Summary of Calcium Chloride Usage

Background

In 2020, Council prohibited the use of calcium chloride on roadways. The Government of Alberta uses calcium chloride on the Anthony Henday and many Canadian cities continue to use liquid de-icers as part of their winter operations. As calcium chloride remains a polarizing option for winter roadway maintenance in Edmonton and in response to Council direction, Administration has taken this opportunity to update its understanding of best practices, equipment, staffing and environmental considerations related to its use in winter maintenance.

This attachment summarizes the industry conditions under which calcium chloride is used, the engagement Administration conducted with staff and industry, and the operational and engagement considerations that would apply if Council chose to advance the à la carte enhancement option identified in Attachment 10.

Industry Conditions For Use

Calcium chloride ($CaCl_2$) is one of several chloride-based materials used in winter road maintenance. It behaves differently from sodium chloride (rock salt) in ways that determine when it is operationally useful:

Effective temperature range. Calcium chloride is effective at lower temperatures than sodium chloride. Published guidance from the Transportation Association of Canada (TAC) indicates sodium chloride begins to lose practical efficacy below approximately -10°C, while calcium chloride remains operationally effective to approximately -25°C to -32°C depending on concentration and application method[1]. This extended range is the primary operational rationale for using calcium chloride: it addresses a temperature band where salt-only applications become ineffective. Edmonton's climate places a meaningful portion of the winter season within this band.

[1]Transportation Association of Canada, Syntheses of Best Practices for Road Salt Management, page 8, April 2013

Application methods. Calcium chloride is applied in three primary ways, each with different equipment and operational implications:

- *Anti-icing*: application of liquid brine to pavement before a forecast snow or ice event, to prevent bonding of snow and ice to the road surface. Requires accurate weather forecasting and pre-treatment scheduling.
- *De-icing*: application after ice has formed to accelerate melting. Typically used when other treatments have not achieved bare-pavement conditions.
- *Pre-wetting*: spraying calcium chloride brine onto solid sand or salt as it is spread, to improve adhesion to the road surface and accelerate activation. This is Edmonton's current use case for calcium chloride.

Application Requirements. Liquid calcium chloride ($CaCl_2$) anti-icing in Canada requires specific application criteria: surface temperatures below -15°C where standard salt fails, application rates of 40 to 80 litres per lane kilometer (approx. 15 to 30 gallons per lane mile), and pre-storm spraying one to three hours before precipitation to stop the ice-pavement bond. Additionally, after storm conditions treated roadways must be mechanically removed to prevent icing.

Infrastructure requirements. Direct application to roadways (as opposed to Edmonton's current pre-wetting use) requires additional infrastructure not currently in place across all district yards:

- Bulk liquid storage tanks with secondary containment sized to prevent uncontrolled release
- Spray application equipment mounted on plow trucks and dedicated anti-icing units
- Loading and calibration equipment at each yard
- Covered storage for sand/salt piles to prevent environmental releases
- Integration with the City's Road Weather Information System (RWIS) for application decisions

The federal *Code of Practice for the Environmental Management of Road Salts* (Environment and Climate Change Canada) sets out national expectations for storage, application and monitoring of chloride-based de-icers.[2]

[2] Government of Canada, August 2, 2022, Code of Practice for the Environmental Management of Road Salts, Government of Canada, https://www.canada.ca/en/environment-climate-change/services/pollutants/road-salts/code-practice-environmental-management.html#s03

Environmental management. All chloride-based de-icers, including calcium chloride, are regulated substances under the *Canadian Environmental Protection Act*[3] when released to the environment at sufficient concentrations. The Canadian Council of Ministers of the Environment (CCME) has published Canadian Water Quality Guidelines for chloride in freshwater[4]. Municipalities using calcium chloride typically manage this through:

- A published Salt Management Plan, aligned with the federal Code of Practice
- Snow storage sites with impermeable surfacing and melt water containment
- Monitoring of chloride concentrations in receiving waters near application areas
- Route-specific application limits near environmentally sensitive areas (e.g., creeks, wetlands, water courses)

Canadian jurisdictional context. The Jurisdictional Scan (Attachment 12) documents that calcium chloride and other liquid de-icers are in active use in Calgary (pre-wetting), Saskatoon (magnesium chloride for post-grading de-icing), Winnipeg (salt brine including calcium chloride), Regina (liquid salt pre-wetting), and Toronto (salt brine anti-icing). Direct roadway application at scale is less common in prairie cities than pre-wetting or anti-icing use.

Engagement Approach

The Snow and Ice Control (SNIC) program engaged with frontline staff and industry to identify best practices and considerations that would apply if the option to advance calcium chloride use were pursued. A review of resident communications and 311 data was also conducted to identify public concerns.

