NEBRASKA NATURAL RESOURCES COMMISSION

Water Sustainability Fund

Application for Funding

Section A.

ADMINISTRATIVE

PROJECT NAME: Upper Republican NRD Soil Moisture Probe Program

SPONSOR'S *PRIMARY CONTACT INFORMATION* **(Not Consultant's)**

Sponsor Business Name: Upper Republican Natural Resources District

Sponsor Contact's Name: Nate Jenkins

Sponsor Contact's Address: PO Box 1140, Imperial, NE 69033

Sponsor Contact's Phone: 308-883-1535

Sponsor Contact's Email: natejenkins@urnrd.org

1. **Funding** amount requested from the Water Sustainability Fund:

   Grant amount requested. $ 123,840

   - If requesting less than 60% cost share, what %? N/A

   If a loan is requested amount requested. $ N/A

   - How many years repayment period? N/A
   - Supply a complete year-by-year repayment schedule. N/A

2. **Neb. Rev. Stat. § 2-1507 (2)**

   Are you applying for a **combined sewer overflow project**? YES☐ NO☒

   If yes:

- Do you have a Long Term Control Plan that is currently approved by the Nebraska Department of Environmental Quality? YES☐ NO☒
- Attach a copy to your application. N/A
- What is the population served by your project? N/A
- Provide a demonstration of need. N/A
- **Do not complete the remainder of the application.**

3. **Permits Required/Obtained** Attach a copy of each that has been obtained. For those needed, but not yet obtained (box **"NO"** checked), 1.) State when you will apply for the permit, 2.) When you anticipate receiving the permit, and 3.) Your estimated cost to obtain the permit.

(N/A = Not applicable/not asking for cost share to obtain)
(Yes = See attached)
(No = Might need, don't have & are asking for 60% cost share to obtain)

G&P - T&E consultation (required)	N/A☒ Obtained: YES☐ NO☐
DNR Surface Water Right	N/A☒ Obtained: YES☐ NO☐
USACE (e.g., 404/other Permit)	N/A☒ Obtained: YES☐ NO☐
FEMA (CLOMR)	N/A☒ Obtained: YES☐ NO☐
Local Zoning/Construction	N/A☒ Obtained: YES☐ NO☐
Cultural Resources Evaluation	N/A☒ Obtained: YES☐ NO☐
Other (provide explanation below)	N/A☒ Obtained: YES☐ NO☐

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4. **Partnerships**

List each Partner / Co-sponsor, attach documentation of agreement:
Partners in the program will be participating farmers/irrigators who will pay half the cost of soil moisture probes. This arrangement is described in the attached contract that the URNRD will have with participating farmers/irrigators.

Identify the roles and responsibilities of each Partner / Co-sponsor involved in the proposed project regardless of whether each is an additional funding source.

The farmers who successfully apply for cost share are responsible for paying 50% of the cost of probes, with the remaining half paid by the URNRD. Sixty percent of the portion paid by the URNRD would then be reimbursed by a Water Sustainability Fund grant. Aside from paying for half the cost of probes, participating farmers must arrange for the purchase and installation of the probes they will use.

5. **Other Sources of Funding**

Identify the costs of the entire project, what costs each other source of funding will be applied to, and whether each of these other sources of funding is confirmed. If not, please identify those entities and list the date when confirmation is expected. Explain how you will implement the project if these sources are not obtained.

The total project cost consists entirely of those paid by farmers accepted into the program for purchasing and installing soil moisture probes, and subscription fees to receive probe data and associated irrigation recommendations electronically via telemetry. Applications for 258 probes were received in 2019 and 2020. Anticipating the same level of demand for 2021 and 2022 and average probe cost of $1,600 each, total probe costs for 2021-2022 will be an estimated $412,800. Landowners must pay half the costs, or $206,400, and the other half will be shared by the URNRD (40%) and WSF (60%). The only non-NRD, non-WSF sources of funding are farmers who will purchase the probes. Since they will be reimbursed for half of their costs only if they have purchased probes and are under contract with the URNRD, this source of funding is confirmed.

6. **Overview**

In 1,000 words *or less*, provide a brief description of your project including the nature/purpose of the project and its objectives. Do not exceed one page!

The Upper Republican NRD Soil Moisture Probe Program would encourage the use of water-saving soil-moisture probes on irrigated land throughout the three-county URNRD by paying for half the costs of probes installed in 2021 and 2022. Farmers would pay one-half the costs of probes and their installation and subscription fees. The remaining one-half would be shared by the WSF (60%) and the URNRD (40%). For the last nine years we have communicated with irrigators who use probes within the URNRD. They regularly indicate that using them and the irrigation recommendations they offer reduces annual water applications by 1"-3" per acre annually. This represents an 8%-23% reduction in use relative to the annual average within the URNRD and aligns very closely with water savings that research has indicated occurs when using ET and soil-moisture data as an irrigation scheduling tool. Grant funds under this proposal would allow a total of approximately 258 probes to be installed on irrigated fields to help

improve irrigation scheduling on approximately 33,540 acres (258 probes x 130 acres each field). Should irrigation reductions on each field average 2" per acre because of the use of probes, total water use over the two-year project period would lessen by approximately 5,600 acre feet. Water savings initiated by the program would be an annual occurrence, over a variable number of years depending on the farmer, if the program initiates long-term use of probes. The desire to preserve water for future use, especially in areas with precarious groundwater supplies, is one reason farmers choose to use probes and other water-saving tools. So, too, is the desire to reduce pumping costs that can approach $10,000 or so annually for each irrigated quarter-section of cropland. But the primary incentive for their use is stay within the URNRD's water-use allotments. Currently, the annualized allocation is 13" per acre. During many below-average precipitation years, the allotment is less than the net irrigation requirement for irrigated corn. Previous programs within the URNRD have demonstrated that most of the demand for probes is for those that electronically relay soil-moisture information to depths of up to normally 4 feet to a software program and digital interface accessible via computer, smart phone and tablets. The programs interpret the data to offer recommendations on whether soil moisture is such that irrigation applications are, or are not, needed. Under the proposed program, irrigators would choose and purchase soil moisture probes of their choice and the URNRD would have access to all data that they provided. The URNRD would reimburse farmers for half the cost of the probes they purchased. Then the URNRD would be reimbursed by the WSF for 60 percent of the amount the URNRD had paid farmers. The net cost to the WSF for each probe, then, would be 30 percent of the total probe cost. The cost of probes currently used in the district varies significantly but average approximately $1,600 apiece. Under an existing program funded by the WSF beginning in 2019, there was funding available for a total of approximately 160 probes. Demand far exceeded that; we received applications to fund 258, which is the basis of this current funding request. The URNRD was awarded $86,400 in 2018. All those funds are obligated via existing contracts with farmers participating in the cost-share program and we will draw down the remaining balance of our grant funds over the next few months as participants submit invoices for probes purchased and used this year. Following is an example of how the current and new, proposed cost-share program works: The URNRD advertises the availability of cost share in January or February and begins taking applications for participation. A deadline for applications is established in late spring or very early summer. If there aren't enough cost-share applications to obligate all available program funding, the deadline is extended. Contracts are executed with participants with the following stipulations, among others: Each individual or entity can receive cost share for no more than three probes; we will cost share no more than one probe in each field; total cost share for each probe cannot exceed $1,300; and the URNRD upon request can have access to data relayed by the probes. For example, on an $1,600 probe, farmers would pay $800, WSF $480 (60% of the remaining $800) and the URNRD $320 (40% of the remaining $800). It has been our experience that approximately 75 percent of those who bought probes under URNRD cost-share programs continued to use them after they no longer received cost share. The URNRD is at a key juncture where actions taken now can help stabilize groundwater levels before reduced water supplies jeopardize the ability to fully irrigate crops in some areas of the district in coming decades. Use of soil moisture

probes in our district has demonstrated the ability to reduce water use and help meet our objective of slowing groundwater declines. Development of new technology now on the market, including advanced moisture probes that offer irrigation scheduling recommendations and would be offered under this program, offer the district new opportunities to preserve groundwater.

