NEBRASKA NATURAL RESOURCES COMMISSION

Water Sustainability Fund

Application for Funding

Section A.

ADMINISTRATIVE

PROJECT NAME: Developing a Truly Sustainable Solution to Nitrate Contamination in the Drinking Water Supply throughout Lower Platte North NRD by the Development of a Hydrogeologic Assessment and Implementing Best Management Practices – A Schuyler Case Study

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

Sponsor Business Name: Lower Platte North Natural Resources District

Sponsor Contact's Name: Eric Gottschalk

Sponsor Contact's Address: 511 Commercial Park Rd P.O. Box 126 Wahoo, NE 68066

Sponsor Contact's Phone: 4024434675

Sponsor Contact's Email: egottschalk@lpnnrd.org

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

   Grant amount requested. $ 233,100.00

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

   If a loan is requested amount requested. $ -

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

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. Click here to enter text.
- What is the population served by your project? Click here to enter text.
- Provide a demonstration of need. Click here to enter text.
- **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☒
G&P - T&E consultation (required)	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☐

Click here to enter text.

4. **Partnerships**

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

LPNNRD will work with the City of Schuyler and staff from UNMC on this project. Schuyler is not committing funds towards this grant, but their input will be invaluable as it is their municipal water supply that is at risk from elevated

nitrates in the groundwater. UNMC staff will work with LPNNRD staff and present information on the health impacts of high nitrates in the drinking water at NRD educational events. Since these will be informal partnerships, there is no formal documentation of agreement. Both will play a vital part in the success of the project.

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

City of Schuyler will provide data about their water quality as well as their concerns and recommendations as the project moves forward. The staff at Schuyler utilities has a good understanding of the local producers and can identify and work with those that they deem most amenable to implementing BMPs.

UNMC will offer guidance as to the health effects of nitrates in the drinking water. Staff from UNMC will prepare and present data at NRD educational events on the topic. There is much research in this sector and the impact on health is a rapidly evolving topic. Having UNMC present their findings will help to keep the local populace informed.

5. Other Sources of Funding

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

The total project costs will be $388,500.00. LPNNRD is asking for $233,100.00 from the Water Sustainability fund (60%). LPNNRD will apply for an NET grant to split the remaining $155,400.00 (40%). If LPNNRD is successful in obtaining NET funding for the project, it will be at a 50/50 match rate. LPNNRD will pay their 50% from local funds. NET is aiming for a January 2023 date for the approval of grants. If the NET grant is unsuccessful, LPNNRD is prepared to pay the entire 40% cost from budgeted funds. The chart below shows the cost breakdown for the project. Any funds marked as NET will be covered by LPNNRD if that grant is unsuccessful.

Table 1: Funding Partners and Costs

		Project Cost Share Breakdown		
Project	Project Cost	WSF	LPNNRD	NET
Iron Chlorosis	$36,000.00	$21,600.00	$7,200.00	$7,200.00
Cover Crops	$24,000.00	$14,400.00	$4,800.00	$4,800.00

Fertigation	$5,000.00	$3,000.00	$1,000.00	$1,000.00
Variable Rate Nitrogen	$20,000.00	$12,000.00	$4,000.00	$4,000.00
Gravity Conversion	$50,000.00	$30,000.00	$10,000.00	$10,000.00
Soil Sampling	$20,000.00	$12,000.00	$4,000.00	$4,000.00
Soil Moisture Sensors	$7,500.00	$4,500.00	$1,500.00	$1,500.00
Water Flow Meters	$170,000.00	$102,000.00	$34,000.00	$34,000.00
Hydrological Assessment	$56,000.00	$33,600.00	$11,200.00	$11,200.00
Totals	$388,500.00	$233,100.00	$77,700.00	$77,700.00

6. **Overview**

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

Nebraska's Natural Resource Districts, created in 1972, are tasked with a variety of duties. Groundwater management, including quantity and quality concerns, is among the most important duties which NRDs are tasked.

Managing a resource that cannot be seen is challenging. Lower Platte North NRD (LPNNRD) conducts spring and fall water level readings, installed district wide remote read water level monitoring equipment, and conducts periodic quality samples to assess overall aquifer health. These efforts are input intensive, taking considerable staff time to acquire, process, and utilize the data. LPNNRD seeks a more robust, accurate, and efficient way to manage groundwater.

The science of groundwater is evolving rapidly, incorporating these advancements is a crucial part of effective management. To better understand the resource, LPNNRD works with various local, state, and federal entities to create new datasets and models. Airborne Electromagnetic (AEM) data was obtained for the district and has become a crucial piece of LPNNRD's management strategy. While AEM data has become an integral resource there are methods to refine the data to better understand the underlying aquifer network. LPNNRD seeks to make these refinements through the completion of a hydrogeologic assessment. Neighboring NRDs have completed this assessment and including LPNNRD's data creates a seamless dataset across multiple groundwater jurisdictions. This will be an invaluable asset for collaboration between various regulatory authorities seeking to effectively manage the groundwater resource.

Geology is the key component to managing groundwater. Knowing the geologic makeup of an area allows identification of sufficient sands and gravels to support community development and siting of irrigation and municipal wells. Identifying areas susceptible to contamination allows intervention before contaminants

reach critical levels. Groundwater quantity and quality are of vital importance to the health of Nebraska's economy and citizens.

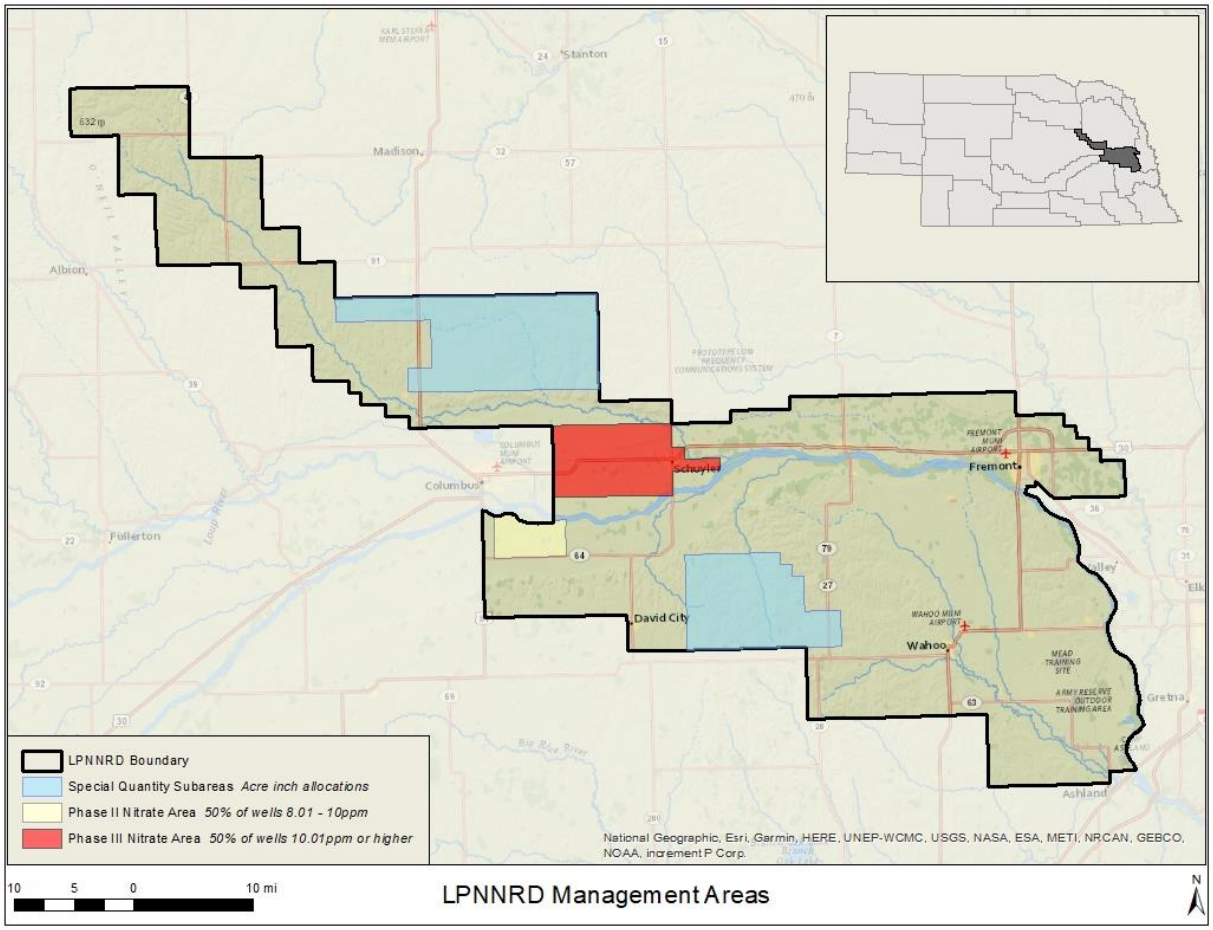

Figure 1: Map showing LPNNRD Management Areas

LPNNRD is experiencing the effects of groundwater quantity. Two areas, bordering multiple NRDs, are of particular concern. Conflict occurs between domestic users and irrigators when irrigation begins in earnest. LPNNRD has restrictions in place to ease the conflict, but a better understanding of the hydrogeology of the area will allow for better management and an easing of restrictions. As these concerns become more frequent across LPNNRD, the increased understanding of the area's hydrogeology will lead to more equitable solutions between competing interests for water use.

