Salt Management Plan
The City of Barrie
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1.0 INTRODUCTION

1.1 OVERVIEW

In 2001, Environment Canada released an assessment report stating that road salts are entering the environment in large amounts and are posing a risk to plants, animals, birds, fish, lake and stream ecosystems and groundwater. Road salts are used in Canada as de-icing and anti-icing chemicals for winter road maintenance, with some use as summer dust suppressants. The Government of Canada has not banned the use of road salts or proposed any measures that would compromise or reduce road safety. The environmental risk management strategy for road salts has focused on the development of best practices respecting storage, spreading and disposal, while ensuring that road safety is not negatively impacted. In response to Environment Canada’s initiative to develop measures to manage the risks associated with road salts, the City of Barrie has prepared this document, which summarizes the City’s road salt management practice. The purpose of this document is to highlight key elements of the City’s current practice and identify plans for future implementation that will encompass the best management practices for road salt application and will comply with the proposed federal code of practice. As we search for ways to reduce the usage of salt, the safety of both pedestrians and drivers will remain to be our top priority within winter maintenance operations, practices and strategies contained in the Salt Management Plan.

The City of Barrie has 1,658 lane kilometres of roads and 610.5 kilometres of sidewalk that are maintained during the winter. These winter maintenance activities include anti-icing, plowing, salting and sanding. Snow and ice conditions on the road system have a dramatic impact on public safety, roadway capacity, travel time and economic costs. The City, like other road authorities, must use road salt to maintain safe roads and sidewalks for the people of Barrie during the winter. Since the Environment Canada report in 2001, the City of Barrie has introduced several changes to its winter maintenance activities to reduce the amount of salt used to maintain user safety on our roads and sidewalks. The City also continues to review and test new products and methods to continue to reduce the salt usage. The last twelve years have also seen improvements in technology to allow staff to use the right material, in the right amount, in the right place at the right time.

Although there is ongoing research into the use of alternatives to road salt (sodium chloride) in winter maintenance, salt continues to be the most cost-effective de-icer across Canada. However, because of the adverse effects that salt has on the environment, this Salt Management Plan strives to minimize the amount of salt entering the environment by including best salt handling practices, and using new technologies to ensure its most effective use over the road and sidewalk systems.

This report presents an update from previous Salt Management Plans and provides an overview of our Salt Management Plan.
2.0 SALT MANAGEMENT POLICY

2.1 PURPOSE AND OBJECTIVE OF DOCUMENT

The Salt Management Plan sets out a policy and procedural framework for ensuring that the City of Barrie continuously improves the management of road salt used in winter maintenance operations. It was based on a comprehensive comparison of past practices against best management practices. The plan sets out specific goals for improving the City’s salt management practices.

Any modifications to the City’s winter maintenance activities must be carried out in a way that provides road and sidewalk safety and user mobility consistent with the weather conditions experienced during the snow and ice control season. Staff is committed to exploring new technologies and practices in winter maintenance activities to reduce the amount of salt entering the environment, while ensuring safety is not compromised.

This Plan is dynamic – allowing the City to phase in new approaches and technologies in a way that is responsive to fiscal demands and the needs to ensure that roadway safety is not compromised.

2.2 RESPONSIBILITIES

Everyone within the City of Barrie and the Roads, Parks and Fleet Department connected to winter road maintenance has some responsibility for developing, implementing and reviewing the success of the Salt Management Plan and its associated activities. It is through a cooperative effort that the City will reduce the environmental effects of its road salt while maintaining safe roads.

2.3 VISION, MISSION AND MANDATE

Vision

The Roads, Parks and Fleet Department will be recognized as an exceptional example of an environmentally responsible user of pre-wetting using salt brine, anti-icing and de-icing techniques to provide for safe road and sidewalk conditions during the winter months.

Mission

The Roads, Parks and Fleet Department will ensure optimal use of pre-wetting using salt brine, anti-icing and de-icing techniques on Barrie roads and sidewalks while striving to minimize salt impacts to the environment.

Mandate
The Roads, Parks and Fleet Department must provide safe winter conditions for vehicles and pedestrians as required by level of service policies and funding guidelines approved by the Barrie City Council.

2.4 POLICY STATEMENT

The City of Barrie will provide effective winter maintenance to ensure the safety of users of our road network in keeping with Provincial Legislation and accepted standards while striving to minimize the adverse effects that the use of road salt can have on our environment. To meet this commitment the City of Barrie:

- Will meet and adhere to the guidelines contained within the Salt Management Plan;
- Will strive to review and upgrade, as necessary, the standards contained in the Salt Management Plan on an annual basis to take into account new technologies and developments; and
- Is committed to ongoing staff training and education.

2.5 APPLICATION

This policy is adopted by the City of Barrie Roads, Parks and Fleet Department and applies to all employees involved in Winter Maintenance Operations.

