JULY 28, 2022

BUREAU OF RECLAMATION

SUBMITTED TO:
BUREAU OF RECLAMATION
NOFO FUNDING OPPORTUNITY
NO. R23AS00008
WaterSMART GRANT:
WATER & ENERGY EFFICIENCY GRANTS
FOR FISCAL YEAR 2023

BWCDD DIVERSION INTAKE STRUCTURE MODERNIZATION & CANAL ENERGY SYSTEM (CES) PROJECT

SUBMITTED BY:
BUCKEYE WATER CONSERVATION & DRAINAGE DISTRICT
205 EAST ROOSEVELT AVENUE
BUCKEYE, AZ 85326

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1. TECHNICAL PROPOSAL

1.1. Executive Summary

This application is being submitted on 07/28/2022
Buckeye Water Conservation and Drainage District
205 East Roosevelt Avenue, Buckeye, AZ 85326,
Maricopa, Category A Applicant, Funding Group III

If NTP **January 2023**
Start **May 2023**
End **December 2025**

Founded in 1922, the Buckeye Water Conservation and Drainage District (BWCDD) operates and maintains 23 miles of the Buckeye Main Canal, 7.5 miles of the Main South Extension Canal, and 14 miles of drainage ditch. The BWCDD system includes 200 miles of lateral ditches, 9 drain wells, and 54 production wells. It encompasses about 22,000 acres and is located near the town of Buckeye, in the Buckeye Valley, which is in the western part of Maricopa County, Arizona. On average, the BWCDD diverts about 151,381 acre-feet of water per year and their water sources include surface water, treated effluent water, and groundwater. The current irrigation system was constructed in 1885 and is over 136 years old and consists primarily of easily eroded earthen canals and laterals with manual controls. This system is inefficient and prone to uncontrolled releases, spills, overflows, and requires constant overwatch and maintenance. Additionally, with the current controls on these main canals and laterals about 23% of excess water is typically diverted to meet the required demand. Also due to drought impacts on the Federal Hydro Energy Generation the District electrical power supply is at risk. The proposed **BWCDD Diversion Intake Structure Modernization and Canal Energy System (CES)** project will help to remedy these issues. Project objectives include modernization of the system river diversion to provide accurate, reliable, and steady diversions to meet demands as well as improve District and on-farm efficiencies and reduce spills. With the implementation of micro hydro power and canal solar, a considerable amount of renewable energy generation will be used to power the diversion installation and off-set pumping costs, while excess power can be made available for distribution.

This project is not located on a Federal facility. This project is divided into two phases. The first phase will modernize and upgrade the existing concrete diversion intake structure on the Gila River with a new concrete diversion structure with Rubicon Gates and SCADA controls. The project also includes a new sluicing structure to move and sluice sediment from the headwork gates and provide efficient diversion of river flows. In addition, the project includes about 600 lineal feet of concrete canal lining and a Canal Energy System (CES) that includes canal in-line micro hydropower and canal spanning solar panels in Phase

I. Phase II includes expansion of canal lining, the CES, modernizing flow control and turnout structures, SCADA, and a regulating reservoir to capture winter flows in the Gila River for reduced groundwater pumping during the growing season.

This Water and Energy Efficiency project is a priority to the BWCDD, and we hope to leverage funding from the WaterSMART program to help complete this project, meeting both BWCDD's and BOR's goals to conserve and better manage our water supply, offset energy use, and increase the efficiency of our system. BWCDD will accomplish the goals established for the WaterSMART program and President Biden's Executive Orders by leveraging funding to conserve and better manage our water resources and increase energy efficiency of our system by modernizing the existing diversion intake structure and integrating renewable energy production to power our groundwater wells and associated SCADA system. This further supports the Lower Colorado River Basin and local sub-basin drought resiliency making more efficient use of the City of Phoenix 91st Avenue effluent flows, surface, and groundwater. If awarded, the BWCDD plan is to perform project activities between January 2023 and December 2025. Construction activities will not start prior to May 2023.

1.2. Technical Project Description

Founded in 1922, the Buckeye Water Conservation and Drainage District (BWCDD) operates and maintains 23 miles of the Buckeye Main Canal, 7.5 miles of the Main South Extension Canal, and 14 miles of drainage ditch. The BWCDD system includes 200 miles of lateral ditches, 9 drain wells, and 54 production wells. It encompasses about 22,000 acres and is located near the town of Buckeye, in the Buckeye Valley in the western part of Maricopa County, Arizona. On average, the BWCDD diverts about 151,381 acre-feet of water per year and their water sources include surface water, treated effluent water, and groundwater. Our water supply includes 54 wells (43%), surface water from the confluence of Gila Rivers and smaller tributaries (Salt, Verde, Agua Fria Rivers) (39%) and the City of Phoenix Effluent Water and other effluent water (18%). The primary purpose of BWCDD is to deliver irrigation water to agricultural users and to relieve waterlogging within the District boundary. In addition, BWCDD provides irrigation to residential homes and construction water for development projects. BWCDD manages power distribution from purchase agreements with the Hoover Dam and the Southwest Public Power Agency to its agricultural and residential users.

The current irrigation system was constructed in 1885 and is over 136 years old and consists primarily of easily eroded earthen canals and laterals with manual controls. This system is inefficient and prone to uncontrolled releases, spills, overflows, and requires constant

overwatch and maintenance. Additionally, with the current controls on these main canals and laterals 23% of excess water is typically diverted, to meet the required demand. Also due to drought impacts on the Federal Hydro Energy Generation the District electrical power supply is at risk. The proposed **BWCDD Diversion Intake Structure Modernization and Canal Energy System (CES)** project will help to remedy these issues. Project objectives include modernization of the system river diversion to provide accurate and reliable steady diversions to meet demands and improve District and on-farm efficiencies and reduce spills. Renewable energy generation of about 1 megawatt will be used to power the diversion installation and off-set pumping cost with micro hydro power and canal solar, while excess power can be made available for distribution.

BWCDD in response to the current severe and extended drought affecting water and energy resources and risk to District viability has directly funded a System Optimization Review (SOR) study, in line with the approaches and requirements in the Reclamation funded SOR studies. The SOR for BWCDD has been initiated and initial priorities and goals established. This project is identified as a high priority with immediate action required. Again, the District has the support of the Board and the local growers. An example of this is not only internally funding the SOR but also funding the preliminary study and design of the diversion structure modernization to a 15 percent design to evaluate alternatives and develop schematic design to determine budgets for design and construction, which is the basis for this grant application. This is the **third WaterSMART Grant application** to Reclamation (previous grants submitted were not awarded) and a critical one to the future of BWCDD.

This project is divided into two phases. The first phase and basis for this grant will modernize and upgrade the existing concrete diversion intake structure on the Gila River with a new reinforced concrete diversion structure with Rubicon Gates and SCADA controls. The new structure will be engineered to have proper sweeping velocities for debris, multiple gates to provide flexibility to divert water under varying river conditions, and all necessary safety features. The Rubicon gates will accurately measure and control the diversion rate for steady flows into the BWCDD canal system and the gates will be operated to reject sediment flows during high flow river events. Steady, and timely inflow to the main canal system will result in less flow variations currently experienced due the manual controls of the current diversion and the diurnal nature of the effluent flows from the 91st Avenue Treatment Plant. Steady flows and level canal pools will result in less system spills, along with improved on-farm irrigation efficiencies. Furthermore, the reliability of the system will be improved during monsoonal events. Monsoon storms make the diversion structure access difficult, unsafe, and at times not accessible. With new modernized

structures and SCADA controls District staff operationally will be able to monitor and control the gates and close them remotely, keeping District personnel safe during a major event.

The project also includes a new reinforced concrete sluicing structure adjacent to the diversion structure to release and sluice sediment from the headwork gates diversion area and provide efficient diversion of river flows. With new modernized structures and SCADA controls BWCDD operationally will be able to monitor and control the sluicing gate and cycle it between open and close remotely to maintain a good hydraulic intake regime, while District personnel stay safe during a major event.

The project also includes renewable energy generation with a **Canal Energy System (CES)**. The existing Main Canal below the diversion is currently earthen, and to construct the planned CES about 600 lineal feet of canal will be concrete lined. The concrete cross section and profile will be optimized for a velocity profile and cross section top width to integrate the renewable energy components. The CES includes canal in-line micro hydropower and canal spanning solar panels in Phase I. Phase II includes expansion of canal lining, the CES, modernizing flow control and turnout structures, SCADA, and an upstream regulating reservoir to capture winter flows in the Gila River for reduced groundwater pumping during the growing season.

The Canal Spanning Solar Panels (CSSP) system of major galvanized steel frame sections mounted with solar panels will cover a length of about 600 lineal feet of the canal. The solar array will include two hinged solar frames on either end of the Main Canal for operation and maintenance access all others will be fixed with pin connections and removable for access to the canal. There are 18 frames, each with 56 solar panels connected to 9 inverters that are networked to tie-into the APS powerlines for direct District use. All major frames will be mounted onto drilled concrete shafts one at each corner of a major frame installation. Covering the existing canal with the CSSP systems provides increased sustainable energy by utilizing the cooling effects of water to boost photovoltaic solar power generation while reducing evaporation by shading canal water. Algae growth rates are linked to sun exposure and water temperature, and this project will be reducing both factors, yielding a reduction in algae growth reducing O&M cost and improving food safety. Additionally, CSSP systems contribute to a distributed power system and can provide power for pumping and irrigation water filtration without necessitating the transport of energy over large distances.

The proposed CES Renewable Energy Project will benefit the District's efforts to **1) Conserve scarce water resources by reducing canal water evaporation and provide water savings from thermoelectric power generation offset**, **2) will partially offset BWCDD reliance on**

non-renewable energy by creating BWCDD driven renewable energy, and **other benefits** such as improve water quality by reducing canal exposure to sunlight and dust to help with the canal ecological system and food safety, and create future opportunity for BWCDD to utilize renewable energy to power electric vehicles for operation and maintenance of the canal system. The benefits of the solar-over-canal project include the BWCDD, surrounding community, along with the agricultural customer base, and the Lower Colorado River Region.

In addition to solar power the project includes the installation of micro hydrokinetic turbines that will harnesses the free-flowing energy in the Main Canal irrigation canals and generate clean, renewable hydropower energy. Energy from the micro hydrokinetic turbines provide a reliable source of energy that also helps to mitigate concerns around the Hoover Powerplant's continued ability to provide power to offset BWCDD's energy demand. This provides a local and distributed means of providing power to the district, while diversifying its power supply sources. Based on BWCDD's historical flow information these turbines will be able to provide more stable baseload power for the majority of the year, balancing the more cyclical nature of our planned daily solar production. The installation of micro hydrokinetic turbines is specific to the BWCDD Main Canal and bypasses FERC licensing for conventional hydropower by installing within an artificial conduit.

This Water and Energy Efficiency project is a priority to the BWCDD, and we hope to leverage funding from the WaterSMART program to help complete this project, meeting both BWCDD's and BOR's goals to conserve and better manage our water supply, offset energy use, and increase the efficiency of our system while supporting drought resiliency in the Colorado River basin. To better understand the BWCDD and our needs, a more detailed overview of the District is provided in the Appendix.

If awarded, BWCDD plans to complete this project within **2.5 years (May 2023 – December 2025, depending on the NTP date)**. Construction activities will not start prior to May 2023.

Engineering/Design Work Required for Project *Allows for time for review*

This technical support will be performed by George Cairo Engineering, Inc. (GCE, Cairo), Rubicon Systems Australia Pty Ltd (Rubicon), Emrgy, and Solar River – both have provided professional services for installation of multiple projects for BWCDD that included automated Rubicon gates.

- Planning of System Improvements
- Design and Fabrication of Rubicon Gate, Controls and Framework
- Design and Fabrication of hydro turbines
- Design and Fabrication of solar arrays

- Preliminary and Final Design of Concrete Structures and Concrete Structures Modifications and Appurtenances
- Order Long Lead Item, may need 16 weeks lead time for fabrication

Pre-Construction/Site Preparation for Project

- Time is of the essence for water outage work, try to complete all activities to reduce Dry-Up time.
- On-site support/final planning and safety/COVID 19 meetings
- Begin Safe Dry-down to prevent canal liner damage, include notification to producers/growers
- Mobilization for project
- Demolition of structure as needed
- Order Additional Concrete

Construction and Installation

- Implementation of all safety measures and COVID 19 requirements
- Install nuisance water dirt plugs and small temporary pumps
- Removal of Manual Gate and Demolition/Removal of any required structure elements
- Continue to Coordinate/schedule with affected water user(s)
- Final Site Preparation
- Construct diversion intake structure
- Gate Installation
- Integration of a radio telemetry network and SCADA software to allow the remote operation and control of these gates and the control and measurement
- Tune controllers to allow these gates to cooperate to match supplied flow to downstream demand
- Concrete line or shotcrete new concrete channel
- Install hydro turbines
- Install solar arrays

Post-Construction

Installation/testing of automation systems/controls
Commission gates and certify accurate measurement and operation
Commission electrical system and tie-into APS grid
Lessons learned sessions after project construction

Closeout/Reports

As required (Progress Reports - Semi-Annual)
As-build final installation
Final report with documentation

1.3. Project Location

The project site is located within the historical boundaries of the town of Buckeye, in Maricopa County, Arizona, and nearby the Arizona State Route 85 Corridor. It is approximately .7 miles northwest downstream of the Gila River and Agua Fria River confluence.

Existing Diversion Structure	Latitude: 33°23'32.35"N	Longitude: 112°22'08.65"W
600’ Canal (Beginning)	Latitude: 33°23'32.35"N	Longitude: 112°22'08.65"W
600’ Canal (End)	Latitude: 33°23'35.03"N	Longitude: 112°22'26.40"W
Proposed Regulating Reservoir	Latitude: 33°23'37.63"N	Longitude: 112°21'44.09"W

The following is a vicinity map and project area map. More information such as shapefile, KMZ, and AutoCAD files can be provided as needed.