Elevated levels of nitrates in groundwater are an increasing problem throughout Nebraska. Nitrate contamination of the drinking water is related to health concerns, including "blue baby" syndrome, cancers, cardiac issues, etc. EPA safe drinking water standards are 10ppm nitrates and report:

- 13,418mi^2 or 17% of Nebraska's land area is above 5ppm
- 18% of Nebraska's population is reliant on self-supplied drinking water
- Nitrates increase over time without intervention.

Protecting drinking water from nitrates often involves costly measures. Hastings received WSF funding for approximately $4.4 million for reverse osmosis equipment and injection wells. This was part of a larger project estimated at $46 million. Platte Center received WSF funding of approximately $210,000 towards a $350,000 project to drill a new well. These projects were funded due to concerns about the sustainability of the drinking water supply. At best, these are temporary solutions and not truly sustainable. If nitrate levels in these areas continue to increase additional steps will need to be taken to protect the drinking water supply, leading to increased taxpayer burden. A truly sustainable solution to the problem of groundwater nitrates is preventing the nitrate concentration to exceed the 10ppm EPA standard.

LPNNRD's project seeks a multi-pronged approach to create a truly sustainable approach to provide healthy drinking water.

- Create hydrogeological assessment for the entire district.
    - This data will give the clearest picture of how groundwater moves throughout the NRD.
        - Identifying those areas most susceptible to nitrate contamination will allow LPNNRD to proactively invest in best management practices (BMPs) and increase sampling efforts to ensure nitrates do not exceed 10ppm.
- Immediate implementation of best management practices in the existing 65mi^2 Richland-Schuyler Phase III area.
    - 50% of wells test higher than 10.01ppm
        - Contains greater than 90% of Schuyler's drinking water protection area
        - Schuyler drilled two new wells due to nitrates
        - Only remaining option is treatment facility
    - Test utility of previously completed hydrogeologic assessment for siting BMPs and their efficacy
        - Controls already in place for robust sampling
        - BMPs chosen in consultation with UNL, NRCS, and producer survey
            - Iron Chlorosis Treatments
                - High pH in area leads to continuous corn
                    - Treatment allows proper rotation
            - Cover Crops
                - Shown to reduce nitrates/fix soil
            - Fertigation and variable rate nitrogen

        - More efficient fertilization leading to less contamination
    - Gravity conversion
        - Slower infiltration rates
        - Reduced consumption
    - Soil sampling
        - Continue monitoring nitrate levels
    - Soil moisture sensor and flow meters
        - More efficient irrigation (quantity and quality benefits)
    - Run BMPs in conjunction with NRCS Eqip program for maximum benefit
- Lessons learned to be applied NRD-wide and providing a statewide blueprint for nitrate remediation.

The completion of the hydrogeologic assessment has far ranging implications. The knowledge gained by completion of the district-wide hydrogeologic assessment will give LPNNRD a robust data set to base management decisions in the future. The immediate application of this knowledge in the existing Phase III area will allow LPNNRD to assess the efficacy of various programs for immediate implementation when the assessment is completed district wide. Neighboring NRDs have completed this assessment and the inclusion of the LPNNRD dataset will create seamless hydrogeological assessment data across a wide swath of eastern Nebraska. This dataset can be utilized by various partner agencies to accomplish a wide range of local, state, and federal goals. With funding assistance from WSF, LPNNRD can begin to create a truly sustainable groundwater supply for not only this district, but eastern Nebraska while providing a statewide blueprint for solving quality and quantity concerns.

7. Project Tasks and Timeline

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

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

- What activities (Tasks) are to be completed.
- An estimate of each Tasks expenditures/cost per year.

- Activities in years 4 through project completion under a single column.

LPNNRD proposes a series of projects over the course of three years to help address nitrate contamination in the Phase III Groundwater Area and gain a better understanding of the groundwater below our feet. It is anticipated that some years will see more activity than others so it is difficult to quantify the rate at which grants funds will be expended. LPNNRD will assume a yearly one-third depletion of funds, though actual amounts may vary significantly based on popularity. The following table is a summary of projects and funding by year.

Table 2: Project costs by year

	Funding Years			
Task	Year 1	Year 2	Year 3	Total
Iron Chlorosis	$12,000.00	$12,000.000	$12,000.00	$36,000.00
Cover Crops	$8,000.00	$8,000.00	$8,000.00	$24,000.00
Fertigation	$1,666.67	$1,666.67	$1,666.67	$5,000.00
Variable Rate Nitrogen	$6,666.67	$6,666.67	$6,666.67	$20,000.00
Gravity Conversion	$16,666.67	$16,666.67	$16,666.67	$50,000.00
Soil Sampling	$6,666.67	$6,666.67	$6,666.67	$20,000.00
Soil Moisture Sensors	$2,500.00	$2,500.00	$2,500.00	$7,500.00
Water Flow Meters	$56,666.67	$56,666.67	$56,666.67	$170,000.00
Hydrological Assessment	$18,666.67	$18,666.67	$18,666.67	$56,000.00
Totals	$129,500.00	$129,500.00	$129,500.00	$388,500.00

8. **IMP**

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

Section B.

DNR DIRECTOR'S FINDINGS

Prove Engineering & Technical Feasibility

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

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

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

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

1.A.1 Insert a feasibility report to comply with Title 261, Chapter 2, including engineering and technical data; Click here to enter text.

1.A.2 Describe the plan of development (004.01 A); Click here to enter text.

1.A.3 Include a description of all field investigations made to substantiate the feasibility report (004.01 B); Click here to enter text.

1.A.4 Provide maps, drawings, charts, tables, etc., used as a basis for the feasibility report (004.01 C); Click here to enter text.

1.A.5 Describe any necessary water and/or land rights including pertinent water supply and water quality information (004.01 D); Click here to enter text.

1.A.6 Discuss each component of the final plan (004.01 E); Click here to enter text.

1.A.7 When applicable include the geologic investigation required for the project (004.01 E 1); Click here to enter text.

1.A.8 When applicable include the hydrologic data investigation required for the project (004.01 E 2); Click here to enter text.

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). Click here to enter text.

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

1.B.1 Insert data necessary to establish technical feasibility (004.02);

LPNNRD worked with UNL on the *Vadose Zone and Groundwater Nitrate Study* published in 2021. This study shows the nitrates in the Phase III area are mostly inorganic, and the result of over fertilization and irrigation. This study is available at: https://lpnnrd.org/wp-content/uploads/2022/02/Lower-Platte-North-NRD_Vadose-study_August2021.pdf. This study, along with existing LPNNRD data, collected yearly, shows a clear threat to the drinking water supply of rural residents and the City of Schuyler.

The proposed Hydrological Assessment will be based on completed studies by surrounding NRDs and to create a seamless dataset across multiple NRD jurisdictions. It will help to bolster AEM data already obtained by the Eastern Nebraska Water Resources Assessment (ENWRA - https://enwra.org/), which is a coalition of NRDs, NeDNR, USGS, and UNL CSD and School of Natural Resources to gain a better understanding of the interaction of surface and groundwater in eastern Nebraska.

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

The largest part of the project, and the one that will help drive this, and all future projects, is the Hydrogeologic Framework Assessment. The Assessment will utilize all available geologic data, including well logs and University of Nebraska Conservation Survey Division (CSD) test holes. The data collection, review, assessment, and interpolation process will differ from the recently completed Airborne Electromagnetic (AEM) data gathered in 2021. LPNNRD will hire a consultant to utilize existing information and follow a consistent and proven approach to perform an interpretation of data across the district. The data gleaned from this study will help to fill in gaps in the AEM data and create a seamless dataset across multiple NRDs, as groundwater pays little attention to political boundaries.

