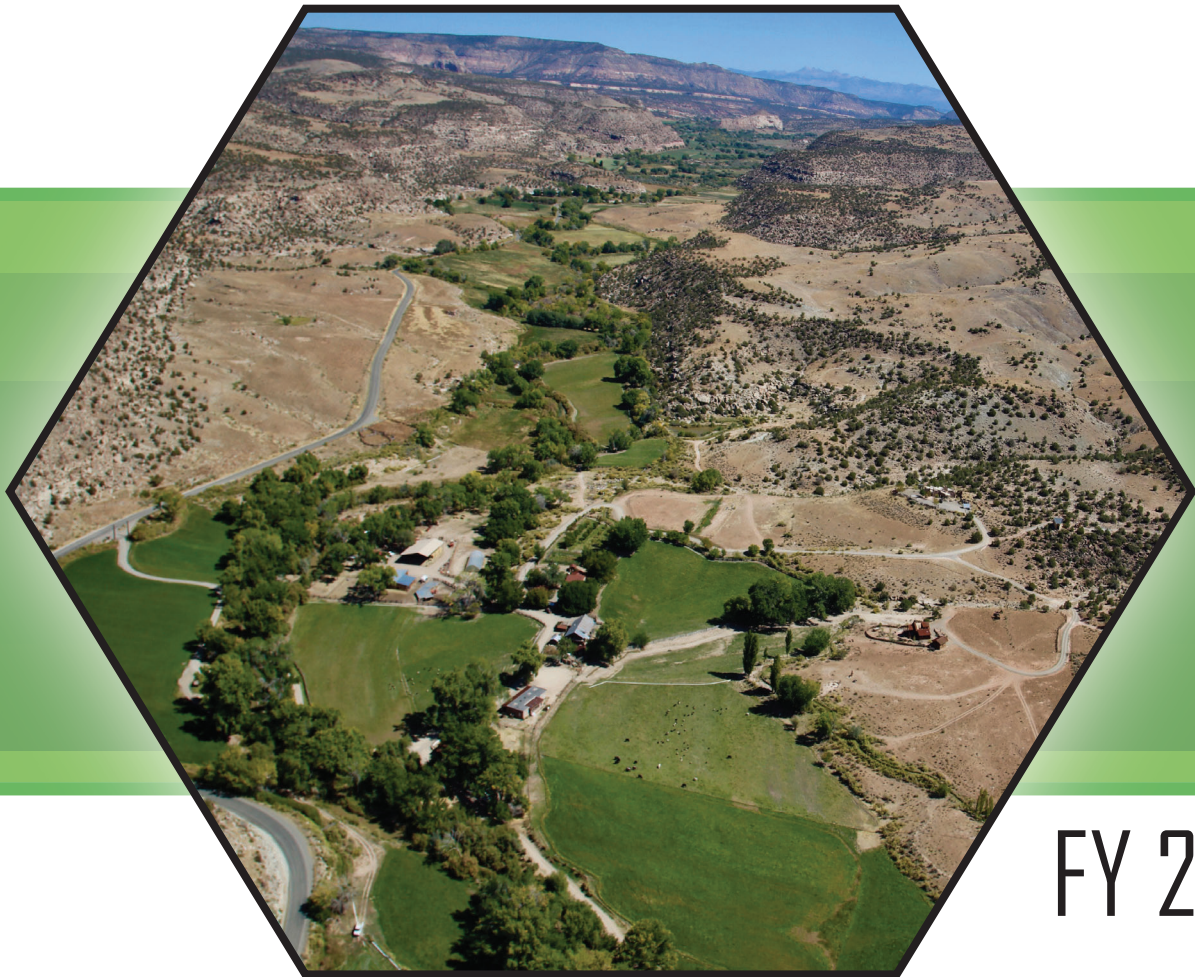


Bureau of Reclamation  
WaterSMART Water and Energy Efficiency Grant  
NOFO No. R23AS00008

# Montezuma Valley Irrigation Company

## Lower Arickaree and Garrett Ridge Canal Piping Project



FY 23

**Applicant Contact    Project Manager:**

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- ATTACHMENT A-Project Location Map*
- ATTACHMENT B-Detailed Project Map*
- ATTACHMENT C-Water Loss Studies*
- ATTACHMENT D-Areas Irrigated by Project Map*
- ATTACHMENT E-Disadvantaged Communities Map*
- ATTACHMENT F-Pages from the Dolores Water Conservancy District Drought Contingency Plan (2018)*
- ATTACHMENT G-On-Farm Landowner Signatures*
- ATTACHMENT H-Letters of Support*

## Technical Proposal and Evaluation Criteria

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### Executive Summary

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#### Applicant Info

*Date:* 07/28/2022

*Applicant Name:* Montezuma Valley Irrigation Company

*City, County, State:* Cortez, Montezuma County, Colorado

*Project Manager:* Brandon Johnson

*Phone:* 970-565-3332

*Email:* bjohnson@mVIC.info

*Applicant Category:* Funding Group: Group III

Project Funding Request: \$3,000,000.00      Total Project Cost: \$6,004,000.00

#### Project Summary

The proposed Montezuma Valley Irrigation Company (MVIC) Garrett Ridge and Lower Arickaree Canal Piping Project will save a total of 2,253 acre-feet of water by piping a total of 16,600 feet in the Garrett Ridge canal and the Lower Arickaree canal. Both canals will be piped using 36-inch SDR 32.5-inch HDPE pipe. The pipe was sized to provide a minimum of 10 cfs in the Lower Arickaree and 22 cfs in the Garrett Ridge. The Project will reduce the water losses in both canals, allowing water not required for irrigation to remain in the Narraguinnep and McPhee Reservoirs, benefitting nearby Ute Mountain Reservation irrigation users, wildlife, and recreational users. A solar array will be installed on the roof of the MVIC maintenance shop building, which will produce 19.13 kilowatt-hours (kWh) of energy per year and is designed to produce 100 percent of MVIC's annual electrical consumption. The Project is listed as a priority project in the Dolores Water Conservancy District's Drought Contingency Plan (2018).

#### Length of Time and Estimated Completion Date

*State the length of time and estimated completion date for the proposed project. Note: proposed projects should not have an estimated construction start date that is prior to May 2023.*

Preliminary engineering work, including anticipated pressure head calculations, preliminary alignment determination and pipe sizing has been completed as of July 2022. Once a funding agreement is established in January-February 2023, MVIC anticipates contracts for design and environmental work to be signed immediately following the establishment of the funding agreement. The topographic survey will need to be completed before the 2023 irrigation season begins, ideally by the end of March 2023. The design team will determine the alignments of both pipelines by April 2023, establishing environmental and cultural survey limits. The design team will complete a 60 percent design by December 2023 and final design by August 2024, ensuring that any environmental commitments developed in the NEPA process are captured in the final design package. The environmental and cultural field surveys are scheduled to be completed by December 2023, NEPA documentation submitted to Reclamation in early 2024, and a FONSI issued in August 2024. The Project will go to bid in September 2024 and the selected contract will mobilize in October 2024. The pipelines and structures need to be completed outside of the irrigation season, from October 2024 to March 2026. Construction closeout will occur in April

2026. The solar portion of the Project will be constructed in May-June 2026. The Project will be accomplished within the three-year allowance and will be completed by July 2026.

### Federal Facility

*Whether or not the project is located on a Federal facility.*

The Project is not directly located on a Federal facility. However, McPhee Reservoir and Dam were created as part of the Dolores Project, which is a Bureau of Reclamation multi-purpose project and operated by the Dolores Water Conservancy District. McPhee Reservoir, through the Narraguinnep Reservoir, supply the water that irrigated the lands through the Garrett Ridge and Lower Arickaree canals.

### Project Location

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#### Geographic Location

Montezuma Valley Irrigation Company's service area covers over 100 square miles and provides irrigation water to 1,524 users in the southwest corner of Colorado in Montezuma County. The service area includes the towns of Cortez and Lebanon, recreational areas around the McPhee and Narraguinnep Reservoirs, and reaches into the Ute Mountain Tribal lands. See Attachment A Project Location Map, Attachment B-Detailed Project Map.

#### Lower Arickaree Canal:

Water is released from the Narraguinnep Reservoir to the Upper Hermana Lateral which feeds water to the Lower Arickaree canal. The Lower Arickaree is 10,400 feet total in length and delivers 10 cfs of water. In addition to the water needed by the users, an additional 2-4 cfs of operational water (depending on the time of year) must be conveyed to operate the ditch and is currently turned out at the end of the canal structure. The Project coordinates are Latitude 37°25'24.49"N, and Longitude 108°36'37.65"W.

#### Garrett Ridge Canal:

Water is released from the Narraguinnep Reservoir into the Lone Peak Lateral. A diversion channels the water into the Garrett Ridge canal. The canal is 19,720 feet long and delivers 22 cfs of water. The Project coordinates are Latitude 37°28'34.41"N, and Longitude 108°38'47.55"W.

### Technical Project Description

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*Provide a more comprehensive description of the technical aspects of your project, including the work to be accomplished and the approach to complete the work. This description should provide detailed information about the project including materials and equipment and the work to be conducted to complete the project.*

The proposed Project will contribute to the goals of Montezuma Valley Irrigation Company, Delores Water Conservancy District, Colorado Water Conservation Board, and the Southwest Basins Roundtable in the following ways:

- **Conserve and use water efficiently.** A quantifiable water savings of 2,253 acre-feet per year, which will be saved and remain in the Narraguinnep and McPhee Reservoirs.



- **Eliminate water losses** from seepage and over-diversion through piping open, earthen canals, and ensuring adequate irrigation water to all full-service irrigators at the end of the canal.
- **Maximize flexibility** on how and when irrigators take their water by promoting efficient technologies, sprinkler application, managing soil erosion, creating a water bank and other sharing processes.
- **Utilize renewable energy** through a solar array of 19.13 kWh.
- **Incorporate community** partners, recreational users, public stakeholders, and water users in providing input, concerns, and solutions to better manage water supplies for all users.

