NEBRASKA NATURAL RESOURCES COMMISSION

Water Sustainability Fund

Application for Funding

Section A.

ADMINISTRATIVE

PROJECT NAME: Lower Elkhorn NRD District Wide Groundwater Model

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

Sponsor Business Name: **Lower Elkhorn Natural Resources District**

Sponsor Contact's Name: Kristie Freudenburg

Sponsor Contact's Address: 1508 Square Turn Blvd Norfolk, NE 68701

Sponsor Contact's Phone: 402-371-7313

Sponsor Contact's Email: kolmer@lenrd.org (will be changing to kfreudenburg@lenrd.org)

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

   Grant amount requested. $ 201,600.00

   - 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☐

There are no permits necessary for completion of this project.

4. **Partnerships**

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

Nebraska Department of Natural Resources (NeDNR)

The NeDNR has been partnering with the LENRD since June 2018; which was the kick-off date for the LENRD Groundwater Model – Phase One Pilot Scale Area (PSA) Model project. The NeDNR staff provided technical review of the PSA model and contributed 50 percent of the cost of the project.

These two entities will resume their partnership in August 2019, when they finish the LENRD hydrogeologic framework, the first major step toward completing the flow model for the entire LENRD service area.

As illustrated in the Letter of Commitment from the Agency Director (see Attachment A), the NeDNR is committed to serving as a partner for development of the LENRD Sub-regional Model (LEM).

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

NeDNR's role will be to work with LENRD's consulting team during all aspects of LEM development. NeDNR's staff will contribute content, data, and technical reviews of LEM progress and be responsible for running the LEM once complete, to determine stream depletion factors and other simulation of water management scenarios with a state-wide interest.

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 LENRD Board of Directors has committed $134,400, which is 40% of the total project cost of $336,000. The balance of the budget shortfall ($201,600) is being requested from the WSF. LENRD's Letter of Financial Assurance and Commitment can be found in Attachment B. The funding breakdown is shown in Table 1.

Table 1 – Cost Breakdown

Task	**Cost**	**WSF (60%)**	**LENRD (40%)**
Project Management	$ 42,000.00	$ 25,200.00	$ 16,800.00
Sub-regional Model	$ 166,000.00	$ 99,600.00	$ 66,400.00
Model Application Tool	$ 60,000.00	$ 36,000.00	$ 24,000.00
Final Report and Map Book	$ 68,000.00	$ 40,800.00	$ 27,200.00
Total	**$ 336,000.00**	**$ 201,600.00**	**$ 134,400.00**

6. **Overview**

Water Sustainability Funds (WSF) are being requested to support the development of a sub-regional flow model, using the most widely accepted model code in the industry, MODFLOW, for the entire Lower Elkhorn Natural Resources District (LENRD) service area. The purpose of the flow model is to create a mathematical representation of the flow systems that can be used to make predictive water management simulations. The flow model will be based on reasonable assumptions and simplifications about the hydrogeologic framework that will be completed by the LENRD and Nebraska Department of Natural Resources (NeDNR) in December 2019. Examples of how the groundwater flow modeling will benefit local-scale water management decisions include:

- Evaluation of areas within the district where groundwater use could be expanded, while minimizing impact to existing water users,
- Evaluation of areas where groundwater allocations may be necessary due to concerns with groundwater supplies and to help maintain a long-term sustainable groundwater supply,
- Drought condition forecasting,
- Identifying areas where there is a higher potential risk for well interference,
- Evaluating how land cover changes (i.e. grass to row crop) will affect groundwater supplies,
- Estimating stream flow depletions, and;
- Providing site-specific information on wells in portions of the District with limited data, or in aquifers anticipated to be high-risk in regard to the expansion of groundwater uses.

The project is needed to ensure that water management challenges which have occurred in other portions of state, such as fully or over-appropriated designations, do not occur in the LENRD service area. The LENRD Board of Directors are taking a proactive stance to manage its groundwater resources in the most sustainable manner to support agriculture, municipalities, and industries and to avoid costly regulations.

This project is an extension of the partnership between the LENRD and NeDNR to incorporate aerial electromagnetic (AEM) data into a numerical groundwater model. In June 2019, LENRD and NeDNR completed a one-year Pilot-scale Area (PSA) model that created a robust hydrogeologic framework using both AEM and other sources of geologic data, which was used as the foundation for construction of the numerical flow model. The PSA model covered an area that was approximately 200,000-acres and included five model layers of the interpreted hydrogeologic framework, as compared to a single layer of data in the existing Lower Platte Missouri River Tributary (LPMT) regional model developed by the NeDNR.

Even though the PSA model was sub-regional (covering less than 20 percent of the LENRD service area near Wayne), it proved that AEM data can be integrated with other

geologic data sources to create a functional model. The PSA model will serve as an example for other NRDs and NeDNR on how to most effectively integrate AEM data into numerical models to support key water management decisions. The PSA model was a key step to take full advantage of the millions of dollars of state and local resources invested into the collection of AEM data and how it could be utilized in new and innovative ways. The LENRD has led the way for other agencies and districts by developing a sound methodology for this data intensive process.

In August 2019, LENRD and NeDNR will resume their partnership to build on the previous effort and finish the hydrogeologic framework for the entire NRD. This area-wide framework will be completed in December 2019.

The last piece of the process, and focus of this grant request, is to extend this process to the balance of the LENRD and build the Lower Elkhorn Sub-regional Flow Model, hereinafter referred to as LEM. Project objectives include:

1) To complete the numerical flow model (MODFLOW) for the entire LENRD,
2) To calibrate the flow model,
3) To establish a Graphic User Interface (GUI), and;
4) To develop a modeling report and hydrogeologic assessment map book.

The deliverable will be a robust and accurate groundwater model that will be operated by LENRD staff using the GUI and the hydrogeologic framework map book. Project products will enhance the current technical capabilities to inform LENRD stakeholders to make informed water management decisions to balance water use between all users, but ultimately to use water in a sustainable manner.

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):

- 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.

Table 2: WSF Funding Request by Calendar Year

Tasks	**2020**	**2021**	**Total WSF Amount**
Project Management	$ 12,600.00	$ 12,600.00	$ 25,200.00
Sub-regional Model	$ 99,600.00	$ -	$ 99,600.00
Model Application Tool	$ 15,000.00	$ 21,000.00	$ 36,000.00

Final Report and Map Book	$ 30,600.00	$ 10,200.00	$ 40,800.00
TOTALS	**$ 157,800.00**	**$ 43,800.00**	**$ 201,600.00**

There are four major tasks associated with development of the LENRD Sub-regional model (LEM), including:

- Project management,
- Building the LEM,
- Development of the model application tool graphic user interface (GUI), and;
- Delivery of a final report and creation of a highly graphic map book which displays details of the LENRD hydrogeologic framework.

Sub tasks include delivery of all GIS data to LENRD and NeDNR and delivery of the model filed to LENRD and NeDNR.

8. **IMP**

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

LENRD's IMP became effective on November 23, 2018.

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);

See the plan of development summary below to show data necessary to establish technical feasibility.

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

The LENRD will develop a Sub-regional Model (LEM) that builds on the proven success of the Pilot-scale Model Area (PSA) project completed in June 2018. This LEM will create a hydrological framework for the entire LENRD boundary. This methodology was observed and approved by the NeDNR. AEM is now available for the entire LENRD and will be incorporated into the LEM, along with well logs and UNL Conservation and Survey Division (CSD) test holes.

The approach includes close collaboration with NeDNR and UNL CSD throughout the entire modeling process. NeDNR will participate in the kickoff meeting and will meet every two weeks with the contractor as the LEM is developed. The LEM model will incorporate data from NeDNR's existing Lower Platte Missouri Tributary (LPMT) Regional Model. The data from NeDNR that was used to build LPMT model such as land cover, climate, and watershed model input data will be used during the construction of LENRD model.

OBJECTIVE 1: To ensure collaboration between the LENRD staff and Board of Directors, NeDNR, UNL CSD, and other stakeholders.

Task 1.1	Includes general project management and coordination between LENRD staff, Board of Directors, NeDNR, and other stakeholders by the contractor.
Task 1.2	Preparation of a project schedule, contract administration services, coordinate and integrate various technical disciplines to facilitate efficient completion of project deliverables.
Task 1.3	Regular communication and disseminate necessary information to Project Team members.
Task 1.4	Development of a Quality Assurance/Quality Control (QA/QC) plan and progress reports. Includes NRD, NeDNR, and full project team progress and strategy meetings.
Task 1.5	The contractor will provide multiple updates at the LENRD Board of Director meeting including one formal presentation to staff and/or the Board to describe the overall project.

OBJECTIVE 2: To obtain and utilize the existing hydrogeologic framework.

Task 2.1	In August 2019, the LENRD and NeDNR will begin developing a hydrogeologic framework for the entire LENRD area. This effort will be completed in December 2019.
Task 2.2	Incorporate all available data into the hydrologic framework that was created during the PSA model project.

Task 2.3 This objective includes creation of data for analysis in Leapfrog (3D geologic modeling software) that includes all AEM data and georeferenced data files for ground surface and bottom of the aquifer from GIS spatial analyses (see Figure 1). The hydrogeologic framework will serve as the foundation of the LEM.

