Irrigation Water Conservation and Management for Drought Zones

in the

Lower Loup Natural Resources District

WaterSMART Water and Energy Efficiency Grant

Grant Application FOA# R24AS00052

Funding Group I

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Executive Summary

Due Date: February 22, 2024

Applicant: Lower Loup Natural Resources District (LLNRD) covers all or parts of Rock, Wheeler, Boone, Platte, Nance, Greeley, Garfield, Loup, Custer, Valley, Sherman, Butler, Buffalo, Howard, Hall Counties, Nebraska.

The LLNRD is proposing an irrigation flow meter cost-share program in areas that have triggered a response due to drought concerns in priority areas within the district where water level data records have documented more than 50% quantity sampling results at or below 10% of the wells measured over the last 25 years.

Background Data

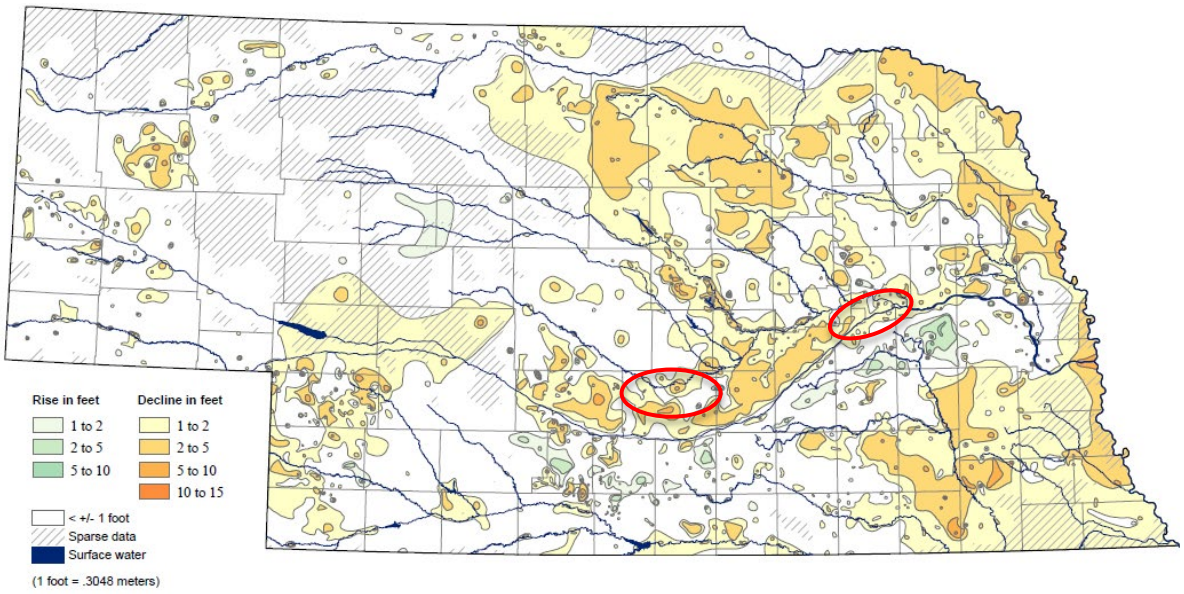
This project is intended to manage groundwater irrigation extractions and increase long term groundwater and surface water availability in a region of Nebraska where several surface and groundwater users exist. The LLNRD is in the lower reach of the Loup River Basin in Nebraska, which was the subject of a Groundwater Discharge Study, conducted by the U.S. Geological Survey in 2019. The study indicated that streams are sensitive to groundwater withdrawals because of the close hydrologic connection between groundwater and surface water. The proposed project can help reduce rates of groundwater decline by providing irrigators and the LLNRD valuable water use information that will improve water management decisions by both irrigators and the LLNRD.

LLNRD staff collected static water levels on 453 irrigation and monitoring wells from March 15 through April 4, 2023. When compared to Spring 2022, a total of 362 wells (80%) reported a decline in water levels, with an average change of -1.63 feet. All counties in the district reported most locations with lower water levels than last year, including two counties with 100% of locations with lower levels, Buffalo (24/24) and Merrick (5/5). The largest single decrease in a single water level was -13.21 feet lower from a well in central Boone County, while the largest increase was 4.99 feet higher from a well in southeastern Greeley County.

A total of 167 static water level locations measured in Spring 2023 have a historical record dating back to at least 1982, the baseline date for water level comparisons per the LLNRD Groundwater Management Plan. The largest concentration of decreasing water levels continues to be found in southern Custer County and northern Buffalo County, south of the South Loup River. Although a new area in Platte County is starting to show consistent downward levels when compared to 1982. Specifically, five water level locations around the Arnold and Broken Bow areas report declines of over 5 feet, and five water level locations around Pleasanton report declines ranging from 4 – 8 feet with one site showing a decline from 1982 over 18 feet.

The University of Nebraska-Lincoln Conservation Survey Division's annual report has also documented significant groundwater declines in the Loup River Basin. This report has identified groundwater declines of up to **ten feet** in the areas designated for this project from the Spring of 2021 to the Spring of 2022. The groundwater declines in this portion of the LLNRD over the last ten years could easily represent a loss 2-3% of the saturated thickness in Zone 18 and a 6-7% loss of saturated thickness of the local aquifer in Zone 20. (Young, A.R. et. al., 2022)

Figure 7. Groundwater-Level Changes in Nebraska - Spring 2021 to Spring 2022



Sources: U.S. Geological Survey, Nebraska Water Science Center; U.S. Bureau of Reclamation, Kansas-Nebraska Area Office; Nebraska Natural Resources Districts; Central Nebraska Public Power and Irrigation District; Conservation and Survey Division, School of Natural Resources, University of Nebraska–Lincoln

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. Unique to Nebraska, NRDs are local government entities, governed by an elected board of directors, with broad responsibilities to protect Nebraska's natural resources. NRD boundaries generally follow major river basins, enabling local districts to respond best to local needs. In particular, NRDs are responsible for the planning, monitoring, and regulation of groundwater in their districts, while the Nebraska Department of Natural Resources (NDNR), a state entity, manages and regulates surface waters within the state.

On September 17, 2022 the LLNRD adopted a Drought Plan to assist the district prepare for and mitigate against future drought. While preparation of this plan was a voluntary action taken by the NRD, it clearly falls within the 12 areas of responsibility granted to NRDs across Nebraska, by the State Legislature. Authority to implement the recommendations within this plan are also well established by Nebraska statutes, and mitigation actions identified within are in-line with other policies, plans, projects, and regulations the Lower Loup NRD has implemented. The proposed project and related controls are a direct result of the implementation of this Drought Plan. Zones 18 and 20 (Figure 1) have met a series of criteria that now triggers a **Severe** Drought Level designation under the LLNRD Drought Management Plan. The installation of permanently installed totalizing flow meters is one of the controls to address water shortages under this designation.