**Lower Arickaree Pipeline:** 9,500 feet of the Lower Arickaree canal will be piped using 36-inch HDPE pipe. A concrete intake structure will control flow into the Pipeline. A flow meter and isolation valve will be placed at the start of the Lower Arickaree downstream of the concrete intake structure. The Lower Arickaree will follow the existing open ditch alignment for 9,500 feet to approximately where the turnout LA-19 is located. The downstream end of the pipe will be closed. A drain will be included to empty the pipeline at the end of the irrigation season. An additional isolation valve is proposed at the Road P crossing. Each turnout would tie onto the 36-inch pipeline with a 6-inch HDPE pipe. Flow to the turnouts will be controlled with a butterfly valve and measured through a flow meter. See Attachment B-Detailed Project Map.

**Garrett Ridge Pipeline:** The lower 7,100 feet of the existing Garrett Ridge canal will be piped with 36-inch HDPE pipe (the main pipeline). A concrete intake structure will be installed to control flow into the main pipeline and into a proposed 2,340-foot 36-inch HDPE spill pipeline to the Upper Herman Lateral. The end of the main pipeline will tie into the existing 18-inch pipeline at the end of the Garrett Ridge.

At the tie-in of the spill pipeline into the Upper Hermana, a concrete outlet structure will be installed to prevent scour. A flow meter will be installed on the main pipeline. A pressure reducing structure will be constructed near the middle of the main pipeline isolation valves will be installed on either side of the Highway 491 crossing. Each turnout will tie onto the 36-inch pipeline with a 6-inch HDPE pipe. Flow to the turnouts will be controlled with a butterfly valve and measured through a flow meter. See Attachment B-Detailed Project Map.

Project Location	Number of Headgates	Number of Users	Length of Proposed Pipeline	Acres Irrigated in Project Area
Garrett Ridge canal	18	36	7,100 feet	828 acres
Lower Arickaree canal	19	61	9,500 feet	305 acres

Figure 1: Descriptions of Project Canals

## Evaluation Criteria

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### 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.*

The assumption is that 100 percent of the water currently being lost due to open ditch seepage losses will be saved. By piping the open ditches of the Lower Arickaree and the Garrett Ridge canals, the estimated amount of water to be conserved as a result of this Project is 2,253 acre-feet per year (1,310 from the Lower Arickaree and 943 from Garrett Ridge).

*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:*

#### Losses from Evaporation

Over three miles of the open, earthen canals will be piped during this Project. Due to the large total surface area, evaporative losses are significant. Between the two canals in the Project, this equates to 10.22 acre-feet of water loss due to evapotranspiration during the growing season. Evaporative losses will be eliminated by converting the open canals to piped canals.



*Photo 1: Water Loss Due to Evaporation and Seepage in the Lower Arickaree canal*

#### Losses from Seepage

Most of the water that will be conserved can be attributed to the large amounts of seepage losses in the open, earthen canals. Water is seeping through the soil lining the canals, into other fields, and/or taken up by vegetation. MVIC diverts and attempts to deliver their full water right on an annual basis. Because of the large seepage losses, the water diverted is not delivered in full. This reduces the ability for users to take advantage of their full shares and to put them to beneficial use on their crops.

#### Losses from Operational Water

Both the Lower Arickaree and the Garrett Ridge canals are currently open ditches. Open ditches require operational water to maintain adequate water surface elevation needed to deliver turnout flows to users. This water serves as the conduit that delivers water when the canal is open, and the need for operational water will be eliminated when the canals are piped. Figure 2 below shows the current amounts of water loss resulting from evaporative, operational, and seepage losses in the Lower Arickaree and Garrett Ridge canals.

Project Location	Evaporative Losses	Operational Losses	Seepage Losses	Water Savings
Garrett Ridge Canal	4.02 AF	891 AF	48 AF	943
Lower Arickaree Canal	6.20 AF	763 AF	540 AF	1310

Figure 2: Water Losses in Project Canals

a. Explain where current losses are going (e.g., back to the stream, spilled at the end of the ditch, seeping into the ground)? 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, water is seeping through the soil lining the canals, into other fields, and/or taken up by vegetation. Water loss due to evaporation will be eliminated when the open canals are piped. Operational water is needed to transmit irrigation water through the canals and is currently turned out at the end of both canals. The operational losses in the Lower Arickaree canal are turned out at the end of the canal and some water eventually flows into McElmo Creek. Current losses in the Garrett Ridge canal are turned out at the end of the canal and seep into the ditch bottom. The proposed Project will allow water to remain in the McPhee and Narraguinnep Reservoirs and will also create a spillway on the Garrett Ridge canal to take the currently turned-out operational water to the Towaoc Highline canal. The Lower Arickaree canal pipe will be closed at the downstream side and a drain will be included to empty the pipeline at the end of the irrigation season.



There are no current losses entering impaired groundwater becoming unsuitable for future use.

c. 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 losses from both canals are not currently benefitting habitats beyond the contained area around the end of the canal. The proposed Garrett Ridge Project will install a spill pipeline to convey excess flows back to the Upper Hermana Lateral for beneficial use to the Towaoc Highline, which provides water to the Ute Mountain Tribe Reservation. The spill pipeline will eliminate operational water that is currently spilled and wasted at the end of the open ditch portion of the existing Garrett Ridge canal. Water saved in the reservoirs will go



into the rivers and laterals instead of being lost to seepage, evaporation, and the need for operational water.

*3. Describe the support/documentation of estimated water savings. Please provide sufficient detail supporting how the estimate was determined, including all supporting calculations.*

The estimated water savings for the proposed Project was determined based on the water loss study conducted by J-U-B ENGINEERS, Inc. on June 24, 2022. See Attachment C-Water Loss Studies.

### **Lower Arickaree canal**

The study included in-ditch flow measurements at two points comprising the limits of the water loss study area. Flowrates were measured at the upper end of the study area just downstream of the Upper Hermana Lateral (LowAri1) and at the existing Parshall flume just beyond the final turnout headgate (LowAri2). The study area was approximately 8,170 feet in length. Turnout flows on the day of the study were provided by MVIC personnel.

Flow measurement point LowAri1 is located approximately 100 feet downstream of an existing three-foot Parshall flume. The throat width of the existing Parshall was 37 inches, or slightly larger than the designed three feet. Additionally, weeds and stones in the approach section of the flume appeared to affect its stage-flow relationship. Due to these factors, the stage reading which corresponds to a flow rate of 2.09 feet per second (ft<sup>3</sup>/s).

On the day of measurement, all turnout flows were assumed to be equal to the discharge rates provided by MVIC personnel. A total of 19 turnouts occurs between the two measurement stations, and the total turnout flow rate was utilized in the water loss calculation. The total turnout flow rate for June 24, 2022, was 8.88 ft<sup>3</sup>/s.

Due to the large total surface area of the Lower Arickaree, evaporative losses were approximated using a method described by Jensen (2010). This method relates evaporation in shallow water bodies to local crop evapotranspiration data.

Seepage loss in the Lower Arickaree is considered any difference in flows between two measurement points that aren't accounted for in turnouts or evaporation. Losses were assumed to be seeps through the earthen embankment.

The operational water in the Lower Arickaree is defined as the water required to maintain adequate water surface elevation needed to deliver turnout flows. The operational water flows through the length of the canal, spills overland, and eventually travels to McElmo Creek. If the canal was piped, operational water would not be required and is considered water savings. Operational water was considered equal to the flowrate measured at point LowAri2 (2.09 ft<sup>3</sup>/s), using the two-foot Parshall flume past the final turnout headgate.

The total losses in the Lower Arickaree are the sum of the evaporative losses, the seepage losses, and the operational water. The losses would be considered water savings if the Canal were piped. The annual water savings are calculated by multiplying the total losses in the Canal by the duration of the irrigation season (184 days). Approximately 1,310 acre-feet of water would be saved each year if the Lower Arickaree were piped.

### **Garrett Ridge canal**

In-ditch flow measurements were taken at one point: GarRid1. Flow at the end of the study area was then recorded from the existing flow meter at turnout GR-37. However, due to variations in flow in the canal during the day of measurement, seepage losses could not be determined by field measurement methods (the flow at the GR-37 flow meter was greater than the measured flow at GarRid1 minus the total turnout flows). MVIC personnel verified that flow rates in the Garrett Ridge had been fluctuating throughout the day of the study and maintaining steady flow rates in the canal had been an ongoing difficulty. Due to the inability to measure the seepage losses by field measurement methods, seepage losses were approximated using published seepage rate data.

Due to the large total surface area of the proposed piped section of the Garrett Ridge, evaporative losses were accounted for using the Jensen method, which relates evaporation in shallow water bodies to local crop evapotranspiration data.

The referenced evapotranspiration rate was approximated by averaging the daily values from the Colorado State University's CoAgMET database during the 2021 irrigation season (4/15/2021-10/15/2021) at the Cortez Station. The average evapotranspiration rate for that period was 0.243 inches per day, which yielded an evaporative loss rate of 0.267 inches per day (0.022 feet per day). The total surface evaporation rate for the Garrett Ridge was approximated by the product of evaporative loss rate and the total surface area of the canal.

Because of non-steady flow rates encountered in the Garrett Ridge during the field investigation, seepage water loss in the Garrett Ridge was calculated using values from Appendix A of the Dolores Project Drought Contingency Plan (Appendix A). Appendix A lists a published range of canal seepage rates for the Garrett Ridge that were developed by the Bureau of Reclamation in 1988.

When the water surface elevation fluctuates in the Lone Pine Lateral, flows in the Garrett Ridge change. These changes in flow rate cannot be observed until the water reaches the flow meter upstream of turnout GR-37, approximately 3.7 miles downstream from the Lone Pine Lateral. Therefore, it can take several hours before excess water in the Garrett Ridge can be identified and corrected by raising or lowering the headgate at the Lone Pine Lateral. Any excess water that reaches the flow meter at GR-37 is considered operational water. Additionally, a minimum amount of operational water is required to maintain an adequate water surface elevation needed to deliver turnout flows. For the Garrett Ridge, operational water was considered equal to the flow meter reading above turnout GR-37 minus the total flow required at turnout GR-37. When the existing piped section of the Garrett Ridge is full, operational water is then wasted through a spill structure just above the beginning of the piped section.

The total losses in the Garrett Ridge canal are the sum of the evaporative losses, the seepage losses, and the operational water. The losses would be considered water savings if the canal was piped. The annual water savings are calculated by multiplying the total losses in the canal by the duration of the irrigation season (184 days). Approximately 943 acre-feet of water would be saved each year if the Garrett Ridge canal were piped.

