved Annually:	**701.6**
Percent from Acoma and Titsing Water Quantity:	**701.6/3,600 = 20% Savings**

Current Water Losses:

Acoma Lateral: Concrete lining of this last section (5,550 LF) would conserve approximately acre-feet annually from:

Seepage:	377 (Measured/Calculated Loss)
transportation/Operational:	6 (Measured/Calculated Loss)
Transpiration	35 (NRCS)
Evaporation:	14 (Measured/Calculated Loss)
	432

Titsing Sub-Main: Decommissioning of the Titsing Sub-Main would conserve approximately an additional acre feet annually from:

Seepage:	380 (Measured/Calculated Loss)
transpiration/Operational:	5 (Measured/Calculated Loss)
Transpiration	38 (NRCS)
Evaporation:	22 (Measured/Calculated Loss)
	445

Total Acre-Feet Loss Annually:	**877**
Percent from Acoma and Titsing Water Quantity:	**877/3,600 = 24% Loss**

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

A. Quantifiable Water Savings

(3) Irrigation Flow Measurement – *Additional Project Specific Questions*

a. How have annual water savings estimates been determined? *All were calculated using our data collected by our ditch-riders (unless otherwise noted).*
Calculations (Seepage and evapotranspiration) as well as actual real-time measurements (Volume change over time for section of canal blocked). Volume (Original Water Depth) – Volume (End Water Depth after 24 hours). Volumes (Actual amount of water released).

b. Have the current operational losses been determined? *All were calculated using our data collected by our ditch-riders (unless otherwise noted). Calculations (Seepage and evapotranspiration) as well as actual real-time measurements (Volume change over time for section of canal blocked). Volume (Original Water Depth) – Volume (End Water Depth after 24 hours). Volumes (Actual amount of water released).*

c. Are flows currently measured at proposed sites, and is so what is the accuracy of existing devices? How has their accuracy been established? *Flow measurements are currently calculated at the proposed sites based upon volume and flow rate.*

d. Descriptions of all proposed measurement devices, including accuracy and basis for accuracy. Two Cipolletti Flumes ± 25 for seepage and Evaporation, but Operational Losses ± 0.1 – provided in Water Conservation Plan data.

e. Will annual farm delivery volumes be reduced by more efficient and timely deliveries? If so, how has this reduction been estimated? *YES, this is based upon our current losses from seepage, spills, stops and restarts, overflows, and increased delivery duration due to less than optimum water levels/elevations and multiple users.*

f. How will actual water savings be verified upon completion of the project? *BWD will compare annual water delivery volumes over the previous 5 year period with post-project water delivery volumes.*

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

B. Water Supply Reliability

BWD meets the terms of Section 9504(a)(3)(B) of Public Law 111-11 in that no additional acreage will receive irrigation water saved from this project. We currently abide by our quota and have strived to reduce it by encouraging our growers to implement seasonal fallowing, upgrading to water reduction irrigation delivery systems, and growing crops that require less water. All our saved water goes to "lower priority" users.

1. Will the Project Address a Specific Water Reliability Concerns?

Issues:

Our main concern is a catastrophic failure of one of our delivery systems causing unsurmountable crop damage. Most of our funds are used for O & M, repair and replacement of extremely old, deteriorated structures and additional staff time to just keep us operating without major incident. *The overall condition of the delivery and drainage systems is relatively poor due to aging infrastructure , flood damage, maintenance challenges and other causes,* USBR TM 86-68210-2016-07, Evaluation of O & M Costs Allocation, July 2016. We have approximately 67 miles of canals, laterals and ditches of which only 30% are lined. We have 465 gate check structures, the majority of which are over 35 years old (life of concrete is only 20 years) and need to be repaired or replaced. Our staff's efforts are well over 100% because of the additional time and effort required to manage our delivery systems to prevent crop damage. We are constantly trying to prevent component failures while slowly addressing our and USBR priority 1 projects.

Concerns: This project, however, will also enable us to conserve approximately 30% of the water going through the delivery system. Allowing us to be pro-active in addressing drought, short-falls, (future droughts, increased demand, seasonal demands)and other critical water issues.

Mechanisms: Earthen conveyance systems replaced by a Concrete Lined Canal and Pipeline.

Conserved Water:

Conserved water will go to lower priority users. The water we save will remain in the system under the stewardship of the BOR because it will not be diverted. They will be able to determine its best use.

This project, however, will also enable us to conserve approximately 30% of the water going through the delivery system. Allowing us to be pro-active in addressing drought, short-falls and other critical water issues.

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

B. Water Supply Reliability

This project will Improve overall reliability by addressing:
Significant water supply short-falls (future droughts, increased demand, seasonal demands).
Benefiting multiple sectors and multiple users:
BWD Farmers, Indian Unit (Quechan Indian Reservation - shared system), Water not diverted stays in system for other low priority water users.
Increase resiliency during drought: Our approved Five-Year Water Conservation Plan helps us to be pro-active and to develop and employ strategies for water use reduction through system efficiency (targeting and prioritizing construction projects).

2. Will the Project Make Water Available to Achieve Multiple Benefits or to Benefit Multiple Users? Yes, it will go to lower priority users who are more effected by water shortages. USBR can use this water to aid other growers, municipalities or other nearby entities. This will be especially important in times of shortages and drought.

Will the project benefit species (T & E)? Please describe the relationship of the species to the water supply, and whether the species is adversely affected by a Reclamation project.
Water left in the Lower Colorado River System could benefit the Yuma Clapper Rail and the Southwest Willow Flycatcher. These birds' nest and raise their young along the Lower Colorado River watershed in the spring. This watershed is the corridor for wildlife preserves as well as small lakes and recreational areas. We have a local conservation group Friends or Haugthlin Lake who are working to protect the watersheds in our area.

Larger Initiative
State of CA Integrated Water Management Program – planning and program development. Demonstrate strategies and actions for small, disadvantaged rural communities.
USBR Colorado River Lower Basin Drought Contingency Plan – recently signed.
We will work to incorporate components the goals or these documents into our Ten-Year Capital Improvement Plan, Water Conservation Plan, and funding strategies.

Will the project benefit Indian Tribes? Yes, since both Irrigation Units (Bard and Indian) share the resources and funding.

Will the project benefit rural economically disadvantaged communities?
Yes, West Imperial County is a rural, low-income, disadvantaged community (Bard, Winterhaven, and Fort Yuma Indian Reservation).

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

B. Water Supply Reliability

3. Does the Project Promote and Encourage Collaboration Among Parties in a Way that Helps Increase the Reliability of the Water Supply?

Yes, this project demonstrates collaboration between our water district and our agricultural users. It can be used as an example to other water managers reflecting how assessment, planning, usage, need, and corrective measures can be achieved to benefit a district. Even though the costs for modernizing irrigation systems can be prohibitive, we demonstrate that we can slowly upgrade and replace our conveyance systems and appurtenances, a few at a time and line our canals and laterals in sections one mile at a time or every 20 years fund a major capital improvement project (2014 for 8 miles at $8 million through NAD Bank). Our water uses recently pledged $25/acre for O & M. They also provide a percent of their fallowing money. They are incredibly supportive of any funding we receive to help improve our system. They actively participate our water conservation methods because not only is good for our water resources it provides them a cost savings, especially with labor costs increasing.

Our collaboration efforts are an ongoing process with our stakeholders (landowners, growers, our District Board). We also help facilitate interaction with the NRCS. BWD as well as our growers have been pushing for this project. They want it done ASAP. They feel that with our grants we can leverage funding to implement projects, especially those that are costly.

Without the collaborative support we would not be able to develop our Water Conservation Plan and implement the improvements we need **to conserve** water. Our partnership is demonstrated in several ways:

1) Voluntary seasonal fallowing program.
2) Irrigation methods that promote water use reduction (sprinklers, drip, etc.)
3) Crops that require less water
4) Helping fund O & M costs (Percent of fallowing and $25/acre)
5) Strategies/Support/approval for proposals/grants that require matching funds.
6) Creating a mutually beneficial partnership that improves efficiency and reduces costs.
7) Creating the framework for addressing and responding incidents (ranging from routine to emergencies).

4. Will the project Address Water Supply Reliability in Other Ways Not Described Above?

This is a small part of our Ten-Year Capital Plan to slowly modernize our water delivery systems and infrastructure to be more self-sustaining, easily managed, provide accurate and reliable data, and conserve water. We are extremely fortunate in that we have Priority 2 Water Rights and as such have a more than adequate supply of water. However, others are not so fortunate. And even though, water reliability has not directly impacted us, we have voluntarily been pro-active in our water conservation efforts to help the community and ourselves as demonstrated in the programs/efforts listed above.

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

C. Implementing Hydropower – Not Applicable

D. Complementing On-Farm Irrigation Improvements

This will complement projects already developed by our local NRCS office to assist growers in this area. One grower already received EQIP funding for water that passes through our system for lining his ditches. NRCS has new projects listed for twenty-one land parcels (See *Conservation Implementation Strategy for Bard, CA Imperial County, Irrigation Improvement Project, Steve Reddy – District Conservationist, NRCS Yuma, AZ provided in* Appendix) In September, we held a meeting for growers about EQIP and USDA had a workshop here in October. We also have contacted Bobbi McDermott a retired NRCS employee and she has met with us several times and has agreed to work with our local growers. We also have asked our new NRCS representative to meet with us at Bard and she will be available the first of the year. We have provided our growers a tentative list of accepted projects and have met with our new NRCS representative. We are also reviewing the new USDA Regional Conservation Partnership Program and meeting with our Board to develop strategies for this new grant opportunity. The three growers listed below have provided Letters of Intent to collaborate with Bard Water District and NRCS for an EQIP grant. We recently were awarded an Agricultural Partnership grant which requires on-farm projects so we will be implementing that in 2021 through 2023.

Planned or On-going Projects by Farmers/Ranchers that Receive Water from BWD to Improve On-Farm Efficiencies: Our local NRCS office has developed a Conservation Implementation Strategy for water conservation improvements for a total of twenty-one fields. This report has been provided in Appendix. A list of **proposed CIS/EQIP** project sites from this report that receive water from the Mohave Canal have been provided below:

Harrison Farms[1]	Glenda Spencer	H. Berryman
Top Flavor Farms[1]	Evelyn Berryman	
Tanimura & Antle[1]	Martha Hill	

Steve Alameda, Top Flavor Farms received EQIP funding in 2018 for water that passes through our system for concrete lining two of earthen ditches.

Other growers include: Ross Martin, Griffin Family Properties, Anthony Costa and Sons, NexGen Farms and Johnny Cloud. We plan to encourage these growers to collaborate with NRCS for EQIP funding also.

[1] These three growers have provided Letters of Intent for the Agricultural Partnership grant. They also lease other small parcels of land in this area. We are working with our local NRCS office to develop a Conservation Implementation Strategy for water conservation improvements for our agricultural fields.

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

D. Complementing On-Farm Irrigation Improvements

How Project will Complement Any On-going or Planned Farm Improvement:

1) More accurate water volume delivery compliment farmers' request based on field dimensions and soil intake characteristics.

2) Eliminating seepage issues from earthen field ditches and deteriorated concrete ditches.

3) Installing larger capacity concrete ditches containing high-flow turn-out structures.

4) More closely matching water volume to field dimensions and soil intake qualities.

5) Installing drip irrigation where practical and cost effective.

Acreage Likely to Be Improved: 1,216.93 Acres

Harrison Farms	682.2 Acres	Top Flavor Farms	221.73 Acres
Tanimura & Antle	313 Acres		

Describe the On-Farm Water Conservation or Water Use Efficiency Benefits that Are Expected to Result from any On-Farm Work:

The current system (unlined earthen Acoma Lateral and Titsing Sub-Main require constant O & M. They are very inefficient and un-reliable so any improvements made for the On-Farm component would be futile until these problems are resolved. The water delivered from these conveyance systems must flow slowly for several reasons.