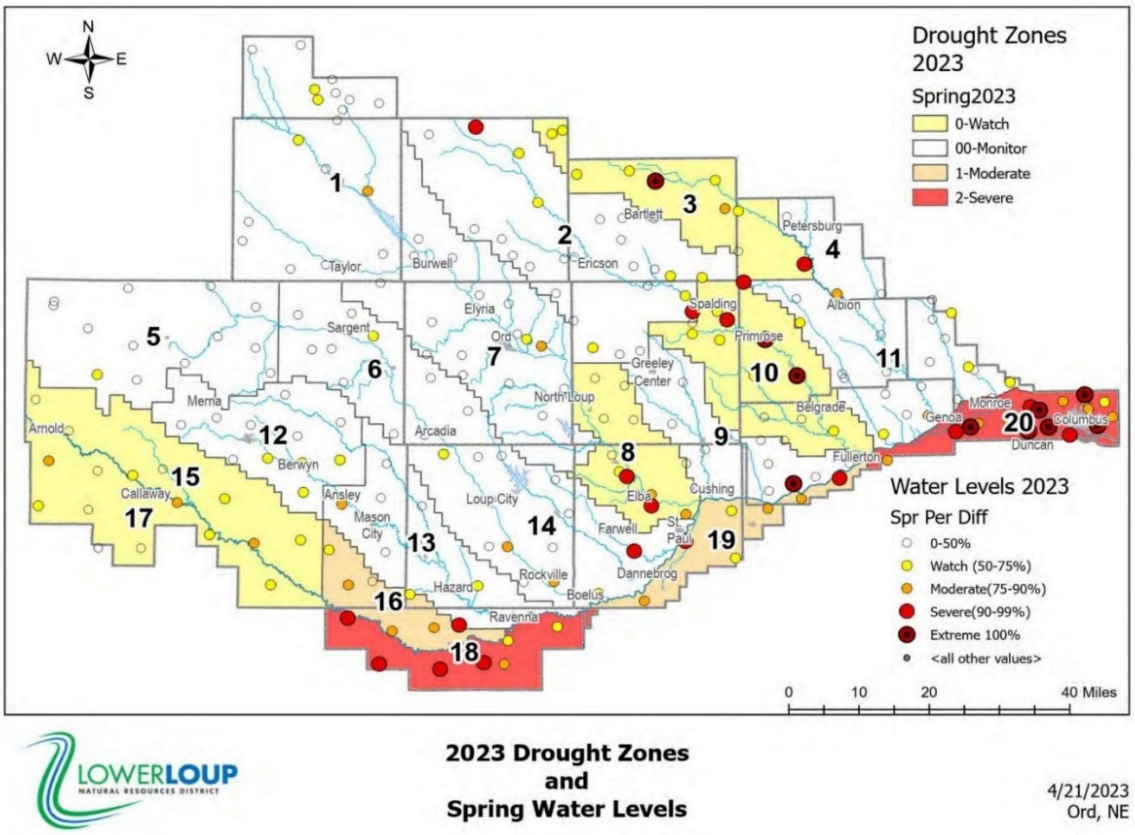
The LLNRD has good history of cooperating with federal agencies by recently completing a study of Age and Water Quality Characteristics of Groundwater Discharge to the South Loup

River in conjunction with the U.S. Geological Survey in 2019 (Hobza and Solder, 2022). The district also cooperated with the Bureau of Reclamation in the Columbus Recharge Project funded by the Drought Response Program FOA# BOR-DO-19-F003.

Project Location

The LLNRD is in central Nebraska and headquartered in Ord, NE. The district includes all or portions of Rock, Wheeler, Boone, Platte, Nance, Greeley, Garfield, Loup, Custer, Valley, Sherman, Butler, Buffalo, Howard, Hall Counties, Nebraska. This project will be confined to **Drought Zones 18 and 20** as delineated in the Figure 1 below. These zones have met criteria establishing a **Severe** Drought Level designation under the LLNRD Drought Management Plan. The Project Areas for this proposal are located in northern Buffalo County (Zone 18) and southeastern Nance and southern Platte Counties (Zone 20) respectively.

Figure 1



LOWER LOUP NATURAL RESOURCES DISTRICT

2023 Drought Zones and Spring Water Levels

4/21/2023
Ord, NE

Technical Project Description

This project is intended to gather data on groundwater irrigation extractions, increase long term groundwater and surface water availability in a region of Nebraska where potential conflict between surface and groundwater users exist, and conserve groundwater for all beneficial uses. The proposed project will help reduce rates of groundwater declines by providing irrigators and the LLNRD water use information that will improve water management decisions by both irrigators and the LLNRD.

Solar-powered weather stations for local crop water use will be deployed within Drought Zones 18 and 20 in conjunction with this Water Smart project in conjunction with the UNL High Plains Climate Center. 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.

LLNRD Staff will coordinate with landowners and local irrigation contractors that service irrigated land in the drought zones to facilitate a cost-share program that will deploy totalizing irrigation flow meters on all irrigation wells in Zones 18 and 20 for irrigation water management purposes and to make these zones more resilient to drought. Studies have shown that the presence and use of flowmeters impacts producer behaviors, such that groundwater pumping is less on wells with flowmeters (Irmak, Et al, 2022). The two areas contain a total of 1,615 irrigation wells some of which are already metered. This program will fund the purchase and installation of permanently installed totalizing flow meters on all wells in the project area for improved irrigation water management and drought resiliency.

Evaluation Criteria

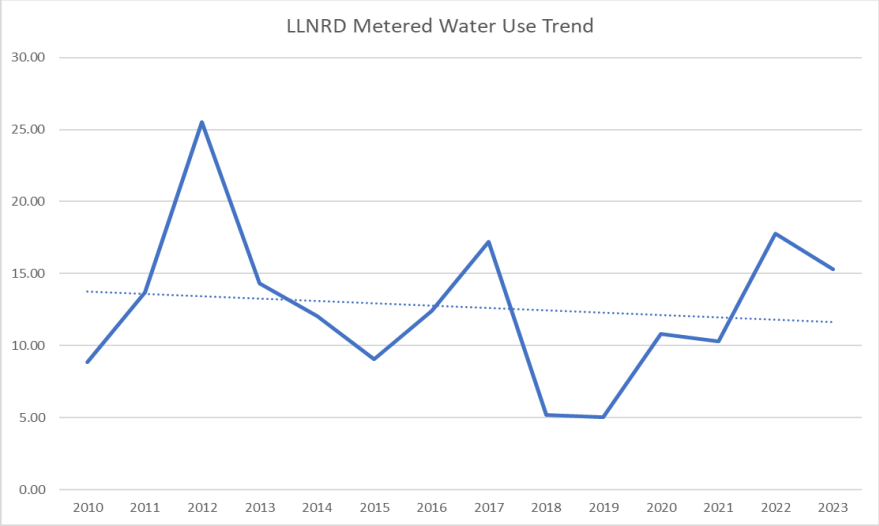
Evaluation Criterion A—Quantifiable Water Savings: *Up to **25 points** may be awarded for this criterion. This criterion prioritizes projects that will conserve water and improve water use efficiency, supporting the goals of E.O. 14008. Points will be allocated based on the quantifiable water savings 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:

1) ***Describe the amount of estimated water savings.*** *For projects that conserve water, please state the estimated amount of water expected to be conserved (in acre-feet per year) as a direct result of this project. Please include a specific quantifiable water savings estimate; do not include a range of potential water savings.*

LLNRD has maintained meters on approximately 80 “baseline” wells across the district where static water levels are regularly taken in the spring and fall of each year to measure recharge to and withdrawals from the local aquifer. Water use data from these wells ranged from 5 to 25 inches/acre fluctuating with wet and dry years, but also indicating a downward trend in water application over time. The graph below indicates a trend in decreased water use of approximately 2.0 inches per acre over a span of 13 years where meters were installed. This correlates to a **0.17 in/ac/yr** decline in irrigation water use where permanently installed totalizing flow meters were installed.