3.0 POLICIES FOR WINTER MAINTENANCE

3.1 INTRODUCTION

The major activities related to winter maintenance are:

- Salt and sand storage
- Salt and sand spreading
- Anti-Icing
- Pre-wetting
- Salt and sand loading
- Snow storage and disposal
- Salt Brine Production and Storage
- Treated Salt – Use and Storage
- Organic liquid anti-icing/de-icing fluid

3.2 SALT AND SAND STORAGE

The City of Barrie has one salt storage facility and one sand storage building. The salt storage facility is capable of storing under cover approximately 15,000 tonnes of salt and 100 tonnes of treated salt, 24 vehicles, all brine production and pumping equipment, two 30,000 litre brine double walled storage tanks and two organic liquid tank. The sand storage building can
accommodate approximately 3,500 tonnes of sand/salt mix. Having all materials under cover and on an impermeable base limits the amount of salt that is exposed to the environment caused by wind and storm water runoff.

3.3 SALT AND SAND SPREADING

The City of Barrie utilizes electronic spreader controls in all City and Contracted equipment. The electronic spreader units allow for accurate placement of sand and salt ensuring improved material application, downloading of activity information for verification and programming of material applications. These units are calibrated annually to ensure accuracy. The rate of application is based on the weather condition, the forecast and the road classification.

3.4 ANTI-ICING

The City of Barrie has 13 anti-icing units and carries out anti-icing to address several types of forecasted weather. Liquid capacities for these units range from 3,785L to 4,921L.

3.5 PRE-WETTING

Pre-wetting of the salt as it is being spread onto the roadway more quickly activates the chemical process and to reduce "bounce" that occurs when dry salt is used. Pre-wetting thus reduces loss of salt to the roadside and the transfer of road salt in excess amounts to general environment. All City and Contracted units that spread salt are fitted with on board pre-wetting tanks. Pre-wetting settings are set according to different weather states and temperatures.

3.6 SALT AND SAND LOADING

Spreaders are loaded inside whenever possible. If inside loading is not possible, appropriate measures are taken in order to minimize salt loss. When loading spreaders outside of the storage structure, care should be taken to minimize spillage of salt onto the loading pad. Deliveries of salt are arranged such that material is placed within the covered storage facility as soon as possible upon delivery. Overloaded spreaders are prone to spilling salt during operations. Therefore, spreaders are not to be loaded beyond their capacity.

3.7 SNOW STORAGE AND DISPOSAL

As a result of snow plowing operations, snow accumulates at the side of roads as windrows or mounds. The City starts snow removal operations when these windrows reach volumes that create a nuisance or hazard to pedestrians and motorists, to maintain capacity for subsequent snowfalls. In previous years, the City of Barrie used in house and rented mobile melters. Testing of the effluent created by these melters created concern for the environmental impact of this process. As a result, snow that is removed from boulevards is stored at the Operations Centre (165 Ferndale Drive North). This location is outfitted with an impermeable pad and stormwater management ponds. Should snow storage exceed our limit, the portable melter will be used at the Operations Centre to melt the snow. The effluent will then be discharged through the Oil and
Grit Separator and then enter into the stormwater management pond. Additional snow is available to be disposed at the Environmental Centre (272 Ferndale Drive North).

3.8 SALT BRINE PRODUCTION AND STORAGE

The City of Barrie produces its own brine with an automated brine maker. This system ensures the accuracy of the quantity of salt in the brine. The brine, at 22% salt concentration by weight, is used for anti-icing and pre-wetting. Brine produced on site is stored in two 30,000 litres double walled tanks designed to contain the liquid in event of a tank rupture.

3.9 TREATED SALT – USE AND STORAGE

Due to the lack of pre-wetting capabilities in the units that clear and treat parking lots and waterfront trails, the City of Barrie uses treated salt as an anti-icing and de-icing agent for these locations. Treated salt is rock salt that is premixed with liquid magnesium chloride. This product has allowed the City to reduce applications in parking lots and trails while still achieving the same result. Due to the product’s damp texture, it doesn’t bounce and scatter like dry salt and will not be affected by wind. The treated salt is also used as the salt additive to winter sand. It is mixed with a pug mill at a rate of 6%. The product and mixing process allows the City to reduce its salt use and ensure accuracy of the amount used.

3.10 ORGANIC LIQUID ANTI-ICING/DE-ICING FLUID

As an additive to brine and as a pre-wetting agent, when it is below -12°C, the City of Barrie uses an organic all natural agricultural product. It reduces salt use and doesn’t have the same effect on the environment, but is too costly to use exclusively.

4.0 OPERATIONAL PRACTICES AND STRATEGIES

4.1 OVERVIEW

This section of the Salt Management Plan discusses the operational practices and strategies related to the effective management of road salt during winter maintenance activities.

