AG TASK FORCE ISSUE:

Subject: GROUNDWATER/DRINKING WATER CHALLENGES

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Date: 7 January, 2026

Introduction

Minnesota has stringent rules and regulations for groundwater and drinking water use and preservation, but there are enforcement challenges and gaps in the rules themselves. This document is intended to broadly discuss the challenges for preserving the future of Minnesota's groundwater as well as the gaps in the rules and regulations.

The legal definition of groundwater is essentially any water found beneath the saturated surface underground wherein; it includes both the water stored in aquifers and the water that infiltrates from precipitation into subsurface saturated zones. A portion of the water that has percolated to the groundwater flows either to a nearby surface water such as wetlands, streams, rivers, and lakes; or to deeper aquifers. This definition and the fate of percolated (or infiltrated) groundwater are important for addressing agricultural drainage. (For completeness, a portion of the percolated (or infiltrated) water will remain in storage within the voids of the soil matrix.).

This document divides groundwater issues into two categories: quantity—the amount available versus demand—and quality—its suitability and safety for use.

Groundwater Quantity Challenges

In general, with current projections of groundwater usage, most regions of Minnesota possess adequate groundwater supplies, but groundwater availability is not limitless. When groundwater is depleted or consumed, it needs to be restored. Groundwater that is polluted needs to be treated before it can be used, which decreases the quantity of groundwater available. There are several major challenges that affect the quantity of groundwater and some of the major challenges are as follows:

- In areas with poor recharge rates, such as in western Minnesota, there is a risk of a shortage of groundwater quantity because the glacial aquifers have a limited extent (limited volume) and poor recharge rates. As such, in western Minnesota, and areas with similar hydrogeologic conditions, decades of pumping can result in declining groundwater quantity over time.

- There are technologies to artificially recharge aquifers such as Aquifer Storage and Recovery (ASR). Though these technologies are common in the western United States, these technologies remain unimplemented in Minnesota because of risks associated with artificial recharge injections possibly resulting in groundwater impairment and

contamination. Minnesota has regulatory constraints requiring variances for water injections.

- The near-surface groundwater is currently being drained continuously by agricultural drainage via drain tile and ditches, into surface water. Drain tile and ditches have been used since the early 1900s to increase farmable land. Recently, to boost crop yields, farmland is being drained to lower the saturation levels. Many old drain tiles and ditches are being replaced and upgraded, and additional drainage systems are being installed, which has greatly increased the overall drainage of groundwater from farmland. The increased agricultural drainage alters hydrology and has increased the watershed yield that enters streams, rivers, and lakes. Although the farm economy benefits from groundwater lowering, the cumulative effect of increased drainage of groundwater (and surface water) is causing increased erosion, sedimentation, damage and pollution to the downstream streams, rivers and lakes.

- Increased groundwater use for cooling and processing in data centers and other high-water usage for industrial operations leads to over-extraction from the aquifers, water shortages, well interference, and adverse impacts on the groundwater-dependent ecosystems.

- Persistent drought conditions in the western United States have prompted interest in importing Minnesota groundwater via pipelines. If groundwater is extracted for export to the western United States, this will result in a reduction of the available groundwater in Minnesota.

- Historic climatic variability and climate change are expected to bring prolonged droughts and periods of excessive precipitation into Minnesota, presenting challenges for the management of groundwater during times of abundance and of shortages. During a drought, there will be a shortage of usable surface water, and more groundwater will be extracted.

- Groundwater available for use such as drinking and industrial uses, is diminished by impairment and contamination. Groundwater in shallow aquifers beneath areas of intensive agriculture can be impaired, failing to meet regulatory standards, and may occasionally be contaminated, posing an immediate health risk.

Groundwater Quality Challenges

Most groundwater aquifers in Minnesota contain fresh, high-quality water. Many shallow aquifers are increasingly impaired and occasionally contaminated. Some of the challenges are:

- Emerging contaminants, such as PFAS, that impact large areas will impact the groundwater system. While treatment technologies exist, infrastructure and residual disposal costs are significant. New contaminants (not yet known) will continue to require similar resources to mitigate their harmful effects.

- Agricultural practices, especially corn-soybean and potato farming, pose increasing risks to groundwater quality across Minnesota. Nitrate contamination is a primary concern,

alongside herbicides, pesticides, and salts from fertilizers, often found in concentrations that exceed regulatory standards, and groundwater is impaired or contaminated. These pollutants continue to accumulate, and their impacts persist for decades. Continued industrialization of agriculture is expected to exacerbate nitrate pollution. Treatment options, typically reverse osmosis, are feasible only at extraction or use points; in situ treatments are not yet viable. Soil health initiatives show promise in reducing the annual accumulation of nitrates but are limited to niche adoption.

- The use of road salt, primarily in cities and suburbs, is affecting groundwater quality, raising the salinity levels in groundwater as well as in streams, lakes, and wetlands. The accumulation of salt in the groundwater poses a threat to the drinking water. Continued exposure has long-term negative health impacts. Water high in salt erodes the plumbing used in drinking water infrastructure, releasing metals, like lead, into the water supply.

- Expanded geothermal and heat pump systems in shallow aquifers over large areas may elevate groundwater contamination by increasing water temperatures. This negatively impacts aquatic life and accelerates the spread of naturally occurring contaminants from rock and soil.

Summary

Shallow groundwater, in addition to surface water, serves as an essential source for streams, rivers, and lakes. Groundwater from deeper aquifers is Minnesota's main source for drinking, irrigation, and industry. Groundwater is the fallback source of water for domestic water supply, in lieu of surface water, during drought conditions and if surface water is impaired or contaminated. Protecting and preserving Minnesota's groundwater quantity and quality are challenges for Minnesota. Excessive extraction and the dangers of pollution are significant challenges, as groundwater is difficult to replenish or clean once it becomes contaminated.

The challenges to protect, maintain and preserve Minnesota's groundwater quantity and quality are an important part of the Future of Water in Minnesota. Good water, and to Minnesota's benefit, good groundwater will attract industry as well as providing low-cost drinking water and irrigation water to the populace of Minnesota.

In our opinion, the existing rules and regulations that protect groundwater should be enforced. Additionally, the exemptions that allow agriculture to bypass Minnesota's groundwater protection and preservation rules should be reconsidered.