Figure 2



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).

> ***2) Describe current losses:*** *Please explain where the water that will be conserved is currently going and how it is being used. Consider the following:*
>
> ***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 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 Project Area (Drought Zones 18 & 20) is just over **152,096.5 AF/yr**. If irrigation systems operated at **85**% efficiency, operational losses would be over **22,814.4AF/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 Loup River. LLNRD estimates that approximately **1,658.53 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 **7.3% 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. This is not only a waste of water and electricity, but also an opportunity to leach ag chemicals from the root zone into the local aquifer where groundwater quality can be impacted.

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 LLNRD and limit these losses to the local groundwater aquifer.

3) Describe the support/documentation of estimated water savings: *Please provide sufficient detail supporting how the estimate was determined, including all supporting calculations. Note: projects that do not provide sufficient supporting detail/calculations may not receive credit under this section. Please be sure to consider the questions associated with your project type (listed below) when determining the estimated water savings, along with the necessary support needed for a full review of your proposal*.

Annual water pumping in the LLNRD project area was estimated to be **152,096.5 AF** based on an average of existing metered sites from 2020-2022. The land area in Zones 18 and 20 in the LLNRD consists of **117,072.37 irrigated acres** and average water use over the past 3 years was **15.59 in/ac**. Annual water savings of **0.17 inches/ac** is expected from the implementation of permanently-installed totalizing flow meters for improved irrigation water management. Once the expected groundwater savings of **0.17 inches/ac** is achieved through improved irrigation water management, the groundwater use in LLNRD will be reduced by 0.17 in/ac/year or **1,658.53 AF/year** in the LLNRD project area.

Projected Water Savings (0.17 in/yr) (117,072.37 ac) = **19,902.3 acre-inches/yr**

(19,902.3acre-inches/yr) (1.0 AF/12 acre-inches) = **1,658.53 AF/yr**

Total Estimated Annual Water Savings = 1,658.53 AF/year

4) 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 **0.17 acre-inches/yr** in water savings are projected on **117,072.37 irrigated acres** in the project area from improved irrigation water management though the implementation of metering irrigation water extraction. 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 0.17 acre-inches/yr on 117,072.37 acres within the LLNRD project area for a total of 1,658.53 AF/yr.

(0.17 inches) (117,072.37 acres) = 19,902.3 acre-inches of water conserved annually

(19,902.3 acre-inches/yr) (1.0 AF/ 12 acre-inches) = **1,658.53 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 Project Area by metering extractions at a portion of the groundwater irrigation wells. The most recent annual groundwater pumping is the project area on average from 2020-2022 has been estimated to be **152,096.5 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 **22,814.5 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 **1,658.53 AF** due to Improved Application Efficiency were achieved, this would represent a **7.3%** reduction in operational losses in the Area.

Estimated Water Conservation / Annual Losses = Percent Reduction in Losses

1,658.53 AF / 22,814.5 AF = 0.0726 or **7.3% 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 LLNRD is the McCrometer propeller meter. Currently, as many as 50% of the wells in the project area are already metered to address groundwater quality concerns in existing subareas. This project will meter the remaining irrigation wells in the Drought Zones. 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. Improved measurement will improve not only management, but also the quality and accuracy of data, reported to the LLNRD and other agencies for 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 or a prefabricated pipe with a meter already installed will 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. Where needed, a Flow Straightener, a flow conditioning device that corrects disturbances created by backflow protection or chemigation valves, pumps, elbows, or other disturbers will be installed. NIST traceability will continue to be the basis for this accuracy.

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 flow meter data for irrigation water applied, crop water use, and in some cases, soil moisture monitoring. As described earlier, this is expected to be **0.17 inches/ac** due to implementation of metering groundwater extraction and ET data acquisition.

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

Upon the completion of this project, post-metering water application will be compared to water applications previous to the installation of permanently-installed totalizing flow meters 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, Subcriterion B.2 will be completed and address the savings in power consumption in the LLNRD 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 LLNRD was calculated to be **152,096.5 AF/yr** on average from 2020-2022. Consequently, a reasonable estimate for the annual power consumption in the LLNRD project area to pump irrigation water is **50,663,344.15 kWh/yr**. The projected groundwater savings derived from improved irrigation water management and reporting is estimated to be **1,658.53 AF/yr** or **1.1%** from this project. This would equate to **557,296.8 kWh/yr** in power savings as demonstrated in the following equations:

(**333.1** kWh/AF) (**152,096.5** AF/yr) = **50,663,344.15 kWh/yr** = Annual Estimated Electrical Consumption

(**50,663,344.15** kWh/yr) (**1.1%/yr** water savings) = **557,296.8 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 1.1% 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 LLNRD 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 **1.1%** annually in LLNRD which will have a commensurate reduction on energy usage in the district. A 1.1% reduction in pumping is estimated to result in energy savings of **557,296.8 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 LLNRD 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.

No.

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

Weather stations equipped with remote telemetry deployed under this project will also be solar-powered by solar panels independent of commercial power.

Additionally, the meters installed under this project will be mechanical bolt-on saddle meters. This meter requires no commercial electricity or battery power to operate. The meter is driven completely by the force of water flowing through the irrigation pipe. Consequently, this meter is reusing power that has been expended to pump water through the irrigation system.

Evaluation Criterion C—Sustainability Benefits (15 points): *Up to* **15 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.*

Resilience and Sustainability Benefits. Will the project address a specific water and/or energy sustainability concern? Please address the following: Explain and provide detail of the specific issue(s) in the area that is impacting water resilience and sustainability. Consider the following:

- ***Describe recent, existing, or potential drought or water scarcity conditions in the project area***.