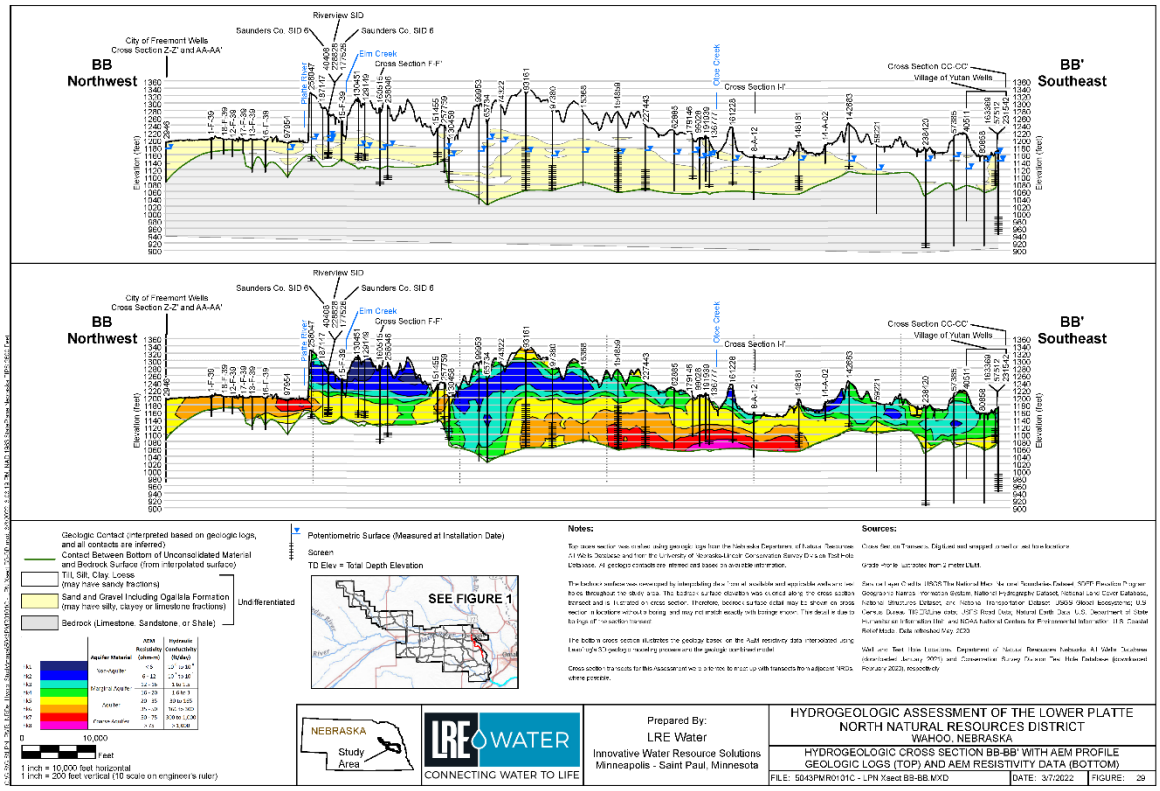

Figure 2: Cross section comparing AEM data and Hydrogeologic data with AEM data

With the completion of the hydrogeologic assessment all Lower Platte River Basin NRDs will have seamless AEM and geologic frameworks. MODFLOW can be utilized to create a uniform flow model allowing for true collaboration between NRDs and the Nebraska Department of Natural Resources (NeDNR). The assessment will include GIS deliverables including the following:

- NRD-wide vulnerability assessment
- Irrigation well development risk layer
- Groundwater flow layer

LPNNRD's consultant will utilize techniques and experience gained from other NRDs. The scope of work will include a kickoff meeting defining work to be accomplished and a final project meeting to go over results and GIS deliverables.

1) Project Management and Meetings
    a. LPNNRD staff will coordinate with the chosen consultant to go over expectations and deliverables
2) Hydrogeologic Framework Assessment
    b. Consultant will complete the hydrogeologic evaluation and create raster surfaces of unconsolidated materials utilizing accepted techniques from ArcGIS Spatial Analyst.
3) Deliverables

c. GIS Layers allowing for further evaluation of the districts hydrogeology
d. A robust evaluation of the entire NRD to include GIS files and hydrostratigraphic surfaces.
e. District-wide vulnerability and irrigation development risk layer
f. ESRI geodatabase and other mapping deliverables to be used in conjunction with AEM data to assist LPNNRD with management decisions relating to quality and quantity issues

A general overview of geologic framework activities is presented in the following chart:

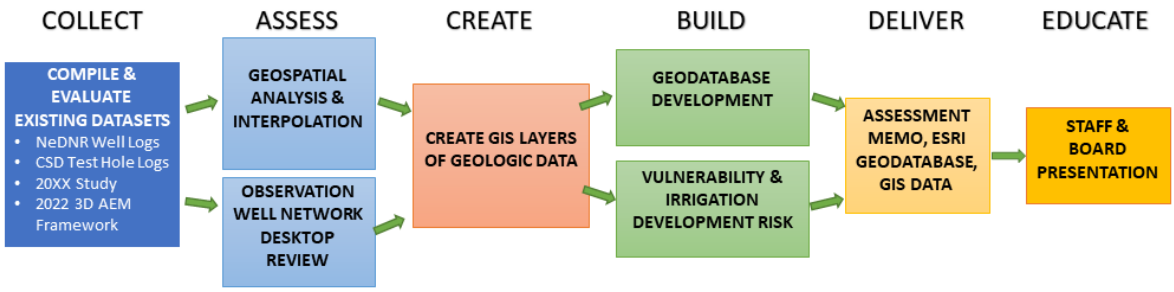

Figure 3: Hydrogeologic Assessment Development Process

While LPNNRD's consultant is completing the hydrogeologic framework, LPNNRD staff will contact landowners in the Richland-Schuyler Phase III area and begin signing producers up for best management practice implementation. A detailed plan of development for these efforts is as follows:

1) Identify producers within the Phase III area.
2) Contact producers and hold an open house detailing the cost share opportunities available.
3) Site visit to assess the viability of the proposed BMP
4) Sign producer up for proposed BMP
5) Assist with implementation of BMP
6) Monitor BMP progress and effect on Nitrate level
    i. Did the proposed BMP lessen, worsen, or stabilize the amount of nitrate from the prior years?
7) Keep spreadsheet of active BMPs and effect on nitrate contamination for future projects.
    ii. A list of the most beneficial BMPs will save time and expenses on future projects throughout the district.

Upon completion of these activities LPNNRD will have a better understanding of risk factors throughout the district for nitrate contamination and can take proactive steps to protect the drinking water supplies of all communities with LPNNRD. The hydrogeologic data will provide additional information on quantity, allowing LPNNRD to work with local producers on irrigation and developers on community planning. These projects will lead to a truly sustainable water supply for various water users in LPNNRD.

The lessons learned from this project can be applied to other areas of Nebraska facing these same issues, saving time and expense. Communities will not have to start from scratch, there will be an existing record of the most effective strategies available.

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

LPNNRD worked with ENWRA to obtain AEM data throughout the area. While this data is very informative, combining it with hydrogeologic data allows for a more robust environment from which to set policy. Lower Elkhorn and Papio NRDs have already completed a hydrogeologic assessment. Their work has shown the benefits of this model and will allow for faster completion of LPNNRD's project. There are cost savings to conduct this study since the framework on how to conduct the study is already documented on prior projects.

LPNNRD consulted with UNL and NRCS on known best practices to address nitrate contamination. LPNNRD met with area producers and distributed a questionnaire asking what, if any, best management practices and cost share opportunities producers would be receptive towards. Comparing the results from the questionnaire to UNL and NRCS guidance is what drove the inclusion of the best management practices requested in the WSF grant application. Working with local producers is the most effective way to make progress on any problem.

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).

The City of Schuyler has drilled two new wells to address nitrate problems in their drinking water supply. Schuyler staff have noted that there are no options for further well development. If the nitrate problem continues unabated, they will be forced to build and operate a water treatment facility. This will cost many times more than addressing the root issue. This project will be the beginning of a final solution for Schuyler, and rural residents, to bring the nitrates in the groundwater

to acceptable levels. The best management practices coupled with the hydrogeologic framework will have lasting benefits for Schuyler and other communities in LPNNRD and statewide.

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.

LPNNRD staff consulted Schuyler Utilities staff about their concerns with nitrate contamination in the groundwater. It was revealed that two wells have recently been drilled to address nitrate contamination in existing wells. According to Schuyler staff, there are no viable options for further well expansion. Schuyler's only remaining option for nitrate remediation would be to build, and maintain, a water treatment facility. Such an endeavor would cost significantly more than treating the root of the problem and bringing the nitrate level of the groundwater, flowing to Schuyler's wellfields, to acceptable EPA levels.

There is no next best alternative for the hydrogeologic framework. AEM data can be used as a proxy data source, but the hydrogeologic framework will help to fill in data gaps in the AEM data and provide a more robust dataset to drive decision-making.

3. Document all sources and report all **costs** and **benefit data** using current data, (commodity prices, recreation benefit prices, and wildlife prices as prescribed by the Director) using both dollar values and other units of measurement when appropriate (environmental, social, cultural, data improvement, etc.). The period of analysis for economic feasibility studies is the project life, up to fifty (50) years; *or*, with prior approval of the Director up to one hundred (100) years, (Title 261, CH 2 - 005).

The project cost estimate is $388,500. This includes $56,000 for the hydrogeologic assessment and $332,500 for best management practices. The cost estimate for the hydrogeologic framework was provided by LRE water, who has completed this type of project for neighboring NRDs. The basis for the cost is associated with the number of well logs analyze and experience with other projects. The project life is estimated at a minimum of 20 years, or longer depending on advancements in the interpretation of geologic data. Best management practice costs were reached by consulting the NRCS EQIP funding which will be used as a compliment to WSF and local funds.

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).

This project will have no engineering, inspection, or construction costs. The only maintenance costs will relate to maintenance on water flow meters, which the NRD contracts out at a current rate of $60 per meter. Costs above and beyond maintenance are the duty of the producer. Project life is estimated as a minimum of 20 years on the hydrogeologic assessment. Project life on best management practices is wholly dependent on the individual producers.