FIGURE 1. – VICINITY MAP (State)

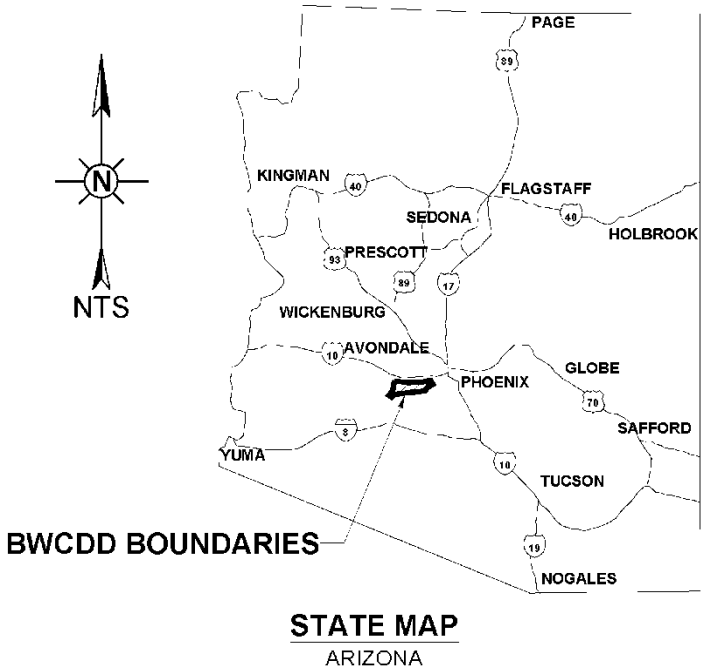


FIGURE 2 – VICINITY MAP (Roadway)

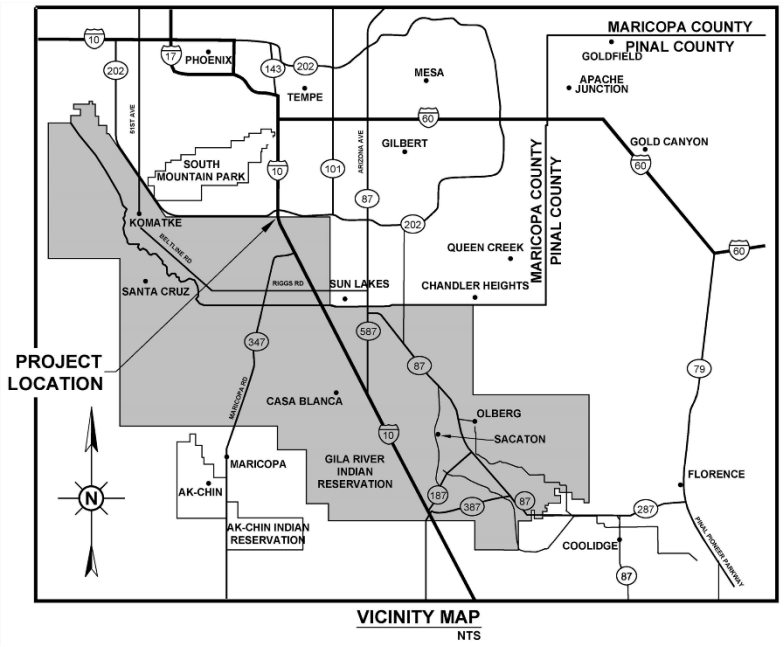
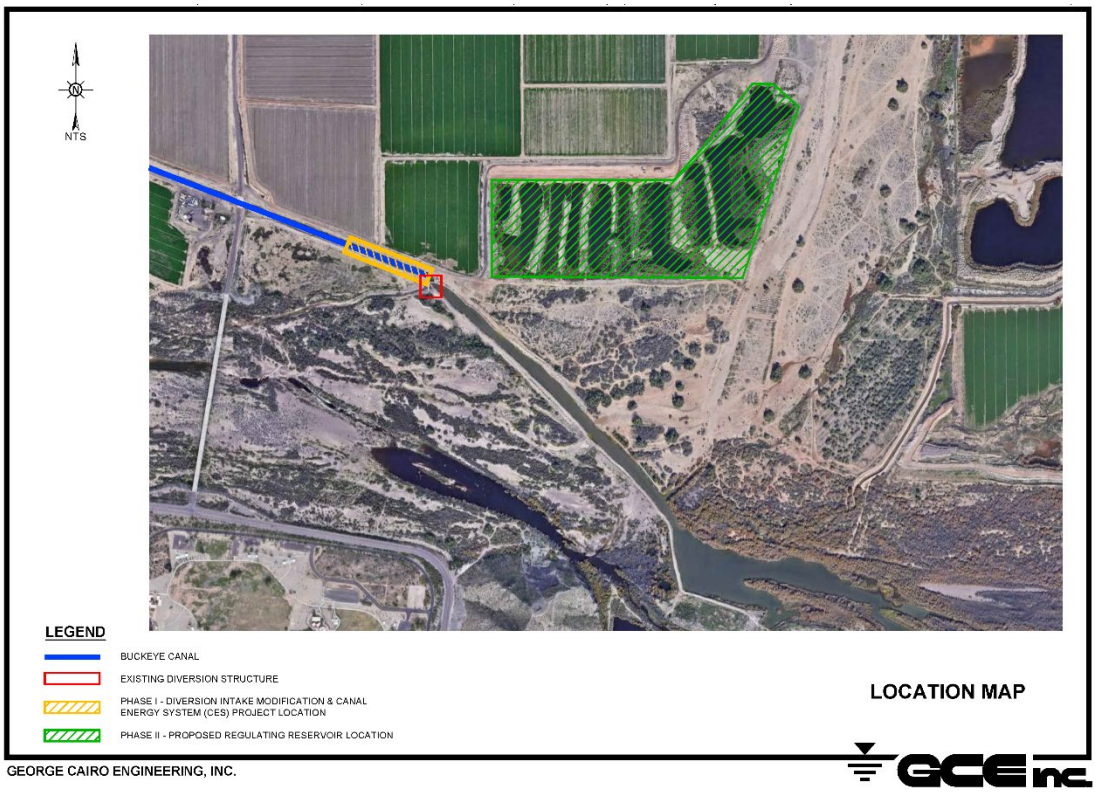


FIGURE 3 – PROJECT LOCATION MAP



1.4. Evaluation Criteria

Evaluation Criterion A – Quantifiable Water Savings

1. Describe the amount of estimated water savings. For projects that conserve water, please state the estimated amount of water expected to be conserved (in acre-feet per year) as a direct result of this project.

Please include a specific quantifiable water savings estimate; do not include a range of potential water savings.

Water Conservation and Drainage District manually operates an open canal gravity supply network which based on the average for the last 5 years of record diverts approximately 151,381 ac-ft per growing season to serve 22,000 acres. The system delivers 116,320 ac-ft to farms, and there is presently about a 35,030 ac-ft gap in water supply losses, which are not recorded and billed as deliveries. Every time water is delivered to a farm, the inadequacy of this manually controlled system is demonstrated by requiring an on-site person to constantly adjust flow rates to prevent flooding/overflows/erosion/water loss upstream. In addition to water impacts the labor cost to BWCDD is substantial. The

proposed project will further modernize the BWCDD and save resources while being better stewards of the available natural resources. The modernization of the diversion structure will result in the savings of about **16,639 ac-ft** to 24,959 ac-ft of water annually, or about **831,950 ac-ft** to 1,247,943 ac-feet over the 50-year life of the structure. The larger value will be accomplished with other planned modernization improvements.

The canal spanning solar portion of this project as a direct result of funding and construction will conserve water by a reduction in evaporation and thermo-electric water consumption. In the first phase of this multi-phased project, the initial 600 linear feet of the Buckeye Main Canal from the diversion downstream will be covered with solar panels. The installation would reduce evaporation in that reach of canal by an estimated **3.46 ac-ft** annually. Ultimately, the BWCDD goal is to cover enough of the remaining miles of Main Canal to offset all pumping costs, and those installations would also reduce evaporation in the canal system annually.

The thermo-electric water consumption offset due to the solar installations is represented by the amount of water that would be consumed in generating an amount of energy from the APS energy mix equivalent to what could be generated by the Canal-Spanning Solar Panel (CSSP) installation. We estimate that energy generated from the Phase I installation will directly offset **11.05 ac-ft** of water consumption, due to the APS energy mix annually.

The total water savings annually will be up to **24,974 ac-ft annually** and **1,248,700 ac-ft over the 50-year life.**

2. **Describe current losses. Please explain where the water that will be conserved is currently going and how it is being used. Consider the following:**
   - **Explain where current losses are going (e.g., back to the stream, spilled at the end of the ditch, seeping into the ground)?**

     The system losses include evaporative losses to the atmosphere, and seepage losses into the ground beneath the predominately earthen conveyance channels. Operational spills outfall to local ephemeral wash areas, and open desert areas. Also, excess flows delivered to water users create over application of irrigation and excess field runoff spills.

   - **If known, please explain how current losses are being used. For example, are current losses returning to the system for use by others? Are current losses entering an impaired groundwater table becoming unsuitable for future use?**
     Currently, losses outfall to local ephemeral wash areas, and open desert areas typically lost to evaporation or evapotranspiration from weeds or other vegetation. During major

outfalls or ones that coincide with weather events there may be enough flow that it ultimately drains to the Gila River alluvial fan areas or the channel. The seepage losses are entering an impaired shallow portion of the groundwater table becoming unsuitable for future use and not used directly.

- **Are there any known benefits associated with where the current losses are going? For example, is seepage water providing additional habitat for fish or animal species?**
  The water lost through terminal spills may eventually make it to the river helping the river arid environment, but most of the time, spilled water is lost to seepage and unsuitable for future use before it gets to the river or being used directly by weeds and other native vegetation. The water has some environmental benefits in that while it is actively spilling it can be used by local wildlife and plant growth of large plants like native trees that sequester carbon and provide habitat for native species.

3. **Describe the support/documentation of estimated water savings: Please provide sufficient detail supporting how the estimate was determined, including all supporting calculations. Note: projects that do not provide sufficient supporting detail/calculations may not receive credit under this section. Please be sure to consider the questions associated with your project type (listed below) when determining the estimated water savings, along with the necessary support needed for a full review of your proposal.**
   The annual water savings values estimated were calculated using our data collected by our ditch-riders (unless otherwise noted) and flow measurement data from Salt River Project (SRP). 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). Available District records and historical data base values including diversions, delivery records and energy usage conversions.

4. **Please address the following questions according to the type of infrastructure improvement you are proposing for funding.**
   Canal Lining:
   a. **How has the estimated average annual water savings that will result from the project been determined?**
      BWCDD manually operates an open canal gravity supply network. Flow rates are measured at the head gate to the laterals which serves the customers. Run times, start, and stop times are on the ditch rider's inspection record. Volumes that include surface water diversions and well inputs are computed and transferred to a water card by the ditch rider which based on the average for the last 5 years of record diverts

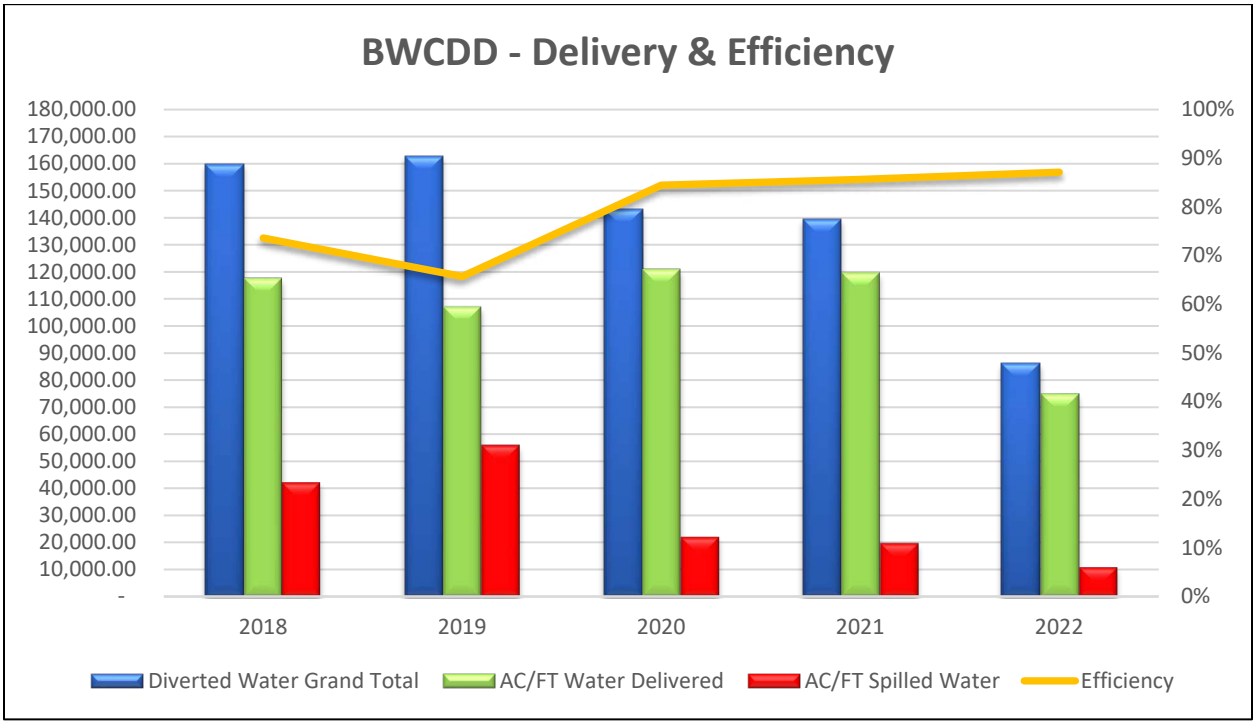
approximately 151,381 ac-ft per growing season to serve 22,000 acres. The system delivers 116,320 ac-ft to farms, and there is presently about an 35,030 ac-ft gap in water supply losses, which are not recorded and billed as deliveries.

Included in overall system losses are the system structural deficit that includes evaporation losses and seepage losses. These were estimated for the canal system to be 5 percent overall including 2 percent for evaporation and 3 percent for seepage based on the overall system losses of 23 percent, this leaves 18 percent of diversions in the Buckeye Main Canal as savings to be accomplished by this project. Design evaluation of the diversion modernization determined that about 50 to 75% of the system losses can be conserved. Based on these values the modernization of the diversion structure will result in the savings of about **16,639 ac-feet** to 24,959 ac-feet of water annually, or about **831,950 ac-feet** to 1,247,943 ac-feet over the 50-year life of the structure. The larger value will be accomplished with other planned modernization improvements.

Table 1. BWCDD 2018 – YTD Delivery Efficiency Table

	2018	2019	2020	2021	2022
Diverted Water Grand Total	159,870.43	162,896.39	143,161.35	139,593.62	86,120.51
AC/FT Water Delivered	117,672.82	107,046.22	120,969.03	119,593.62	75,046.24
AC/FT Spilled Water	42,197.61	55,850.17	22,192.32	19,878.60	11,074.27
Efficiency	74%	66%	84%	86%	87%

Figure 4. BWCDD 2018 – YTD Delivery Efficiency Graph



b. How have average annual canal seepage losses been determined? Have ponding and/or inflow/outflow tests been conducted to determine seepage rates under varying conditions?

Yes. Average annual seepage losses are based on both field observations and historical performance records of the canal conveyance in addition to field validation. Ponding test in various areas of the district including the Main Canal have been completed under varying conditions and times of year to determine an annual average value.

c. What are expected post-project seepage/leakage losses and how were these estimates determined?