4. Please address the following questions according to the type of infrastructure improvement you are proposing for funding:

(1) Canal Lining/Piping

- a. How has the estimated average annual water savings that will result from the project been determined? Please provide all relevant calculations, assumptions, and supporting data.  
The water losses were measured in the open ditch section, which will now be piped. All of these losses are assumed to be from seepage, operational water, or evaporation; all of which will be completely eliminated with the piping of the ditch.
- 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? If so, please provide detailed descriptions of testing methods and all results. If not, please provide an explanation of the method(s) used to calculate seepage losses. All estimates should be supported with multiple sets of data/measurements from representative sections of canals.

Seepage losses were calculated using the previously stated method. Values were calculated using the following equation: and shown in Figure 2 below:

$$\text{Evaporation Losses} + \text{Seepage Losses} + \text{Operational Water} \times \text{Duration of Irrigation Season (184 days)}$$

Figure 2 that has been referenced earlier, is shown again below.

Project Location	Evaporative Losses	Operational Losses	Seepage Losses	Water Savings
Garrett Ridge Canal	4.02 AF	891 AF	48 AF	943
Lower Arickaree Canal	6.20 AF	763 AF	540 AF	1310

Figure 2: Water Losses in Project Canals

- c. What are the expected post-project seepage/leakage losses and how were these estimates determined (e.g., can data specific to the type of material being used in the project be provided)?  
Seepage losses are estimated to be 5 percent post-project. This was estimated based on the Bureau of Reclamation’s estimated efficiency of 95 percent for an HDPE pipeline.
- 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?  
Annual transit loss reduction for the proposed Project are as follows:  
  
Garrett Ridge canal= 703.73 acre-feet per mile  
Lower Arickaree canal 727.78 acre-feet per mile  
The entire Project= 717.52 acre-feet per mile
- e. How will actual canal loss seepage reductions be verified?  
Canal flows will be measured using a portable flow meter and will be compared to the results from the water loss study conducted by J-U-B ENGINEERS, Inc. A simple inflow and outflow summary will verify actual seepage loss reduction.

f. *Include a detailed description of the materials being used.*

**18,970 linear feet of 36-inch SDR 32.5 HDPE pipe-**

- To pipe open ditches in the Lower Arickaree and Garrett Ridge canals. Running the pipeline within the existing ditch alignment will minimize utility conflicts and the need for new easement acquisition.

**Pressure reducing structure on the Garrett Ridge canal-**

- This structure will reduce the amount of hydrostatic head at the end of the main pipeline when it fills.

**Eighteen 3-inch air vacuum valves-**

- Air-vacuum valves allow air to evacuate the pipeline when filling at the beginning of the irrigation season, prevent air-lock at high points in the pipeline, and allow air to flow into the pipeline when draining at the end of the irrigation season.

**Two 36-inch flow meters-**

- Meters will monitor the water flows in both canals. Meters will enable MVIC personnel to measure and manage the water use more efficiently.

**One Drain and cap at end of the Lower Arickaree canal-**

- The drain and cap will allow the pipe to fill, eliminating the need for operational water.

**Spill pipeline connecting the Garrett Ridge canal to the Upper Hermana canal-**

- When the main pipeline is full, the spill pipeline will convey any excess flows back to the Upper Hermana Lateral for beneficial use to the Towaoc Highline, which provides water to the Ute Mountain Tribe Reservation. The spill pipeline will eliminate operational water that is currently spilled and wasted at the end of the open ditch portion of the existing Garrett Ridge canal.

## 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.*

MVIC participates in several local and regional planning efforts. Their strategic goals align with the regional efforts of identifying and implementing water and energy efficient processes that will benefit water users, local communities, and the environment. One regional group that focuses on economic development is the Comprehensive Economic Development Strategy (CED). Their plan for Montezuma County prioritizes the addition of solar as a potential renewable energy source, as priority three on the Community Development Action Plan (2021) and is ranked as number one on the Building and Infrastructure Sustainability resiliency impact for the County.

MVIC already uses solar on several pumps and are planning to expand their use of solar as a renewable energy source. The proposed Lower Arickaree and Garrett Ridge canal Piping Project will install a 19.13 kWh solar array on the existing roof of the MVIC maintenance shop. **This size of solar array was designed to offset 100 percent of MVIC’s annual electrical**



**consumption**, and over the 25-year warranted life of the solar panels, MVIC projects that it will result in a net savings of over \$100,000 in electricity costs!

*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.*

The 19.13 kWh solar array that will be installed as part of the Project will provide approximately 30,911 kWh per year that will be used to offset MVIC energy demands. It is estimated that 30,911 kWh is equivalent to reducing MVIC’s carbon footprint by 48,665 pounds of CO<sub>2</sub> per year and 1,216,620 pounds of CO<sub>2</sub> over the life of the solar panels.

*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*

By utilizing solar as a renewable energy source, MVIC will impact the climate by a reduction in greenhouse gas emissions. Examples of the equivalencies from the reduction of Carbon Dioxide in the environment is shown in Figure 3.

<b>48,665 lbs. of Carbon Dioxide Emissions are Equivalent to:</b>	<b>Each Year</b>	<b>Over 25 Years</b>
Gasoline-Powered Passenger Vehicles	4.7	117.5
Gallons of Gasoline Consumed	2,465	61,625
Homes’ Electricity	4.3	107.5
Barrels of Oil Consumed	50.7	1,267.5

*Expected environmental benefits of the renewable energy system*

The 30,911 kWh that the solar array will produce is equivalent to sequestering carbon in the environment. Figure 4 shows ways in which the MVIC solar Project will benefit the environment, over each year and over the life of the solar panels (25 years).

<b>48,665 lbs. of Carbon Dioxide Emissions are Equivalent to:</b>	<b>Each Year</b>	<b>Over 25 Years</b>
Incandescent Lights Switched to LED’s	830	20,750
Trash Bags of Waste Recycled Instead of Landfilled	948	23,700
Acres of U.S. Forests Preserved from Conversion to Cropland	.148	3.7
Acres of U.S. forests	25.9	647.5

- *Any expected reduction in the use of energy currently supplied through a Reclamation project*  
There is no anticipated direct reduction in energy use currently supplied through a Reclamation project. Power is provided through Empire Electric Association.
- *Anticipated benefits to other sectors/entities*  
Benefits and beneficiaries:
  - Reduced greenhouse gas emissions are a step in the right direction for combatting climate change. The proposed solar Project will offset approximately 48,665 pounds of CO<sub>2</sub> per year compared with coal plant generation.
  - The power generated will allow MVIC to offset all of their electrical usage at their maintenance building. In a small way, this will reduce the peak usage that Empire Electric Association is required to deliver.
- *Expected water needs, if any, of the system*  
The proposed solar array project will not include water needs.

### 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 (e.g., reduced pumping).*

- *If quantifiable energy savings is expected to result from the project, please provide sufficient details and supporting calculations. If quantifying energy savings, please state the estimated amount in kilowatt hours per year.*  
The proposed Lower Arickaree and Garrett Ridge canal Piping Project will install a 19.13 kWh solar array on the existing roof of the MVIC maintenance shop. This size of solar array was designed to offset 100 percent of MVIC's annual electrical consumption, and over the 25-year warranted life of the solar panels, MVIC projects that it will result in a net savings of over \$100,000 in electricity costs!
- *How will the energy efficiency improvement combat/offset the impacts of climate change, including an expected reduction in greenhouse gas emissions.*  
The 19.13 kWh solar array that will be installed as part of the Project will provide approximately 30,911 kWh per year that will be used to offset MVIC energy demands. It is estimated that 30,911 kWh is equivalent to reducing MVIC's carbon footprint by 48,665 pounds of CO<sub>2</sub> per year and 1,216,620 pounds of CO<sub>2</sub> over the life of the solar panels.
- *If the project will result in reduced pumping, please describe the current pumping requirements and the types of pumps (e.g., size) currently being used. How would the proposed project impact the current pumping requirements and energy usage?*  
The Lower Arickaree and Garrett Ridge canals are gravity fed systems. There are no pumps required to move the water to the users.
- *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.*  
The energy savings are calculated by the reduction in MVIC's carbon footprint and the net savings in MVIC's electricity costs.
- *Does the calculation include any energy required to treat the water, if applicable?*  
No.

- *Will the project result in reduced vehicle miles driven, in turn reducing greenhouse gas emissions? Please provide supporting details and calculations.*

No.

- *Describe any renewable energy components that will result in minimal energy savings/production (e.g., installing small-scale solar as part of a SCADA system).*

The installation of the 19.13 kWh solar panels will offset 100 percent of MVIC’s electricity consumption, and over the 25-year warranted life of the solar panels, MVIC projects that it will result in a net savings of over \$100,000 in electricity costs. The solar array will also provide approximately 30,911 kWh per year that will be used to offset MVIC energy demands. It is estimated that 30,911 kWh is equivalent to reducing MVIC’s carbon footprint by 48,665 pounds of CO<sub>2</sub> per year and 1,216,620 pounds of CO<sub>2</sub> over the life of the solar panels.

### Evaluation Criterion C – Sustainability Benefits

**Enhancing drought resiliency:** *This NOFO places a priority on projects that enhance drought resiliency, through this section and other sections above, consistent with the SECURE Water Act. Please provide information regarding how the project will enhance drought resilience by benefitting the water supply and ecosystem, including the following:*

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

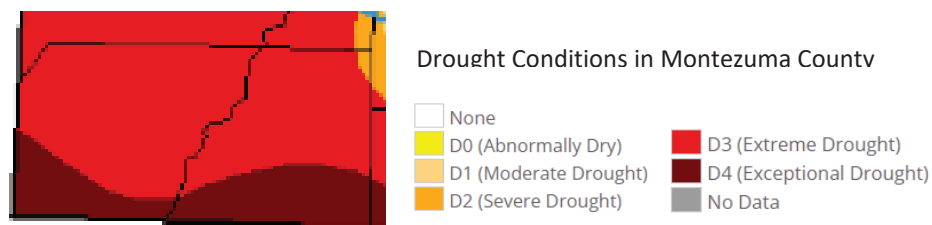
#### Drought in Montezuma County

McPhee Reservoir has only reached maximum active capacity 9 out of the last 20 years. As of July 12, 2022, the Dolores River that provides the water stored in McPhee Reservoir is running at only 33 percent of the river’s July average. McPhee Reservoir’s water inflow for July 2022 is at 164,950 acre-feet, which is 55 percent of the July average of 300,079 acre-feet. Even more drastically, MVIC has only 11 percent of their full water supply available this year.



