Irrigation Water Conservation for the High Stream Depletion Factor Area of the Republican River using Remote Meter Reading Technology

in the

Lower Republican Natural Resources District

WaterSMART Water and Energy Efficiency Grant

Grant Application FOA# R22AS00023

Funding Group II

Lower Republican Natural Resources District

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Executive Summary

Date: November 03, 2021

Applicant: Lower Republican Natural Resources District (LRNRD), Alma, Harlan County, Nebraska.

The LRNRD is proposing Phase I of an innovative real-time operational irrigation water management program for groundwater irrigated acres in the high stream depletion factor areas where groundwater in the alluvial aquifer of the Republican River Basin interacts with surface water in the Republican River. Upon the successful award of this proposal, the LRNRD will utilize funds from the District, the State of Nebraska, and the Bureau to deploy near real-time telemetry equipment on **1,057** irrigation flow meters within one of the most densely irrigated areas of the district for improved on-farm water management and reporting of water use to the district. Weather stations with telemetry will be deployed across the district to collect data necessary for evapotranspiration (ET_o) data that will be broadcast via the internet to all irrigators in the project area for local crop water use data to aid in irrigation scheduling. This project will greatly improve the on-farm groundwater conservation further incentivized through NRCS programs in the district and reduce or reverse the influence of groundwater depletion on the baseflow to the Republican River in the LRNRD. The availability of real-time water use data to the LRNRD will also improve management of water on a basin-wide scale and aid in the district's responsibilities related to the Interstate Compact on the Republican River between Colorado, Kansas, and Nebraska.

This project is expected to last three years, beginning in the winter of 2022-2023 and ending in 2025. This project is not located on a federal facility and the LRNRD does not receive water from Bureau projects.

Background Data

This project is intended to reduce groundwater irrigation extractions and increase long term groundwater and surface water availability in a region of Nebraska where significant conflict between surface and groundwater users exist. The LRNRD is in the lower reach of the Republican River Basin in Nebraska, which was the subject of a Basin Study, released by the Bureau of Reclamation in March 2016, that included the States of Nebraska, Kansas and Colorado as partners. The study indicated that declining groundwater levels and stream flows have created intense competition for limited water supplies, and litigation between the states of Kansas and Nebraska. The proposed project can help reduce rates of groundwater decline by providing irrigators and the LRNRD timely water use information that will improve water management decisions by both irrigators and the LRNRD.

Natural Resources Districts (NRDs) in Nebraska were created by state statute in 1972 and gained the authority to regulate irrigation development and water use in 1979 under the Nebraska Groundwater Management and Protection Act. In order to meet new requirements of the Republican River Compact, the LRNRD began its mandatory metering program in 2002 and was complete by 2005. The district manages groundwater extractions pursuant to state statute for 325,000 acres irrigated by 3,587 groundwater wells. The LRNRD currently enforces groundwater pumping allocations of 9 inches per acre on all of these acres per year over a five-

year period. Consequently, the allocation for LRNRD groundwater irrigators is 45 inches per acre over a five-year period. This current allocation period for LRNRD is 2018 through 2022.

LRNRD participated in a study with the USGS to document water level changes in the High Plains Aquifer and specifically, the Republican River Basin between 2002 and 2015. By 2002, water levels in the High Plains aquifer in parts of Texas and southwestern Kansas had declined more than 150 ft and, in the Republican River Basin, had declined more than 50 ft. Water levels were measured in 977 wells which were screened in the High Plains aquifer within the Republican River Basin. The area-weighted, average water-level change from 2002 to 2015 for the High Plains Aquifer within the Republican River Basin was a decline of 4.5 feet. (McGuire, V.L. 2017)

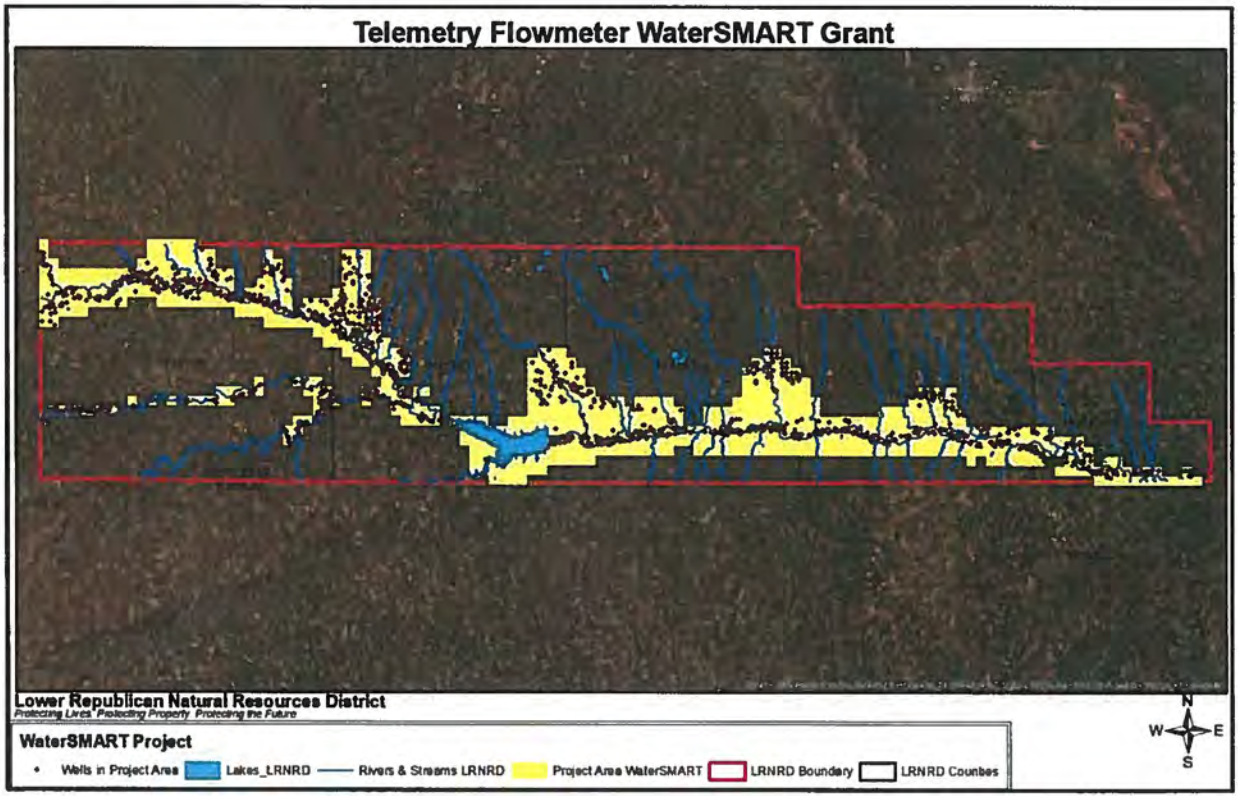
The University of Nebraska-Lincoln Conservation Survey Division's annual report has also documented significant groundwater declines in the Republican River Basin. This report has identified groundwater declines between 5 and 20 feet in the areas designated for this project from predevelopment to the Spring of 2019. The groundwater declines in this portion of the LRNRD over the last thirty-five years could easily represent a loss 10 – 20% of the saturated thickness of the local aquifer. The LRNRD intends to implement this innovative and proactive program that will have the potential of slowing or reversing these groundwater declines in the Lower Republican NRD through improved irrigation water management. (Young, A.R. et. Al., 2019)

Because of the water savings experienced locally and wide-spread acceptance of remote technology aiding irrigation management in the region, the LRNRD proposes with this application to deploy remote meter-reading technology in the high stream depletion factor area around the Republican River within the LRNRD by upgrading **1,057 meters** with FlowConnect™ technology from McCrometer. This area represents a zone of influence where pumping from these groundwater wells has the highest depletion impact on flows in the Republican River within a five-year period. The wells in this project area supply water to **104,949 irrigated acres** in the district. In addition, LRNRD proposes to deploy **eight** weather stations equipped with sensors necessary for capturing crop water use or evapotranspiration (ET_o) data across the district to provide irrigators with local crop water use to better schedule irrigation water events.

The LRNRD has good history of cooperating with the Bureau of Reclamation and other federal agencies by recently completing a Small-Scale Water Use Efficiency grant project entitled "*Real-Time Water Use Data Delivery System for LRNRD*, Agreement #**R17AP00169**". This project created the data management system necessary to collect data remotely from irrigation flow meters and incorporate this meter data into the district's water meter database. The district also cooperated with the Bureau in the *Republican River Basin Study* published in March, 2016. LRNRD further cooperated with the USGS in their study *"Water-Level Changes in the High Plains Aquifer, Republican River Basin in Colorado, Kansas, and Nebraska, 2002 to 2015"* published in March 2017. The proposed project represents the Phase 1 of LRNRD's initiative to upgrade all irrigation flow meters in the district with remote telemetry for enhanced irrigation and groundwater management.

Project Location

The LRNRD is in south central Nebraska and headquartered in Alma, NE. The district includes all or parts of Furnas, Harlan, Franklin, Webster, and Nuckolls Counties. The project area is high-lighted in yellow in the map below and includes parts of each of these counties. The project area delineates the High Stream Depletion Factor area of the LRNRD in southcentral Nebraska in which groundwater wells have the most-immediate response or effect on surface water flow in the Republican River.



Technical Project Description

This project will implement several water management tools with remote data collection capabilities to provide water use and environmental data in near real-time to agricultural water users as well as district water managers. This will improve irrigation water management on the farm as well as on a watershed-basin level for groundwater wells in each of the counties of the LRNRD creating a real-time operational model to evaluate current pumping allocations and guide decisions regarding future allocations.