3.B Only primary tangible benefits may be counted in providing the monetary benefit information and shall be displayed by year for the project life. In a multi-purpose project, estimate benefits for each purpose, by year, for the life of the project. Describe intangible or secondary benefits (if any) separately. In a case where there is no generally accepted method for calculation of primary tangible benefits describe how the project will increase water sustainability, in a way that justifies economic feasibility of the project such that the finding can be approved by the Director and the Commission (005.02).

The hydrogeologic assessment will be a crucial resource for LPNNRD staff and board to drive policy and manage groundwater in terms of both quantity and quality. Targeting of BMPs in areas discovered to be vulnerable to nitrates will drive down costs and bring better outcomes to rural residents and communities. This assessment will provide guidance for future projects and funding in collaboration with NeDNR, NDEE, NET, and Federal partners.

The primary tangible benefit is a challenge to define. Proper long-term management of groundwater ensures that future uses of the groundwater can occur sustainably and allow current and future users beneficial use of groundwater that is safe and plentiful. In a state as reliant on groundwater as Nebraska a sustainable water supply is a necessity. The hydrogeologic assessment and targeted best management practices will ensure a bright future for the residents of LPNNRD. These projects will provide relevant decision makers with the confidence that their decisions are based on the best available scientific data.

Nebraska’s reliance on water grows yearly. Water users in the LPNNRD include communities, industry, commercial, agriculture, and private wells. Omaha and Lincoln, the two major population centers in the state, have wellfields in LPNNRD. MUD and Lincoln Water Systems rely on a safe and plentiful supply of water for their customers. Irrigators and cattle producers need to be able to rely on the availability of water for their crops and livestock. With all of these interconnected uses of water, it is imperative that LPNNRD and surrounding NRDs have knowledge of the water under their borders.

Perhaps the ultimate primary tangible benefit is simply by knowing how groundwater moves, and with an arsenal of proven best management practices available, communities and rural residents in LPNNRD can feel confident that the water they consume is safe and well within EPA guidelines for nitrates and other contaminants. Schuyler will be the first community to benefit from this project, but they will not be the last. This kind of sustainable development in terms of quantity and quality will allow Nebraska's population to not only grow but thrive.

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).

The total project cost of $388,500 is shown in *Table 2* and will be utilized over the course of three years. *Table 2* is further summarized below:

Table 3: Yearly project costs by agency

	Funding Years			
Funding Partner	Year one	Year Two	Year Three	Total
WSF	$77,700.00	$77,700.00	$77,700.00	$233,100.00
LPNNRD	$25,900.00	$25,900.00	$25,900.00	$77,700.00
NET	$25,900.00	$25,900.00	$25,900.00	$77,700.00

The local share will be split between LPNNRD and NET funding. If NET funding is unavailable, LPNNRD's share will increase by the same amount to $155,400. An acceptable method for calculating cost v benefit does not exist for a hydrogeological assessment. The accessibility of this data is a powerful tool when working with producers, communities, and the public to manage water resources. An adequate and safe supply of water is crucial to the economy of Nebraska and its communities.

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.)

There is no generally accepted method for calculating primary tangible benefits for a hydrogeologic model or removing nitrates from drinking water. The next best proxy is to look at the costs associated with other alternatives. Without a firm understanding of how groundwater moves throughout the district, communities will find themselves in a position where eventually they will have to build treatment facilities for their drinking water. Schuyler already finds itself in this position. With no further options for new well development a water treatment plant is an eventuality. Without an engineering estimate it is difficult to place an exact price on what such a facility may cost but looking towards other projects may provide some guidance. Platte Center was forced to drill a new well to avoid high nitrates in their drinking water at a cost of $350,000. The City of Hastings

was forced to build a treatment facility at a cost of roughly $46 million dollars including $7.35 million for the installation of reverse osmosis treatment equipment and four injection wells (~$4 million WSF funding). The population of Hastings is approximately four times that of Schuyler. While there are many factors that influence costs, if we simply take the total estimated cost of the Hastings facility and divide by difference in population, a treatment facility for Schuyler may cost between $1.5 million and $10 million depending on the level of treatment required. Reduction of contaminants is a far less expensive and truly sustainable path forward for municipal water systems and LPNNRD wants to lead the way.

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.

   LPNNRD has budgeted funds to cover the 40% cost share. These funds will be used as necessary and be available for the duration of the grant.

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

   LPNNRD's budget comes from a mill levy assessed to property values. The budget is set on a yearly basis and has stayed static for several years. A portion of the budget has been allocated to ensure there is sufficient funding to cover LPNNRD's 40%.

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.).

   As envisioned, the project will have minimal impact on the existing landscape. The existing landscape will not be altered from current agricultural use. There will be no new disruptions to flora or fauna created by the project.

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

   In 1972, the Nebraska Legislature created and declared that NRDs are essential to the health and welfare of the people and the State of Nebraska. NRDs were tasked by the legislature to conserve, protect, develop, and manage the state's natural resources. LPNNRD employs a professional staff upon whose shoulders this responsibility falls. LPNNRD staff are trained and well qualified these cost-share programs as outlined in the grant application. Staff have experience with

all the project areas proposed and are fully capable of executing the vision of our locally elected Board of Directors. Staff have the expertise to assist producers, install and maintain equipment, and both analyze and utilize any data collected during the project.

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

LPNNRD adopted a Groundwater Management Plan (GMP) in 1997, https://lpnnrd.org/wp-content/uploads/2018/12/GWMA_Rules__Regulations-.pdf. This plan was last amended in 2018. The GMP addresses all facets of Nebraska Revised Statute 46-709 to protect the district's groundwater quantity and quality. On June 15th, 2018, the LPNNRD Board Chair signed a voluntary integrated management plan, https://lpnnrd.org/wp-content/uploads/2018/06/IMP_Final.pdf. This plan strengthened the partnership between LPNNRD and Nebraska Department of Natural Resources (NeDNR). This project meets the criteria of both plans in seeking to sustainably manage both groundwater quantity and quality to protect the interests of competing water users.

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. Click here to enter text.

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.

On July 1st, 1972, the Nebraska Legislature created the Natural Resources Districts pursuant to Chapter 2, Article 32, 2-3201. The Legislature tasked NRDs with the management of groundwater and hydrologically connected groundwater and surface water. Chapter 46, Article 7, 46-702 of the Groundwater Management and Protection Act states, "The Legislature also finds that natural resources districts have the legal authority to regulate certain activities and, except as otherwise specifically provided by statute, as local entities are the preferred regulators of activities which may contribute to groundwater depletion."

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

LPNNRD staff met with staff from City of Schuyler Utilities to discuss their concerns regarding nitrate contamination of their drinking water supply. Schuyler staff noted that two new municipal wells have been drilled to protect the towns drinking water supply from nitrates. It was further noted that these new wells contained iron, manganese, and uranium. With no further options for development, Schuyler will need to construct and operate a water treatment facility, if the root cause of the nitrate problem is not addressed. This will be a costly proposition for Schuyler. A far less expensive, and sustainable, option is to address the source problem and bring the nitrate level of the area to within EPA standards. Failure to act will have additional negative consequences for rural residents who do not rely on a municipality for their drinking water needs. Inaction will lead to a worsening of nitrates in the drinking water supply and will result in poor health outcomes for the residents of the area.

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.

    - High nitrates in drinking water are a problem throughout Nebraska. This project seeks to remove them from the groundwater.

- This project seeks to protect the drinking water supply of both urban and rural residents. The 2020 Census shows the following population breakdown:
    - City of Schuyler – 6547 residents
    - Village of Richmond – 70 residents
    - Rural and suburban communities – 1318
    - Total residents of area – 7935
- The project will address the nitrate concerns by taking proactive measures to bring the nitrates in the groundwater down to acceptable EPA levels. This will be accomplished through education and implementation of best management practices. Successes from this plan can be applied to future nitrate concerns throughout the district.
- LPNNRD established Phase Areas (those high in nitrates) in 2003. Our rules require yearly sampling and reporting so the nitrates can be monitored. In the Richland-Schuyler area these nitrates have steadily increased and have become a problem for the residents that rely on groundwater as their source of potable water. LPNNRD holds yearly classes to educate producers on fertilizer applications, but it has become apparent that best management practices will need to be part of a cost share program to be widely adopted.
- If this problem is not addressed, nitrates in this area will continue to worsen and Schuyler will be forced to build a treatment plant and rural residents would need to install reverse osmosis units, which are costly to install and difficult to maintain.
- Negative health outcomes have been linked to high nitrates in the drinking water supply including: (Presentation by Jesse E. Bell, PhD; Health Concerns with Nitrates in Drinking Water, May 2019)
    - Methemoglobinemia (blue baby syndrome)
    - Colorectal cancer
    - Thyroid disease
    - Neural tube defects
    - Pediatric cancers

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.