Photo 3: Low Water Level at McPhee Reservoir

According to USDA’s National Integrated Drought Information System, Montezuma County is in drought categorized as extreme or exceptional.



Extreme and exceptional drought is impacting the Project area in the following ways:

- Agricultural and recreational losses are large
- Reservoirs are extremely low
- Mandatory water restrictions are implemented
- Water temperatures increase, not supporting native fish populations
- Fire season is extended, large fires occur
- Snowpack is low, water levels are low

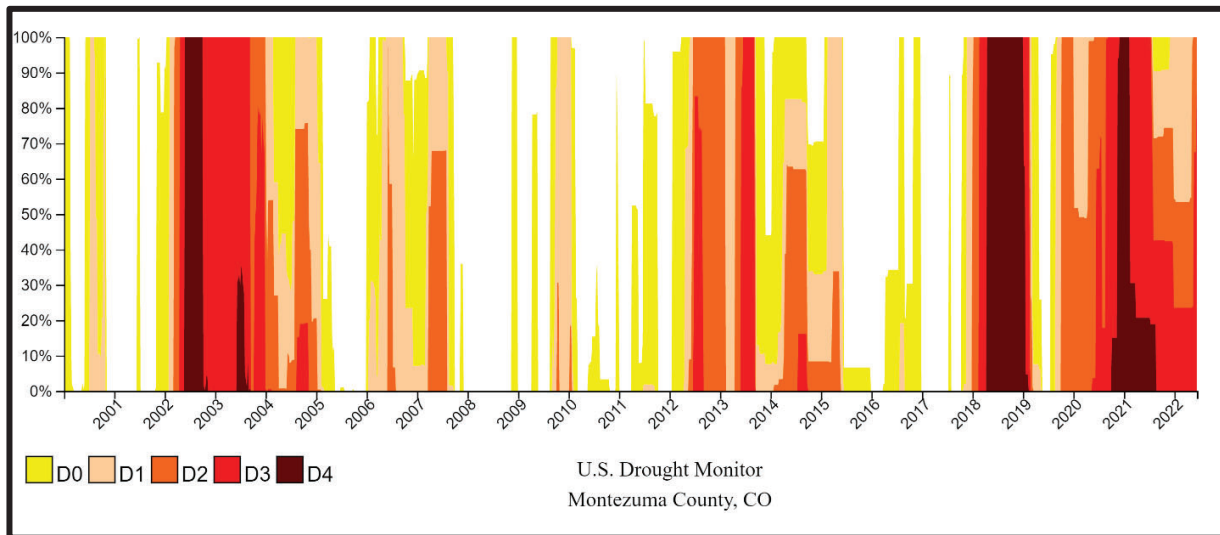


Figure 6: Montezuma County Historic Drought Conditions

Since 2001, drought conditions have continued to worsen. The map detail in Figure 7 above shows that each summer season has gotten increasingly drier. The historic increase has led to a region-wide decrease in water availability. Figure 7 below shows the probability of rivers in Montezuma County reaching 50 percent capacity this year.

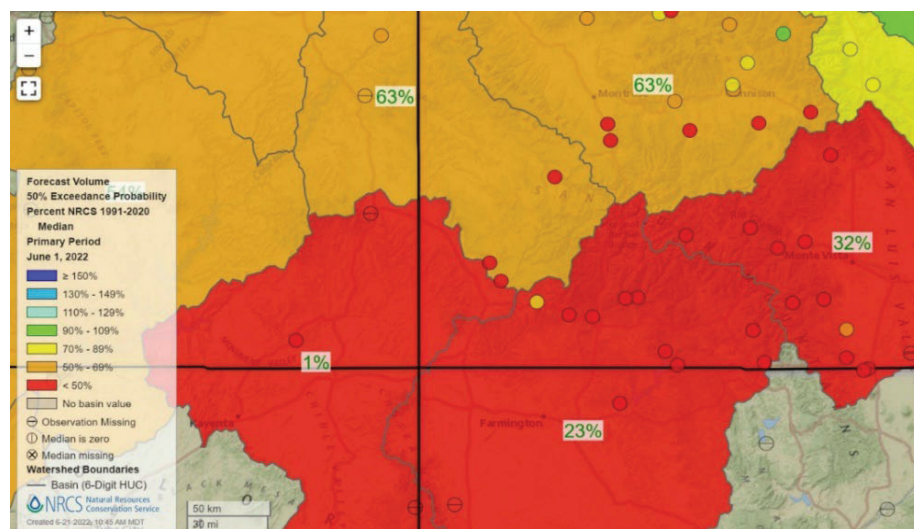


Figure 7: Probability of Rivers Reaching a 50% Volume



## Impacts from Drought on Agriculture

Irrigators are heavily impacted by drought. There are no alternative water sources for the irrigators in the Project area past the Dolores River and the McPhee and Narraguinnep Reservoirs, and the annual average precipitation along the Dolores River watershed is 16 inches. This precipitation is unreliable from year to year and does not fall when crops need it most. Farmers are vulnerable to the amount of snowmelt runoff in the Dolores River, the amount of water spilled from McPhee and Narraguinnep Reservoirs for boating and fishing, the amount of annual precipitation, the efficiency of the water delivery system throughout the entire growing season, and the inaccuracy of water availability projections.

Low amounts of water, or a water supply that runs out mid irrigation season leads to reduced crop production and reduced income to prepare for the next crop planting. Farmers must decide and purchase seed by April, but often the water projections for the season are unknown. If the farmers are anticipating a full water supply, they often plant up to 60 percent of their irrigated land in alfalfa because it provides the highest income. However, alfalfa takes a couple of years to develop a mature stand, making it a multi-year commitment to grow. Grains such as wheat and corn are more flexible and take less water to grow but provide a lower income. This uncertainty results in farmers annual income fluctuating drastically from year to year. Since 2002, irrigators have received an average of 74 percent of their water share, but in 2021, irrigators only received 11 percent of their water share. Piping the Lower Arickaree and Garrett Ridge canals will help to ensure that the water is delivered efficiently to the water users. See Attachment D-Areas Irrigated by Project Map.

- *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).*

As outlined in the Dolores Project Drought Contingency Plan, lower water levels cause the water temperature in reservoirs and streams to rise. Piping the Lower Arickaree and Garrett Ridge canals will allow more water to remain in the McPhee and Narraguinnep Reservoirs and help the water maintain a lower temperature that sustains the native fish populations.

- *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).*

The Towaoc Highline Contract gave the right for MVIC to use any water saved “for any use, including, but not limited to, fish and wildlife enhancement and maintenance of cottonwood habitat.” Through the proposed Project, water that remains in the McPhee and Narraguinnep Reservoirs will benefit the fish and wildlife that depend on water and plants in the San Juan River Basin.

Climate change has caused Spring run-off peak flows that are projected to occur earlier. The risk of detrimental effects to peak flow related fish habitat is currently high and could increase under the changing climate. Summer flows are projected to be lower and stream temperatures are projected to be higher, negatively affecting fish habitat.

The San Juan River Basin is home to nine native fish species. The Colorado River Basin is unique in housing one of the highest number of fish species that are found only in that basin. The San Juan River Recovery Implementation Program focuses on the San Juan River Basin and two endangered fish species: Razorback Sucker (*Xyrauchen Texanus*) and the Colorado Pikeminnow (*Ptychocheilus Lucius*).

### **Colorado Pikeminnow**

A big river minnow found only in the Colorado River Basin. First listed as an endangered species in 1967 and was given full protection under the Endangered Species Act in 1973. Wild populations now only occur in rivers upstream of Glen Canyon Dam, Arizona. Colorado Pikeminnow can reach 6 feet in length, weigh 80 pounds, and live up to 40 years. They are known for their long-distance spawning migrations of more than 200 miles.

### **Razorback Sucker**

A big river sucker found only in the Colorado River Basin. First listed as endangered and given full protection under the Endangered Species Act in 1991. Wild populations of Razorback Suckers are now extremely rare due to poor survival of the youth, loss of habitat, and predation by non-native fish species. They can reach 36 inches in length, weigh 14 pounds, and live 40 years. Spawning only occurs during high spring flows.

- *Please describe any other ecosystem benefits as a direct result of the project.*  
There are no other known ecosystem benefits resulting from the Project.
  
- *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?*  
MVIC and Dolores Water Conservancy District (DWCD) have identified ways to better manage the limited water supply:
  - Water exchange between users. Full-service irrigators pay a base rate plus an additional rate per acre-foot used. No matter how much water the irrigator uses, they pay the base rate. On years that a farmer plants less acreage, or fallows fields, they can choose to leave water in the canals, rivers, and reservoirs for other users.
  - Participate in a water-banking agreement between users.
  - Users will benefit through management of water, allowing for a more accurate water supply forecasting and projections.
  - Provide the option to store MVIC water in either Narraguinnep or McPhee Reservoirs. MVIC water is stored in Narraguinnep Reservoir. This option would allow water that is typically held in Narraguinnep to be stored in McPhee Reservoir. In drought years, this additional water would help keep McPhee full enough to pump without the level dropping below the elevation where the water cannot be reached. Holding more water in McPhee would also allow more water to be pumped out to other users in Colorado and into the Colorado River.
  - Implementing more efficient On-Farm irrigation methods for users.

*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.*

This past 2021 irrigation season was difficult for all water delivery systems, and the 2022 irrigation season has been even more difficult. Drought, climate change, sediment in the open canals, Spring run-off occurring earlier, lower water levels in the Dolores River and reservoirs, and uncertainty of water supply when planting crops have created excessive burdens on already disadvantaged communities and areas of persistent poverty.

- *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.*

The spillway that will be part of the piping of the Garrett Ridge canal that will feed to the Towaoc Highline canal, will ensure that the water reaches the irrigation fields within the Ute Mountain Tribal lands instead of being turned out at the end of the Garrett Ridge canal.

- *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?*

The Project will conserve water to allow it to stay in the system longer. It will enable 2,253 acre-feet of water to be saved for future use in the reservoirs, not to be turned out at the end of the canals, and to be piped to the Ute Mountain Tribe through the Towaoc Highline canal.