LRNRD has required flowmeters on all irrigation wells in the district since 2005. **3,587** active registered irrigation wells currently exist in the district, **1,057** of which are in highest stream depletion factor area of the Republican River. This area represents the most densely irrigated portion of the LRNRD with the greatest impact on flows in the Republican River. This project will deploy FlowConnect™ telemetry technology on **1,057 irrigation flow meters** improving the irrigation management on **104,949 acres** in the LRNRD. The predominant irrigation flow meter in the district is the mechanical McCrometer propeller meter. FlowConnect™ integrates built-in communications to the meter for transmitting accurate, reliable irrigation flow data. This innovative design eliminates cables, pole mounting, solar panels, and other components – removing unnecessary costs and improving data quality by reducing opportunities for noise interference or cable damage. FlowConnect's ExactRead technology, made possible with the digital register option, ensures the totalizer reading on the meter's register in the field and the totalizer remotely viewed on the web are always the same. Flow data is generated and transmitted directly from the meter register. Consequently, no raw pulse data is communicated that can lead to incorrect water volume calculations.

Solar-powered weather stations for local crop water use will be deployed throughout the district in conjunction with this Water Smart project. Water measurement tools and methods to be utilized under the project, Water Balance or Checkbook Method, are proven and is a well-known tool for irrigation scheduling. The premise of the tool is to balance water being extracted from the soil (via evaporation and plant transpiration) with water being added to the soil (via irrigation and rainfall). Typically, automated weather stations are used to measure specific environmental conditions and then specific formulas are used to calculate reference ET and/or estimate effective rainfall. Crop specific coefficients will be applied to ET values to fine tune water use. When used consistently with reliable field data, the water balance index can show growers how closely their irrigation practices are meeting the current plant water use demand.

Local contractors proficient in meter installation and remote telemetry will be selected from previous work done on irrigation projects within the area. All water use data (meter data), crop water use, and soil-moisture (if applicable) will be served to farmers through a web-based server on a single website accessible via personal computer or smartphone. Farmers in this program will no longer need to go to separate websites to obtain different pieces of water management data for irrigation management decisions.

Evaluation Criteria

Evaluation Criterion A—Quantifiable Water Savings: *Up to **28 points** may be awarded for this criterion. This criterion prioritizes projects that will conserve water and improve water use efficiency, supporting the goals of E.O. 14008. Points will be allocated based on the quantifiable water savings expected as a result of the project. Points will be allocated to give greater consideration to projects that are expected to result in more significant water savings.*

All applicants should be sure to address the following:

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.*

All irrigation wells in the LRNRD have been required to be metered since 2005. As a result, historical groundwater pumping records are available for this area. 2020 is the most-recent year for which complete groundwater pumping records are available for the project area. 2020 is also a representative year for groundwater use in the area not being extremely wet or dry. The total groundwater extraction measured in the project area in 2020 was 49,802 acre-feet (AF).

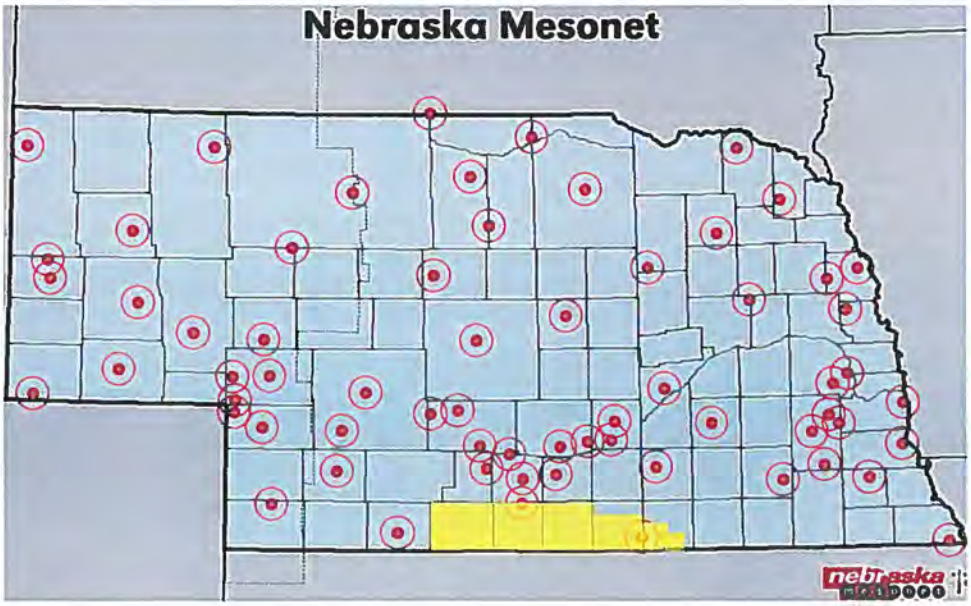
The adjacent groundwater conservation district, Middle Republican NRD (MRNRD), in recent years has implemented a similar program to deploy remote telemetry and other water management sensors for groundwater conservation through irrigation water management with success. MRNRD has experienced water savings of **0.47 in/ac** from the installation of meters with real-time telemetry for improved on-farm irrigation water management. LRNRD Board and Staff expect to see the similar water savings from the same practice.

LRNRD estimates that approximately **4,110 acre-feet (AF)** of water will be conserved per year as a result of the application of remote telemetry to irrigation flow meters and other water management sensors for improved irrigation management in the High Stream Depletion Factor Area of the LRNRD. Real-time telemetry will aid farmers in their on-farm water management decisions which will affect water conservation in the project area going into the future.

Water measurement tools and methods to be utilized under the project are proven, including the Water Balance or Checkbook Method that is a well-known tool for irrigation scheduling. The premise of the tool is to balance water being extracted from the soil (via evaporation and plant transpiration) with water being added to the soil (via irrigation and rainfall). Typically, automated weather stations are used to measure specific environmental conditions and then specific formulas are used to calculate reference ET and/or estimate effective rainfall. Crop specific coefficients will be applied to ET values to fine tune water use. When used consistently with reliable field data, the water balance index can show growers how closely their irrigation practices are meeting the current plant water use demand. The general use of irrigation scheduling, which will be made easier and more effective by supplying crop water demand

information available under the proposed project, was shown to reduce water applications by 11 percent in Nebraska (Kranz et al., 1992).

The map below represents the weather station coverage in the Nebraska Mesonet System (https://www.mesonet.unl.edu). The coverage is noticeably vacant in the (highlighted) LRNRD with only one station located at the eastern edge of the LRNRD's boundaries. Additional weather station coverage is needed within the LRNRD and will be addressed with the deployment of **eight** full weather stations equipped with the sensors necessary to calculate evapotranspiration (ET) for the district.



Describe current losses: *Please explain where the water that will be conserved is currently going and how it is being used. Consider the following:*

a. Explain where current losses are going (e.g., back to the stream, spilled at the end of the ditch, or seeping into the ground)?

Groundwater applied as irrigation water is currently lost due to deep percolation from the crop root zone and runoff which can result in off-site transpiration and evaporation resulting in non-beneficial uses. The deployment of real-time telemetry devices on irrigation flow meters, weather stations, and other water management sensors will aid in reducing and limiting these water losses by improving the seasonal timing of irrigation water applications closer to the needs of the crops as well as improving the application efficiency of water applications. Currently annual groundwater pumping in the High Stream Depletion Factor Area is just over **49,802 AF/yr**. If irrigation systems operated at **85%** efficiency, operational losses would be over **7,404 AF/yr** (15% lost).

Groundwater that is conserved will remain in the local aquifer to maintain groundwater levels for future irrigation events as well as improved discharge for baseflow in the Republican River. LRNRD estimates that approximately **4,110 AF/yr** will be saved throughout the project area through improved irrigation management practices. Once this estimated improvement in irrigation efficiency is achieved, this would represent nearly a **55.5% reduction** in operational losses.

b. 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?

Current losses are not being used by other water users. Current losses are to non-beneficial uses including irrigation runoff and deep percolation.

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?

No. The current losses to the system are non-beneficial. Current losses include deep percolation which results in an economic loss to the irrigator and immobilization of water in the local vadose zone and runoff which is another loss to the irrigator and may result in off-site (non-beneficial) transpiration. This project will improve the efficiency of irrigation in LRNRD and limit these losses to the local groundwater aquifer.

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.*

Annual water pumping in the LRNRD project area was measured in 2020 at **49,802 AF**. The land area in the LRNRD High Stream Depletion Factor Area is **104,949 acres**. Annual water savings of **0.47 inches/acre** is expected from the implementation of real-time telemetry for improved irrigation water management. Once the expected groundwater savings of **0.47 inches/ac** is achieved through improved irrigation water management, the groundwater use in LRNRD will be reduced by 0.47 in/ac/year or **4,110 AF/year** in the LRNRD project area.

Projected Water Savings (0.47 in/yr) (104,949 ac) = 49,326 acre-inches/yr

(49,326 acre-inches/yr) (1.0 AF/12 acre-inches) = 4,110 AF/yr

Total Estimated Annual Water Savings = 4,110 AF/year

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

Irrigation Flow Measurement: *Irrigation flow measurement improvements can provide water savings when improved measurement accuracy results in reduced spills and over-deliveries to irrigators. Applicants proposing municipal metering projects should address the following:*

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

Conservative estimates of **0.47 acre-inches/yr** in water savings are projected on **104,949 acres** in the project area from improved irrigation water management though the implementation of real-time irrigation water use. Weather stations with telemetry will be installed as a component of this project which will provide accurate and local evapotranspiration (ET) data to agricultural producers for irrigation scheduling.

The following water conservation calculations are based on saving 0.47 acre-inches/yr on 104,949 acres within the LRNRD project area for a total of 4,110 AF/yr.

