

NEBRASKA NATURAL RESOURCES COMMISSION

Water Sustainability Fund

Application for Funding

Section A.

ADMINISTRATIVE

PROJECT NAME: Driving Water Savings Through Advanced Data Collection and Modeling in the Twin Platte Natural Resources District – Phase 2

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

Sponsor Business Name: **Twin Platte Natural Resources District**

Sponsor Contact's Name: **Kent Miller**

Sponsor Contact's Address: **PO Box 1347, North Platte, Nebraska 69103**

Sponsor Contact's Phone: **(308) 535-8080**

Sponsor Contact's Email: **komiller@tpnrd.org**

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

Grant amount requested. \$ **132,090**

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

If a loan is requested amount requested. \$ **0**

- 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 <input checked="" type="checkbox"/> Obtained: YES <input type="checkbox"/> NO <input type="checkbox"/>
DNR Surface Water Right	N/A <input checked="" type="checkbox"/> Obtained: YES <input type="checkbox"/> NO <input type="checkbox"/>
USACE (e.g., 404/other Permit)	N/A <input checked="" type="checkbox"/> Obtained: YES <input type="checkbox"/> NO <input type="checkbox"/>
FEMA (CLOMR)	N/A <input checked="" type="checkbox"/> Obtained: YES <input type="checkbox"/> NO <input type="checkbox"/>
Local Zoning/Construction	N/A <input checked="" type="checkbox"/> Obtained: YES <input type="checkbox"/> NO <input type="checkbox"/>
Cultural Resources Evaluation	N/A <input checked="" type="checkbox"/> Obtained: YES <input type="checkbox"/> NO <input type="checkbox"/>
Other (provide explanation below)	N/A <input checked="" type="checkbox"/> Obtained: YES <input type="checkbox"/> NO <input type="checkbox"/>

4. **Partnerships**

List each Partner / Co-sponsor, attach documentation of agreement:

N/A

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

N/A

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.

Project costs that are not covered by a Water Sustainability Fund (WSF) grant will be paid for by the Twin Platte Natural Resources District (TPNRD) (see Table 1). Funding from the TPNRD has been confirmed (see Attachment A).

A list of acronyms used throughout this application is included as Attachment B.

Table 1. Project costs and funding sources

Year	WSF Grant	TPNRD Portion	Project Cost
1	\$117,090	\$78,060	\$195,150
2	\$15,000	\$10,000	\$25,000
Total	\$132,090	\$88,060	\$220,150

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!

Since the joint adoption between the TPNRD and the Nebraska Department of Natural Resources (NDNR) of an Integrated Management Plan (IMP) for the district in 2009, two overarching activities were carried out during the first 10-year increment:

- 1) The TPNRD implemented various activities to provide offset water to the Platte River in amounts specified in the original IMP;**
- 2) The TPNRD and the NDNR completed a Robust Review as outlined in the IMP in order to reassess the amount of offset water the TPNRD should be required to provide in order to achieve the Goals and Objectives of the IMP.**

A key shortcoming of the previous management strategy used during the first increment IMP that was identified by stakeholders was that actual water use was not being directly measured in any way. Beginning at the start of the second 10-year increment in 2019, the TPNRD launched the first phase of their Water Data Program. The goal of the Water Data Program is to quantify water use across the District, with the dual purpose of educating producers and accurately modeling groundwater withdrawals for inclusion in the 2023 Robust Review. Phase I of the Water Data Program was granted Water Sustainability Funds in 2019 so that the TPNRD could begin to collect water use data based on electrical records and sensors installed at non-electric wells.

Since then, significant strides have been made to bring the TPNRD closer to the goal of quantifying groundwater use across its footprint. Producers in the TPNRD are able to

sign up for the Water Data Program and provide some basic information such as field locations, crop type, tillage type, and electrical provider. If the well is non-electric, a sensor supplied by Paige Wireless is installed at the pivot to track time of operation. In a separate but related effort, flow rate tests are being conducted on every well in the TPNRD. An accurate flow rate combined with the time of operation for each well gives a pumping measurement. Flow meters have been deployed across the district to serve as a validation dataset for the electrical record and sensor-derived water use measurements.

Water use data is made available to the producer via a mobile application or through a web browser. Daily and cumulative totals of water applied the field are shown on easy-to-read graphs (see Attachment C). TPNRD staff use a different dashboard to view the data, called the Groundwater Manager's Platform. This password-protected platform allows the staff member to view the data collected across the district. Aggregated data is viewable by stream flow zones along the South Platte, North Platte, and Platte River to observe average pumping depth in the vicinity of each stream reach identified in the IMP. An important component of the Groundwater Manager's Platform is the Sensor Status page, which keeps track of where the Paige Wireless sensors have been deployed and the time elapsed since the last message. The current state of the Groundwater Manager's Platform is considered a minimum viable product, or MVP. Funding is being requested under this application to make improvements to the MVP so that it can be an even more powerful tool to the TPNRD.

Phase 2 of this project involves additional tasks that supplement the tasks of Phase 1 (Table 2). While working on the tasks of Phase 1, two gaps were discovered in the process: (1) the TPNRD needs a better way to track and maintain the hundreds of Paige Wireless devices deployed across the district; (2) a new evapotranspiration (ET) data product is available to incorporate into the modeling and close the water budget from 2011-2020 and beyond.