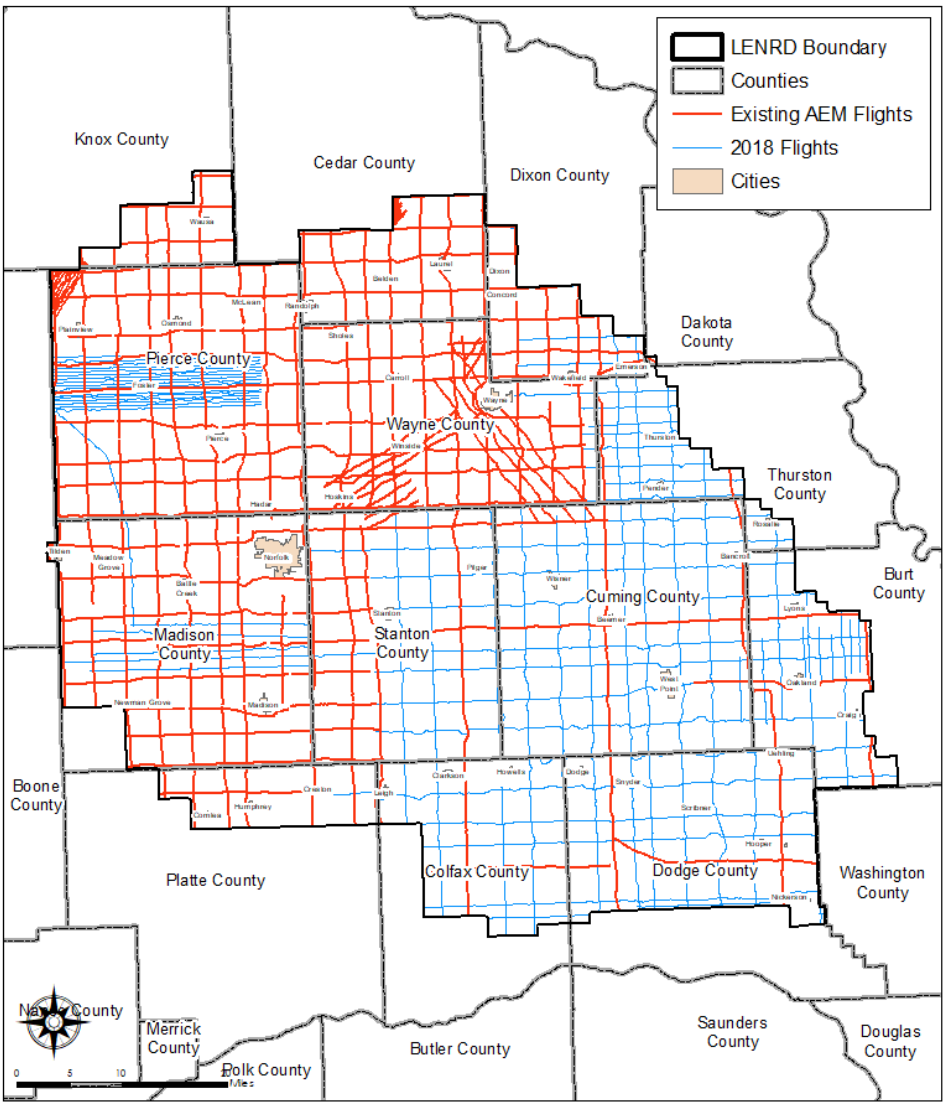

Figure 1 – LENRD AEM Flight Converge

OBJECTIVE 3: To construct a Sub-regional Numerical Flow Model for the LENRD.

Task 3.1 Develop the LENRD LEM using information from existing regional models such as initial aquifer parameters, other input values, and boundary conditions.

Task 3.2 Build the flow model using the MODFLOW code and quarter-mile grids (160-acres) and applying telescoping mesh refinement and the

UnStructured Grid in areas such as streams (grids as small as 100 by 100 feet). This allows for a more robust dataset to allow to better differentiate the interconnectivity between streams and groundwater.

The model domain, grid size, and configuration will be determined based on the findings within the hydrogeologic framework. The Regional Soil Water Balance model's components will be used as appropriate. The model will be able to predict the future impacts of changes to water use and water demands.

Task 3.3 Work with NeDNR staff to refine modeling methodology based upon what was learned during the PSA model effort. This includes applying appropriate modeling methodology and codes, compile input parameters, acquire existing input layers and modify as necessary, and review all existing regional flow models to ensure consistency with established methods. See Figure 2 for an example of the five-layer cross section from the PSA model layer output.

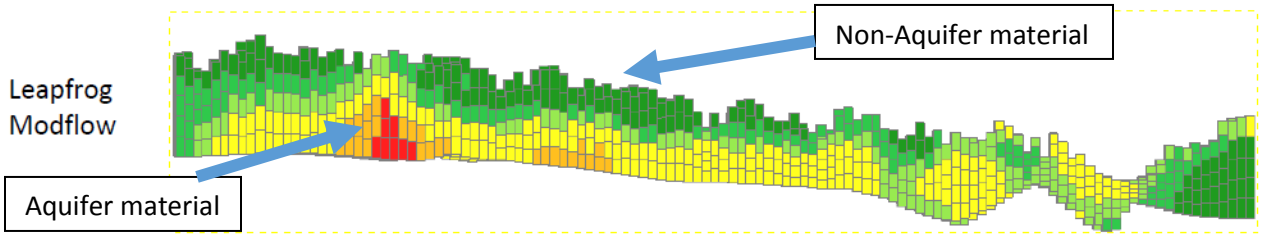

Figure 2 – Leapfrog Five Layer Profile Example

Task 3.4 Review the watershed model data of LPMT Model and provide refinement of the watershed model grid as needed for the LENRD model. Includes an update of land cover data of the refined grids for watershed model simulation and a run of the watershed model and analyze the surface water budget of the model.

Task 3.5 Construct the flow model using input of the processed data (aquifer properties) from the hydrogeologic framework into the model. The contractor will set and assign necessary boundary condition packages to the groundwater model, set and assign stress periods and time steps of model simulation, and refine the grid size of the groundwater model (equal to the watershed model grids). This includes a refinement of recharge and pumping data from watershed model and conducting a test model simulation using a variety of management scenarios.

Task 3.6 Calibrate the flow model by analyzing the baseflow and groundwater head calibration statistics of the initial watershed and groundwater runs. Real-time groundwater level data will be used from LENRD. The contractor will perform sensitivity analysis of the model, develop a model calibration strategy and perform automated Parameter Estimation (PEST) runs of

model for model calibration. The contractor will also perform a sensitivity analysis of the calibrated model.

OBJECTIVE 4: To create a model application graphic user interface tool.

Task 4.1 Provide support to LENRD in developing a tool that runs the model and the post-processing tool in a Graphic User Interface (GUI). The watershed model is used to estimate irrigation water use, and groundwater model is used to estimate the stream baseflow and change in groundwater levels. LENRD's GUI will be highly advanced and customized to increase its utility to the staff allowing it to be used without continuously hiring a consultant.

Task 4.2 Development of a GUI includes a review of the data and source codes of the watershed model, development of a program that streamlines the subprograms of the watershed model and groundwater model. The new program will read a main name file that contains the necessary inputs so that modification and compilation of the source codes is not required for each use.

The GUI will enable LENRD staff to make the changes through the GUI in crops, acres, irrigation types and groundwater pumping and generate the input files for the models based on such changes. The staff will be able to develop water management scenarios based on LENRD needs (tool customization) and the GUI will allow staff to be able to read, synthesize, and generate visualizations of the land use acres, water budget, groundwater levels of the models and generate other management decision scenarios. A manual will be provided that describes documentation of the program and GUI. The contractor will provide training and follow-up consultation, as needed.

OBJECTIVE 5: To create a final modeling report and map book.

Task 5.1 Provide a final summary report that describes methodology, critical inputs, and other applicable data after incorporation of all available AEM data into the flow model. The final report will have benefit beyond LENRD, as it will provide proven methodology and scientific justification for incorporation of AEM into a full sized sub-regional model and will be utilized by other NRDs and agencies constructing a model using AEM. The report will summarize critical modeling inputs including aquifer extents, parameters, boundary conditions, and overall discussion. It will provide a summary of the hydrogeologic framework inputs used within the LEM, provide metadata on all GIS files and layers, and explanation of critical information.

The ‘map book’ will be far more detailed than existing deliverables such as the Water Inventory Report based upon the intensive analysis completed as part of the hydrogeologic framework and the incorporation of AEM data.

Task 5.2 Provide a robust map book for the entire LENRD that includes a summary of the hydrogeologic setting, principal aquifer characteristics, high-capacity well development potential (risk map), and aquifer extents. A typical map book includes creation of 35 to 45 figures and 20 hydrogeologic cross sections to be used at Board Meetings, coffee shop discussions, and to explain the groundwater system to communities and agricultural producers in a highly graphic format.

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 planned structural measures associated with model development, However, the model will be a valuable tool in identifying the most effective areas for future structures that will provide groundwater recharge benefits.

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 PSA model project completed in June 2019 by LENRD and NeDNR was intended to prove that the model development process, utilizing AEM data, along with geologic data, is authentic and useful. The NeDNR has agreed the PSA model project was a success, and those methods will be applied to creation of the LEM. The PSA modeling process is a first of its kind in Nebraska, and possibly the United States. The next best alternative would be use of geologic data only, which wouldn’t build on the investment of LENRD, WSF, and NeDNR on the AEM data collection flights.

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).

The total cost of the project $336,000. The purpose of the LEM is to manage groundwater in a sustainable manner to balance agricultural, commercial, industrial, municipal, and recreation users. The most impactful use is irrigation for agriculture. If groundwater is not properly managed, allocations and regulations on irrigation may be necessary. This could have a devastating impact on the Nebraska and LENRD area economy. While a detailed benefit to cost analysis has not been completed, it is self-evident that the benefits will far out weight the cost to develop the LEM.

Proper water management, using the LEM model as a tool, will enable the LENRD Board of Directors to make informed decisions on rules and regulations regarding groundwater usage. This will also benefit streamflow, thus water quality, fish and wildlife, and the environment in general.

Because the project is based upon geologic data, its project life extends well into the future, at which point, more accurate geologic data is collected and the model is updated. Because the LENRD is utilizing AEM data recently collected, the project life will be long-term in nature.

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 project total cost and breakdown is provided in Table 3.