(0.47 acre-inches) (104,949 acres) = 49,326 acre-inches of water conserved annually

(49,326 acre-inches/yr) (1.0 AF/ 12 acre-inches) = **4,110 AF/yr Total Annual Water Conservation**

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.

Yes, Current water use has been quantified in the High Stream Depletion Factor Area by metering extractions at all groundwater irrigation wells. The most recent annual groundwater pumping is the project area from 2020 has been measured to be **49,802 AF/yr**.

This volume represents total groundwater application on all irrigated acres and average application efficiency of all irrigation types is considered to be at least 85%. It would be reasonable to estimate current operational losses to be equal to the remaining 15% or **7,470.3 AF/yr.** Operational losses would be due to deep percolation, runoff, evaporation, and off-site transpiration due to current inefficiencies. If estimated water conservation of **4,110 AF** due to Improved Application Efficiency were achieved, this would represent a **55%** reduction in operational losses in the High Stream Depletion Factor Area.

Estimated Water Conservation / Annual Losses = Percent Reduction in Losses

4,110 AF / 7,470.3 AF = 0.55 or **55% Reduction in Losses**

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?

Yes, the predominant meter used for irrigation water measurement in the LRNRD is the McCrometer propeller meter. The McCrometer propeller meter is manufactured and individually tested to be +/- 2 % accurate when properly installed. This accuracy is determined by factory gravimetric testing ensured by NIST (National Institute of Standards and Testing) traceability. A significant percentage of meters currently installed have been discovered not to be installed to manufacturer's specifications making them as much as 10.8% inaccurate due to a state requirement for backflow protection devices on all irrigation wells which occurred after flow meters were installed. These inaccuracies will be corrected at the time of upgrade with the installation of flow conditioning devices by the installation contractor. Improved measurement will improve not only management, but also the quality and accuracy of data, reported to the LRNRD and state agencies for Interstate Compact Compliance and basin-wide water management which reaches across state boundaries.

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

The McCrometer MO300 Bolt-on saddle propeller meter will continue to be used at each groundwater metering site. The +/- 2% accuracy will remain the same. Additionally, all meters will be installed to meet or exceed manufacturer's specifications with the FS100 Flow Straightener, a flow conditioning device manufactured by McCrometer that corrects disturbances created by backflow protection or chemigation valves, pumps, elbows, or other disturbers. NIST traceability will continue to be the basis for this accuracy. In addition, each meter will be upgraded with FlowConnect™ telemetry with digital registers capable of ExactRead™

technology. ExactRead™ technology ensures 100% data transmission accuracy between the meter in the field and the website.

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

Yes, Seasonal efficiency, which improves timing of irrigation events throughout the season, and application efficiency, or more precise individual irrigation events, will be improved through better irrigation water management as a result of utilizing real-time data for irrigation water applied, crop water use, and in some cases, soil moisture monitoring. As described earlier, this is expected to be **0.47 inches/ac** due to implementation of real-time meter and ET data acquisition.

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

Upon the completion of this project, post-telemetry water application will be compared to water applications previous to the installation of telemetry-aided water management sensors to measure reductions in groundwater pumping.

Evaluation Criterion B—Renewable Energy (20 points) *Up to* **20 points** *may be awarded based on the extent to which the project increases the use of renewable energy or otherwise results in increased energy efficiency and reduced greenhouse gas emissions.*

Since this project addresses increased irrigation efficiency through irrigation management by the installation of permanently installed totalizing flow meters with telemetry, Subcriterion B.2 will be completed and address the savings in power consumption in the LRNRD Project Area as a result of this project

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

Up to **10 points** *may be awarded for projects that address energy demands and reduce greenhouse gas emissions by retrofitting equipment to increase energy efficiency and/or through water conservation improvements that result in reduced pumping or diversions.*

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.

A representative value for irrigation well power consumption of **333.1 kWh/AF** was obtained from district records where power coefficients were used in lieu of meter readings due to a meter failure. This will be used as a representative value for electrical consumption for irrigation pumping in the project area for the following calculations. As stated under Criteria A, annual water consumption in LRNRD was measured to be **49,802 AF** in 2020. Consequently, a reasonable estimate for the annual power consumption in LRNRD to pump irrigation water is **16,589,046 kWh/yr**. The projected groundwater savings derived from improved irrigation water management and reporting is estimated to be **4,110 AF/yr** or **8.25%** from this project. This would equate to **1,368,596 kWh/yr** in power savings as demonstrated in the following equations:

(333.1kWh/AF) (49,802 AF/yr) = 16,589,046 kWh/yr = Annual Estimated Electrical Consumption

(16,589,046 kWh/yr) (8.25%/yr water savings) = **1,368,596 kWh/yr Estimated Power Savings from Water Conservation.**

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

Since much of the electricity used in the project area is still generated by fossil fuels, any reduction in electrical consumption will reduce greenhouse gas emissions. In this case, a 8.25% reduction in irrigation pumping will have a significant effect on electrical savings reducing the reliance on fossil fuels used to generate electricity in the region. With less reliance on fossil fuels for generation of electricity, a greater portion of the electricity used will come from renewable sources such as solar and hydropower.

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?

Most irrigation wells in LRNRD are vertical turbine pumps powered by 70 horsepower electric (or similar) motors. District records showed electrical usage was approximately **333.1 kWh/AF** of irrigation water produced. Water savings through enhanced irrigation water management is expected to reduce groundwater pumping by **8.25%** annually in LRNRD which will have a commensurate reduction on energy usage in the district. An 8.25% reduction in pumping is estimated to result in energy savings of **1,368,596 kWh/yr.**

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.

All energy savings calculations are based on the use of power at the point of diversion which is the irrigation well that extracts groundwater from the local aquifer. No alternate site of diversion will be implemented in this project.

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

No. This project does not involve water treatment, only the improved management of irrigation water in LRNRD so **no** power requirements are needed for water treatment.

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

Yes. LRNRD employs three staff members that regularly read and perform maintenance on currently installed irrigation flow meters in the district. The district conservatively estimates that district staff drive **30,000 miles per year** solely for reading meters. The district estimates that upon the conclusion of this project, the miles driven will be reduced by at least **75%** to **7,500 miles per year.**

Achieving the goals of this project would not be possible without the deployment of real-time telemetry. Approval of this proposal will prevent thousands of miles driven and in turn the production of greenhouse gases by LRNRD employees in the future.

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 FlowConnect™ telemetry units that will be deployed under this program have a solar powered option used for frequent readings. These units utilize cellular telemetry

communications and are powered by a 540-mA solar panel eliminating the need for commercial power sources to power the telemetry system. Since each system will be a cellular node, the communications system will be independent of a capital-intensive system of towers that would be necessary for a traditional radio telemetry system. Weather stations equipped with remote telemetry deployed under this project will also be solar-powered by 540-mA solar panels independent of commercial power.

Evaluation Criterion C—Sustainability Benefits (20 points): *Up to* **20 points** *may be awarded under this criterion. This criterion prioritizes projects that address a specific water and/or energy sustainability concern(s), including enhancing drought resilience, addressing the current and future impacts of climate change, and resolving water related conflicts in the region. In addition, this criterion is focused on the benefits associated with the project, including benefits to Tribes, ecosystem benefits, and other benefits to water and/or energy supply sustainability.*

Enhancing drought resiliency. In addition to the separate WaterSMART Environmental Water Resources Projects NOFO, 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?

Yes. Since the project seeks to conserve groundwater resources that are hydrologically linked to surface water, this project will improve ecological resiliency for wildlife habitat of waterfowl, fish, and other species that live in or near Harlan County Lake, the Republican River, and its tributaries. This project will not only support sustainability of water resources for a variety of human uses but will also improve the sustainability of water resources linked to wildlife habitat in the project area.

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 conserved due to reduced groundwater pumping will remain in the local aquifer to maintain groundwater levels for other uses including municipal, industrial, and domestic as well as improve baseflow for surface water uses in the Republican Basin.

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 Republican River Basin is in the North American migratory flyway of the Whooping Crane and Sandhill Crane. This project will improve the water supply that contributes to the habitat of these migratory birds.

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

Aside from water sustainability for human uses and wildlife benefits, this project will have benefits for wetlands and riparian habitat as well. Harlan County Lake is a major water feature of the project area which is fed by flows in the Republican River and its tributaries. Improved baseflow in the Republican River as well as its tributaries will maintain water levels in Harlan County Lake and support miles of riparian habitat in the area which is important for fish, waterfowl, and their habitat along the lake shore, the Republican River and its tributaries.

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. Acquiring irrigation water application data and crop water use in real-time will aid farmers in making irrigation scheduling decisions. Real-time water application data will have the potential to make individual irrigation applications more efficient and precise while real-time crop water use data has the potential to improve timing of application or seasonal irrigation efficiency. This information will alert the irrigators to current environmental factors that may delay or make an irrigation event unnecessary, thus conserving groundwater for future use and support the life of the local aquifer.

Projects that are intended to improve streamflows or aquatic habit, and that are requesting $500,000 or more in Federal funding, must include information about plans to monitor the benefits of the project. Please describe the plan to monitor improved streamflows or aquatic habit benefits over a five-year period once the project has been completed. Provide detail on the steps to be taken to carry out the plan.

Not Applicable. The direct effect of this project is groundwater conservation through enhanced irrigation management. Improved flow in the Republican River may be an indirect effect of the project, but the goal of this project is groundwater conservation which will sustain groundwater levels that may have an indirect effect on flows in the Republican River.

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.