1) Prevent erosion of the sidewalls
2) Prevent overflow and uncontrolled water loss
3) Prevent uncontrolled flooding of the agricultural field and subsequent contamination of produce (crop must be destroyed).
4) Minimize agitating the bottom sludge (loaded with bacteria)

Water Conservation and Costs Savings to Farmers:

1) *Reduced water volume requests due to more reliable and faster flow rates (enlarged ditches).*
2) *Reduced water volume requests if drip lines used instead of flood irrigation.*
3) *Reduced water volume requests due to lining ditches or repairing concrete (reduce seepage and transpiration).*
4) *Reduced water volume requests due to more accurate field data (size and soil intake characteristics).*
5) *Estimate a 25% water savings based on these improvements.*

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

D. Complementing On-Farm Irrigation Improvements

Once the Acoma Lateral is lined/Titsing decommissioned and re-routed with a pipeline and flow rates and/or elevations determined. NRCS and our farmers can work together to improve their end of the system. Based on collaboration with NRCS, our growers will select their project to improve efficiency, conserve water and subsequently reduce their costs. This could include:

These **irrigation efficiency improvements** can be achieved by EQIP funding for one or more of these improvements:

1) *Replacing deteriorated leaking check gates and structures to* ***prevent operational losses.***

2) *Concrete lining, thus* ***eliminating seepage*** *issues from deteriorated earthen field ditches and deteriorated concrete ditches. Also* ***reduce evaporation*** *and* ***transportation losses*** *due to less time spent in conveyance system.*

3) *Installing larger capacity concrete ditches containing high-flow turn-out structures* ***for better management and to reduce water quantities needed.***

4) *More closely matching water volume to field dimensions and soil moisture intake qualities structures* ***for better management and to reduce water quantities needed.***

5) *Purchasing/Utilizing drip irrigation or sprinklers when practical(seed germination, light watering) and cost effective* ***to reduce water quantities needed.***

6) *Installing measurement devices (meters, soil absorption, etc.)* ***for better water management and efficiency***

7) *Evaluating Field Irrigation Systems - Surveys/Measurements - Field elevations, water/soil absorption rate as well as cost analysis* ***for better water management and efficiency.***

8) *Hydrology Study – Flow rates and volumes – modeling to determine most efficient design since volumes the most constant FACTOR* ***for better water management and efficiency****.*

9) *Innovative Methods to kill bacteria in concrete liner (copper or zinc composites in concrete mortar), chemical additives to water supply, UV or ozone treatment to* ***eliminate catastrophic crop destruction.***

10) *Improved conveyance and perimeter berms to prevent uncontrolled flooding* ***to eliminate catastrophic crop destruction.***

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

D. Complementing On-Farm Irrigation Improvements

Other expected outcomes of the project are as follows:

1) Engineering/Design and Assessment for Better Water Management for water delivery and distribution from the Mohave Canal.
2) Subsequent construction actions (Appurtenances) will increase water supply reliability. Other subsequent outcomes include water conservation by significantly reducing water loss from seepage, transpiration, transportation, and operational.
3) Also flow rate can be increased which results in subsequent water delivery reductions.
4) Operational and evaporation losses will also be reduced.
5) Improvement and modernization of our overall system and infrastructure, specifically, by developing engineering/design plans for the Mohave Canal Lining Project.
6) Accomplish Agricultural Water Conservation and Efficiency goals of Conservation and Efficiency.
7) Accomplish Agricultural Water Conservation and Efficiency goals of preventing possible water-related crisis (shortfalls and flooding).
8) Mitigate future conflicts or risks in this high-profile area.
9) Partnerships: We will work together with NRCS and our farmers (Water users – Bard Unit) and USBR to share costs by leveraging funding and resources. Our most valuable resources are our seasoned staff and our own well- maintained heavy equipment.
10) Canals and laterals that are lined are easier to maintain, thus more time can be allotted to other deteriorated sites that require more overwatch, O & M, repair/replacement.
11) Reduce risk of bacterial contamination of produce from the E. Coli present in the bottom sludge. That we cannot effectively remove without increasing the depth of the canal which then requires more water to be utilized to maintain the required elevation for delivery.

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

E. Department of the Interior Priorities

Creating a conservation stewardship legacy second only to Teddy Roosevelt:
This project utilizes sound hydrological strategies coupled with time-tested structures (concrete lining) to create a more efficient and responsive water delivery system. Located in a rural area, and surrounded by desert, we are uniquely positioned to promote stewardship. Through our partnerships with our water users (farmers) we are creating a balance between water conservation, planning, efficiency, and cost savings. We are addressing issues brought about by changes in the environment, especially drought. We are using a "Best Practices" model by conserving water and subsequent watersheds and habitats) by a variety of voluntary activities (BWD as well as On-Farm) as previously discussed (seasonal fallowing, irrigation method, crop vs. water requirements, system delivery improvements, etc.). Through our partnerships with our water users (farmers) we are creating a balance between water conservation, planning, efficiency, and cost savings.

East of us, the Colorado River Gila River areas create watershed and riparian areas. The buffer zone that exists between us and that area consists of desert with washes (replenished by rainfall, complemented by the surrounding mountainous terrain). Most of the viable habitat is located along this river corridor, with native plants (reeds, cottonwood, willow, and sedges) then native shrubs and trees. These provide habitat for our native species as well as migratory birds. This watershed creates a natural wildlife corridor from New Mexico to California. We are southwest of the Gila River (and its tributaries: Aqua Fria and Salt Rivers) that continues west to join the Lower Colorado River in Yuma that support wildlife preserves (KOFA. Mittry Lake and Cibola). We work closely with our state and federal agencies to solve conflicts from wildlife in agricultural fields and water delivery systems.

Utilizing our natural resources:
We have limited natural resources in this fragile desert environment, other than water. We are using a "Best Practices" model by **conserving, protecting, and restoring** our natural resources (water and subsequent watersheds and habitats) through BWD system improvements and On-Farm voluntary activities (as discussed in previous sections).

Restoring trust with local communities:
As a small isolated rural close-knit community, our trust has been tried and tested through several generations. We have depended upon each other for many years and continue to foster that trust through our friendships, partnerships, and communication. We work together with local, county, state, and Federal agencies (USBR, AZ Fish and Game, AZ DWR, BLM, USFWS). Our office is in Bard, surrounded by farmland and desert. We and our staff are readily accessible to our community. Many of our staff have lived in this area for many years and are involved in farming. Through our outreach efforts we are developing a network of support from local and state offices. Many of our workers and their parents have lived in this area for many years and have been involved in farming. Tribal members have lived on this land for many generations.

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

E. Department of Interiors Priorities (continued)

Striking a regulatory balance:

We work together to support and protect our local community lifestyle and resources. Our only regulatory challenges are the environmental compliance requirements for improvement projects, but most of these areas are farmland and already disturbed. Work is usually performed in the canal or its right-of-way on elevated berms/roads (on imported borrow of fill dirt). We usually receive a Categorical Exclusion. We work with local, county, state, and Federal agencies (USBR, AZ Fish and Game, AZ DWR, BLM and USFWS) as well as the Quechan Indian Tribe to resolve any issues. Watershed/riparian areas, drainages, and washes form a buffer zone and are not utilized. We have not been involved in water mitigation activities for many years. We have an attorney on-staff to provide legal counsel as needed. Our appointed BWD Board addresses and votes on issues. See section 6. Environmental Compliance, that addresses our preliminary response to NEPA requirements.

Modernizing our infrastructure:

We are diligently pursuing all funding opportunities to improve and maintain our antiquated system. This has always included our water users' contributions. Our only limiting factor for is funding (50% march) because these projects are quite costly. Improvements to our infrastructure have been based on priorities established by the BOR and BWD during their site visits and evaluation of our systems. We have utilized their technical guidance for this project for engineering design and construction. Our water users recently pledged $25/acre for Capital Improvements. They also provide a percent of their fallowing funds for system efficiency improvements. They are incredibly supportive of any funding we receive to help to correct system deficiencies as well as improving our system efficiency. We currently utilize an O & M Agreement established between the BOR and BWD to maintain and operate both the Bard and Indian Units. This is implemented on a yearly basis.

1. Technical Proposal and Evaluation Criteria (Continued)

1.5 Evaluation Criteria (continued)

F. Implementation and Results

Project Planning:

We are a small rural Water District and it is difficult for us to compete for the larger grants based on Water savings. However, if you compare the percentage of our water savings instead of the quantity it is quite high (20-30%). As our first small system modernization projects were successfully completed in phases, we are now ready to undertake our second large scale project finishing the concrete lining of the Acoma Lateral (5,550 LF, 4250 LF completed) and decommissioning the earthen Titsing Sub-Main (2.5 Miles) and installing a 2,700 LFD pipeline from the Acoma Lateral. We know we have developed a strategy to succeed. We hope to receive the NTP by late summer of 2021 and will begin the Engineering and Design component in order to begin construction the following year (2022.

Each year, we identify and prioritize our system needs and problems and projects not addressed in the previous year are added. Our criteria include:

1) Is the project (components) listed as a priority on our Capital Improvement Plan and Water Conservation Plan or in current studies?
2) Can the problem or need be remedied with existing resources and funds?
3) What benefits will occur from the corrective action taken (water/monetary savings, efficiency, sustainability, annual maintenance, crop losses, shortfalls, acre foot savings).
4) Are additional resources and funds available if the existing funds are not available?

This project was discussed during the USBR Reservation Division System Evaluation Project conducted in January 2017; Technical Memorandum No. 35-RDE-8150-STY-2016-02. After careful review by BWD in consultation with the USBR, BWD has updated their priority levels for the Acoma Lateral and Titsing Sub-Main to a **Priority 1** and proposes to line the remaining 5,550 linear feet of the Acoma Lateral and the decommissioning of the Titsing Sub-Main (2.5 Miles) and the installation a 36 inch diameter pipeline (2,700 LF) to provide water to the Titsing water users (Bard Unit, Area F). In order to fund the Acoma Lining and Titsing Pipeline project, we have taken a phased approach as discussed below.

In 2018, BWD submitted a WEEG application to line 2.5 miles of the Acoma lateral but **were unsuccessful**. During the de-briefing, it was recommended that we apply under the Small-Scale Water Efficiency Program or Field services program. This required us to significantly reduce the section to be lined from 2.5 miles to 4,250 LF, then this was further reduced to 2,125 linear feet, submitting two applications: Phase 1 and Phase 2 . Now that the Small Scale Program no longer allows, two grant submittals, we are trying to receive funding from the WEEG to complete this project because of the high costs for concrete lining and pipeline projects and the length of time it will take (4-5 years) with small grants to complete this project.

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

F. Implementation and Results

Also, by adding this new component, the decommissioning of the nearby Titsing Sub-Main (2.5 Miles), BWD can better and more efficiently serve those water users with an extension/diversion pipeline from the Acoma Lateral. This also **increases** our water conservation quantity for the overall project. The Titsing Sub-Main is the least used and most deteriorated in our system. In 2019, we also received funding from USBR for the Engineering and Design (Phase 3) the remaining half that this funding request is for. Also, to leverage our resources, we partnered with the USBR archaeologist conducting all the field work and preparing report for the Class III Cultural Survey for the entire Lateral.