Table 3 – Project Cost Summary

Task	**Cost**	**WSF (60%)**	**LENRD (40%)**
Project Management	$ 42,000.00	$ 25,200.00	$ 16,800.00
Sub-regional Model	$ 166,000.00	$ 99,600.00	$ 66,400.00
Model Application Tool	$ 60,000.00	$ 36,000.00	$ 24,000.00
Final Report and Map Book	$ 68,000.00	$ 40,800.00	$ 27,200.00
Total	**$ 336,000.00**	**$ 201,600.00**	**$ 134,400.00**

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).

Although there is no generally accepted method for calculating primary tangible benefits for this project, the LENRD is confident it will greatly promote and increase water sustainability efforts throughout the region and state-wide. While this project will result in a groundwater flow model, it will also have a significant impact on groundwater management decisions within the LENRD. The model will enable the LENRD Board of Directors to rely on a scientific based tool to make informed decisions about the potential impacts that decisions may have on the groundwater. This will help ensure that all future decisions are made with water sustainability in mind. Water will be used in a more efficient manner and communities will have scientific data to base decisions, such as siting new wells, or planning for drought, among a large number of other ancillary benefits.

The first of four goals in the draft Integrated Management Plan developed by the LENRD in collaboration with NeDNR was to "Develop and maintain a water supply and use inventory based on the best available data and analysis." A sub-regional groundwater model will fulfill that goal, by utilizing all the data the LENRD has collected, and providing an advanced method to analyze and model groundwater scenarios. This is the best possible method the LENRD can use to balance the need for further groundwater development with the associated risks to water sustainability.

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).

There is no generally accepted method for calculating primary tangible benefits for this project; however, the table below illustrates the annual costs associated with the project. Benefits may include increased streamflow, stronger management of groundwater consumption, reduced cost for communities to study and site new wells, resiliency to drought through future planning efforts (supported by the LEM), and cost savings to the State using the LEM by NeDNR. Table 4 displays the project cost summary while Table 5 shows the WSF funding request by calendar year.

Table 4 – Project Cost Summary

Task	**Cost**	**WSF (60%)**	**LENRD (40%)**
Project Management	$42,000.00	$25,200.00	$16,800.00
Sub-regional Model	$166,000.00	$99,600.00	$66,400.00
Model Application Tool	$60,000.00	$36,000.00	$24,000.00
Final Report and Map Book	$68,000.00	$40,800.00	$27,200.00
Total	**$ 336,000.00**	**$ 201,600.00**	**$ 134,400.00**

Table 5 – WSF Cost Request by Calendar Year

Tasks	**2020**	**2021**	**Total WSF Amount**
Project Management	$12,600.00	$12,600.00	$25,200.00
Sub-regional Model	$99,600.00	$ -	$99,600.00
Model Application Tool	$15,000.00	$21,000.00	$36,000.00

Final Report and Map Book	$30,600.00	$10,200.00	$40,800.00
TOTALS	**$157,800.00**	**$ 43,800.00**	**$ 201,600.00**

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.) N/A

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 LENRD Board of Directors is committing $134,400 in financial commitment and a support letter is provided in Attachment B. The LENRD has estimated the 2019-2020 property tax levy at 2.39769 cents per $100 of valuation. for a total property tax requirement of $4,382,627. LENRD's financial commitment for this initiative represents just over three percent of the NRD's total property tax requirement over the next two years. The annual property tax request is finalized and approved by the LENRD Board of Directors each year.

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

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 development of this project will have no negative impacts on the natural environment. Once the sub-regional groundwater model has been created, it will provide positive impacts to water sustainability through more educated and scientifically backed decisions made by the LENRD Board, communities, and other agencies that will benefit from the use of the model.

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

The LENRD is well qualified to carry out this project. Since its inception in 1972, LENRD has been collecting groundwater data and utilizing that data for management decisions. This data will be used to support the development of the LEM and expand LENRD's ability to make sound groundwater management decisions. Groundwater management

is a statutory duty of Natural Resources Districts (NRDs). The development of this project will aid the LENRD in adhering to the statutory responsibilities and authorities given to the NRDs by the state, including but not limited to Nebraska Revised Statutes 2-3,201 through 2-3,243 and 46-701 through 46-755. As one of the state's preferred regulators of groundwater, the LENRD 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.

LENRD Groundwater Management Plan
The LENRD Groundwater Management Plan[1] (GMP), last amended in 2018, identifies a reservoir life goal to: "*provide an adequate supply of acceptable quality groundwater to forever fulfill the reasonable groundwater demands within the NRD for domestic, municipal, agricultural, industrial, wildlife and other uses deemed beneficial by the NRD Board*." This project will help fulfill multiple goals of the GMP by allowing the LENRD Board to make future water management decisions with these goals in mind. The plan was amended in 2018 to integrate the goals of the LENRD Drought Management Plan, which was adopted by the board to acknowledge the challenges that can be encountered in regard to groundwater management in response to the impacts of drought conditions.

LENRD Integrated Management Plan
This project directly addresses the first goal in the voluntary Integrated Management Plan[2] (IMP) developed in collaboration with the NeDNR. The first goal is to "*Gain a better understanding of water resources."* This project will enable the LENRD to combine all of the groundwater data it has collected, particularly the AEM data collected in 2013, 2014, 2016, and 2018, and utilize it through modeling.

Lower Platte River Drought Contingency Plan
Beginning in 2016, the Lower Platte South NRD, Papio-Missouri River NRD, Lower Platte North NRD, Metropolitan Utilities District, Lincoln Water System, and NeDNR (collectively referred to as the Lower Platte River Consortium (Consortium)) embarked on a collaborative effort to develop a drought contingency plan for the Lower Platte River Basin in Nebraska[3]. This plan was funded in part by WSF. While the LENRD wasn't a planning partner, there have been project areas identified within the LENRD that could benefit the Consortium's goals.

<u>Alluvial Groundwater Pumping</u>
Section 5.1.5 of the drought plan mentions 'alluvial groundwater pumping' to use wells to augment streamflow during times of shortage by pumping surface water from sand pits. It is possible that dams or other surface water detention structures used for flood

[1] Lower Elkhorn Natural Resources District, 2015, Groundwater Management Plan, 2018 Revision.
[2] Lower Elkhorn Natural Resources District, 2018, Integrated Management Plan.
[3] Lower Platte River Drought Contingency Plan, 2018

control within the LENRD could be used to augment flows to the Platte River. The LEM could be used to estimate stream flow and groundwater recharge benefits.

Groundwater Wellfield Augmentation Project
Section 5.1.6 of the drought plan states that a wellfield augmentation project would be developed at a site with significant and accessible groundwater supplies to pump water on demand to augment surface water flows, primarily for short durations during times of low flows. The new LEM could be used to explore potential benefits of pumping excess groundwater for the benefit of Platte River flows.

Lower Platte River Basin Coalition – Basin Water Management Plan
In 2017, LENRD, Lower Loup NRD, Lower Platte North NRD, Lower Platte South NRD, Nebraska Association of Resources Districts, NeDNR, Papio-Missouri River NRD, Upper Elkhorn NRD, and Upper Loup NRD established the Lower Platte River Basin Coalition – Basin Water Management Plan[4]. This effort was funded in part by the NeDNR. Together with the NeDNR, the seven NRDs entered into an Interlocal Cooperative Agreement. The Coalition recognizes the interrelation of water resources inherent within the basin and has embarked on a critical mission to protect and sustain the long-term balance between the water uses and water supplies throughout the Basin within the seven represented NRDs.

Goal 3 Develop and adopt water use policies and practices that contribute to the protection of existing surface and groundwater uses while allowing for future water development. LENRD's LEM will be used as an innovative resource to support effective water use policies to protect both surface and groundwater uses.

NeDNR Annual Report and Plan of Work - 2018

In 2018 the NeDNR completed the most current Annual Report and Plan of Work[5]. The NeDNR utilizes several of its program areas to implement the state water planning and review process. Five of the six implementation objectives identified in the Annual Plan of Work will be addressed through this project. They include:

1) Maintain data, information, and analysis capabilities for water planning, including specific programs for collecting, maintaining, and distributing information on stream flows, as well as analyzing water uses and water supplies across the state;

   LENRD's efforts on the PSA model, and development of the LEM, will greatly benefit NeDNR's capabilities for water planning.

2) Provide staff and resources to support planning and implementation of water resources projects;

[4] Lower Platte River Basin Coalition – Basin Water Management Plan. October 2017
[5] NeDNR. Annual Report and Plan of Work for the State Water Planning and Review Process. September 2018.

NeDNR staff are involved directly in development of the LEM.

3) Support locally developed water management plans for conjunctively managing hydrologically connected groundwater and surface water supplies;

   The LEM will be used to model stream depletion factors for the LENRD and mapping hydrologically connected areas using a more robust tool.

4) Provide resources to map and identify areas vulnerable to flood damage;

   NA

5) Participate in interagency collaboration with federal agencies, state agencies, local natural resources districts (NRD's), and other water interest entities on various water resources programs and projects;

   The PSA model, and development of the LEM, is an excellent example of interagency collaboration between LENRD, NeDNR, and UNL CSD.

6) Consolidate and present information in a form that is understandable and useful to the public and interagency collaborators.

   NeDNR staff have presented the results of the PSA model to Eastern Nebraska Water Resources Assessment (ENWRA). LENRD and their project team have shared the results of the PSA model with the LENRD Board and UNL CSD. The same presentations will occur with the LEM.

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.

Nebraska's NRDs are specifically tasked by the legislature to manage groundwater, as well as the hydrologically connected groundwater and surface water. In the Groundwater Management and Protection Act, financial and other incentive programs

are referenced 19 times and the necessary authority is granted to NRDs to implement such programs.

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

The LENRD does not anticipate any negative environmental or ecological consequences as a result of the LEM being developed. The purpose of this project is to positively impact groundwater sustainability and stream flows by best utilizing all available groundwater data when making groundwater management decisions.

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.