The Republican River Basin is designated fully-appropriated by the Nebraska Department of Natural Resources (NDNR) for water resources negatively affecting groundwater levels and surface water flows in the Republican River. The LRNRD is in the lower reaches of the Republican River Basin in Nebraska, which was the subject of a Basin Study, released by the Bureau of Reclamation in March 2016, that included the States of Nebraska, Kansas and Colorado as partners. The study indicated that declining groundwater levels and stream flows have created intense competition for limited water supplies, and litigation. The proposed project can help reduce rates of groundwater decline from drought and increased demand by providing irrigators and the LRNRD timely water use information that will improve water management decisions by both irrigators and the LRNRD.

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.

Irrigated agriculture is the focus of this proposal which will conserve water through improved irrigation efficiencies through the implementation of the LRNRD Integrated Management Plan. Irrigation wells are powered by either electricity or internal combustion engines to extract groundwater from the local aquifer. Improving the irrigation efficiency of farms in LRNRD will reduce the volume of groundwater pumped and consequently the amount of energy consumed either in the form of electricity or fossil fuels which will have positive effects on energy sustainability in Nebraska. Improved groundwater management through irrigation efficiency will reduce the electricity demand in the Republican River Basin. Conserving groundwater as proposed in this application will improve the supply of power to this area of the State of Nebraska.

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?

Water conservation though voluntary methods of irrigation efficiency and improving compliance with district Rules and Regulations are the primary methods of achieving groundwater sustainability in LRNRD. Irrigation efficiencies will be achieved through providing real-time water use as well as local ET to irrigators for improved on-farm irrigation management. Compliance with LRNRD groundwater allocations will inevitably reduce pumping by the growth of lower water use plants or fallowing land which will not only reduce power demands, but also store more water in the local aquifer. Improving aquifer storage will improve the ability of water users in the area to better meet water demands during times of drought or water shortage due to climate change.

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 due to reduced groundwater pumping through allocations and improved irrigation efficiency will remain in the local aquifer to achieve sustainable groundwater levels.

Multiple water users will benefit in the future including agriculture, municipal, and industrial. Conservation will maintain groundwater supplies for all of the above-mentioned beneficial uses

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

Improvements to the LRNRD Water Allocation Database to incorporate data from remote telemetry was funded through a 2017 Small-Scale Water Use Efficiency grant awarded by the US Bureau of Reclamation. Deployment of real-time telemetry will deliver water use and ET data directly to landowners within the NRD for improved management of irrigation water.

This water conservation program within LRNRD would be virtually impossible without permanently installed totalizing flow meters equipped with remote telemetry. For an allocation program to work, clear and concise rules and regulations are necessary for the water user. In addition, accurate measurement of water pumped is necessary to ensure compliance with pumping allocations. Automated data transmission of groundwater extraction will be delivered to the LRNRD as well as individual water users. The delivery of water use data through real-time telemetry is the most efficient method of accessing large amounts of data from numerous points on a frequent basis.

Water conserved under the LRNRD's allocation and water conservation program will remain in the local aquifer for future sustainable uses to the benefit of all water users.

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

LRNRD estimates that approximately **4,110 acre-feet (AF)** of water will be conserved per year as a result of the application of remote telemetry to irrigation flow meters and other water management sensors for improved irrigation management in the High Stream Depletion Factor Area of the LRNRD. Real-time telemetry will aid farmers in their on-farm water management decisions which will affect water conservation in the project area, maintain groundwater levels, and assist the LRNRD and the State of Nebraska in meeting the Interstate Compact Requirements on the Republican River with Kansas.

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: Presidential Executive Order 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.

Real-time telemetry will gather continuous data that will ensure the highest accuracy of (and greatest confidence in) groundwater extractions within the LRNRD. Daily water meter records gathered in real-time will provide water users and district water managers with crucial information for on-farm water management as well as basin-wide water management. Real-time data access to water use from meters as well as water management sensors such as weather stations for local crop water use (ET) will increase efficiency of on-farm water use and therefore conserve water stored in the local aquifer for times of water shortage.

FlowConnect™ units will regularly supply groundwater extraction data from irrigation wells in real-time without the need for LRNRD staff to drive to the well sites enhancing the environment by conserving staff time and resources including vehicle emissions, mileage, and wear and tear. Frequent water use data available to district water managers will improve water management on the basin level enabling practices such as the LRNRD Integrated Management Plan to benefit districtwide groundwater management with minimal labor expense, energy consumption, and wear and tear to equipment for LRNRD.

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

Yes. Improved management of groundwater will conserve water in storage in the aquifer for all uses at times of drought or other environmental conditions related to climate change. Real-time data from select groundwater wells is already being supplied thanks to a 2017 Small-Scale Water Efficiency Grant. Real-time flow data supplied to the irrigators will improve on-farm irrigation management and therefore improve groundwater storage for use in times of shortage. In the same manner, real-time data supplied to LRNRD water managers will improve basin wide water management to the benefit of both the district and the State of Nebraska for compliance with the

Republican River Compact which will be most important at times of water shortage due to drought.

c. Will the proposed project establish and use a renewable energy source?

Yes. The remote telemetry units proposed for this project have a solar-powered option that will be utilized when irrigators want or need water use data on a more frequent basis. Weather stations equipped with remote telemetry deployed under this project will also be solar-powered by 540-mA solar panels independent of commercial power to collect rainfall and other environmental data necessary.

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

Yes. Reduced pumping of groundwater will result in reduced production of greenhouse gases regardless of the energy source to pump the water. Since the energy source of the irrigation pumps is either electricity or internal combustion engines and most electricity is generated from fossil fuels, reduced pumping for irrigation will have an effect of lowering greenhouse gases in the atmosphere due to decreased use of electricity or direct use of fossil fuels.

(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 the following:

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. Several disadvantaged and underserved communities exist in the LRNRD as noted in the following answers. Benefits to these communities will be groundwater sustainability water resources for all users and beneficial uses including agriculture, municipal, industrial and domestic uses. Groundwater pumped for irrigation is the largest use of water in the LRNRD, therefore improving the efficiency of the use of groundwater will be to the benefit of all water users in the district.

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 (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.

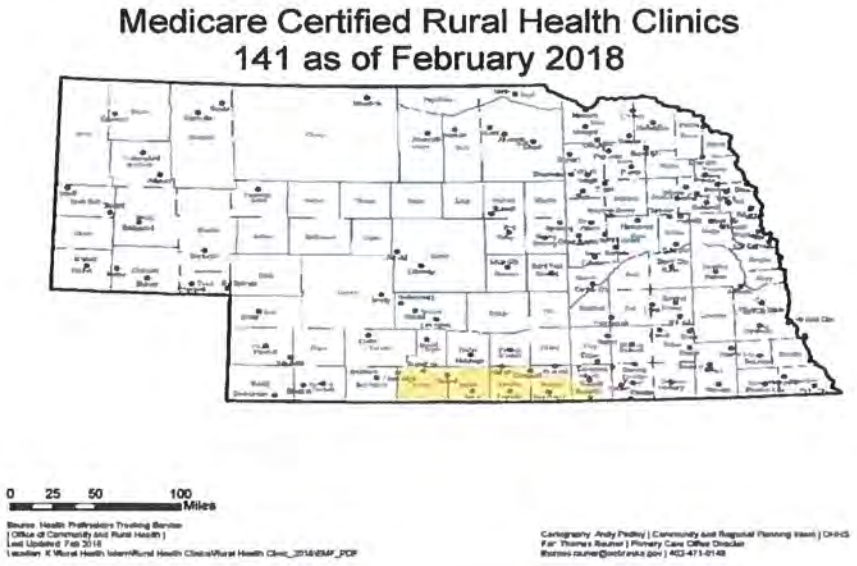
Yes. 2019 data from the U.S. Census Bureau reports that the annual median household income for the State of Nebraska is **$61,439**. The median annual income from for each county in the LRNRD is less than the statewide annual median household level as shown in the table below:

LRNRD County	2019 Median Household Income
Franklin County, Nebraska	$ 49,282
Furnas County, Nebraska	$ 48,838
Harlan County, Nebraska	$ 49,835
Nuckolls County, Nebraska	$ 43,388
Webster County, Nebraska	$ 46,188

Consequently, the project area meets the criteria for a disadvantaged community. (https://data.census.gov)

> ***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.***

The State of Nebraska Department of Health and Human Services has designated medical facilities for underserved communities in the state. Medicare-certified rural health clinics are created to serve rural underserved areas with affordable and accessible primary health care services. **Nine** communities in the LRNRD including Cambridge, Arapahoe, Oxford, Alma, Hildreth, Franklin, Campbell, Red Cloud, and Superior have received this designation as shown in the map below.



(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?***

No.

> ***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?***

No.

(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. LRNRD is one of the district agencies responsible for maintaining compliance between the States of Nebraska, Colorado, and Kansas with the Interstate Compact on the Republican River. Water consumption reduced under the project will help ensure that Nebraska's Compact allocation will not be exceeded. It will also reduce the amount of water use in excess of the allocation that must be offset by increasing stream flow via streamflow augmentation projects developed in the Republican River Basin by improving groundwater discharge to the Republican River from aquifers closest to the river. The project will help prevent and/or reduce statewide liability for noncompliance that include significant penalties. As an example, the State of Kansas recently sought, but did not successfully receive, a court judgement of approximately $70 million for Nebraska's noncompliance with the Compact in 2005-2006.

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

Yes, Water conserved due to reduced groundwater pumping will remain in the local aquifer to maintain groundwater levels for other uses including municipal, industrial, and domestic as well as improve baseflow for surface water uses in the basin.