7. **Project Tasks and Timeline**

Identify what activities will be conducted to complete the project, and the anticipated completion date.
For multiyear projects please list (using the following example):

Tasks	Year 1$	Year 2$	Remaining	Total $ Amt.
Probe Cost Share	$103,200	$103,200		$206,200
			TOTAL	$206,200

- What activities (Tasks) are to be completed.
- An estimate of each Tasks expenditures/cost per year.
- Activities in years 4 through project completion under a single column.

The same tasks will be accomplished in both Year 1 and Year 2 of the project: The URNRD will advertise the availability of cost share for half the costs of soil-moisture probes, accept applications for cost share, enter into contracts with participating farmers, and then reimburse farmers for half their probe costs once they document that the probes have been paid for. The application process will begin in the winter of each year and applications will be accepted until mid to late spring. Contracts between the URNRD and farmers are executed concurrently. Farmers contract with probe dealers for the purchase, installation, and use of probes. The URNRD has the ability to monitor data collected by the probes. Each year, total reimbursements to participating farmers will be $103,200 for a total of $206,400 over the two-year project period. After farmers document that they have installed the probes, the URNRD will reimburse them for half the costs of their probes. The URNRD will then request reimbursement from WSF for 60% of what the URNRD paid farmers. Total reimbursements to farmers over the two years will be $206,200 and the URNRD would be reimbursed $123,840 (60% of $206,200) over the two years.

8. **IMP**

Do you have an **Integrated Management Plan** in place, or have you initiated one? YES☒ NO☐ Sponsor is not an NRD☐

Section B.

DNR DIRECTOR'S FINDINGS

Prove Engineering & Technical Feasibility

(Applicant must demonstrate compliance with Title 261, CH 2 - 004)

1. Does your project include physical construction (defined as moving dirt, directing water, physically constructing something, or installing equipment)?
YES☐ NO☒

If you answered "YES" you must answer all questions in section 1.A.
If you answer "NO" you must answer all questions in section 1.B.

If "YES", it is considered mostly structural, so answer the following:

1.A.1 Insert a feasibility report to comply with Title 261, Chapter 2, including engineering and technical data; N/A

1.A.2 Describe the plan of development (004.01 A); N/A

1.A.3 Include a description of all field investigations made to substantiate the feasibility report (004.01 B); N/A

1.A.4 Provide maps, drawings, charts, tables, etc., used as a basis for the feasibility report (004.01 C); N/A

1.A.5 Describe any necessary water and/or land rights including pertinent water supply and water quality information (004.01 D); N/A

1.A.6 Discuss each component of the final plan (004.01 E); N/A

1.A.7 When applicable include the geologic investigation required for the project (004.01 E 1); N/A

1.A.8 When applicable include the hydrologic data investigation required for the project (004.01 E 2); N/A

1.A.9 When applicable include the criteria for final design including, but not limited to, soil mechanics, hydraulic, hydrologic, structural, embankments and foundation criteria (004.01 E 3). N/A

If "NO", it is considered mostly non-structural, so answer the following:

1.B.1 Insert data necessary to establish technical feasibility (004.02); This program is similar to probe cost-share programs that have existed previously in the URNRD and been funded by a variety of other grants. In one respect then, technical

feasibility of the proposal has been established by our prior experience successfully managing and implementing the program. The use of soil-moisture probes to improve irrigation scheduling has been common for a long period of time; within the last 10 years or so a wide variety of capacitance probes with data relayed by telemetry units have been on the market and made the use of probes across many fields much easier. A variety of studies have established the technical feasibility of soil moisture probes, concluding that use of soil moisture sensors can improve irrigation under limited water-supply conditions (e.g., Aguilar, J; Rogers, D; Kisekka, I, 2015).

1.B.2 Discuss the plan of development (004.02 A); Since 2013, the URNRD has incentivized the use of soil moisture probes through cost-share programs like the one now being requested for grant funding. The programs have been grant funded. Cost-share from the URNRD and grant partners, including WSF, have led to the purchase or lease of approximately 770 probes on about 100,000 acres within the district. Nearly all the units that have been installed use telemetry to relay data accessible by computer, smart phone or tablets informing irrigators of soil moisture content, in most cases, at every 4" to depths up to 4'. Software programs offered by most vendors of the probes then compare actual moisture content to suggested moisture content levels to offer recommendations on whether water needs to be applied to the crop. The program has increased in popularity over the past several years and has been dependent on a variety of grant funds, including from the U.S. Bureau of Reclamation. The intent of this proposed grant is to help encourage the use of soil-moisture probes that we believe, and research has concluded, reduce water use. Under the proposed program, approximately 129 probes per year in 2021 and 2022, or a total of about 258 probes total, would be installed with aid from the WSF and URNRD. Irrigators would purchase or lease soil-moisture probes of their choice and pay half the costs of the probes and related services, e.g. installation. The URNRD would pay the other half, and of that amount, reimbursement of 60% would come from WSF funds. For example, if a probe cost $1,700, the irrigator would pay the full amount, then be reimbursed $850 by the URNRD. The URNRD would then request reimbursement from the WSF of $510 (60% of $850).The URNRD would have access to all the individual accounts of participating farmers so we could see the soil moisture information, related watering recommendations, and determine whether the recommendations were being followed.

1.B.3 Describe field or research investigations utilized to substantiate the project conception (004.02 B); A variety of studies have concluded that use of soil moisture sensors can improve irrigation scheduling that is necessary under limited water-supply conditions (e.g., Aguilar, J; Rogers, D; Kisekka, I, 2015), suggesting reduced water use can be achieved. Our experience has been that this is true. The soil-moisture content data made available to farmers via probes with telemetry units can drastically increase their understanding of and interest in soil moisture in relation to crop root depth. Determining exactly how much less water is used because of attentive use of soil moisture probes is difficult in

research settings because of challenges establishing an experiment control. While we can observe the behavior of an individual farmer when he uses a probe for irrigation decisions, we can't definitively know what the same farmer's behavior would have been had he not used a probe. Year-to-year comparisons (same field with a probe used one year, not used the next) are difficult because precipitation patterns are never the same year to year. That said, we have gotten abundant input from farmers who use soil moisture probes. The predominant response from farmers who use the information to make irrigation decisions is that they believe they apply 1"-3" less water over the course of an irrigation season.

1.B.4 Describe any necessary water and/or land rights (004.02 C); No water rights and/or land rights are needed; probes will be installed by farmers who willingly participate in the program.