Table 2. Summary of Phase 1 and Phase 2 Tasks

Phase 1 Tasks	Phase 2 Tasks
<ol style="list-style-type: none"> 1. Deployed hundreds of Paige Wireless devices to track water use on non-electric wells 2. Obtained electric records for hundreds of wells to calculate water use 3. Conducted flow rate tests on all active irrigation wells 4. Created platform for farmers to view their data (GiSC) 5. Created Groundwater Manager's Platform MVP 6. Integrated subregional models with COHYST model 	<ol style="list-style-type: none"> 1. Add functionality to the Groundwater Manager's Platform. Specifically, improve the sensor status page to incorporate a maintenance ticketing system. Other improvements will be made. 2. Use OpenET data to close the water budget from 2011-2020 for the 2023 Robust Review. 3. Establish connection with the OpenET API for ET data after 2020

Funding for Phase 2 will contribute to the validity of the overall project. Phase 2 includes work that is vital to completing the 2023 Robust Review and will add exponential value to the work being completed under Phase 1. Phase 2 will display field-by-field data in the Groundwater Manager's Platform MVP, providing statistical summaries and visualizations of water usage data so that the TPNRD can observe the state of water use

in the district at a glance. Also included in Phase 2 are improvements to the sensor network page to view device diagnostics like signal strength and battery life. A system will be implemented in the platform to create and track work orders for device maintenance. Additionally, Phase 2 will enhance the overall user experience in the Platform with customizable settings and training materials. Finally, new ET data available from OpenET will provide consumptive use during the 2011-2020 period, for which no actual water use data is available. Beyond 2020, OpenET data will be accessed through an application programming interface (API) which will allow automated data retrieval for all irrigated acre parcels in the TPNRD.

Phase 2 will provide benefits to the overall project objective of measuring water use across the TPNRD. Both the TPNRD and the irrigator will be working together to strike the appropriate balance between maximum beneficial consumptive use and limiting adverse impacts to the aquifer and streamflow. This will provide a true paradigm shift to irrigators and managers in the TPNRD, empowering them to make proactive water management decisions by understanding how an action can affect the aquifer and stream before they take it.

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):

<u>Tasks</u>	<u>Year 1\$</u>	<u>Year 2\$</u>	<u>Year 3\$</u>	<u>Remaining</u>	<u>Total \$ Amt.</u>
Permits	\$18,000				\$18,000
Engineering		\$96,000			\$96,000
Construction		\$87,000	\$96,000		\$183,000
Close-out				\$8,000	\$8,000
				TOTAL	\$305,000

- 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.

This project will be Phase 2 of the development and delivery of a software solution that will allow the TPNRD to track agricultural groundwater use in their NRD. Phase 2 will be completed over the course of two years. Phase 2 includes two major tasks: 1) adding functionality to the Groundwater Manager's Platform MVP; 2) integrating ET data for the 2011-2020 time period and beyond.

Groundwater Manager's Platform Improvements

Functionality will be added to the Groundwater Manager's platform in four different areas during Year 1:

1. **Sensor network dashboard:** providing additional visual features of Paige wireless devices and implementing a system to track maintenance work.

2. **Model scenario analysis:** continuing to build out integration with groundwater models for use in the 2023 Robust Review (initiated in Phase 1 of this project).
3. **Detailed water usage dashboard:** creating a dynamic field inventory for visualizing water usage.
4. **Enhanced application user experience:** adding ability for customizing text and definition with the application, including a place to host training materials.

Integrating New ET Data

New ET data available from the OpenET team will be used to complete the water budget for modeling the 2011-2020 time period. This task will be completed during Years 1 and 2. This task involves bringing in field-level ET and precipitation data for the TPNRD field boundaries from 2011-2020 and forging the connection to the OpenET API for data after 2020.

The estimated total cost of the ET data task is \$100,000. Year 1 costs, summarized in Table 3, are to generate and deliver OpenET data on a parcel-by-parcel basis. Year 2 costs are to provide technical support, stakeholder engagement, and a data summary.

The total project cost after two years is estimated to be \$220,150 of which the TPNRD will cover 40% of the cost and the WSF would cover 60% of the cost.

Table 3. Major project task costs and timeline

Tasks	Year 1	Year 2	Total \$ Amt.
Groundwater Manager's Platform	\$120,150	\$0	\$120,150
OpenET Integration	\$75,000	\$25,000	\$100,000
Total			\$220,150

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);

A list of acronyms used throughout this application is included as Attachment B.

The TPNRD will be working with a team of water and software experts to complete the tasks in Phase 2 of the Water Data Program. The project team will add functionality to the Groundwater Manager's Platform MVP and work to integrate a new ET data product into the groundwater modeling from 2011-2020 and beyond.

Phase 2 of this project is a continuation of the systems built in Phase 1. In Phase 1, a Groundwater Manager's Platform was developed for TPNRD staff members to view water usage data that has been collected from electric and non-electric wells. The Platform allows staff to view individual and aggregated water usage, as well as where the Paige Wireless sensors have been deployed on non-electric wells. An installation record of the Paige Wireless device is also available on the Well Details page. The sensor network page in the Phase 1 Groundwater Manager's Platform includes the time elapsed since the last device message and a map view of where the sensors are deployed. Under Phase 2, improvements will be made to this page to include sensor battery life and signal strength, as well as a maintenance ticketing system that the TPNRD can use to track work orders. Other improvements to the Groundwater Manager's Platform in Phase 2 include a dynamic field-by-field view that provides statistical summaries and visualizations of water use. Overall user experience will be improved with customizable settings and a page dedicated to training materials for new and experienced users.

The project team that built the Phase 1 Groundwater Manager's Platform MVP will continue to add the improvements specified above under Phase 2. The team has extensive experience in preparing software solutions that help natural resources managers collect, view, and analyze the data they need to make decisions. The project team has successfully implemented water resource management platforms such as the Upper Big Blue's Water Pooling Module (Attachment D) and the Rosedale-Rio Bravo Water Trading Platform (Attachment E).