One of the primary benefits of the LEM is to mitigate threats to drinking water. The hydrogeologic framework and data that was necessary to create the LEM will be a direct benefit to communities that are facing threats to drinking water, such as nitrates or a

lack of supply. The model can be used as is, or it can be refined, if needed, to meet certain objectives. For example, refining the model locally around an existing wellfield will help provide information necessary to site future wells and to delineate more accurate Wellhead Protection Areas (WHPA). This will be useful to better understand areas of land where recharge to the groundwater occurs and conservation practices can help limit infiltration of contaminants, mainly nitrates, and identify areas of potential well interference if siting new wells. Having the model as a starting point will cut the traditional effort of these types of assessments in half.

Besides the LEM and associated data, the hydrogeologic assessment map book will include a wide variety of data such as transmissivity, aquifer thickness, aquifer locations, groundwater depths, etc. that can assist the LENRD to establish more targeted Groundwater Management Areas or be shared with public water supply systems. A deliverable of the project is a Graphic User Interface to better delineate aquifer units in order to better define the Groundwater Management Areas. This will lead to more accurately placed management measures, such as best management practices (BMPs), to reduce nitrate infiltration to groundwater. The information can also be used to evaluate how vulnerable an aquifer is to potential surface contamination within the WHPA. This is explained in more detail in the Groundwater Management Plan section below.

In addition to concerns about groundwater quality, the LENRD is also concerned about water quantity issues. The groundwater flow model and hydrogeologic framework will enable the LENRD to refine the two groundwater quantity subareas within the LENRD; one in Madison County and one in Wayne County. These areas have known groundwater quantity issues. Within these areas, irrigators must abide by an allocation of irrigation water that is determined annually by the LENRD Board. With the new data, and better-defined areas, these regulations can be applied more scientifically. The Board can be assured they are not applying allocations and other regulations onto producers where such actions may not be justified. This project will create a scientific basis for application of the rules and regulations.

Additional water quantity issues were discovered during the drought of 2012. During that event, some areas of the LENRD experienced water shortages in domestic and irrigation wells. In response, the LENRD approved a Drought Mitigation Plan to help guide the response of the LENRD Board in future drought crises. The LEM and hydrogeologic framework will allow the LENRD to forecast areas that would be affected by drought by running a drought scenario in the model. This will enable the LENRD to notify communities far ahead of time using ‘triggers’, which could be defined by the model.

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.

Groundwater Management Plan (GMP)
The 2018 GMP by the LENRD identifies a reservoir life goal to "*provide an adequate supply of acceptable quality groundwater to forever fulfill the reasonable groundwater demands within the NRD for domestic, municipal, agricultural, industrial, wildlife and other uses deemed beneficial by the NRD Board*." Development of the LEM will assist in fulfilling multiple other goals found in the GMP.

One such goal is to "*establish a baseline of data and monitor trends in groundwater quality and quantity*." The LENRD has taken many proactive steps to achieve this goal. A system of 65 dedicated monitoring wells is strategically placed throughout the LENRD. Each monitoring well is equipped with a transducer, a device that records and stores depth to groundwater measurements every eight hours. Recently, through a Nebraska Environmental Trust grant, the LENRD has begun equipping each dedicated monitoring well with telemetry equipment. The completion of this project will result in the ability of the LENRD, the public, and other interested entities to access depth to groundwater measurements real-time. The LENRD also collects static water levels annually from a large network of privately-owned irrigation wells. The LENRD has been collecting water quantity data since the mid 1970's, and water quality data since the 1980's. The real time water level data, along with stream flow data, was used to calibrate the Pilot Scale Area (PSA) model and will be used to calibrate the LEM. The area of the PSA model is shown in Figure 3.

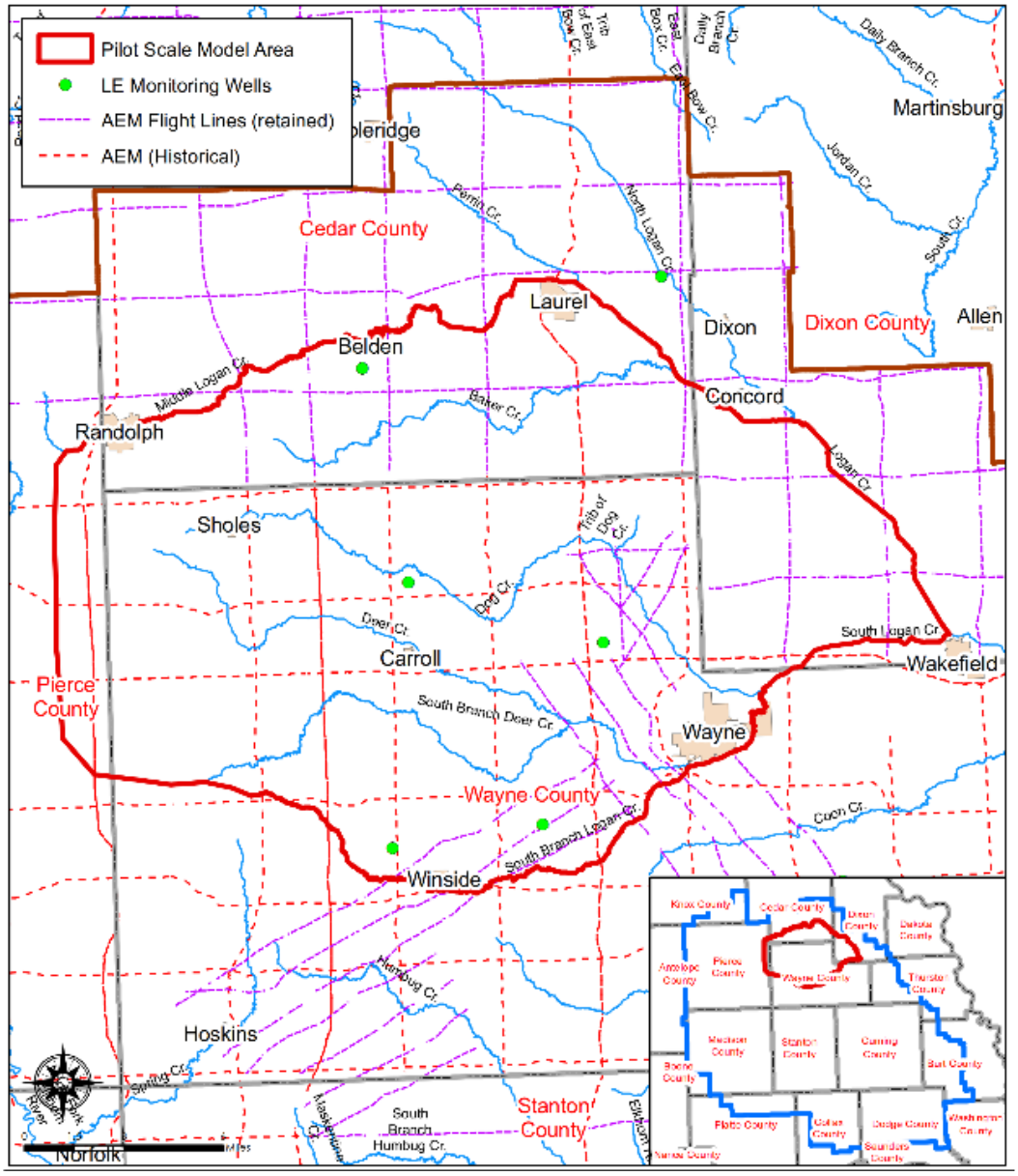

Figure 3 – Pilot-scale Model Area

Another goal of the GMP is to "*Maintain and improve groundwater quality."* In order to meet this goal, the LENRD has developed a Groundwater Management Area in Pierce County, in addition to helping to form the Bazile Groundwater Management Area in parts of Pierce and Knox County, along with areas of three other NRDs. These areas are subjected to additional controls with the goal of reducing nitrate levels. The Groundwater Management Area was reviewed, and additional controls were added for some areas. The LENRD also promotes the use of BMPs that target water quality through the availability of cost share opportunities. The hydrogeologic framework will indicate areas that are more vulnerable to nonpoint source pollution so strategic actions can be implemented to reduce infiltration of pollutants, mainly nitrates. The map book

will also include customized figures showing LENRD staff where to concentrate BMPs to reduce nitrate infiltration into water supplies.

The LENRD also has a goal to "*minimize pumping conflicts."* To address this goal, the LENRD does not allow irrigation wells to be drilled without a permit. Setbacks from other wells are also set and must be adhered to for new and replacement wells. The LEM's graphic user interface, combined with the map book, will enable LENRD staff to operate the model and understand how new high-capacity wells may affect wells already in use. The graphic user interface will enable the staff to do this in-house without performing additional studies.

Integrated Management Plan
This project directly addresses the first goal in the voluntary IMP developed in collaboration with the NeDNR. The first goal is to, "*Gain a better understanding of water resources".* This project will allow the LENRD and NeDNR to maximize the previous investments into AEM and combine all available data into one hydrogeologic framework, particularly the AEM data collected in 2013, 2014, 2016, and 2018. The ability to model various scenarios will greatly assist the LENRD in understanding and predicting how different decisions and situations will affect groundwater supplies.

This project also directly addresses the second goal found in the IMP which states, "*Sustain a balance between current and future water uses and supplies through water management strategies and projects".* The ability to model different scenarios will also address goal three, which is to, "*Improve the public's understanding and participation in integrated water management.* Finally, this project with also support goal four of the IMP, *Support planning and management in the Basin and ensure consistency with the Basin Plan."*

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.

The intent of the LEM is to have a powerful tool to allow the LENRD staff and Board of Directors to manage water in a more sustainable manner. This resource will assist in identifying potential areas for recharge and to better manage groundwater to reduce depletions. Properly managed groundwater could lead to increased streamflow. The proposed LEM will enable the LENRD to predict aquifer recharge, potential aquifer depletion, and impacts to streamflow. Without a groundwater model, the LENRD does

not have a scientific method to accurately predict these events and their long-term impacts.