1.B.5 Discuss the anticipated effects, if any, of the project upon the development and/or operation of existing or envisioned structural measures including a brief description of any such measure (004.02 D). The project will have no effects on existing or future structural measures since it applies only to field applications of water.

Prove Economic Feasibility

(Applicant must demonstrate compliance with Title 261, CH 2 - 005)

2. Provide evidence that there are no known means of accomplishing the same purpose or purposes more economically, by describing the next best alternative. Irrigation scheduling based on soil moisture available to plants requires physical measurements of soil moisture and probes are the only tool able to make such measurements. Measurements of evapotranspiration indicate water needed for plants' anticipated use and evaporation, but doesn't measure the amount of water in the soil available to meet those water demands.

3. Document all sources and report all **costs** and **benefit data** using current data, (commodity prices, recreation benefit prices, and wildlife prices as prescribed by the Director) using both dollar values and other units of measurement when appropriate (environmental, social, cultural, data improvement, etc.). The period of analysis for economic feasibility studies is the project life, up to fifty (50) years; *or*, with prior approval of the Director up to one hundred (100) years, (Title 261, CH 2 - 005). One way to quantify benefits of reduced water usage is to estimate the value of water applied for irrigation relative to crop yields and crop prices. Volumes of water saved now because of reduced irrigation due to use of probes or other tools will be water that wouldn't otherwise be available at some point in the future for beneficial use. The most recent data available from the National Agricultural Statistics Service, from 2018, shows average irrigated corn yields in

Chase County, located within the URNRD, of 224.7 bushels per acre. Average dryland corn yields in Chase County during the same year were 104.7 bushels per acre. Additionally, average irrigation usage in the district that year was 9.8" per irrigated acre. To estimate a value of each acre inch of water we can assume that the 120 bushel per acre variance between dryland and irrigated corn within Chase County that year was due to the 9.8" of water that was applied, on average, per acre via center pivot irrigation systems. The average corn price in 2018 was approximately $3.70 per bushel, meaning that on a per-acre basis irrigated land produced $444 more value per acre than non-irrigated land ($3.70x120 bushels). Each inch of irrigation water, then, produced $45.31 of added value ($444/9.8" average water use) per acre. The use of a $1,600 soil moisture probe can be expected to reduce water applications by approximately 2" per acre on a typical 130-acre field, putting the per-acre cost of saving 1" of water at approximately $6.15 per acre ($1,600/2"/130). Since the use of probes and the associated reduction in water use should maintain or increase yields compared to yields from water use not prescribed by probes, in today's dollars $6.15 per acre is being paid for a tool that annually generates $45.31 per acre in additional, future value.

3.A Describe any relevant cost information including, but not limited to the engineering and inspection costs, capital construction costs, annual operation and maintenance costs, and replacement costs. Cost information shall also include the estimated construction period as well as the estimated project life (005.01). The costs of the soil moisture probes and installation varies significantly depending on type and brand, but the URNRD has determined the average cost to be $1,600 based on prices from known vendors of the products in the area. There are no O&M costs associated with the probes during the initial purchase of a probe. The purchase price covers all data transmission and software in the first year. In subsequent years, there is a service fee. However, under this proposed program, no WSF funds or URNRD funds would be used exclusively for service fees. Grant and URNRD funds will only be used for the initial purchase, installation of probes, and subscription fees for the first year.

3.B Only primary tangible benefits may be counted in providing the monetary benefit information and shall be displayed by year for the project life. In a multi-purpose project, estimate benefits for each purpose, by year, for the life of the project. Describe intangible or secondary benefits (if any) separately. In a case where there is no generally accepted method for calculation of primary tangible benefits describe how the project will increase water sustainability, in a way that justifies economic feasibility of the project such that the finding can be approved by the Director and the Commission (005.02). The project will help increase water sustainability by reducing water use within the URNRD. Input from irrigators who use moisture probes within the District already suggests annual water savings of 1"-3" per year, per acre. It is expected that approximately 258 probes will be installed under the project over a two-year period. Should this number of probes installed, they will be used on a total of approximately 33,500 acres over two

years. Should the average reduction in water use be 2" per acre, total reduced water use over the two-year period would be 67,000 acre inches, or 5,583 acre feet. This estimate is very conservative because it assumes the probes purchased under the proposed program would only be used the year in which they were purchased. Our experience with previous probe programs suggests that approximately 75 percent of irrigators who purchase probes continue to use them. Those that don't continue to use them choose not to for a variety of reasons, but the most common reason appears to be lack of computer skills and use that prevent them from regularly checking the data provided by the probes. Should 75 percent (193) of the probes continue to be used over a five-year period subsequent to buying them and when cost-share was no longer available, total acres inches of saved water assuming 2" of reduced water use per year would be almost 21,000 acre feet.

3.C Present all cost and benefit data in a table to indicate the annual cash flow for the life of the project (005.03).

Activity	**Cost Year 1**	**Cost Year 2**	**Total**
Probe Purchases 129 per Year	$206,400	$206,400	$412,800
Total By Year and Fund	WSF:$61,920 URNRD:$41,280 Irrigators:$103,200	WSF:$61,920 URNRD:$41,280 Irrigators:$103,200	**WSF: $123,840** URNRD: $82,560 Irrigators: $206,400

3.D In the case of projects for which there is no generally accepted method for calculation of primary tangible benefits and if the project will increase water sustainability, demonstrate the economic feasibility of such proposal by such method as the Director and the Commission deem appropriate (005.04). (For example, show costs of and describe the next best alternative.) As mentioned earlier, if 2" less water was applied over the two-year program on 33,540 acres

equipped with probes, total water savings over that period would be 67,080 acre inches. Assuming value of $45.31 per acre inch of water, the total value of the water saved during the project would be approximately $3.039 million. Comparatively, the total cost of the program over the same time period will be $412,800. There is no known alternative to soil moisture probes for reducing water use based on knowledge of soil-moisture content.

Prove Financial Feasibility

(Applicant must demonstrate compliance with Title 261, CH 2 - 006)

4. Provide evidence that sufficient funds are available to complete the proposal. The URNRD has a cash reserve of approximately $2.1 million and the 2019-2020 property tax levy will generate $1.9 million. The 2020-2021 tax levy is anticipated to generate approximately the same amount.

5. Provide evidence that sufficient annual revenue is available to repay the reimbursable costs and to cover OM&R (operate, maintain, and replace). Current levy authority combined with the cash balance is sufficient to pay reimbursable and annual operations costs.

6. If a loan is involved, provide sufficient documentation to prove that the loan can be repaid during the repayment life of the proposal. N/A

7. Describe how the plan of development minimizes impacts on the natural environment (i.e. timing vs nesting/migration, etc.). The equipment installed as part of the project is non-intrusive and will have no expected impact on the natural environment. We intend for the project to have a positive impact on the environment by conserving water.

8. Explain how you are qualified, responsible and legally capable of carrying out the project for which you are seeking funds. The URNRD is qualified to carry out the project because it has operated a similar project for the previous seven years. We have a solid understanding of how moisture probes work and how to administer a cost share program for them that is cost effective. We are responsible for such a project because it pertains to water use and the district is charged with managing groundwater. We are legally qualified pursuant to Neb. Rev. Stat. 46-702 to manage groundwater.

