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**Date:** August 13, 2020  
**To:** Mayor and Council  
**Author:** Shaun Martinho, Manager of Public Works  
**RE:** Road Salt Alternatives  
**Report No.:** MS 2020- 37

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## **AIM**

To provide Council with information related to best practices for the application of road salt as part of winter operations and outline the benefits and draw backs of road salt alternatives.

## **BACKGROUND**

At the Regular Meeting of Council dated March 9, 2020 the following motion of was made:

227-2020

Moved by Councillor Thomas Neufeld

Seconded by Councillor Kimberly DeYong

That a report be provided from Administration to investigate alternatives to using salt on roads and sidewalks, such report to be provided within six months.

Most municipalities in Ontario use *O. Reg. 366/18: Minimum Maintenance Standards for Municipal Highways* (MMS) to set the standard of care for the removal of snow and ice on roads, sidewalks, and bicycle trails. The MMS were designed to provide municipalities with a “due diligence” defense in the event of vehicular accidents, slips, trips, falls, and other incidents. On roadways, prescribed levels of service are based on vehicular traffic and prevailing weather conditions The Minimum Maintenance Standards are attached in Appendix A.

The following is a brief summary of winter control operations and the standard of care prescribed by the MMS for Kingsville:

- The Municipal Services Department removes snow from 440-lane km of roadway, 41 km of sidewalk and 12 municipal/facility parking lots.
- Kingsville currently has 7 snow routes, 8 snowplows, and 7 dedicated drivers. The routes can be seen in Appendix B.
- Most local roads in urban centers are Class 5 meaning they have to be attended to within 24 hours of the event or after 10cm of snow accumulation.
- Most rural roads are Class 4 meaning they have to be attended to within 16 hours or after 8 cm of snow accumulation.
- Collector roads, such as Division St N are Class 3 meaning they have to be attended to within 12 hours or after 8 cm of snow accumulation.
- Sidewalks and active transportation pathways are maintained by the Environmental Services Department. The standard is to reduce the snow to a depth of less than or equal to 8 cm within 48 hours.

## **DISCUSSION**

### **Methods**

Factors such as funding, staffing, available equipment, local climate, roadway conditions, traffic volumes and environmental impacts are considered when developing strategies for winter control. Municipalities can choose from a unique combination of materials, equipment, and methods, including both chemical and physical, for snow and ice control operations. Strategies typically include a combination of the following activities:

#### **Mechanical Removal (Plowing):**

This involves the physical process of attempting to remove an accumulation of snow or ice by means such as plowing, sweeping, or blowing snow. It is effective when snow and ice has not yet bonded to the pavement. This occurs when pavement temperatures are above freezing or when road temperatures are lower than 12°C. Plowing is typically used in conjunction with ice control chemicals.

#### **Traction Enhancement (Abrasives):**

This involves applying abrasive materials such as sand, cinders, ash, tailings, and crushed stone to the snow/ice surface. These materials alone are not classified as an ice control chemicals. They are primarily used to improve traction on snow packed surfaces that are too thick for chemicals to penetrate and when temperatures are too low for deicing agents to work effectively.

#### **Anti-icing:**

Roadway anti-icing is a snow and ice strategy of preventing the formation or development of bonded snow and ice to a pavement surface. This is accomplished by applying either a solid or liquid freezing point depressant at the beginning of a winter event. Anti-icing works best when temperatures are above -6.5°C.

#### **Deicing**

This winter maintenance activity involves destroying the bond between the snow and pavement surface by chemical or mechanical means or a combination of the two. De-icing is a suitable strategy for most weather, site, and traffic conditions. Deicing can be accomplished at temperatures up to -12°C.

## **Products**

Municipalities can choose from a variety of anti-icing and deicing products. Selection is based on variables such as cost, performance, effects on infrastructure and environmental impacts. A summary table of the most common products can be found in Appendix C. The following is a more detailed description of the most commonly used products in Ontario.

### **Sand**

The primary benefit of using sand is that it provides an immediate improvement in traction when temperatures have fallen to a point that chemicals are rendered ineffective.

Limitations to the effectiveness of sand include the propensity for it to blow off the road and disperse with passing traffic. In addition, it is estimated that without an extensive clean-up effort, between 50%-90% of the sand remains in the environment. These sand deposits mix with oil, grease, and other automotive by-products before they enter waterways. The use of abrasives can lead to the clogging of storm sewers, infilling of streambeds, the clouding of waterways, and injury to aquatic organisms. Currently, Public Works uses a 50/50 salt-sand mixture on gravel roads and in rural areas when temperatures fall below the effectiveness of using salt.

### **Rock Salt (Sodium Chloride)**

This is the most common product used for winter control in Windsor Essex County. Road salt is locally sourced and readily available, making it the most cost effective de-icing agent. In 2006, Environment Canada summarized the benefits of road salt use in Canada. The specific benefits cited included an estimated 88% reduction in accidents and decreases in tort and liability claims. While salt and other chloride-based chemicals are generally effective and inexpensive, they contribute to the corrosion of vehicles, deterioration of infrastructure and degradation of the environment. Several studies have shown that salts can negatively affect vegetation, harm aquatic life, and deteriorate soil conditions.