The LEM can also help with planning future dam sites. As with any structural project the LENRD may pursue, choosing a location with potential for recharge benefits is important. By utilizing the LEM, the LENRD can choose the location for a project with multiple benefits, such as recharge, streamflow augmentation, and flood control. The hydrogeologic framework will identify areas where clay layers are absent or thin, in combination with where the aquifer has the capacity to store recharged water. Then, the LEM will quantify potential recharge benefits, and display where the benefits will occur (i.e. how many high capacity wells will be offset by the recharge).

Reducing aquifer depletion is also a priority with all decisions. While it is important to agricultural producers in the LENRD to allow new development of irrigation, permission must be balanced with ensuring that existing users and the underlying aquifers are not negatively impacted. The LEM could be used to determine areas that can withstand further development without causing additional depletion, while identifying areas that cannot be developed without causing negative impacts.

The LEM will be used by NeDNR to map hydrologically connected areas of surface and groundwater. The robust LEM will consist of five model layers, or more, providing a tool that better represents the hydrogeology and connections with surface water compared to the regional LPMT single-layer model.

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 primary goal of the LEM is to enhance the LENRD Board of Director's ability to make sustainable management decisions to achieve a balance or maintain a sustainable use of water supplies for agricultural, environmental, private, and municipal and industrial purposes., This is legislative purpose for all NRDs. The LEM provides a robust and scientifically advanced tool to support achieving multiple water supply goals as listed in the IMP, Groundwater Management Plan, and Lower Platte River Basin Coalition Basin Water Management Plan.

This project will benefit all water users in the LENRD and take advantage of the millions of dollars invested previously by LENRD and NeDNR in the collection of AEM data. Model development is the next major step after obtaining AEM data, which is now complete for the entire LENRD**.**

The primary benefits of the LEM is to create more sound regulations that properly balance water use, fairly, and working towards maintaining an unappropriated status. The LEM will help LENRD avoid water management issues experienced by neighboring NRDs. Without the ability to predict the impact various decisions may have on groundwater, the future quality and quantity of groundwater could be at risk. While the LENRD Board does its best to make informed decisions, it can be more effective when all the relevant available information is utilized and presented in a practical user-friendly platform. Should expansion of irrigation be allowed in areas that cannot support it, the long-term impacts of that overuse will affect all water users, and not just irrigators.

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 LENRD and NeDNR's previous effort to complete the PSA model in June 2019 will benefit the State and other NRDs by saving future financial resources and providing a blueprint of success for how to integrate AEM data into a functioning flow model. Furthermore, the PSA model displayed how to incorporate geologic data from well logs with AEM in creating the hydrogeologic framework, of which the AEM data was then incorporated into. This project will further that benefit to the State and other NRDs as the first district-wide sub-regional groundwater flow model and will be used as a template for future projects.

Specifically related to water resources, the LEM will aid the LENRD Board in its decision-making processes for groundwater management. Using the LEM will assist the Board in allowing as much sustainable groundwater development as possible without interfering with existing users, reducing stream flows, or impacting other natural systems. Agriculture is a driving force within the LENRD, so it is crucial to the local and state-wide economy to allow the growth and development to continue while balancing other beneficial uses and the need to maintain water sustainability.

It is not the goal to reduce beneficial uses. Instead the LEM will promote the responsible and conservative use of groundwater resources. Doing so will benefit all residents of the LENRD in safeguarding the groundwater they rely on.

The LEM will be developed in collaboration with NeDNR. Once NeDNR accepts the model, it will benefit their short-term and long-term water management goals in the Lower Elkhorn basin; a major drainage for the Lower Platte River. Both Lincoln and Omaha have an interest in increased flows during times of drought for the benefit of their respective water supply systems. The LEM may be used to help in locating future

dam sites that have multiple-benefits, such as flood control, groundwater recharge, and streamflow augmentation when needed.

The LEM will also be used by NeDNR to display hydrologically connected areas (HCA). This project will provide far more accurate and detailed hydrogeologic parameters, such as thickness of aquifers, transmissivity, hydrologic conductivity, and others, leading towards a more accurate delineation of HCAs using the most advanced and robust hydrogeologic data available.

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.

There is no physical construction, O/M, land and water acquisition, or evaluation of alternatives with this effort. Development of the LEM is cost-effective because it is being built based upon recently completed, 'proof-of-concept' methodologies. These methodologies were established by a partnership between NeDNR and LENRD during completion of the PSA model project in June 2019. The objectives of the project are described below as well as the cost breakdown shown in Table 6.

Table 6 – Project Cost Summary

Task	**Cost**	**WSF (60%)**	**LENRD (40%)**
Project Management	$ 42,000.00	$ 25,200.00	$ 16,800.00
Sub-regional Model	$ 166,000.00	$ 99,600.00	$ 66,400.00
Model Application Tool	$ 60,000.00	$ 36,000.00	$ 24,000.00
Final Report and Map Book	$ 68,000.00	$ 40,800.00	$ 27,200.00
Total	**$ 336,000.00**	**$ 201,600.00**	**$ 134,400.00**

The LEM will be based on the entire LENRD boundary and will use the Lower Platte Missouri River Tributary (LPMT) as a basis for hydrologic inputs. The approach includes close collaboration with NeDNR and UNL CSD throughout the entire modeling project. NeDNR will participate in the kickoff meeting and will meet every two weeks with the contractor as the LEM is developed. The LEM model will incorporate data from NeDNR's existing Lower Platte Missouri Tributary (LPMT) Regional Model. The data from NeDNR that was used to build LPMT model such as land cover, climate, and watershed model input data will be used during the construction of LENRD model.

OBJECTIVE 1: To ensure collaboration between the LENRD staff and Board of Directors, NeDNR, UNL CSD, and other stakeholders.

Task 1.1 Includes general project management and coordination between LENRD staff, Board of Directors, NeDNR, and other stakeholders by the contractor.

Task 1.2 Preparation of a project schedule, contract administration services, coordinate and integrate various technical disciplines to facilitate efficient completion of project deliverables.

Task 1.3 Regular communication and disseminate necessary information to Project Team members.

Task 1.4 Development of a Quality Assurance/Quality Control (QA/QC) plan and progress reports. Includes NRD, NeDNR, and full project team progress and strategy meetings.

Task 1.5 The contractor will provide multiple updates at the LENRD Board of Directors meetings including one formal presentation to staff and/or the Board to describe the overall project.

OBJECTIVE 2: To obtain and utilize the existing hydrogeologic framework.

Task 2.1 In August 2019, the LENRD and NeDNR will begin developing a hydrogeologic framework for the entire LENRD area. This effort will be completed in December 2019.

Task 2.2 Incorporate all available data into the hydrologic framework that was created during the PSA model project.

Task 2.3 This objective includes creation of data for analysis in Leapfrog (3D geologic modeling software) that includes all AEM data and georeferenced data files for ground surface and bottom of the aquifer from GIS spatial analyses (see Figure 4). The hydrogeologic framework will serve as the foundation of the LEM.

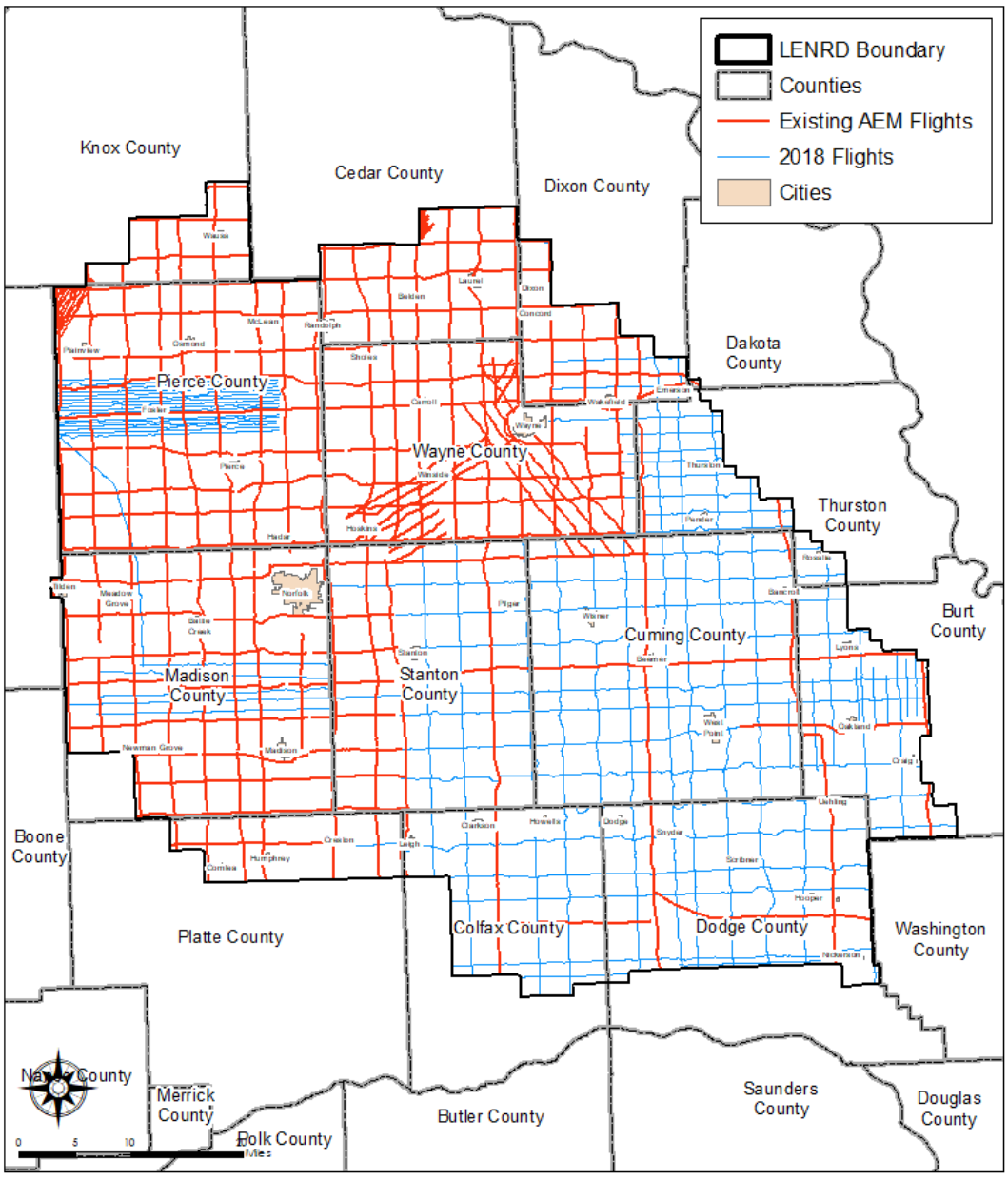

Figure 4 – LENRD AEM Flight Converge

OBJECTIVE 3: To construct a Sub-regional Numerical Flow Model for the LENRD.