Implementation Plan:

Once the Categorical Exclusion is completed and we receive the NTP, we will begin initial planning. An Action Plan will be developed that lists each task, scheduled interval, responsible party, comments/notes and when the activity or task is completed and by whom. A work plan will also be completed. Major phases will include:

Engineering/Design Work Required for Project (6 months) *Allow for plenty of time for review*

This will be performed by George Cairo Engineering – is providing professional services for engineering and design for the last half and a quote for this project (Acoma/Titsing) has been provided in Appendix (Costs for each phase/component have been delineated).

This will include the following components:

Site Field Survey – Elevations/Staking

Preliminary Design, Hydraulic Analysis, Alternative Material Analysis

Final Design, Plan and Specifications

Pre-Construction/Site Preparation for Project (1 Month)

Subcontractor Selection and Vendor Procurement and Award for

Engineering/Design (Completed and approved)

Materials/Supplies (Order Concrete and pipe/connectors/boxes)

Final planning, measurements, scheduling, mobilization of equipment, complete all non-construction activities to be ready for construction.

Project Manager/Water Master Coordinate/schedule with affected water user(s) for Dry-out

Dry-out notification to producers/growers - BWD

Survey – Elevations/Staking

Adjustments/Alterations Gates and appurtenances as required (Concrete Tie-Ends) - BWD

On-site support/final planning and meetings – Cairo and BWD

Begin pre-casting or ready to cast in place any concrete tie-ends for structures (Sidewalls, Aprons, and Appurtenances) – BWD

Order additional Concrete as needed

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

F. Implementation and Results

Construction and Installation (2 months)

Coordinate/schedule with affected water user(s) – BWD

Dry-Out - BWD

Final Site Preparation – Vegetation Removal and Prism Trimming/Fill/Compaction - BWD

Concrete Supplier – Concrete Contractor

Concrete Foundation/Tie-Ends (Sidewalls and aprons) - BWD and Cairo (Oversee)

Required construction, especially near gates, road/pedestrian crossings - BWD

Trencher and Concrete Installation/Attach to concrete structures - BWD

Pipeline Design Concrete

New Turnout/Junction Box, Tie-Ends

Post-Construction:

Cleanup and Testing for leaks

Closeout/Reports

As required (Progress Reports - Quarterly or Semi-Annual).

Documentation – Photos

Final report with documentation

The pictures (Figure 1-13) provided on pages 9-16 are examples of the work to be accomplished and our approach. They show the various activities/components BWD used Phases 1 and 2 of the Acoma Concrete lining projects. These represent same activities concrete lining activities that will take place for this project. By carefully leveraging funding and resources we are finally ready to proceed with this large-scale undertaking to complete the final improvements and modification of the Acoma Lateral and nearby Titsing Sub-Main systems that serves the far Northwestern section of the Bard Water District conveyance systems.

We also have the following technical reports provided by USBR, NCRS and BWD for this project

USBR Reservation Division System Evaluation Project conducted in January 2017; Technical Memorandum No. 35-RDE-8150-STY-2016-02 (Provided upon Request)

Conservation Implementation Strategy for Bard, CA Imperial County, Irrigation Improvement Project, Steve Reddy – District Conservationist, NRCS Yuma, AZ (Appendix)

Current Agricultural and Environmental Situation in the Bard Water District, Charles Sanchez, Ph.D University of Arizona. (Provided upon Request)

2020 Water Conservation Plan – BWD (Provided upon Request)

Ten-Year Capital Improvement Plan – BWD (Oversized sheets, but can be provided upon Request)

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

F. Implementation and Results

Readiness to Proceed: Tasks and Milestones with Tentative Schedule

Estimated Project Schedule (Two Years):

Milestone/Task	Planned Start Date	Planned Completion Date
USBR Award	02/01/21	02/01/21
USBR NTP	09/01/21	09/01/21
Pre-Construction Contractor/Vendor Procurement: Engineering/Design	10/01/21	11/30/21
Construction/Installation Coordinate/schedule with affected water user(s) Site Preparation Trenching and Concrete Lining Tie-Ends Concrete Structures/Foundations Cleanup and Debris removal	04/01/22[1]	07/31/22[1]
Completion Closeout/Final Report	10/01/22	12/31/22

[1] Construction and Installation must take place between April and July. There is less demand (quantity and time), thus minimal impact to our producers/growers. We would schedule our work as to accommodate them.

If additional time is required for decommissioning the Titsing (Environmental Compliance) and rights-of-way, the project's duration may change from 2 years to 3 years.

Performance Measures:

Water Saved or Better Managed:

Pre-project Estimation:

Inflow/Outflow: Data is collected whenever water is released. This is incorporated into our data base. We can generate report for early and late seasons adding the ratio of acre-feet diverted to acre-feet received to calculate efficiency.

Post-Project Methods:

Pre-project results will be compared with Post-project results to calculate water savings. We will compare ratio of acre-feet diverted to acre-feet received to calculate efficiency.

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

G. Nexus to Reclamation Project Activities

The Colorado River is the source of our water supply via the All – American Canal. The BWD approved diversion request is approximately 51,000 acre/feet per year. The Indian Unit's approved diversion request is approximately 49,000 acre/feet per year.

The Yuma Project, initiated in 1909, is a Federal Reclamation Project and lies within the historical boundaries of the Fort Yuma Indian Reservation in Southeastern California (Imperial County) along the lower Colorado River near Yuma, Arizona. The Bard Water District and Lands located in the Yuma Project includes the Valley Division in Arizona and the Reservation Division in California. The Reservation Division consists of approximately 14,700 irrigable acres of which 7,100 acres are in the Bard Unit (Bard Water District, mostly on the Eastern portion) and 7,600 acres in the Indian Unit (mostly on the Western portion). This proposed project area (Reservation Main Canal) was originally constructed as part of the 1909 Yuma Project.

Work began on the distribution system of the Reservation Division in 1909 and the patented land was opened to settlers in 1910. With the construction of the Laguna Dam from 1905-1909, approximately 38,000-acre feet per year were provided to the non-Indian sections. The Bard Irrigation District was organized in 1927 to represent landowners in the Bard District. Water for the project was diverted from the Laguna Dam. Later after the construction of the Imperial Diversion Dam (1938), 5 miles upriver and the completion of the All-American Canal (1941), irrigation for the Reservation Division was diverted from 5 turnouts along the All-American Canal. This included the Siphon Drop Power Plant for the Indian Unit and the Yuma Main Canal for the Valley Division in located in Arizona.

On December 1, 1978, the Bard Irrigation District was renamed the Bard Water District. In March 1981, the Bard Water District entered into a contract with the U.S. Bureau of Reclamation (USBR) for the operation and maintenance of the Bard Unit, In January 1983, BWD entered into an additional contract to operate and maintain the Indian Unit facilities. The Indian Unit Water Users pay the Bureau of Indian Affairs (BIA) their O & M costs, then these funds pass through to the USBR and eventually BWD is compensated. *The overall condition of the delivery and drainage systems is relatively poor due to aging infrastructure , flood damage, maintenance challenges and other causes,* USBR TM 86-68210-2016-07, Evaluation of O & M Costs Allocation, July 2016.

The Fort Yuma Indian Reservation of California was established for the Quechan Indian Tribe by an Executive Order of January 9, 1884. These Indian lands are held in trust by the BIA for the individual Indian allottees in about 10-acre allotments. This acreage is pooled and leased to approximately 10 major farm operators in the area. The leases are administered by the Bureau of Indian Affairs. The Bard Unit contains patented lands held in private ownership. There are about 190 individual water user accounts in the Bard Water District and 10 in the Indian Unit.

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

G. Nexus to Reclamation Project Activities

Answers to the Criteria questions have been provided below followed by a discussion of our history and activities with the USBR.

The BWD receives Reclamation Water: ***Yes***
Colorado River via the All-American Canal via the Reservation Main Canal

Project on Reclamation lands or facilities: ***NO***
Lower Colorado River and All-American Canal

Project in same basin as Reclamation project or activity: ***Yes***
Lower Colorado River Basin

Project contributes water to a basin where a Reclamation project is located: ***Yes***
Lower Colorado River Basin (Confluence of Colorado River in Yuma)

Tribal Benefit: ***Yes***
This project will help Reclamation meet their trust responsibilities to the Quechan Indian Tribe and as such will benefit them. Water conservation measures improvements will help protect native plants, wildlife and habitat.

The Bard water users originally contracted (beginning in 1909) with the Bureau of Reclamation under Present Perfected Rights to provide water under this pre-existing agreement. Bard's consumption is based upon these farm units. The Yuma Project Reservation District (YRPD) are able to divert all the water needed for crops; not to exceed 25,000 acres per year. The Bard Water District is just below the Laguna Dam, the first dam built on the Colorado River to divert water for the Yuma Project. The Bard Unit is part of the Yuma Project Reservation Division and has 2nd Priority Water under the California Seven Party Agreement. Return water flows back into the Colorado River and continues to Mexico as specified by the International Agreement. The most important crops grown in the Bard Water District are produce, Medjool dates, citrus, cotton, alfalfa hay, and wheat. Crops can be grown year-round in this warm dry climate with little need for frost protection.

Currently, the Bard Water District operates and maintains 67 miles (353,760 Linear Feet) of irrigation ditches and canals; only 39% are lined with concrete or concrete piping. There are 465 (Check Gates and Delivery Gates) and YPRD diverts approximately 90,000 acre feet per year to irrigate approximately 15,000 acres. Efforts to conserve water are challenging in Bard's rapidly aging system, but Bard works closely with the USBR to be pro-active in addressing these issues. This project is connected to the Reclamation activity of improving efficiency and conservation of *our water systems for our district.*

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

G. Nexus to Reclamation Project Activities continued)

The Bard Water District Activities/USBR Funding:

1) BWD maintains a continuous working relationship with the Bureau of Reclamation's office in Yuma (collaborating to update our Water Conservation Plan for 2020 as well as assisting with our new grants), USBR's Technical Service Center, the as well as with the USDA, NCRS and the University of AZ, Yuma campus.
2) BWD works diligently to maintain and repair our aging systems with very little funding and resources. In 2004, we received a North American Development Bank grant with 25% Tribal and 25% Bard Water District matching funds. 12 Miles of canals and ditches were lined with concrete or concrete piping and check structures were installed. Bard water users obtained this loan and pay $18.50 per acre per year until 2023 to cover the costs of this construction. All water saved may be used by a lower priority.
3) Also, in 2004, BWD received $225,000 from the USBR Water Conservation Program for Measuring Devices.
4) In 2016, BWD initiated a two-year pilot seasonal land fallowing project in 2016 (MWD) which we expanded threefold (approximately 500 acres initially to 1,500 acres in 2017 and 2018 with USBR, CAWCD, MWD, DW, and SNWA).
5) In 2018, Bard Water Users partnered with the NCRS for several new Canal Lining Projects.
6) In 2018, our water users pledged $25/acre for Capital Improvements. They also provide a percent of their fallowing funds for system efficiency improvements. They are incredibly supportive of any funding we receive to help correct system deficiencies as well as improving efficiency.
7) BWD maintains a continuous working relationship with the Bureau of Reclamation's office in Yuma (collaborating to update our Water Conservation Plan for 2020 as well as assisting with our new grants), USBR's Technical Service Center, the as well as with the USDA, NCRS and the University of AZ, Yuma campus.
8) BWD works diligently to maintain and repair our aging systems with very little funding and resources. In 2004, we received a North American Development Bank grant with 25% Tribal and 25% Bard Water District matching funds. 12 Miles of canals and ditches were lined with concrete or concrete piping and check structures were installed. Bard water users obtained this loan and pay $18.50 per acre per year until 2023 to cover the costs of this construction. All water saved may be used by a lower priority.
9) Also, in 2004, BWD received $225,000 from the USBR Water Conservation Program for Measuring Devices.
10) In 2016, BWD initiated a two-year pilot seasonal land fallowing project in 2016 (MWD) which we expanded threefold (approximately 500 acres initially to 1,500 acres in 2017 and 2018 with BOR, CAWCD, MWD, DW, and SNWA).