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

Yes. Information on depletions to stream flow caused by groundwater use for Republican River Compact accounting purposes will be available much sooner than is now possible because groundwater use, via the telemetry units on flow meters, will be available almost instantaneously. Beneficial agreements reached recently among the compact states allow Nebraska to provide volumes of water to Kansas based on actual, instead of projected, water use and water supplies. Because the projections are naturally very liberal to ensure compliance, providing actual instead of projected volumes needed to maintain compliance is expected to reduce, possibly significant, amounts of water that must be produced to maintain compliance. Near real-time acquisition of water use data will aid District and State efforts to calculate actual Compact Compliance needs.

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, other districts in the Republican Basin are experiencing conflicts over water use due to water shortages and compliance with water use regulations. Availability of real-time water use data from irrigation flow meters for the district and individual users will improve visibility to water use and compliance with local water use regulations. As an example, the State of Kansas recently sought, but did not successfully receive, a court judgement of approximately $70 million for Nebraska's noncompliance with the Compact in 2005-2006.

Evaluation Criterion D—Complementing On-Farm Irrigation Improvements (10 points)
Up to **10 points** *may be awarded for projects that describe in detail how they will* **complement on-farm irrigation improvements** *eligible for Natural Resources Conservation Service (NRCS) financial or technical assistance.*

Note: Scoring under this criterion is based on an overall assessment of the extent to which the WaterSMART Grant project will complement ongoing or future on-farm improvements. Applicants should describe any proposal made to

NRCS, or any plans to seek assistance from NRCS in the future, and how an NRCS-assisted activity would complement the WaterSMART Grant project. Financial assistance through EQIP is the most commonly used program by which NRCS helps producers implement improvements to irrigation systems, but NRCS does have additional technical or financial assistance programs that may be available. Applicants may receive maximum points under this criterion by providing the information described in the bullet points below. **Applicants are not required to have assurances of NRCS assistance by the application deadline to be awarded the maximum number of points under this sub-criterion.** Reclamation may contact applicants during the review process to gather additional information about pending applications for NRCS assistance if necessary.

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.

NRCS Environmental Quality Incentive Program (EQIP) Practices from the **449 Irrigation Water Management - Advanced Technologies** practice code will be deployed on irrigated farms in the project area by the NRCS. Specific practices that will be applied on irrigated land in the LRNRD project area will include; Variable Rate Irrigation (VRI), Soil Moisture Sensors, Rainfall Detection with Auto-stop for center-pivots, Integrated Evapotranspiration, and Variable Speed Pumping.

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

LRNRD Staff have begun conversations with the NRCS Area Engineer, the local NRCS District Conservationist, and the NRCS Nebraska State Irrigation Engineer to prioritize these practices within the LRNRD High Stream Depletion Factor Area. These practices will be encouraged and incentivized to landowners and operators in the project area as part of this program.

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.

Practices including Variable Rate Irrigation (VRI), Soil Moisture Sensors, Rainfall Detection with Auto-stop for center-pivots, Integrated Evapotranspiration, and Variable Speed Pumping are available to farmers in the State of Nebraska through the USDA Natural Resources Conservation Service. Funding for these practices will be pursued through this agency for irrigators to further improve on-farm irrigation water application efficiency and therefore reduce the groundwater extraction in LRNRD to improve the probability of achieving water conservation goals set forth in the LRNRD IMP. Approximately **15%** of the LRNRD farms are estimated to implement these NRCS practices,

Applicants should provide letters of intent from farmers/ranchers in the affected project areas.

Please see attached letters of support in the section by the same name at the end of this document on **pg. 37**

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

The LRNRD already enforces an allocation of 45 inches/acre over 5 years or 9 inches/acre/year. The current allocation period is 2018 – 2022. In times of drought, farmers may have difficulty

complying with the allocation and sometimes exceed the annual pumping allocation. Real-time access to pumping data coupled with local ET readings will better enable the irrigators to more closely match irrigation events to crop water use requirements and therefore comply with water allocations under LRNRD Rules and Regulations. In addition, the deployment of practices such as rainfall detection with automatic shut-off systems for center-pivots and variable rate technologies will further complement water savings by integrating flow data to these irrigation systems.

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

Yes, the proposed Water Smart Project will complement the on-farm water conservation programs because many of the irrigation water management technologies will utilize the signal output capabilities of the new flow meters to integrate flow measurement for improved application efficiency of the irrigation system.

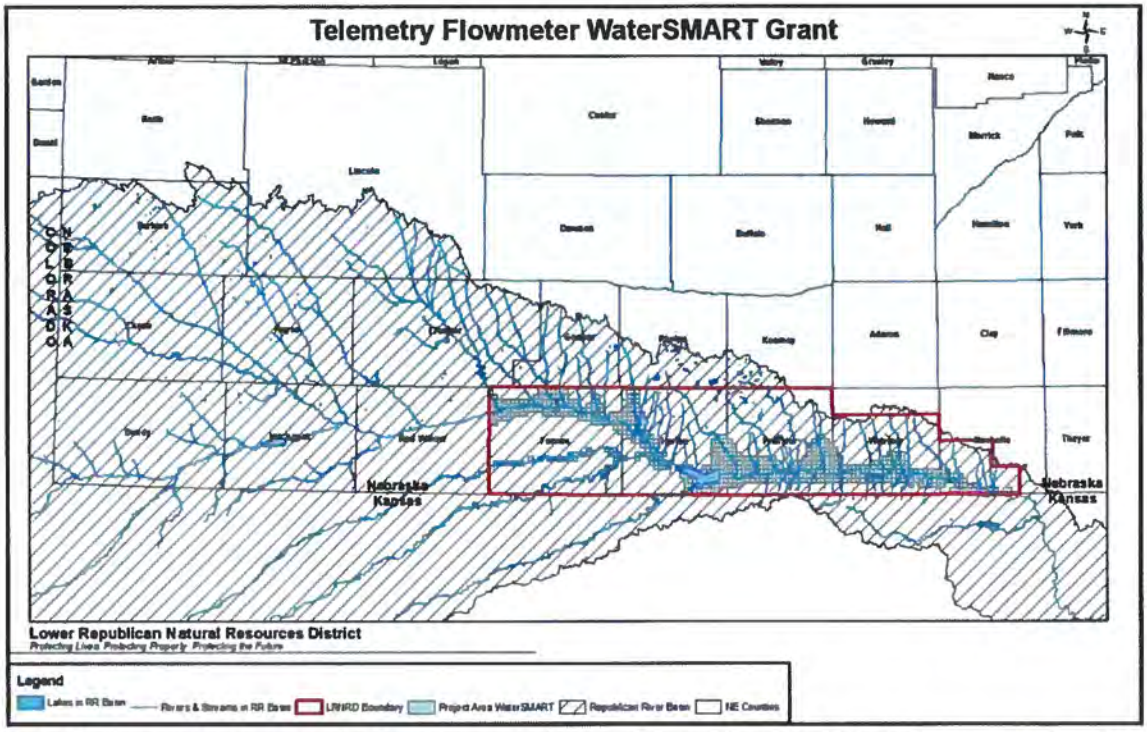
Describe the on-farm water conservation or water use efficiency benefits that are expected to result from any on-farm work.

Advanced Irrigation Water Management Technologies deployed through the USDA-NRCS programs include Variable Rate Irrigation (VRI), Soil Moisture Sensors, Rainfall Detection with Auto-stop for center-pivots, Integrated Evapotranspiration, and Variable Speed Pumping. Groundwater savings will be realized with these features that will improve seasonal and application efficiency and reduce irrigation water losses on the farm to non-beneficial uses.

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.

LRNRD estimates that an additional 5% water savings could be realized from the implementation of these advanced irrigation water management technologies. Since water pumping in the LRNRD project area was measured in 2020 at **49,802 AF**, additional water savings would be estimated at **2,490.1 AF/yr** as a result of these practices.

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



Note: On-farm water conservation improvements that complement the water delivery improvement projects selected through this funding opportunity may be considered for NRCS funding and technical assistance to the extent that such assistance is available. For more information, including application deadlines and a description of available funding, please contact your local NRCS office. See the NRCS website for office contact information, www.nrcs.usda.gov/wps/portal/nrcs/main/national/contact/states/.

Evaluation Criterion E—Planning and Implementation (8 points): *Up to* **8 points** *may be awarded for these subcriteria.*

Subcriterion E.1— Project Planning: *Points may be awarded for proposals with planning efforts that provide support for the proposed project.*

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? *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. Provide the following information regarding project planning:

Yes, please find the attached excerpts of the LRNRD Integrated Management Plan (IMP) in **Appendix A** outlining the Goals and Objectives of the LRNRD IMP.

(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.

LRNRD recently adopted its 5th generation Integrated Management Plan which became effective on **September 27, 2021**. An IMP is jointly developed and adopted by Nebraska DNR and an NRD for integrated surface water and groundwater management within the NRD. This IMP

between Nebraska DNR and LRNRD is required under *Neb. Rev. Stat.* § 46-715 (1)(a). The entirety of LRNRD was determined to be fully appropriated on July 16, 2004, under the requirements of LB962 Laws 2004, Sec. 60 (3)(b). Under this legislation, areas for which Nebraska DNR had previously determined a joint action plan was necessary, under prior law, were designated as fully appropriated as of the operative date of LB962 (2004).

In addition to this IMP, integrated water management within LRNRD is also subject to an interstate water compact and a basin-wide plan. The Republican River Compact (Compact, 1943) is an interstate agreement among Nebraska, Kansas, and Colorado that provides for the apportionment of the Virgin Water Supply of the Republican River Basin among the three states. The Final Settlement Stipulation (FSS, 2002) and RRCA Resolutions define how compliance within the Compact's requirements is to be determined, including detailed accounting procedures and the use of a jointly developed groundwater model. The current jointly developed groundwater model is called the RRCA Groundwater Model. The Republican River Compact Administration (RRCA) administers the Compact and consists of one Commissioner from each of the three states. This IMP must ensure compliance with the 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).