Task 3.1 Develop the LENRD LEM using information from existing regional models such as initial aquifer parameters, other input values, and boundary conditions.

Task 3.2 Build the flow model using the MODFLOW code and quarter-mile grids (160-acres) and applying telescoping mesh refinement and the UnStructured Grid in areas such as streams (grids as small as 100 by 100

feet). This allows for a more robust dataset to allow to better differentiate the interconnectivity between streams and groundwater.

The model domain, grid size, and configuration will be determined based on the findings within the hydrogeologic framework. The Regional Soil Water Balance model's components will be used as appropriate. The model will be able to predict the future impacts of changes to water use and water demands.

Task 3.3 Work with NeDNR staff to refine modeling methodology based upon what was learned during the PSA model effort. This includes applying appropriate modeling methodology and codes, compile input parameters, acquire existing input layers, and modify as necessary, and review all existing regional flow models to ensure consistency with established methods. See Figure 5 as an example of the five-layer PSA model output.

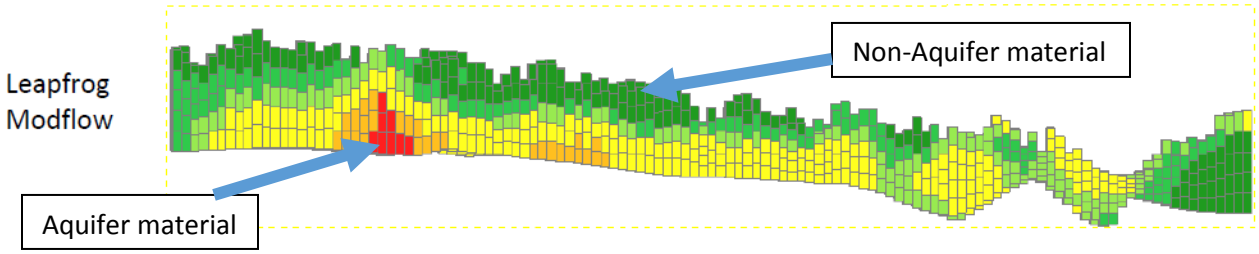

Figure 5 – Leapfrog Five Layer Profile Example

Task 3.4 Reviewing the watershed model data of LPMT Model and providing refinement of the watershed model grid as needed for the LEM. Includes an update of land cover data of the refined grids for watershed model simulation and a run of the watershed model and analyze the surface water budget of the model.

Task 3.5 Construct the flow model using input of the processed data (aquifer properties) from the hydrogeologic framework into the model. The contractor will set and assign necessary boundary condition packages to the groundwater model, set and assign stress periods and time steps of model simulation, and refine the grid size of the groundwater model (equal to the watershed model grids). This includes a refinement of recharge and pumping data from watershed model and conducting a test model simulation using a variety of management scenarios.

Task 3.6 Calibrate the flow model by analyzing the baseflow and groundwater head calibration statistics of the initial watershed and groundwater runs. Real-time groundwater level data will be used from LENRD. The contractor will perform sensitivity analysis of the model, develop a model calibration strategy, and perform automated Parameter Estimation (PEST) runs of

model for model calibration. The contractor will also perform a sensitivity analysis of the calibrated model.

OBJECTIVE 4: To create a model application graphic user interface tool.

Task 4.1 Provide support to LENRD in developing a tool that runs the model and the post-processing tool in a Graphic User Interface (GUI). The watershed model is used to estimate irrigation water use, and the groundwater model is used to estimate the stream baseflow and change in groundwater levels. LENRD's GUI will be highly advanced and customized to increase its utility to the staff allowing it to be used without continuously hiring a consultant.

Task 4.2 Development of a GUI includes a review of the data and source codes of the watershed model, development of a program that streamlines the subprograms of the watershed model and groundwater model. The new program will read a main name file that contains the necessary inputs so that modification and compilation of the source codes is not required for each use.

The GUI will enable LENRD staff to make the changes through the GUI in crops, acres, irrigation types and groundwater pumping and generate the input files for the models based on such changes. The staff will be able to develop water management scenarios based on LENRD needs (tool customization) and the GUI will allow staff to be able to read, synthesize, and generate visualizations of the land use acres, water budget, groundwater levels of the models, and generate other management decision scenarios. A manual will be provided that describes documentation of the program and GUI. The contractor will provide training and follow-up consultation, as needed.

OBJECTIVE 5: To create a final modeling report and map book.

Task 5.1 Provide a final summary report that describes methodology, critical inputs, and other applicable data after incorporation of all available AEM data into the flow model. The final report will have benefit beyond LENRD, as it will provide proven methodology and scientific justification for incorporation of AEM into a full sized sub-regional model and will be utilized by other NRDs and agencies constructing a model using AEM. The report will summarize critical modeling inputs including aquifer extents, parameters, boundary conditions, and overall discussion. It will provide a summary of the hydrogeologic framework inputs used within the LEM, provide metadata on all GIS files and layers, and explanation of critical information will also be provided.

The ‘map book’ will be far more detailed than existing deliverables such as the Water Inventory Report based upon the intensive analysis completed as part of the hydrogeologic framework and the incorporation of AEM data.

Task 5.2 Provide a robust map book for the entire LENRD that includes a summary on the hydrogeologic setting, principal aquifer characteristics, high-capacity well development potential (risk map), and aquifer extents. A typical map book includes creation of 35 to 45 figures and 20 hydrogeologic cross sections to be used at Board Meetings, coffee shop discussions, and to explain the groundwater system to communities and agricultural producers in a highly graphic format.

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 creation and use of the LEM aims to prevent a fully appropriated status by the State by making proactive water management decisions. This project will help the LENRD achieve the NeDNR’s goal of having all basins ‘not fully or overappropriated’. The LENRD Board of Directors understands that the potential to become fully appropriated is real and changes need to be made. Smarter water management decisions will be supported by the LEM, reducing the chances of the State needing to intervene in local management decisions.

The Elkhorn River is a major tributary to the Platte River where three federally listed endangered species call home in the Lower Platte Basin. The three species that are protected under the Endangered Species Act of 1973 are:

- Pallid Sturgeon
- Piping Plover
- Interior Least Tern

Sound water management decisions throughout the Elkhorn Basin will benefit streamflows, which in turn, increase flows in the Platte River. Additionally, increased flows in the Platte River support water supplies for Omaha and Lincoln. Increased flows in the Platte, especially during drought, reduce the chances of either Lincoln or Omaha using their authority under Nebraska Revised Statue 46-233 for ‘induced groundwater recharge’ which could cause irrigators upstream of the Lincoln and Omaha wellfields to cease surface water irrigation when water level triggers reach a certain threshold.

The proposed project will promote water conservation which will have a positive cumulative impact on stream flow by minimizing aquifer depletion. More educated decisions can be made by the Board, particularly within the hydrologically connected areas, which will help reduce pumping impacts on streamflow. The beneficial impacts will be maximized in areas with the highest stream flow depletion factor (SDF) as defined by the NeDNR SDF analysis along the Elkhorn and Logan Creek. Current and potential future deficiencies in flow within the Lower Platte River or Elkhorn corridor would negatively impact the habitats for these three increasing the importance of educated management through the use of a model.

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 LENRD is vital to the state of Nebraska and the United States of America. Currently the High Plains aquifer supplies water to 25 percent of the agricultural production in the US and without this supply there would be a debilitating effect on public security, public health, and safety. As an example of the concern, the United States Department of Homeland Security's Office of Cyber and Infrastructure Analysis released a report entitled Analysis of High Plains Resource Risk and Economic Impacts[6] which analyzed how continued depletions of the High Plains aquifer in Kansas and Nebraska might impact critical infrastructure and the economy at the local, regional, and national levels. In the introduction, the threat is described as follows, "The area overlying the High Plains Aquifer is one of the most prolific agricultural regions in the Nation, covering 111.8 million acres (175,000 square miles) in parts of eight States—Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. Following World War II, improved pumps and center pivot irrigation technology made High Plains groundwater available for large-scale irrigated agriculture. The High Plains has since become one of the most intensively irrigated areas in the United States, accounting for about 30 percent of all groundwater withdrawn for irrigation. As of 2007, the High Plains supported 50 million acres of cropland, 15.4 million acres of which were irrigated. The High Plains supplies approximately one-fourth of the Nation's agricultural production. Associated crops provide significant amounts of feed to the Midwest cattle operations that account for 40 percent of U.S. feedlot beef

[6] Office of Cyber and Infrastructure Analysis, 2015, Analysis of High Plains Resource Risk and Economic Impacts, August 2015, Department of Homeland Security, National Protection and Programs Directorate.

output. The aquifer also provides drinking water to 82 percent of the people who live within its boundaries. Increasing reliance on the High Plains aquifer has exceeded groundwater recharge rates. Water-level declines began in parts of the High Plains Aquifer soon after the onset of substantial irrigation, around 1950; by 1980, water levels had declined by more than 100 feet in parts of Texas, Oklahoma, and southwestern Kansas."