9. Explain how your project considers plans and programs of the state and resources development plans of the political subdivisions of the state. The project is consistent with the URNRD's Groundwater Management Plan, Integrated Management Plan jointly developed with and approved by the State and duties associated with the Republican River Compact of which the State is party. All the URNRD is a Groundwater Management Area where controls designed to reduce water consumption and extend aquifer life are in place. The

project's intent and design to reduce water use are consistent with the State's interest in "management, protection and conservation of groundwater…that's essential to economic prosperity and future wellbeing of the State…and the public interest demands procedures for the implementation of management practices to conserve and protect groundwater supplies," (Neb. Rev. Stat. 46-702).The project will help the District meet Integrated Management Plan goals and objectives designed to sustain a balance between water uses and water supplies and maintain compliance with the Republican River Compact. Among the specific objectives in the IMP the project will help achieve is reducing District-wide groundwater use under average precipitation conditions.

10. Are land rights necessary to complete your project? YES☐ NO☒

If yes:

10.A Provide a complete listing of all lands involved in the project. The land eligible for participation in the project includes all irrigated land within Perkins, Chase and Dundy Counties.

10.B Attach proof of ownership for each easements, rights-of-way and fee title currently held. N/A

10.C Provide assurance that you can hold or can acquire title to all lands not currently held. N/A

11. Identify how you possess all necessary authority to undertake or participate in the project. The authority needed to undertake the project since it is a cost-share project in nature is primarily that which is needed to collect and spend tax dollars for authorized purposes. As a political subdivision of the State, the URNRD can collect and spend tax dollars and managing groundwater is one of our authorized purposes.

12. Identify the probable consequences (environmental and ecological) that may result if the project is or is not completed. We expect and hope that the environmental consequences arising from the project will be preservation of water that can extend, hopefully indefinitely, the life of the aquifer underlying the district.

Section C.

NRC SCORING

In the NRC's scoring process, points will be given to each project in ranking the projects, with the total number of points determining the final project ranking list.

The following 15 criteria constitute the items for which points will be assigned. Point assignments will be 0, 2, 4, or 6 for items 1 through 8; and 0, 1, 2, or 3 for items 9 through 15. Two additional points will be awarded to projects which address issues determined by the NRC to be the result of a federal mandate.

Notes:

- The responses to one criterion *will not* be considered in the scoring of other criteria. Repeat references as needed to support documentation in each criterion as appropriate. The 15 categories are specified by statute and will be used to create scoring matrixes which will ultimately determine which projects receive funding.

- There is a total of 69 possible points, plus two bonus points. The potential number of points awarded for each criteria are noted above. Once points are assigned, they will be added to determine a final score. The scores will determine ranking.

- The Commission recommends providing the requested information and the requests are not intended to limit the information an applicant may provide. An applicant should include additional information that is believed will assist the Commission in understanding a proposal so that it can be awarded the points to which it is entitled.

Complete any of the following (15) criteria which apply to your project. Your response will be reviewed and scored by the NRC. Place an N/A (not applicable) in any that do not apply, an N/A will automatically be placed in any response fields left blank.

1. Remediates or mitigates threats to drinking water;

    - Describe the specific threats to drinking water the project will address.
    - Identify whose drinking water, how many people are affected, how will project remediate or mitigate.
    - Provide a history of issues and tried solutions.
    - Provide detail regarding long-range impacts if issues are not resolved.

The average nitrate level within the URNRD has more than doubled since 1974. The proposed project will address rising nitrate levels that have been observed in the URNRD by helping reduce irrigation usage that can exacerbate leaching of nitrates into

the groundwater. The URNRD the last two years has increased testing for nitrates and changed its testing distribution across the District to better identify and target areas with high and/or rising nitrate levels. Rising arsenic levels have been detected in municipal water supplies recently, including in Imperial and Wauneta. In Benkelman, new municipal wells had to be located and installed because of unacceptable levels of uranium and arsenic in the former groundwater supply. It has not yet been determined whether there is a relationship between nitrates and development of high arsenic levels, but nitrates can trigger elevated levels of uranium. Wauneta is in the process of locating and installing new municipal wells. It is reasonable to say that because of the predominance of irrigated cropland in the URNRD and its close proximity to municipal and residential wells – there are approximately 430,000 irrigated acres in the district - all 9,000 of the residents within the URNRD could benefit from improved water quality potentially caused by less irrigation the project could create. If efforts to reduce the leaching of nitrates into groundwater are not addressed, the current rate of increase in nitrate levels will continue to increase. This potentially could lead to contamination issues forcing the location of new municipal wells, reverse osmosis systems and/or restrictions imposed by the URNRD on fertilizer applications.

2. Meets the goals and objectives of an approved integrated management plan or ground water management plan;

   - Identify the specific plan that is being referenced including date, who issued it and whether it is an IMP or GW management plan.
   - Provide the history of work completed to achieve the goals of this plan.
   - List which goals and objectives of the management plan the project provides benefits for and how the project provides those benefits.

   The Integrated Management Plan jointly developed and approved by the URNRD and Nebraska Department of Natural Resources has been formally approved four times. The initial plan became effective June 2, 2005; it was revised and approved and then became effective on April 3, 2008; it was revised and approved and became effective on Nov. 1, 2010; and most recently was revised before becoming effective on Jan. 15, 2016. The district also has a groundwater management plan for its groundwater management area, which is the entire URNRD. The District has taken a series of actions to achieve the IMP goals including: 1) Implementing the Rock Creek and NCORPE augmentation projects that have achieved, and will continue to ensure, compliance with the Republican River Compact as adopted in 1943 and as implemented in accordance with the Settlement Agreement approved by the U.S. Supreme Court in 2003. The augmentation projects kept Nebraska in compliance with the compact in 2013, 2014, 2015 and 2016. These actions have helped achieve the IMP goal of maintaining compliance with the compact. 2) Reached agreements with the other NRDs in the Republican Basin and the State that apportion Compact compliance responsibilities to the NRDs based on depletions to stream flow that occur within their respective Districts. This has helped achieve the second IMP goal of ensuring that water users within the URNRD assume their