- *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.*

The Project will pipe the Lower Arickaree Canal and a portion of the Garrett Ridge Canal. The open canals lose essential water to seepage, evaporation, and operational water.

Enclosing the canal will allow the lost water to be used by farmers and secondary water irrigators and held in the reservoirs longer during the irrigation season. This will provide additional water for use in times of drought and will enable users to exercise their water rights more fully. It will also benefit the environment, fish, and wildlife habitats on the Weber River by allowing prolonged and better-balanced stream flows of available water. The conserved water will enable flows to remain in the river system for extended periods.

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

This Project's development will allow more water to be saved and held in the Narraguinnep and McPhee Reservoirs and within the Dolores River system. The conserved water will flow through the existing canal system to the current users in the Lower Arickaree and Garrett Ridge canals and through the Towaoc Highline canal to the Ute Mountain Tribe users.

- *Indicate the quantity of conserved water that will be used for the intended purposes .*  
The 3,285 acre-feet of conserved water will be used to make the water system more reliable. This water will be stored in the McPhee and Narraguinnep Reservoirs and delivery to the Ute Mountain Tribe to reduce the impacts of drought and water shortages.

**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**

*E.O. 14008: Tackling the Climate Crisis at Home and Abroad, focuses on increasing resilience to climate change and supporting climate-resilient development. For additional information on the impacts of climate change throughout the western United States, see:*

*<https://www.usbr.gov/climate/secure/docs/2021secure/2021SECUREReport.pdf>. Please describe how the project will address climate change, including the following:*

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

Concern over water conservation is most prevalent in the western United States, and especially in Montezuma County Colorado. Because of climate change and drought, water conservation in Colorado is something that is taken seriously by water distributors and users throughout the State. Although MVIC can do nothing to stop climate change, and especially drought, they actively seek ways to reduce the disastrous effects of drought on their water users, and by extension, the State. By enclosing their unlined and open canal system, MVIC is protecting their water right and Colorado's water resources. This will help ensure that MVIC's resources are available to sustain those living within their service area.

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

As MVIC improves its delivery system, they increase resiliency and implement sustainable projects with 50 to 100 years of life to deliver water to their users more effectively. The Project adds safety and sustainability to Lower Arickaree and Garrett Ridge delivery systems that have 11,680 acre-feet of water flowing through these Project areas each year.

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

The proposed Lower Arickaree and Garrett Ridge canal Piping Project will install a 19.13 kWh solar array on the existing roof of the MVIC maintenance shop. This size of solar array was designed to offset 100 percent of MVIC's annual electrical consumption, and over the 25-year warranted life of the solar panels, MVIC projects that it will result in a net savings of over \$100,000 in electricity costs!

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

The 19.13 kWh solar array that will be installed as part of the Project will provide approximately 30,911 kWh per year that will be used to offset MVIC energy demands. It is estimated that 30,911 kWh is equivalent to reducing MVIC's carbon footprint by 48,665 pounds of CO<sub>2</sub> per year and 1,216,620 pounds of CO<sub>2</sub> over the life of the solar panels.



## (2) Disadvantaged or Underserved Communities

*E.O. 14008 and E.O. 13985 support environmental and economic justice by investing in underserved and disadvantaged communities and addressing the climate-related impacts to these communities, including impacts to public health, safety, and economic opportunities. 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.*

### High housing cost burden and substandard housing

Households who pay more than 30 percent of their income on housing are considered Rent Overburdened. Half of renters in Colorado spent more than 30 percent of their income on housing and 42 percent of renters in Montezuma County spend more than 30 percent of their income on housing.

#### Montezuma County:

- 27 percent higher than the national average of people without health insurance.
- 31 percent higher than the national average of people under 65 years old with a disability.
- 36 percent higher than national average of people who do not have health insurance. The 2020 statistics from the US Census Bureau show that the disparity between the annual incomes of owner-occupied housing and renter-occupied housing is significant and that gap is projected to continue.

### Disadvantaged Communities

The U.S. Department of Transportation developed criteria that define various disadvantaged by census tracts. These Historically Disadvantaged Communities are consistent with OMB's Interim Guidance for the Justice40 Initiative and are defined by looking at 22 indicators. Montezuma County has areas that meet the following Federally designated disadvantages:

- Area of Persistent Poverty
- Health Disadvantage
- Economy Disadvantage
- Equity Disadvantage
- Transportation Disadvantage

Figure 8 below shows where these areas of disadvantage are located and shows census tracts that have three or more disadvantaged areas. See also Attachment E-Areas of Persistent Poverty Map.

### Social Vulnerability

The citizens of Montezuma County face barriers that would weaken their ability to prepare and respond to a natural or human-made disaster. Studies have found communities that exhibit certain social conditions such as high poverty, low percentage of vehicle access, aging populations, and low educational status contribute to the area’s ability to prevent suffering and economic loss resulting from a disaster. The Center for Disease Control has used 15 social factors to determine the level of social vulnerability of every census tract. These factors were combined into four categories: Socioeconomic Status, Household Composition, Race/Ethnicity/Language, and Housing/Transportation. Montezuma County’s ratings are summarized in Figure 9 below.

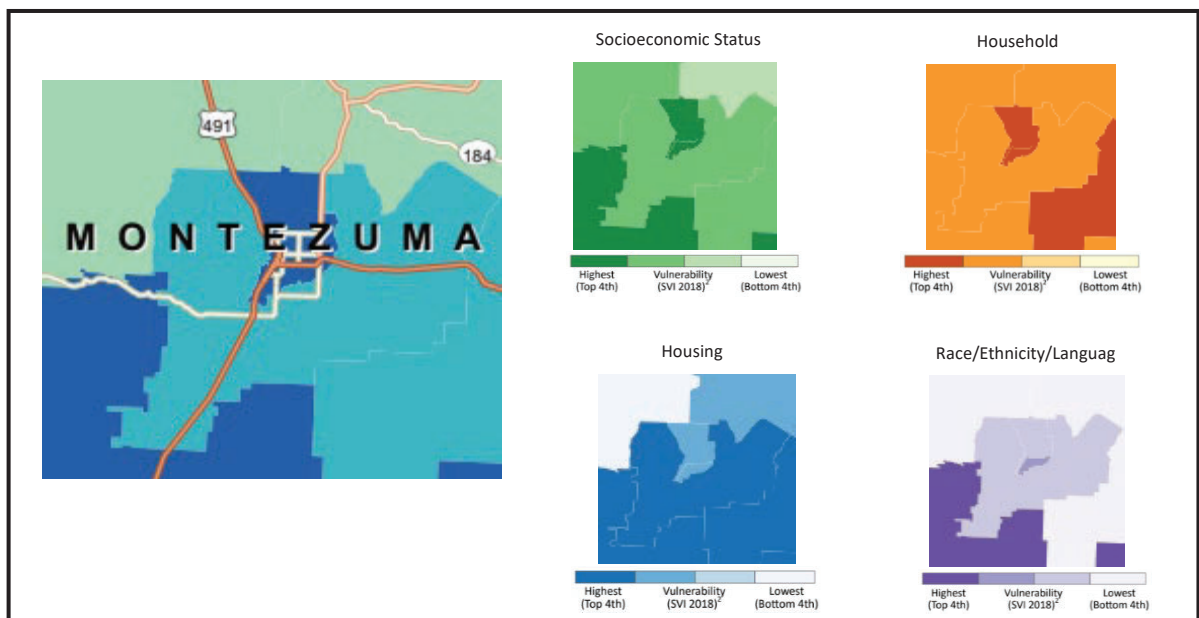
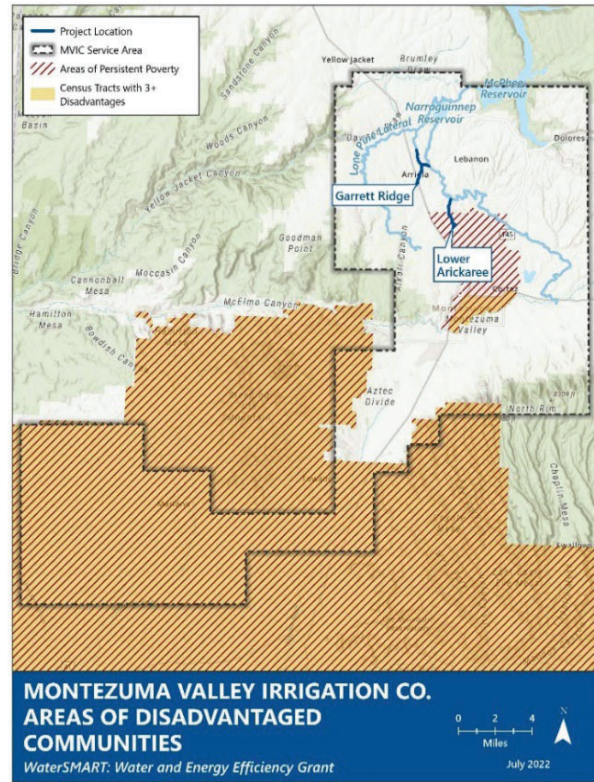


Figure 9: Social Vulnerability Index in Montezuma County Colorado

*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. County population of 25,700. 10,417 households and 29,62% that rent.*

Owner-Occupied households are defined as those who pay more than 30 percent of their gross income on housing are categorized as Overburdened, with the median gross income of the county at \$43,553, or \$3,629 per month. Renter-occupied households who pay more than 30 percent of their gross income on housing are categorized as Rent Overburdened. Figure 10 below shows the disparity between household income and

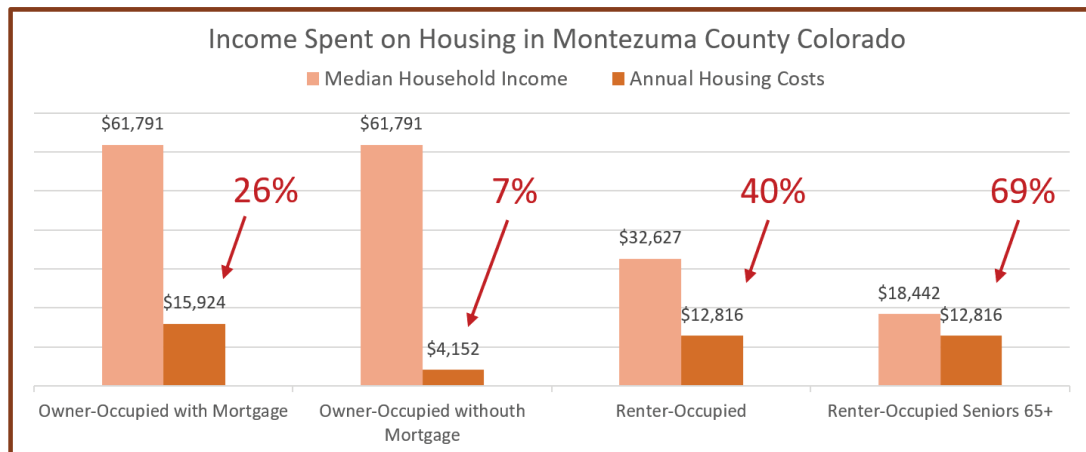


Figure 10: Income Spent on Housing in Montezuma County Colorado

housing costs. Note that the percentage that homeowners spend on housing ranges from 7-26 percent, while renters spend between 40-69 percent of their income on housing. In Montezuma County, that would equate to a household making less than \$2,583 per month. This means that 42 percent of households who rent are overburdened in Montezuma County.