- LPNNRD has both a Groundwater Management Plan (GMP) and a Voluntary Integrated Management Plan (V-IMP).
    - GMP was first adopted in 1997 and last updated on June 15th, 2018
        - Issued by LPNNRD
    - The V-IMP was signed by the board chair on June 15th, 2018
        - Issued by LPNNRD and NeDNR

- LPNNRD has a long history of work to back the goals of both plans:
  - Yearly sampling requirements for Phase Areas
  - Intensive sampling of the entire district on a rotating schedule
  - Water Flow Meter installation required on all new wells and on any approved expansion of irrigated acres.
  - Producers must attend a Nitrogen and Water Certification class every four years.
    - Classes present information on fertilizer application and discuss nitrogen credits already present in the soil from previous applications. Irrigation timing, amounts, and how they affect fertilizer moving through the root zone are discussed as well.
- This project achieves goals in the GMP and IMP in the following ways:
  - Additional soil sampling of the area
    - Will allow for finer modeling of the area
  - Installation of Water Flow Meters
    - Allows for closer monitoring of water applications (a concern of both the GMP and IMP)
  - Best Management Practices
    - Begin to remediate nitrates from the soil of the affected area through UNL and NRCS recommended BMPs
  - Hydrogeologic Assessment
    - Build a hydrogeologic framework of LPNNRD to gain better understanding of nitrate flow through groundwater and total available groundwater.
    - Provide a better understanding of the development potential for future irrigation needs.
    - Fill in gaps in existing AEM Data
    - Expansion of the existing Nitrate Risk Tool
  - Future management decisions
    - This project and the products developed will allow LPNNRD to proactively address nitrate problems that are discovered in future. The hydrologic assessment will allow a better understanding of how groundwater flows through the district and which areas are more vulnerable to contamination and shortages. Once identified LPNNRD can begin targeting these areas with BMPs before the problem has a chance to reach critical levels.
    - Outcomes from this project will inform future projects as LPNNRD will have a better understanding of which BMPs prove most effective and which BMPs are more readily embraced by producers. This will save considerable time and expense in future efforts.

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.

This project is not intended to increase aquifer recharge and will not impact recharge, depletion, or stream flow aside from the water that will not be wasted by a water treatment facility and reduction in over irrigation.

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 goals of this project are to bring nitrate contamination of the groundwater under EPA guidelines for drinking water and apply these lessons to future communities facing the same problem.
- This project will provide these benefits by implementing best management practices and educating producers on the health hazards of consuming water high in nitrates. The completion of the hydrogeological assessment will be the driving force for applying the proper BMPs in this area and other areas of similar concern.
- If the project is successful, it will help achieve many of LPNNRDs water supply goals.
    - Sustainable drinking water supply for rural residents
    - Prevent Schuyler from building a water treatment facility
        - Potentially saving millions of dollars for taxpayers
    - Reduce the amount of fertilizer applied
    - Reduce over-irrigation
        - Sustainable supply of water for both agricultural and municipal users
    - Provide a hydrogeologic framework across LPNNRD and create a seamless dataset between multiple NRDs. This framework will allow for the siting of the proper BMPs for the specific conditions a community faces.
    - Evaluate the impact of new well development.
        - Siting of irrigation wells and monitoring wells where they are best suited.
    - Establish a better understanding of aquifer characteristics including:

        - Boundary conditions
        - Potential recharge areas
        - Aquifer vulnerability
            - Both quantity and quality
    - Increased understanding of the interconnectedness of surface water and groundwater (meets both state and local goals)
    - Provide online tools and better in-person trainings for producers to understand the impact of current practices on water quality and quantity
    - High quality data to be used in groundwater modelling such as MODFLOW.
- LPNNRD has a range of management and education requirements for the nitrate phase area. Even with these requirements nitrate contamination continues to increase, threatening the drinking water supplies for both rural and urban residents. The solutions to these problems are input intensive and provide very little economic gain for producers. Without cost share opportunities to offset the cost of the best management practices nitrates in the groundwater will continue to increase. LPNNRD rules and regulations do not allow for the kinds of restrictions regulating fertilizer application and irrigation until a Phase IV area is declared, 50% of wells +15ppm. By this time the level of nitrates in the groundwater will be high enough to constitute an emergency. Decreasing the nitrates in the groundwater supply before they reach this level is a far less expensive option than continuing the current path which will require heavy handed restrictions and the development of treatment facilities to ensure a safe drinking water supply. Treating the root cause of the issue before it becomes an emergency leads to true sustainability of the water resource.

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.

- This project will maximize the increased beneficial use of Nebraska's water resources in the following ways:
    - Provide a sustainable drinking water solution for area residents
    - Save taxpayer funds for a water treatment facility
    - Allow producers to understand their total water usage and decrease irrigation to match needs instead of watering indiscriminately
- This project will cause no reduction in the beneficial use of Nebraska's water resources.
- Clean drinking water is imperative for the residents of the State of Nebraska to thrive. The results of this project can be applied statewide in other areas of nitrate contamination.

6. Is cost-effective;

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

- The only ongoing costs associated with the project would be maintenance of the flow meters. LPNNRD currently bids out and contracts with a company to service 25% of currently installed flow meters per year. The cost for maintenance is $60 per meter. Costs for actual repairs are covered by the producer. Maintenance costs would be $10,200.00 at current contracted pricing to be paid every four years.
- The costs of this project are a fraction of what it would cost to build a treatment facility or install RO units in rural homes.
- The three-year costs of the project are presented in the table below:

Table 4: Project Costs by Task

Task	Cost Estimate
Iron Chlorosis	$36,000
Cover Crops	$24,000
Fertigation	$5,000
Variable Rate Nitrogen	$20,000
Gravity Conversion	$50,000
Soil Sampling	$20,000
Soil Moisture Sensors	$7,500
Water Flow Meters	$170,000
Hydrogeological Assessment	$56,000
Total Project Costs	$388,500

- Costs for a water treatment facility for Schuyler would be significantly higher to implement and have continuing costs far greater than treating the problem at its core.
  - The Hastings plant cost approximately $41 million, and simply drilling a new well in Platte Center cost $350,000. Neither project led to true sustainability, whereas this project seeks that goal and at a greatly reduced cost.

7. Helps the state meet its obliga8tions 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.

This project will not impact any state interstate compact, decree, or other such state contracts or agreements or federal law.

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 Untied 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 project is designed to protect the City of Schuyler Water System and domestic well users in the project area and provide a blueprint for future communities to follow.
- This project will protect the City of Schuyler's Water System from nitrate contamination above the EPA standard for drinking water (10ppm). Clean drinking water is a vital component to the health and prosperity of all Nebraskans.
- The cost savings of the project will be enormous.
    - Schuyler will not need to build a treatment facility
        - Costs could run into the millions
    - Rural residents will not need reverse osmosis units
        - Cost of the unit and proper installation may run into the thousands of dollars, which is a substantial burden for an individual resident.
    - Producers will have a better understanding of fertilizer requirements
        - Fertilizer is a major expense for producers. Cost savings here not only help the producers bottom line but protects the health of area residents from the dangers of high nitrates
    - Allow producers to better understand irrigation needs
        - Irrigation systems are expensive to run. Allowing producers better data for when, and how much, to irrigate conserves groundwater and puts more money back into the local economy
- High nitrates in drinking water can result in myriad health consequences. The Agency for Toxic Substances and Disease Registry lists the following: https://www.atsdr.cdc.gov/csem/nitrate-nitrite/health_effects.html
    - Methemoglobinemia (blue baby syndrome)

        - "Methemoglobinemia is the critical health effect from exposure to nitrates and nitrites. Depending on the percentage of total MetHb, the clinical presentation may be one of oxygen deprivation with cyanosis, cardiac dysrhythmias and circulatory failure, and progressive central nervous system (CNS) effects [Skold et al. 2011]. CNS effects can range from mild dizziness and lethargy to coma and convulsions [Fan and Steinberg 1996; Bradberry 2003; Osterhoudt 2001; Skold et al. 2011]."
    - Cardiovascular Effects
        - Hypotension
    - Reproductive and Developmental Effects
        - Anemia
        - Threatened abortion/premature labor
        - Preeclampsia
        - Spontaneous abortions
        - Intrauterine growth restrictions
        - Various birth defects
    - Studies have hinted at development of diabetes mellitus in childhood
    - Increased cancer correlation