One objective of the IMP that would assist in long-term Compact compliance is reducing existing groundwater use within the District by **20 percent** from the 1998 to 2002 baseline pumping volumes. When combined with streamflow augmentation and incentive programs, LRNRD's groundwater depletions to the Republican River can be maintained within Nebraska's portion of allowable groundwater depletions as computed through use of the Republican River Compact Administration Groundwater Model. Through our IMP, we also have committed to reductions in water use through a combination of regulatory and supplemental programs designed to reduce beneficial consumptive use. This voluntary project will allow producers to take their water management to a higher level and contribute to the 20% reduction.

(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).

Compliance Standards shall be used to assess actions taken by LRNRD under the IMP. On an annual basis Nebraska DNR and LRNRD shall reexamine the sufficiency and effectiveness of the Compliance Standards to determine whether amendments or modifications are necessary to ensure Nebraska's compliance with the FSS, RRCA Resolutions, and Compact.

LRNRD shall adopt and implement rules and regulations that shall ensure that standards are met. The procedures for determining whether the Compliance Standards are met will be based on the RRCA Accounting Procedures and on the annual forecast as outlined in the "Monitoring and Studies" section. The Compliance Standards are:

i. To assist with ensuring long-term Compact compliance, provide for a twenty percent (20%) reduction in pumping from LRNRD's Baseline Pumping Volume, using a

combination of regulation and supplemental programs, so that the average annual groundwater pumping volume is no greater than 195,572 acre-feet over the long term. The objective of this standard is to maintain groundwater depletions at a relatively constant level over the long-term. Nebraska DNR and LRNRD will evaluate the trends in long-term groundwater depletions over typically wet and dry cycles and jointly assess whether additional management actions are necessary to accomplish this objective. This standard will be assessed every five years using the methodology established for the basin-wide plan.

ii. The Net Groundwater Depletions for LRNRD shall be no greater than the Allowable Groundwater Depletions for LRNRD (applying LRNRD's Two-Year Averaging or Five-Year Averaging Baseline Depletion Percentage as appropriate). If the Net Groundwater Depletions for LRNRD exceed the Allowable Groundwater Depletions for LRNRD, management actions will be required in the amount the Net Groundwater Depletions for LRNRD exceeded the Allowable Groundwater Depletions for LRNRD. This standard will be evaluated annually.

Other Controls and Management Activities LRNRD may employ to meet the goals of the IMP and maintain Compact Compliance include:

- Curtailment of groundwater pumping within the High Stream Depletion Area.
- Maintaining metering requirements for all groundwater uses
- When necessary, setting a one-year pumping allocation within the LRNRD
- Providing for transfers according to LRNRD regulations
- Moratoriums on new uses with exceptions
- Limiting or preventing the expansion of irrigated uses
- Surface Water Leasing
- Groundwater Leasing
- Augmentation

A variety of these controls will be effectively executed with the addition of real-time telemetry on irrigation wells in the High Stream Depletion Factor Area in the LRNRD.

For more information on Basin Studies, including a list of completed basin studies and reports, please visit: www.usbr.gov/WaterSMART/bsp.

Subcriterion E.2— Readiness to Proceed: *Points may be awarded based upon the extent to which the proposed project is capable of proceeding upon entering into a financial assistance agreement. Please note, if your project is selected, responses provided in this section will be used to develop the scope of work that will be included in the financial assistance agreement.*

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.

• 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.2.2.4.; this section should be focused on a summary of the major tasks to be accomplished as part of the project.

Upon the successful award of this proposal, the LRNRD will identify and prioritize wells for installation of meters with telemetry. With the help of the meter manufacturer, an installation procedure will be created for installation contractors. The LRNRD will then interview and hire

contractor(s) for meter installation. Training will be conducted for contractors to ensure that meters are installed to specifications and telemetry units are initialized correctly.

LRNRD will proceed with procuring the equipment necessary for this project. Totalizing flow meters will be sized according to measurements of well discharge pipes and models will be selected and purchased that will best accommodate proper installation for accurate readings.

Totalizing flow meters with remote telemetry will be purchased, and installation will begin in October, 2022. Installation of weather stations for local crop water use is planned to occur in April of 2023. Subsequent installations will be conducted in the fall and winters of 2023, 2024, and 2025. Following the deployment, a final report will be prepared for the Bureau by March, 2026.

To achieve groundwater conservation goals, LRNRD plans to have all wells and other water management sensors in the project area equipped with telemetry by 2026 with the assistance of the proposed project.

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

No permits are required for the tasks performed under this project.

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

No structural engineering or design work is necessary for this project. Installation contractors will conduct site surveys of individual meter installation sites to ensure proper meter installation and accuracy. No excavation or construction is necessary for this project.

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

No new policies, rules & regulations, or other administrative action is necessary for this project. The 5th generation Integrated Management Plan (IMP) was adopted by the LRNRD on 9/27/21 and will be the guidance for the district and this proposal.

- ***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)***

November 3, 2021: Submit Application to Bureau

March, 2022: Successful notification of award from the Bureau

July, 2022: Sign contract with the Bureau

September, 2022: Achieve Environmental and cultural compliance from the Bureau

October, 2022 - March, 2023: Install approximately 353 telemetry-equipped flowmeters

April, 2023: Installation of weather stations for local crop water use

October, 2023 - March, 2024: Install approximately 352 telemetry-equipped flowmeters

October, 2024 - March, 2025: Install approximately 352 telemetry-equipped flowmeters

October, 2025 – Feb, 2026: Install any remaining telemetry-enabled totalizing flowmeters due to weather conditions, etc.

March, 2026: Prepare Final Project Report for Bureau

Evaluation Criterion F—Collaboration (6 points): *Up to* **6 points** *may be awarded for projects that promote and encourage collaboration among parties in a way that helps increase the sustainability of the water supply.* Please describe how the project promotes and encourages collaboration. Consider the following:

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, remote telemetry to improve irrigation water management has become very popular in the LRNRD over the past four years with the initial telemetry sites installed to create the data collections system in the NRD and in the neighboring district.

Many discussions have taken place with the eleven-member LRNRD Board. They have individually voiced support and intent to vote to approve the resolution to pursue this grant proposal. Unfortunately, for several reasons, the Board was unable to meet for its regular October Board meeting. The resolution will be on the agenda at the **November 10, 2021** Board Meeting and approval of the resolution is expected.

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

This project represents a cooperative effort between the LRNRD, the Nebraska Department of Natural Resources (NDNR), and McCrometer Corporation, with assistance from the Bureau of Reclamation. The irrigation water management of several hundred farmers will be positively affected by this partnership. Similarly, the basin wide water management within the High Stream Depletion Factor Area will be improved by assisting the LRNRD and the State of Nebraska to comply with the Interstate Compact on the Republican River with the State of Kansas. This collaboration will result in one of the first regional water management data networks in the country.

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

Yes. This innovative project will affect a very large portion of the Republican River Basin. The successful implementation and completion of this project will have the potential to be replicated in other water management districts in the Republican River Basin, other portions of Nebraska, as well as other states.

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

The Resolution from the LRNRD Board of Directors will be electronically transmitted to the Bureau following the submittal of this application as permitted under **Section D.2.2.8 of NOFO R22AS00023** since the LRNRD was not able to meet in October. Approval of the resolution is expected at the **November 10, 2021** Board meeting and will codify the intent and support of several local landowners for this project.

Letters of Support from local landowners and future participants can be found in a section with the same name beginning on **page 37**. See attached **Letters of Commitment / Participation** on pages **35 & 36** from McCrometer for irrigation equipment and remote technology and the Nebraska DNR for financial support of this project.

Evaluation Criterion G— Additional Non-Federal Funding (4 points): *Up to* **4 points** *may be awarded to proposals that provide non-Federal funding in excess of 50 percent of the project costs. State the percentage of non-Federal funding provided using the following calculation:*

Non-Federal Funding	$2,360,858	54.1%
Total Project Cost	$4,360,858	

Evaluation Criterion H— Nexus to Reclamation (4 Points):*Up to* **4 points** *may be awarded if the proposed project is connected to a Reclamation project or Reclamation activity. No points will be awarded for proposals without connection to a Reclamation project or Reclamation activity.*

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. However, the proposed project is in the Republican River Basin as are many Reclamation Projects:

Enders Reservoir, which has historically served Frenchman Valley Irrigation District. Swanson Reservoir, serving Frenchman-Cambridge Irrigation District
Hugh Butler Lake, serving Frenchman-Cambridge- Irrigation District
Harry Strunk Lake, serving Frenchman-Cambridge- Irrigation District
Harlan County Lake, serving Nebraska Bostwick and Kansas Bostwick Irrigation Districts

- ***If the applicant is not a Reclamation contractor, does the applicant receive Reclamation water through a Reclamation contractor or by any other contractual means?***

The LRNRD does not receive Reclamation water and is not on Reclamation lands. To the extent that reduced groundwater extraction within the project area will increase baseflow in the Republican River, it will contribute water to Reclamation projects.

- ***Will the proposed work benefit a Reclamation project area or activity?***

Yes. Harlan County Lake is within project area and consequently will receive benefits from this project for the water users that these Reclamation projects serve through improved baseflow due to reduced groundwater pumping. Frenchman Creek is a major tributary to the Republican River

and downstream of the confluence of the Frenchman and Republican multiple canals which are part of Reclamation projects exist. Canals include: Meeker, Bartley, Cambridge, Naponee, Franklin, and Superior within Nebraska along the Republican River. Reduced groundwater pumping under this project will have a positive impact on the baseflow in the Republican River since alluvial aquifers provide discharge to the Republican River Basin for baseflow in the Republican River.