A cohort of frontline SNIC crew from across the City's district yards attended a tour of a local company that holds a contract for administering calcium chloride on provincial roadways. The tour provided staff with direct exposure to equipment, processes, and procedures used by an operating contractor. SNIC managers also met with industry representatives and leadership from the City of Calgary to identify issues, processes, and procedures. PARS additionally received correspondence from

[3] Government of Canada, July 23, 2026, Canadian Environmental Protection Act, 1999, Government of Canada, https://laws-lois.justice.gc.ca/eng/acts/c-15.31/page-1.html#h-63275
[4] Canadian Council of Ministers of the Environment, 2026, CCME Guidelines, CCME, https://ccme.ca/en/current-activities/canadian-environmental-quality-guidelines

EPCOR and a local environmental organization highlighting concerns around calcium chloride use.

Results

The engagement identified the following considerations that would apply to any advancement of calcium chloride use:

- **Equipment and procurement.** Direct application requires equipment specific to calcium chloride handling and delivery. A capital procurement and operating cost analysis is required, incorporating storage, application and calibration equipment across affected yards.
- **Application procedures.** Clear procedures are required defining where, how, and when calcium chloride would be applied. These procedures would need to align with the federal Code of Practice and be integrated with existing SNIC operational protocols.
- **Staff training.** Ongoing operator training would be required to ensure correct equipment usage and consistent application. Training would need to cover both routine operations and cold-weather edge cases where efficacy declines.
- **Public communication.** Public perception of calcium chloride in Edmonton remains negative from the 2017–20 pilot period. Any advancement would require a sustained communications plan addressing environmental concerns, vehicle and property concerns, and use case rationale.
- **Environmental monitoring.** Increased monitoring of application volumes, surface water, runoff and snow storage facilities would be required to demonstrate compliance with the federal Code of Practice and to inform ongoing operational adjustments.
- **Operational role.** Calcium chloride is not a comprehensive solution to Edmonton's snow and ice conditions but represents one tool available for specific temperature and precipitation conditions where other materials are less effective.
- **Industry standard.** Liquid salts and de-icers are established practice in Canadian and North American municipal winter maintenance, with variation in application method and volume based on local climate and infrastructure conditions.

EPCOR Consultation

The City consulted with EPCOR to identify operational impacts related to potential calcium chloride use on roadways, including effects on concrete, asphalt, metal and underground infrastructure. EPCOR identified the need to assess impacts on critical assets including concrete vaults, water valves, manholes, and stormwater management gates, and to consult with the watershed section on potential river loading and site-specific infrastructure risks.

Corrosion of transformers, switching cubicles, and other electrical assets located near roadways was identified as a specific concern. Additional research and data from jurisdictions currently using calcium chloride is being gathered to assess deterioration rates and inform potential mitigation approaches.

The 2022 report on snow storage on green space was identified as the foundational reference for soil salinity, environmental monitoring, and potential underground infrastructure impacts.

Implementation Approach

If Council chose to advance calcium chloride use through the à la carte enhancement option identified in Attachment 10, implementation would be structured as a two-season phased expansion.

Season One: Preparation and Training

The first phase would focus on a 12-to-24-month procurement period to acquire and calibrate specialized equipment aligned with industry best practices, climate demands, and maintenance requirements. New personnel would be hired and integrated into a comprehensive training program. Operators would gain hands-on experience with equipment and application techniques focused on timing, calibration and designated application locations. Supervisors would collaborate with industry experts to design the operational framework, including integration with the RWIS and route-specific application protocols.

Season Two: Implementation and Evaluation

The second phase would mark the beginning of an application trial. Staff would apply the product according to established protocols, with interventions timed to

specific weather events. Road conditions would be closely monitored and compared against comparable surfaces that did not receive treatment. Comparative data would inform ongoing refinement of the process to identify optimal application conditions across roadway categories.

Engagement Scoring

Calcium chloride was scored against the four evaluation pillars outlined in the main report (Section: Operational Enhancements: À La Carte):

- **Resident Awareness and Popularity (+):** Public sentiment toward calcium chloride in Edmonton remains low, contrasted with positive feedback residents provide for road conditions on the Anthony Henday and in private lots where liquid anti-icers are used. This split public sentiment resulted in the lowest of the three possible scores.
- **Accessibility (++):** Improved road conditions from anti-icing application would provide accessibility benefits for winter driving conditions, particularly for high-volume corridors and bridge decks, resulting in a middle score.
- **Operational Benefit (+++):** From an operational standpoint, calcium chloride provides clearing crews with a versatile tool for addressing conditions where other materials are less effective. When applied correctly with specialized equipment, it prevents ice formation and supports bare-pavement conditions on treated surfaces. Reflecting its role as a benchmark tool in cold-weather winter maintenance, this pillar received the highest score.
- **Operations Insights (+):** Frontline staff currently hold a neutral-to-negative view, largely due to difficulties encountered during the 2017–20 pilot period and lingering equipment concerns. Ongoing collaboration with industry may improve this outlook over time, but current staff hesitation resulted in the lowest score for this pillar.