The post project seepage/leakage losses for the new concrete lined reach are assumed to be about zero based on new shotcrete lining with expansion and contraction joints, and any shrinkage cracks sealed with an approved sealant.

d. What are the anticipated annual transit loss reductions in terms of acre-feet per mile for the overall project and for each section of canal included in the project?

There is a total of 600 lineal feet of canal concrete lined in this project. The post project seepage/leakage losses for the new concrete lined reach are assumed to be about zero based on new shotcrete lining with expansion and contraction joints, and any shrinkage cracks sealed with an approved sealant.

Evaporation losses in this reach of canal will be reduced in about half which is about 3.5 feet of depth over the 600-feet of Canal that translates into about 3.46 ac-ft/year.

e. How will actual canal loss seepage reductions be verified?

A canal ponding test will be made on the new concrete lined with sealed joints reach of canal at varying depths. Evaporation will be accounted for with weather pan evaporation data from the nearest official weather station.

f. Include detailed description of the materials being used.

Canal lining will be 4-inches thick with fibermesh reinforcement placed to Reclamation specifications. Canal lining will be sealed with CCS 1500 a strong bonding, flexible, and durable joint sealant. Testing will involve watertight plugs, water level sensors, and data recording all following the standard practice for lined canal ponding test.

Irrigation Flow Measurement:

a. How have average annual water savings estimates been determined? Please provide all relevant calculations, assumptions, and supporting data.

BWCDD manually operates an open canal gravity supply network. Flow rates are measured at the head gate to the laterals which serves the customers. Run times, start, and stop times are on the ditch rider's inspection record. Volumes that include surface water diversions and well inputs are computed and transferred to a water card by the ditch rider which based on the average for the last 5 years of record diverts approximately 151,381 ac-ft per growing season to serve 22,000 acres. The system delivers 116,320 ac-ft to farms, and there is presently about an 35,030 ac-ft gap in water supply losses, which are not recorded and billed as deliveries.

Included in overall system losses are the system structural deficit that includes evaporation losses and seepage losses. These were estimated for the canal system to be 5 percent overall including 2 percent for evaporation and 3 percent for seepage based on the overall system losses of 23 percent, this leaves 18 percent of diversions in the Buckeye Main Canal as savings to be accomplished by this project. Design evaluation of the diversion modernization determined that about 50 to 75% of the system losses can be conserved. Based on these values the modernization of the diversion structure will result in the savings of about **16,639 ac-feet** to 24,959 ac-feet of water annually, or about **831,950 ac-feet** to 1,247,943 ac-feet over the 50-year life of the structure. The larger value will be accomplished with other planned modernization improvements.

b. Have current operational losses been determined? If water savings are based on a reduction of spills, please provide support for the amount of water currently being lost to spills.

The current operational losses values estimated 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 if so, what is the accuracy of existing devices? How has the existing measurement accuracy been established?

Flow measurements of water diverted from the Gila River through the intake structure are currently calculated at the downstream flow measurement structure manually, located about 1,500 downstream of the diversion. The Salt River Project (SRP) has been responsible for tracking and recording the flow data and providing it to the District as needed. The calibrated accuracy of the installation is not known but typically these critical depth in channel flume devices have an accuracy of plus or minus 2 percent in ideal conditions.

d. Provide detailed descriptions of all proposed flow measurement devices, including accuracy and the basis for the accuracy.

Proposed flow measurement will be done through the diversion flow control gates themselves. These devices are modern Rubicon gates to be used to control and simultaneously measure water levels or flows. The Rubicon Flumegate is an automated overshot control gate with integrated flow calculation and control software, ultrasonic water level sensors, robust gate position cables, it addresses approach velocity adjustments in the calculations and uses the appropriate weir equation and coefficient based on the position of the gate and hydraulic flow regime. Measurements are also corrected for hydraulic partially and fully drowned conditions. In proper installations these gates have been lab tested and certified to measure within plus or minus 2.5 percent accuracy or 97.5 percent flow accuracy.

e. Will annual farm delivery volumes be reduced by more efficient and timely deliveries? If so, how has this reduction been estimated?

YES, currently the system lateral diversion intakes and on-farm delivery gates are manually opened by District zanjeros for desired delivery flow rates and typically not adjusted during a delivery set therefore, fluctuating water levels in the Buckeye Main Canal will vary delivery rates to water users. Varying delivery rates to farms can result in application inefficiencies. While more efficient and timely steady water deliveries will yield higher on farm delivery efficiencies with less on-farm spills improving on-farm water usage efficiencies.

Estimates of water savings is based upon our current losses from spills, stops and restarts, overflows, and increased delivery durations due to less than optimum water levels/elevations and multiple users.

f. How will actual water savings be verified upon completion of the project?

BWCDD will put a data collection and management program in place and use the data collected with the new gates to compare annual water delivery volumes over the previous 10-year period with post-project water delivery volumes. Also, this information will be used in the future with NRCS conducted farmer irrigation evaluations to determine application efficiencies of individual irrigation sets and irrigation seasons for local farms post improvements.

Evaluation Criterion B – Renewable Energy

Subcriterion No. B.1: Implementing Renewable Energy Projects Related to Water Management and Delivery

Describe the amount of energy capacity. For projects that implement renewable energy systems, state the estimated amount of capacity (in kilowatts) of the system. Please provide sufficient detail supporting the stated estimate, including all calculations in support of the estimate.

Canal Energy System – Canal Spanning Solar Energy Generation

Using the Tectonicus SAM software we have calculated a nameplate power capacity for the Phase I installation of 876 kW, determined by the number and type of PV modules in the array.

It should be noted that the installation will create a micro-climate in the annular space between the canal water surface and panel arrays that will cool the panels. This cooling will increase the efficiency and generation of power, this additional power is not included in these calculations presented below. Suspending solar panels over water has the potential to boost solar performance by reducing the temperature of the panels. Studies on floating solar installations show that solar over bodies of water, similar to this CSSP project have shown performance ratio improvements ranging from +2.0% (Oliveira-Pinto & Stokkermans, 2020) to 7.53% (Goswami & Sadhu, 2021).

The installation will utilize 1,036 Zshine Mono Double Glass ZXM7-SHLD144 Series 540-watt panels, which yields a nameplate power generation of 559.44 kilowatts.

$$1{,}036\ Panels \times\ 540\ watts\ =\ 559.44\ Total\ watts$$

The installation will also have 9 Chint Power Systems CPS SCA60KTL-DO/US-480 60-kilowatt string inverters to connect the solar arrays to the local grid. Each inverter will be connected to 8 strings of 14 panels, each inverter collecting energy from a total of 112 solar panels. The panels will be mounted in groups of 56 to steel structures suspending them above the canal, with 18 of these structures in total. Two of each structure will share the same inverter. The structures will hold the panels at a 5-degree tilt, maximizing the panels' exposure to sunlight as well as the number of panels above the canal. The location and orientation of the panels give them a solar azimuth of 111, and the ground coverage ratio for the installation is 0.3.

Canal Energy System – Canal Hydropower Energy Generation

Based on canal geometry, flow rate, and duration information provided by BWCDD Emrgy conducted an analysis of the available hydropower capacity of the BWCDD Main Canal in the project area. This stretch of Main Canal is a 1,600-foot section that is currently earthen-lined, and the project will concrete line and incorporate a CES with hydropower in a reach of 600-feet. Lining the canal would provide not only water savings benefits but also increase the velocity of the canal, resulting in higher in-channel power output.

Manning's Equation is used to calculate flow depth and velocity from the canal geometry and flow values provided by BWCDD. Historical flow rates were analyzed from 2018 - 2021 to obtain a variety of flow conditions. Based on the output from Manning's Equation and geometric properties of the canal a turbine array design was completed to optimize power production. Power produced from the turbines is calculated using the hydrokinetic equation, using inputs from Manning's Equation and specific coefficients relating to the efficiency and velocity of the water as it interacts with the micro hydrokinetic turbines. These coefficients are based on in-lab testing in 2017 and 2022 at Alden Laboratories, as well as actively-operating systems in several states in the U.S. and international locations.

At full build out of the 1,500-foot reach of canal and a design flow of 230 cfs, the average flow rate from 2018 - 2021, the Emrgy turbines would produce an array power of 44.4 kilowatts (kW). Using the maximum flow of 245 cfs and minimum flow of 210 cfs from 2018 - 2021, the array power would range between 47.2 and 40.2 kW, respectively. However, this is a phased project and the initial phase build out of 600-foot reach of canal would range between 18.9 and 16.08 kW, respectively

Describe the amount of energy generated. For projects that implement renewable energy systems, state the estimated amount of energy that the system will generate (in kilowatt

hours per year). Please provide sufficient detail supporting the stated estimate, including all calculations in support of the estimate. Please explain how the power generated as a result of this project will be used, including any existing or planned agreements and infrastructure.

Canal Energy System – Canal Spanning Solar Energy Generation

Our NREL SAM model has calculated an *annual* energy generation for the installation of 962,223 kilowatt hours for the first year, determined by inputs specific to the system and its site including inverter and panel models, panel tilt, panel self-shading, site latitude & longitude, and recorded weather patterns at the site over the course of several years. NREL SAM is the industry standard software for modeling solar energy plant generation, developed by the Berkeley National Labs under direction of the Department of Energy. The model uses a shovel-ready engineered design that was developed in 2022 using currently available PV panels, Inverters, and steel sections. We input in generation specifications as to the specific panels, inverters, as well as losses and inefficiencies due to local weather patterns, local soiling rates, wiring transmission rates.

The local standard power loss to soiling is 1.75% loss of the solar irradiance on the panels but is cleaned and losses diminished naturally during rain events. Electric inefficiency due to diodes and connections required for panel installation is 0.5% of the generated power. DC wiring causes loss of 2% of the generated power and the DC optimizer causes an additional 1% loss. AC wiring loses another 1% of the total generated power. All these inefficiencies are considered and are normal in the NREL SAM model that determined the annual power generation.

BWCDD is already tied into APS distributed control power system and has a contractual agreement related to power usage and renewable energy generation and usage.

Canal Energy System – Canal Hydropower Energy Generation

Based on outputs from Manning's Equation, the hydrokinetic equation, and the Emrgy localized design optimization for the BWCDD annual energy production can be calculated. The annual renewable energy produced would on average equal 142,790.4 kilowatt-hours per year (kWh/yr) based on the average flow from 2018 – 2021 and an installation of 8 turbines in a total of 4 Precast Units.

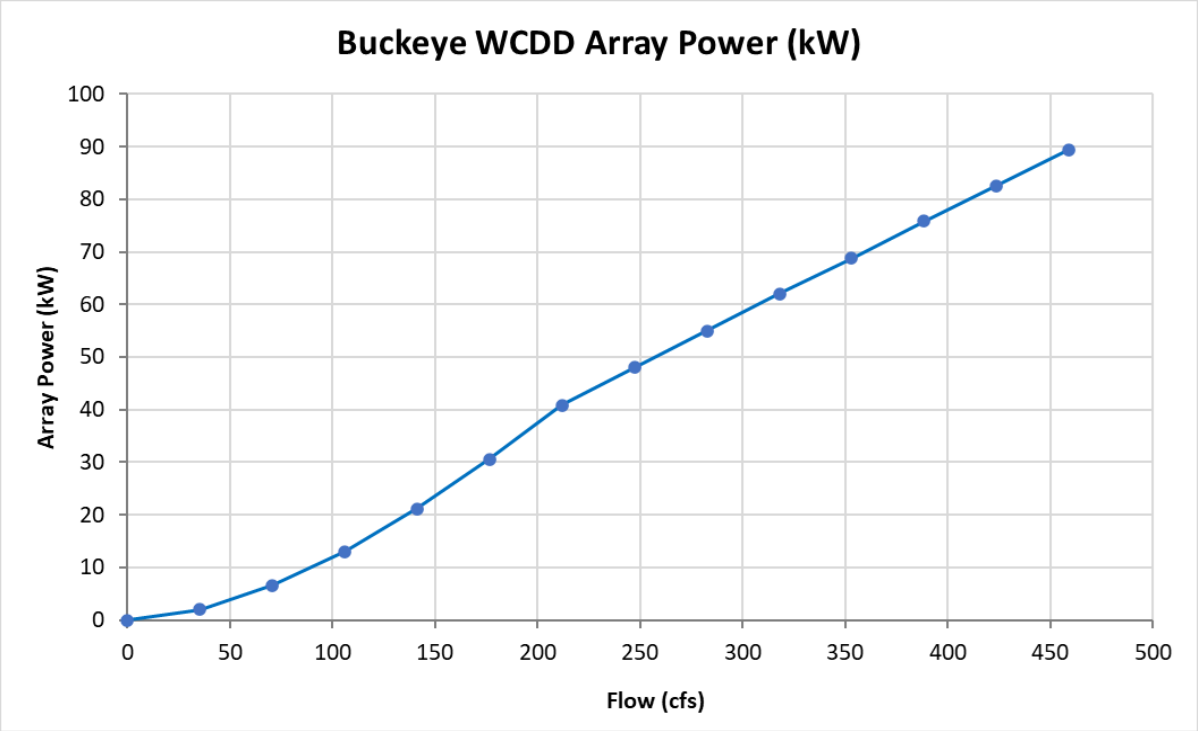
Table 2. EMRGY Turbine Array Sumary	
Number of Turbines	8
Turbine Generator Size (kW)	5
Number of PCUs	4
Inverter Capacity (kW)	4
Total Array Capacity (kW)	40
Annual Energy Production (AVG) (kWh)	142,790.40
Annual Energy Production (Min) (kWh)	129,283.20
Annual Energy Production (Max) (kWh)	151,795.20
Capacity Factor (Avg)	24.60%

The system with a full array over 1,500-feet of canal would produce on average about 356,796 kWh/yr. The total for both phases meaning the initial 600 feet of canal and additional 1,100 for the grand total of 1,500 and 20 turbines is summarized below.

Table 3. EMRGY Turbine Array Summary

Number of Turbines	20
Turbine Generator Size (kW)	5
Number of PCUs	10
Inverter Capacity (kW)	10
Total Array Capacity (kW)	100
Annual Energy Production (Avg) (kWh)	356,976
Annual Energy Production (Min) (kWh)	323,208
Annual Energy Production (Max) (kWh)	379,488
Capacity Factor (Avg)	41%

Figure 5. EMRGY Turbine Power Curve Graph



Describe any other benefits of the renewable energy project. Please describe and provide sufficient detail on any additional benefits expected to result from the renewable energy project, including:

- **How the system will combat/offset the impacts of climate change, including an expected reduction in greenhouse gas emissions?**

  Due to the impending drought and climate change and the lowering water levels in the Colorado River hydro generation facilities are losing capacity with hydro recovery being dependent upon many factors. This project will help to offset the energy demand from the Buckeye Water Conservation and Drainage District on the Hoover Dam hydro energy generation contractual demands. In addition, renewable energy from the project will help reduce greenhouse emissions.