Montezuma County has an aging population; a large percentage of seniors who are 65-plus. The national average of seniors is 16.5 percent and Montezuma County is 22.9 percent. This means more residents living on fixed incomes, spending more of their income on housing, and spending less in the local economy.

### Wildfire Risk

Colorado has an average of 5,821 wildfires per year, with an estimated cost of \$500,000 per day. The Colorado State Forest Service provided the map below in Figure 11 showing the potential risk of wildfires in Montezuma County.



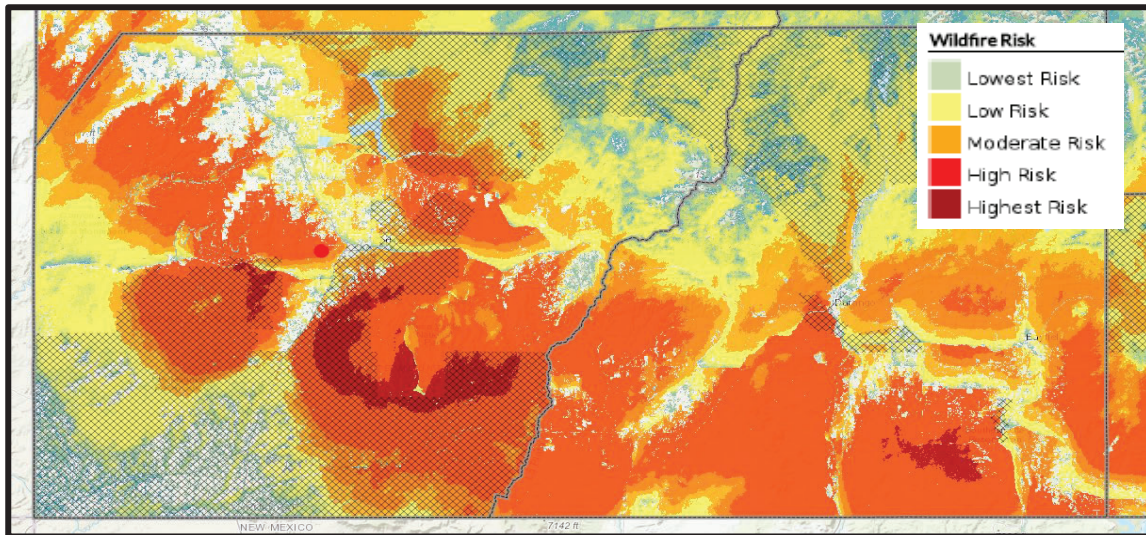


Figure 11: Risk of Wildfire in Montezuma County

- b. *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.*

The proposed Project will benefit disadvantaged communities as designated by the U.S. Department of Transportation’s Historically Disadvantaged Communities and is consistent with OMB’s Interim Guidance for the Justice40 Initiative.

### (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?*

MVIC provides irrigation water to the Ute Mountain Tribe through the Towaoc Highline canal. The Ute Farm & Ranch and the Ute Mountain Ranches receive their irrigation water from MVIC.

The 2,340-foot spill pipeline that is part of the Garret Ridge canal piping Project will allow water to flow into Upper Hermana Lateral, which connects to the Towaoc Highline canal, and into Ute Mountain Tribal lands. The additional water into the Towaoc Highline will provide a more stable water supply to the irrigation fields within the Tribal boundaries, resulting in sustainability and a more efficient use of water supply throughout the delivery system. Figure 12 shows the end of the Towaoc Highline canal that supplies irrigation water to the town of Towaoc within the Tribal lands.

The Project will not provide renewable energy to the Ute Mountain Tribe.



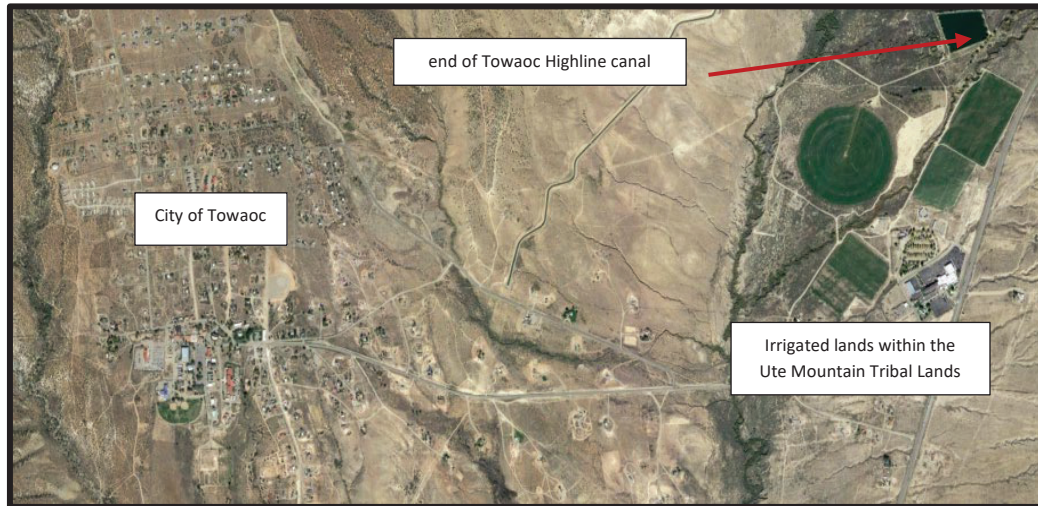


Figure 12: Ute Mountain Tribal Land Irrigation from MVIC

- 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?*

Reducing runoff at the end of the Garrett Ridge canal by piping through a spill pipeline to the Upper Hermana Lateral that connects to the Towaoc Highline canal will support Tribal resiliency to drought. A stable water supply will help irrigators of the Ute Mountain Tribe prepare for and react to drought conditions.

#### (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?*

Montezuma Valley Irrigation Company participates in the Southwest Basins Roundtable. This group consists of stakeholders from the nine river subbasins in southwest Colorado. This group was formed as part of the Colorado Water for the 21<sup>st</sup> Century Act of 2005. All nine subbasins are tributaries to the Colorado River, two remain free flowing to the state line.

The goals of the Roundtable are to bring together recreational, environmental, agricultural, industrial, and domestic water users to collaborate on water plans, address conflicts, and approve state funding for area projects.

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

The proposed Project will benefit agricultural, environmental, and recreational sectors. Agricultural users will benefit through the piping of an open canal. Piping the canals will eliminate the need for operational water, deliver water more efficiently, allow irrigators to receive more of their shares of water, and better manage the water at the ends of each canal. The end water will either be capped or flow through a spill pipeline to other irrigators. More water will remain in the McPhee and Narraguinnep Reservoirs

for other uses, and fish habitats will benefit from water remaining in the reservoirs and Dolores River. Recreational users will benefit by water either remaining in the McPhee and Narraguinnep Reservoirs or being released into the Dolores River for boating and fishing activities.

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

Yes, as mentioned above, open canals lose water through seepage and could result in a breach, which could significantly impact residential and other areas. It will disrupt services to many communities and agricultural users. This project will pipe the Lower Arickaree and Garrett Ridge canals, reducing seepage to groundwater and other fields, loss through evaporation, and the need for operational water.

MVIC has partnered with the Dolores Water Conservancy District to develop the Drought Contingency Plan. See Attachment F-Pages from the Dolores Water Conservancy District Drought Contingency Plan (2018).

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

There is a history of conflict over water in the area. Tensions were resolved in a 2009 lawsuit between MVIC and the Federal Government. The procedure was clarified for determining the amount of water available to MVIC and its shareholders on an annual basis. In order to keep tensions from increasing to the point of a lawsuit again, all parties have taken steps to cooperate and have been successful in jointly developing local and regional plans.

## 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 planned or ongoing projects by farmers/ranchers that receive water from the applicant to improve on-farm efficiencies.*
  - *Provide a detailed description of the on-farm efficiency improvements.*

Full-service irrigators have maximum flexibility on how and when they take their Project water, which allows for greater on-farm efficiencies compared to historic irrigation practices. MVIC normal water allocation is 4 acre-feet per share. Due to the severe drought, MVIC began this irrigation season allocating only 2.6 acre-feet per share. Monthly meter readings monitor the water usage, and the water is shut off when an irrigator uses the allocation. Many shareholders monitor their own usage and shut off their water when they have used their shares or shut off their water to leave it in the canal for other users.

The users on one headgate in the Lower Arickaree canal created agents to monitor the water usage and improve water efficiency on the entire headgate. The agents manage 319 shares and 41 accounts on the single headgate.

Another user on the Garrett Ridge canal has installed three lines of gated pipe in ditches that had been open, earthen ditches. They hold 10 shares of water, and the

installation of the pipe has reduced their water use to less than 6 shares to cover nearly 8 acres.

One outcome of On-Farm irrigation improvements is for irrigators to identify areas of improvement on their farms. Improvements may include better use of existing irrigation technologies, enhanced soil health management, and adjusting or changing cropping patterns to lower water demand and usage. When improvements are made, water savings is not the only benefit. Additional benefits include decreased labor, potential yield increases, and decreased energy demand.

Water conserved when upgrading from side roll irrigation to center pivots is substantial, going from 75 percent efficient to 90 percent. Soil health also affects how well water is used and applied to the crop. By decreasing excess water in pivot wheel tracks, issues with rutting of the tracks may be prevented. This, in turn, decreases soil erosion. Soil management may improve water infiltration when correct tillage strategies are used, or cover crops are planted.

