

TECHNICAL ANALYSIS — SUBMISSION TO PUBLIC CONSULTATION

Private Wells, Septic Systems, and Tile Drainage: What ALTO HSR Construction Could Mean for Rural Water Infrastructure

Southern Corridor — Eastern Ontario | April 24, 2026

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IMPORTANT CAVEAT

ALTO has not yet disclosed specific route locations within its identified corridors. This analysis is based on the broad corridor options presented in ALTO’s public consultation materials and the known hydrogeological characteristics of the region. Actual impacts will depend on the final alignment selected.

ALTO’S RESPONSE TO DIRECT QUESTIONS

When asked directly about groundwater, wells, and septic systems through the formal consultation process, ALTO’s complete response was: “It is unfortunately too early in the development phase to answer these questions. Our field studies program covers water, aquatic habitats, and overall environmental quality.” The specific question about setback distances and vibration transmission through limestone was not acknowledged at all. This response is inadequate. ALTO is asking the public to comment on route options before conducting the work needed to understand what those routes would do to the water systems rural families depend on.

Section 1 — Why This Matters

In rural Eastern Ontario along the ALTO southern corridor, virtually every home and farm depends on a private well for drinking water and a septic system for wastewater treatment. There is no municipal water or sewer to fall back on. High-speed rail construction involves deep excavation, blasting, dewatering, and permanent grade-separated embankments, all of which can damage or destroy these systems. Unlike a broken window or a cracked driveway, damage to a well or septic system can make a property uninhabitable. Ontario’s own guidelines acknowledge that construction activities including “dewatering of trenches, cut and fill operations, blasting, and the reduction of infiltration due to surface compaction” can disrupt groundwater flow and alter water levels. These are not speculative risks, they are the standard engineering activities required to build a grade-separated high-speed rail corridor.

Section 2 — The Geology: Why the Southern Corridor Is Especially Vulnerable

The southern corridor passes through the “Napane limestone plain”, one of seven distinctive hydrogeological terrains in southern Ontario. This terrain is characterized by flat-lying Paleozoic limestone bedrock with only patchy soil cover, cut by deep valleys where streams flow through fractures and karst features in the rock. The Western Cataraqui Region Groundwater Study (Ontario Ministry of the Environment / Cataraqui Region Conservation Authority) found that 74% of wells in the corridor area (encompassing Kingston, Napane, and Loyalist Township) are drilled into this bedrock, classified as the most vulnerable to contamination of any geological zone in the region. The depth to first water in the limestone zone (Zone 1-B, encompassing Odessa, Napane, and the corridor between Loyalist Township and Greater Napane) ranges from just 0 to 10 metres, with wells characteristically having casing lengths often less than 6.7 metres, making them highly susceptible to contamination. Limestone aquifers are particularly vulnerable because water moves through dissolution fractures and karst channels rather than through porous sand or gravel, meaning groundwater flow can be rapid, unpredictable, and easily redirected by construction activity.

Section 3 — Impact on Private Wells

3.1 Dewatering

High-speed rail construction requires deep excavation for bridge foundations and grade-separated crossings. Where these excavations go below the water table, construction crews must pump out groundwater to keep work areas dry. This can drastically lower the water table in surrounding areas. In limestone terrain, fracture networks can transmit pressure changes over considerable distances, homeowners may experience sudden drops in well yield kilometres from the construction site. The UK’s HS2 project faced intense scrutiny over dewatering impacts when tunnelling through chalk aquifers (a geological formation with similar fracture-flow characteristics to limestone), requiring dedicated water supply management programs with the Environment Agency before construction began. ALTO has proposed nothing comparable.

3.2 Blasting

Where the rail corridor must cut through limestone bedrock, blasting is typically required. Research documents that blasting of sedimentary bedrock can contaminate water resources by introducing blast residues into fractures and by creating new fracture connections between previously isolated water-bearing zones. The Western Cataraqui study found salty wells (chloride above 250 mg/L) at depths of 15 to 46 metres in limestone; blasting could create fracture connections between shallow potable-quality water zones and deeper naturally saline zones, permanently contaminating wells that have been reliable for decades.