Source	Coal	Oil	Natural gas	Nuclear	Hydro-electric: conven-tional	Hydro-electric: pumped -storage	Solar photo-voltaic	Total
2021 Net Gen	14,301	43	33,776	31,630	5,817	90	691	86,348

Table 4. Net energy generation for electric utilities by source in Arizona in 2021 (thousand MWH).[1]

BWCCD procures its power through SPPA (Southwest Public Power Agency) which in turn gets its power largely from a mix of sources within Arizona. According to the EIA, in 2021, electric utilities in Arizona generated 86,348,000 MWh, of which about 39.12% was generated from natural gas, 16.56% from coal, and 0.05% from oil (Table 6) The rest (44.27%) was generated from sources that do not emit greenhouse gasses.

Source	Coal	Natural Gas	Oil
CO_2 emission rate (pounds/kWh)	2.23	0.91	2.13
CO_2 emission rate (metric tons/MWh) (rounded to two decimal places)	1.01	0.41	0.97

Table 5. CO_2 emission rate for U.S. electric utility and independent power electricity generation, by source, in 2020.[2]

We can calculate the CO_2 emission rate of the average MWh generated by electric utilities in Arizona by calculating the average CO_2 emission rate of those utilities' energy sources, weighted by the percentage of Arizona's total energy generation by electric utilities that each source represents.

Source	Coal	Natural gas	Oil	Other
Share of total Energy	.1656	.3912	0.0005	.4427

[1] *Electricity Data Browser*. (n.d.-b). U.S. Energy Information Administration. Retrieved July 27, 2022, from https://www.eia.gov/electricity/data/browser/#/topic/0?agg=2,0,1&fuel=vvvvu&geo=0000000001&sec=8&linechart=%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E%7E&freq=A&start=2001&end=2021&ctype=linechart<ype=pin&rtype=s&pin=&rse=0&maptype=0

[2] *Frequently Asked Questions (FAQs): How much carbon dioxide is produced per kilowatthour of U.S. electricity generation?* (n.d.). U.S. Energy Information Administration. Retrieved July 27, 2022, from https://www.eia.gov/tools/faqs/faq.php?id=74&t=11

generation by electric utilities in AZ (%/100)				
CO_2 emission rate (metric tons/MWh)	1.01	0.41	0.97	0

Weighted average CO_2 emission rate (metric tons/MWh)	0.33

Table 6. Calculation of CO_2 emission rate of the average MWh generated by electric utilities in Arizona.

Based on our modeled annual energy output of 962,223 kWh for the CSSP solar installation (equivalent to 962.223 MWh), the energy generation from this installation will offset:

$$CO_2\ emission\ offset = Energy\ generated\ by\ CSSP\ (MWh/year) * AZ\ electric\ utility\ energy\ mix\ average\ CO_2\ emission\ rate\ (metric\ tons/MWh)$$
$$962.223\ MWh/year * 0.33\ \boldsymbol{metric\ tons/MWh} \simeq \mathbf{317.53}\ \boldsymbol{metric\ tons/year}$$

We calculate that the CSSP component of the CEP will offset 317.53 metric tons of CO_2 emissions annually, represented by the amount of CO_2 that would be emitted on average by generating that energy with Arizona's e energy mix. Note these totals are only for the solar portion of this project and do not include the energy off-set from the hydro power, if desired we can calculate and provide for consideration.

- **Expected environmental benefits of the renewable energy system.**

  Studies have shown that by shading and reducing light and solar radiation availability to algae reduces their growth rate (Hunter, 2007; Singh & Singh, 2015). Reduced growth of algae would reduce both fouling of the irrigation water a major issue associated with food safety and maintenance costs to manage and remove algae.

  Additionally, utilizing the available space above canals removes the need to retire agricultural land or clear undeveloped land to produce solar power. A study by NREL (Ong et. al., 2013) has found that, on average, land-based solar requires 7.9 acres of land per MW of capacity. We estimate the combined power capacity of installations as 559.44 kW, or

about 0.56 MW. To achieve that power capacity, land-based solar panels would have to occupy:

$$0.56\ MW * 7.9\ acres/MW \simeq 4.4\ acres$$

Unlike conventional hydropower plants, the placement of micro hydrokinetic turbines in artificial conduits allows for hydro-based power generation without affecting flows in the adjacent Gila River or its wildlife habitat. The proposed micro hydrokinetic turbines also emit no emissions and reduce dependency on other fossil fuel-based power, which are more sensitive to economic and geopolitical events. The renewable green power generation is driven by BWCDD existing canal operations.

- **Any expected reduction in the use of energy currently supplied through a Reclamation project.**

  Yes. BWCDD obtains their electrical energy from APS that currently obtains power from the Federal Hydro Power System via a Reclamation project. A stated goal of this project is to use the new generated green energy to directly off-set groundwater pumping for irrigation with BWCDD. The need to pump groundwater is partially due to regional and statewide DCP support of the drought and mitigation actions that allow additional water to remain in Lake Mead, therefore this project will help BWCDD with some of the ramifications of supporting all the users of the Colorado River water supply system. The project will offload a little less than a MW from the Reclamation power load which will be from a combination of solar and hydro power.

- **Anticipated benefits to other sectors/entities.**

  With large power consumers currently in development in the greater Phoenix area, BWCDD may also have the option to have power generated within the canal to be transmitted to these large consumers, such as data centers. Overall, the production by the turbines will support APS as they work to meet increasing energy demand stemmed by local population growth in the greater Buckeye and Phoenix area.

  Reductions in demand will also reduce the load on the Federal Hydro Power System affected by the drought. Reclamation is faced with several challenges associated with the reduced power generation and need to meet contractual requirements including those for Indian Tribes regionally. Again, this project will help and can be used as an example of direct benefit to others.

- **Expected water needs, if any, of the system.**

The solar portion of this project installation is designed to have a 5-degree tilt to the panels which is adequate for mitigating dust accumulation impacts, therefore there is no water required to clean or maintain the system.

Coupled with the energy being harnessed by the free-flowing energy within irrigation Main Canal, there is no further water needed beyond what would otherwise be diverted through the headgate of the BWCDD Main Canal. The canals are a non-consumptive addition to the waterways in which they operate.

Subcriterion No. B.2: Increasing Energy Efficiency in Water Management

Describe any energy efficiencies that are expected to result from implementation of the water conservation or water efficiency project.

- **If quantifiable energy savings is expected to result from the project, please provide sufficient details and supporting calculations.**

  Yes, and the energy savings associated with water conservation are quantifiable. Water conserved will result in a direct proportional amount of reduced groundwater use and associated pumping and energy use. These reductions in demand will also reduce the load on the Federal Hydro Power System affected by the drought.

  Based on these values the modernization of the diversion structure will result in the savings of about **16,639 ac-feet** to 24,959 ac-feet of water annually, or about **831,950 ac-feet** to 1,247,943 ac-feet over the 50-year life of the structure. The larger value will be accomplished with other planned modernization improvements.

  Groundwater pumping accounts for about 56% of the water supply therefore at a cost of about $9.76 dollars per acre foot this results in a reduction of energy consumption of about $90,942 annually to pump 9317.8 ac-feet, or about $4.5 million over the life of the diversion.

- **How will the energy efficiency improvement combat/offset the impacts of climate change, including an expected reduction in greenhouse gas emissions.**

  Water conservation and SCADA controls will require less man hours on the canal banks for operation and maintenance. This results in less vehicular travel time hours on the canal banks and a reduction in greenhouse gas emissions. The greenhouse gas emissions from a gallon of gasoline are about 8,887 grams CO_2/ gallon. BWCDD zanjeros (irrigation system ditch rider) will typically drive to the canal headworks a minimum of 4 times a day for operation and maintenance. The Diversion Intake Structure automation would require less field attention in the canal for operation's-based activities. Assuming that the reduction is

approximately 50% (eliminating the midday verification), below is the calculation for the greenhouse gas emission reduction volume:

*52 miles round trip to project site * 1 gallon/15 miles * 4 times/day * 365 day/year * 8,887 grams of CO_2/gallon = 44,980,069 grams CO_2/year = 44.98 metric tons CO_2/year*

*~ 60% Reduction = 60% * 44.98 metric tons CO_2/year = 26.99 metric tons of CO_2 saving annually*

- **If the project will result in reduced pumping, please describe the current pumping requirements and types of pumps currently being used. How would the proposed project impact the current pumping requirements and energy usage?**

  Based on the projected reduced diversion with the modernization of the Main Canal diversion structure it will result in the savings of about **16,639 ac-feet** to 24,959 ac-feet of water annually, or about **831,950 ac-feet** to 1,247,943 ac-feet over the 50-year life of the structure. The larger value will be accomplished with other planned modernization improvements.

  Balancing and make-up water from wells makes up the total water diversion total. Groundwater pumping accounts for about 56% of the water supply therefore at a cost of about $9.76 dollars per acre foot this results in a reduction of energy consumption of about $90,942 annually to pump 9317.8 ac-feet, or about $4.5 million over the life of the diversion. Therefore, this project will reduce the pumping requirements and associated energy demands to operate the groundwater well pump systems.

- **Please indicate whether your energy savings estimate originates from the point of diversion, or whether the estimate is based upon an alternate site of origin.**

  Yes, the energy savings estimate originates from the point of diversion at the Intake Diversion Structure located on the Gila River. Flows in the Buckeye Main Canal are diverted through a system of manual gates which will be upgraded and modernized along with shotcrete lining of a portion of inflow earthen canal to aid in achieving straight laminar flows to power new hydrokinetic turbines. Supplemented by the canal spanning solar panels.

- **Does the calculation include any energy required to treat the water, if applicable?**

  There is no treatment of the conveyed irrigation water by BWCDD. Private landowner on-farm drip systems or center pivots for example may use energy to filter and pressurize water but that is outside the scope of this project.

- **Will the project result in reduced vehicle miles driven, in turn reducing greenhouse gas emissions?**

  Water conservation and SCADA controls will require less man hours on the canal banks for operation and maintenance. This results in less vehicular travel time hours on the canal banks and a reduction in greenhouse gas emissions.

  The greenhouse gas emissions from a gallon of gasoline are about 8,887 grams CO_2/ gallon. BWCDD zanjeros (irrigation system ditch rider) will typically drive to the canal headworks a minimum of 4 times a day for operation and maintenance. The Diversion Intake Structure automation would require less field attention in the canal for operation's-based activities. Assuming that the reduction is approximately 50% (eliminating the midday verification), below is the calculation for the greenhouse gas emission reduction volume:

  *52 miles round trip to project site * 1 gallon/15 miles * 4 times/day * 365 day/year * 8,887 grams of CO_2/gallon = 44,980,069 grams CO_2/year = 44.98 metric tons CO_2/year*

  *~ 60% Reduction = 60% * 44.98 metric tons CO_2/year = 26.99 metric tons of CO_2 saving annually*

- **Describe any renewable energy components that will result in minimal energy savings/production.**

  100% of all Rubicon FlumeGates (described previously) supplied for this project will be modulating in operation and will not be operated with conventional power nor generator power, and they will not be connected to the grid in any way. Rubicon gates and meters are powered using solar panels and lithium battery sets; the power generated is sufficient to run the gates' motors, sensors, RTU, and communication system. Depending on the gate size and communication device, Rubicon gates and meters incorporate 80W to 120W solar panels as part of their standard configuration.

Evaluation Criterion C – Sustainability Benefits

Enhancing Drought Resiliency:

- **Does the project seek to improve ecological resiliency to climate change?**

  Yes. This project will help to retain water from the Gila River to improve the ecological resiliency of agriculture, endangered species, and communities. In the future phases of this project water storage off of and adjacent to the Gila River will create ecological habitat that will be made feasible by the design and installation of a new diversion structure for the BWCDD.

- **Will water remain in the system for longer periods of time? If so, provide details on current/future durations and any expected resulting benefits (e.g., maintaining water temperatures or water levels).**

  Yes. Water will remain in the system for longer periods of time by conserving the runoff water from the Gila River. Instead of water spilling or drying up in smaller streams, water will remain in the river corridor thus making water available for other natural uses as needed. Furthermore, the Solar Panels used in this project will prevent water from evaporating.

- **Will the project benefit species (e.g., federally threatened, or endangered, a federally recognized candidate species, a state listed species, or a species of particular recreational, or economic importance)? Please describe the relationship of the species to the water supply, and whether the species is adversely affected by a Reclamation project or is subject to a recovery plan or conservation plan under the Endangered Species Act (ESA).**

  Yes. This project will help endangered species throughout the County such as the Arizona cliffrose and Arizona agave. Many migratory bird species fly through this location, including the threatened Lewis's woodpecker. Species like the Lesser long-nosed bat that use their elongated muzzles to pollinate the endangered saguaro cacti will also benefit from these improvements. This project will allow for the ecosystem to harmonize while encouraging biodiversity.

- **Please describe any other ecosystem benefits as a direct result of the project.**

  This project will preserve water that can then be used by farmers, communities, and even neighboring cities such as Paloma and Arlington. This results in increased productivity and efficiency for crops, saved water and energy due to wells not having to run as long, promoting a locally driven circular Bio-Economy.

- **Will the project directly result in more efficient management of the water supply? For example, will the project provide greater flexibility to water managers, resulting in a more efficient use of water supplies?**

  Yes, the proposed project will help improve water management, water conservation, reduced spill, while supplying accurate and reliable deliveries to meet demands. Automated Rubicon gates help with the diversion of accurate and regulated flows that will reduce canal water level fluctuations and provide a direct accounting of flows for water management use.

Addressing a specific water and/or energy sustainability concern(s). Will the project address a specific sustainability concern? Please address the following:

- **Explain and provide detail of the specific issue(s) in the area that is impacting water sustainability, such as shortages due to drought and/or climate change, increased demand, or reduced deliveries.**

  As climates grow warmer the effects of this 22- year drought begin to intensify. Climate change is causing abnormal effects on the water cycle, increasing the rate of evaporation, at a pace quicker than anticipated. The current water delivery system is approximately 136 years old with little to no modern improvements. Without automation and integrated controls, it is extremely difficult to precisely match water supply with demand to prevent mismatched flows and minimize operational spills and in turn, causing cost and energy deficiencies. Adverse weather conditions cause flooding to crop and flooding hazard to residential homes adjacent to the canal resulting in a lack of water to some growers. These challenges make it more complex to balance the needs of people, agriculture, fish, and wildlife that depend on irrigation diversions and a healthy flowing Gila River. This project will help conserve water from the Gila River and improve the accuracy of water deliveries while saving energy.

- **Explain and provide detail of the specific issue(s) in the area that is impacting energy sustainability, such as reliance on fossil fuels, pollution, or interruptions in service.**

  Maricopa County is one of the most populous Counties in Arizona, containing 62% of Arizona's population within its boundary lines. Such rapid population growth comes with a skyrocket in infrastructure, congestion, and increase energy and water use.