- *Have the farmers requested technical or financial assistance from NRCS for the on-farm efficiency projects, or do they plan to in the future?*  
Over twenty farmers who represent over 1,000 acres have indicated an interest in irrigation efficiency upgrades, such as moving from flood irrigation to sprinklers or pivots. These farmers are willing to explore financial assistance through NRCS in the future as water availability becomes dependable.
- *If available, provide documentation that the 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.*  
These farmers have indicated an interest in projects to improve irrigation efficiency such as sprinklers or pivots, which are eligible for NRCS assistance. They have not yet applied for funding and are hesitant to invest more into farms that are not being provided adequate irrigation flows. These farmers represent 1,079 acres and have signed the attached landowner signatures form to indicate their interest in future irrigation efficiency improvement projects. See Attachment G- On-Farm Landowner Signatures.
- *Applicants should provide letters of intent from farmers/ranchers in the affected project areas. See Attachment G- On-Farm Landowner Signatures.*
- *Describe how the proposed WaterSMART project would complement any ongoing or planned on-farm improvement.*
  - *Will the proposed WaterSMART project directly facilitate the on-farm improvement? If so, how? For example, installation of a pressurized pipe through WaterSMART can help support efficient on-farm irrigation practices, such as drip-irrigation.*  
The proposed Project will facilitate On-Farm improvement projects by increasing their trust in MVIC's ability to provide adequate irrigation water going forward. Increased water reliability in the area will provide the confidence necessary to further invest in On-Farm upgrades.

**OR**

- *Will the proposed WaterSMART project complement the on-farm project by maximizing efficiency in the area? If so, how?*

The landowners have seen the success and yields that have come from sprinkling the ground; however, many existing systems are 30-plus-years old and need to be updated to be more efficient, and possibly have an opportunity for drip irrigation. The proposed Project will facilitate conversations with NRCS about those possibilities.

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

- *Estimate the potential on-farm water savings that could result in acre-feet per year. Include support or backup documentation for any calculations or assumptions.*

712 acres within the Project area are currently being flood irrigated that can be converted to sprinkler irrigation. This conversion has the potential to save 56.6 acre-feet of water annually, as demonstrated in the following table:

<b>Average Annual Flow Delivery Per Acre</b>	<b>0.39 gpm</b>
<b>Total Flood Irrigated Acres</b>	712 acres
<b>Annual Volume to Flood Irrigated Acres</b>	226.4 acre-feet/year
<b>Assumed Flood Irrigation Efficiency</b>	50 percent
<b>Assumed Sprinkler Irrigation Efficiency</b>	75 percent
<b>Flood vs. Sprinkler Efficiency Difference</b>	25 percent
<b>Water Lost to Inefficient Application</b>	56.6 acre-feet/year

- *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.*

See Attachment B-Detailed Project Map

## 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 and adaptation strategy identified in a completed WaterSMART Basin Study? Please self-certify or provide copies of these plans where appropriate to verify that such a plan is in place. Including a specific excerpt or a link to the planning document may also be considered where appropriate.*

MVIC does not have an independent Water Conservation Plan or a System Optimization Review in place. MVIC has collaborated with several local and regional groups to support planning efforts to improve water supply and management in Montezuma County and Colorado. Their strategic goals align with the regional efforts of identifying and implementing water and energy efficient processes that will benefit water users, local communities, and the environment. See Attachment F-Pages from the Dolores Water Conservancy District Drought Contingency Plan 2018).

- 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.*

One regional group that MVIC collaborates with is the Comprehensive Economic Development Strategy (CED). Their plan for Montezuma County prioritizes the addition of solar as a potential renewable energy source as priority three on the Community Development Action Plan (2021) and ranked as number one on the Building and Infrastructure Sustainability resiliency impact for the County.

MVIC stakeholders also participate as an at-large agricultural representative on the Southwest Basin Roundtable and aligns with the Roundtable’s priorities of:

- Balance all needs and reduce conflict
- Support the needs of agriculture
- Meet municipal and industrial water needs
- Meet recreational water needs
- Meet environmental water needs
- Promote healthy watersheds
- Manage risk associated with Colorado River Compact

- 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 Dolores Water Conservancy District has several drought contingency goals that the Project will help to fulfill. The Dolores Water Conservancy District’s Drought Contingency Plan states:

*“To evaluate potential mitigation and response actions that may be implemented to reduce the water shortages and provide greater drought resiliency for water users; primarily the irrigator and fishery.”*

- 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)*

MVIC participated in the development of the DWCD Drought Resiliency Plan in 2018, collaborated with the Comprehensive Economic Development Strategy (CED), and the Southwest Basin Roundtable. MVIC has implemented many mitigation actions including piping and enclosing sections of canals to conserve and better manage their water delivery system. The proposed Project is another step in addressing local and regional mitigation actions to help reduce the risk of water loss and to better manage limited available water.

## Subcriterion E.2 – Readiness to Proceed

*Applications that include a detailed project implementation plan (e.g., estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates) will receive the most points under this criterion.*

MVIC has been coordinating this Project over the past year. They have conducted water loss studies on the canals, preliminary alignment, and pipe sizing determination, and coordinated with stakeholders on this Project.



- *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.; this section should focus on a summary of the major tasks to be accomplished as part of the project.*
  - **Planning:** Water loss studies, preliminary pipe sizing, anticipated pressure head calculations, and preliminary alignment determinations of both canals have been completed as of July 2022
  - **Funding Agreement:** Estimated January/February 2023
  - **Survey and Preliminary Design:** Topographic survey of existing canals, March 2023; 60% design complete, December 2023
  - **Environmental:** Kick-off NEPA, January/February 2023; FONSI issued, August 2024
  - **Final Design:** Design complete, August 2024
  - **Bidding:** Project bidding, September 2024
  - **Construction:** Solar installation construction, May – June 2026; installation of pipelines and construction of structures, October 2024 – March 2026; construction closeout, April 2026
- *Describe any permits that will be required, along with the process for obtaining such permits.*

The design alignments of both pipelines would follow the existing canal alignments to stay within existing prescriptive easements.

**For the Garrett Ridge pipeline -**  
Plan approval from Colorado Department of Transportation (CDOT) for the crossing of Highway 491 and permit obtained by the contractor.

**For both pipelines -**  
Underground installation permit for each Montezuma County Road crossings from the Montezuma County Road and Bridge Department – obtained by the contractor.
- *Identify and describe any engineering or design work performed specifically in support of the proposed project.*

Some preliminary engineering has been completed on both the Garrett Ridge and Lower Arickaree pipeline Project. Pressure head calculations identified the need for a pressure reducing structure on the Garrett Ridge Pipeline and a minimum dimension ratio of 32.5 for both the Garrett Ridge and the Lower Arickaree. Preliminary alignments for both canals were developed in order to estimate construction quantities for the Project. Additionally, preliminary plans to pipe the Garrett Ridge were developed by AgriTech Consulting of Lakewood, CO in 2010. These plans provided a preliminary alignment for the Garrett Ridge pipeline.
- *Describe any new policies or administrative actions required to implement the project.*

There are no new policies or administrative actions required for the Project other than obtaining required permits.

- *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 50% complete ; and construction/installation (100% complete).*

Tasks	Milestones	Estimated Completion Dates
Preliminary Planning/Design	Water loss study, pipe sizing, preliminary alignment determination of canals, topographic survey	March 2023
Environmental	Pipeline alignment determination 60% design complete Final design complete	April 2024 December 2023 August 2024
Cultural Compliance	NEPA kick-off Complete environmental field work FONSI issued	February 2023 December 2023 August 2024
Mobilization	Complete cultural survey Complete cultural report	December 2023 February 2024
Construction	Project bidding Mobilization Pipeline and structure construction Construction closeout Solar installation	September 2024 October 2024 March 2024-2026 April 2026 June 2026

- *Was the expected timeline for environmental and cultural compliance discussed with the local Reclamation Regional or Area Office?*  
Cost estimates are based on the past twenty-plus environmental reports that J-U-B ENGINEERS, Inc. has completed for WaterSMART projects during the past eight years.

### Evaluation Criterion F – Collaboration

*Please describe how the project promotes and encourages collaboration. Consider the following:*

- *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?*  
Yes, there is widespread support to pipe the Lower Arickaree and Garrett Ridge canals. Irrigators on the Project canals have shown support for the Project and have also collaborated to address water supply and management issues.

The proposed Project is listed as a priority project in the Dolores Water Conservancy District’s Drought Contingency Plan (2018). The Comprehensive Economic Development Strategy’s plan for Montezuma County prioritizes the addition of solar as a potential renewable energy source, as priority three on the Community Development Action Plan (2021) and is ranked as number one on the Building and Infrastructure Sustainability resiliency impact for the County.

- *What is the significance of the collaboration/support?*  
MVIC also collaborates with several local, regional, and state groups that focus on planning, mitigation, and response actions.

- *Will this project increase the possibility/likelihood of future water conservation improvements by other water users?*  
Many MVIC shareholders have significantly improved their delivery systems. The users on one headgate in the Lower Arickaree canal created agents to monitor the water usage and improve water efficiency on the entire headgate. Many users are utilizing more wobblers, gated pipe, side roll sprinklers, and using less flood irrigation to water their fields.
- *Please attach any relevant supporting documents (e.g., letters of support or memorandum of understanding).*  
See Attachment H-Letters of Support

### Evaluation Criterion G – Additional Non-Federal Funding

*State the percentage of non-Federal funding provided using the following calculation:*

$$\frac{\$3,004,000 \text{ Non – Federal Funding}}{\$6,004,000 \text{ – Total Project Cost}} = 50\%$$

### Evaluation Criterion H – Nexus to Reclamation

*Describe the nexus between the proposed project and a Reclamation project or Reclamation activity. Please consider the following:*

- *Does the applicant have a water service, repayment, or O & M contract with Reclamation?*  
No, MVIC does not have any water service, repayment, or O&M contracts with Reclamation.
- *If the applicant is not a Reclamation contractor, does the applicant receive Reclamation water through a Reclamation contractor or by any other contractual means?*  
No.
- *Will the proposed work benefit a Reclamation project area or activity?*  
The Lower Arickaree and Garrett Ridge canals are not part of a Reclamation project but are fed from the McPhee Reservoir that was build as part of a Reclamation project, the Dolores Project. The Dolores Project was one of the last Federal projects constructed as part of the Colorado River Storage Projection Act of 1956 and is unique in that it incorporates elements that are not historically part of a Reclamation project. It assisted in satisfying the Ute Mountain Tribe’s reserved water rights, provided for a fishery release to the lower Dolores River, and is the second largest allocation of Project water stored in McPhee Reservoir.
- *Is the applicant a Tribe?*  
No, the applicant is not a Tribe.