3.3 Permanent drainage alteration

Even after construction is complete, the HSR embankment permanently alters surface and subsurface drainage patterns. A continuous, impermeable, grade-separated corridor acts as an underground dam, blocking the natural lateral flow of groundwater through limestone fractures. Wells on the “upstream” side may see rising water levels and flooding; wells on the “downstream” side may see permanent yield reductions. Ontario’s guidelines warn that changes in land use including paving and compaction can result in major alterations in infiltration and surface runoff patterns, reducing groundwater recharge.

Section 4 — Impact on Septic Systems (Tile Beds)

A standard on-site septic system has two components: a septic tank that separates solids, and a tile bed where liquid effluent is distributed through perforated pipes into a gravel-and-soil treatment zone. Ontario Building Code requires tile beds to maintain a minimum vertical separation between the pipe network and the seasonally high water table. If the water table rises into the treatment zone, the system fails — raw effluent can reach groundwater, contaminating not just the homeowner’s own well but neighbouring wells that draw from the same aquifer.

Construction threats to tile beds

- Soil compaction: Heavy construction equipment passing over a tile bed area can compress the soil and cut off the oxygen supply to the microorganisms that treat effluent, causing irreversible damage. Construction staging areas, access roads, and haul routes near existing tile beds are a direct threat.
- Water table changes: If HSR construction temporarily lowers the water table through dewatering but then the permanent embankment blocks natural drainage, the water table may subsequently rise on one side of the corridor. Tile beds that were properly installed above the historical high water table could find themselves saturated, triggering system failure.
- Vibration damage: Blasting and heavy equipment operation can physically damage septic tank structures and crack or displace tile bed piping.

Replacement costs for failed tile beds in the limestone terrain of the southern corridor (where bedrock is often close to the surface) run \$30,000–\$60,000 or more for alternative systems such as mound systems or tertiary treatment units. In some cases there may be no suitable replacement location on the property given setback distances from the well, property lines, and watercourses.

Section 5 — Impact on Agricultural Tile Drainage

The southern corridor crosses extensively tile-drained farmland in Eastern Ontario. Agricultural tile drainage consists of networks of subsurface perforated pipes installed beneath fields to remove excess water from the crop root zone. These systems represent investments of thousands of dollars per acre and are essential to agricultural productivity in Eastern Ontario’s clay-over-limestone soils. An HSR embankment crossing tile-drained fields would sever drainage runs, block outlets, and create ponding on the upstream side.

THE JURISDICTIONAL PROBLEM — FEDERAL CROWN IMMUNITY

Ontario’s Drainage Act provides the established legal framework for resolving drainage disputes between landowners, municipalities, and utilities. However, approximately 30 Ontario municipalities have reported that CN and CPKC are refusing to cooperate on drainage costs, arguing that the province cannot constitutionally apply its rules to interprovincial railways. As a federal Crown corporation, ALTO would likely assert the same constitutional position. This means farmers whose tile drainage is severed by HSR construction may have no provincial legal mechanism to compel repair, restoration, or compensation through the established Drainage Act process. The cost and complexity of pursuing remedies through the federal Canadian Transportation Agency would place an extraordinary burden on individual farmers. (Source: Farmtario, July 2024.)

Section 6 — The Compounding Problem

System	Impact	Consequence	Estimated Cost
Private well	Yield loss from dewatering; contamination from blasting	No potable water; no municipal backup	\$10,000–\$30,000+ (new deeper well)
Septic tile bed	Water table rise; soil compaction; vibration damage	System failure; raw sewage; no sewer to connect to	\$15,000–\$60,000+ (replacement)
Agricultural tile drainage	Severed runs; blocked outlets; federal Crown immunity from Drainage Act	Crop loss; field flooding; no clear legal remedy	\$1,000–\$3,000/acre to repair

These properties would receive no HSR station and no direct benefit from the project. The rural communities along the southern corridor would bear the full burden of construction disruption for a service that does not stop for them.