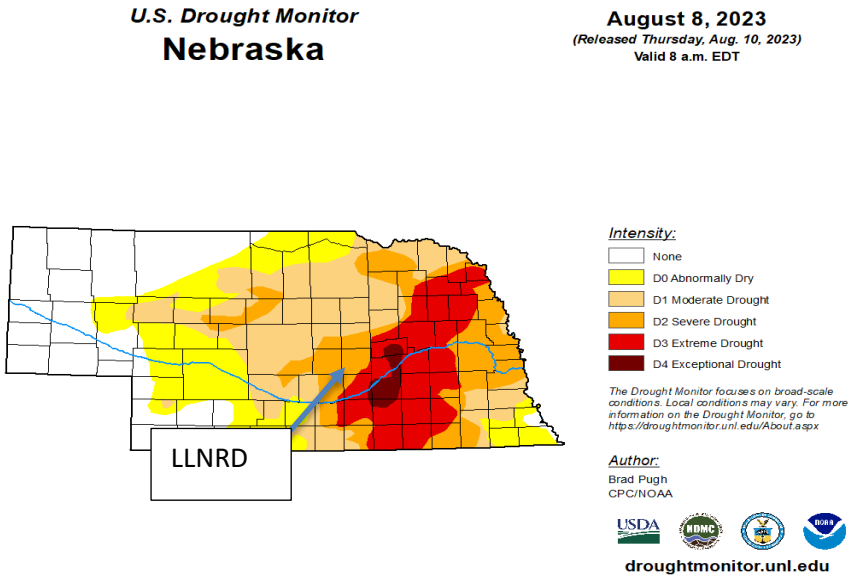
LLNRD staff have monitored several drought factors as a result of their drought Management Plan established in Sept of 2022. These drought factors include but are not limited to 1) Designation of the US Drought Monitor, 2) Measurements of the Lower Loup NRD Annual Spring Static Water Level Readings, 3) USGS Daily Streamflow Gages, 4) Local reporting of Drought Impacts, and 5) Regional Drought Forecasting.

Drought Zones 18 and 20 were triggered into a **Severe** designation because each area was in an intensity of at least D3 or D4 measured by the US Drought Monitor and at least 50% or greater of the static water level measurement wells were at or below 10% of the well's measure static water level range over the last 25 years. As a result, the LLNRD Board of Directors voted to proceed with requiring the installation of permanently installed totalizing flow meters in Drought Zones 18 and 20 at their regularly scheduled meeting on **January 25, 2022**.

- ***Is the project in an area that is experiencing, or recently experienced, drought or water scarcity?***

Yes, this area has been significantly impacted by drought for the past several years. Much of the project area in LLNRD is currently in the area designated as either **severe, extreme, or exceptional** drought by the Drought Monitor published by the National Drought Mitigation Center at the University of Nebraska-Lincoln as seen in the following **Figure 2**.

Figure 2



- ***Describe any projected increases to the severity or duration of drought or water scarcity in the project area. Provide support for your response (e.g., reference a recent climate informed analysis, if available).***

Drought Factors measured by LLNRD staff under the Drought Management Plan are leading indicators of the effects of drought on water resources in the region. The **Severe** designation for Drought Zones 18 and 20 may just be the first areas to fall subject to these controls as other zones in LLNRD are showing similar effects of drought. Several other zones are already exhibiting lower levels of drought (see **Figure 1**). Zones 3, 8, 10, 15, and 17 have met triggers that designate a "Watch" level and zones 16 and 19 have triggered a "Moderate" level under the LLNRD Drought Management Plan. If current levels of drought continue, a number of these zones may progress to higher levels of severity requiring further controls.

- ***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 LLNRD Drought 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 LLNRD 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 Loup 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.***

Water conserved due to reduced groundwater pumping through installation of permanently-installed totalizing flow meters and improved irrigation efficiency will remain in the local aquifer to achieve sustainable groundwater levels. Historical data from metered wells in LLNRD show a downward trend of irrigation water applied where permanently installed totalizing flow meters have been installed. Farmers will be able to utilize the water application information from these meters to improve irrigation water management as well as drought resiliency within the designated drought zones. 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.

- ***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 extraction data and crop water use will aid farmers in making irrigation scheduling decisions. Quantifying irrigation water application rates will have the potential to make individual irrigation applications more efficient and precise with accurate crop water use data. These practices have the potential to improve timing of application or seasonal irrigation efficiency. The deployment of weather stations in the Drought Zones will provide local crop water use (ET) data to farmers in the project area for improved irrigation water management. 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.

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.

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

LLNRD estimates that approximately **1,658.53** acre-feet (AF) of water will be conserved per year as a result of the application of irrigation flow meters and other water management sensors for improved irrigation management in the Project Area. Permanently-installed totalizing flow meters 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 LLNRD in achieving water management goals. The proposed project can help reduce rates of groundwater decline from drought and increased demand by providing irrigators and the LLNRD timely water use information that will improve water management decisions by both irrigators and the LLNRD.

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 LLNRD. Irrigation efficiencies will be achieved through providing water measurement to irrigators for improved on-farm irrigation management. Compliance with LLNRD groundwater regulations will inevitably reduce pumping 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.

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

This water conservation program within LLNRD would be virtually impossible without permanently installed totalizing flow meters. Accurate measurement of water pumped is necessary to ensure compliance with district groundwater management regulations. Groundwater extraction data will be available to the LLNRD staff as well as individual water users for on-farm water management as well as water management on the basin level. Water conserved under the LLNRD's Drought Management Plan will remain in the local aquifer for future sustainable uses to the benefit of all water users.

- ***Will the project assist States and water users in complying with interstate compacts?***

The Loup Basin is not subject to any interstate compacts since the Basin is not directly linked to a bordering state. However, the Loup Basin is the largest source of streamflow in the Lower Platte Basin, and water savings and availability directly impact downstream demands.

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

Yes. The effects of drought will inevitably cause conflict between surface and groundwater users. Both surface and groundwater use is prevalent in LLNRD. The implementation of the district's Drought Management Plan provides foresight to these potential conflicts and the controls implemented will mitigate those effects.

Ecological Benefits. In addition to the separate WaterSMART Environmental Water Resources Projects NOFO, this NOFO places a priority on projects that that result in ecological benefits, through this section and other sections above, consistent with the SECURE Water Act. Please provide information regarding how the project will provide ecosystem benefits, including the following:

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

Yes. The Lower Loup NRD has 13 species with ranges that are on either the state or federal threatened and endangered species list:

• Small White Lady's Slipper
• Sturgeon Chub
• Western Prairie Fringed Orchid
• American Burying Beetle
• River Otter
• Blowout Penstemon
• Finescale Dace
• Piping Plover
• Rufa Red Knot
• Interior Least Tern
• Northern Long-eared Bat
• Northern Redbelly Dace
• Whooping Crane

Although drought will impact each species differently, in general, species will become more vulnerable during drought conditions. When a drought occurs, critical habitat and food supplies may become damaged or scarce. Certain species may also find it difficult to find adequate supplies of drinking water. Piping Plovers, the River Otter, the American Burying Beetle, and Whooping Cranes are all especially vulnerable to drought conditions affecting their habitat. This project will improve the water supply that contributes to the habitat and survival of these species.

- ***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, recreational benefits, etc.).***

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 Loup River Basin.

- ***Will the proposed project reduce the likelihood of a species listing or otherwise improve the species status?***

Yes. This project will benefit not only the species themselves but will also support the habitat of these threatened or endangered species as well.

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

With improved irrigation efficiency, there will be a reduced chance of leaching fertilizers and pesticides past the root zone and eventually into the aquifer. Since groundwater is the source of drinking water in LLNRD, prevention of contamination will protect human health. By applying fertilizers and pesticides to the appropriate quantity, material costs will be reduced and more efficient distribution in the supply chain will occur. Additionally, with proper irrigation, the opportunity for harmful compounds in runoff will be minimized. This will protect surface water, fish and wildlife, and humans.

Note: 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 Loup 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 Loup River.