• Is the applicant a Tribe?

No.

PERFORMANCE MEASURES

Performance Measure A.2: Measuring Devices: *Good water management requires accurate and timely water measurement at appropriate locations throughout a conveyance system. This includes irrigation delivery systems and municipal distribution systems.*
Measuring Devices: A.2.b. Irrigation Metering: *Measuring devices that may be installed can include, but is not limited to, the following:*

Flow meters: Water Conservation will be achieved and quantified with the installation of permanently installed irrigation flow meters with telemetry. A key metric of this proposal will be the objective to install **1,057** metered telemetry stations on large capacity irrigation wells in LRNRD.

Potential benefits from improved irrigation delivery system measurement include being able to:
• Facilitate accurate and equitable distribution of water within a district

For an allocation program to work, accurate measurement of water pumped is necessary to ensure compliance with pumping allocations and to facilitate equitable distribution among users. Permanently installed totalizing flow meters with telemetry will facilitate accurate and equitable water marketing in LRNRD under this proposal.

Pre-project estimations of baseline data:

All groundwater extractions have been metered in LRNRD pursuant to groundwater management regulations. As a result, this will provide for an accurate baseline of past water use for evaluation of water savings due to the installation of meters with real-time telemetry.

Post-project methods for quantifying the benefits of projects to install measuring devices:
• Compare post-project water measurement (deliveries, diversions, and waste/spills) data to pre-project data or estimates—taking into account other factors which may have cause changes

Groundwater for irrigation pumped within the project area will continue to be measured and comparisons will be made between pre and post project pumping records within the project area to gauge water savings.

Performance Measure A.3: SCADA: *SCADA systems provide water managers with real-time data on the flow rates and volumes of water at key points within an irrigation water delivery system.*
The projected opportunities for improved operational efficiencies that could be realized through implementation of a SCADA or SCADA/GIS system (e.g., improved delivery

equity, improved response to unanticipated events, reduced administrative spillage, and enhanced productivity of human resources)

- Real-time water use data will be available to farmers on 104,949 irrigated acres for improved water management. This will assist farmers in meeting LRNRD allocations for groundwater conservation.
- Real-time water use will also be available to LRNRD for Compact Compliance for the Interstate Compact with Kansas and Colorado on the Republican River.

Pre-project estimations of baseline data:
• Collect data on diversions and deliveries to water users

Collection of groundwater pumping data prior to this project was done manually. This required LRNRD district staff to physically drive to each well site to manually record pumping data which was extremely labor intensive.

Post-project methods for quantifying benefits of SCADA or SCADA/GIS system projects:
• Track and record the diversions to water users and compare to pre-project diversions. This would show results of improved management if yearly fluctuations in weather are accounted for.

Upon the successful completion of this project, pumping data will be supplied to irrigators and LRNRD water managers daily. This frequent data will enable farmers to improve seasonal irrigation efficiency (timing irrigation events throughout the season) and aid basin-wide water management by delivering daily water use data to LRNRD water managers.

Project Budget

Funding Plan

The non-federal cost share required for the project has been appropriated in expectation of pursuing this project and is available to the LRNRD. Third-party funding in the amount of **$1,200,000** will be contributed by the Nebraska Department of Natural Resources (NDNR) to contribute to the Remote Metering Program (see attached letter of commitment) upon the successful award of this proposal. Other non-federal funding will be provided solely by the LRNRD. The LRNRD currently has and will budget over the three-year duration of the project a cash balance sufficient to pay for the non-federal portion of the project.

The LRNRD does not seek to include any in-kind costs incurred before the project start date. Letters of support and participation from project partners are attached. No funding requests are pending that have not been approved. The funding commitment from the LRNRD is **$1,160,858.** The LRNRD board has committed to budget these funds over the three-year span of this grant proposal. No contingencies are associated with the funding commitment.

The LRNRD 's contribution to the cost-share requirement will be monetary. Funds expended by LRNRD will be used to purchase remote meter telemetry equipment, miscellaneous equipment for installation, and contractor services for installation. Grant funds from the Bureau would be used for the same expenses. The remaining balance of **$2,000,000** is requested of the Bureau of Reclamation in this **$4,360,858** proposal. No other federal sources of funds have been requested. No pending funding requests would negatively affect the project

if not approved. **Letters of Commitment/Partnership** from project partners are attached beginning on page **35**. **Letters of Support** can be found beginning on page **37**.

Budget Proposal

Table 1.— Total Project Cost Table		
Funding Sources	**% of Total Cost**	**Total Cost by Source**
Bureau of Reclamation	45.9%	$2,000,000
Lower Republican NRD (LRNRD)	26.6%	$1,160,858
Nebraska Dept of Natural Resources (NDNR)	27.5%	$1,200,000
Totals	100.00%	$4,360,858

Table 2 - Budget Proposal				
Budget Item Description	**Computation $/unit**	**Quantity**	**Quantity Type (hours/days)**	**Total Cost**
Salaries and Wages				
	No federal funds to be used for salaries/wages			
Fringe Benefits				
	No fringe benefits provided by this project			
Travel				
	No federal funds to be used for travel			
Environmental Compliance Costs				
				$ 500.00
Equipment				
Flow Meter Telemetry Stations	$3,524.00	1057	ea	$3,724,868
Satellite Option	$175.00	50	ea	$8,750
ET Weather Stations	$6,500.00	8	ea	$52,000
Subtotal				**$3,785,618**
Supplies and Materials				
Advantage Pro (telemetry) Software	$ 40,240.00	1	ea	$40,240
Server	$ 6,000.00	1	ea	$6,000
Subtotal				**$46,240**
Contractual/Construction				
Flow Meter Telemetry Site Assessment/Installation	$400.00	1057		$422,800
Data Acquisition/Processing	$50.00	352	Yr 1	$17,600
Data Acquisition/Processing	$50.00	705	Yr 2	$35,250
Data Acquisition/Processing	$50.00	1057	Yr 3	$52,850
Subtotal				**$528,500**
Total Project Costs				**$4,360,858**

Budget Narrative

As indicated in Table 2, the only costs for which the LRNRD is seeking reimbursement are the costs of the equipment and supplies associated with the project and contract services to install the telemetry equipment. No salaries, wages, or travel costs are included. LRNRD staff will

administer the project tasks including landowner communication, site selection, and contractor management. No in-kind services by the district are contributing to federal funds requested representing an **additional** contribution not reflected in the budget proposal. No reimbursement for fringe benefits or travel will be sought and are not included as project costs.

The equipment costs listed in Table 2 are the result of quotes the LRNRD has received for telemetry equipment required for accessing meters. All equipment will be installed under a contract as quoted by an installer experienced in this work. The **$400/site** installation and site assessment charge includes two trips to the meter installation site. One for measurements to ensure proper installation and the second to install the meter with telemetry equipment and flow conditioning devices. This cost has been compared with other similar service providers and was determined to be reasonable. The line items for data acquisition and processing is the data acquisition costs incurred during the duration of the project to install 1,057 meter telemetry units (352 in the first year, an additional 705 in the second year, and 1,057 in the third year for a total 2,114 data fees over the three year period).

The environmental and regulatory compliance costs of **$500** listed in the budget table are minimal because the project primarily entails upgrading existing equipment, flow meters, that are currently in compliance with environmental regulations. If environmental and regulatory costs exceed the budgeted amount, the LRNRD, as may already be required, will pay additional and necessary amounts.

Total project costs are **$4,360,858**. The LRNRD will be responsible for **26.6%**, the NDNR will contribute **27.5%** and the Bureau is requested to contribute **45.9%.**

Environmental and Cultural Resources Compliance

To allow Reclamation to assess the probable environmental and cultural resources impacts and costs associated with each application, all applicants must respond to the following list of questions focusing on the NEPA, ESA, and NHPA requirements. Please answer the following questions to the best of your knowledge. If any question is not applicable to the project, please explain why. The application should include the answers to:

- ***Will the proposed project impact the surrounding environment?***

No. No earth-disturbing work affecting water, animals, or water will be done.

- ***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, only occasional migratory species including Whooping Cranes or Sandhill Cranes reside in the project area. Neither these species nor their habitat will be affected by the work in 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.***

Yes, but none will be impacted as no project equipment will be installed on such lands.

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

The water delivery system consists of privately-owned groundwater wells constructed from the 1950's through the early 2000's.

- ***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.***

No.

- ***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.***

No.

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

No.

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

No. To the contrary, this project may assist them by sustaining the agricultural economy in the region.

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

No.

- ***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.

Required Permits or Approvals

No permits will be required of the LRNRD for this project.

References

Kranz, W. L. Eisenhauer, D. E., Retka, M. T., 1992. Water and energy conservation using irrigation scheduling with center-pivot irrigation systems. AGRICULTURAL WATER MANAGEMENT, 22 (1992) 325-334

McGuire, V.L., 2017, Water Level changes in the High Plains aquifer, Republican River Basin in Colorado, Kansas, and Nebraska, 2002 to 2015 (ver. 1.2, March 2017): U.S. Geological Survey Scientific Investigations Map 3373, 10p., 1 sheet with appendix, https://doi.org/10.3133/sim3373.

Young, A.R., Burbach, M. E., Howard, L. M., Lackey, S.O., Joeckel, R.M., 2019 Nebraska Statewide Groundwater-Level Monitoring Report 2019. University of Nebraska-Lincoln, Conservation and Survey Division, Nebraska Water Survey Paper 87, 24 pp.

Official Resolution

The Resolution from the LRNRD Board of Directors will be electronically transmitted to the Bureau following the submittal of this application as permitted under **Section D.2.2.8 of NOFO R22AS00023** since the LRNRD Board of Directors was not able to meet in October. Approval of the resolution is expected at the **November 10, 2021** Board meeting and will codify the intent and support of several local landowners for this project.