In addition to the improvements made to the Groundwater Manager's Platform, Phase 2 will involve bringing in field-level ET and precipitation provided by the OpenET team. The OpenET team includes leading national and international experts in remote sensing of ET, cloud computing, and water policy. OpenET is a collaborative effort to develop an online platform for mapping and obtaining ET data across the western United States. The development of OpenET is being led by NASA, the Desert Research Institute (DRI), and Environmental Defense Fund (EDF) in collaboration with 30 researchers and practitioners (Attachment F). OpenET will provide data in daily, monthly, and yearly timesteps at a spatial resolution of 0.22 acres (30 m x 30 m). The field boundary dataset used for this project will be the TPNRD's certified irrigated acres spatial dataset. This grant will be used to collaborate with OpenET to provide historical ET data from 2011-2020, establish a connection with the OpenET API for data after 2020, and integrate that data into the groundwater modeling necessary for the 2023 Robust Review. The project team has extensive experience in working with this data to make water budget calculations and display results to water managers. Specifically, OpenET data was used to develop groundwater allocations for the Rosedale-Rio Bravo Water Trading Platform (Attachment E).

1.B.2 Discuss the plan of development ([004.02 A](#));

The two tasks for Phase 2 of the Water Data Program are to: 1) add functionality to the Groundwater Manager's Platform MVP; 2) integrate ET data for the 2011-2020 time period and beyond.

The project team has been collaborating to bring the data collected during Phase 1 of the Water Data Program to the growers and water managers of the TPNRD through two software platforms: the Grower's Dashboard, and the Groundwater Manager's Platform. Under Phase 2, improvements will be made to the Groundwater Manager's Platform so that the TPNRD can better manage the hundreds of Paige Wireless devices installed on non-electric wells to track time of operation. Software developers on the project team will be responsible for making the upgrades to the Platform, with TPNRD providing feedback.

Water usage data collected as part of the Water Data Program will be incorporated into the groundwater modeling necessary to perform the 2023 Robust Review. For the 2011-2020 time period, during which no water usage data is available, ET estimates will be used to represent consumptive use. ET data will be provided on a field-by-field basis through OpenET. Olsson will provide the TPNRD's certified acres dataset to the OpenET team, and they will return monthly ET values using six different climate models: ALEXI/DisALEXI, METRIC, PT-JPL, SEBAL, SIMS, and SSEBOP. OpenET will also generate an ensemble model dataset, which combines all six model results and will likely be used for this project.

Modelers on the project team will use the ET data to perform a field level water balance and develop datasets that will be incorporated into the groundwater model. The project team has been coordinating with NDNR to develop a methodology to perform this water balance, and will continue to do so as Phase 2 commences.

Separately from the Water Data Program, the TPNRD has contracted with Olsson to construct three subregional groundwater models. These models are housed in Olsson's Groundwater Evaluation Toolbox (GET), where the TPNRD has the ability to run their own simulations. Using these models in tandem with the COHYST model, the TPNRD will have the ability to perform the 2023 Robust Review utilizing the Groundwater Manager's Platform and ET data obtained through Phase 2 of the Water Data Program. See Water Data Program systems diagram in Attachment H for a project development schematic.

In 2023, TPNRD will be conducting their periodic Robust Review as outlined in their IMP. The basic components of this new Robust Review method are:

- 1) Leveraging power usage data as an indicator of groundwater pumping,
- 2) Calibration of the power record data against direct pumping rate measurements to compute an estimate of actual groundwater pumping,
- 3) Refinement of the methodology used to compute the crop demand and consumption of groundwater due to irrigation in the TPNRD, which is the key driving factor underlying the results of the Robust Review, and
- 4) Automation of these and other computations to ease future levels of effort required and to significantly improve water management capabilities.

The funding for Phase 2 tasks described in the following paragraphs will significantly contribute to the components in the Robust Review method listed above.

Modeling simulations for the Robust Review will be completed at the end of 2023. The Robust Review will serve as the official indication of whether the TPNRD is on track to

meet their offset requirements. New depletion targets for the TPNRD will be generated by this Robust Review and findings will be incorporated into the IMP. Products generated in Phase 2 of the Water Data Program will be essential to completing the Robust Review in 2023 for the TPNRD.

- 1.B.3 Describe field or research investigations utilized to substantiate the project conception (004.02 B);

A key component to this project is integrating new ET data from OpenET.

The OpenET project provides widespread access to refined evapotranspiration data that will be critical in enhancing the sensitivity of the models used in TPNRD's 2023 Robust Review.

1. The scientific article "Remote Sensing of Evapotranspiration of the Central Arizona Irrigation and Drainage District, USA" by Adrew N. French and others, published November 26, 2018 (Attachment H) gives an intercomparison studies of various ET models, including the Satellite-Based Energy Balance for Mapping Evapotranspiration with Internalized Calibration (METRIC), Two-Source Energy Balance (TSEB), and evapotranspiration mapping with Vegetation Index for the South Western US (VISW) and emphasizes the need for multi-model integration.

"Currently, ET models results are reported based on the author's own implementation with no apparent means to verify consistency with other implementations of the same model namesake. Tracking down inconsistencies due to implementation differences could significantly improve community ET modeling results. In this study, a simple to implement, equally weighted model averaging approach, using three models, showed a benefit: outlier estimates were reduced and total ET estimates appear to track ET values known from experience. An additional benefit for averaging is a de-emphasis of model-intercomparisons, with a focus on accepting that each model has contributed complementary information. There are many documented remote sensing ET models that could be added to an ensemble framework, and doing so would add credibility to average ET estimates. Such a framework might not be practical on single-user platforms, but with rapidly improving IT technology and cloud-based computing, as being proposed by the OpenET organization, model sample sizes could be readily increased to 10 or more while remaining accessible for multiple users."