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

G. Nexus to Reclamation Project Activities continued)
The Bard Water District Activities/USBR Funding:

11) In 2018, Bard Water Users partnered with the NCRS for several new Canal Lining Projects.

12) In 2018, our water users pledged $25/acre for Capital Improvements. They also provide a percent of their fallowing funds for system efficiency improvements. They are incredibly supportive of any funding we receive to help correct system deficiencies as well as improving efficiency.

13) **In 2018, BWD was awarded four USBR grants:**
WATERSMART Small-Scale Water Efficiency Grant to install a new Drop Leaf gate to stop the unrestricted water flow into a 1-mile section of the Cocopah Canal past the Ute Lateral ($33K) *Unfortunately after a year of waiting for the NTP and additional costs we have declined but re-applied in 2019 and were awarded.*

WCFS Program for Lower Colorado River: Demonstrating Conservation Technologies for Measurement Devices/Flume Construction on the Reservation and Cocopah Canals ($80K).

Water Conservation Field Services Program for Lower Colorado River: Design and Engineering for the Five Gate Structure ($83K).

Third Funding for Two Year Voluntary Pilot System Water Conservation Program, total of around 2,400 acres ($295K).

14) **New Grants Awarded 2019-2020**
Two Small-Scale Water Efficiency Program (SWEP) grants - Phases 2 and 3 Engineering and Design and Concrete Lining Acoma Lateral (2,135 LF Each) – Completed August 2020

CA DWR Supplemental Funding for Planning: Five Gate Engineering and Design Project

One Small-Scale Water Efficiency Program (SWEP) grants submitted April 2019 (Denver office) for Engineering/Design (Last Half 4,250+ LF of Acoma Lateral).

Water Conservation Field Services Program Lower Colorado Region - *SOR.*

WaterSMART Water and Energy Efficiency grant - Construction of Five Gate October 2019

Cooperative Water Management Program Phase 1 – Watershed Planning November 2019

Small-Scale Water Efficiency Program (SWEP) grants – Cocopah Drop Leaf Gate Replacement (Engineering/Design and Construction) Winter 2019/2020

Agricultural Water Conservation and Efficiency Grants Fostering District/Farmer Partnerships – Engineering and Design and Concrete Lining 1/3 of Mohave Canal

1. Technical Proposal and Evaluation Criteria

1.4 Evaluation Criteria

G. Nexus to Reclamation Project Activities (continued)

15) Applied for – Not Awarded

WaterSMART Drought Resiliency grant - Meeting with staff/board to identify project

Water Conservation Field Services Program Lower Colorado Region *for Engineering/Design for Mohave Canal Lining and Appurtenances (Phased for 1/5 of 2.7 miles).*

Small-Scale Water Efficiency Program (SWEP) grants – RC Gate Replacement

USDA RCPP Grant – Matching Funds for Five Gate December 2019

16) In Progress or Pending

USDA EQIP Grants – Working with local farmers Fall 2019-Spring 2020

IRWM – State of CA – Matching Funds for USBR Grants and New Projects TBD.

1. Technical Proposal and Evaluation Criteria

BWD Overview of System

Source of Water Supply:
Colorado River → All American Canal → Reservation Canal → Acoma Lateral (2.5 M) and Titsing Sub-Main (2.5 M)

Total Quantity of Water Supplied: Bard Unit: 50,000 acre ft/yr Indian Unit: 49,000 acre ft/yr

Quantity of Water Supplied Acoma: 2,000 acre feet **Titsing:** 1,600 acre **feet**

Water Rights Involved: 2nd Priority

Current Users: Agricultural **Number of Water Users Served:** 150

Current Water Demand: 51,000 acre feet/year **Projected Water Demand:** Same

Estimated Water Loss Reduction if Conveyance modernized:
Approximately 4,259 acre feet/year or 30% of water delivered to this area.

Major Crops: Wheat, Sudan Grass, Produce and Cotton (Listed by water demand: High → Low)

Total Acres Served: Bard Unit 7,120 **Acoma Lateral Acres Served:** 200

Potential Shortfalls in Water Supply: If drought continues, quantities could be reduced. Increased demand from new users. Water conservation measures are critical. Farmers here have already been encouraged to implement seasonal fallowing, use drip irrigation methods, sprinkler systems to germinate seeds, eliminate crops that require large quantities of water (i.e. wheat or Sudan grass – Estimated total of 16-acre feet (48 hours @ 4-6 intervals).

Bard Water District Water Delivery or Distribution System: Agricultural Use only.

Type and Approximate Total Lengths of Canals, Laterals and Pipes: 67 Miles 353,760 LF

Concrete Lined/Pipe: 26 Miles 137,280 LF (39%) **Unlined:** 41 Miles or 216,480 LF (61%)

Type and Approximate Total Lengths of Canals: 13 Miles 36,640 LF
Concrete Lined: 7 Miles 36,960 LF **Unlined:** 6 Miles 31,680 LF

Type and Approximate Total Lengths of Laterals: 50 Miles 264,000 LF
Concrete Lined: 13 Miles 68,640 LF **Unlined:** 35 Miles 184,800 LF

Fragmented/Deteriorated Concrete Lined Lateral: 2 Miles 10,560 LF

Type and Approximate Total Lengths of Pipes: 3 Miles 15,840 LF

Number of Irrigation Turnouts: 465 (Check Gates and Delivery Gates)

Significant Irrigation Improvements: Remote Monitoring Devices: 5 and 2 (2020)

NRCS Projects: 2 (2019) and 22 (proposed)

1. Technical Proposal and Evaluation Criteria

H. Additional Non-Federal Funding

Our funding will be the 50% from our Water User's commitment to provide BWD $25/acre for Capital Improvements each year (approximately $375,000) and their contribution from fallowing to improve system efficiency. BWD has developed a great partnership with our water users for Irrigation methods that promote water use reduction (sprinklers, drip, etc.) and Crops that require less water. They actively participate our water conservation methods because not only is good for our water resources it provides them a cost savings. The In-Kind will be our Labor and use of our Heavy Equipment.

The concrete lining of the last half of the Acoma Lateral and new pipeline extension/diversion replacing the Titsing Sub-Main is critical for completion of improvements for this conveyance system. We have taken a very conservative approach, completing this project phases, leveraging funding and resources from ourselves (In-kind and Bard Water Users-Capital Improvement funds) as well as the Quechan Tribe with USBR or other matching funds in a step by step process. The construction has been separated into three phase (2 of which are complete) which has allowed us a more reasonable 2-3 year approach. **Without this funding for this final critical fourth phase we cannot complete this project any time soon**, even with our Water User's commitment to providing BWD $25/acre for Capital Improvements each year, this would take all our funding for other projects away for at least five years and delay the project significantly. This would put the BWD's system at considerable risk, diverting all our funds to only one project. The 50% matching funds help tremendously for these costly projects.

2. Project Budget

2.1 Funding Plan and Letters of Commitment

The Federal share of this project is $1,117,994 (50%) and the Non-Federal Share is $117,994 (50%) from the Bard Water District.

BWD Staff will be utilized for specific tasks during this two year, eight-week construction phase (May – June) with (Six on-site personnel: hours ranging from 420- 440 hours each). Two laborers and equipment operators (1,080 manhours total for each category). This phase will require dry-outs for sections of canal and overtime to complete work within the narrow timeframe to minimize negative impact to farmers/producers. There also be a four-week pre-construction phase for site preparation and planning to minimize the dry-out time. The eight-week post-construction phase will include cleanup and testing of the conveyance gates, associated structures, and pipeline. We will utilize our staff and heavy equipment. The project will be overseen by the BWD General Manager and an Engineer from George Cairo Engineering, but BWD's responsibilities will include project management, site preparation, vegetation removal, prism trimming/fil/compaction, some demolition, trenching, concrete work, dust control, cleanup and removal of debris and material at completion. By using our own staff costs will be greatly reduced because less hours will be required, and we will utilize our own equipment.

Costs incurred before start date: None

Summary of Non-Federal and Federal Funding Sources

SOURCE	AMOUNT
Costs to be reimbursed with the required Federal funding (50%)	**$1,117,994.00**
Costs to be paid by BWD (50%)	**$1,117,994.00**
Value of third-party contributions	**$0.00**
TOTAL PROJECT COSTS	**$2,235,988.00**

Federal Funding

BUDGET ITEM DESCRIPTION	AMOUNT
Materials and Supplies: Pipe 36 Inch	$990,000.00
Materials and Supplies: Concrete $96,000	$96,000.00
Contractual: Engineering and Design $45,000 - $13,006	$31.994.00
TOTAL FEDERAL FUNDING	**$1,086,000.00**

Non-Federal Funding (BWD) – In Kind ($574,250) and Cash ($249,875)

BUDGET ITEM DESCRIPTION	AMOUNT
Salaries and Wages – In Kind	*$83,471.00*
Fringe - In Kind	*$42,746.00*
Materials and Supplies – Cash Safety Supplies $1,000	$1,000.00
Equipment – In Kind	*$219,500.00*
Trencher – In Kind	*$555,000.00*
Contractual – Cash $45,000 - $31,994 = $13,006	$13,006.00
In Direct Costs – De Minimus In-Kind	*$203,271.00*
TOTAL NON-FEDERAL FUNDING	**$1,117,994.00**

2. Project Budget

2.2 Budget Proposal

BUDGET ITEM DESCRIPTION	COMPUTATION		Quantity Type	TOTAL COST
	$/Limit	Quantity		
Salaries and Wages				
Project Manager	$41.67	600	Hrs	$25,002.00
Water Master/Foreman	$26.50	560	Hrs	$14,840.00
Equipment Operator	$19.34	1,080	Hrs	$20,887.20
Laborer	$13.28	1,080	Hrs	$14,342.40
Adm. Assistant	$17.50	80	Hrs	$1,400.00
Contracts & Grants Specialist	$35.00	200	Hrs	$7,000.00
Total		**3,600**	**Hrs**	**$83,471.60**
Fringe Benefits				
Project Manager	$15.35	600	Hrs	$9,210.00
Water Master/Foreman	$14.58	560	Hrs	$8,164.80
Equipment Operator	$10.74	1,080	Hrs	$11,599.20
Laborer	$10.74	1,080	Hrs	$11,599.20
Adm. Assistant	$7.76	80	Hrs	$ 620.80
Contracts & Grants Specialist	$7.76	200		$1,552.00
Total		**3,600**	**Hrs**	**$42,746.00**
Equipment (BWD)				
Front End Loader CAT 938G	$150.00	400	Hrs	$60,000.00
Rubber Tired Excavator CAT M318F	$155.00	400	Hrs	$62,000.00
Dump Truck – Kenworth	$135.00	200	Hrs	$27,000.00
Water Truck – GMC	$85.00	200	Hrs	$17,000.00
Service Truck 1 Ton 2000 Ford	$90.00	400	Hrs	$36,000.00
Project Manager Truck	$35.00	500	Hrs	$17,500.00
Total		**1,400**	**Hrs**	**$219,500.00**
Trencher	$100.00	5,550	LF	$555,000.00
Materials and Supplies				
Safety Supplies	$1,000.00	1	LS	$1,000.00
Pipe 36 Inch	$99,000.00	2,700	LF	$990,000.00
Concrete	$120.00	800	CY	$96,000.00
Total				**$1,087,000.00**
Contractual/Construction				
Engineering and Design	$45,000.00	1	LS	$45,000.00
Total				**$45,000.00**
Environmental and Regulatory Compliance – Categorical Exclusion				**$0.00**
TOTAL DIRECT COSTS				**$2,032,717.60**
Indirect Costs – De-Minimus Fixed	10%			**$203,271.76**
TOTAL ESTIMATED PROJECT COSTS				**$2,235,989.36**

2. Project Budget

2.3 Budget Narrative

Salaries and Wages *(Will require OT during construction phase to minimize Dry-out Time)*
Table will be provided upon award with current salaries or wages.