share, but only their share of the responsibility to maintain compliance with the Compact; 3) Implemented a uniform groundwater allocation system whereby all water users within the District have the same allocation. By implementing the augmentation projects, the District has prevented water users in close proximity to the Republican and River and its tributaries from being subject to lower water allocations. This has helped achieve the third IMP goal of the District apportioning its share of Compact compliance responsibility equitably so as to minimize adverse economic, social, and environmental consequences arising from Compact compliance activities. 4) Continued to prohibit expansion of new irrigated acres and permanently retired approximately 1,500 acres from irrigation using District and federal funds. This has helped achieve the fourth IMP goal of protecting groundwater users whose water wells depend on recharge from the river or stream and the surface water appropriators on such rivers or streams from stream flow depletions caused by water uses begun after the time in which the Republican Basin was designated fully appropriated. The proposed project helps achieve the following IMP goals and objectives in the following ways:1) Maintain compliance with the Republican River Compact: Use of soil moisture probes will help reduce water consumption, aiding State efforts to not exceed its allocation under the Compact and/or limit the amount of excessive use that must be offset by increasing stream flow via stream flow augmentation projects developed in the Republican River Basin. Compliance with the Compact aided by reduced water use prevents statewide liability for noncompliance that include significant penalties. For instance, 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. 2) Reduce existing groundwater use within the URNRD by 20 percent from the 1998 to 2002 baseline pumping volumes under average precipitation conditions so that, when combined with stream flow augmentation and incentive programs, the URNRD's groundwater depletions are maintained within their portion of Nebraska's allowable groundwater depletions as computed through the use of the Republican River Compact Administration Model. Additionally, voluntary reductions in baseline pumping volumes will continue to be pursued by the URNRD with the incentive of limiting the level of long-term management actions that are necessary during compact call years: The project will help achieve this goal by reducing pumping on approximately 33,540 acres. Anecdotal evidence from irrigators which aligns with research on the use of probes currently suggests water usage can be reduced by approximately 1"-3" per acre annually through their use. The proposed cost-share program is part of a long-term effort to encourage use of probes on as many acres as possible in the district. Those who install probes as part of the proposed program and have success using them can reasonably be expected to explain their benefits to fellow farmers, creating additional use of probes beyond those cost-shared as part of the proposed project.4) Cause the reductions in water use required for compact compliance to be achieved through a combination of regulatory, incentive, and augmentation programs designed to reduce consumptive use. To the extent funds are available, incentive programs will be made available through targeted incentive

programs: Augmentation projects designed to offset depletions to stream flow have been developed by the URNRD to help accomplish this objective. The proposed project represents an attempt to reduce depletions via reductions in groundwater pumping. One of the URNRD's primary objectives related to groundwater quantity, contained in the district's groundwater management plan, is "to reduce the amount of groundwater being withdrawn." The proposed project will help achieve this objective.

3. Contributes to water sustainability goals by increasing aquifer recharge, reducing aquifer depletion, or increasing streamflow;

   List the following information that is applicable:

   - The location, area and amount of recharge;
   - The location, area and amount that aquifer depletion will be reduced;
   - The reach, amount and timing of increased streamflow. Describe how the project will meet these objectives and what the source of the water is;
   - Provide a detailed listing of cross basin benefits, if any.

   Approximately 33,540 acres can reasonably be expected to receive improved irrigation scheduling and reduced water use via the project by making farmers aware of actual soil-moisture content. Historically, probes incentivized by URNRD cost share programs have been located in all three of the counties that comprise the URNRD, and we expect that to be the case with the program proposed in this application. Input from irrigators who use moisture probes within the District and follow the irrigation recommendations they provide suggest annual water savings of 1"-3" per acre are common. It is estimated that approximately 258 probes will be installed under the project over a two-year period. Should this number of probes installed, they will be used on a total of approximately 33,540 acres over two years. Should the average reduction in water use be 2" per acre, total reduced water use over the two-year period would be 67,080 acre inches, or 5,590 acre feet. This estimate is conservative because it assumes the probes purchased under the proposed program would only be used the year in which they were purchased. Our experience with previous probe programs suggests that approximately 75 percent of irrigators who purchase probes continue to use them. Those that don't continue to use them choose not to for a variety of reasons, but the most common reason appears to be lack of computer skills and use that prevent them from regularly checking the data provided by the probes. Should 75 percent (193) of the probes continue to be used over a five-year period subsequent to buying them and when cost-share was no longer available, total acres inches of saved water assuming 2 inches of reduced water use per year would be 167,700 acre inches, or nearly 14,000 acre feet. The area where the reduced aquifer depletion will occur as a result of the project is impossible to predict because all irrigators in the district will be eligible to apply for cost share under the program. However, widespread declines in groundwater levels throughout most of the URNRD will ensure that most, if not

all, the probes installed under the program will be in areas with declining water tables. Groundwater pumping in the URNRD, on average, has a 15 percent impact on stream flow over the long term. Annual additions to stream flow assuming this average impact in the district from a 2" reduction in use would be approximately 419 acre feet annually over the long term.

4. Contributes to multiple water supply goals, including, but not limited to, flood control, agricultural use, municipal and industrial uses, recreational benefits, wildlife habitat, conservation of water resources, and preservation of water resources;

   - List the goals the project provides benefits.
   - Describe how the project will provide these benefits
   - Provide a long range forecast of the expected benefits this project could have versus continuing on current path.

   Using actual soil moisture content relative to crops' water needs to guide irrigation decisions can reduce unnecessary irrigation applications. In this way it makes water use more efficient and aids agricultural use, both reducing energy costs associated with pumping and preserving water for future use that wouldn't have been available otherwise. It also aids agriculture within the context of the district's limitations on groundwater use. Reduced water usage caused by the project will help prevent farmers from exceeding their allocation (13" per year) and facing penalties – namely the loss of some allocation. Allocation also influences land values within the URNRD. Unused allocation from previous years can be "banked" for use in future years. Land that has significant banked allocation tends to have a higher market value. Municipal and domestic uses may also benefit from the project to the extent that reduced water usage prevents impacts on municipal well fields and domestic wells. It is fair to say that all municipal wellfields within the District have the potential to be impacted by water used for irrigation. Additionally, about 45 percent of the district's residents live outside cities and villages and have domestic wells potentially impacted by irrigation withdrawals. There is a recreational and wildlife benefit from the project to the extent that reduced pumping it causes results in more stream flow. In particular, Enders Reservoir and Champion Lake in Chase County have experienced less inflows over time due to groundwater pumping for irrigation. In general, the project seeks to conserve and preserve groundwater in an area where there have been significant groundwater declines over time. On average, groundwater levels are approximately 27' lower in the district compared to the period before irrigation development.

5. Maximizes the beneficial use of Nebraska's water resources for the benefit of the state's residents;

   - Describe how the project will maximize the increased beneficial use of Nebraska's water resources.

- Describe the beneficial uses that will be reduced, if any.
- Describe how the project provides a beneficial impact to the state's residents.

It is our hope and intent that the project does not reduce beneficial uses, but rather eliminates unnecessary uses of water or reduces uses that have minimal crop yields not justified by pumping expenses. The combination of soil sensors and software that interprets the data to provide recommendations on whether soil is dry enough to warrant irrigation helps farmers distinguish between beneficial and non-beneficial applications of water. Eliminating non-beneficial uses of water as proposed under the project preserves water for the future that can be beneficially used. All residents of Nebraska benefit from this environment of additional irrigation supplies because it helps ensure that all the benefits derived from irrigated agriculture – food, fuel, tax revenues, jobs and economic output – continue longer, or indefinitely.

6. Is cost-effective;

- List the estimated construction costs, O/M costs, land and water acquisition costs, alternative options, value of benefits gained.
- Compare these costs to other methods of achieving the same benefits.
- List the costs of the project.
- Describe how it is a cost effective project or alternative.