This article suggests that integrating ET models into one platform would be a valid process for generating ET values. OpenET provides data from multiple ET models to calculate an "ensemble value" for each location. See page 4 of Attachment F for more information on the initial ensemble of ET models used in OpenET data.

2. The scientific article, "GYMEE: A Global Field-Scale Crop Yield and ET Mapper in Google Earth Engine Based on Landsat, Weather, and Soil Data" by Hadi Jaafar and Roya Mourad had four primary objectives (Attachment I):

- a. *Assess the validity of integrating remotely sensed energy balance evapotranspiration modeling with the derived, modified Monteith model in obtaining crop yield.*
- b. *Evaluate the potential application of the operational model under different climatic and management conditions.*
- c. *Analyze the temporal and spatial variations in above-ground biomass and yield.*
- d. *Investigate the effect of the inclusion of environmental stresses (vapor, temperature, and moisture) on the crop yield modeling process through showcasing examples from the study sites.*

This study also suggests using an ensemble of ET models may be a better approach. Jaafar and Mourad estimated ET based on the latest version of the single-source Surface Energy Balance for Land (pySEBAL) to determine crop yield. Their results “endorse the use of remote sensing as a helpful tool for the operational estimation of crop yield at a field scale”. SEBAL is one of the ET models that OpenET has integrated into their “ensemble value”.

1.B.4 Describe any necessary water and/or land rights (004.02 C); N/A

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).

There are currently no known structural measures which may be affected by the project, however, the GET modeling platform made available to the TPNRD through this project will provide the analysis tool upon which a number of structural projects may be evaluated in the future because of IMP requirements. Any projects that may impact streamflow and aquifer declines will need to be analyzed and projects specifically designed to improve streamflow will be assessed on their effectiveness.

The analyses that can be completed include examining the effects of certified groundwater acreage retirements, canal recharge projects, surface water consumptive use leasing, and/or detention for intentional recharge. These projects are designed to enhance streamflow or reduce groundwater level declines. The TPNRD will also use the modeling platform to simulate the effects of conservation land management practices (e.g. no till) on recharge.

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.

The next best alternative to the development of Groundwater Manager’s Platform would require an extreme level of staff participation to implement weather station devices and to collect ET, soil moisture, precipitation, and water usage data that the sensor dashboard aggregates and organizes automatically.

Maintenance of all the devices would require direct contact with every landowner on a regular basis, resulting in the need to hire more TPNRD staff members. The small incremental increase for Phase 2 of this project is minimal compared to the salaries and benefits of additional full-time TPNRD staff members that would be necessary to maintain the collected data.

The proposed project is not only significantly more cost effective than any other alternative, but also provides the TPNRD with an opportunity to manage their water more proactively and regularly perform the calculation of their offset requirements. With this modeling platform, the TPNRD can simulate management scenarios before they implement them, transforming this process from reactive to proactive decision-making.

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](#)).
- 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 total project cost after two years is estimated to be \$220,150, of which the TPNRD will cover 40% of the cost and the WSF would cover 60% of the cost.

- 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 primary benefit of this project will be expanded understanding of consumptive use in the TPNRD. The sensor maintenance ticketing system and network diagnostics being integrated into an easy-to-use platform interface allow the TPNRD water managers to have a more comprehensive picture of water use on a regular basis. With the ability to look at specific fields as well as an aggregation of water usage, the TPNRD can target conservation strategies, outreach, and education within the district to better manage resource consumption. Having the ability to run scenarios with a more refined water budget analysis aids TPNRD in management decision making as they work to meet the offset requirements in their IMP to ultimately reach and maintain a level of water use that is sustainable over the long term.

- 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). See Attachment J.
- 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.)

The TPNRD has several goals and objectives in their IMP and groundwater management plan (GMP) that they are required to accomplish. This project will be essential to the TPNRD in determining whether those goals and objectives have been met. The TPNRD is also required to utilize the “best available information” (Nebraska Rev. Statutes §46-709) in carrying out these duties. Without the information collected and implemented by this project, there is no other cost-effective means to measure water use and determine if the IMP goals and objectives are being met using the best available information. The IMP is in place to ensure the long-term water sustainability of the area, making the goals and objectives of the IMP inherently beneficial.

The goals of the IMP are related to the obligations that the State of Nebraska has to the PRRIP. The PRRIP is an interstate agreement between Nebraska, Colorado, Wyoming, and the federal government. Nebraska receives benefits provided by the PRRIP related to the Endangered Species Act and three endangered species on the Platte River—the whooping crane, the least tern, and the piping plover. Without the PRRIP, the U.S. Fish and Wildlife Service may require water users in the Platte River Basin to curtail their water use activities, likely costing hundreds of millions of dollars in direct expenses and reduced economic output. In the Environmental Impact Statement for the PRRIP, the implementation of other alternatives was estimated to cost approximately \$250 million with a reduction in economic output of \$10 million per year.

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.

See Attachment A from the General Manager of the TPNRD documenting the District’s 2021 budget.

5. Provide evidence that sufficient annual revenue is available to repay the reimbursable costs and to cover OM&R (operate, maintain, and replace).

There are no reimbursable costs related to this project. See Attachment A from the General Manager of the TPNRD documenting the District’s 2021 budget. The TPNRD is funded by a tax levy that has been in place for many decades.

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.).

This project will not have a negative impact on the natural environment.

8. Explain how you are qualified, responsible and legally capable of carrying out the project for which you are seeking funds.

The TPNRD has a wide range of statutory responsibilities and authorities, including but not limited to Nebraska Revised Statutes §2-3,201 through 2-3,243 and the Ground Water Management and Protection Act (Nebraska Rev. Statutes §46-701 through 46-756). As the state of Nebraska's preferred regulator of groundwater, the TPNRD is clearly both qualified and responsible to carry out the proposed project.