4.2 WEATHER MONITORING

The City currently has two Road Weather Information Systems (RWIS) stations. One is located in the south east side of the City at the intersection of Yonge Street and Ashford Drive and the other is in the north end at the intersection of Bayfield Street and Livingstone Street. The RWIS sites provide real-time information on road conditions to the Road Patrollers and Forepersons over the internet. The Road Patrol and Foreperson vehicles also have mobile road temperature sensors that read the surface temperatures of the road they are travelling over. This information enables staff to make informed decisions as to when and where winter operations should commence or end, including what material application rates will work best for the forecasted or actual conditions present.
RWIS station technology provides specific weather state and precipitation forecasts. We are able to get real-time site conditions including:

- Pavement temperature
- Pavement condition
- Wind speed and direction
- Atmospheric temperature and humidity
- Types of precipitation

The RWIS system also provides internet access to current weather radar information and forecasting specific to the City of Barrie. Road Patrollers and Forepersons can also use several weather reporting services such as Environment Canada, The Weather Network®, local weather forecasts and Internet sources.

The City’s Roads, Parks and Fleet (RPF) Department have installed three RWIS stations at Livingstone St. and Bayfield St., Yonge St. and Ashford Drive and Veteran’s Drive and Commerce Park Drive of the City. With the City’s planned development in the annexed lands and existing Barrie areas, the proposed and established RWIS stations will provide weather monitoring and forecast information to ensure service levels are consistent with other areas throughout the City. In 2018, RPF proposes to install one additional RWIS station to provide an even wider present weather monitoring and microclimate weather forecast for the City. The proposal is currently pending Council budget approval.

4.3 ANTI-ICING PROGRAM

Anti-icing is the application of a chemical solution (salt brine or other organic liquid material) to the pavement before a storm or formation of frost to prevent the bonding of ice or snow to the road surface. To accomplish this, salt brine is sprayed on the road surface, the water component of the brine then evaporates or is dried up by traffic, and only the salt component remains on the road surface. A pre-treatment can be made well in advance of a storm (up to two days) provided that the storm does not start out with above freezing temperatures and rain, which will wash the chemical away. Anti-icing reduces the overall application of salt.

4.4 PRE-WETTING

All contractor and City spreader units are equipped with on-board pre-wetting capabilities. This enables the units to pre-wet the salt as it is applied to the roadway and increases the efficiency of the salt. It reacts more quickly and doesn’t bounce and scatter off the roadway. The net result is an overall reduction of salt usage.

4.5 WINTER EVENT

Winter weather can offer various combinations of precipitation, pavement temperatures, wind and visibility. A successful winter operation can employ numerous practices.

The prime objective in applying salt on the road surface is to prevent the formation of ice rather than to melt an accumulation. Therefore, salting, whether prior to or during a storm, must be timely. The exact effective range of salt varies, being dependent on many factors. Salt applied in
brine form prior to or in solid form at the beginning of a storm will prevent packing so that the plows can remove nearly all the snow. During a storm where plowing is continuous, further salt applications after each clean sweep of the plow will prevent ice formation. Salt applied in the early morning immediately after the clean sweep of the plow will have the advantage of any morning sunshine and traffic to aid the salting process. Traffic volume increases the effectiveness of salt. Speed and safety with a controlled distribution of salt are the important factors in efficient salting.

4.6 LOADER SCALE

During the winter months, all vehicles are loaded by one of two loader operators who track all loads in the electronic loader scale. The loader scale tracks the unit number and quantity of material loaded. This information can be used to track and verify the amount of salt used by the unit. It has been used to discover electronic spreader devices that have malfunctioned or operators who have used incorrect application rates.

5.0 MONITORING AND UPDATING THE SALT MANAGEMENT PLAN

5.1 OVERVIEW

The Salt Management Plan should be reviewed and updated each year, with new technologies or practices added or changed.

5.2 VEHICLE GLOBAL POSITIONING SYSTEMS (GPS)

The City of Barrie has GPS installed in all of its winter maintenance vehicles. The use of GPS allows staff to ensure all roads have been covered. It provides vehicle tracking and monitoring, twenty-four hour a day, seven days a week, over the Internet for as many or as few vehicles as required.

The live system to enables our staff to monitor these vehicles. It keeps track of the location and application rate of all material spread. This will contribute to the City’s ability to control the amount of road salt used on the road surface and ensure the committed Level of Service to be met for the community.