Climate Change*: E.O. 14008 emphasizes the need to prioritize and take robust actions to reduce climate pollution; increase resilience to the impacts of climate change; protect public health; and conserve our lands, waters, oceans, and biodiversity.*

- ***Describe how the project addresses climate change and increases resiliency. For example, does the project help communities adapt to bolster drought resilience?***

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 the Loup River, and its tributaries. The sensitivity of surface water flow to groundwater pumping in the South Loup River has been documented. (Hobza and Solder, 2022) 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 dependent upon surface water flow in the project area.

Permanently-installed totalizing flow meters will gather water use data that will ensure the highest accuracy of (and greatest confidence in) groundwater extractions within the LLNRD. Groundwater extraction data gathered will provide water users and district water managers with crucial information for on-farm water management as well as basin-wide water management. Access to water use from meters will increase efficiency of on-farm water use and therefore conserve water stored in the local aquifer for times of water shortage.

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

Yes. Aside from water sustainability for human uses and wildlife benefits, this project will have benefits for wetlands and riparian habitat as well. This in turn will support miles of riparian habitat in the area which is important for fish, waterfowl, and their habitat along streams and lake shores in the Loup River and its tributaries. Water conservation will bolster the resiliency for this ecological habitat by improving water storage in the local aquifer which will promote baseflow in streams within the Loup River basin for the benefit of wildlife and its habitat.

- ***Does the proposed project seek to reduce or mitigate climate pollutions such as air or water pollution?***

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.

Increased levels of Nitrate-nitrogen concentration in groundwater have been well-documented in parts of Nebraska including portions of LLNRD. Practices promoted by this project will limit leaching of nitrate-nitrogen from farm fields to the benefit of not only groundwater quantity, but also groundwater quality.

- ***Does the proposed project include green or sustainable infrastructure to improve community climate resilience?***

Yes. Propeller meters proposed by this project are mechanical and require **no power** – neither batteries nor commercial power – just the force of the water flowing through the pipe. These meters are sustainable in the truest sense of green energy. The meters that will be installed run on the force of the water flowing through the pipe. While not using commercial electricity or batteries, they are renewable in the sense that they require no **new** power to operate, just the force supplied by the water already flowing through the pipe that is existing in the irrigation system.

- ***Does the proposed project contribute to climate change resiliency in other ways not described above?***

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. Groundwater extraction and local weather (ET) 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, groundwater use data supplied to LLNRD water managers will improve basin wide water management to the benefit of both the district and the State of Nebraska for water sustainability within the Loup River Basin.

Evaluation Criterion D—Disadvantaged Communities, Insular Areas, and Tribal Benefits (15 points)

Up to **15 points** may be awarded based on the extent that the project demonstrates support for the Biden-Harris Administration's priorities, including E.O. 14008: *Tackling the Climate Crisis at Home and Abroad* and the President's memorandum, *Tribal Consultation and Strengthening Nation-to-Nation Relationships.*

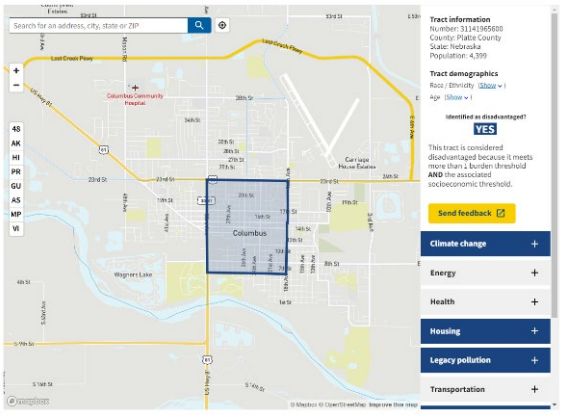
Please address only those priorities that are applicable to your project. It is not necessary to address priorities that are not applicable to your project. A project will not necessarily receive more points simply because multiple priorities are addressed. Points will be allocated based on the degree to which the project supports one or more of the priorities listed, and whether the connection to the priority(ies) is well supported in the application.

E.1.4.1 Subcriterion D.1. Disadvantaged Communities

E.O. 14008 affirms the advancement of environmental justice for all through the development and funding of programs to invest in disadvantaged communities. This criterion, which is used to identify projects that advance the Justice 40 Initiative, includes all Federally recognized Tribes and Tribal entities, and any disadvantaged communities in insular areas (American Samoa, Guam, the Northern Mariana Islands, or the Virgin Islands) identified pursuant to the following criteria.

• Please use the White House Council on Environmental Quality's interactive Climate and Economic Justice Screening Tool (CEJST), available online at Explore the map Climate & Economic Justice Screening Tool (screeningtool.geoplatform.gov/ en/#17.59/36.63278/-105.181329) to identify any disadvantaged communities that will benefit from your project. The CEJST developed by the White House Council on Environmental Quality is a geospatial mapping tool that utilizes publicly available, nationally consistent data sets related to climate change, the environment, health, and economic opportunity to identify disadvantaged communities. In addition to identifying specific census tracts that are disadvantaged, the CEJST includes the lands of Federally recognized Tribes as disadvantaged communities. In addition, regardless of whether a Federally recognized Tribe has land, all Federally recognized Tribal entities are considered disadvantaged communities for the purposes of the Justice40 Initiative.[2]

Yes. A portion of Columbus, NE contains Census Tract # 31141965600 which is considered disadvantaged according to the Climate and Economic Justice Screening Tool. Columbus, NE and this Census tract is located in Drought Zone 20 within the project area for this proposal. (https://screeningtool.geoplatform.gov)



• If applicable, describe how the proposed project will serve or benefit a disadvantaged community, identified using the tool. For example, will the project improve public health and safety by addressing water quality, add new water supplies, provide economic growth opportunities, or provide other benefits in a disadvantaged community?

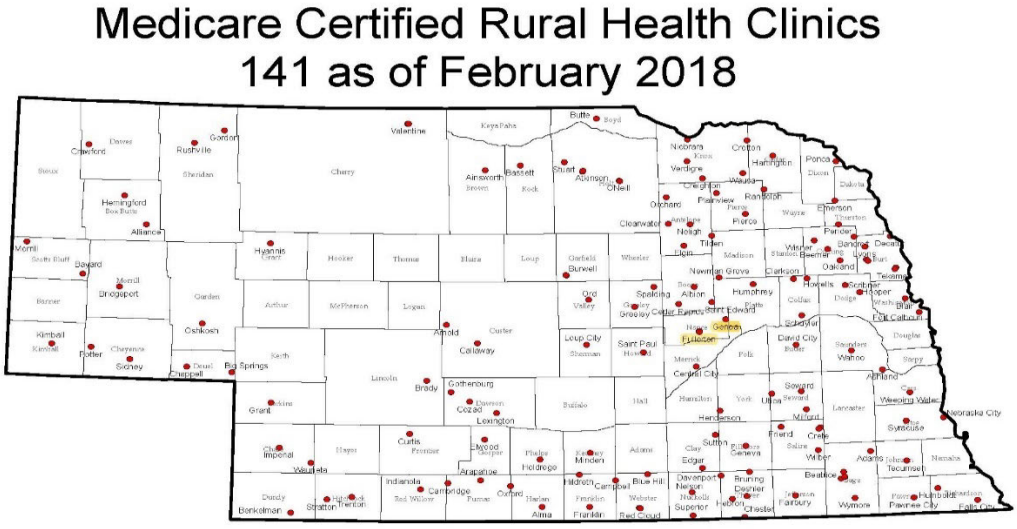
Yes. Several disadvantaged and underserved communities exist in the LLNRD. Benefits to these communities will be groundwater sustainability water resources for all users and beneficial uses including agriculture, municipal, industrial and domestic uses. Groundwater pumped for irrigation is the largest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