9. Explain how your project considers plans and programs of the state and resources development plans of the political subdivisions of the state.

This project is being implemented to assist the TPNRD to fulfill the requirements of their IMP. The IMP is written in accordance with the Basin-Wide Plan for the Upper Platte River Basin. Both the IMP and the Basin-Wide Plan are required by the Nebraska Ground Water Management and Protection Act (GWMPA). Nebraska is also a signatory to the interstate agreement called the PRRIP. The TPNRD also has a GMP pursuant to the GWMPA. This project will assist Nebraska and the TPNRD in meeting the requirements of all of these plans.

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. **N/A**

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 TPNRD has a wide range of statutory responsibilities and authorities, including but not limited to Nebraska Revised Statutes §2-3,201 through 2-3,243 and the Ground Water Management and Protection Act (Nebraska Rev. Statutes §46-701 through 46-756). As the state of Nebraska's preferred regulator of groundwater, the TPNRD is clearly both qualified and responsible to carry out the proposed project.

12. Identify the probable consequences (environmental and ecological) that may result if the project is or is not completed. **N/A**

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.

A list of acronyms used throughout this application is included as Attachment B.

The approximately 44,000 people that live in the TPNRD rely on groundwater for drinking water. According to the Nebraska Department of Environment and Energy's 2020

Groundwater Quality Monitoring Report (see Attachment K), there are three community water supply systems with mandatory requirements triggered by high levels of nitrates within the TPNRD. In addition, there is one community public water supply system that is required to treat their drinking water due to high levels of uranium. Should future alternate drinking water supplies be needed, other groundwater sources could be evaluated with the modeling platform produced by this project. Because the TPNRD was designated as fully appropriated and overappropriated in 2004, any new use of hydrologically connected groundwater can only be developed if this use does not adversely impact existing users. This requirement means that only the most scientifically sound and up-to-date modeling tools should be used to ensure adverse impacts would not occur when evaluating other groundwater sources.

Irrigation pumping contributes to elevated nitrate levels by promoting the leakage of fertilizers into groundwater supplies and depleting water available for drinking water. One of the overall goals of this project is to educate irrigators on how much water they are using and how their water use affects the aquifer and nearby streams. By delivering this information to the irrigator in an easy-to-understand way, they will feel empowered to more responsibly manage their water use, which promotes sustainability of the drinking water supply in the TPNRD. The platform will also serve as a means of identifying areas where the TPNRD could impose limitations to protect drinking water if it becomes necessary.

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.

This project will assist the TPNRD in meeting the goals and objectives of the TPNRD's IMP and GMP. The TPNRD's IMP was jointly adopted by the TPNRD and the NDNR on August 13, 2009 and updated on February 14, 2013. The first ten years (first increment) of the IMP conclude in September 2019. The second increment IMP has been developed and became effective September 11, 2019 (see Attachment L). The TPNRD's GMP was adopted on December 14, 1995 (see Attachment M).

TPNRD IMP

The TPNRD's IMP has the vision of "jointly managing and balancing water use and water supply while optimizing economic, social and environmental benefits for the near and long term", and the following goals:

- Protect to the extent possible existing users, local economy, environmental health, and recreational uses
- Manage total water supply in the TPNRD to achieve sustainability of supply and use while allowing for growth and changes in use
- Recognize there are multiple causes of streamflow depletion and to the extent possible distribute responsibilities appropriately

In the overappropriated area of the TPNRD, the goal of the IMP is to return the area to a fully appropriated designation and sustain it. It was determined that progress toward this designation would be benchmarked in ten (10) year increments. Within the first increment of the IMP (September 2009-August 2019), a major goal of the TPNRD was to “address impacts of streamflow depletions to surface water appropriations and water wells constructed in aquifers dependent upon recharge from streamflow to the extent those depletions are due to water use initiated after July 1, 1997.” The TPNRD is required by the IMP to provide annual accretions to the river equal to or exceeding the post 1997 depletion amount.

This project will assist the TPNRD in achieving all of these goals by providing the data and tools required to assess their progress toward the 1997 condition. ET and water usage data collected in Phase 2 of the project will be incorporated into the groundwater models which have the ability to quantify their streamflow depletion offsets on an annual basis rather than the current process of measuring progress every four years. More frequent offset water estimates give the TPNRD an enhanced ability to proactively manage their water resources.

The TPNRD has expended significant resources to meet the goals and objectives of their IMP since its adoption in 2009. These efforts have included the issuance of a moratorium on new or expanded water well construction, requiring water users to certify their irrigated acres, the development of provisions for groundwater transfers, and the establishment of an accounting system for municipal, industrial, and commercial water users. In addition, the TPNRD has attended basin-wide meetings and implemented several studies and data collection efforts to monitor their progress toward meeting IMP goals. The TPNRD has also developed several projects utilizing state and local funding to assist them in meeting the IMP goals. This project will assist the TPNRD in evaluating the benefits of these projects, ensuring that the value of these investments are fully recognized.

TPNRD GMP

The goals of the TPNRD’s GMP are to “identify the groundwater supplies, identify changes of the groundwater levels, and identify the sources and levels of groundwater contamination within an NRD boundary, to establish groundwater quantity and quality goals, as well as a goal for the life of the groundwater reservoir, and to develop long-term solutions necessary for the prevention and/or reduction of groundwater declines or of high levels of groundwater contaminants posing environmental and health hazards.” The GMP specifically recognizes the “lack of good scientific knowledge about groundwater systems.”