The system may also provide total winter material loading information within

The GPS allows for the recording and analysis of:
- Truck speed
- Vehicle location
- Start and finish times
- Wing and plow activation status
- Winter material accumulations tracking
- Spreader controls (on or off and application rate)
5.3 EQUIPMENT CALIBRATIONS

All City and Contractor winter operation vehicles are equipped with electronic spreader distribution systems. The vehicles are calibrated at the beginning of the season and again at other times when necessary. The following application rates are currently used for salt:

- 50kg/lane km
- 100kg/lane km
- 130kg/lane km
- 150kg/lane km
- 195kg/lane km
- 300kg/lane km

The average salt application rate for roads is 130kg/lane km. Vehicle operators can make judgment calls to increase or reduce application rate at different roads geometries, i.e. hills, curves and intersections.

And for sand:

- 500kg/lane km
- 650kg/lane km

5.4 IMPROVED RECORD KEEPING

All City staff involved in winter maintenance activities, including foremen, patrollers and equipment operators, as well as contracted staff are required to record all activities, including material usage and location. This information is used to calculate and keep track of salt usage and distribution across the City.

5.5 OPERATOR TRAINING

To be eligible to operate winter maintenance equipment the operator must be on the approved operators list. To be placed on this list they must have a valid DZ driver's license or higher and have attended the City of Barrie’s comprehensive winter control training seminar prior to the start of the winter season. Topics covered in this training seminar reflect the Winter Operations Plan and any other important information.

Several operators, patrollers or other staff also attends the Ontario Good Roads Association’s Snow School or parts of the Association of Road Supervisors of Ontario Winter Operations Series.

5.6 FUTURE INITIATIVES

The Roads, Parks and Fleet Department will continue to seek the optimal use of pre-wetting, anti-icing and de-icing techniques on City roads and sidewalks while maintaining safe surfaces for pedestrian and vehicular traffic and striving to minimize salt impacts to the environment. The following initiatives will be implemented based on the resources availability:
Thoroughly implementation of City’s Winter Operations Plan including staff training for the source water protection areas and smart on use of salt;

Conduct field data collection and assist the GIS Branch to prepare a city-wide map of road curvatures throughout the City;

Working with the GIS Branch to develop a procedure to capture road gradients and curves from as-built drawings, and incorporate to appropriate GIS layer on the SDE;

Provide operational support to the Infrastructure Planning Group in reviewing transportation infrastructure that receives winter maintenance services in order to better identify users of the system (eg. vehicles, bicycles, e-bikes, pedestrians, etc.) at a minimum every five years and incorporate user data and winter maintenance considerations into the Transportation Master Plan;

Establish a priority sand route level of service category for municipal roads within scope of the Minimum Maintenance Standards (MMS). This route category would be ploughed like a priority route, and receive pickled sand as the treatment option as opposed to road salt;

Perform an annual review transportation infrastructure that receives winter maintenance services, specifically priority plow (and salt/sand) routes to identify opportunities for improvement and propose changes in service will consider all road segments’ planning classification (Arterial, Collector, and Local), MMS class, gradient, zoning and proximity to points of interest (schools, vulnerable sector community, churches and community buildings). Environmental Vulnerability of the surrounding area must also be considered;

Perform analysis and researches in establishing areas for direct liquid application routes with the use of additives.

Establish partnership with Traffic Group and Landfill Operations to track the volume of anti-icing/de-icing materials used for parking lots and Barrie Landfill Facility;

Update Global Positioning System devices used by City plows, sanders and contractor vehicles to incorporate Salt Vulnerable Area maps and track salt application within these areas;

Perform microclimate analysis within the City boundary and propose additional RWIS station where provides value added services to the Corporation;

Install road watch sensors at all bridges throughout the City to be able to better perform transportation infrastructure winter maintenance services;

Engage with post-secondary institutions that are currently performing research on winter maintenance practices. Contribute and participate in these research opportunities when able;

Prepare and implement a Patrolling Guideline to ensure a representative sample of roads is patrolled;

Review and change winter maintenance routes, including removing salt application on streets that no longer require bare pavement (former bus routes);

Hold a promotional campaign to begin at the start of every winter maintenance season and continue throughout the season that will help educate the general public about salt application best management practices and the City’s winter maintenance program. May include promotional materials in the local newspaper, informational pamphlets, ads through City run social media outlets, etc;

Investigate and employ ploughing as the primary technique to reduce amount of material applied to the surface;

Continue participating in the Ontario Road Salt Management Group to keep current on industry practices. Share and learn from the established group about the innovated winter operations practices and applied materials to reduce negative environmental impact; and
• Ensure future City Works yards are designed and constructed in accordance with the Transportation Association of Canada’s Best Practices related to the effective management of road salt.

6.0 CLOSING

With the need to develop and implement the City’s Salt Management Plan, the trial of new materials, equipment, and technologies has provided a positive step towards reducing our salt usage, while maintaining the same level of service the public has come to expect.

The Roads, Parks and Fleet Department will continue to measure and evaluate these benefits for operational improvement, cost savings, and environmental benefits on a yearly basis or as need dictates.