The costs associated with the project are limited to the purchase and installation of soil moisture probes by farmers, who will then be reimbursed for half of their expenses. The basis of the grant request is the average probe cost of $1,600. Based on our experience with similar programs in previous years that have been funded by various grants, we can expect applications for cost share on approximately 90-150 probes for each year of the two-year project. For the purposes of this grant, we are assuming cost share will be provided on 129 probes annually that have an average cost of $1,600 apiece. The number of anticipated probes cost-shared annually under this two-year proposal, 129, is the annual average number of probes subject to cost-share applications the last two years. Total project cost, then, would be $412,800 over two years for a total of 258 probes. We are requesting grant funds only for the reimbursable portion of the project costs. Irrigators will pay half the costs of the probes, and of the remaining 50%, WSF funds will pay 60% and the URNRD 40%. For example, if a probe cost $1,600, the irrigator would pay the full amount, then be reimbursed $800 by the URNRD. The URNRD would then request reimbursement from the WSF of $480 (60% of $850). Requested grant funds of $123,840 would cover 60 percent of the reimbursable cost of the probes. That is the only expense associated with the project. Because in most cases now probes are purchased, not leased, it can be expected that many of the probes bought under the program will be used in future years after cost-share has expired. Most probe vendors charge an annual service fee of approximately $200-$400 in years after probes are purchased, but this expense will not be covered by the proposed grant.

Irrigation scheduling based on soil moisture available to plants requires physical measurements of soil moisture and probes are the only tool able to make such measurements. Measurements of evapotranspiration indicate water needed for plants' anticipated use and evaporation, but doesn't measure the amount of water in the soil available to meet those water demands The most recent data available from the National Agricultural Statistics Service, from 2018, shows average irrigated corn yields in Chase County, located within the URNRD, of 224.7 bushels per acre. Average dryland corn yields in Chase County during the same year were 104.7 bushels per acre. Additionally, average irrigation usage in the district that year was 9.8" per irrigated acre. To approximate a value of each acre inch of water we can assume that the 120 bushel per acre variance between dryland and irrigated corn within Chase County that year was due to the 9.8" of water that was applied, on average, per acre. The average corn price in 2018 was approximately $3.70 per bushel, meaning that on a per-acre basis irrigated land produced $444 more value per acre than non-irrigated land ($3.70x120 bushels). Each inch of irrigation water, then, produced $45.31 of added value ($444/9.8" average water use) per acre. The use of a $1,600 soil moisture probe can be expected to reduce water applications by approximately 2" per acre on a typical 130-acre field, putting the per-acre cost of saving 1" of water at approximately $6.15 per acre ($1,600/2"/130). Since the use of probes and the associated reduction in water use should maintain or increase yields compared to yields from water use not prescribed by probes, in today's dollars $6.15 per acre is being paid for a tool that annually generates $45.31 per acre in future value.

7. Helps the state meet its obligations under interstate compacts, decrees, or other state contracts or agreements or federal law;

   - Identify the interstate compact, decree, state contract or agreement or federal law.
   - Describe how the project will help the state meet its obligations under compacts, decrees, state contracts or agreements or federal law.
   - Describe current deficiencies and document how the project will reduce deficiencies.

   The compact the project will help meet is the Republican River Compact between Nebraska, Kansas and Colorado as adopted in 1943 and as implemented in accordance with the Settlement Agreement approved by the U.S. Supreme Court in 2003. Water consumption reduced under the project within the URNRD will help ensure 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 stream flow augmentation projects developed in the Republican River Basin. 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. Recently developed augmentation projects in the Basin - the Rock Creek Augmentation Project in Dundy County and the NCORPE Augmentation Project in Lincoln County - have successfully kept the state in compliance with the Compact. But should their capacity at some be point be insufficient to ensure compliance, the only other available option to the NRDs in the Republican Basin including URNRD would be to impose stricter allocations, or prohibit irrigation altogether, on acres close to the Republican River and its tributaries (approximately 40,000 acres in URNRD) in dry years when compliance action was needed. By reducing water use and therefore the impacts on stream flow caused by groundwater pumping that are considered usage of Nebraska's compact allocation, the project could help prevent or at least mitigate special regulations on water users close to the Republican and its tributaries.

8. Reduces threats to property damage or protects critical infrastructure that consists of the physical assets, systems, and networks vital to the state or the United States such that their incapacitation would have a debilitating effect on public security or public health and safety;

   - Identify the property that the project is intended to reduce threats to.
   - Describe and quantify reductions in threats to critical infrastructure provided by the project and how the infrastructure is vital to Nebraska or the United States.
   - Identify the potential value of cost savings resulting from completion of the project.
   - Describe the benefits for public security, public health and safety.

   Continued aquifer depletion that the proposed project seeks to address could impact both critical infrastructure and the economy at the local, regional and national levels, according to the U.S. Department of Homeland Security (DHS) Office of Cyber and Infrastructure Analysis. Decreases in critical infrastructure caused by dwindling water supplies could be experienced in the food and agriculture, energy, and chemical sectors according to the analysis. Specifically, food and fuel (ethanol) prices could rise due to less crop production and water and wastewater systems could be negatively impacted by growing populations and declining groundwater levels. Transportation systems infrastructure could be affected by potentially less demand for transportation services as a result of less agriculture and ethanol production. Interestingly, for purposes of projecting future crop yields that might impact those infrastructure areas, DHS used Dundy County in the URNRD as the lone example. DHS modeling showed that in the future, dryland crop yields might actually decline slightly and reliance on groundwater irrigation could be more tenuous. "Whereas farmers have used irrigation to offset impacts of climate variability on crop yields in the past, the depletion of the High Plains Aquifer could hinder their ability to do so in the future," according to the report. "As groundwater availability decreases over time, it is possible that more agricultural land will be converted from irrigated to dryland farming." Counties of highest concern overlying the aquifer are those the

modeling described in the report showed as having 25 or fewer years of groundwater use available. No such counties in Nebraska were shown to be facing that imminent of a problem, but of the seven counties in Nebraska where the life of the aquifer usable for irrigation was shown to be 50-100 years, two are in the District (Dundy and Chase). One of the four counties in the Nebraska with a usable aquifer life of 100-200 years was in the District (Perkins).

9. Improves water quality;

   - Describe what quality issue(s) is/are to be improved.
   - Describe and quantify how the project improves water quality, what is the target area, what is the population or acreage receiving benefits, what is the usage of the water: residential, industrial, agriculture or recreational.
   - Describe other possible solutions to remedy this issue.
   - Describe the history of the water quality issue including previous attempts to remedy the problem and the results obtained.

   Average nitrate levels within the URNRD have more than doubled since water quality testing began in 1974 and now stand at 5.02 ppm; the median level among the 140 samples collected and tested in 2019 was 3.5 ppm. This is still well below the maximum acceptable level of 10 ppm, but it is prudent to act now to slow or eliminate the rate of increase. To the extent less over-watering is caused by the project, nitrate leaching into the groundwater supply could be reduced. The URNRD the last two years has increased testing for nitrates and changed its testing distribution across the District to better identify and target areas with high and/or rising nitrate levels. The URNRD has annually taken water samples from both domestic and irrigation wells for more than 40 years to test for contaminants. Rules and regulations have been established that require more testing in areas where high nitrate levels are detected. Additionally, limitations on groundwater use (allocations) were established in 1979. Allocations were set for groundwater quantity purposes but were expected to help slow the rate of nitrate infusion into the groundwater supply. Other possible solutions to rising nitrates are limitations on fertilizer use. We hope to help prevent such restrictions with help from projects such as the one proposed in this grant application.

10. Has utilized all available funding resources of the local jurisdiction to support the program, project, or activity;

    - Identify the local jurisdiction that supports the project.
    - List current property tax levy, valuations, or other sources of revenue for the sponsoring entity.
    - List other funding sources for the project.