To address this lack of knowledge, the TPNRD has completed studies, collected data, and pursued groundwater modeling projects to further their understanding of the hydrologically connected surface and groundwater systems since the adoption of the GMP. This project will synthesize the information gathered from these efforts into a modeling platform that will give the TPNRD water level change estimates and impacts to baseflow. The TPNRD can also test a myriad of groundwater management actions to model their effect on the aquifer and streams, aiding them in making long-term decisions for groundwater sustainability. The TPNRD is actively going through the process of updating their GMP. ET and water usage data collected for Phase 2 of the Water Data

Program will be used to improve the subregional groundwater models that are utilized in updating the GMP.

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.

Phase 2 of the Water Data Program contributes to the overall goal of the program to collect actual water usage for all groundwater irrigation in the TPNRD. Water usage is provided to growers and TPNRD staff members via two software platforms: the Grower Dashboard, and the Groundwater Manager's Platform. The irrigator has access to the Grower Dashboard and information about how their water use affects the aquifer and nearby streams. By educating irrigators on their water use and impacts to the hydrologic system, it is likely that many irrigators will voluntarily reduce pumping. This benefit will help the TPNRD reduce their aquifer depletions and meet their IMP requirement to return streamflow in the Platte River to historic 1997 levels.

Water use information will be used as input data for the watershed and groundwater models housed in the GET platform. Using GET, the TPNRD will be able to simulate management actions that increase water aquifer recharge, reduce aquifer depletion, or increase streamflow. GET will produce maps and graphs that will assist the TPNRD in assessing the spatial and temporal benefits of their management decisions. These modeling tools will help the TPNRD evaluate not only their current water use, but also how their water use might be managed in the future for the long-term sustainability of the aquifer and streams.

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.

The proposed project will contribute to multiple water supply goals such as sustainable agricultural water use, the protection of municipal, industrial, domestic, and livestock uses, the conservation of water resources, and the preservation of water resources. The modeling platform developed as part of this project will supply the TPNRD with essential

information that will drive decision making to support these water supply goals. This project will provide education to irrigators on their water use and how it affects the aquifer and streamflow, empowering them to conserve the future groundwater resource.

Activities in Phase 2 support the overall Water Data Program which includes running modeling simulations to complete the 2023 Robust Review for the TPNRD. Water use and ET will be used as input data for the watershed and groundwater models housed in the GET modeling platform. The TPNRD will need to use the modeling platform to predict the potential benefits of future management actions, monitor the actual benefits of past actions, and adjust their actions in an informed manner. The modeling platform represents the best science available and will be critical to the TPNRD in ensuring these water supply goals are met. Without the modeling platform, water management decision making will continue to be a reactive process rather than the proactive approach that is needed to ensure water sustainability.

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.

The TPNRD is required by their IMP to return overappropriated areas in the District to a fully appropriated condition. In order to accomplish this, the TPNRD must "address impacts of streamflow depletions to surface water appropriations and water wells constructed in aquifers dependent upon recharge from streamflow to the extent those depletions are due to water use initiated after July 1, 1997." Pursuant to the IMP, the TPNRD must provide annual accretions to the river equal to or exceeding the post-1997 depletion amount.

To meet this requirement, it is necessary for the TPNRD to be as informed as possible on the water use in their District and its implications on future aquifer levels and streamflow. This project will educate the irrigator on how their groundwater use affects the hydrologic system, encouraging them to optimize their operations. Both the TPNRD and the irrigator will be working together to strike the appropriate balance between maximum beneficial consumptive use and limiting adverse impacts to the aquifer and streamflow. The proposed project will accomplish this goal by providing the information necessary to quantify this balance. Promoting the sustainability of the local economy will provide a benefit to all of the state's residents.

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 total cost of the project is \$220,150. The next best alternative would be to install weather station devices to cover 320,000 acres and create a flow meter program at the TPNRD to measure water use. The TPNRD would have to hire a consultant to incorporate the ET, precipitation, and water use data into a model and conduct annual model runs, including the Robust Review in 2023, 2027, and 2029. The Robust Review is a highly technical evaluation that is required by the TPNRD's IMP at regular intervals. Several NRDs have metering programs in place and cost-share with the landowner on meter installation, maintenance, and repair. If the TPNRD were to institute a similar program, estimated resource and staff costs would amount to over \$12,900,000 over a ten-year period. This cost is significantly higher than the proposed project cost and does not include modeling, which could involve perpetual costs of at least \$250,000 per year.

This project is proposing to use monthly precipitation and evapotranspiration data to complete a water-balance on each parcel in the TPNRD and relay this information to the irrigator via an easy-to-understand dashboard. Another benefit this project supports is the ability to efficiently re-evaluate the IMP goals and the TPNRD's requirement in offset water. There is no other technically or financially comparable way of achieving the same benefits. The modeling platform will empower the TPNRD to make proactive water management decisions by understanding how an action can affect the aquifer and streams before they take it. Hiring a consultant to conduct model runs and produce a report once per year does not give the TPNRD the same flexibility.

The goals of the TPNRD's IMP are also related to obligations that Nebraska has to the PRRIP, an interstate agreement between Nebraska, Colorado, and Wyoming. The modeling platform proposed as part of this project will help Nebraska demonstrate that it has met its obligations. The PRRIP provides benefits to Nebraska related to the Endangered Species Act; specifically, to three endangered species on the Central Platte River, the whooping crane, the least tern, and the piping plover. The PRRIP meets conditions the U.S. Fish and Wildlife Service could require for water users along the Platte River. The Environmental Impact Statement for the PRRIP indicated that without the PRRIP, other alternatives could cost \$250 million and economic output could be reduced by over \$10 million annual in the Platte River Basin.