Letters of Commitment/Participation

NEBRASKA

Good Life. Great Water.

DEPT. OF NATURAL RESOURCES

Pete Ricketts, Governor

October 25, 2021

Mr. Todd Siel, General Manager
Lower Republican Natural Resources District
30 North John Street
PO Box 618
Alma, NE 68920

Dear Todd:

Please consider this message a formal Letter of Commitment from the Nebraska Department of Natural Resources (NeDNR) to provide up to $1,200,000 in matching state funds upon approval of your Bureau of Reclamation WaterSMART grant application for the Irrigation Water Conservation for the High Stream Depletion Factor Area using Telemetry Meter Technology Project, under the WaterSMART Grants: Water and Energy Efficiency Grants for Fiscal Year 2022 program (R22AS00023). Projects like these can provide multiple benefits across the basin, including improved producer water application decisions, reductions in pumping and consumptive use, and improvements in implementing future water management activities such as dry-year water leases or other conjunctive management opportunities. These efforts are also expected to be complimentary toward implementation of the Integrated Management Plan (IMP) for the Lower Republican Natural Resources District (LRNRD) and the Republican River Basin-Wide Plan.

Matching State funds from NeDNR will be available to the applicant upon successful award of the WaterSMART grant application, as the funds are currently included within the agency budget. There are no time constraints on the availability of these funds, and there are no other contingencies associated with this funding commitment.

NeDNR staff look forward to working with your district to implement this financial commitment, pending approval of your WaterSMART grant application. Once again, NeDNR fully supports your district's water management goals and appreciates your ongoing efforts to implement our joint IMP and Basin-Wide Plan.

Sincerely,

Thomas E. Riley, P.E., Director

Thomas E. Riley, P.E., Director
Department of Natural Resources
301 Centennial Mall South
P.O. Box 94676
Lincoln, Nebraska 68509
office 402-471-2363
fax 402-471-2900
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October 25, 2021

Lower Republican NRD
Attn: Todd Siel, General Manager
30 North John Street
Alma, NE 68920

Re: Bureau of Reclamation Water Smart Application; FY 2022 Water and Energy Efficiency Grant

Dear Mr. Siel:

McCrometer is glad to be a partner in the project titled **"Irrigation Water Conservation for the High Stream Depletion Factor Area of the Republican River using Remote Meter Reading Technology"**. McCrometer will commit to supplying meters and telemetry equipment as well as technical support upon the successful award of this grant proposal.

McCrometer has provided durable and accurate flow measurement devices for the agricultural irrigation industry for over 65 years. This project will support agriculture, improved water management for groundwater preservation, and local communities in the Republican River Basin.

McCrometer applauds the Bureau of Reclamation for the recognition of practices that will enhance irrigation water management in the industry of agriculture by supporting projects through the Water Smart Program and strongly encourages the approval of this proposal.

Respectfully Submitted,

Kenneth A Quandt
Market Development Manager
McCrometer, Inc.

Letters of Support

MURDOCH PARTNERSHIP

Marlin Murdoch, General Partner
Duane Murdoch, General Partner

October 25, 2021

Lower Republican NRD
Attn: Todd Siel, General Manager
PO Box 618
30 John Street
Alma, NE 68920

Re: Bureau of Reclamation Water Smart Grant Application; **"Irrigation Water Conservation for the High Stream Depletion Factor Area of the Republican River using Remote Meter Reading Technology"**

Dear Mr. Siel:

This is a letter of support for the Lower Republican Natural Resource District's (LRNRD)'s grant application for metering with real-time telemetry and water reporting. As a farmer in the district as well as a board member for the LRNRD, I am intimately aware of the need to provide our growers every advantage possible to conserve and protect our water. While the work the producers have done in the district since the enactment of allocations is amazing, we need to continue to utilize all the resources and technologies available to ensure we continue to be good stewards of the land and water.

I was very pleased with the two meters that were installed on my farms in the irrigation season of 2021. The meters functioned as expected and will definitely help us to make better decisions about our irrigation use in the future. I am very excited for the meters to be installed on a larger scale across the district so our producers can experience this new technology and start to understand how it will benefit management decisions on their farms in the future.

Assistance from the NRD is needed for the applications that will be developed to provide producers with near real-time access to their water use reports. Not only will this help us to be more efficient and profitable on our own operations, but it will also help to ensure that we are meeting our obligations to the other states in the Republican River Compact.

I appreciate the staff and other board members supporting this project. Efforts such as these will help to ensure the farmers in the Republican River Valley can help feed the world for generations to come.

Sincerely,

Marlin Murdoch

Murdoch Partnership
Marlin Murdoch
Oxford, NE

BRUGH FARMS

Allen and Teri Brugh

October 19, 2021

Lower Republican NRD
Attn: Todd Siel, General Manager
PO Box 618
30 John Street
Alma, NE 68920

Re: Bureau of Reclamation Water Smart Grant Application; **"Irrigation Water Conservation for the High Stream Depletion Factor Area of the Republican River using Remote Meter Reading Technology"**

Dear Mr. Siel:

This is a letter of support for the Lower Republican Natural Resource District's (LRNRD)'s grant application for metering with real-time telemetry and water reporting. Having these meters available for me and other irrigators within the NRD will give us a tool to manage water better to achieve sustainability. This tool will help me decide where I am at in regards to my current allocation and 5-year allocation. These meters will also help me save time in making water management decisions on my farm. Having the opportunity to use two of these telemetry meters through the NRD's pilot WaterSMART grant helped me to understand the benefits of these technologically advanced systems.

Assistance from the NRD is needed for the educational programs associated with these irrigation systems as well. We need this type of assistance if we are going to succeed in the goal of sustainable groundwater management in LRNRD and the State of Nebraska. This will also be a very important tool in our efforts to comply with the Republican River Compact between Colorado, Nebraska and Kansas.

Efforts from LRNRD to provide assistance for meters with telemetry is very helpful and greatly appreciated. Thank you for pursuing this project.

Respectfully Submitted,

Brugh Farms
Allen Brugh
Alma, NE

RRCA Accounting Procedures
The procedures outlined in *RRCA Accounting Procedures and Reporting Requirements*, a document describing the definitions, procedures, basic formulas, data requirements, and reporting formats to be used by the RRCA.

RRCA Groundwater Model
The computer-based groundwater model developed under the provisions of the FSS of the Compact and subsequently adopted and revised through action of the RRCA.

RRCA Resolution
A formal agreement entered into by the RRCA.

Stream Depletion Factor
A measure of how much groundwater pumping at a specific location would deplete streamflow after a specified period of time.

V. Goals and Objectives

LRNRD and NeDNR have adopted the following Goals and Objectives:

A. Goals

1. Maximize LRNRD's efficient and beneficial consumptive use of the available water supply, increase certainty for long-range planning of water supplies, and increase collaboration among all water users in LRNRD.
2. Ensure that groundwater and surface water users within LRNRD assume their share of the responsibility to keep Nebraska in compliance with the Compact.
3. Provide that LRNRD's share of that responsibility be distributed in an equitable manner and to minimize adverse economic, social, and environmental consequences to the extent possible.
4. Sustain a balance between water uses and water supplies within LRNRD so that the economic viability, social and environmental health, safety, and welfare of LRNRD can be achieved and maintained for both the near and long-term.
5. Reserve any streamflow available from regulation, incentive programs, and purchased or leased surface water and groundwater required to maintain Compact compliance from any use that would negate the benefit of such regulations or programs, to the extent allowed by statute and the surface water controls of this IMP.

B. Objectives

1. With limited exceptions, prevent the initiation of new or expanded uses of water that increase Nebraska's computed beneficial consumptive use of water within LRNRD, as required for Compact Compliance and by Nebraska law.
2. Achieve the required reductions in water use through a combination of regulatory and incentive programs designed to reduce beneficial consumptive use.
3. NeDNR shall ensure administration of surface water appropriations in the basin is in accordance with the Compact and Nebraska law.
4. Make such additional reductions in groundwater use in Compact Call Years as are necessary, after taking into account any reduction in beneficial consumptive use achieved through basin-wide incentive and streamflow augmentation programs, to achieve a reduction in beneficial consumptive use in LRNRD that ensures the district limits its groundwater depletions to the Allowable Groundwater Depletions for LRNRD. Compact Call Years will be determined as described in the "Final Forecast and Compact Call Year Determination" section of this IMP (page 21).
5. To assist in ensuring long-term Compact compliance, reduce existing groundwater use within LRNRD by 20 percent from the 1998 to 2002 baseline pumping volumes under average precipitation conditions so that, when combined with streamflow augmentation and incentive programs, LRNRD's groundwater depletions are maintained within their portion of Nebraska's Allowable Groundwater Depletions as computed through use of the RRCA Groundwater Model. Additionally, voluntary reduction in baseline pumping volumes will continue to be pursued by LRNRD with the incentive of limiting the level of long-term management actions that are necessary during Compact Call Years.
6. LRNRD and NeDNR will continue to investigate and explore augmentation projects that would add to or retime the water supply within the basin. Such augmentation and retiming projects include, but are not necessarily limited to, the following:
    a. Leasing or purchasing surface water and/or groundwater.
    b. Augmentation wells, both within and outside of the Republican River Basin.
    c. Exploring trans-basin diversion projects.
    d. Conjunctive management of surface water irrigation projects.

VI. Plan Areas and Limitations for Certain Purposes

Except as noted in the next paragraph, the area subject to this IMP is the geographic area within the boundaries of LRNRD (Figure 1). The 10 percent/Five-Year Region (Rapid Response Area) is