    The jurisdiction that supports the project is the URNRD. We believe our regulating and managing all ag water use in the area since the 1970's makes us uniquely qualified to pursue the proposed project. The District's 2019-2020 tax

levy is $.055 per $100 of valuation and will generate $1.909 million of revenue. The URNRD's other source of revenue is the $10-per-irrigated-acre occupation tax that generates approximately $4.4 million annually.

11. Has a local jurisdiction with plans in place that support sustainable water use;

- List the local jurisdiction and identify specific plans being referenced that are in place to support sustainable water use.
- Provide the history of work completed to achieve the goals of these plans.
- List which goals and objectives this project will provide benefits for and how this project supports or contributes to those plans.
- Describe and quantify how the project supports sustainable water use, what is the target area, what is the population or acreage receiving benefits, what is the usage of the water: residential, industrial, agriculture or recreational.
- List all stakeholders involved in project.
- Identify who benefits from this project.

- The URNRD's Long Term Plan, Master Plan, Integrated management Plan and Groundwater Management Plan all seek to preserve water within the URNRD. Slowing and eventually stopping groundwater declines, in one form or another, is included as a primary goal in the long range, master and groundwater management plans. The URNRD's 2010-2020 master plan, for instance, has the stated goal of "developing, promulgating and enforcing rules and regulations that provide for appropriate protection of the aquifer so as to slow and eventually stop water table declines in order that beneficially usable quantities of water remain in the aquifer; incentives to use water efficiently; conservation of groundwater; and maintaining or enhancing groundwater quality." The URNRD's Integrated Management Plan, first approved in 2005, revised and approved in 2008 and 2010, and revised and approved again in January 2016, has goals and objectives with a purpose of "sustaining a balance between water uses and water supplies so that the economic viability, social and environmental health, safety and welfare of the river basin…can be achieved and maintained for both the near and long term." The District has pursued sustainable water use since the 1970's when it became, in 1979, the first entity in Nebraska and possibly the country to limit agricultural water use by establishing an allocation on the use of groundwater. Since that time, allocations have been reduced by approximately 40%. The regulations have slowed groundwater declines compared to what was predicted to occur absent regulations. Average groundwater declines are approximately 60% less than what USGS predicted they would be if regulations weren't established (Lappala, 1978) and the most significant groundwater declines are approximately half what USGS estimated would occur without regulations. In addition to allocations, regulations limiting proximity of irrigation wells to one another were approved in 1979 and again in 1992. In 1997, the District approved and implemented the first well-drilling moratorium in Nebraska. Larger declines in areas that abut the District in Kansas and Colorado which do not have regulations or whose regulations are less stringent also illustrate the

beneficial impact of these actions within the District. Average annual declines in areas of Kansas with a similar climate have been more than double what has occurred in the District. The URNRD in recent years began restricting the use of unused allocation, or "carry-forward", and created new penalties for water users who use more than their water allotments. All agricultural water use has been metered since the late 1970's and approximately 400 wells are measured in the spring and fall to track groundwater levels. Metering, well measurements and allocations have created an extensive database from which the District can base decisions to further its long- term goal of slowing groundwater declines in the District. The primary goal which the project will help achieve, mentioned in the response to the first part of this question, is to slow and eventually stop groundwater declines. The project will help achieve this goal by helping farmers reduce or eliminate unnecessary use of groundwater. By knowing for certain how much water is available for crop consumption in the soil profile, and receiving recommendations via software that interprets soil moisture relative to crop needs, they can limit irrigations to what is needed. The project will also help achieve the following objectives contained in the District's Long Range Implementation Plan: Conduct monitoring and other data collection activities and research necessary for interpretation of changes in groundwater levels and actual and potential pollution of the aquifer. The URNRD will have access to data provided to farmers from soil moisture probes. This information will be a form of data collection that can aid our understanding of how pumping relative to crop water needs as suggested by probes relates to groundwater level changes; Reduce the potential for non-point contamination of ground and surface water through education, research, management practices, incentives and rules that protect the water but also minimize adverse effects on the economy of the area: Less water use and subsequently less leaching of nitrates into the groundwater supply via the project will help achieve this objective. One of the URNRD's primary objectives related to groundwater quantity, contained in the District's Groundwater Management Plan, is "to reduce the amount of groundwater being withdrawn." The proposed project will help achieve this objective. The target area of the project is the 1.7 million-acre land area of the District. The approximately 430,000 irrigated acres in the area are located throughout the District. The population of the area directly benefitting from the project is the 9,000 residents of the District and all residents of the Republican Basin and Nebraska generally that benefit from the agricultural output and stream flow generated in the District. The District considers all residents of the District stakeholders in and beneficiaries of the project.

12. Addresses a statewide problem or issue;

- List the issues or problems addressed by the project and why they should be considered statewide.
- Describe how the project will address each issue and/or problem.
- Describe the total number of people and/or total number of acres that would receive benefits.
- Identify the benefit, to the state, this project would provide.

One of the main challenges it appears Nebraska will face in coming decades is maintaining its water supply so it can sustain irrigated agriculture that is a vital aspect of the state economy. The project attempts to address this challenge by limiting water use to what is needed to produce reasonable crop yields. To protect and preserve water supplies, it is expected that regulating water use through an allocation system such as what is done in the URNRD will become more common across Nebraska. As regulations become more commonplace, it will be important that farmers be familiar with tools such as soil moisture probes so they do not exceed allocations. We view the proposed project as an entryway for farmers to become familiar with technologically advanced moisture probes so they can continue to use them. It is worth noting that almost all the probes purchased under previous and similar URNRD cost-share programs have been those with telemetry that relay information to phones and computers and offer irrigation scheduling recommendations. As stated before, most all Nebraskans benefit from the efficient and wise use of water because of the revenue, jobs and recreation it provides. Should supplies within the URNRD dwindle to the point in some areas that crops can't be fully irrigated, land values will likely decrease. This could increase the need, for example, for local school districts that currently don't rely, or rely very little, on state aid to be eligible and in need for more, impacting other school districts across the state. Tax revenue in the form of sales and income taxes generated by irrigated agriculture in the district would also decrease, impacting residents across the state. This project, and no project, is a "silver bullet" that can alone produce more sustainable uses of water to prevent such consequences. But it is part of a broader effort including other actions such as regulations. The project appeals to the URNRD as a means of reducing water use because similar programs in the past have demonstrated the ability, according to farmers who use probes, to reduce water use. The program is expected to reduce water use on approximately 33,540 acres within the district depending on how many probes are purchased under the program. Because the aquifer within the district is unconfined and water use from one irrigation well can affect the supply of another, it is reasonable to assume all 430,000 irrigated acres within the district will benefit. The economy of the district is driven by irrigated agriculture, so all 9,000 residents of the district have the potential to benefit from reduced water use the project will cause.

13. Contributes to the state's ability to leverage state dollars with local or federal government partners or other partners to maximize the use of its resources;

- List other funding sources or other partners, and the amount each will contribute, in a funding matrix.
- Describe how each source of funding is made available if the project is funded.
- Provide a copy or evidence of each commitment, for each separate source, of match dollars and funding partners.
- Describe how you will proceed if other funding sources do not come through.