Yes. 2022 data from the U.S. Census Bureau reports that the annual median household income for the State of Nebraska is **$71,722**. The median annual income from for all three project area counties in the LLNRD is less than the statewide annual median household level as shown in the table below:

2022 State Median Income : $71,722	
LLNRD Counties	2022 Median Household Income
Buffalo	$70,093.00
Platte	$69,943.00
Nance	$60,054.00
Average	$66,696.67

Consequently, the project area meets the criteria for a disadvantaged community as defined by Section 1015 of the Cooperative Watershed Act. (https://data.census.gov)

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. The communities of **Genoa** and **Fullerton** in the LLNRD have received this designation as shown in the map below:



E.1.4.2 Subcriterion D.2. Tribal Benefits

The Department 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. Address the following, if applicable:

• *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. The project does not directly serve and/or benefit a tribe.

• *Does the proposed project support Tribal led conservation and restoration priorities, and/or incorporate or benefit indigenous traditional knowledge and practices?*

No.

• *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, increased renewable energy, or economic growth opportunities? Does the proposed project support Reclamation's Tribal trust responsibilities or a Reclamation activity with a Tribe?*

No. The project does not directly support tribal resilience to climate change and drought impacts or provide other Tribal benefits.

Evaluation Criterion E—Complementing On-Farm Irrigation Improvements (8 points)

Up to **8 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 LLNRD 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?

LLNRD 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 LLNRD Project 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 LLNRD to improve the probability of achieving water conservation goals set forth in the LLNRD IMP. Approximately **15%** of the LLNRD project area 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.

- ***Describe how the proposed WaterSMART project would complement any ongoing or planned on-farm improvement.***
    - ***Will the proposed WaterSMART project directly facilitate the on-farm improvement? If so, how? For example, installing a pressurized pipe through Water SMART can help support on-farm irrigation practices such as drip irrigation.***
        - LLNRD chooses to answer the next question.

    OR

    - ***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 new irrigation water management technologies can or will utilize the signal output capabilities of the new flow meters to integrate flow measurement for improved application efficiency of the irrigation system. In addition, practices such as irrigation scheduling can make use of the water use records generated by the meter to improve application efficiency of individual irrigation applications.

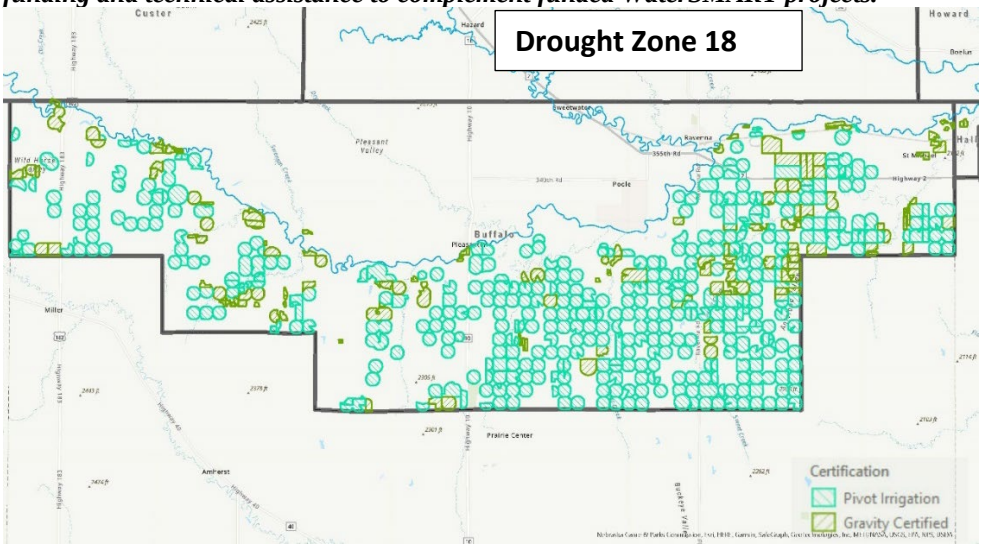
- ***Describe the on-farm water conservation or water use efficiency benefits that are expected to result from any on-farm work.***
    - ***Estimate the potential on-farm water savings that could result in acre-feet per year. Include support or backup documentation for any calculations or assumptions.***

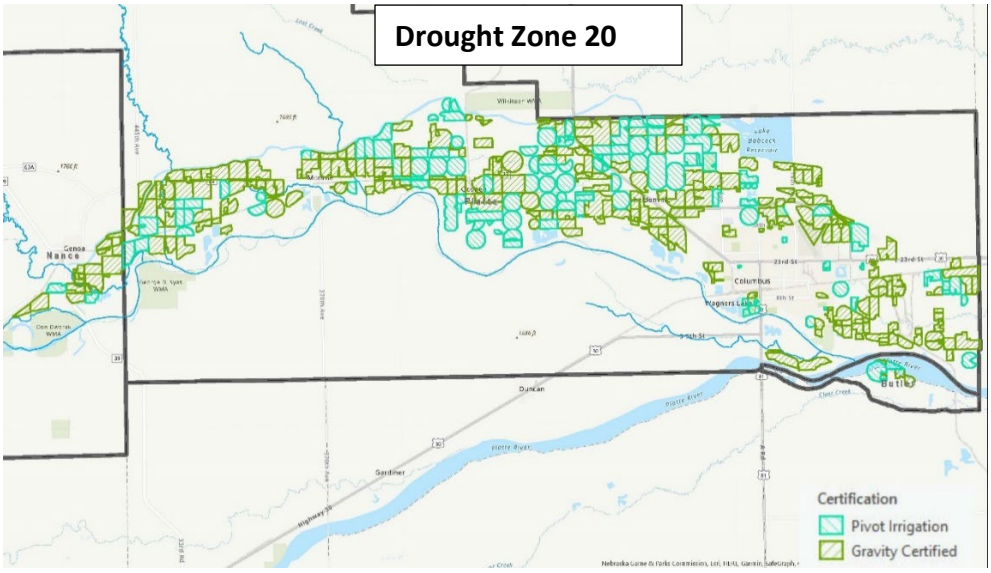
Advanced Irrigation Water Management Technologies deployed through the USDA-NRCS programs include Variable Rate Irrigation (VRI), Soil Moisture Sensors, Rainfall Detection with Auto-stop for center-pivots, Integrated Evapotranspiration, and Variable Speed Pumping.

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.