  Carbon dioxide smothered air incubate this region, causing extremely hot temperatures, health related problems such as heart disease, lung cancer, and heat related deaths and emergencies. In fact, Maricopa County received another "F" rating in air quality from the American Lung Association.

  Because the extreme temperatures have amplified the effects of this on-going drought, the demand for water and energy has greatly increased, while water and energy shortages persist. Excessively running A/C because of the heat, increased pumping of water and running wells because of shortages, are just a few examples of how energy is being exploited. The energy sustainability in Maricopa County can be improved with this project.

- **Please describe how the project will directly address the concern(s) stated above. For example, if experiencing shortages due to drought or climate change, how will the project directly address and confront the shortages?**

This project will directly address the concerns above by creating a more reliable water source. The current state of this project depicts large amounts of water being spilled and lost due to manually controlled outdated irrigation systems, while energy is being exploited. New and improved automated gates grant us the ability to remotely open and close gates to better manage water for more efficient and accurate deliveries, preventing spills. This will increase water quantities which will also benefit neighboring cities like Buckeye, Paloma, and Arlington.

This project also includes canal lining and canal solar panels. Canal lining prevents invasive weed growth and seepage, which is a potential problem for reduced water flow. Canal Solar Panels store renewable energy that will supply energy to pump water in the irrigation system. Shade from these solar panels also reduce evaporation rates and reduce the heat island effect. This will also help address climate change and improve energy sustainability by not relying on fossil fuels to run.

With water savings and more regulated inflows wells will not have to run as long to make up for lost water, and crops are able to thrive. Energy and water will be saved and stored, tackling the effects of drought and climate change head on.

- **Please address where any conserved water as a result of the project will go and how it will be used, including whether the conserved water will be used to offset groundwater pumping, used to reduce diversions, used to address shortages that impact diversions or reduce deliveries, made available for transfer, left in the river system, or used to meet another intended use.**

  Water conserved will directly offset groundwater pumping and reduce diversion volumes. These flows can then be used to address other demands downstream including those of the Gila River Indian Community, the San Lucy Village, Arlington Water District, and Paloma Irrigation and Drainage District.

- **Provide a description of the mechanism that will be used, if necessary, to put the conserved water to the intended use.**

  Because the water conserved will directly offset groundwater pumping it will be stored in the aquifer and used in the future to meet demands and afford resiliency against the drought. Reduced diversion volumes no mechanism is needed as these flows can then be used to address other demands downstream including those of the Gila River Indian Community, the San Lucy Village, Arlington Water District, and Paloma Irrigation and Drainage District.

- **Indicate the quantity of conserved water that will be used for the intended purpose(s).**

The reduced diversion amount is about 16,639 ac-feet per year off-setting what is pumped and will be left in the ground the quantity conserved that can be used for the intended purpose is about 7,329 ac-feet of diverted surface water for other intended purposes.

Other project benefits. Please provide a detailed explanation of the project benefits and their significance. These benefits may include, but are not limited to, the following:

(1) Combating the Climate Crisis:

Please describe how the project will address climate change, including:

- **Please provide specific details and examples on how the project will address the impacts of climate change and help combat the climate crisis.**

  Conserving, protecting, and restoring our natural resources (water and subsequent watershed and habitats) are ways we are implementing a "Best Practices" model. Our partnership with farmers/ growers equips us to work together to develop strategies to address the climate crisis through neoteric and innovative agriculture conservation practices.

  We are also utilizing solar energy by lining the canals with solar panels. This not only harvests renewable energy, but it helps in the production of food, fiber, materials, and energy. Recognizing the 30 by 30 initiative with NRCS and USDA, we are identifying On-Farm projects to reduce carbon emissions and promote biodiversity especially in the riparian areas and watersheds that border our district.

  - Reducing climate pollution: Agricultural Greenhouse Gas Emissions (10% of US total released)
    (1) Reduce carbon emissions through use of solar powered SCADA units and reduced O&M time requiring on-site vehicles.
  - Protecting public health: According to the CDC effects from Climate Change include increased incidence of respiratory and cardiovascular disease, injury, and death due to extreme weather events, heat wave, droughts and floods causing losses to property and crops and change in food distribution, water-borne illnesses, and mental health (CDC). This is especially true in rural, underserved, low-income populations such as ours. This project would:
    (1) Improve air quality by reducing carbon emissions through use of solar powered SCADA units and reduced O&M time requiring on-site vehicles and dust generated from dirt roads.
    (2) Reduce risk of biological contamination by automated controls to reduce incidence of spills, overflows, and flooding.

(3) Reduce cumulative effects from poor health (Type 2 Diabetes, Respiratory and Cardiovascular diseases).
(4) Reduce incidence of floods and damages to homes and farms.

- **Does this proposed project strengthen water supply sustainability to increase resilience to climate change?**

  Yes. this project improves the integrity of delivery system to prevent leakage, seepage, overflows, flooding, spills, and improving both the quantity and quality of water. This project will help with future adverse conditions caused by drought and climate change, as well as help identify shortfalls. On farm efficiency and crop production will be improved and spills by downstream water districts are less likely to occur. Furthermore, evaporation rates will decrease, allowing water to stay in the system for longer periods of time. This project is in-line with President Biden and DOI objectives and drought mitigation for the Lower Colorado Basin. This results in less fallowed lands and less particulate dust and lung and respiratory disease locally and in the urban area increased by monsoonal winds.

- **Will the proposed project establish and utilize a renewable energy source?**

  Yes. This project will generate two sources of renewable energy including micro hydro power, and canal spanning solar panels that then produce power and electricity to run the irrigation system. Also, remote devices for automated gates use solar panel power systems.

- **Will the project result in lower greenhouse gas emissions?**

  Yes. The proposed project improves the maintenance of district agriculture production that provides plants for economic sequestration of carbon. This project also uses renewable energy, minimizing the reliance on fossil fuels, lowering greenhouse gas emissions.

(2) Disadvantaged or Underserved Communities:

Please describe how the project supports these Executive Orders, including:

a. Does the proposed project directly serve and/or benefit a disadvantaged or historically underserved community? Benefits can include but are not limited to: public health and safety through water quality improvements, new water supplies, new renewable energy sources, or economic growth opportunities.

Yes. Because of its ethnic minorities, poverty level and rural location, Maricopa County is a historically underserved, rural, low income and disadvantaged. Urban sprawl from

Phoenix and influx of new residents (40% increase in 20 years) has caused a large disparity between income, poverty, unemployment, and subsequent quality of life. These people typically feel the extremities of climate change first, having to choose between the water bill, air conditioning, or food and even receiving lower quality water. Public health and safety will improve by better management of water, improved deliveries, and efficient water use. Economic Growth Opportunities are available through reduced farming costs allow for more employment and help create 2nd tier producers (value added products).

b. If the proposed project is providing benefits to a disadvantaged community, provide sufficient information to demonstrate that the community meets the disadvantaged community definition in Section 1015 of the Cooperative Watershed Act, which is defined as a community with an annual median household income that is less than 100 percent of the statewide annual median household income for the State, or the applicable state criteria for determining disadvantaged status.

Table 7. BWCDD Disadvantaged Community Variables

Buckeye Water Conservation & Drainage District Disadvantaged Community Variables			
Variable	Buckeye	Gila River Indian Tribe	Salt River Indian Tribe
Population	95,463	14,260	7,386
Low income, high and/or persistent poverty	MHI[1] $71,707 9.95% Live in Poverty	MHI[1] $9,283 52% Live in Poverty	MHI[1] $31,852 22% Live in Poverty
High unemployment and underemployment	4.6%	22.6%	5.9%
Racial and ethnic residential segregation, particularly where the segregation stems from discrimination by government	1% Native American 25% Hispanic	100% Native American or Family Members	100% Native American or Family Members
Linguistic isolation	25% Spanish Speaking	Spanish Speaking O'odham	Spanish Speaking O'odham
High housing cost burden and substandard housing	10% Substandard Housing Expensive	90% Substandard	70% Substandard
High transportation cost burden and/or low transportation access	Limited Public Transportation	Limited Public/Tribal Transportation	Limited Public/Tribal Transportation

Disproportionate environmental stressor burden and high cumulative impacts	Poverty Level Magnify Wide Gap Between High and Low	Poverty Level Magnify 50% Type 2	Poverty Level Magnify 50% Type 2 Diabetes

	Income		
Limited water and sanitation access and affordability	Expensive Rural - Archaic	Archaic System	Archaic System
Disproportionate impacts from climate change	Poverty Level Magnify	Poverty Level Magnify	Poverty Level Magnify
High energy cost burden and low energy access	Utility Rates High	Utility Rates High	Utility Rates High
Access to healthcare	Limited, small clinic	IHS for BIA registered	IHS for BIA registered

Because of urban sprawl (many communities) create a wide income gap between inhabitants
2MHI = Median Household Income

c. If the proposed project is providing benefits to an underserved community, provide sufficient information to demonstrate that the community meets the underserved definition in E.O. 13985, which includes populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life.

See Table 2. Population includes 25% Hispanics, they reside in a sparsely populated rural area, with little or no tax base to support their infrastructure. They are isolated by historically being considered less than equal as agricultural workers. The nearby Indian Reservations are also an underserved community and share BWCDD's water resources from Gila River.

(3) Tribal Benefits: The Department of the Interior is committed to strengthening tribal sovereignty and the fulfillment of Federal Tribal trust responsibilities. The President's memorandum "Tribal Consultation and Strengthening Nation-to-Nation Relationships" asserts the importance of honoring the Federal government's commitments to Tribal Nations. Please address the following, if applicable:

a. Does the proposed project directly serve and/or benefit a Tribe? Will the project increase water supply sustainability for an Indian Tribe? Will the project provide renewable energy for an Indian Tribe?

Yes. this will uphold Reclamation's trust responsibilities to the local Indian Tribes. Any water conservation measures that support the Gila River basin and other small tributaries in this network system (Hassayampa, Agua Fria, Verde, and Salt Rivers) will help conserve water that the Salt River and Pima-Maricopa Indian Tribes need for their native wetland and riparian areas and water resources for residential, municipal, and agricultural use.

b. Does the proposed project directly support tribal resilience to climate change and drought impacts or provide other Tribal benefits such as improved public health and safety through water quality improvements, new water supplies, or economic growth opportunities?

Saving water through better management (automation) allows for a small buffer of resiliency against possible state or federal mandated water quantity reductions due to drought or climate change. This project will improve the integrity of delivery system to prevent a series of issues such as leakage, seepage, overflows, flooding, spills, and improving both the quantity and quality of water. Solar panel lined canals also help slow the evaporation rate, in efforts to save more water. Not only do solar panels over canals help in evaporation savings of up to 50% (Reclamation 2016), but this also preserves sacred tribal land by not requiring any additional right of way or retiring Tribal agriculture land with solar farms. These improvements will also result in improved on-farm efficiency and crop production. Less water used leaves more in the river and in the groundwater for Tribes including the Tohono O'odham San Lucy District at Painted Rock Dam.

(4) Other Benefits: Will the project address water and/or energy sustainability in other ways not described above? For example:

a. Will the project assist States and water users in complying with interstate compacts?

Yes, it will help stakeholders of the Arizona DCP agreements.

b. Will the project benefit multiple sectors and/or users (e.g., agriculture, municipal and industrial, environmental, recreation, or others)?

Yes.

- Agricultural – Economic (less water needed, less restriction on crop types, less danger of crop damage from overflows/flooding, reduce shortfalls, less energy needed for pumps, less danger or lawsuits or losses from bacterial contamination or flooding). Reduce O&M cost to BWCDD so funding can be used for other

deteriorating structures and sites. Enable growers off Buckeye Main Canal to implement On-Farm improvements.

- Environmental – Prevent flooding/erosion of earthen canal/lateral, less noxious/invasive weeds, less erosion, conservation support healthier ecosystem (Native plants, habitat, native species, and migratory birds). More viable washes/ springs.
- Recreational/Tourism – Gila River/Watershed, Salt River, Verde River, Agua Fria River, Hassayampa River, Improved off roading/camping/hiking/photography/ bird watching.
- Cultural – Protection and preservation of native gathering sites (plants and clay), ancient trails, village, or ceremonial site.
- Food Safety – Less produce contamination and catastrophic crop failure due better water elevation controls to prevent of overflows/flooding of fields with food crops.
- Public Safety – Less residual flooding from overflow and spillage resulting in unsafe driving conditions and erosion of road and ditch banks.

c. Will the project benefit a larger initiative to address sustainability?

Yes, this project falls in line with the USDA NRCS 30x30 initiative in protecting 30% of all land and water by 2030.

d. Will the project help to prevent a water-related crisis or conflict? Is there frequently tension or litigation over water in the basin?

Yes.

- Preventing possible water-related crisis (shortfalls or flooding) – creating resiliency
- Leveraging funding to conserve and better manage the water resources and increase efficiency of the system, thus reducing quantities delivered during drought.
- Improving water conservation of water delivery system to reduce water quantities.
- Reducing water quantities to allow water to be used by lower priority users that have shortfalls and mandatory water reductions during drought conditions.
- Reduce groundwater pumping and improve drought resiliency and basin dependence.

Evaluation Criterion D – Complementing On-Farm Irrigation Improvements

If the proposed project will complement an on-farm improvement eligible for NRCS assistance, please address the following:

- **Describe any ongoing projects by farmers/ranchers that receive water from the applicant to improve on-farm efficiencies.**

  As part of the Buckeye Water Conservation and Drainage District's commitment to their dynamic 20-Year Strategic Plan, the District intends to work with the local NRCS office to develop a Conservation Implementation Plan for water conservation improvements for our landowner agricultural fields. The District aim is to aid water users and farmers in future applications for NRCS project funding through EQUIP.

  - **Provide a detailed description of the on-farm efficiency improvements.**

    Identified areas, on-farm structures, and on-farm irrigation systems which are identified in the District funded System Optimization Review (SOR) will be prioritized as recommended to strive for an ideal use of our limited water resources.

    These irrigation efficiency improvements include:

    1) Eliminating seepage issues from earthen field ditches and deteriorated concrete ditches.
    2) Installing larger capacity concrete ditches containing high-flow turn-out structures.
    3) More closely matching water volume to field dimensions and soil intake qualities.
    4) Installing drip irrigation where practical and cost effective.
    5) Water Conservation and Cost Savings to farmers:
    6) Reduce water volume requests due to more reliable and faster flow rates (enlarged ditches).
    7) Reduced water volume requests if drip lines used instead of flood irrigation.
    8) Reduced water volume requests due to lining ditches or repairing concrete (reduce seepage and transpiration).
    9) Reduced water volume requests due to more accurate field data (size and soil intake characteristics).
    10) Estimate a 25% water savings based on these improvements.