Project Manager: Nick Bahr General Manager 560 Hrs [120 Hrs Pre-construction + 440 Hrs Construction + 40 Hrs Post-Construction]
Manage Overall Project:
Bid Procurement Process
Meet with Contractors
Scheduling of Staff and Equipment.

Water Master/Foreman/Crew Leader: 560 Hrs [80 Hrs Pre-construction + 440 Hrs Construction + 40 Hrs Post-Construction]
Assist Project Manager – supervise BWD employees

EQ Operator: 2 x 540 Hrs [80 Hrs Pre-construction + 420 Hrs Construction + 40 Hrs Post-Construction]
Initial site preparation – some demolition activity and water diversion system if required, assist with construction – gate and concrete structure placement and testing, dust control

Laborer: 2x 540 Hrs [80 Hrs Pre-construction + 420 Hrs Construction + 40 Hrs Post-Construction]
Assist with construction – gate attachment, testing and structural supports

Administrative Assistant: 80 Hrs
Payroll, In-Kind and Costs Tracking, Billing, Documentation

Contracts & Grants Specialist 200 Hrs
Grant/contact administration: Reports, Cost Tracking, Changes/Modifications

Fringe: Fixed for all staff. Table with current rates will be provided upon award.

BWD certifies that the labor rates included in the budget proposal represent the actual labor rates of the identified personnel.

Travel: No Travel Required

2. Project Budget

2.3 Budget Narrative (Continued)

Equipment: Will use BWD equipment (BWD Schedule) Current Rate schedule will be provided upon Award.

Front End Loader – Site preparation and final cleanup, installation
Rubber Tired Excavator – Site preparation and final cleanup, installation
Dump Truck – Haul away construction debris and material
Water Truck – Dust Control
Service Truck – Used in support of BWD Crew on-site
Project Manager Truck – project management at site
Trencher

Materials and Supplies:
Safety: Level D Personal Vests, glasses, hard hats, gloves; Drinking Water
Concrete 800 cubic yards for 5,550 LF plus some additional for pipeline
Pipe
Fill Dirt to bring to required slope/grade

Contractual:
Engineering and Design see Quote from George Cairo
On-Site Construction Management – George Cairo

Other:
Environmental Regulatory Compliance Costs: Class III Cultural Survey already completed for Acoma Lateral (Entire 2.5 Miles). No earth disturbing activities for pipeline.

See responses to Environmental Compliance Questions on page 20 to determine what needed and preparation of Environmental compliance documents as required

Indirect Cost Rate: **NO** approved government rate so use De-Minimus on total Direct Costs

3. Required Permits or Approvals

There are no permits or approval required for this project.

4. Letters of Support

Provided in Appendix – commitment to NRCS/EQIP

Discussion of participation – see section D.

5. Official Resolution

Resolution **WILL BE PROVIDED BY** November 17, 2020.

6. Environmental and Cultural Resources Compliance

BWD worked closely with the USBR Archeologist to ensure all environmental compliance requirements were met before NTP. BWD completed the field work and prepared the report for the Class III Cultural Survey which was provided to USBR for their review and final input. No adverse effects were identified for this project and a NTP was given. We have provided our initial responses for environmental compliance for your review.

6.1 Impact to Surrounding Environment ***NONE***

No significant impact, all earth-disturbing work will occur within existing canal and sidewalls. Canal is at higher elevation and was created with imported fill.

6.2 Threatened or Endangered Species, or Designated Critical Habitat ***NONE***

This area is greatly disturbed and in constant agricultural use. There are no threatened or endangered species present or critical habitat. *See page 14 last paragraph for description of surrounding biomes.*

6.3 Wetlands or Other Surface Waters (CWA) – Waters of the United States ***NONE***

There are no wetlands within the project boundary.

6.4 Water Deliver System Date of Construction

The Acoma Canal was constructed in 1940.

6.5 Modifications or Effects to Individual Features of a Delivery System (i.e., head gates, canals, or flumes) ***NO***

There will be no effect on the existing delivery system.

6.6 Features in the Bard Water District Listed or Eligible for Listed on the National Register of Historic Places ***NONE – within project site***

These include The All American Canal, USBR Dams, Head Gates, and Retention Areas, Old Southern Pacific Rail Line and Bridges, Fort Yuma, Pothole, Petroglyphs.

6.7 Archaeological Sites in Proposed Project Area ***NONE***

There are no archaeological sites in the project area.

6.8 Disproportionately High or Adverse Effects on Low Income or Minority Populations ***NONE*** No disproportionally high or adverse effects on low income or minority populations. If anything, this will have the opposite effect economically.

6.9 Limit Access to and Ceremonial Use of Indian Sacred Sites or Impact on Tribal Lands ***NO***

Not limit access to and ceremonial use of sacred sites or impact Tribal lands.

6.10 Contribution to Introduction, Continued Existence, or Spread of Noxious Weeds or Non-Native Invasive Species ***NO***

If anything, this project will have the opposite effect, reducing noxious weeds and non-native invasive species, including aquatic vegetation.

Appendix

Reports Referenced

Can be provided upon request.

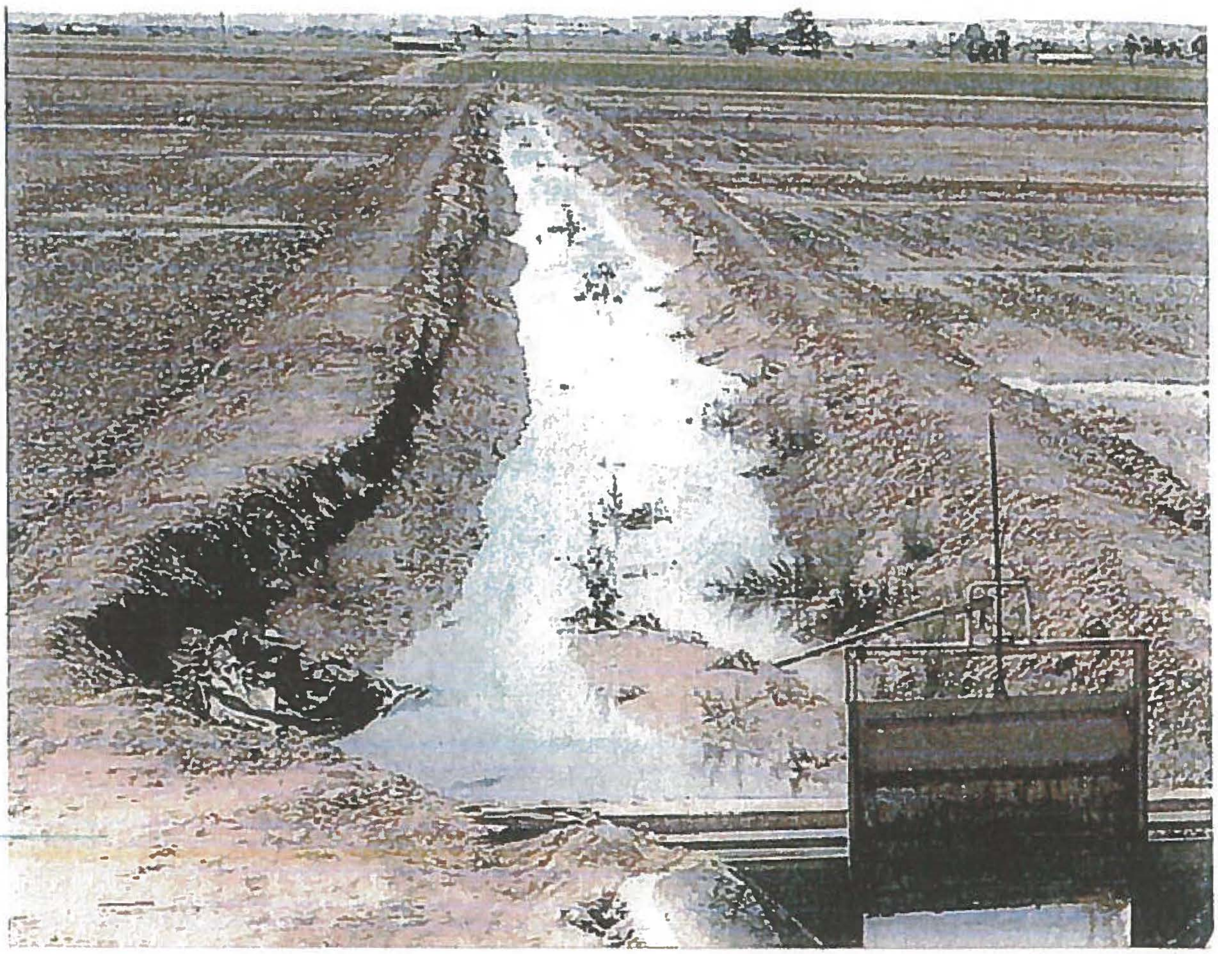
USBR Reservation Division System Evaluation Project conducted in January 2017;
Technical Memorandum No. 35-RDE-8150-STY-2016-02

Current Agricultural and Environmental Situation in the Bard Water District,
Charles Sanchez, Ph.D University of Arizona.