Farmers who participate in the program by receiving cost share will pay half the costs of probes. If the grant is not provided and no cost-share program is conducted, this source of funding will not exist. The commitment from farmers to pay for half the cost exists in the cost-share contract the URNRD has with participating farms. Also, since the URNRD reimburses farmers after they have paid for the probes, their funding commitment is assured.

14. Contributes to watershed health and function;

- Describe how the project will contribute to watershed health and function in detail and list all of the watersheds affected.

There are seven watersheds defined by the U.S. Environmental Protection Agency as impaired that are entirely or partially contained within the District: Arikaree; Stinking Water; North Fork of the Republican; South Fork of the Republican; Republican; and Frenchman. All are considered impaired waters for the following reasons: Arikaree – E. Coli; Stinking Water – E. Coli; North Fork of the Republican – E. Coli; South Fork of the Republican – E. Coli; Republican – E. Coli; Chlorophyll; Dissolved Oxygen; Nitrogen; Phosphorus; Selenium; Frenchman – E. Coli; Chlorophyll; Selenium. To the extent that reduced groundwater pumping under the proposed project can mitigate decreases in stream flow, the project could reduce impairment of the Republican and Frenchman watersheds by increasing dissolved oxygen and dilution of phosphorus, nitrogen and selenium. Less leaching of nitrogen and phosphorus due to reduced irrigation may decrease their presence in groundwater and therefore natural discharges to streams (base flow), improving watershed health.

15. Uses objectives described in the annual report and plan of work for the state water planning and review process issued by the department.

- Identify the date of the Annual Report utilized.
- List any and all objectives of the Annual Report intended to be met by the project
- Explain how the project meets each objective.

The 2019 Annual Report and Plan of Work for the State Water Planning and Review Process contains three objectives for the Republican Basin that the proposed project will help achieve. The first is achieving standards contained in the URNRD's Integrated Management Plan. Among the goals and objectives in the Integrated Management Plan is reducing groundwater pumping and not increasing depletions to stream flow caused by groundwater pumping. Because of the intent of the proposed project is to reduce groundwater pumping, it is expected to help accomplish these objectives. The Annual Report and Plan for Work also includes meeting objectives in the Republican River Basin-Wide Plan as part of the four-year work plan. The Republican River Basin-Wide Plan took

effect in early 2019 and was devised with input from stakeholders across the Republican Basin. The overarching goal of the Basin-Wide Plan is to sustain a balance between water uses and supplies. The proposed project will help achieve this objective by helping maintain supplies through reduction of unnecessary water use. Lastly, the Annual Report and Plan for Work has maintaining Republican River Compact compliance as an objective. To the extent the proposed project lessens depletions to stream flow caused by groundwater pumping, it will help maintain Compact compliance.

16. Federal Mandate Bonus. If you believe that your project is designed to meet the requirements of a federal mandate which furthers the goals of the WSF, then:

- Describe the federal mandate.
- Provide documentary evidence of the federal mandate.
- Describe how the project meets the requirements of the federal mandate.
- Describe the relationship between the federal mandate and how the project furthers the goals of water sustainability.

Congressional approval was required for the Republican River Compact to be entered into by Nebraska, Colorado and Kansas and Congressional approval would be required to dissolve it. Therefore, we consider it a federal mandate. The IMP approved by the URNRD and State that outlines how Compact compliance will be achieved includes groundwater pumping reductions. The proposed project is designed to lessen groundwater pumping, therefore is also designed to help achieve Compact compliance, a federal mandate. The Compact was entered into with Congressional approval in 1943 and allocates the annual, average supply of the Republican River among the three states thusly: 49 percent to Nebraska; 40 percent to Kansas; and 11 percent to Colorado. The amount of water subject to those percentages varies annually depending upon stream flows. Before a 2002 settlement agreement between the compact states, the accounting that determined each state's consumptive use under the compact included surface water and alluvial groundwater for irrigation, municipal and industrial uses, and evaporation from U.S. Bureau of Reclamation Reservoirs. Subsequent to the 2002 agreement approved by the U.S. Supreme Court, depletions to stream flow caused by all groundwater use including from upland wells is included in the calculations. A groundwater model was developed to compute depletions to stream flow caused by groundwater pumping. Annually, the State of Nebraska, using estimates of surface water supplies and depletions, forecasts whether action will need to be taken the following year to ensure compliance with the compact. A primary intent of the IMPs developed by the NRDs in the Republican Basin and NDNR is to ensure compact compliance. One way it seeks to do this is by mitigating impacts on stream flow by establishing goals to reduce groundwater pumping. Reducing groundwater pumping is the main intent of the proposed project and, if achieved as projected, will therefore aid the federal mandate of compact compliance. The Compact, by constraining uses to allocations between the states, is naturally a limiting force on groundwater pumping and this has been

demonstrated in many ways over the past approximately 20 years. All wells in the Lower and Middle Republican NRDs were metered because of the compact (wells in URNRD were metered because of water quantity concerns that predated Compact issues); moratoriums on new irrigation development were established because of efforts to comply with the Compact; and water use restrictions, or allocations, were implemented in the Lower and Middle Republican NRDs because of the Compact (water quantity concerns predating Compact concerns caused allocations in the URNRD). In this way, there is a direct connection between the federal mandate of Compact compliance and water sustainability goals.

State of Nebraska/URNRD Soil Moisture Probe Program
Landowner Cost-Share Agreement

Participant: John Doe	**Program Administrator:** Upper Republican NRD
Number of Cost-Shared Probes: 3	**Agreement Term:** Effective on the date agreement returned to the NRD, extending through Feb. 28, 2022

The undersigned Participant and the Upper Republican Natural Resources District hereby agree to a cost-share assistance arrangement to help encourage the use of soil-moisture probes and related technology in 2021 with funds from the State of Nebraska's Water Sustainability Fund and the Upper Republican NRD. The participant agrees:

1. Probes for which cost-share is sought were installed after the date at which the application for cost share was submitted.
2. Reimbursement requests made to the NRD will include copies of invoices for probes and probe-related services in Perkins, Chase or Dundy Counties correlating to fields specified by the participant below. The location(s) shall be noted on the invoices and locations may be modified upon the request of the participant, and at the discretion of the NRD.
3. Reimbursement requests must be submitted to the NRD no more than three (3) months after the invoice was received by the participant. This deadline may be extended at the discretion of the NRD.
4. Reimbursement will equal one-half (1/2) of the cost of the probe(s) for up to three probes used during the 2020 irrigation season, commencing when this agreement is returned to the NRD. The maximum reimbursement for each of up to three probes will be $1,300. Cost share will be provided for one probe per field.
5. Cost share for probe related services such as installation and subscription fees is available under this agreement, but only if cost share is also requested for purchase or lease of a probe.
6. NRD may have access to data relayed by probes and will not provide data to others without permission from Participant.

Provide probe locations below:

Probe 1: County	**Section**	**Township**	**Range**
Probe 2: County	**Section**	**Township**	**Range**
Probe 3: County	**Section**	**Township**	**Range**

Participant

Name, Address, Telephone, Email	**Signature:**
John Doe Farm PO Box 000 Imperial, NE 69033	_____ **Date:** _____

Sponsor (URNRD)_____