LLNRD estimates that an additional 3% water savings could be realized from the implementation of these advanced irrigation water management technologies. Since water pumping in the LLNRD project area was estimated in 2020-2022 at **152,096.5 AF**, additional water savings would be estimated at **4,562.9 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 F—Readines to Proceed (8 points): *Up to* **8 points** *may be awarded for these subcriteria. Points may be awarded based upon the extent to which the proposed project is capable of commencing upon entering into a financial assistance agreement. 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.***

Upon the successful award of this proposal, LLNRD will identify and prioritize wells and farm cooperators for installation of meters in the designated Drought Zones. To achieve groundwater conservation goals, LLNRD plans to have all wells and other water management sensors in the project area equipped with permanently-installed totalizing flow meters by the beginning of irrigation season of 2026 with the assistance of the proposed project. A cost-share program will be initiated that will provide 50% assistance toward the purchase and installation of a permanently-installed totalizing flow meter. An outreach program will notify Drought Zone farmers of the program to fund meter installation and register them for the program. Outreach will also occur with local irrigation dealers to inform them of the need for meters in designated areas as well as proper meter specifications.

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

- ***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 Drought Management Plan was adopted by the LLNRD on **9/17/22** and will be the guidance for the district and this proposal.

- ***Describe the current design status of the project. If additional design work is required prior to construction, describe the planned process and timeline for completing the design work***.

The LLNRD board held a hearing on the proposed meter regulations at their regular board meeting on **January 25, 2024**. At this time the LLNRD Board voted to proceed with meter regulations in the project area including Drought Zones 18 & 20 with a target deadline of Feb 1, 2026. LLNRD realizes that 100% compliance will be achieved at a date after this deadline, but within the scope of this project.

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

Feb, 2024: Submit Application to Bureau

Dec, 2024: Successful notification of award from the Bureau

Mar, 2025: Sign contract with the Bureau

Apr, 2025: LLNRD initiates and administers cost-share program for irrigation flow meters in Drought Zones 18 & 20. Conduct field inspections to ensure that meters have been installed to specifications through May, 2026.

Oct, 2026: Prepare Final Project Report for Bureau

Evaluation Criterion G—Collaboration (5 points): *Up to* **5 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. Three meetings were held with as many as 45 stakeholders involved with the development of the LLRND Drought Management Plan. This demonstrates the widespread support and seriousness of the concern for drought within the LLNRD. Many discussions have taken place with the LLNRD Board. They have individually voiced support and the intent to vote to approve the resolution to pursue this grant proposal. The resolution was passed at the **January 25, 2024** Board Meeting and a copy of the resolution is attached.

• What is the significance of the collaboration/support?

This project represents a cooperative effort between the LLNRD, landowners, and several landowners within LLNRD 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 Project Area will be improved by assisting the LLNRD with the installation of permanently installed totalizing flow meters.

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

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

• 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.

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

The Resolution from the LLNRD Board of Directors was signed at the **January 25, 2024** Board Meeting and a copy of the resolution is attached at the end of this document under "Official Resolution". **Letters of Support** from local landowners and future participants can be found in a section with the same name.

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 Loup River Basin as are many Reclamation Projects:

> Virginia Smith Dam and the Bureau-owned Calamus Reservoir. Davis Creek Dam and Reservoir which is managed and operated by the Twin Loups Irrigation District. In addition, the Lower Loup NRD is home to the formerly Bureau-owned Farwell Irrigation District, Sargent Irrigation District, the Middle Loup Public Power & Irrigation District, the North Loup River Public Power & Irrigation District, as well as the Nebraska Public Power District, and the Loup River Public Power District.

• 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 LLNRD 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 Loup River.

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

No.

• 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. A key metric of this proposal will be the objective to install **200** meters on large capacity irrigation wells Drought Zones 18 and 20 in LLNRD.

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

For a groundwater management program to work, accurate measurement of water pumped is necessary to ensure compliance with pumping regulations and to facilitate equitable distribution among users. Permanently installed totalizing flow meters will facilitate accurate and equitable water management in LLNRD under this proposal.

Pre-project estimations of baseline data:

Drought Zone 20 includes two groundwater quality management subareas where groundwater extractions have been metered pursuant to groundwater quality management regulations. This meter data was used to determine baseline groundwater use in the project area and serve as a benchmark for water conservation.

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

- *Present how measurement devices were used to identify water losses which were previously unknown and how these will be addressed.*

Approximately 550 permanently installed totalizing flow meters are already installed in Zone 20 to determine background water use. Additional aspects including groundwater level monitoring wells within the area and other drought factors were considered to determine that water use was not sustainable and conservation practices were necessary to ensure aquifer sustainability.

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 LLNRD. Other non-federal funding will be provided solely by the LLNRD. The LLNRD currently has and will budget over the 2-year duration of the project a cash balance sufficient to pay for the non-federal portion of the project.

The funding commitment from the LLNRD is **$351,923.** The LLNRD board has committed to budget these funds over the two-year span of this grant proposal. No contingencies are associated with the funding commitment.

The LLNRD 's contribution to the cost-share requirement will be monetary. Funds expended by LLNRD will be used to provide cost-share for the purchase and installation of permanently installed totalizing irrigation flow meters. Grant funds from the Bureau would be used for the same expenses. The remaining balance of **$351,923** is requested of the Bureau of Reclamation in this **$703,847** proposal. No other federal sources of funds have been requested. No pending funding requests would negatively affect the project if not approved. **Letters of Support** can be found at the end of this document in a section by the same name.

Budget Proposal

Table 1 - Total Project Cost Table

Funding Sources	% of Total Project Cost	Total Cost by Source
Costs to be reimbursed with the requested federal funding	50.0%	$351,923
Costs to be paid by applicant, Lower Loup NRD	50.0%	$351,923
TOTAL PROJECT COST	100%	$703,847

Table 2 - Budget Proposal

Budget Item Description	Computation $/unit	Computation Quantity	Quantity Type (hours/days)	Total Cost
Salaries and Wages				
	No wages to be requested by this project			
				$0
Fringe Benefits				
	No fringe benefits being requested by this project			
Travel				
	No federal funds to be used for travel to install equipment			
Environmental Compliance Costs				
				$ 500.00
Equipment				
Irrigation Flow Meters (mechanical propeller)	$1,967.00	200	ea	$393,400
Flow Straightening Devices	$555.00	200	ea	$111,000
ET Weather Stations	$42,715.18	2	ea	$85,430
Subtotal				**$589,830**
Supplies and Materials				
Installation	$ 400.00	200	ea	$80,000
			ea	$0
Subtotal				**$80,000**
Contractual/Construction				
				$0
Subtotal				**$0**
Total Direct Costs				**$670,330**
Indirect Costs		5%		**$33,516.52**
Total Estimated Costs				**$703,847**

Budget Narrative

As indicated in Table 2, the only costs for which the LLNRD is seeking reimbursement are the costs of the equipment and supplies associated with the project and contract services to install the permanently-installed totalizing flow meters. No salaries, wages, or travel costs are included. LLNRD 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 based upon cost-share applications received recently in the district office for flow meter purchases and installation pursuant to district programs. For other Bureau-funded projects, McCrometer has been able to certify that it meets requirements of the Build America, Buy America provisions of the Infrastructure Investment and Jobs Act ("the Act") Pub. L. No. 117-58 as outlined for manufactured products including the flow meter products that will be supplied to LLNRD. Pricing included in the budget above reflects the costs necessary to meet these requirements. A quotation for weather stations has been obtained from the UNL High Plains Climate Center and is contained in **Attachment A**.