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 proposed project will assist the State of Nebraska in meeting its obligations under the PRRIP, an interstate agreement between Nebraska, Colorado, and Wyoming. The TPNRD lies upstream of the critical habitat areas of the Platte River. Impacts to flows must be quantified and limited within or above the critical habitat reach. Both the NNDP (see Attachment N), a component of the Water Plan for the PRRIP, and the TPNRD's IMP require the TPNRD to offset any new depletions to Platte River streamflow that have occurred since July 1, 1997.

This project will enable the TPNRD to efficiently track their depletions and offset requirements using advanced modeling techniques. The TPNRD has also undertaken various management actions pursuant to their IMP to comply with the NNDP. The only way to document whether these actions have been successful is with a groundwater model. The proposed modeling platform will enhance the TPNRD's ability to measure this success, but also simulate the effects of management actions before they take them. This level of proactive management would not be possible without this project.

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.

The groundwater supply in the TPNRD is critically important to the State of Nebraska and to the United States. Without this supply, effects to public security, public health, and safety would be debilitating. The TPNRD water use estimation and modeling project is absolutely essential in promoting the sustainability of the groundwater supply in the Upper Platte River Basin. Enhancing the TPNRD's ability to make informed decisions shifts the reactive management of the past to a proactive approach for the future.

This proactive approach will be especially critical as projected declines in groundwater supplies contribute to uncertainties in future food security. A report released by the United States Department of Homeland Security's Office of Cyber and Infrastructure Analysis titled Analysis of High Plains Resource Risk and Economic Impacts (see Attachment O) outlines the importance of the High Plains Aquifer to the country. The report analyzed how continued depletions of the High Plains aquifer in Kansas and Nebraska might impact critical infrastructure and the economy at local, regional, and national levels. According to the report, groundwater supplies in some areas of the TPNRD are projected to face exhaustion in 100-200 years. How the TPNRD manages their supply in the present will dictate whether groundwater is available in the future. The

proposed project is clearly beneficial to public security, public health, and safety by supplying the TPNRD with information on the current state of groundwater availability in the District and how that might change over time.

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.

Groundwater supplies in some areas of the TPNRD have experienced high levels of nitrates. According to the Quality-Assessed Agrichemical Contaminant Database for Nebraska Ground Water maintained by the Nebraska Department of Environment and Energy, 7 of the 9 monitoring wells sampled in the TPNRD in 2017 exhibited nitrate levels well above the drinking water Maximum Contaminant Limit of 10 milligrams per liter. Irrigation pumping contributes to elevated nitrate levels by promoting the leakage of fertilizers into groundwater supplies by leaching nutrients in the soil downward into the aquifer. One of the goals of this project is to educate irrigators on how much water they are using and how their water use affects the aquifer and nearby streams. This project will also enhance the TPNRD's ability to spatially define field application rates through water use calculations. The TPNRD can work with irrigators that overirrigate to lessen their water application. Reducing overirrigation improves groundwater quality by reducing nitrate leakage.

The TPNRD has worked to address this issue of high nitrates by regularly collecting water samples to monitor nitrate levels. The TPNRD also provides worksheets and forms to help irrigators calculate the total nitrogen needed for their predicted yield. Irrigators can use these forms and water samples to take advantage of any residual nitrogen from the previous year and avoid nitrogen overapplication.

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 local jurisdiction that supports this project is the TPNRD. The TPNRD has the ability to support the proposed project as evidenced by the budget provided for fiscal year 2021 (see Attachment A). To demonstrate the TPNRD's commitment to the project, the TPNRD has already entered into contracts with software developers and pivot companies to store Paige Wireless device data and maintain them.

The TPNRD also has the option to support this project through their tax levy authority. The current tax levy for the TPNRD is 2.2383¢ per \$100 valuation. The TPNRD has developed several projects utilizing state and local funding to assist them in meeting the IMP goals. This project will assist the TPNRD in evaluating the benefits of these projects, ensuring that the value of these investments are fully recognized.

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 local jurisdiction, the TPNRD, has multiple plans in place that support sustainable water use, including an IMP and a GMP. The TPNRD's IMP was jointly adopted by the TPNRD and the NDNR on August 13, 2009 and updated on February 14, 2013. The first ten years (first increment) of the IMP conclude in September 2019. The draft second increment IMP has been developed and will become effective September 3, 2019 (see Attachment M). The TPNRD's GMP was adopted on December 14, 1995 (see Attachment N).

TPNRD IMP

The TPNRD's IMP has the vision of "jointly managing and balancing water use and water supply while optimizing economic, social and environmental benefits for the near and long term", and the following goals:

- Protect to the extent possible existing users, local economy, environmental health, and recreational uses
- Manage total water supply in the TPNRD to achieve sustainability of supply and use while allowing for growth and changes in use
- Recognize there are multiple causes of streamflow depletion and to the extent possible distribute responsibilities appropriately

In the over appropriated area of the TPNRD, the goal of the IMP is to return the area to a fully appropriated condition and sustain it. It was determined that progress toward this designation would be benchmarked in ten (10) year increments. Within the first increment of the IMP (September 2009-August 2019), a major goal of the TPNRD was to "address impacts of streamflow depletions to surface water appropriations and water wells constructed in aquifers dependent upon recharge from streamflow to the extent those depletions are due to water use initiated after July 1, 1997." The TPNRD is required by the IMP to provide annual accretions to the river equal to or exceeding the post-1997 depletion amount.

This project will assist the TPNRD in achieving all of these goals by providing the tools required to assess their progress toward the 1997 condition. The proposed tools will have the ability to quantify their streamflow depletion offsets on an annual basis rather than the current process of measuring progress every four years. More frequent offset water estimates give the TPNRD an enhanced ability to proactively manage their water resources.