  - **Have the farmers requested technical or financial assistance from NRCS for on-farm efficiency projects, or do they plan to in the future?**

    Yes, they have in the past in limited numbers however as the system is modernized whereby on-farm benefits can be realized many growers are planning on utilizing NRCS EQUIP funding as well as rural grant funding.

  - **If available, provide documentation that on-farm projects are eligible for NRCS assistance, that such assistance has or will be requested, and the number or percentage of farms that plan to participate in available NRCS programs.**

This information was not readily available, but it can be collated and provided to Reclamation upon request if awarded this grant.

- **Applicants could provide letters of intent from farmers/ranchers in affected project areas.**

  Letters of Support from farmers and ranchers in the BWCDD are available in the Appendix Section.

- **Describe how the proposed WaterSMART project would complement any ongoing or planned farm improvement.**

  In the current climate of today's emerging agricultural technology there are many methodologies and technologies that are used to irrigate fields – flood, high-precision surface, pivots, sprinklers, drip irrigation, etc. – one thing all these technologies have in common is the need for a reliable and steady water supply; some are more susceptible than others to variations in incoming flow and pressure.

  The proposed project will complement future on-farm improvements by providing the water users a reliable water source with consistent, accurate daily flows and further pursuing water conservation efforts. Also, the new renewable energy will add reliability to the well network that serves these on-farm systems, and this added power makes new energy available to run clean on-farm systems like pressurized filtration and drip systems and center pivot Low Energy Precision Application (LEPA), SCADA, and other state-of-the-art modernization technology.

- **Will the proposed WaterSMART project directly facilitate the on-farm improvement? If so, how? For example, installing a pressurized pipe through WaterSMART can help support efficient on-farm irrigation practices, such as drip-irrigation.**
  OR
- **Will the proposed WaterSMART project complement the on-farm project by maximizing efficiency in the area? If so, how?**

  The proposed **BWCDD Diversion Intake Structure Modernization and Canal Energy System (CES) Project** would be a tangible representation of the District's effort to transform its decades old, earthen canals to a modernized, streamlined system beginning at its headworks, affecting the output of the entire system. The introduction of accurate metering technologies for improved deliveries, additional water storage to regulate flows, and generating green energies which offset costs to the users, providing a means for the users to integrate new, innovative technologies to meet their water and energy needs. The

provision of water in the quantity needed when it is needed yields improved on farm efficiencies.

- **Describe the on-farm water conservation or water use efficiency benefits that are expected to result from any on-farm work.**

  It is envisioned that application efficiencies will be improved reducing runoff, over application of irrigation will be reduced, and conversion to modern system will result in water savings with better water control.

- **Please provide a map of your water service area boundaries. If your project is selected for funding under this NOFO, this information will help NRCS identify the irrigated lands that may be approved for NRCS funding and technical assistance to complement funded WaterSMART projects.**

  Please see the BWCDD Service Area Boundary Map in the Appendix Section.

Evaluation Criterion E – Planning and Implementation

Subcriterion E.1 – Project Planning
Does the applicant have a Water Conservation Plan and/or System Optimization Review (SOR) in place? Does the project address an adaptation strategy identified in a completed WaterSMART Basin Study?
Provide the following information regarding project planning:

(1) Identify any district-wide, or system-wide, planning that provides support for the proposed project. This could include a Water Conservation Plan, SOR, Drought Contingency Plan or other planning efforts done to determine the priority of this project in relation to other potential projects.

The Buckeye Water Conservation and Drainage District (BWCDD) has led a collaborative effort with neighboring irrigation districts and cities to develop and implement a 20-Year Strategic Conservation Plan. In efforts to fulfill their commitment, the District has directly funded a System Optimization Review (SOR) study in line with the approaches and requirements in the Reclamation funded SOR studies. The SOR for BWCDD has been initiated and initial priorities and goals established. The Diversion Intake Structure was identified as a high priority with immediate action required.

(2) Describe how the project conforms to and meets the goals of any applicable planning efforts and identify any aspect of the project that implements a feature of an existing water plan(s).

The project will address one of the highest prioritized items identified in the District funded SOR. As the lead of the 20-Year Strategic Conservation Plan, the BWCDD has shown its commitment to the plan by engaging in the preliminary planning for the District's entire system's headworks. The District hired George Cairo Engineering, Inc. (GCE), a local water resources and irrigation system modernization expert firm, to conduct the preliminary study and design of the diversion structure modernization to a 15 percent design to evaluate alternatives and develop schematic design to determine budgets for design and construction. Due to the cost of operation and maintenance of an older system, funding for a project of this scale is quite exorbitant. We are a small rural Water District, and it is difficult for us to compete for the larger grants based on Water savings, as our system is mainly manually controlled with little to no measurement software. However, the implementation of updated technologies through the phases of this contract will vastly improve our system's efficiency in multiple ways which ultimately meets our goal of water resources conservation and expended energies while supporting sustainable growth.

(3) If applicable, provide a detailed description of how a project is addressing an adaptation strategy specifically identified in a completed WaterSMART Basin Study or Water Management Options Pilot (e.g., a strategy to mitigate the impacts of water shortages resulting from climate change, drought, increased demands, or other causes)

Yes. This project is addressing an adaptation strategy identified in the Basin Study including Changes to Agricultural Practices and Land Use (Improve Irrigation Efficiency) and Supply and Infrastructure Investments (New Infrastructure Water and Energy Supplies). Adaptive management in the Water Plan calls for development of projects that will conserve water for drought resilience and development of projects that are in-line with low carbon footprint goals. The plan further identifies as a goal working with the farmers to encourage less water intensive crops and improve irrigation efficiency, as the need to evaluate and apply new technologies to help meet goals set forth by the District. This proposed project specifically is in-line with the WaterSMART Basin Study strategy to mitigate the impacts of water storages resulting from climate change and drought.

Subcriterion E.2 – Readiness to Proceed

Identify and provide a summary description of the major tasks necessary to complete the project. Note: please do not repeat the more detailed technical project description provided in Section D.2.2.2. *Application Content.* This section should focus on a summary of the major tasks to be accomplished as part of the project.

Buckeye Water Conservation and Drainage District would like to start Phase I construction in Fall of 2023, but unless we receive the Award and NTP in May of 2023 from USBR, this is unlikely due to long lead items and finalization of engineering design.

BWCDD Staff will be utilized for specific tasks during this currently scheduled 3-year project. Construction will occur during the Mid-October to Mid-December. Approximately 40% will be constructed in Fall 2023, 40% will be constructed in Fall 2024, and the last 20% will be installed in Fall 2025. Contractors will be working regular workday hours; no overtime is anticipated on this project.

Implementation Plan:

Once the NEPA (and possible 401 Certification and 404 Permit has been obtained) is completed and we receive the NTP, we will begin initial planning. 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 project Gantt chart that is resource loaded with critical path items identified in the work plan will also be completed. Major phases will include:

- ***Engineering/Design Work Required for Project 9 months***
  Allows time for review.
  This technical support will be performed by George Cairo Engineering, Inc. with input from Rubicon, Instream, Emrgy, Tectonicus, and Water Xience
  - Design and Fabrication of Rubicon FlumeGates, Controls and Framework by Rubicon
  - Design and Fabrication of Radial Gate, Controls and Framework by Instream
  - Design and Fabrication of Micro Hydrokinetic Turbines, Controls and Framework by Emrgy
  - Design and Fabrication of Solar Spanning Panels, Controls and Framework by Water Xience and Tectonicus
  - Design of Civil Work, Diversion Intake Structure Upgrades, Canal Lining and Canal Energy System by GCE
  - Order Gates, Solar Panels and Hydrokinetic Turbines– BWCDD (Long Lead Items, may need 6 months lead time for fabrication)

- ***Pre-Construction/Site Preparation for Project***
  Two sites, Intake Diversion Structure and Downstream Canal
  Time is of the essence for water outage work, complete all activities to reduce Dry-Up time.

- On-site support/final planning and safety/COVID 19 meetings – GCE, Rubicon, Instream, Emrgy, Tectonicus, Water Xience, concrete and civil works Contractor.
- Begin Safe Dry-down to prevent canal liner damage, include notification to producers/ growers by BWCDD
- Mobilization of Employees and Equipment
- Subcontractor Selection and Vendor Procurement and Award for
- Contractor: Concrete structure, Canal Lining (Forms, attachments, support structures)
- Final planning, measurements, scheduling, mobilization of equipment, all non-construction activities that can be completed to be ready.
- Project Manager/Water Master Coordinate/schedule with affected water user(s) for Dry-out

- ***Construction and Installation (3 Years)*** *Two sites, sites, Intake Diversion Structure and Downstream Canal*
  - Intake Diversion Structure Site Preparation by BWCDD Equipment Operator Project Manager/Water Master Supervise Contractors/Construction, Fabrication at each site GCE oversight
  - FlumeGate delivery by Rubicon
  - Radial Gate delivery by Instream
  - Structural Shotcrete/Concrete (Removal by BWCDD, GCE oversight)
  - Gate Installation (Attach Diversion Intake Structure bays) by BWCDD, Rubicon, Instream, and GCE oversight
  - Canal Lining Site Preparation by BWCDD Equipment Operator Project Manager/Water Master Supervise Contractors/Construction, Fabrication at each site GCE oversight
  - EMERGY Flume and Hydrokinetic Turbine delivery by EMERGY
  - Canal Spanning Solar Panels delivery by Tectonicus and Water Xience
  - 1,500’ Canal Shotcrete Lining by BWCDD, GCE oversight
  - EMERGY Flume and Hydrokinetic Turbine Installation by BWCDD, EMRGY and GCE oversight
  - Canal Spanning Solar Panels Installation by BWCDD, Tectonicus, Water Xience, and GCE oversight
  - Electrical Wiring - Contractor
  - Installation of metals such as safety walkway and handrails – BWCDD

- ***Post-Construction:***

(All work activities not requiring Dry-out)

- Installation/testing of automation systems/controls by Rubicon, Instream, Emrgy, Water Xience, Tectonicus, and GCE
- Commission gates and certify accurate measurement and operation by Rubicon, Instream, and GCE
- Postmortem to discuss lessons learned by Rubicon, Instream, Emrgy, Water Xience, Tectonicus, Contractor and GCE
- Staff Training with Rubicon regarding new FlumeGate control
- Staff Training with Instream regarding new Radial Gate control
- Staff Training with EMRGY regarding EMRGY Turbine system control
- Staff Training with Tectonicus and Water Xience regarding Canal Spanning Solar Panel system control

- ***Closeout/Reports***
  - As required (Progress Reports - Quarterly or Semi-Annual)
  - As-built final installation
  - Final report with documentation

FlumeGate, Radial Gate, EMRGY Turbine, and Canal Spanning Solar Panel Specifications are provided in the Appendix Section.

Describe any permits that will be required, along with the process for obtaining such permits.

The Buckeye Water Conservation and Drainage District's diversion intake structure is located on fee title District-owned land; however, the structure is within the Gila River Floodplain and jurisdictional waters of the U.S. Army Corps of Engineers, which may require a 401 Certificate and 404 Permit from the U.S. Army Corps of Engineers/Arizona Department of Environmental Quality (ADEQ) to be in compliance with the 1972 Clean Water Act (CWA). Due to the District's landownership and which the structure is located, the permitting process will be streamlined and most likely done under a maintenance contract.

The BWCDD will comply to any additional permitting which may be required. Any power generated will be utilized by the BWCDD and therefore does not require a Federal Energy Regulation Corps. (FERC) Grant.

Identify and describe any engineering or design work performed specifically in support of the proposed project.

Design work including schematic design and sizing for determining cost and performance factors were completed by George Cairo Engineering Inc. (GCE), Emrgy, Tectonicus, and Water Xience.

Describe any new policies or administrative actions required to implement the project.

No new policies or actions, BWCDD has obtained prior approval from their board for funding and passed a resolution for the proposed improvement projects and they have coordinated and gained approval from water users to minimize impacts to their operations.

Please also include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates. Milestones may include, but are not limited to, the following: complete environmental and cultural compliance; mobilization; begin construction/installation; construction/installation (50% complete); and construction/installation (100% complete). Was the expected timeline for environmental and cultural compliance discussed with the local Reclamation Regional or Area Office?

YES, all work will comply with Federal environmental and cultural resource laws and other required regulations. See responses to Environmental Compliance Questions in Section 3 for additional information. All work and staging will stay within the already disturbed area and there will be no new ground disturbance.

Upon receipt of the Reclamation letter of award, the District anticipates implementing the following schedule. Construction start date will not occur prior to May 2023.

Table 8. Tentative Milestone/Task Schedule

Milestone/Task	Planned Start Date	Planned Completion Date
BOR Notice of Award	1/1/23	1/31/23
BOR Notice to Proceed & Contract Execution (Contract, PASS, ASAP, etc.)	1/1/23	6/1/23
BOR NEPA Review (Complete NEPA process (Categorical Exclusion))	1/1/23	6/1/23
Permits (Potential need for 401 Certificate and 404 Permit)	1/1/23	6/1/23

Engineering Design and Consultation (Finalize Design and Environmental)	2/1/23	12/31/25
Order Long-Lead Items (Rubicon and Instream Gates, Emrgy Turbines, Tectonicus/WX? Solar Spanning Panels and Materials)	3/1/23	8/31/23
Pre-Construction (Procurement, Bid Selection, Pre-construction Activities)	8/1/23	10/31/23
Construction & Installation (Construction, Inspection, & Commissioning)	11/1/23	12/31/25
Semi-Annual Project Report (Prepare report and submit to BOR)	12/1/23	12/31/23
Semi-Annual Project Report (Prepare report and submit to BOR)	6/1/24	6//30/24
Semi-Annual Project Report (Prepare report and submit to BOR)	12/1/24	12/31/24
Post Construction (Post-construction Activities)	12/1/25	12/31/25
Semi-Annual Project Report (Prepare report and submit to BOR)	6/1/25	6/30/25
Completion and Final Report (Closeout activities and final report submittal to BOR)	12/1/25	12/31/25

Evaluation Criterion F – Collaboration

Please describe how the project promotes and encourages collaboration.

- **Is there widespread support for the project? Please provide specific details regarding any support and/or partners involved in the project. What is the extent of their involvement in the process?**

  The Buckeye Water Conservation and Drainage District has led a collaborative effort with Paloma Irrigation and Drainage District , Arlington Canal Company, City of Goodyear, The City of Buckeye, and potentially the City of Avondale to initiate the development of our 20-Year Strategic Conservation Plan in which the District and surrounding areas are partners and looking to adopt in order to address the current and future water and energy resource conditions that have drastically changed with the effects of the impending severe drought in the Basin. This project is a priority for BWCDD and will help BWCDD meet their goals of conserving water resources and generating renewable energy as part of their drought response and planned path to better manage the water diverted at the headworks, groundwater pumping, energy reliability, for BWCDD and the irrigation district's systems downstream.

