

**Tri-Basin Natural Resources District
1723 Burlington St.
Holdrege NE 68949**

RFP for Engineering Services Groundwater Evaluation

Introduction

Tri-Basin Natural Resources District (TBNRD) requests proposals from qualified firms interested in providing engineering services to develop a groundwater supply evaluation tool. Groundwater level changes have been observed across TBNRD for more than 45 years. TBNRD needs a tool for understanding spatial and temporal changes in groundwater levels, to evaluate and identify trends and key factors. This tool will be used for analysis of groundwater supply trends for the purpose of helping the TBNRD Board of Directors make policy decisions regarding groundwater quantity management and groundwater supply augmentation.

Net Recharge Management Tool Draft Scope

The purpose of this project is to create a “Net Recharge Management Tool” to assist TBNRD in understanding and quantifying net aquifer recharge and groundwater level changes within TBNRD. The project study area includes evaluation of the entire TBNRD area and evaluation of each township individually.

Development of the Net Recharge Management Tool will include an evaluation of the current and historical groundwater conditions. The groundwater evaluation will include the following:

- **Water Balance Calculations:** Develop an annual water balance across the entire TBNRD and within each township. The water balance will be based on the following:

Inflows	Source
Precipitation Data	CNPPID and High Plains Regional Climate Center
Canal Diversions and Deliveries	CNPPID
Canal Seepage	Calculated Based on unlined canal surface area
Lake Seepage	CNPPID
Groundwater Flux In	COHYST
Streams and Drains Base Flow In	COHYST
Groundwater Recharge	COHYST
Net Runoff In (across study boundary)	COHYST
Outflows	Source
Groundwater Flux Out	COHYST, TBNRD
Streams and Drains Base Flow Out	COHYST
Field Evapotranspiration (ET)	COHYST
Stream ET	COHYST
Field Losses	COHYST
Lateral Losses	COHYST
Net Runoff Out (across study boundary)	COHYST
Livestock and Industrial Consumption	NDEE and DNR
Groundwater Data	Source
Groundwater Levels	CSD, CNPPID, TBNRD, DNR, USGS

- **Calibrate Water Balance Based on Historic Groundwater Analysis:** Estimate annual changes in groundwater volume using historic water measurements from Nebraska Conservation and Survey Division (CSD) groundwater data, USGS data, COHYST data and TBNRD throughout the study area. The annual changes in groundwater volume will be used to calibrate the water balance calculations over the time period of 1954 to 2022, or other calibration time period that may be proposed by interested firms. Water balance factors that will be calibrated based on the yearly changes in the groundwater volume include travel time through the vadose zone, surface water streamflow that leaves this study's boundary, and specific yield of the aquifer.
- **Evaluation of Key Factors:** Evaluate the relationship between the volume of groundwater and the key factors that affect the volume of groundwater. Factors that affect the volume of groundwater include precipitation, evapotranspiration, surface water diversions, groundwater flux, surface water streamflow, evaporation, recharge from reservoirs, recharge from canal seepage, groundwater pumping, and irrigation system efficiency. Evaluate trends based on historical records and water balance calculations.

Evaluation of trends will include quantification estimates for how precipitation, surface water diversions and deliveries, annual groundwater pumping volumes, irrigation methods, and recharge projects will impact net recharge, seepage, evaporation, evapotranspiration, runoff in and out of the system, and streamflow in and out of the system. The evaluation will assist with development of the Net Recharge Management Tool.

- **Net Recharge Management Tool:** A tool will be developed to estimate natural and human-induced recharge to and withdrawals from aquifers within TBNRD. The tool should also be able to accept inputs to allow evaluation of the impact of management practices and projects on recharge and groundwater volumes. The tool will estimate changes in net recharge and groundwater volumes on an annual basis for TBNRD as a whole and for each individual township within the district. Development of the tool shall utilize the best available data at the highest resolution feasible. The data to be entered by the user shall include:
 - Annual Precipitation (percent of average annual precipitation)
 - Annual Surface Water Diversions
 - Annual Groundwater Pumping Volume (Some actual pumping data available from TBNRD, some must be estimated)
 - Additional Stored Water Volume (potential recharge locations)
 - Annual ET

Other parameters required to calculate changes in net recharge and groundwater volumes shall be estimated by the tool. This includes but is not limited to annual seepage from surface water features into the groundwater supply, groundwater flux, runoff and streamflow in/out, specific yield of the aquifer, and travel time through the vadose zone. The tool should allow TBNRD to select either a specific year or an average of a range of years as the baseline for comparison with the tool's predicted outputs.