2020 Water Conservation Plan – BWD

Conservation Implementation Strategy
Bard, CA. Imperial County

IRRIGATION IMPROVEMENT PROJECT



NRCS
Natural Resources Conservation Service

Steve Reddy – District Conservationist
2197 4th Avenue, Suite 104
Yuma, AZ 85364

1.0 Overview/Background

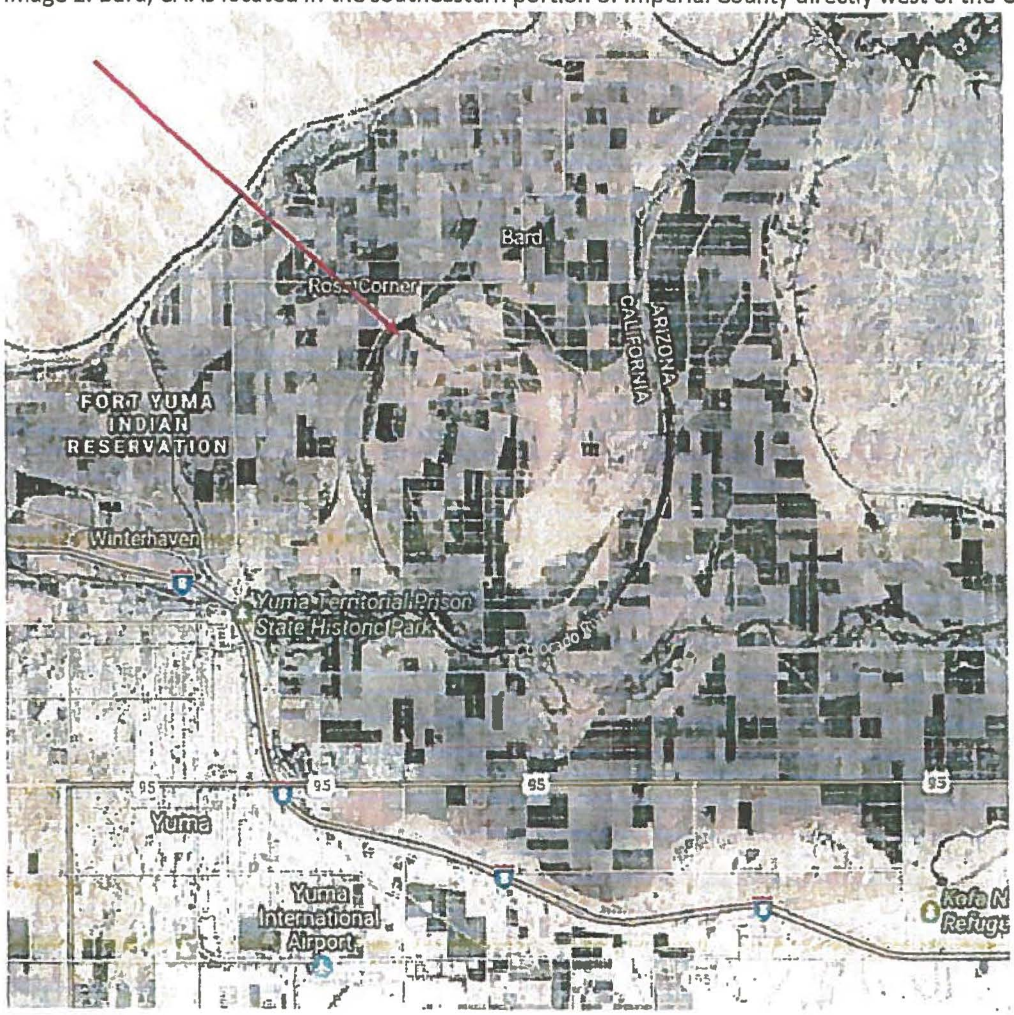
1.1 Location

Bard, CA is an agricultural area northwest of Yuma County on the west side of the Colorado River (map 1) and south of the All American Canal. The area has been in agricultural production since the early 1900s and is recognized as one of the earliest irrigation projects implemented by the United States Bureau of Reclamation in the Southwest.

The Bard area is basically an old floodplain of the Colorado River. The soils are alluvial and are comprised of a variety of clay (Kofa, Gadsden) loam (Indio, Ripley) and sand layers. Often a field may contain a thin surface clay layer that overlies more coarse textured layers beneath.

The climate is identical to Yuma valley conditions: hot and dry (approx. 3"/yr.). The Bard area is predominately agricultural and is not experiencing residential developmental (1).

Image 1. Bard, CA. is located in the southeastern portion of Imperial County directly west of the Colorado River.



1.2 Agricultural Status

Crop production in Bard has historically been dates, citrus, alfalfa, cotton, and wheat. Dates are still a major crop in this area. Recently, crop production is transitioning more toward winter crops including lettuce, broccoli, cilantro, etc. Older citrus groves are being removed and the land is being converted to winter produce crops, followed by a wheat or Sudan grass rotation. The size of fields is variable ranging from 10 acres to 40 acres.

1.3 Bard Conservation District

The Bard Resource Conservation District was formed in 1953 and still exists to represent land owners. Among the priorities listed back in the District's 2000 Long Range Plan (2) are the following: *"Disseminate information on soils and water conservation methods. Encourage land users to utilize the most efficient irrigation methods, which are economically feasible. The quality and quantity of water acceptable for its intended uses and managed in an efficient and sustainable manner is the goal of this item."* According to growers in Bard, these priorities are still relevant today.

Earlier, the District cited its 1986 collaboration with the SCS in a County Resource Inventory (3). The Bard Conservation District listed the following high priority needs from the Inventory:

1. Irrigation water management	*15,000 acres*
2. Salinity	*5,000 acres*
3. High Water Table	*5,000 acres*
4. Flooding	*acres not mapped*

Again, according to growers in Bard, these priorities still exist although some improvements have been made by the irrigation district and by individuals.

1.4 Irrigation District

The Bard Water District has been in existence for many years and performs the task of delivering irrigation water to 14,676 acres of agricultural land. Of this total, about 7,120 acres is in the so-called, 'Bard Unit,' which is private land. The Bard Unit (map 2) is the initial target area for this NRCS Conservation Implementation Strategy due to the resource concern and the 'willing and able' status of several land owners.

The Bard Water District also serves approximately 7,556 acres of agricultural land in the Quechan Indian Reservation. Some of these Reservation lands have similar resource concerns and could possibly be part of a second stage Conservation Implementation Strategy, if requested. At this time, Quechan agricultural land is leased entirely to non-reservation growers. Should lessees on Reservation lands want to be included in a second stage CIS project, a clearer landowner concurrence process with the Quechan Indians would need to be developed.

1.5 NRCS Service Center - Yuma

The Yuma NRCS Service Center has an agreement with Imperial County, California to provide conservation services and EQIP contracts to landowners in Bard, CA. The close location and similar land use makes it practical for the Yuma NRCS to provide this service rather than the NRCS office in El Centro, CA.

The Yuma NRCS has experience in Bard and has recently completed a FY16 irrigation project that included 2300 Ft of concrete ditch and 15 large turnouts. Collaboration of the Yuma FSA with El Centro FSA was needed to complete contract eligibility. A FY17 project has been obligated and is now underway. It will include lining of a 777 Ft of earthen ditch and installation of 6 large turnouts.

Image 2. Yellow outline represents approx. 7,120 acres of private farmland in the Bard CIS..

2.0 Resource Concern Statement

The primary resource concern in Bard, CA is 'Inefficient Irrigation' on agricultural land. The condition occurs throughout the area due mainly to old, obsolete irrigation field structures. It is a concern because water demands and projections in the Southwest are constantly being measured and reviewed. Growers and Districts know they must use their Colorado River water resources even more efficiently as demands for reduced river volume increase from all sectors.

Inefficient irrigation in this area means more water is being applied than needed, resulting in more water percolating to the high water table in Bard. This excess irrigation adds to the drainage issues that have been a chronic problem for this area. Also, inefficient irrigation adds stress on the irrigation district's ability to deliver water and to maintain its infrastructure.

3.0 Goal Statement

The overall goal is to improve the irrigation water use efficiency and agricultural productivity of priority fields in Bard. The benefits will include water savings, reduced impact on high water table, reduced demand on Water District, and improved management of winter crops.

The project goal is to install these practices on 6-7 high priority fields annually over the next three years. A total of 18-21 fields will be improved using new irrigation infrastructure and management practices for the lifetime of the practices.

The inefficient use of water is the result of old, undersized, and obsolete field irrigation infrastructure. The inefficiency is magnified in some cases by underdeveloped Water District delivery ditches and structures that limit water volume availability to growers.
Both private land owners (and lessees) and the Water District desire to improve efficiency. Irrigation efficiencies can be achieved by:

1) *Eliminating seepage losses from earthen field ditches and deteriorated cement ditches.*
2) *Installing larger capacity concrete ditches containing high flow turnout structures.*
3) *More closely matching water volume to field dimensions and field soil intake qualities.*
4) *Installing drip irrigation where practical and cost effective.*

Early observations indicate there are several fields that would benefit from shortened irrigation lengths or more strategically located irrigation structures. To compliment infrastructure improvements, Irrigation Water Management practices would be implemented to guide land users in efficient use of the new system components.

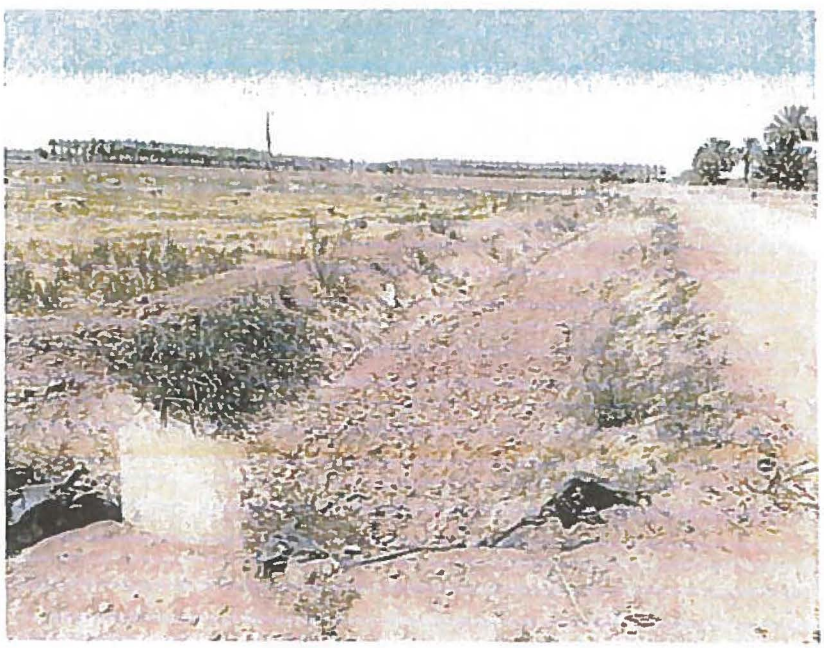
4.0 Purpose of Proposed Strategy

4.1 Infrastructure Efficiency and Management

The purpose of this Bard CIS is to raise the irrigation efficiency of agricultural fields through infrastructure improvements and irrigation management practices. New infrastructure would allow use of larger hydraulic 'heads' of water. Experience has shown that larger 'heads' of water provide both quicker distribution across a field and result in more uniform infiltration, with minimal deep percolation losses.

Many of the existing irrigation structures in Bard are either earthen ditches (image 1) or old undersized concrete ditches utilizing metal slide 'ports' for water distribution to individual sets. Many of these concrete ditches are 50-60 years old, are deteriorated, and use labor intensive distribution controls (Image 2). Water loss through earthen structures and deteriorated concrete structures can be substantial according to a Rio Grande District study (4). The Bard Water District referred to water savings estimates from this study to support a 2003 proposal for canal renovation and relining projects (5).

Image 1. Bard, CA. Example of earthen irrigation ditch.



There are several earthen field ditches that use a variety of distribution ports placed in the embankment (image 3). Generally, earthen irrigation ditches are less efficient, allow excessive seepage loss, and require substantial maintenance for weed control. With a transition to high intensity winter crops, growers will be required to improve control and performance of their irrigation systems. Also, as winter crop acreage expands, food safety requirements will become more important. These requirements strongly discourage wet, muddy conditions, and standing water, all conditions commonly associated with earthen ditches.

Image 2. Bard, CA. Example of deterorated concrete field ditch with slide ports.

Image 3. Bard, CA. Example of distribution port in collapsed earthen embankment.

4.2 High Water Table

Growers in Bard have mentioned chronic issues with a high water table in the area (6). The high water table is the result of several factors including presence of the Colorado River, seepage from the All American Canal and District canal, and agricultural irrigation. The high water table, and resulting saline soil in some locations, has resulted in localized examples of poor plant condition. Installation of field tile drains has been tried with limited improvement.

Improved irrigation efficiencies would help manage the high water table by reducing excessive seepage losses from agricultural fields. A joint study in 1955 by SCS and Bureau of Indian Affairs investigated the Bard area high water table condition with emphasis on drainage recommendations (7). The water table map from this study shows several locations with groundwater "less than 36" from the surface."

A recent Depth to Groundwater Map (2017 Bureau of Reclamation) now shows many of those areas combined into zones labelled: 0-6' depth to groundwater (8). It is not clear to me whether groundwater levels have improved when compared to the 1955 study.

5.0 Alternatives

5.1 No Action Alternative

The No Action alternative would allow the existing irrigation infrastructure to remain in its current poor condition and performance level. Inefficient irrigation would continue across a variety of crop rotations. Excessive water loss through seepage would continue to contribute to the high water table, worsening the potential for saline soil and poor crop growth.

