LOWER PLATTE SOUTH
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Memorandum

Date: November 10, 2026

To: Directors

From: Steve Herdzina, Water Resources Coordinator SH

Subject: Water Resources Subcommittee Meeting Minutes – November 2026

The Water Resources Subcommittee met virtually on Monday, November 9th at 6:30 pm. Subcommittee members present included Directors Jacobson - committee chair, Baker, Eagan, Hellerich, Peterson, Ruth, and Schutz. Members absent included Director Spangler. NRD staff present were David Potter, Jeremy Gehle, Steve Herdzina, and Tyler Benal. Also in attendance was Arindam Malakar from the UNL Nebraska Water Center. Director Jacobson called the meeting to order at 6:39 pm. A quorum was present for the meeting.

A. Consideration of UNL Agreement for a Nitrate Vadose Zone Characterization Project [ACTION]–

Tyler Benal, Drinking Water Protection Specialist detailed the proposed working agreement with the University of Nebraska-Lincoln to complete vadose zone coring work and the characterization of vadose zone nitrate in the subsurface. The project budget will support direct-push coring that will be completed by the Conservation and Survey Division (CSD). Nitrate that moves below the root zone can take years to reach groundwater. Nitrogen stored in the soil today can therefore affect the future quality of drinking water supplies. This project will evaluate subsurface nitrogen content in various areas including near public water supply wells in the LPSNRD. The project will collect up to 15 soil cores to a maximum depth of 50 feet. The vadose zone cores will be analyzed for nitrate, ammonium, organic nitrogen, and soil properties. Groundwater will also be sampled where the cores reach the water table. Results will be compared with previous coring results and water well monitoring data and summarized in a technical report for the District. Coring is expected to finish before the 2027 growing season. The working agreement would run from December 1, 2026, through December.

Questions were asked and answered throughout by staff and UNL.

It was moved by Baker, seconded by Hellerich, and unanimously approved (6-0) with Director Schutz abstaining by the Water Resources Subcommittee to recommend the Board of Directors approve the one year working agreement with UNL up to $60,000 to complete the assigned vadose zone work and characterization of vadose zone nitrate in the subsurface pending legal counsel review.

B. Staff Updates [NO ACTION]–

Jeremy Gehle updated the Subcommittee on a potential new stream gage near Waverly. He indicated that this project would involve USGS and will ask them to attend and share more information at a future meeting. He indicated a similar request will be made to Lincoln Water for an update on their 2.0 project.

The meeting adjourned at 7:03 pm.

Enclosures

Cc: Bob Andersen

Characterization of Vadose Zone Nitrate at Lower Platte South Natural Resources District
Draft Statement of Work – November 2026

Arindam Malakar and Chittaranjan Ray
University of Nebraska

Abstract

Nitrate that moves below the root zone can take years to reach groundwater, so what is stored in the soil today affects the quality of drinking water supplies in the future. This project will collect up to 15 soil cores to a maximum depth of 50 feet near public water supply wells in the Lower Platte South Natural Resources District (NRD). The cores will be analyzed for nitrate, ammonium, organic nitrogen, and soil properties, and groundwater will be sampled where the cores reach the water table. The results will be compared with earlier coring and well monitoring data and summarized in a technical report for the NRD. Coring is expected to be completed before the 2027 growing season.

This project will investigate the occurrence of nitrate and other reactive nitrogen species, such as ammonium and organic nitrogen, in the vadose (unsaturated) zone near several public water supplies with historical monitoring data. Direct-push cores will be collected to characterize soil types and physical properties, and selected core intervals will be analyzed chemically. Where cores reach the water table, fresh groundwater samples will be collected and analyzed for nitrate, ammonium, total dissolved nitrogen, pH, and trace elements. Sites are located within the Lower Platte South Natural Resources District (LPSNRD) (Figure 1).