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 LLNRD, as may already be required, will pay additional and necessary amounts.

Total project costs are **$703,847**. The LLNRD will be responsible for **50%**, and the Bureau is requested to contribute **50%.**

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?***

See Criterion C for a list of 13 species with ranges that are on either the state or federal threatened and endangered species list within the LLNRD.

- ***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 LLNRD for this project.

Overlap or Duplication of Effort Statement

LLNRD does not have any project that overlap or duplicate the effort of the proposed project in terms of activities, costs, or commitment of key personnel. The proposed project has not been or will be submitted for consideration to any other potential funding source – whether it be federal or non-federal.

Conflict of Interest Disclosure Statement

LLNRD does not have any actual or potential conflict of interest at the time of submission, not do we anticipate having any conflict of interest during the federal award period.

Applicability

LLNRD will take the appropriate steps to avoid conflicts of interest in its responsibilities under or in respect to Federal financial assistance agreements. The procurement of supplies, equipment, construction, and services by recipients and by subrecipients shall be in accordance with the provisions of 2 CFR§200.318.

Notification

LLNRD will disclose in writing any conflict of interest to Reclamation. LLNRD will establish internal controls that include procedures to identify, disclose, and mitigate or eliminate identified conflicts of interest.

Restrictions on Lobbying

LLNRD will not use funds under a grant or cooperative agreement for lobbying activities and will provide the required certifications and disclosures.

Review Procedures

LLNRD will resolve any conflict of interest if determined by the Financial Assistance Officer.

Uniform Audit Reporting Statement

LLNRD was the recipient of approximately $610,000 in federal reimbursements for fiscal year 2023 and was consequently not required to submit a Single Audit report for that year.

Certification Regarding Lobbying

LLNRD is requesting for more than $100,000 in federal funding and is certifying as such in Form SF-424 which is attached to this application.

Disclosure of Lobbying Activities

LLNRD does not currently employ a lobbyist and does not expect to do so within the timeframe of this project.

References

Irmak, S. Brar, D. Kukal, M. S. Odhiambo, L. Djaman, K, 2022. Automated real-time irrigation analytics inform diversity in regional irrigator behavior and water withdrawal and use characteristics. AGRICULTURAL WATER MANAGEMENT, 272 (2022) 107837

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

Hobza, C.M., and Solder, J.E., 2022, Age and water-quality characteristics of groundwater discharge to the South Loup River, Nebraska, 2019: U.S. Geological Survey Scientific Investigations Report 2022–5042, 57 p., https://doi.org/10.3133/sir20225042.

Young, A.R., Burbach, M. E., Howard, L. M., Lackey, S.O., Joeckel, R.M., Nebraska Statewide Groundwater-Level Monitoring Report 2022. University of Nebraska-Lincoln, Conservation and Survey Division, Nebraska Water Survey Paper 91, 9 pp.

Official Resolution

RESOLUTION TO DEVELOP A WATER AND ENERGY EFFICIENCY GRANT APPLICATION

No. 2024-01

WHEREAS, the Lower Loup Natural Resources District has adopted a Drought Management Plan during the Lower Loup Natural Resources District – Board of Directors Meeting on November 17, 2022; and

WHEREAS, the Lower Loup Natural Resources District Drought Management Plan identifies flow meters as a viable measuring device for irrigation metering; and

WHEREAS, the United States Department of Interior, Bureau of Reclamation, has announced the WaterSMART Opportunity for the Fiscal Year 2024 Water & Energy Efficiency Grant Projects to provide financial assistance to entities responsible for water management; and

WHEREAS, Lower Loup Natural Resources District has a present need to provide funding for cost share in order to implement irrigation flow measurements necessary under the authority of the Nebraska Groundwater Management and Protection Act.;

NOW, THEREFORE BE IT RESOLVED that the Lower Loup Natural Resources District Board of Directors agree to and authorize its staff to develop a proposal to be submitted to the United State Department of Interior. The Lower Loup Natural Resources District can provide 50% of the cost share funding needed for match for the WaterSMART Grant; and, if selected for a WaterSMART Grant, Lower Loup Natural Resources District will work with the Reclamation to meet the established deadlines for entering into a cooperative agreement.

AND, THEREFORE, BE IT FURTHER RESOLVED that this Order takes effect February 1, 2024.

Approved January 25, 2024

Henry Thoene

Henry Thoene., Chairman

Larry Mohrman

Larry Mohrman, Secretary

Letters of Support

Manulife Investment Management

February 10, 2024

Lower Loup NRD
Attn: Tylr Naprstek, Assistant General Manager
2620 Airport Road
Ord, NE 68862

Re: LLNRD's proposal to the Bureau of Reclamation Water Smart Program for the Purchase and Installation of Irrigation Flow Meters

Dear Mr. Naprstek:

This is a letter of support for the Lower Loup Natural Resources District's (LLNRD)'s grant application for the purchase and installation of metering and water reporting. The installation of water meters on our investor owned properties allows us to focus on our sustainability goals and manage the water resource to the best of our abilities. Knowing how much water we are using and how crops grown and cropping systems affect those values is critical to making water management decisions on our farms.

We were able to use grant funding to help us place the meters on our farm and believe it offers an incentive for other farms in the area to put this tool to use. Having these meters available for us and other irrigators within the NRD will give us a tool to manage water better to achieve sustainability.

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 LLNRD and the State of Nebraska. We have properties in several states and find the assistance Nebraska NRDs offer is of the highest quality and look forward to working with them in the future.

Efforts from LLNRD to provide assistance for irrigation flow meters is very helpful and greatly appreciated. Thank you for pursuing this project.

Respectfully Submitted,

Paul A. Burgener

Paul A. Burgener
Vice President, U.S. Farm Management
Manulife Investment Management Agriculture Services

February 12, 2024

Lower Loup NRD
Attn: Tylr Naprstek, Assistant General Manager
2620 Airport Road
Ord, NE 68862

Re: LLNRD's proposal to the Bureau of Reclamation Water Smart Program for the Purchase and Installation of Irrigation Flow Meters

Dear Mr. Naprstek:

This is a letter of support for the Lower Loup Natural Resources District's (LLNRD)'s grant application for the purchase and installation of metering and water reporting. As a producer, having these meters cost-shared and the data available for irrigators within the NRD will give us a tool to manage water better to achieve sustainability. This tool will help with decisions on over or underwatering on an annual basis. These meters will also help save time in making water management decisions.

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 LLNRD and the State of Nebraska. As we have seen in 2012 and 2022, groundwater management is susceptible to the impacts from drought and having flow measurements in place is a preemptive strike to help conserve the groundwater resources.

Efforts from LLNRD to provide assistance for irrigation flow meters is very helpful and greatly appreciated. Thank you for considering this project.

Respectfully Submitted,

John Krohn

Drought Stakeholder