The TPNRD has expended significant resources to meet the goals and objectives of their IMP since its adoption in 2009. These efforts have included the issuance of a moratorium on new or expanded water well construction, requiring water users to certify their irrigated acres, the development of provisions for groundwater transfers, and the establishment of an accounting system for municipal, industrial, and commercial water users. In addition, the TPNRD has attended basin-wide meetings and implemented several studies and data collection efforts to monitor their progress toward meeting IMP goals. The TPNRD has also developed several projects utilizing state and local funding to assist them in meeting the IMP goals. This project will assist the TPNRD in evaluating the benefits of these projects, ensuring that the value of these investments are fully recognized.

TPNRD GMP

The goals of the TPNRD's GMP are to "identify the groundwater supplies, identify changes of the groundwater levels, and identify the sources and levels of groundwater contamination within an NRD boundary, to establish groundwater quantity and quality goals, as well as a goal for the life of the groundwater reservoir, and to develop long-term solutions necessary for the prevention and/or reduction of groundwater declines or of high levels of groundwater contaminants posing environmental and health hazards." The GMP specifically recognizes the "lack of good scientific knowledge about groundwater systems."

To address this lack of knowledge, the TPNRD has completed studies, collected data, and pursued groundwater modeling projects to further their understanding of the hydrologically connected surface and groundwater systems since the adoption of the GMP. This project will synthesize the information gathered from these efforts into a modeling platform that will give the TPNRD water level change estimates and impacts to baseflow. The TPNRD can also test a myriad of groundwater management actions to model their effect on the aquifer and streams, aiding them in making long-term decisions for groundwater sustainability.

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.

This project helps the state meet its obligations under the PRRIP, which is clearly a statewide issue. This interstate agreement was signed by the Governor. The Legislature has provided a significant amount of general fund appropriations through the DNR to

implement the PRRIP. This project is essential to Nebraska's ability to meet its obligations under the PRRIP.

Nebraska's obligations are contained within the NNDP, a component of the Water Plan for the PRRIP. Generally speaking, the NNDP requires Nebraska to offset any depletions to Platte River streamflow that result from new or expanded uses that have occurred subsequent to July 1, 1997. Successful implementation of the PRRIP and the NNDP provides benefits to the approximately 500,000 irrigated acres in the Platte River Basin that were developed subsequent to 1997. By successfully offsetting the impact of these irrigated acres, Nebraska's economy will benefit significantly by allowing those acres to remain in irrigated agriculture.

The TPNRD has undertaken various management actions pursuant to their IMP in order to provide compliance with the NNDP. However, the only way to document whether these actions have, in fact, been successful requires a groundwater model. In addition to providing the TPNRD with groundwater modeling capabilities, the proposed platform will incorporate actual water use calculations. Irrigators in the TPNRD will be given information on how their water use affects the aquifer and streamflow, helping them optimize their irrigation practices for water sustainability. This will provide direct benefits to the 320,000 groundwater irrigated acres in the TPNRD, as well as to residents across the state by ensuring adequate groundwater and surface water supplies will be available into the future.

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.

The TPNRD will pay 40% of the project cost in this WSF application. Significant additional investments were made by the TPNRD to initiate this project as quickly as possible for Phase 1. TPNRD has since been funding additional tasks such as the initial development of the manager's platform and installation of Paige Wireless devices across the District. These initial efforts and the TPNRD's budget from fiscal year 2021 demonstrates their commitment to the project (see Attachment A).

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.

This project will contribute to watershed health and function in the South Platte River, North Platte River, Birdwood Creek, and Platte River watersheds. Benefits to water quality and quantity will be realized across the entire TPNRD. This project will provide

the TPNRD the information they require to make appropriate management decisions regarding water consumption and potential actions they could take to reduce aquifer depletions and increase streamflow.

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 following excerpt is taken from the Annual Report and Plan of Work published by the Department of Natural Resources (Department) in September 2020:

“The Department plans to use the WWUM and COHSYT models and pertinent datasets for future IMP analyses, which will include implementing additional management actions and scenarios to improve understanding of conjunctive management of groundwater and surface water. A robust review of management actions at the river basin scale will also be conducted using these models in 2023 and 2027. The Department and others will review the data, tools, and models, and update as needed to fulfill goals and objectives of planning efforts.”

This project will use the COHYST model to evaluate the progress of the TPNRD’s water use and management activities toward their IMP goals. The newest and most scientifically advanced data will be incorporated into the model, which will assist the Department in their objective of an improved understanding of groundwater and surface water supplies in the Upper Platte River Basin. The TPNRD has also developed three subregional groundwater models that will be used in conjunction with the COHYST model to perform the 2023 Robust Review. New ET data collected as part of this project will be used to update all of the groundwater models and represent the best science available. The project team has been actively collaborating with NDNR to develop the methodologies that will be followed to perform the 2023 Robust Review.

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.

This project will aid in meeting the requirements of a federal mandate called the PRRIP. PRRIP is the means by which the states of Colorado, Wyoming, and Nebraska are providing regulatory certainty with regard to the U.S. Endangered Species Act. The federally listed least tern, piping plover, and whooping crane must be addressed under the Endangered Species Act. If the PRRIP did not exist, other water management actions would be required of the states or individual water users on the Platte River. The TPNRD

modeling platform is essential to Nebraska's ability to meet its obligations under the PRRIP. Nebraska's obligations are contained within the NNDP, a component of the Water Plan for the PRRIP. Generally speaking, the NNDP requires Nebraska to offset any depletions to Platte River streamflow that result from new or expanded uses that have occurred subsequent to July 1, 1997. The TPNRD has undertaken various management actions pursuant to their IMP in order to provide compliance with the NNDP. However, the only way to document whether these actions have been successful requires the use of the groundwater model included in the proposed modeling platform. Without this project, it will be difficult to properly document Nebraska's compliance with the NNDP for water uses within the TPNRD.