9. Improves water quality;

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

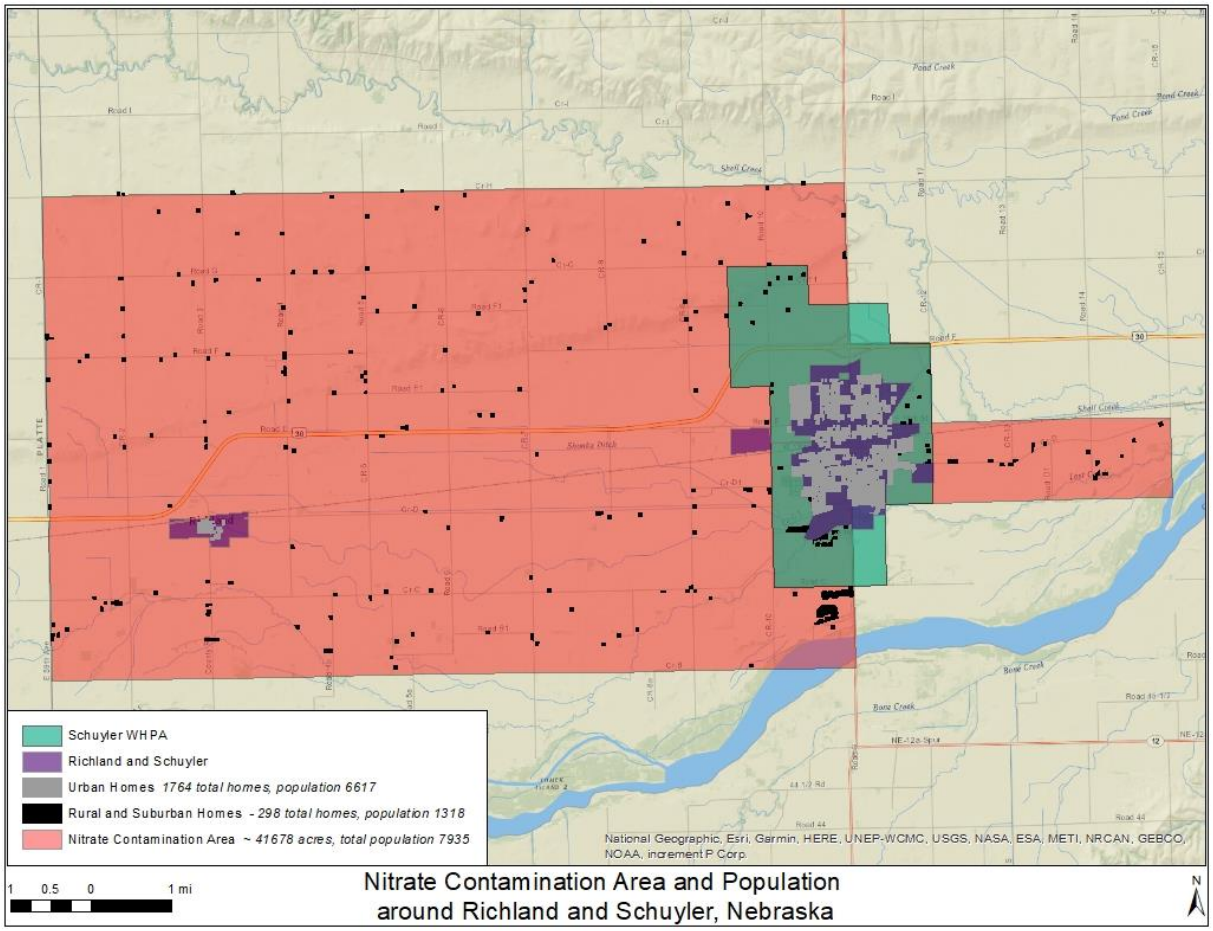

Figure 4:Project Area

- The area shown in the map is a Phase III nitrate area, meaning that 50% of tested wells are higher than 10ppm nitrates. The project seeks to bring these levels down to EPA drinking water standards through a series of best management practices. Geology is the key component of how nitrates infiltrate the aquifer and utilizing the geologic assessment allows for the selection of the most effective BMPs for the community in need.
- The target area as shown in the map has the following characteristics:
  - Approximately 41,678 acres in size
  - Urban Population of 6617 with 1764 homes
  - Rural and suburban population of 1318 with 298 homes
  - Total population of 7935
- Primary water uses are:
  - Municipal water supply
  - Domestic Wells
  - Agriculture – to include irrigation and livestock
  - Commercial/Industrial

- The only feasible alternate solution to the nitrate problem is twofold:
  - Outfit all rural and suburban homes served by a domestic well with a reverse osmosis unit. These units are costly to install and difficult to maintain.
  - Schuyler will need to build a treatment facility for high nitrates for their urban population. This will come at enormous cost to taxpayers.
- LPNNRD identified high nitrates in the groundwater in 2004 in the Richland Schuyler area. LPNNRD requires yearly soil and water sampling and provides courses for producers addressing the nitrate issue. These courses are well received but result in incremental progress as the solutions are input intensive and generate little revenue.
  - LPNNRD has just finished a project with funding assistance from NET.
    - The project sampled the vadose zone of the Phase III area and led to the development of a Nitrate Risk Assessment website for producers to gain an understanding of how practices affect the nitrates in the groundwater and how BMPs can help offset those impacts. The next step is to implement these BMPs and expand the hydrogeologic understanding to the entire NRD. Expanding the hydrogeologic assessment to the entire NRD will allow LPNNRD to target areas that are most vulnerable and begin working with producers to implement BMPs before there is a critical nitrate problem.

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.

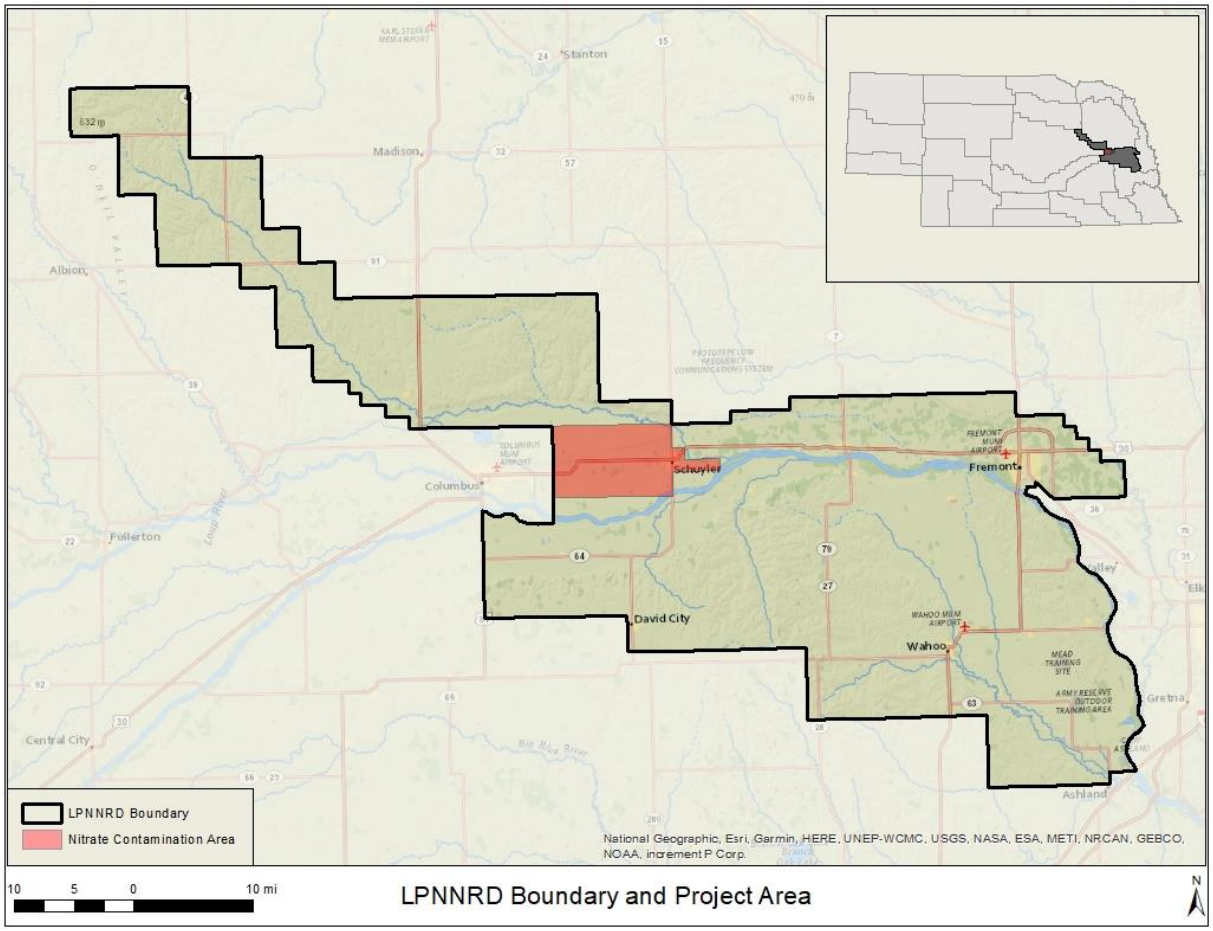

Figure 5: Map showing LPNNRD Boundary in relation to Nebraska

- Lower Platte North NRD is the local jurisdiction that supports the project. NRDs have statutory authority to regulate groundwater for both quantity and quality.
- LPNNRD is currently finalizing the upcoming budget. The upcoming budget will vary little from the previous budget, those amounts are listed below:
  - Property Tax Levy
    - 0.033449
  - Valuations
    - $10,406,030.147
  - Property Tax Request
    - $3,480,714.52
- LPNNRD will apply for NET funds to help make up the local 40% share. If unsuccessful, LPNNRD has funds budgeted for the entire 40% local share.