5.2 Alternative 1

Alternative 1 would primarily be Concrete lining of earthen ditches and relining of old, obsolete concrete-lined ditches under the EQIP program. Irrigation distribution efficiencies could be improved from 10 to 30% as measured by Win-SRFR analysis. Drip irrigation is also a possibility on existing date groves (Date growers have inquired about drip irrigation but no planning has yet been completed).

Because new irrigation structures will be installed, basic Irrigation Water Management will be required on the project acres. Basic IWM would provide guidance to growers on frequency and duration of irrigation events. NRCS would also encourage use of Advanced IWM technology where practical and appropriate. Installation of drip irrigation would be complimented by soil moisture sensors. The Yuma Field Office could demonstrate use of field moisture sensors and suggest situations where the equipment would be most useful.

5.3 Alternative 2

Application of Advanced Irrigation Water Management using soil moisture sensors, data loggers, and data relay equipment. Use of this technology will improve the information growers have on soil moisture throughout their crop soil profile. This information can improve irrigation efficiency by helping growers know actual water content at various soil depths. For this technology to be used effectively on a widespread basis, it is recommended that instruction and field demonstrations be held by NRCS and the equipment company. In the end, any improvements through use of Advanced IWM will be limited by the performance of the existing irrigation infrastructure.

5.4 Preferred Alternative and Proposed Actions

Alternative 1 is the preferred choice because it directly addresses the problem of inefficient irrigation caused by limitations and deficiencies in existing field infrastructure. In addition, Basic Irrigation Water Management would help growers use the new and larger infrastructure as designed. Ideally, some growers would also select Advanced Irrigation Water Management which would provide even more improvements in water use. Ultimately, it is the ability of growers to apply a larger 'hydraulic head' of water rapidly and uniformly across fields that will result in most irrigation efficiency improvements.

6.0 Environmental Evaluation

6.1 Cultural Resources

The Bard, CA area has been in agricultural production since the early 1900s. Many of the irrigation structures, including both earthen and concrete ditches are old enough to be classified as cultural resources. In addition, CCC (Civilian Conservation Corps) structures from the 1930s are present and, in many cases, still in use. The Bard Water District has encountered historic CCC structures in past renovation efforts and apparently has some procedure for documenting them. Regardless of existing procedures in Bard, a conversation with the NRCS archaeologist indicates that each historic item encountered would have to be documented and reviewed by Arizona NRCS. Consequently, any irrigation ditch improvements in Bard will occur only after Arizona NRCS cultural resources processes have been followed.

Yuma NRCS will gather additional information on cultural resources procedures used in Bard and report them to AZ NRCS for potential streamlining of effort. The fields designated for this CIS are all privately owned with no projects on State leased land or on Reservation land.

6.2 Endangered Species

Earthen drainage ditches exist in the Bard area to remove excess ground water and return it to the Colorado River. These earthen drains provide conditions for wetland vegetation (cattails, etc.) to flourish, and in turn, provide habitat for endangered wildlife (Ridgeway's Rail, Yellow Billed Cuckoo). Because this suitable habitat exists, the Bard Water District has difficulty every year getting permission from wildlife agencies before cleaning and performing other necessary drain maintenance (9). However, the USF&WS National Wetlands Inventory map did not show the drainage ditches to be considered wetlands. On the other hand, areas surrounding Bard, especially near Haughtelin Lake, are indicated as wetlands.

The USF&WS IPAC tool (Information for Planning and Consultation) was used to find locations of potential endangered species. A large area in the center of the Bard project area, containing a drainage ditch, was selected for the search. The IPAC Tool reported three endangered species but said the *"project area was outside designated critical habitat."* Perhaps Bard Water District is getting direction from a State wildlife agency since the Federal reports did not seem to indicate endangered species conflict. The anticipated NRCS irrigation ditch improvements on private land may impact these drainage ditches and endangered species by causing some reduction of field seepage water. Yuma NRCS staff will seek advice from the NRCS biologist on how to proceed with the CPA-52 on Endangered Species.

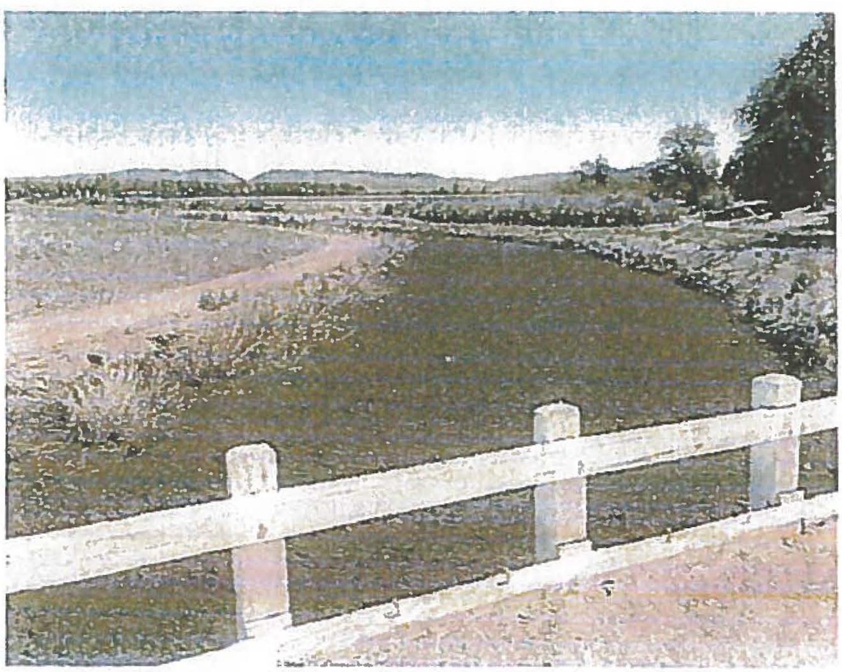
6.3 Clean Water Act

The earthen drainage ditches collect and route seepage water from beneath the Bard agricultural area to the Colorado River (outlet structure near the I-8 bridge). The anticipated irrigation ditch improvements on private land may impact quality of the water being returned to the Colorado River. There may be some change in drainage water quality, such as salinity increase or decrease, resulting from some reduction in field seepage. Yuma staff will seek outside agency opinion on water quality impacts as part of the CPA-52 process.

6.4 Invasive Species

As mentioned, the earthen drainage ditches provide conditions for wetland type vegetation to flourish (image 4). They also provide conditions for various invasive species such as the aquatic weed Giant Salvinia (Salvinia molesta). This aquatic plant currently exists in these drainage ditches and creates thick mats on the water surface. As part of annual maintenance duties on these drains, Bard Water District removes this vegetation. The anticipated NRCS irrigation ditch improvements on private land are not expected to impact or spread this invasive species.

Image 4. Bard, CA. Giant Salvinia growth on water surface of drainage ditch,



7.0 Partnerships and other Funding Sources

The primary partnership will be between private land owners (or lessees) and NRCS through the Environmental Quality Incentives Program (EQIP). The NRCS will make the appropriate reimbursement for practice installation (typically 75% reimbursement of final costs) while the land user would contribute the balance.

The Bard Water District will contribute to general water use efficiency through continued replacement and upgrade of its distribution structures. Should a land user request a relocated turnout based on an NRCS design, the user may have to pay the Water District for that relocation construction cost.

The Bard Water District has undertaken upgrades of its delivery system (particularly the Reservation Main Canal) in recent years (2003-06). The District is currently considering additional planned renovations through collaboration with the Bureau of Reclamation. A joint meeting between Bard Water District, BOR, and NRCS (6/28/17) explored the possibility of the District pursuing Regional Conservation Planning Program (RCPP) funding beginning in 2018. Should a RCPP be successful, the remaining portions of this NRCS Strategy would become part of that effort.

8.0 Implementation

8.1 Client/Field Numbers

I have met with three large agricultural companies that operate in the Bard area. They have given me potential project fields controlled by owners or lessees. Approximately 21 fields have been identified as priorities for irrigation efficiency improvements. The fields have been averaged over the three year CIS lifespan to allow for a workload of seven projects per year. The actual order of these projects will depend on the ranking scores, application submittal, and the complexity of the eligibility process for applicants. An estimate of project acres, conservation practices, and EQIP payments are shown in the attached table (table 1).

The EQIP costs shown include Irrigation Water Management, but only at the Basic Level. The drip irrigation field (owner suggests three stages) would include a pumping plant and advanced Irrigation Water Management as well as sensors and data logger. The EQIP total costs is approximately $741,000. There is the possibility of additional practices being added to a contract, such as cover crop, land leveling, or water measuring device, that could easily increase total cost. For that reason the requested budget for this CIS is $800,000.

Table 1. Estimate of Bard CIS projects practices, and budgets.

Bard, CIS - Year 1				
Field	Acres	Ditch	Structures	EQIP
Blackwell	40	1050	4	$27,100
Nelson	60	1300	4	$37,626
H. Berryman	79	1919	6	$45,587
Curtis	95	4000	12	$90,443
JV Hovater 654	36	1240	8	$44,381
Nolan	58	1608	5	$37,189
Hill dates 1	10	microjet	pump	$35,706
Total	378	11117	39	$318,032

Bard, CIS - Year 2				
Field	Acres	Ditch	Structures	EQIP
Wavers 655 (JV)	37	1240	8	$29,764
Fresh Innovation 624 (JV)	42	1265	8	$30,080
Fagundez 696 (JV)	14	510	2	$6,651
Spencer	35	1000	6	$34,121
TopFlavor	40	1000	8	$41,773
Fagundez 697 (JV)	17	560	4	$14,412
Hill dates 2	10	microjet	pump	$35,706
Total	195	5575	36	$192,507

Bard, CIS - Year 3				
Field	Acres	Ditch	Structures	EQIP
JV Amado 628	18	1061	4	$27,255
JV Homeland 629	8.3	600	2	$14,378
JV Face 605	31.5	990	8	$41,594
JV Face 606	37.5	1238	7	$44,371
JV Face 607	37	1300	5	$33,635
JV Face 608	37	1300	5	$33,635
Hill dates 3	10	microjet	pump	$35,706
Total	179.3	6489	31	$230,574

CISTotal	752.3	23181	106	$741,113

8.2 NRCS Office Workload

The projected CIS workload is the maximum the Yuma Field Office staff can practically manage. The Yuma Field Office consists of one District Conservationist responsible for administrative, contracting, and all field activities. The office staff is expected to remain at this minimal level during the period of this CIS. 100% of the District Conservationist's time and effort will be required for implementation and management of the Bard CIS, especially as contracts and projects accumulate by year three.

Due to the engineering and technical nature of the practices, substantial field time will be necessary for benchmark survey, client/contractor coordination, system design, construction oversight, As-Built survey, payment, etc.

Other workload difficulties or scheduling delays may arise with the eligibility process, contractor errors, or document processing between Imperial County NRCS and the Yuma NRCS.

8.3 Shared Workload Possibilities

One requirement of this CIS is the need for several irrigation system designs. Although, irrigation ditch designs are currently produced by the Yuma Field Office, the high number of designs would be a challenge to produce. The NRCS Area Engineer (Nathan Rodriguez) has offered to assist with designing whenever possible, but he has demands from several offices and attempting to schedule his availability would be difficult. The Area Engineer's assistance may best be reserved for more technical items like drip irrigation design review or culvert analysis.

An alternative would be assistance from an existing TSP for production of routine ditch designs. I have inquired with Agritech Consulting (Flagstaff, AZ) which does have Arizona TSP certification and is currently working in the Yuma/Bard area. Their engineer, Mark Niblack, is experienced in ditch design and planning and would be available to provide this service. He and I have plans to meet on site to discuss project field challenges and TSP design estimates. Fees would be based on the NRCS-TSP data base service rates. How funding for use of a TSP could be arranged with NRCS has not yet been determined.