### **Salt Brine**

Rock salt only begins to work once it has gone into a solution. To increase the speed of this process some municipalities pre-mix salt with water to create a brine. Brines have the same melting characteristics of solid rock salt, but because it is applied in liquid form, the salt can begin to work immediately. Salt brines can be used for anti-icing and applied to the road in preparation of a winter event. It has been demonstrated that it takes four times less salt to prevent ice accumulation than to remove ice after it has formed. Furthermore, salt brines can be used to pre-wet rock salt, increasing its performance and improving its longevity on the road surface. The primary disadvantage of using salt brine is that it requires specialized equipment for storing, mixing and applying. Kingsville's snow plows are not currently equipped to apply this material.

### **Calcium Magnesium Acetate (CMA)**

CMA is an environmentally friendly deicing agent that was developed as an alternative to rock salt. This product can be produced from cheese whey and solid waste materials such as sludge. CMA is generally used in solid form and spread on surfaces like other deicers. It is applied at the same rate as rock salt and has been proven just as effective. CMA is less corrosive and causes less freeze thaw damage to concrete when compared to salt. CMA has a low toxicity and is biodegradable, resulting in minimal impact to vegetation, fish

and aquatic life, groundwater and soils. Unfortunately, CMA is one of the most expensive deicing chemicals and can cost 10 times more than rock salt.

#### Agricultural By-products

A variety of ag-based chemicals are being used either alone or as additives for other winter maintenance chemicals. Ag-based additives increase cost but may provide enhanced ice-melting capacity, reduce corrosiveness, and/or last longer than standard chemicals when applied on roads. Furthermore, ag-based additives utilize renewable resources and have less impact on the environment. For example, Beet 55 is a de-sugared beet molasses that is delivered as a concentrate and mixed with salt brine onsite (Appendix D). This product claims to reduce the corrosivity of salt brine by 75% and decrease salt application rates by 50%. It should be noted that these products require specialized equipment for mixing, storage and application. Currently, Public Works does not have the resources or equipment to pilot these products.

### **Kingsville's Salt Management Program**

The Town of Kingsville's Salt Management Plan (Appendix E) commits to providing efficient and effective winter maintenance to ensure the safety of users of the municipal road network and in keeping with applicable legislation while striving to minimize adverse impacts to the environment. Several key strategies Public Works uses to reduce salt use are:

#### Diligent Weather Monitoring

Accurate information about current and forecasted weather conditions allow for the pretreatment of roads before the winter event arrives. This increases safety for road users and reduces the required amount of salt to achieve the desired level of service. Town staff receive three weather reports per day and advanced warnings of inclement weather.

#### Frequent Road Patrols

As per the Minimum Maintenance standards, winter road patrols are completed from November 1 to April 30. Air and pavement temperature sensors in the patrol vehicles assist in monitoring temperature trends to determine proper application rates. Road conditions are assessed with the goal of dispatching resources strategically and efficiently.

#### Computerized Spreader Controllers

These devices enable spreaders to maintain consistent salt application rates at different ground speeds, to communicate with fleet tracking systems and to generate accurate records of salt being applied. They are calibrated each year before the start of winter.

#### Judgement of Public Works Staff

Public Works staff and road supervisor's receive annual training on proper winter control methods. Topics typically include weather and road monitoring, plowing techniques, salt rationing, truck operation, pre-trip inspections, and safety. Courses emphasize the importance of proper salt management and staff use their knowledge and expertise to make informed decisions when on the road.

### **LINK TO STRATEGIC PLAN**

Effectively manage corporate resources and maximize performance in day-to-day operations.

## FINANCIAL CONSIDERATIONS

In 2020, the Town of Kingsville has purchased 2100 tons of salt and applied 1200 tons to area roadways. In comparison, the Town of LaSalle and the Town of Essex purchased 4000 ton and 3500 ton respectfully. The following table outlines total rock salt purchases and expenses over the last 5 years.

Year	Rock Salt (tons)	Total Expenses
2016	3807	312,620.95
2017	3810	313,875.97
2018	4583	390,040.97
2019	4022	353,592.67
2020 (YTD)	2102	192,908.62

The cost per unit and associated benefits of various winter control products can be seen in Appendix C.

## CONSULTATIONS

- K & S Windsor Salt
- Ontario Good Road Association
- *O. Reg. 366/18: Minimum Maintenance Standards for Municipal Highways*
- National Cooperative Highway research Program Snow and Ice Control: Guidelines for Materials and Methods
- Western Transportation Institute: Benefit=Cost of Various Winter Maintenance Strategies

## RECOMMENDATION

That Council receive the information related to road salt alternatives and that given the current resources and capabilities of Public Works, that road salt continues to be the primary anti-icing and deicing chemical used for winter control.

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