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 Lower Platte North NRD is the local jurisdiction. The specific plans are the following (see Figure 4 above):
        - Groundwater Management Area Rules and Regulations
            - https://lpnnrd.org/wp-content/uploads/2018/12/GWMA_Rules__Regulations-.pdf
        - Lower Platte North Natural Resources District Voluntary Integrated Management Plan
            - https://lpnnrd.org/wp-content/uploads/2018/06/IMP_Final.pdf
    - LPNNRD has worked on these plans continuously for many years.
        - The GWMA was established in 1997 in accordance with State law.
            - It has been updated and amended over the years based on new findings and advances in the science of groundwater.
        - The IMP was drafted in partnership with NeDNR and adopted in 2018.
            - Both LPNNRD and NeDNR provide yearly reports based on the requirements set forth in the IMP.
            - The IMP is evaluated on a periodic basis and changes can be made to better serve the interest of the district and NeDNR.
    - Groundwater Management Plan Goals
        - Increase water quality
            - Bring nitrate levels in line with EPA regulations for drinking water (under 10ppm) utilizing best management practices
            - Identify areas prone to contamination
        - Increase efficiency of water use
            - Meters allow producers to monitor water usage
            - Soil Moisture sensors allow producers to irrigate when necessary and not based on topsoil conditions
            - Monitor water use in conjunction with spring and fall water level measurements to assess aquifer health
            - Compare meter readings with real time data from monitoring stations
            -
        - Increase understanding of interconnectedness of aquifers
            - Hydrogeologic assessment combined with AEM data will give a better understanding as to the limits of induvial aquifers in LPNNRD.

- Unlike areas further west, aquifers in LPNNRD tend to be discrete and varied, with different areas having vastly different access to sufficient groundwater

- Voluntary Integrated Management Plan Goals
  - Update Policies, practices, and programs to maintain and improve water supply and water quality as it affects supply
    - Utilize data gathered to update list of best management practices
    - Set more accurate trigger levels for groundwater decline management
    - Identify areas of vulnerability for quantity and quality
  - Evaluate new technologies and methods of water accounting that support water management goals
    - Hydrogeologic assessment combined with AEM data gives a robust picture of groundwater and its interaction with surface water
    - Allows for closer cooperation between NeDNR and LPNNRD to jointly manage water use and quality
    - Allows for basin wide cooperation between local, state, and federal entities
      - Consistent dataset to draw conclusions
- Stakeholders in the project include
  - LPNNRD
  - Surrounding NRDs
  - ENWRA
  - State Agencies
    - NeDNR
    - NDEE
    - Others
  - University of Nebraska System
    - UNL CSD
    - UNL School of Natural Resources
    - Other departments/Universities as applicable
  - Federal Agencies
    - USGS
    - NRCS
    - FSA
    - USFWS
    - Other Federal Agencies as applicable
- There are many beneficiaries of this project from private citizens to local, state, and federal entities. LPNNRD has grave concerns regarding water quality as well as water quantity and having a hydrogeologic assessment to better understand the groundwater LPNNRD is tasked with protecting will prove invaluable. Beginning immediate work in the Richland-Schuyler Phase III area will address the problem of high nitrates in the groundwater

threatening the drinking water supply of area residents. Other beneficiaries of the project will include a litany of local, state, and federal agencies with jurisdiction over groundwater quality and quantity. Local water systems can utilize this data to site additional wells for future expansion and local producers will see benefits from the project as it will allow for the expansion of the Nitrate Risk Tool already in place in the Phase III area. This tool allows producers to input a variety of factors and see the predicted impact on their operation and surrounding environment. Giving producers this information will lead to efficiencies in fertilization and irrigation, giving them higher profits and a boost to the local economy. Neighboring NRDs can incorporate this data into their existing geologic assessments, allowing for more collaborative work across NRD boundaries. NeDNR and NDEE can utilize the data to improve their projects and programs including NeDNR Integrated Management planning and NDEE 319 funding assistance through EPA. NRCS and USGS can utilize the data in various federal programs. Ultimately the entire state will benefit from this project as LPNNRD will provide a blueprint to follow for other areas experiencing the problems currently facing LPNNRD. A path towards an actual sustainable supply of safe drinking water benefits everyone.

12. Addresses a statewide problem or issue;

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

Nitrates in the groundwater is a statewide issue. EPA estimates Nebraska has

- an area of 13,418 mi^2 with groundwater nitrates above 5 ppm.
- 17% of the state's area with groundwater nitrates above 5ppm.
- 18% of Nebraska's population to have self-supplied drinking water
    - (https://www.epa.gov/nutrient-policy-data/estimated-nitrate-concentrations-groundwater-used-drinking)

This means even with costly municipal treatment centers; a significant number of Nebraskans are still at risk of consuming elevated levels of nitrates in their drinking water. As groundwater does not follow political boundaries, issues in one political subdivision often occur in neighboring political subdivisions. This makes nitrate contamination a statewide issue, but it also means that proven solutions undertaken by one NRD may be applied to issues in another.

Locally, LPNNRD covers slightly over one million acres, including 27 cities and towns. The population of LPNNRD was 65,643 persons in the 2020 Census. The

entire district is currently considered a Phase One Management Area for Nitrates. Two additional areas are in Phase II (50% of area wells test 8.01-10ppm nitrates) and Phase III (50% of area wells test 10.01 or higher nitrates). To fully understand how contaminants move through the groundwater will require the development of a hydrogeologic assessment for the entire district. Once complete LPNNRD will be able to quickly assess areas at risk for elevated nitrates and begin working with producers to implement best management practices that will help to avoid a worsening of water quality and lead to a sustainable drinking water source for all residents of the district. LPNNRD proposes to begin implementing best management practices to address nitrate contamination in the Phase III area as part of this project. A hydrogeologic assessment for this portion of the NRD was completed as part of a prior project and has already reaped great benefits for LPNNRD decision-makers from a management perspective. Expanding the assessment to the entire district will prove invaluable. This is especially important due to the former AltEn ethanol facility recently being treated as a superfund site in Mead.

A hydrogeologic assessment not only shows areas vulnerable to groundwater contamination but will show areas susceptible to groundwater quantity concerns. In both ways the assessment will benefit residents of LPNNRD and Nebraska at large as a clean and plentiful source of water is vital to Nebraska's agriculturally dominated economy and health of its citizens.

Surrounding NRDs have completed a hydrogeologic assessment and adding LPNNRDs data will create a seamless hydrogeologic framework that may be utilized by NeDNR in their modelling efforts as well as other state agencies like NDEE to assess how contaminants flow through not just LPNNRD, but the entire region. This region contains wellfields for both MUD and Lincoln Water System. Understanding the risk of contamination to, and ability to supply sufficient water from, their wellfields is critical to a majority of the state's population.

Information obtained from the hydrogeologic assessment can be easily displayed in an easy to digest format. This will help educate the public on issues surrounding their groundwater. This information will help communities prepare plans for drinking water with NDEE and help support IMP plans, programs, and actions with NeDNR and NRDs.

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.

Funding partners and the amounts they will contribute are shown in the following:

Table 5: Funding partners

Partner	Funding
WSF	$233,100
NET	$77,700
LPNNRD	$77,700

WSF and NET funding are based on reimbursable expenses billed to the project. Neither WSF nor NET funds have been awarded to the project at the time of application. LPNNRD funding is already budgeted and available for project activities.

If the NET grant application is not approved, LPNNRD has funds committed to complete the project as applied. There will be no adjustment of project activities. If WSF funding is not available, LPNNRD will have to prioritize project activities based on available funding from NET and LPNNRD budget.

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.

The project occurs in two areas simultaneously. It covers the entirety of LPNNRD for the hydrogeologic assessment and focuses more narrowly on the Phase III area around Richland and Schuyler to apply the data the assessment provides. The assessment completed for this area will allow LPNNRD to target specific best management practices based on efficacy and willingness of local producers to implement. The project will help to remediate nitrate contamination in this area and provide LPNNRD a framework and blueprint to address nitrates and other groundwater issues before they reach a critical stage.

The watersheds affected will be listed in two tables. The first table will summarize the watersheds of the entirety of LPNNRD at the HUC8 level. The second table will be more narrowly focused on the Richland Schuyler Phase III area at the HUC12 level. Maps for both areas will follow each table.