- **What is the significance of the collaboration/support?**

  This project demonstrates collaboration between the water districts including Paloma Irrigation & Drainage District, Arlington Canal Company, City of Goodyear, City of Buckeye, the BOR, and the agricultural users. It can be used as an example to other water managers reflecting how assessment, planning, usage, need, storage, coupled with automation and new technology can be used to benefit a district, especially districts relying on multiple sources of water under various conditions (distance from source, seasonal fluctuations in supply, drought, and climate change).

- **Will this project increase the possibility/likelihood of future water conservation improvements by other water users?**

  YES, the BWCDD is one of the few districts in Arizona which provides water and power to its users and there are multiple interests in our approaches to improve existing facilities. The modernization of the intake diversion structure, downstream canal, planned addition of a regulating reservoir, and incorporation of improved metering and renewable technologies would be an opportunity to showcase the coupling of hydro and solar energies to improve water storage, efficiency, and generate supplemental power to become more energy independent. Investing in upgrading the head of the BWCDD system would exemplify to neighboring districts, current and potential future water users the District is committed to water conservation for present and future commercial and residential growth.

- **Please attach any relevant supporting documents (e.g., letters of support or memorandum of understanding).**

  Please refer to the Appendices Section for Letters of Support.

Evaluation Criterion G – Additional Non-Federal Funding

State the percentage of non-Federal funding in excess of 50% of the project costs.

Non-Federal Funding = 51%
Total Project Cost = $10,149,471.40

Our funding will be the 51% from our District's Account and In-Kind services. The In-Kind services will include our Labor and expenses, and use of our Heavy Equipment. This project is required to be constructed while the system if kept in service for the water users during their year-round growing season. The district will also have the overall administration and coordination of the project as part of our In-Kind services.

We are taking a more conservative approach, so we can leverage funding and resources from ourselves as well with the USBR in a step-by-step process. **Without this funding we cannot only proceed** very slowly, even with our Capital Improvements funds, this would take all our funding for other projects away for at least five years and delay the project significantly. This would put the BWCDD's system at considerable risk, diverting all our funds to only one project. The 50% matching funds help tremendously for these costly projects.

Evaluation Criterion H – Nexus to Reclamation

Describe the nexus between the proposed project and a Reclamation project or Reclamation Activity.

This project is connected to Reclamation Basin Objectives and activities for improving efficiency and conservation of the water systems in the Basin including Buckeye Water Conservation and Drainage District (BWCDD).

- **Does the applicant have a water service, repayment, or operations and maintenance (O&M) contract with Reclamation?**
  YES, the BWCDD receives Reclamation Project Water via the Gillespie Dam Lift Station that is filled by the City of Phoenix 91st Avenue WWTP Effluent that is linked to Reclamation via a water service contract.

- **If the applicant is not a Reclamation contractor, does the applicant receive Reclamation water through a Reclamation contractor or by any other contractual means?**
  YES, the BWCDD receives Reclamation Project Water via the Gillespie Dam Lift Station that is partially filled by the City of Phoenix 91st Avenue WWTP Effluent that is linked to Reclamation via a water service contract.

- **Will the proposed work benefit a Reclamation project area or activity?**
  YES, Gila River Basin, Gila River and Hassayampa River (downstream confluence), Agua Fria River, Verde River, Salt Rivers (upstream tributaries) share basin with Gila River and Salt River Tribes which are BOR irrigation projects. Lower Colorado River Basin (Yuma BOR Project: Confluence of Colorado River downstream in Yuma). The project will benefit the Basin regionally and at the Lake level by reducing demands on the Gila River which reduces demands on the Colorado River and Lake Mead. Additionally, this project would benefit the Federal Hydro Generation and associated contracts impacted by the drought.

- **Is the applicant a Tribe?**
  No. However, this project will help Reclamation meet their trust responsibilities to the two local Indian Tribes. Any water conservation measures that support the Gila River basin and other small tributaries in this network system (Hassayampa, Agua Fria, Verde, and Salt Rivers) will help conserve water that the Salt River and Pima-Maricopa Indian Tribes need for their native wetland and riparian areas and water resources for residential, municipal, and agricultural use and help to protect native plants, wildlife, and habitat that are culturally significant to the Tribes.

Performance Measures

Provide a brief summary describing the performance measure that will be used to quantify actual benefits upon completion of the project.

See Performance measures on the project include the following:

(1) Meeting project schedule and budget.
(2) Recording the solar energy generation monthly and determining performance of the PV system. Goal will be to meet the project nameplate value.
(3) BWCDD will use weather data, evaporation calculations, and water level sensors to evaluate the microclimate and evaporation rates under the PV system. Goal will be to meet the planned evaporation reduction.
(4) **Pre-project Estimation:** Inflow/Outflow: Data is collected whenever water is released. This is incorporated into our data base. We can generate reports for early and late seasons adding the ratio of acre-feet diverted to acre-feet received to calculate efficiency. Current

measurement has assumed accuracy error of 5 to 20 percent due to means and methods and system physical performance due to varying water levels.

(5) **Post-Project Methods:** Pre-project results will be compared with Post-project results to calculate water savings. This will be improved with the new SCADA improvements. We will compare the ratio of acre-feet diverted to acre-feet received to calculate overall system efficiency. New Rubicon devices have a certified accuracy of plus or minus 2.5 percent when installed properly. The performance measure will be the results of this flow measurement versus preconstruction, and they will be field validated for both pre and post and results document. The goal would be to improve on the flow measurement and delivery accuracy to be at a minimum plus or minus 5 percent.

2. PROJECT BUDGET

2.1. Funding Plan

The Federal share of this project is $5,000,000.00 (49%) and the Non-Federal Share is $5,149,471.40 (51%) from the BWCDD. The BWCDD is the lead partner and will serve as the contact point for coordination with Reclamation, Contractors, and Engineer. BWCDD labor resources will be utilized for the specific tasks during the approximate 2.5-year project duration. For In-Kind, BWCDD will utilize internal staff, vehicles for travels and equipment. BWCDD will be responsible for project management, site evaluation, permitting work, survey work, pre-construction work, partial construction work, construction management and inspection, responses to construction request for additional information, and commissioning work. It is BWCDD's goal to do as much as in-kind internal staff and resources as possible on this project. BWCDD will prepare bi-annual financial reporting and project status reporting as well as the final report. By using BWCDD staff and equipment, cost will be reduced due to efficiencies. In lieu of a commitment letter, the BWCDD has provided the Official Resolution to show BWCDD's commitment for the project and cost share commitment with the District's Board Members full approval.

The construction and installation will be done by a pre-certified qualified and selected Contractor through BWCDD construction bidding process. The Engineering will be done by George Cairo Engineering, Inc. (GCE) and GCE will also provide support during construction.

Costs incurred before start date: $0.00

2. PROJECT BUDGET

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The Federal share of this project is $5,000,000.00 (49%) and the Non-Federal Share is $5,149,471.40 (51%) from the BWCDD. The BWCDD is the lead partner and will serve as the contact point for coordination with Reclamation, Contractors, and Engineer. BWCDD labor resources will be utilized for the specific tasks during the approximate 2.5-year project duration. For In-Kind, BWCDD will utilize internal staff, vehicles for travels and equipment. BWCDD will be responsible for project management, site evaluation, permitting work, survey work, pre-construction work, partial construction work, construction management and inspection, responses to construction request for additional information, and commissioning work. It is BWCDD's goal to do as much as in-kind internal staff and resources as possible on this project. BWCDD will prepare bi-annual financial reporting and project status reporting as well as the final report. By using BWCDD staff and equipment, cost will be reduced due to efficiencies. In lieu of a commitment letter, the BWCDD has provided the Official Resolution to show BWCDD's commitment for the project and cost share commitment with the District's Board Members full approval.

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Costs incurred before start date: $0.00

2.2. Budget Proposal

SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal Funding	$5,000,000.00
Costs to be paid by the Applicant	$5,149,471.40
Value of third-party contributions	$0.00
TOTAL PROJECT COSTS	**$10,149,471.40**

Project Costs Breakdown:

Federal Costs

BUDGET ITEM DESCRIPTION	AMOUNT
Construction:	$5,000,000.00
TOTAL FEDERAL FUNDING	**$5,000,000.00**

Non-Federal Funding (BWCDD) – In Kind and Cash

BUDGET ITEM DESCRIPTION	AMOUNT
Salaries and Wages*: In Kind*	$348,751.52
Fringe: *In Kind*	$53,311.20
Equipment: *In Kind or Cash* if rented	$339,192.70
Materials and Supplies:	$135,000.00
Travel:	$37,542.40
Contractual: Engineering GCE	$723,605.81
Construction: Contractor Civil Work & Gate Installation (Partial)	$8,442,067.77
Other: Environmental Compliance & Permitting	$70,000.00
In Direct Costs – De Minimis In-Kind	$0.00
TOTAL NON-FEDERAL FUNDING	**$10,149,471.40**

BUDGET ITEM DESCRIPTION	COMPUTATION		Quantity TYPE	TOTAL COST
	$/Unit	Quantity		

SALARIES/WAGES				
Project Manager	$62.50	1800	HR	$112,500.00
Water Master/Foreman	$24.04	2048	HR	$49,233.92
Project Assistant	$26.44	3600	HR	$95,184.00
Accountant	$24.00	1200	HR	$28,800.00
Equipment Operator	$38.88	720	HR	$27,993.60
Gate Fabricator	$21.00	480	HR	$10,080.00
Gate Fabricator Assistant	$16.00	960	HR	$15,360.00
Concrete Fabricator	$20.00	480	HR	$9,600.00
			Subtotal	$348,751.52
FRINGE BENEFITS				
Project Manager	$14.26	1800	HR	$25,668.00
Water Master/Foreman	$5.55	2048	HR	$11,366.40
Project Assistant	$2.46	3600	HR	$8,856.00
Accountant	$2.17	1200	HR	$2,604.00
Equipment Operator	$2.97	720	HR	$2,138.40
Gate Fabricator	$1.91	480	HR	$916.80
Gate Fabricator Assistant	$1.07	960	HR	$1,027.20
Concrete Fabricator	$1.53	480	HR	$734.40
			Subtotal	$53,311.20
EQUIPMENT (District Owned)				
Front End Loader	$120.15	660	HR	$79,299.00
Rubber Tired Excavator Gradall	$143.19	330	HR	$47,252.70
Dump Truck	$130.03	220	HR	$28,606.60
Water Tanker	$160.19	880	HR	$140,967.20
Crew Truck	$48.94	880	HR	$43,067.20

			Subtotal	$339,192.70
SUPPLIES AND MATERIALS				
Safety supplies	$5,000.00	1	LS	$5,000.00
Construction Materials	$130,000.00	1	LS	$130,000.00
			Subtotal	$135,000.00
TRAVEL				
Meetings with 1/2T Pickup Trucks	$0.70	5168	HR	$3,617.60
Site Evaluation with 1/2T Pickup Trucks	$0.70	1664	HR	$1,164.80
Construction with 3/4T Pickup Trucks	$0.70	46800	HR	$32,760.00
			Subtotal	$37,542.40
CONTRACTUAL				
Engineering Design and Consultant	$723,605.81	1	LS	$723,605.81
			Subtotal	$723,605.81
CONSTRUCTION				
Contractor and Installer	$8,040,064.52	1	LS	$8,040,064.52
Construction Support, Inspection & Commissioning	$402,003.25	1	LS	$402,003.25
			Subtotal	$8,442,067.77
OTHER				
Reclamation environmental and cultural compliance costs	$40,000.00	1	LS	$40,000.00
Permitting costs	$30,000.00	1	LS	$30,000.00
			Subtotal	$70,000.00
TOTAL DIRECT COSTS				**$10,149,471.40**
INDIRECT COSTS				
De minimis	0%		base	$0.00

TOTAL ESTIMATED PROJECT COSTS	**$10,149,471.40**

2.3. Budget Narrative

Salaries and Wages (inclusive of Fringe Benefits)

BWCDD	**FY 2023**	**FY 2024**	**FY 2025**	**Estimated Sub-Total**
General Manager/ Project Manager: Overall project management, coordination with Engineers, Manufacturer, Contractor, Scheduling of Staff and Equipment, etc.	60 hr/month for 6 months	60 hr/month for 12 months	60 hr/month for 5 months	1800 hrs
Water Master/Foreman: Assist Project Manager – supervise BWCDD field staff, working with growers, water level control, etc.	32 hr/month for 4 months	80 hr/month for 6 months	80 hr/month for 6 months	2048 hrs
Project Assistant: Assist Project Manager with project coordination & reporting	120 hr/month for 6 months	120 hr/month for 12 months	120 hr/month for 12 months	3600 hrs
Accountant: helped management project financials	40 hr/month for 6 months	40 hr/month for 12 months	40 hr/month for 12 months	1200 hrs
Equipment Operator: Site initiation work, manage and handle all equipment during construction activities, etc.	120 hr/month for 2 months	120 hr/month for 2 months	120 hr/month for 2 months	720 hrs
Gate Fabricator	80 hr/month for 2 months	80 hr/month for 2 months	80 hr/month for 2 months	480 hrs

Gate Fabricator Assistant	160 hr/month for 2 months	160 hr/month for 2 months	160 hr/month for 2 months	960 hrs
Concrete Fabricator: Site initiation work, construction activities, etc.	80 hr/month for 2 months	80 hr/month for 2 months	80 hr/month for 2 months	480 hrs

BWCDD certifies that the labor rates included in the budget proposal represent the actual labor rates of the identified personnel. The certification can be provided upon award of project.

Travel

IRS 2022 mileage is $0.585/mile. Due to the recent price increase in fuel and car value, the following assumption includes a 15% increase = $0.70/mile estimated for FY 2023, 2024, and 2025.

Item	**FY 2023**	**FY 2024**	**FY 2025**	**Estimated Sub-Total**
Meetings: Travel to Engineers, Contractors, and Consultants Offices	136 mi round trip, 1 meeting/month, 6 month, 2 vehicles	136 mi round trip, 1 meeting/month, 8 month, 2 vehicles	136 mi round trip, 1 meeting/month, 5 month, 2 vehicles	5168 miles
Site Visits: Travel to project sites for pre-construction work	52 mi round trip, 1 visit/month, 6 months, 2 vehicles	52 mi round trip, 1 visit/month, 5 months, 2 vehicles	52 mi round trip, 1 visit/month, 5 months, 2 vehicles	1664 miles
Construction: Travel to construction sites during	52 mi round trip, 20 visit/month, 2 months, 3 vehicles	52 mi round trip, 20 visit/month, 10 months, 3 vehicles	52 mi round trip, 20 visit/month, 3 months, 3 vehicles	46800 miles

construction activities				

Equipment:
Used USACDOE equipment (EP 1110-1-8 30 November 2018)
Rate = (Average Hourly Rate + Fuel) * 30 → Multiple by 30% since USACE rates are from 2018

- Front End Loader
- Rubber Tired Excavator Gradall
- Dump Truck
- Water Tank

Materials and Supplies:

List of Materials:
Appurtenances and structures for new Diversion Intake Structure and Downstream Canal Lining:
Concrete, sections near gate reinforced with mesh and/or rebar

Rebar	Istream Radial Gate
Gravel	Rubicon FlumeGates
Forms/Traverses	Selected soil material
Emrgy Hydro Turbines	

Safety Supplies:

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

Automation, Measurement Devices and Controls:
Rubicon FlumeGate® includes the following items:

The FlumeGate® constructed out of marine grade aluminum is a precision overshot leaf flow measurement and flow control gate that measures fully submerged flows (90 percent) and mounts directly into a flow control structure gate bay.