A key finding of this report is that "(i)f current water use practices are continued into the future, sixty counties in Kansas and seven in Nebraska are projected to face exhaustion of groundwater supplies in 100 years or less." It is clear that water use practices will need to be carefully managed to ensure that groundwater is available in the future. This clear benefit to public security, public health and safety will be provided by the use of the LEM in management decision making.

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 prob and the results obtained.

Development and use of the LEM will help the LENRD Board of Directors more accurately delineate groundwater aquifers and improve water quality management within Groundwater Management Areas. The immediate targets are Wellhead Protection Areas which delineate the area of land above a public water suppliers' source that recharges the wells. The LEM and its associated data will help LENRD and communities more accurately delineate these WHPAs, thus allowing for a more targeted and confident approach to applying conservation practices to reduce the infiltration of nitrates and other contaminants to the water supply.

The LENRD is home to almost 90,000 residents across 2,526,700 acres and 50 communities. High nitrate levels in portions of the LENRD have been an issue for years. In 1996, the LENRD created a Groundwater Quality Management Area in a portion of Pierce County due to the presence of nitrates in groundwater that exceeded the Maximum Contaminant Level (MCL) set at 10 parts per million by the Environmental Protection Agency (EPA). The area was later expanded, and a new management area was created in conjunction with four other NRDs. In addition to the Bazile Groundwater Management Area (BGMA), high nitrate levels have affected numerous communities within the LENRD. Some of the affected communities have received Administrative Orders from the state regulatory agencies due to the persistent presence of nitrate in regular sampling events. Results of the LENRD's 2017 water quality sampling efforts showed that nitrate levels in Pierce County ranged from non-detect to over 44 ppm. Of

the 310 samples collected, 176 samples tested greater than nine ppm. A breakdown of water use, by registered wells, is shown in Figure 6.

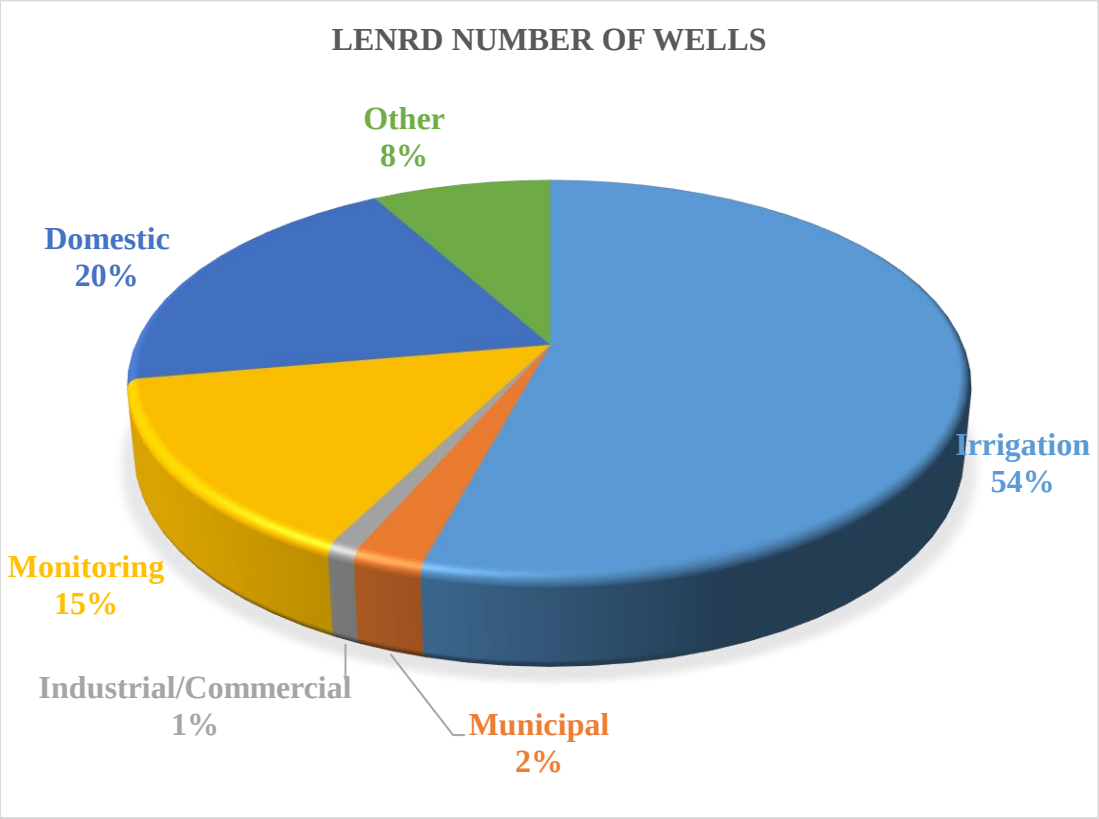

Figure 6 – LENRD Number of Wells

The LEM will provide a mechanism to help predict and mitigate these risks. Utilizing the AEM data collected over the past six years will assist the LENRD in identifying areas above the aquifer that make it more vulnerable to surface contamination and the relative rate at which contaminants such as nitrates may move or travel through the aquifer based on the hydraulic conductivity. This information could then be used to develop programs to target nitrate infiltration, particularly in areas of high risk. These areas at risk of nitrate infiltration are also often areas with aquifer recharge potential. The hydrogeologic framework the model will create will be vital in mapping out these vulnerable areas and balancing the risk of nitrate infiltration with the need for recharge. This framework will also be available to communities to improve their understanding of geologic characteristics of their WHPAs. The model will enable the LENRD to take advantage of the investment the LENRD, Natural Resources Commission, and NeDNR have made in collecting groundwater data, and maximize the usefulness of this data.

The other solution to addressing water quality issues is to continue the current practices the LENRD has in place. However, encouraging the utilization of BMPs and implementing regulations to protect the resource have so far been unsuccessful by themselves. Without the use of a groundwater model and hydrogeologic framework, the

LENRD Board does not have all the information needed to make the most effective decisions that will have the greatest impact on the water quality issues the LENRD faces.

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 LENRD has and will continue to support the proposed project through their tax levy authority. The PSA model was completed though a partnership with LENRD and NeDNR. No funds expended from that project have been counted towards this application, as the PSA model and this LEM project are both standalone projects. No benefits or funds from the PSA model are being counted towards this project; however, the lessons learned from the PSA model will be invaluable to the development of the LEM project.

LENRD fiscal year 2020 budget provides for an estimated property tax requirement of $4,382,627.00. The final levy is estimated to be set at 2.39769 cents per $100 actual valuation.

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 that supports the LEM is the LENRD, who is supported as a collaborator by the NeDNR. All water users will benefit through use of the LEM. This project is proposed to assist with implementation of the requirements in their GMP and voluntary IMP developed in partnership with NeDNR. Development of the voluntary IMP was overseen by a stakeholder group composed of 23 individuals. Both the GMP and the IMP were developed under the authority granted through the Groundwater Management and Protection Act (GMPA) and both have the overarching intent to plan for and maintain water sustainability across the entire LENRD, and this project will assist in fulfilling those responsibilities. The project also addresses goals within a Basin

Coalition Plan developed by downstream NRDs, the Lower Platte River Drought Contingency Plan. Furthermore, the LEM will support goals of the Lower Platte River Basin Coalition – Basin Water Management Plan.

LENRD Groundwater Management Plan

The LENRD Groundwater Management Plan[7] (GMP), last amended in 2018, identifies a reservoir life goal to: "*provide an adequate supply of acceptable quality groundwater to forever fulfill the reasonable groundwater demands within the NRD for domestic, municipal, agricultural, industrial, wildlife and other uses deemed beneficial by the NRD Board*." This project will help fulfill multiple goals of the GMP by allowing the LENRD Board to make future water management decisions with these goals in mind. The plan was amended in 2018 to integrate the goals of the LENRD Drought Management Plan, which was adopted by the board to acknowledge the challenges that can be encountered in regard to groundwater management in response to the impacts of drought conditions.

LENRD Integrated Management Plan

This project directly addresses the first goal in the voluntary Integrated Management Plan[8] (IMP) developed in collaboration with the NeDNR. The first goal is to "*Gain a better understanding of water resources."* This project will enable the LENRD to combine all of the groundwater data it has collected, particularly the AEM data collected in 2013, 2014, 2016, and 2018, and utilize it through modeling.

Lower Platte River Drought Contingency Plan

Beginning in 2016, the Lower Platte South NRD, Papio-Missouri River NRD, Lower Platte North NRD, Metropolitan Utilities District, Lincoln Water System, and NeDNR (collectively referred to as the Lower Platte River Consortium (Consortium)) embarked on a collaborative effort to develop a drought contingency plan for the Lower Platte River Basin in Nebraska. This plan was funded in part by WSF. While the LENRD wasn't a planning partner, there have been project areas identified within the LENRD that could benefit the Consortium's goals.

<u>Alluvial Groundwater Pumping</u>

Section 5.1.5 of the drought plan mentions 'alluvial groundwater pumping' to use wells to augment streamflow during times of shortage by pumping surface water from sand pits. It is possible that dams or other surface water detention structures used for flood control within the LENRD could be used to augment flows to the Platte River. The LEM could be used to estimate stream flow and groundwater recharge benefits.

<u>Groundwater Wellfield Augmentation Project</u>

Section 5.1.6 of the drought plan states that a wellfield augmentation project would be developed at a site with significant and accessible groundwater supplies to pump water on demand to augment surface water flows, primarily for short durations during times of

[7] Lower Elkhorn Natural Resources District, 2015, Groundwater Management Plan, 2015 Revision.

[8] Lower Elkhorn Natural Resources District, 2015, Integrated Management Plan, in progress.

low flows. The new LEM could be used to explore potential benefits of pumping excess groundwater for the benefit of Platte River flows.