Table 6: HUC8 Watersheds in LPNNRD

HUC8 ID	Name
10200202	Lower Platte
10220003	Lower Elkhorn

10200103	Middle Platte-Prairie
10270201	Upper Big Blue
10200203	Salt
10210009	Loup
10200201	Lower Platte-Shell
10220001	Upper Elkhorn

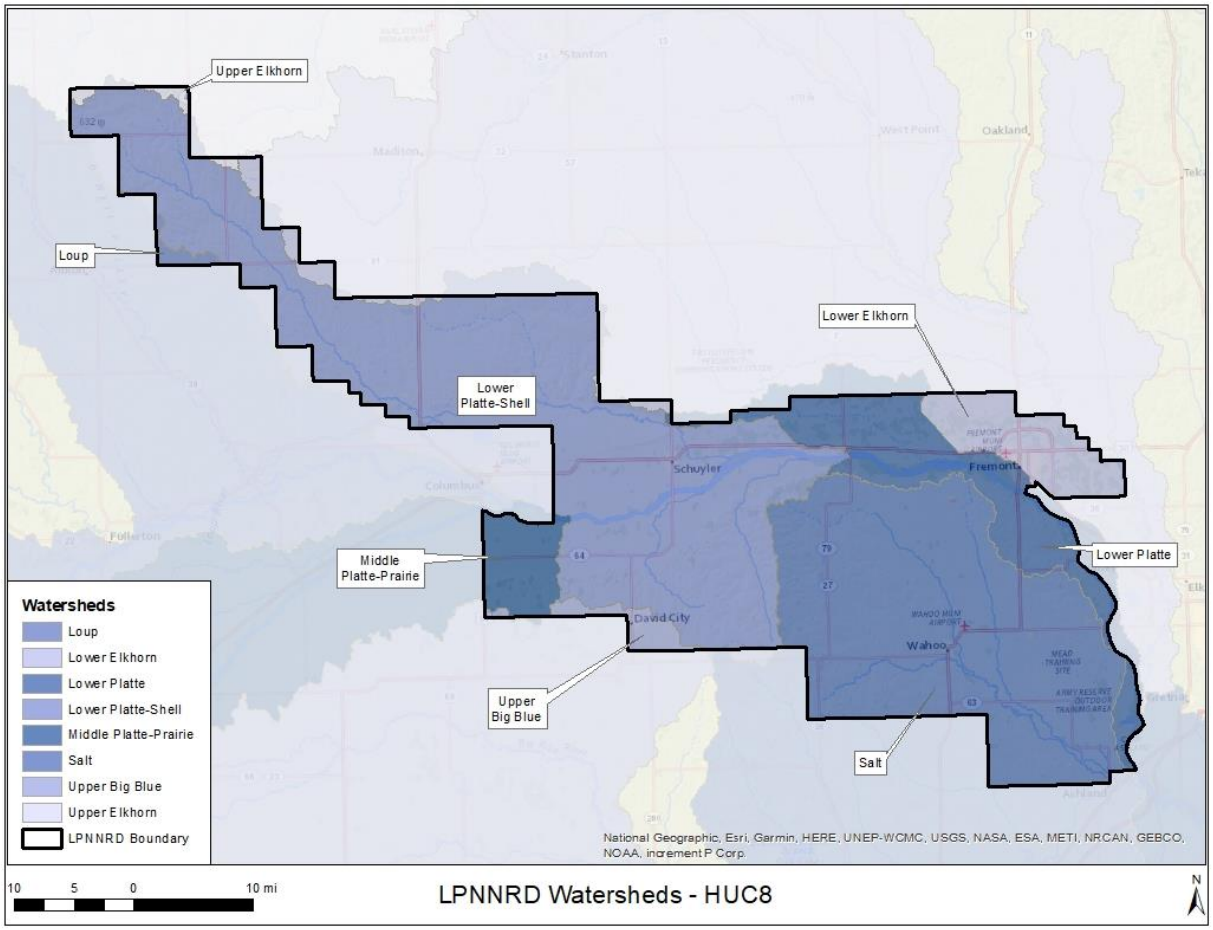

Figure 6: Map showing HUC8 watersheds in LPNNRD

Table 7: HUC12 Watersheds in Phase III Area

HUC12 ID	Name

102002010301	Shonka Ditch
102002010310	Lost Creek-Platte River
102002010306	Tomek Island-Platte River
102002020101	Rawhide Creek-Platte River
102002010209	Brewery Hill-Shell Creek
102002010302	Headwaters Lost Creek

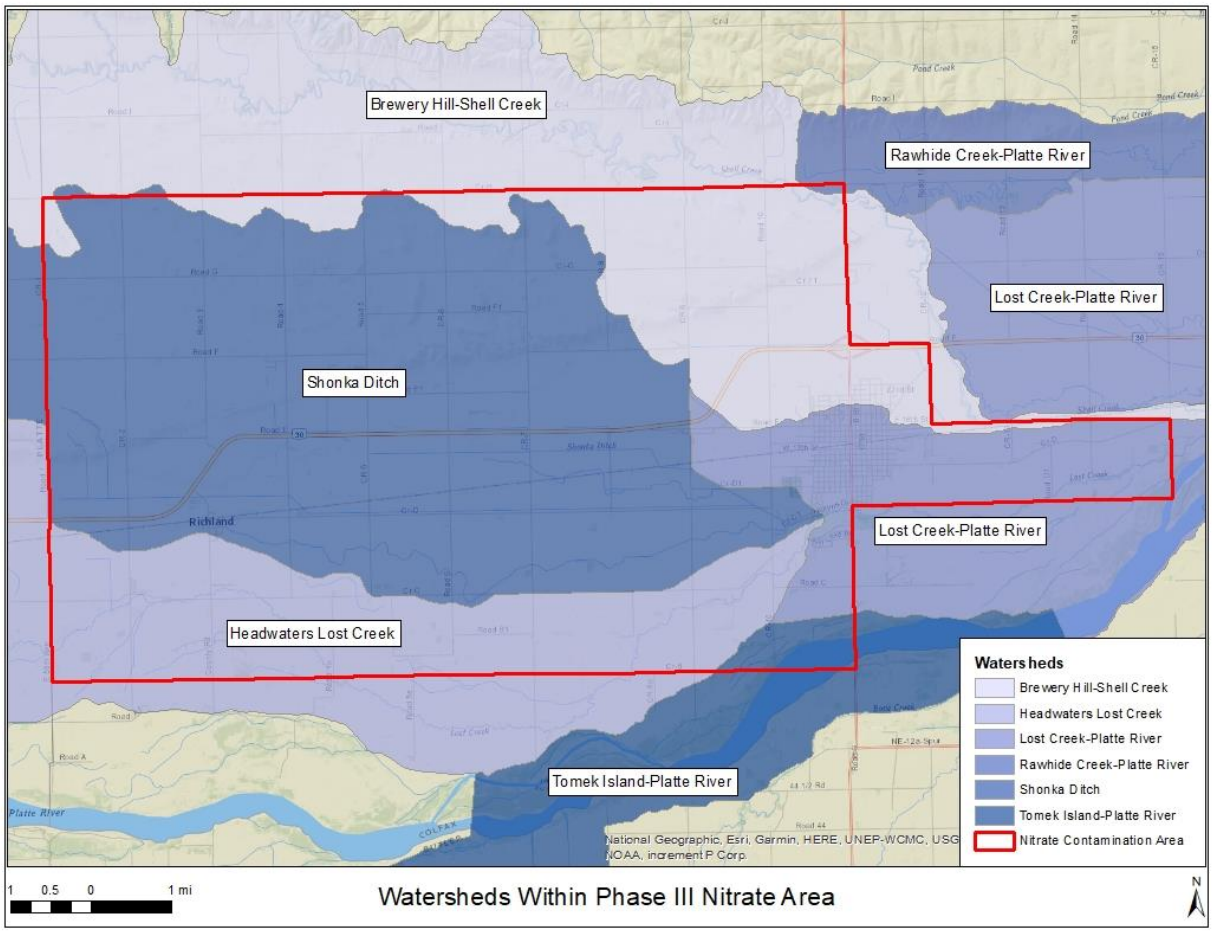

Figure 7: Map showing HUC12 watersheds in Phase III Area

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

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

The most recent NeDNR Annual Report and Plan of Work for the State Water Planning and Review Process is dated September 2020. LPNNRD's proposed hydrogeologic assessment will support this plan in various ways.

- Objective #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."
    - The hydrogeologic assessment's primary purpose is to fill in existing data gaps and strengthen the understanding of the groundwater supply, and its characteristics, in LPNNRD. This will allow the state and local entities to make key management decisions and support water resources planning (quantity and quality).
- Objective #2
  - "Provide staff and resources to support planning and implementation of water resources projects."
    - NeDNR staff will be involved in the development of the hydrogeologic assessment. NeDNR staff will have immediate access to the data as a tool for planning and implementing water resource projects.
- Objective #3
  - "Support locally developed water management plans for conjunctively managing hydrologically connected groundwater and surface water supplies."
    - The project will establish better understanding of aquifer characteristics including boundary conditions and areas of potential recharge.
    - The project will help to clearly define hydrologically connected surface and groundwater more clearly.
    - Serve as a foundation for the development of conceptual hydrogeologic models used to build numerical groundwater flow models utilizing programs such as MODFLOW.
- Objective #4
  - "Provide resources to map and identify areas vulnerable to flood damage."
    - This project is not intended to provide these resources.
- Objective #5
  - "Participate in interagency collaboration with federal agencies, state agencies, local NRDs, and other water interest entities on various water resources programs and projects."
    - LPNNRD and NeDNR have a long history of working collaboratively on water issues.
    - The hydrogeologic assessment will be made available to numerous entities including:
      - NeDNR

        - USGS
        - UNL
        - CSD
        - Surrounding NRDs
        - ENWRA
        - Other agencies and groups that have need of the data
    - NeDNR will be a partner on the project and track progress and provide feedback to ensure the assessment meets the needs of diverse users.
- Objective #6
    - “Consolidate and present information in a form that is understandable and useful to the public and interagency collaborators.”
        - The hydrogeologic assessment excels at presenting data in an easy to consume, highly visual format and can be incorporated into figures and maps as tools for outreach.
        - The assessment data can be utilized in custom websites to allow producers to see the impact of various practices on groundwater quality and quantity.

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:

    - Explain how the project meets each objective.
    - 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