Tool output and results should achieve the following objectives:

- The tool shall depict predicted changes in net recharge and groundwater volumes on an annual basis for TBNRD as a whole and for each individual township. The tool shall also be able to provide outputs from multi-year scenarios.
 - The tool shall estimate groundwater levels in annual time-steps by township based on groundwater volumes.
 - The tool shall allow for exporting output data to a GIS format specified by TBNRD to enable creation of maps for clear internal and external communication.
 - The tool shall allow TBNRD to develop scenarios that include changes to input parameters.
 - The tool shall assist in assessing the effectiveness of groundwater recharge projects, changes in canal deliveries, and impacts resulting from adoption of water resources management practices.
 - The tool shall be developed to assist TBNRD with decision-making regarding water usage, groundwater recharge deliveries and storage.
- **Tool Input Support:** A separate spreadsheet shall be created to guide TBNRD in developing appropriate ranges for input values. This spreadsheet will guide the following input adjustments:
 - Percentage of average annual precipitation.
 - Annual surface water diversion variations.
 - Percentage of average annual evapotranspiration (ET)
 - Annual variations in groundwater pumping volumes.

The spreadsheet shall assist the NRD in selecting the proper adjustments to average values of input parameters to be used during forecasting of future groundwater storage volumes.

- **Tool Design Report:** The project shall include a tool design report to detail the methods and assumptions used to develop the tool. The report shall include the following:
 - Background and purpose of the project.
 - A detailed description of the calculations used within the tool.
 - Conduct a sensitivity analysis of the tool and assess the tool's limitations based on available data.
 - An evaluation of factors that could impact the tool's accuracy and usefulness in the future.
 - A user guide to assist TBNRD with use of the tool.
 - A guide for TBNRD to use when adjusting tool input values for forecasting purposes. The guide shall address adjustments to Annual Precipitation, Annual ET, surface water diversions and groundwater pumping volumes.
 - The guide shall evaluate historic annual precipitation amounts and present average annual precipitation amounts during drought years and wet years to assist TBNRD with forecasting efforts.
 - The guide shall evaluate potential yearly variance in ET. This shall consider crop types, tillage methods, irrigation methods, pumping volume, and other relevant factors to calculate the percentage of average annual ET

across the entire TBNRD and by township. Provide general guidelines on factors that influence field ET to assist TBNRD with forecasting efforts.

- **Groundwater Recharge Project Evaluation:** Evaluate potential groundwater recharge sites and their capacity. The tool will be used to evaluate the effectiveness of these projects in helping offset any identified shortages in natural recharge. Prepare and submit an Evaluation Report that will summarize data sources, describe the methods used for the evaluation, and present quantities of recharge and groundwater withdrawals associated with each project.
- **Meetings and Presentation:** Conduct progress meetings to discuss project status and obtain input from TBNRD, CNPPID, NDNR, CSD, USGS and others. Prepare brief written meeting summaries of the progress meeting discussion. Provide training for TBNRD staff on using the recharge tool. Conduct a presentation of the findings to TBNRD Board. The meetings and presentation will be conducted at the TBNRD office in Holdrege, Nebraska.
- **Grant Reporting:** Provide TBNRD with progress reporting and documentation as required for any grants that are used to fund the project.

Proposal Requirements

If your firm is interested in being considered for this project, please provide a brief written proposal including the following sections:

1. **Cover:** Firms shall clearly identify the name of the project, name of the firm, and named subconsultants. *Section may not exceed 1 page in length.*
2. **Cover Letter:** Cover letter shall be on company letterhead, shall identify the primary point of contact, and shall be signed by an authorized representative of the firm who has authority to act in this regard. *Section may not exceed 1 page in length.*
3. **Technical Understanding and Approach:** Firms shall provide a qualitative description of their proposed methodology, deliverables, and project schedule. *Section may not exceed 5 pages in length.*
4. **Qualifications of Project Team:** Firms shall clearly identify their proposed Project Team, including the prime firm and any subconsultants, key individuals (with prime or subconsultant firm identified), and an organization chart showing roles and lines of communication. Qualifications for key individuals regarding similar projects shall be summarized. Resumes shall be included in a separate section (Section 7). *Section may not exceed 3 pages in length.*
5. **Firm Experience:** Firms shall describe their knowledge and experience with similar projects. Firms are requested to submit no more than three (3) projects of similar scope and size. Sufficient contact information should be included to allow TBNRD to contact the entities served to obtain feedback on quality and performance. *Section may not exceed 3 pages in length.*
6. **Cost Proposal:** Firms shall provide a budgetary estimate of cost for their proposed approach. *Section may not exceed 1 page in length.*
7. **Resumes:** Firms shall provide resumes for no more than four (4) key staff. Each resume shall be no longer than 1 page. *Section may not exceed 4 pages in length.*

Lengthy or elaborate proposals are not desired. Proposals shall be organized following sections described above for consistency and ease of review by TBNRD. Information provided beyond the page limits listed above will be discarded and not evaluated.

Please submit an electronic copy of your proposal to jthorburn@tribasinprd.org by November 1, 2024.

TBNRD will review and discuss the information supplied and select the firm based on the firm's proposals and discussions with interested firms' project teams. TBNRD may contact the firm for clarification regarding their proposal. Formal interviews are not anticipated.

Questions and requests for additional information should be directed to:

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