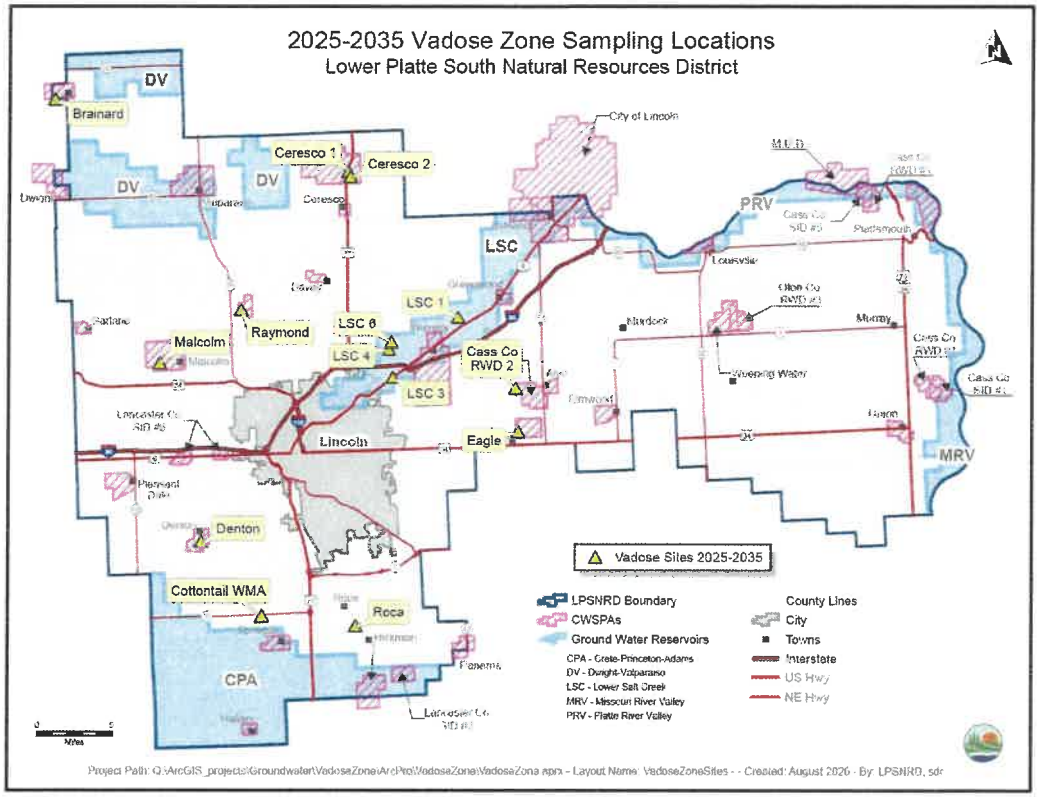


Figure 1. Community water system protection areas in the Lower Platte South NRD, as provided by the NRD

The sampling plan, collection, and chemical analysis will be led by Dr. Arindam Malakar, Nebraska Water Center and School of Natural Resources, and will follow an approved Quality Assurance Project Plan (QAPP). LPSNRD will contact landowners, supervise coring and field work, and assist with collection of fresh groundwater samples. The results will be summarized in a technical report that includes datasets, geologic classifications, chemical analyses of the core intervals and water samples, and interpretations.

Project tasks include:

- Review and document previous analytical results of vadose zone monitoring in these areas.
- Develop a sampling plan and QAPP.
- Collect and geologically classify cores and analyze composite samples from 2- to 5-ft intervals for nitrate, ammonium, organic nitrogen, pH, and moisture content, with particle size on selected samples.
- Graph nitrate, ammonium, pH, organic nitrogen, and moisture content against depth below land surface.

- Estimate porewater nitrate and compare it with groundwater nitrate measured at the base of each core hole.
- Calculate vadose zone nitrate-N storage (lbs/acre) for the full profile and by depth interval.
- Collect and analyze fresh groundwater samples for nitrate, ammonium, total dissolved nitrogen, pH, and trace elements (arsenic, selenium, and uranium).

Description of work

The University of Nebraska will compare the profiles of nitrate to any previously collected vadose zone core profiles to characterize nitrate storage in the vadose zone. After locations are agreed upon, LPSNRD will obtain landowner permission. The University of Nebraska will then schedule core collection using Conservation and Survey Division (CSD) direct-push drilling equipment and crew. Coring at cropped sites will be completed before the 2027 growing season, following the LPSNRD priority list (Table 1). The driller will be responsible for utility clearance at each location. The University of Nebraska will collect, store, and process cores using approved methods.

Table 1. Tentative coring sites in order of priority, with approximate depth to water table (maximum coring depth 50 ft).

CWSPA/Site	Priority	Depth to water (ft)	Land use
Elmwood -Fleischman	1	15	Crop (dryland)
Weeping Water/Otoe Co RWD #3 -TBD	2	50	
LSC 1	3	15	Crop (dryland)
LSC 4	4	35	Crop (dryland)
LSC 6	5	35	Crop (irrigated; dryland corners)
Eagle	6	50	Crop (dryland)
Cass Co. RWD2	7	50	Crop (dryland)
Ceresco 2	8	50	Crop (dryland)
Denton (split)	9	40	Crop (dryland)
Raymond	10	50	Crop (dryland)
Brainard	11	30	Crop (dryland)
Roca	12	20	Crop (dryland/alfalfa)
Ceresco 1	13	50	No crop (CRP)
Malcolm	14	50	Crop (dryland)
LSC 3-Lincoln Wetland	15	15	No crop (wetland)

Cottontail WMA	16	40	No crop (CRP)

Cores will be divided into 2- to 5-ft intervals based on core length and lithology, and subsamples will be collected immediately for gravimetric moisture content. The remaining core will be air-dried, ground, and composited. Composite subsamples will be extracted with 1 M KCl[1] and analyzed for nitrate-N and ammonium-N by cadmium reduction and salicylate colorimetric methods, respectively. Sediment pH will be measured in a 1:1 soil:water slurry. Organic N will be calculated as total Kjeldahl N minus KCl-extractable ammonium-N[2]. Undisturbed cores from selected depths, chosen based on geologic heterogeneity, will be analyzed for bulk density and particle size distribution[3]. These data will be used to estimate saturated hydraulic conductivity and water retention with pedotransfer functions for vadose zone travel-time analysis.