- The FlumeGate is a combination automated overshot control gate and flow measurement device that mounts in new or existing structures and arrives as a complete turnkey installation.
- Each FlumeGate comes equipped with a control pedestal which includes a standard processor and keypad for automation (for remote mounting), solar panel power system and a 16 ft mast for mounting of a communication antenna: one aluminum external mounting frame, c/w stainless steel anchors, Hilti epoxy and SIKA sealant.
- Included is one (or more) 12-volt DC deep cycling battery pack; each pack consists of two or more batteries. Note, the batteries must be removed from the meter and charged if the gates are not installed within four weeks of delivery.
- One set of primary ultrasonic water level sensors (long range).
- Standard Rubicon local flow and level software (level control requires tuning, added charge).
- Options include an operator walkway to span the gate, attached to the top beam, with access from one or both sides.

The Instream Model 713 - Radial Gate and Hoist Assembly includes the following items:
All materials must be of sound quality and workmanship and meet the accepted specifications of the manufacturer.

• Embedment's	ASTM A167 or A240 Stainless Steel Type 304
• Pivot embedment	CSA G40.21 Grade 300W Minimum
• Pivot Bearing	Lubron AQ self-lubricating bearings
• Gate, Support Arms and Steel Parts	
Plate	CSA G40.21 Grade 300W Minimum
Structural	CSA G40.21 Grade 300W Minimum
• J-Seal	Molded Neoprene Rubber D2000 with Fluorocarbon (Teflon) Nosing (Optional)
• Fasteners and Anchors	ASTM F593/F594, Grade 8 Stainless Steel Type 304
• Cables	Galvanized, 6 x 19 Classification, E.I.P.S. Steel Core
• Drums	ASTM C 1018 Round Bar Minimum
• Cross-shaft	C1045 Precision Ground/ CSA G40.21 Grade 300W Minimum
• Paint:	
Gate and Accessories:	International Paints Intergard FP Black as per manufacturers specifications
Lift Components:	Two coats Industrial Enamel

Canal Energy System (CES):

The EMERGY Turbine includes the following items:

Turbine units arrive at the site in three subassemblies. See Appendix for Specifications

- EM 2.0 5kW Rotating Assembly and generator assembly
- EM 2.0 Flume
- 10kW Power Control Units (PCUs), 1ph/240V/60hz
- Control cabinet
- Inverter

The Solar Spanning Canal Panel System includes the following items:

- Z Purlins (Panel Frame)
- C Purlins
- Beams
- HSS A500 Columns
- HSS A500 Foundation posts
- Lifting Lug Flat Steel Bars
- Lifting Lug Steel Plates
- Beam/Strut Straight Steel Plates
- Beam/Strut Diagonal Steel Plates
- Base Plates
- Lifting Lug Fasteners
- Major/Minor Frame Fasteners
- Beam/Strut Straight Fasteners
- Module Fasteners
- Anchor Bolts
- Column Pins
- Washer plates
- 10 AWG XHHW Wiring Coppers
- Modules
- Foundation Concrete
- Depth Foundation Concrete
- Rebars
- Additional Wires

Contractual:

<u>Engineering:</u>

- Cost was estimated based on recent pricing.
- Project management activities including periodic project coordination meetings with BWCDD and Contractors, inclusive of a project kick-off meeting
- Data collection and final field design and hydraulic survey work
- Permitting coordination and support activities (if needed)
- Final Design plans for the Diversion Intak Structure, Canal Lining, and Canal Energy System (CES) Solar Arrays and Hydro Turbines
- Services during construction assistant on an as-needed basis for bid procurement, RFIs and addendum responses (if needed)
- Post design, services during construction activities, and installation and commissioning supervision (if needed)
- Provide as-builts (if needed)
- USBR Environmental Compliance and support services (if needed)

Construction

Other than engineering, all construction work will go through the District procurement process. Buckeye Water Conservation and Drainage District (BWCDD, District) is not required though aims to follow the Arizona Statues Title 42 Special Taxing Districts, Chapter 19 Irrigation and Water Conservation Districts, Article 3 Administration, 48-2985 and 48-2986 that requires the preparation of plans, public advertisement, receiving bids, and awarding a contract. BWCDD practice is to advertise the project, depending on the size and scope of a project, the normal time from advertisement to receipt of bids is generally 2 to 4 weeks but may be extended on large multi-million-dollar projects. The District may hold a pre-bid meeting, project site tour, and allow for questions from prospective bidders. Once bids are received, the District will evaluate and check the bid responses against the bid requirements and select the lowest qualified bidder. The District will issue a Notice of Award and then proceed with the project contract execution and issue a Notice to Proceed.

Contractor:

The following will be Structure and Gate Installation Contractor's work with the assistance of BWCDD Staff. Cost was estimated based on recent pricing.

For Diversion Intake Structure Modernization:
Install earthen berm if needed
Install pump-out to remove any nuisance water
Remove existing gates from structure
Perform demolition work where applicable
Structure form work
Prep concrete surface for gate installation including any concrete repairs or construct cast-in-place structures to hold the new Rubicon gates
Install new gates with Rubicon On-Site Support
Bolt new gates to the existing structure and adjust for proper sealing
Test and commission gates
Remove earthen berm form the Lateral D Canal
Return to normal operating conditions in the Lateral D while completing the remainder of the electrical and site work
Rubicon will install all SCADA related and Total Control Channel electric work and live connect system work.

Installation Methods:

The Rubicon FlumeGate includes the following installation method:
Installation labor is priced at USD $1,750 per site (included).

Services during commissioning include:

- Site visits by a Rubicon certified Field Technician. The visits will involve mounting of the external frame, supervising the lifting of the gate into the frame, commissioning and training in the operation and maintenance of the meter.

The Instream Model 713 - Radial Gate and Hoist Assembly includes the following installation method:

The contractor shall do installation of all the gate and hoist components in a professional and workmanlike manner. The manufacturer shall provide installation drawings and an operation and maintenance manual. It shall be the contractor's responsibility to handle, store and install the gate components in strict compliance with the manufacturer's drawings, specifications, and recommendations. Care must be taken when storing the gates prior to installation and during the installation of the gate assemblies and parts to avoid any warping or damage to any of the components. After installation, the equipment shall be cleaned, lubricated, and serviced in accordance with the Manufacturer's Instruction. The cable shall be adjusted to equalize tension and prevent racking of the gates. Check for proper installation of the seal with the aid of a feeler gauge. Adjust using the seals and seal rubbing plates. The gate shall be operated through at least one complete cycle before grouting or placing second stage concrete.

The Emrgy Hydrokinetic Turbine includes the following installation method:

Site preparation will include (Additional site preparation work may be necessary depending on the type of interconnect point and local requirements):

- Pouring concrete pads for power control units (PCUs) as well as trenching (if necessary)
- Laying cable from PCU locations to the interconnect point(s).
- Components will be unloaded from the flatbed, using a telehandler or crane, and staged at the appropriate locations on site for assembly
- Assembly is recommended using a team of three, plus the equipment operator, to pick, place, and assemble each Generator Assembly and Rotating Assembly to the corresponding Flume.
- Unloading and assembly for 20 turbine units and 10 PCUs is expected to take two days using a team of four and a telehandler.
- Turbine unit installation into the canal requires a properly sized crane with enough reach to lift the 14,000 lb assembled unit into the channel from the shore.
- Turbine installation is recommended using a team of three, plus the crane operator.
- Installation of 20 turbine units is expected to take a maximum of two days using a team of four and a properly sized crane.
- Electrical connection of the turbine units will require running cable from each turbine generator to the corresponding PCU and connecting the PCUs to the interconnect point(s)

using the previously laid cable. Final inspection and approval are dependent on local County and Utility requirements.

The Solar Spanning Canal Panel System includes the following items:

- Contractor mobilization (including survey control verification and initial staking)
- Construct embankment for concrete pad with ground mounted for transformer & SES
- Drill shafts canal left starting at upstream end
- Electrical construction work – conduits installation to stub out from transformer pad
- Contractor conduits installation to stub out from SES location to GRIC-UA transformer location
- Construction concrete pad for GRIC-UA ground mounted transformer & SES
- Drill shafts canal right starting from upstream end
- Precision as-built survey of drilled shaft anchor bolts
- Assemble and install structural steel frames with on frame conduits, wiring, and solar panels
- Coordination with GRIC-UA for grid connection
- Install solar system conduits, wiring, and electrical equipment (panels, inverters, SES, switch, etc.)
- Test solar side electrical system
- Connect solar system to APS
- Project walk through
- Final grading and clean up
- Demobilization

Third-Party In-Kind Contribution
$0.00

Other Expenses

<u>Environmental and Regulatory Compliance Costs:</u>
$40,000 for NEPA work. The proposed project scope and work limits will be reviewed for and comply with all NEPA requirements as required under this NOFO.

<u>Permitting Work:</u>
$30,000 for other permitting work.
Buckeye Water Conservation and Drainage District's diversion intake structure is located on fee title District-owned land; however, the structure is within the Gila River Floodplain and jurisdictional waters of the U.S. Army Corps of Engineers, which may require a 401 Certificate and 404 Permit from the U.S. Army Corps of Engineers/Arizona Department of Environmental Quality (ADEQ) to be in compliance with the 1972 Clean Water Act (CWA). Due to the District's

landownership which the structure is located, the permitting process will be streamlined and most likely done under a maintenance contract. Power generated will be utilized by the BWCDD and therefore does not require a Federal Energy Regulation Corps. (FERC) Grant.

Indirect Costs
0% de minimis of overall sub-total.

3. ENVIRONMENTAL AND CULTURAL RESOURCES COMPLIANCE

Environmental and Cultural Resource Considerations

- **Will the proposed project impact the surrounding environment (e.g., soil [dust], air, water [quality and quantity], animal habitat)? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.**

  No significant impact on the surrounding environment, all earth-disturbing work will occur within existing diversion and canal easement.

- **Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? If so, would they be affected by any activities associated with the proposed project?**

  No known Endangered species will be negatively affected by this project.

- **Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "Waters of the United States?" If so, please describe and estimate any impacts the proposed project may have.**

  No, there are no wetlands within the project boundary.

- **When was the water delivery system constructed?**

  The current irrigation system was constructed in 1885 and is over 136 years old and consists primarily of easily eroded earthen canals and laterals with manual controls.

- **Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.**

  Phase I: the project will replace old, eroded, manual gates with upgraded automated gates, and the existing earthen canal channel is to be lined with shotcrete/concrete, along with the introduction of the canal energy system coupling of hydrokinetic turbines and canal spanning solar panels. Phase II: This phase will include more canal lining, hydrokinetic turbines and

canal spanning solar panels as well as construction of a drainage channel and regulating reservoir.

- **Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.**

  Buckeye Canal and some Laterals. Approximately 5-20 miles away: BWCDD Diversion Structure, Gillespie Dam Bridge, El Rio Research Project Site & Trails, Gila River and Salt Confluence, Gila River, and Hassayampa River Confluence.

- **Are there any known archeological sites in the proposed project area?**

  There are no archaeological sites in the project area, but approximately 5-20 miles away: BWCDD Diversion Structure, Gillespie Dam Bridge, El Rio Research Project Site & Trails, Gila River and Salt Confluence, Gila River, and Hassayampa River Confluence.

- **Will the proposed project have a disproportionately high and adverse effect on low income or minority populations?**

  No disproportionally high or adverse effects on low income or minority populations. If anything, this will have the opposite effect economically.

- **Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?**

  No limited access to or ceremonial use of sacred sites or impact Tribal lands.

- **Will the proposed project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?**

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

4. REQUIRED PERMITS OR APPROVALS

The Buckeye Water Conservation and Drainage District's diversion intake structure is located on fee title District-owned land; however, the structure is within the Gila River Floodplain and jurisdictional waters of the U.S. Army Corps of Engineers, which may require a 401 Certificate and 404 Permit from the U.S. Army Corps of Engineers/Arizona Department of Environmental Quality (ADEQ) to be in compliance with the 1972 Clean Water Act (CWA). Due to the District's landownership which the structure is located, the permitting process will be streamlined and most likely done under a maintenance contract.

5. OVERLAP OR DUPLICATION OF EFFORT STATEMENT

Buckeye Water Conservation and Drainage District (BWCDD) does not have any projects which overlap between the proposed project nor any other active or anticipated proposal or projects in terms of activities, costs, or commitment of key personnel. The submitted proposal from BWCDD is not in any way duplicative of any proposal or project that has been or will be submitted for funding consideration to any other potential funding source.

6. CONFLICT OF INTEREST DISCLOSURE STATEMENT

Buckeye Water Conservation and Drainage District does not have any existing conflicts of interest, nor do we anticipate having any conflict of interest during the Federal award period.

7. UNIFORM AUDIT STATEMENT

The Buckeye Irrigation and Drainage District has not received $750,000 in U.S. dollars or more in federal grant award funds during a single fiscal year, nor has the District spent more than $750,000 in a single fiscal year.

8. LETTERS OF SUPPORT

Please see attachment for Letters of Support on this project. Letters of Support from:

- Ron Rayner, A Tumbling T Farms
- W.T. Gladden, Gladden Farms and Saddle Mountain Dairy
- Jason Hardison, Hardison Farms
- Trevor Bales, Bales Hay Sales
- Larry Vanderway, Grandview Dairy

9. OFFICIAL RESOLUTION

Authorized and approved by District Board, no third-party financial support. Please see the Official Resolution in the Appendices Section.

10. UNIQUE ENTITY IDENTIFIER AND SYSTEM FOR AWARD MANAGEMENT

Buckeye Water Conservation and Drainage District is registered with the State of Arizona and has an UEI number. Please see the completed SF-424 Form.

11. CERTIFICATION REGARDING LOBBYING

The Buckeye Water Conservation and Drainage District (BWCDD) discloses that there are no lobbying services. Please see the completed SF-LLL Form.

12. APPENDICES

Appendix A: Letters of Support

Appendix B: Official Resolution
Appendix C: BWCDD Background
Appendix D: District Boundary Map
Appendix E: Data and Quotes