9.0 Progress Evaluation and Monitoring

9.1 Infrastructure Installation

The number of fields and acres improved will be a major measure of progress, as will the number of water control structures and feet of ditch installed. Progress will also be measured by comparing the feet of earthen ditches converted to concrete-lined ditches, and the number of old slide ports converted to high flow turnouts.

The Farm Irrigation Rating Tool will be used to show a score for improvement and the Estimated Change in Gross Water Applied on each project field. The comparison of before and after improvements (percent, or acre inches saved) will be calculated and totaled as fields are completed. This will also be used as part of the evaluation of progress.

9.2 Irrigation Efficiency

Initial evaluation of new practice performance would be provided by Irrigation Water Management 'Grower's Records.' These records would confirm that the improvements were working as designed and the water use estimates are valid. These Irrigation Water Management practices would also undergo yearly 'Spot Check' evaluation by Area Office Staff.

Evaluation of water use improvements will also be made by the Bard Water District. The District is required to record grower water requests and actual water usage. These records could be compared to historic client usage. The Bard Water District may also have access to water diversions into their system, as well as drainage ditch outflows to the Colorado River. These numbers could be used as a combined measure of District and land owner efficiency efforts. For those growers who use Advanced Irrigation Water Management equipment, detailed records would be stored and would be available for longer term monitoring.

10.0 Summary

The Bard, CA agricultural area has resource concerns, primarily irrigation efficiency, that need attention. Fortunately there are landowners, lessees, and agencies willing to collaborate in making the improvements. The practices and process discussed above will address these concerns.

References

1. 2009. Davey, James. The Sustainability of Irrigated Agriculture in the Lower Colorado River Region. Conference Proceedings, U.S. Committee on Irrigation and Drainage

2. 2000. Long Range Plan. Bard Resource Conservation District

3. 1986. Annual Plan, Bard Resource Conservation District FY 1986-87.

4. 2004. Fipps, Guy and Craig Pope. Irrigation District Efficiencies and Potential Water Savings in the Lower Rio Grande Valley of Texas.

5. 2003. Water Conservation Improvement Project for Bard, California. Border Environment Cooperation Commission

Arlene Kingery
Contracts & Grant Specialist
Bard Water District
1473 Ross Road
Winterhaven, CA 92283
760/572-0704

Subject: Letter of Intent for Bard Water District Agricultural Water Conservation and Efficiency Grant Application to Line 1 Mile of the Mohave Canal

Dear Arlene,

We are pleased to submit this Letter of Intent to collaborate with Bard Water District and apply for NRCS/EQIP funding for this project. We realize that the modernization of infrastructure (concrete lining of the Mohave earthen canal) will provide us new opportunities to improve our irrigation systems also. We plan to work with NRCS to identify specific improvements and leverage funding with EQIP to help us optimize the reliability and efficiency of our water delivery systems. This will allow us to improve water management and conserve water. The Mohave Canal currently irrigates 682.4 acres of our agricultural fields. If Bard Water District is successful in receiving this funding, we look forward to working with them.

Sincerely,

William Harrison

Harrison Farms Family Partnership

10/29/19

Arlene Kingery
Contracts & Grant Specialist
Bard Water District
1473 Ross Road
Winterhaven, CA 92283
760/572-0704

Subject: Letter of Intent for Bard Water District Agricultural Water Conservation and Efficiency Grant Application to Line 1 Mile of the Mohave Canal

Dear Arlene,

We are pleased to provide this Letter of Intent to collaborate with Bard Water District for this grant application as well as our local NRCS office to apply for future funding under the NRCS/EQIP Program. The concrete lining of the Mohave earthen canal will create new opportunities for us to adapt and improve our irrigation systems. We plan to work with NRCS to identify these how these specific improvements will help us and subsequently leverage funding with EQIP to optimize the reliability, efficiency and safety of our water delivery systems. This will allow us to improve water management and conserve water. We also feel that this will reduce the risk of bacterial contamination from the sludge residue at the bottom of our earthen canals and ditches. The Mohave Canal currently irrigates 221.73 acres of our agricultural fields. If you are successful in receiving this funding, we look forward to working with you and NRCS.

Sincerely,

Steve Alameda

President, Top Flavor Farms

Tanimura & Antle

October 29, 2019

Arlene Kingery
Contracts & Grant Specialist
Bard Water District
1473 Ross Road
Winterhaven, CA 92283
760/572-0704

Dear Arlene,

We are pleased to submit this Letter of Intent to collaborate with Bard Water District and apply for NRCS/EQIP funding for this project. We realize that the modernization of infrastructure (concrete lining of the Mohave earthen canal) will provide us new opportunities to improve our irrigation systems also. We intend to work with NRCS to identify specific improvements and leverage funding with EQIP to help us optimize the reliability and efficiency of our water delivery systems. This will allow us to improve water management and conserve water. The Mohave Canal currently irrigates 313 acres of our agricultural fields. If Bard Water District is successful in receiving this funding, we look forward to working with them.

Sincerely,

Mark Stover

Arlene Kingery

From: Randy Riley <rriley@gcairoinc.com>
Sent: Wednesday, September 2, 2020 4:48 PM
To: Nick Bahr
Cc: Arlene Kingery; George Cairo
Subject: BWD-06 Acoma Canal Cost Proposal for Phase C and Titsink turnout and Pipeline.
Attachments: SKM_C650i20090216430.pdf

Nick,

Attached is the Acoma Canal Rev 1 proposal to include the Phase C (remaining Acoma Design) and the Titsink turnout and pipeline.

Please call if you have any questions.

Thanks,

Randy Riley, P.E.

GCE inc.
GEORGE CAIRO ENGINEERING, INC.
1630 S. Stapley Dr., Suite 117
Mesa, Arizona 85204
480.921.4080 • 480.921.4087 Fax
www.gcairoinc.com

GEORGE CAIRO ENGINEERING, INC.

- Consulting Civil & Agricultural Engineers
- Water Resource Specialists
- Land Surveyors

BWD – Acoma Canal Lining Design Proposal Rev 1

Bard Water District (BWD) – Acoma Canal Lining Design and Titsink Turnout and Pipeline

Introduction

GEORGE CAIRO ENGINEERING, INC. (GCE) appreciates the opportunity to provide this proposal for the civil design, grading and concrete lining design in Winterhaven, California. Based on communications with the district the Acoma canal is proposed to be converted from the current earthen channel to a concrete lined canal to reduce and eliminate water seepage.

Scope of Work

Site Field Survey

GCE will establish or tie into project control as a basis for all survey work. An existing digital terrain model will be developed by GCE. GCE will also collect field survey data and hardscape of existing structures and major existing landscape features as needed within and directly adjacent to the existing 50 canal easement. This information will be required if we will be trimming and paving the proposed concrete lined canal.

Preliminary Design, Hydraulic Analysis, and Alternative Material Analysis

GCE will prepare preliminary design plans for Bard Water District to transform the existing earthen ditch to a concrete lined canal to eliminate seepage.

GCE will perform a hydraulic analysis of the proposed concrete lined canal to determine the most efficient hydraulic section that will minimize costs and reduce construction cost associated with regrading and trenching the proposed canal section.

GCE will also perform an alternative material analysis to determine if it is more cost effective to line the existing earthen channel with shotcrete or other materials to reduce or eliminate the need to refill and regrade the existing channel.

Final Design Plans and Specifications

GCE will complete the final design of the project. This will include sealed design plans for the rehabilitation of the earthen canal and any specifications required.

Services During Construction

GCE will complete the construction observation / inspection to verify that the contractor adheres to the design plans for all construction activities.

Assumptions

- **Phase A**
  - GCE will have access to the site to conduct survey
  - Canal capacity is 40 CFS
  - Total length 4,250 LF of lining (downstream of existing Flume to Avenue A)
  - No bypass design required
  - No structures are included in this design proposal
- **Phase B**
  - GCE will have access to the site to conduct survey
  - Canal capacity is 40 CFS
  - Total length 1,350 LF of lining (downstream of Avenue A to next road crossing)
  - No bypass design required
  - **Structures** are included in this design proposal option that will include the following;
    - 2 inlet headwall structures with trash rack
    - 1 outlet headwall structure
    - 2 turnout structures with gates
- **Phase C**
  - GCE will have access to the site to conduct survey
  - Canal capacity is 20 to 40 CFS
  - Total length 4,360 LF of lining (downstream of Phase B to the end of the Acoma canal, not including the existing concrete lined ditch)
  - No bypass design required
  - **Structures** are included in this design proposal option that will include the following;
    - 4 inlet headwall structures with trash rack
    - 5 outlet headwall structures
    - 5 turnout structures with gates
    - 3 Check Structures with Jack Gates and walkway
- **Titsink Turnout and Pipeline**
  - GCE will have access to the site to conduct survey
  - Pipe capacity is 20 CFS
  - Total length 2,700 LF of 36" Dia Pipe
  - No bypass design required
  - **Structures** are included in this design proposal option that will include the following;
    - 1 New Turnout Structure
    - 1 Pipeline Flow Control Structure
    - 1 Outlet headwall

Cost Proposal

GCE proposes to conduct the subject services on a lump sum cost based on the Scope-of-Services given for this project as interpreted from communications with BWD and our understanding of the work. We propose to do the work for a lump sum per phase as shown below;

The cost breakdown is as follows:

- **Phase A**
  - Site Field Survey — $ 2,250.00
  - Preliminary Design, Hydraulic Analysis — $ 3,750.00
  - Final Design Plans and Specifications — $ 20,000.00
  - Services During Construction — $ To Be Determined

  Phase A Total $ 26,000.00

- **Phase B**
  - Site Field Survey — $ 900.00
  - Preliminary Design, Hydraulic Analysis — $ 1,900.00
  - Final Design Plans and Specifications — $ 5,000.00
  - Services During Construction — $ To Be Determined
  - Structural design Sheet to include district Pre-cast structures and details — $ 2,400.00

  Phase B Total $ 10,200.00

- **Phase C**
  - Site Field Survey — $ 1,900.00
  - Preliminary Design, Hydraulic Analysis — $ 3,750.00
  - Final Design Plans and Specifications — $ 22,000.00
  - Services During Construction — $ To Be Determined
  - Structural design — $ 6,750.00

  Phase C Total $ 34,400.00

- **Titsink Turnout and Pipeline**
  - Site Field Survey — $ 1,500.00
  - Preliminary Design, Hydraulic Analysis — $ 1,000.00
  - Final Design Plans and Specifications — $ 12,000.00
  - Services During Construction — $ To Be Determined
  - Structural design — $ 6,000.00

  Phase C Total $ 20,500.00

TOTAL ALL PHASES = $91,100.00

Any additional work elements not included are considered Out of Scope services and additional cost to our proposal. GCE will carry the required insurance certificates for this project. If additional limits of coverage are required any and all costs associated will be billed to the project.

Schedule

GCE can complete the work within 120 working days from a notice to proceed based on the assumption that timely feedback is provided by the district for the preliminary submittal, and we can meet to finalize design plans and details as soon as possible.

Thank you for your consideration and please contact Randy Riley or me directly at 480-921-4080 if you have any questions or need additional information in support of this proposal.

GEORGE CAIRO ENGINEERING, INC.

George A. Cairo

George A. Cairo, P.E., D.WRE
Principal Engineer

By signature, I authorize the "Notice to Proceed" for work to be completed as described under the agreed Scope of Work.

Authorized Signature: ______________________________

Print Name: ______________________________

Title: ______________________ **Date:** ______________