## Performance Measures

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*Provide a brief summary describing the performance measure that will be used to quantify actual benefits upon completion of the project (e.g., water saved or better managed, energy generated or saved).*

There are two areas of the Project where performance measures can be documented and quantified to show the benefits upon Project completion. These include renewable energy that will be generated and water that will be saved.

### **Energy Generated Performance Measures**

The energy produced by the solar array will be metered. The metered output will be recorded monthly and compared to this application's estimation of power generation. This information will be provided to the MVIC Board of Directors in an annual report.

### **Water Savings and Better Water Management Performance Measures**

For the completed pipeline systems on the Garrett Ridge and Lower Arickaree canals, an inflow/outflow method will be used to measure actual water saved. The total amount of water entering the main pipeline and the total amount delivered at each turnout will be metered using a flow meter. Comparing the total amount of water flowing into the main pipeline (inflow) with the total turnout deliveries over a period (outflow) will allow the efficiency of the pipeline system to be calculated and monitored.

## Project Budget

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### **Funding Plan and Letters of Commitment**

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*Describe how the non-Federal share of project costs will be obtained.*

MVIC will provide the non-Federal share of the Project through a loan from the Colorado Water Conservation Board.

*Identify the sources of the non-Federal cost-share contribution for the project, including:*

- *Any monetary contributions by the applicant towards the cost-share requirement and source of funds (e.g., reserve account, tax revenue, and/or assessments).*  
MVIC will be applying for a loan from the Colorado Water Conservation Board for their contribution.
- *Any costs that will be contributed by the applicant.*  
MVIC has spent significant time planning for the Project, and they will continue to do so in oversight and record keeping. MVIC conducted and paid for preliminary engineering work and the water loss studies and will not be included towards Project costs.
- *Any third-party in-kind costs i.e., goods and services provided by a third party.*  
There are no incurred in-kind costs included in this Project.
- *Any cash requested or received from other non-Federal entities.*  
No.

- Any pending funding requests i.e., grants or loans that have not yet been approved and explain how the project will be affected if such funding is denied.

MVIC is preparing to apply for a loan from the Colorado Water Conservation Board.

In addition, identify whether the budget proposal includes any project costs that have been or may be incurred prior to award. For each cost, describe:

- The project expenditure and amount.  
N/A.
- The date of cost incurrence.  
N/A.
- How the expenditure benefits the Project.  
N/A.

## Budget Proposal

Table 1 – Total Project Cost Table

Source	Amount
Costs to be reimbursed with the requested Federal funding	\$3,000,000
Costs to be paid by the applicant	\$3,004,000
Value of third party contributions	\$0
<b>Total Project Cost</b>	<b>\$6,004,000</b>

Table 2 – Budget Proposal

Budget Item Description	Computation		Quantity Type	Total Cost
	\$/Unit	Quantity		
<b>Salaries and Wages</b>				\$0
<b>Fringe Benefits</b>				\$0
<b>Travel</b>				\$0
<b>Equipment</b>				\$0
<b>Supplies and Materials</b>				\$0
<b>Contractual /Construction</b>				\$5,774,100
Construction Engineering	\$255,600	1	EA	\$255,500
Design/Inspection	\$409,600	1	EA	\$408,800
Mobilization	\$400,000	1	EA	\$400,000
Clear & Grub	\$50,000	1	EA	\$50,000
Lower Arickaree Connection to Upper Hermana	\$30,000	1	EA	\$30,000
Garrett Ridge Reinforced Concrete Intake/Overflow Structure	\$2,000	5	CY	\$10,000
Excavate, Install, Backfill, & Compact 36" SDR 32.5 HDPE Pipe	\$100	18,970	LF	\$1,897,000
Furnish 36" SDR 32.5 HDPE Pipe	\$100	18,970	LF	\$1,897,000



Furnish & Install Pressure Reducing Structure Garrett Ridge	\$100,000	1	EA	\$100,000
Construct Concrete Outlet Structure into Upper Hermana	\$2,000	5	CY	\$10,000
Furnish & Install 3" Combination Air Vacuum Valve	\$5,000	18	EA	\$90,000
Furnish Install 36" Flow Meter	\$10,000	2	EA	\$20,000
Furnish Install Isolation Valves	\$30,000	3	EA	\$90,000
Furnish & Install 6" Turnout Tees, 2 Butterfly Valves, Flow Meter, and Vault	\$10,000	37	EA	\$370,000
Furnish Install System Drain on Lower Arickaree	\$20,000	1	EA	\$20,000
Reseed Disturbed Area	\$0.10	596,000	SF	\$59,600
County Road Roadway Surface Repair	\$8	225	SF	\$1,800
Traffic Control at County Road Crossings	\$2,300	2	EA	\$4,600
Highway 491 Road Crossing	\$25,000	1	EA	\$25,000
Driveway Crossing Repair	\$1,200	4	EA	\$4,800
19.13 kWh Solar Array	\$30,000	1	EA	\$30,000
<b>Other</b>				<b>\$0</b>
Environmental/NEPA Compliance	\$229,900	1	EA	\$229,900
<b>Total Direct Costs</b>				<b>\$6,004,000</b>
<b>Indirect Costs</b>				<b>\$0</b>
Type of rate	Percentage	\$base		\$0
<b>Total Estimated Project Costs</b>				<b>\$6,004,000</b>

## Budget Narrative

### *Salaries and Wages*

No MVIC salaries or wages will be included. All services will be contracted. MVIC’s staff time will be over and above the cost of the Project and will not be counted towards the Project cost.

### *Fringe Benefits*

No fringe benefits are required.

### *Travel*

No travel will be required.

### *Equipment*

Equipment will be part of the contracted portion of the Project.

### *Materials and Supplies*

Materials and supplies will be part of the contracted portion of the Project and will be documented as required.

*Contractual*

In order to determine unit costs, which were included in the cost estimate for this Project, MVIC relied upon contract unit prices from similar projects recently completed. MVIC will follow the State of Colorado procurement process for procuring a contractor for this Project. They will bid the construction portion of the Project to several prequalified construction companies. The contractual costs shown are estimates for each of the components to furnish and install all the pipe and equipment. Generally, the low bidder will be selected based on a determination of acceptable qualifications.

*Third-Party In-Kind Contributions*

No third-party in-kind contributions will be included in this Project.

*Environmental and Regulatory Compliance Costs*

The total environmental review cost is \$229,900. The estimate is based on similar projects in the Colorado area and accounts for the more stringent permitting requirements associated with in-stream biological assessments in the region and includes funds for the elevated public involvement standards.

*Other Expenses*

Then environmental review is included under other expenses.

*Indirect Costs*

No indirect costs will be part of the Project.

*Total Costs*

Entity Portion: \$3,004,000	Fed Portion: \$3,000,000	Total: \$6,004,000
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## Environmental and Cultural Resources Compliance

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

Minimal environmental impacts will be those associated with piping the Lower Arickaree and Garrett Ridge canals and will be contained to the Project sites for the duration of construction. In the past, similar projects have had minimal lasting impacts. The surface vegetation will be restored upon completion of the Project.

*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?*

There are no listed or proposed listed species within the Lower Arickaree and Garrett Ridge canals. The Razorback Sucker and the Colorado Pikeminnow are endangered species in the Dolores River and other rivers within the Colorado River Basin.

*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.*

MVIC is not aware of any impacts to wetlands in this area.

*When was the water delivery system constructed?*

The Lower Arickaree and Garrett Ridge canals were originally constructed in 1916. Maintenance and minor improvements have been made over the years.

*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.*

As part of the environmental document, the required historical documentation for the canal will be included.

*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.*

MVIC is unaware of any building, structures, or features that would qualify. A cultural resource inventory will be completed as part of the environmental document.

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

MVIC is not aware of any impacts to or locations of archeological sites.

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

No, the Project will not require right-of-way or relocations from adjacent properties and will have no impact on residential properties or uses within the study area.

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

No. the spillway canal that is part of the Garrett Ridge canal project will provide water to the Towaoc Highline pipeline. The Towaoc Highline provides water to the lands within the Ute Mountain Tribe but is an existing pipeline. The proposed Project does not impact any ceremonial or sacred Tribal sites.

*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?*

No. All construction will be along the open canals and vegetation will be replaced when the Project is completed.

## Required Permits or Approvals

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*Applicants must state in the application whether any permits or approvals are required and explain the plan for obtaining such permits or approvals.*

The required permits and approvals are associated with piping the two sections of canals and can only be obtained after the design is completed. Plans will be submitted for the following permits once the design is finished:

**For the Garrett Ridge pipeline -**

Plan approval from Colorado Department of Transportation (CDOT) for the crossing of Highway 491 and permit obtained by the contractor.

**For both pipelines -**

Underground installation permit for each Montezuma County Road crossings from the Montezuma County Road and Bridge Department – obtained by the contractor.

## Letters of Project Support and Letters of Partnership

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*Include letters from interested stakeholders supporting the proposed project.*

Letters of support from the following can be found in Attachment H- Letters of Support.

- Dolores Water Conservancy District
- Southwestern Water Conservation District
- High Desert Conservation District
- City of Cortez
- Montezuma Board of County Commissioners
- Natural Resources Conservation Service

## Official Resolution

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The Official Resolution for the Lower Arickaree and Garrett Ridge Project will be submitted within 30 days after the application deadline.

## Overlap or Duplication of Effort Statement

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There are no overlap or duplication of efforts at the time of submission.

## Conflict of Interest Disclosure Statement

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There is no actual or potential conflict of interest at the time of submission.

## Uniform Audit Reporting Statement.

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MVIC was not required to submit a Single Audit for the most recently closed fiscal year.

## Certification Regarding Lobbying.

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Please see the GG Lobbying Form V1.1 Certification Regarding Lobbying.