Section 7 — What Alto Has Not Addressed

ALTO's public consultation materials to date have not included any assessment of impacts to private water supply wells, on-site septic systems, or agricultural tile drainage along the southern corridor. No pre-construction well surveys have been planned or budgeted; no baseline groundwater monitoring has been considered; no hydrogeological assessment of the limestone plain aquifer has been commissioned; no mitigation or compensation framework for affected well and septic owners has been developed; and the jurisdictional question regarding the Drainage Act and federal Crown immunity has not been addressed. For comparison, Ontario's Ministry of Transportation requires pre-construction door-to-door water well surveys, baseline groundwater monitoring, and continued well monitoring throughout and following construction for highway projects in areas with private wells. HS2 in the UK established dedicated water supply and groundwater management programs with the Environment Agency before construction began. ALTO has proposed nothing comparable.

Section 8 – Formal Requests

1	<p>Commission a hydrogeological assessment of the limestone plain aquifer before route selection</p> <p>A comprehensive hydrogeological assessment of the Napanee Limestone Plain aquifer must be commissioned before any route alignment is finalized. This assessment must address: groundwater flow systems and fracture connectivity; the vulnerability of shallow limestone wells to dewatering and blasting; and the interaction between the proposed embankment and lateral groundwater flow.</p>
2	<p>Commit to pre-construction water well surveys and ongoing groundwater monitoring</p> <p>ALTO must commit to pre-construction door-to-door water well surveys on all properties within a defined impact zone of any route alignment, establishing legally defensible baselines for subsequent damage claims. Ongoing groundwater monitoring throughout and following construction must be conducted to a standard equivalent to Ontario MTO requirements for highway projects.</p>
3	<p>Publish minimum setback distances and vibration transmission modelling for limestone terrain</p> <p>ALTO must publish the minimum setback distances it intends to apply between HSR construction activities (blasting, dewatering, heavy equipment) and private water supply wells and septic systems, along with the vibration transmission modelling used to determine those distances. These must be specific to limestone and karst geology, not generic guidelines.</p>
4	<p>Clarify the Drainage Act jurisdictional position</p> <p>ALTO must publicly confirm whether it intends to comply with Ontario's Drainage Act for agricultural tile drainage affected by HSR construction, or whether it will assert federal Crown immunity from provincial drainage legislation. Farmers and municipalities along the corridor are entitled to know which legal framework governs their drainage remedies before the route is selected.</p>
5	<p>Develop a compensation framework for well and septic system damage</p> <p>ALTO must develop and publicly disclose a compensation framework for private well and septic system damage attributable to construction, including: how damage will be assessed; what compensation is available; and through what legal mechanism disputes will be resolved. This framework must be established before construction begins, not after damage has occurred.</p>

Key Sources

Cataraqui Region Conservation Authority / Ontario Ministry of the Environment. Western Cataraqui Region Groundwater Study. (74% of wells in limestone; Zone 1-B most vulnerable; 0–10m depth to water.)

Sharpe, D.R. et al. “Seven hydrogeological terrains characteristic of southern Ontario.” Canadian Journal of Earth Sciences, 2023.

Ontario Ministry of the Environment. B-6: Guidelines for Evaluating Construction Activities Impacting on Water Resources.

Matheson, G.M. and Miller, D.K. “Blast Vibration Damage to Water Supply Well Water Quality and Quantity.” 1997.

New Hampshire Department of Environmental Services. “Rock Blasting and Water Quality Measures.”

Ontario Onsite Wastewater Association. “How a Septic System Works.” (Soil compaction cutting off oxygen to treatment microorganisms.)

Farmtario. “Railway reluctance on drainage costs will be carried downstream.” July 2024. (CN and CPKC federal Crown immunity from provincial Drainage Act.)

Farmtario. “Interprovincial high-speed rail proposal on track for farmer blowback.” February 2026.

HS2 Ltd. “Water supply and management.” (Dedicated groundwater management programs with Environment Agency.)

Ontario Ministry of Transportation. Environmental Impacts and Mitigation — Groundwater. (Pre-construction door-to-door well surveys; ongoing monitoring requirements.)