Lower Platte River Basin Coalition – Basin Water Management Plan
In 2017, LENRD, Lower Loup NRD, Lower Platte North NRD, Lower Platte South NRD, Nebraska Association of Resources Districts, NeDNR, Papio-Missouri River NRD, Upper Elkhorn NRD, and Upper Loup NRD established the Lower Platte River Basin Coalition – Basin Water Management Plan. This effort was funded in part by the NeDNR. Together with the NeDNR, the seven NRDs entered into an Interlocal Cooperative Agreement. The Coalition recognizes the interrelation of water resources inherent within the basin and has embarked on a critical mission to protect and sustain the long-term balance between the water uses and water supplies throughout the Basin within the seven represented NRDs.

Goal 3 Develop and implement water use policies and practices that contribute to the protection of existing surface and groundwater uses while allowing for future water development. LENRD's LEM will be used as a tool to support effective water use policies to protect both surface and groundwater uses.

All of the communities and residents of the LENRD will both directly and indirectly benefit from this project. Direct benefits to the communities include: a better understanding of their source water, drought planning, wellhead protection planning, well siting capabilities, among others, all using the new data within the hydrologic framework (being developed prior to the development of the LEM, outside of this project) and the LEM. By having a model built utilizing data specific to the region, the best possible framework will be in place for running various scenarios before making important management decisions. This method of decision making will enable the LENRD to manage ground water use in a manner that achieves and sustains a balance between water uses and water supplies. This will provide environmental benefits to the inhabitants of the LENRD by maintaining adequate groundwater and surface water supplies for their use and minimizing conflicts between water users in the future.

12. Addresses a statewide prob or issue;

- List the issues or probs addressed by the project and why they should be considered statewide.
- Describe how the project will address each issue and/or prob.
- 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.

The creation and use of the LEM aims to prevent a fully appropriated status by the State by making proactive water management decisions. This project will help the LENRD achieve the NeDNR's goal of having all basins 'not fully or over-appropriated', which would save the State significant resources, as a designation of a fully appropriated

basin triggers more intense application of regulations, meaning increased NeDNR resources would be necessary.

The LENRD Board of Directors understands that the potential to become fully appropriated is real and changes need to be made. Smarter water management decisions will be supported by the LEM, reducing the chances of the State needing to intervene in local management decisions. The proposed project will promote water conservation which will have a positive cumulative impact on stream flow by minimizing aquifer depletion. More educated decisions can be made by the Board, particularly within the hydrologically connected areas, which will help reduce pumping impacts on streamflow.

The Elkhorn River is a major tributary to the Platte River, where three federally listed endangered species call home in the Lower Platte Basin. The three species protected under the Endangered Species Act of 1973 are:

- Pallid Sturgeon
- Piping Plover
- Interior Least Tern

Additionally, increased flows in the Platte River support water supplies for Omaha and Lincoln, who support the majority of the state's population. Increased flows in the Platte, especially during drought, reduces the chances of either Lincoln or Omaha using their authority under Nebraska Revised Statue 46-233 for 'induced groundwater recharge' which could cause irrigators upstream of the Lincoln and Omaha wellfields to cease surface water irrigation when water level triggers reach a certain threshold.

Development of the LEM will help ensure future Board of Directors and LENRD staff have access to the most robust hydrogeologic data and modeling tool possible to support scientifically based water management decisions. It is well documented that water sustainability is a state-wide issue. This project will directly and indirectly affect the almost 90,000 residents within the LENRD, which will support addressing the statewide issue of sustainability. Nearly a million other downstream residents, serviced by the Lincoln and Omaha public water systems, would also potentially benefit. By using the LEM in decision making, the LENRD can ensure that it manages groundwater with sustainability as the goal. While that is currently the hope of each decision made, the model will help ensure that the goal of sustainability is attained.

Groundwater quality is also an issue within the state and within the LENRD. The ability to model scenarios of how contaminants, such as nitrates, spread through the groundwater will be invaluable in the effort to decrease nitrate levels. Strategies derived from this model may also be applicable to other areas of the state.

Groundwater quality and quantity, and the overall sustainability of groundwater, are statewide issues. If each NRD strives to use their data in the best possible manner to make the best possible decisions, these goals can be attained. That is the goal of this project in the LENRD**.**

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 LENRD and NeDNR have previously invested a shared $131,000 into the Pilot-scale (PSA) model and Geospatial Assessment project, which was completed in June 2019. That project provided a 'proof of concept' for the use of AEM data into a regional groundwater model and hydrogeologic framework – a state-wide benefit.

In August 2019, the LENRD and NeDNR plan to continue their partnership with the next major step - completion of the hydrogeologic framework over the entire LENRD, building on what was created during the PSA project, another $200,000 shared investment.

The final step of this district wide LEM is this project. The cost of portion is proposed to be split 60/40 between the WSF and LENRD. This project is a prime example of leveraging resources and finances between the LENRD, NeDNR, and Natural Resources Commission (NRC). The LENRD has no intention to recover its past investment, but instead intends to leverage its resources and investment thus far and share the benefits from that investment with other stakeholders, with similar interest, across the state. The cost breakdown for this final step in this major project is described in Table 7. A letter of support and financial commitment can be found in Attachment B.

Table 7 - LEM WSF Application Cost Breakdown

Task	**Cost**	**WSF (60%)**	**LENRD (40%)**
Project Management	$ 42,000.00	$ 25,200.00	$ 16,800.00
Sub-regional Model	$ 166,000.00	$ 99,600.00	$ 66,400.00
Model Application Tool	$ 60,000.00	$ 36,000.00	$ 24,000.00
Final Report and Map Book	$ 68,000.00	$ 40,800.00	$ 27,200.00
Total	**$ 336,000.00**	**$ 201,600.00**	**$ 134,400.00**

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.

Use of the LEM will result in targeted conservation practices intended to reduce infiltration of nitrates to vulnerable water supplies. These practices will improve soil health, reduce sediment in runoff, and reduce erosion, thus contributing directly to watershed health and function. A list of specific targeted watersheds is not known at this time, but a collective benefit will be realized throughout the Elkhorn River basin.

The proposed project's main objective is the development of LEM and hydrogeologic framework that will allow the LENRD to make better management decisions. Actions made through the guidance of this model will help to fulfill the LENRD's obligation to protect natural resources within the LENRD's boundaries. In the course of fulfilling its responsibilities, the LENRD has identified a variety of concerns, many related to the agricultural industry found in northeast Nebraska. Not only will addressing these resource concerns benefit the agricultural industry, but communities within the LENRD will also reap the benefits of sustained and improved resources. These concerns primarily include water quantity and water quality, however, soil health, drought, and at-risk species habitat will all benefit through the implementation of practices guided by the model. While the primary objectives of the project focus on water resources, practices implemented by the project to improve quantity and quality of water will have additional benefits that address other resource concerns and improve watershed function.

Water quality and quantity issues within the LENRD have been identified through current groundwater monitoring practices. Areas at risk to decreased water levels and increased nitrate levels have been identified; however, a method to most effectively address these issues does not currently exist. Development of a hydrogeologic framework will allow the LENRD to pinpoint areas where management practices are needed to reduce infiltration of nitrates to the aquifer. Implementation of these practices will slow runoff, improve soil health, and reduce the quantity of fertilizers and chemicals needed. It will also help to identify areas at risk of groundwater declines and manage them accordingly.

The groundwater model will also assist in drought condition forecasting, identifying areas at risk of well interference, evaluating potential impacts of land cover changes on groundwater supplies, estimating stream flow depletions, and evaluating areas with otherwise limited data. The model will also be available as a tool for communities within the LENRD for projects such as delineating wellhead protection areas, siting new wells, performing aquifer studies, drought management planning, and recharge assessments. The combination of these capabilities will contribute to maintaining a healthy and functioning watershed.

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.

NeDNR was a full partner during the development of the Pilot-scale Area model and will continue that partnership for development of the full-scale Lower Elkhorn Sub-regional Model (LEM). These are the exact types of projects sought through the objectives listed in the NeDNR Annual Report and Plan of Work.

NeDNR Annual Report and Plan of Work - 2018

In 2018 the NeDNR completed the most current Annual Report and Plan of Work[9]. The NeDNR utilizes several of its program areas to implement the state water planning and review process. Five of the six implementation objectives identified in the Annual Plan of Work will be addressed through this project. They include:

1) **Maintain data, information, and analysis capabilities for water planning, including specific programs for collecting, maintaining, and distributing information on stream flows, as well as analyzing water uses and water supplies across the state;**

   This project achieves this objective as LENRD's efforts on the PSA model, and development of the LEM, will greatly benefit NeDNR's capabilities for water planning. NeDNR's Lower Platte Missouri River Tributary (LPMT) will be used as a foundation for model development. Stream flows and groundwater data will be used to calibrate the model.

2) **Provide staff and resources to support planning and implementation of water resources projects;**

   This project achieves this objective as NeDNR staff are involved directly in development of the LEM.

3) **Support locally developed water management plans for conjunctively managing hydrologically connected groundwater and surface water supplies;**

   This project achieves this objective as the LEM will be used to model stream depletion factors for the LENRD and mapping hydrologically connected areas using a more robust tool that integrates AEM.

4) **Provide resources to map and identify areas vulnerable to flood damage;**

   NA

[9] NeDNR. Annual Report and Plan of Work for the State Water Planning and Review Process. September 2018. Page 1 - 2

5) **Participate in interagency collaboration with federal agencies, state agencies, local natural resources districts (NRD's), and other water interest entities on various water resources programs and projects; and**

   This project achieves this objective as the PSA model, and development of the LEM, is an excellent example of interagency collaboration between LENRD, NeDNR, and UNL CSD.

6) **Consolidate and present information in a form that is understandable and useful to the public and interagency collaborators.**

   This project achieves this objective as NeDNR staff have presented the results of the PSA model to Eastern Nebraska Water Resources Assessment (ENWRA). The PSA model is a blueprint for other NRDs to utilize AEM in a groundwater model. LENRD and their project team have shared the results of the PSA model with the LENRD Board and UNL CSD. The same presentations will occur with the LEM.

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.

    N/A