Textural descriptions and lithology will be compared with nitrate-N, ammonium-N, organic N, pH, and moisture profiles. At locations with previous LPSNRD cores, repeat profiles will allow comparison of nitrate distribution over time and may support estimates of transport and attenuation rates. Previous coring data provided by LPSNRD will be compared with the new profiles in the final technical report. Fresh groundwater samples will be collected by direct push from cores that reach the water table and analyzed for nitrate, ammonium, total dissolved nitrogen, pH, and trace elements (arsenic, selenium, and uranium). These results will be compared with historical groundwater monitoring data at each location.

Accurate assessment of nitrate occurrence and leaching potential beneath specific land uses helps land and water managers target fertilizer and irrigation management. The University of Nebraska team is developing a standardized protocol for collecting and analyzing vadose zone cores to estimate nitrate occurrence and transport potential, and this project will contribute to that protocol.

Budget

The project budget will support direct-push coring by the Conservation and Survey Division (CSD). Up to 15 vadose zone cores (maximum 50 ft below the surface) will be collected in the priority order of Table 1. The CSD rate is $1,500 per day, including coring supplies, the operator, and an assistant. Laboratory costs cover approximately 100 composite samples analyzed for gravimetric moisture, organic N, ammonium-N, nitrate-N, and pH, with particle size (% clay, silt, sand) determined on selected samples. One fresh groundwater sample will be collected from each core that reaches the water table and analyzed for nitrate, ammonium, total dissolved nitrogen, and trace elements. Partial salary support for Dr. Malakar and partial graduate student stipend support will cover laboratory processing, data reduction, analysis, and preparation of the final report.

References

(1) Spalding, R. F.; Kitchen, L. A. Nitrate in the Intermediate Vadose Zone Beneath Irrigated Cropland. *Groundw. Monit. Remediat.* **1988**, *8* (2), 89–95. https://doi.org/10.1111/j.1745-6592.1988.tb00994.x.

(2) Bremner, J. M. Nitrogen-Total. In *Methods of Soil Analysis, Part 3—Chemical Methods*; Sparks, D. L., Ed.; Soil Science Society of America: Madison, WI, 1996; pp 1085–1121. https://doi.org/10.2136/sssabookser5.3.c37.

(3) Kettler, T. A.; Doran, J. W.; Gilbert, T. L. Simplified Method for Soil Particle-Size

Determination to Accompany Soil-Quality Analyses. *Soil Sci. Soc. Am. J.* **2001**, *65* (3), 849–852. https://doi.org/10.2136/sssaj2001.653849x.

UNL Budget (December 1, 2026 to December 31, 2027)

Funding Agency: Lower Platte South Natural Resources District
PI Name: Arindam Malakar
Project Title: Characterization of Vadose Zone Nitrate at Lower Platte South NRD

Project Start Date: 12/1/2026
Project End Date: 12/31/2027

UNL Basic Request Budget				
	Person Months		Year 1	Total
Senior Personnel	Yr1	Yr2		
Arindam Malakar	1.50	0.00	10,436	10,436
Chittaranjan Ray	0.00	0.00	-	-
Total Senior Personnel			***10,436***	***10,436***
Other Personnel	# of Ppl			-
Post Docs	0	0	-	-
Other Professionals	0	0	-	-
Graduate Students	1	0	16,250	16,250
Undergraduate Students	0	0	-	-
Secretarial	0	0	-	-
Other	0	0	-	-
Total Other Personnel			***16,250***	***16,250***
Fringe Benefits			13,518	13,518
Total Salaries and Benefits			**40,204**	**40,204**
Equipment			-	-
Travel			-	-
Supplies			2,500	2,500
Subawards			-	-
Other			11,841	11,841
Total Other Direct Costs			**14,341**	**14,341**
Total Direct Costs			**54,545**	**54,545**
F&A Base	TDC		54,545	54,545
F&A	10.0%		5,455	5,455
Total Request			**60,000**	**60,000**

MTDC Exclusions	*Year 1*	*Total*
Equipment	-	-
Tuition Remission	*5,985*	*5,985*
Subawards in excess of $50K	-	-
Participant Support Costs	-	-
Rent	-	-
Alterations and Renovations	-	-
Total Exclusions	***5,985***	***5,985***