



Transportation and Works Department

York Region Salt Management Plan

October 2004

Transportation & Works Department



York Region
salt
management
plan

6.0 Summary

With the need to develop and implement the Region'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 Road Maintenance Division will continue to measure and evaluate these benefits for operational improvement, cost savings, and environmental benefits on a yearly basis or as the need dictates.

Table of Contents

1.0	INTRODUCTION	2
1.1	Overview	2
2.0	SALT MANAGEMENT POLICY	4
2.1	Purpose and Objective of Document	4
2.2	Responsibilities	4
2.3	Policy Statement	5
2.4	Application	5
3.0	WINTER MAINTENANCE POLICIES	6
3.1	Introduction	6
3.2	Salt and Sand Storage	6
3.3	Salt/Sand Spreading	7
3.4	Anti-Icing	7
4.0	OPERATIONAL PRACTICES AND STRATEGIES	8
4.1	Overview	8
4.2	Weather Monitoring	8
4.3	Anti-Icing Program	10
4.4	Liquid Brine Making	11
4.5	Winter Event	11
5.0	MONITORING AND UPDATING THE SALT MANAGEMENT PLAN	12
5.1	Overview	12
5.2	Vehicle Global Positioning Systems	12
5.3	Equipment Calibrations	13
5.4	Improved Record Keeping	13
5.5	Operator Training	14
5.6	Future Initiatives	15
6.0	SUMMARY	16

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. The report recommended that salt be designated toxic under the Canadian Environmental Protection Act (CEPA). It should be noted that Health Canada stated that road salts are not harmful to humans. As of April 2003, the Minister still has not announced whether or not road salts are to be designated as CEPA-toxic. However, if Environment Canada designates road salts as toxic, they will not ban road salts, but rather they will encourage users to develop management strategies that encourage improvement of salt handling and salt reduction through the use of new technologies, and the initiation of salt management plans.

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 is not banning the use of road salts or proposing any measures that would compromise or reduce road safety. The environmental risk management strategy for road salts will focus 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 Regional Municipality of York has prepared this document, which summarizes the Region's current road salt management practice. The purpose of this document is to highlight key elements of the Region'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.

The Region has about 1,028 kilometres of paved arterial roads carrying large volumes of traffic. The current winter standard of bare pavement is used on all paved roads. Winter maintenance procedures involve plowing, sanding and salting to maintain the roads in a safe state of repair. Plowing is the preferred method of removing snow and ice from the road surface; however, plowing alone cannot remove ice that has become bonded to the pavement. Salt has been the de-icing chemical of choice to deal with this bond.

5.6 Future Initiatives

In future years, the Region will be implementing the following initiatives:

- The use of pre-treated road salts. With the addition of de-icing chemicals such as Calcium Chloride or Magnesium Chloride to road salt this will enhance the performance characteristics to allow an increased range of use. These chemicals have corrosion inhibitors and can melt snow and ice down to temperatures in the -30 to -60 degrees celsius range, where regular salt only melts to -12 degrees.
- Work with water resources protection to identify areas that are vulnerable to road salts such as:
 - o Groundwater recharge areas
 - o Areas with exposed or shallow water tables
 - o Sources of drinking water
 - o Salt sensitive wetlands
 - o Salt sensitive kettle lakes
 - o River with low flows
 - o Salt sensitive habitats for species at risk

Once these areas are identified the Roads Transportation Branch will develop a plan to mitigate the impacts of road salts on these locations.

- The Southeast Roads Maintenance Yard's salt storage facility has been identified for replacement with a drive-thru salt shed. The replacement of the salt shed has been included in the 10-Year Facility Capital Plan.

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 licence or higher and have attended the Region's comprehensive winter control training seminar prior to the start of the winter season. Liquidated damages are in place should a non approved driver operate a winter maintenance vehicle.

The Region's winter control training seminar consists of the following topics:

- Preseason Preparation
- Weather Basics
- Snow and Ice control
- Equipment Operations
- Salt Properties and Environmental Impacts



However, with the recent concerns that have been raised on the negative side effects that salt has on the environment, we look for ways to reduce our salt dependency, while maintaining user safety. This remains the most important priority within winter maintenance operations. Although there is ongoing research into the use of alternatives to road salt (sodium chloride) in winter maintenance, it continues to be the most cost effective de-icer across Canada.

Due to the adverse effects that salt has on the environment, the Salt Management Plan will minimize the amount of salt entering the environment. The Region's Roads Transportation Branch has been working at ways to minimize salt usage. There are new technologies such as Road Weather Information Systems (RWIS), Global Positioning Systems (GPS) and electronic spreader controls to help our Patrollers know when to use salt and provide the tool to review the work done. There have been advances in equipment with the introduction of Salt Brine Spreaders, and drive-thru salt domes. This use of a Salt Brine and good housekeeping will reduce a large amount of salt going into the environment, along with improved staff training, documentation to track salt usage, and keep staff up to speed with advances.

2.0 Salt Management Policy

2.1 Purpose and Objective of Document

This Salt Management Plan is intended to set out a policy and procedural framework for ensuring that the Region minimizes the amount of road salt entering the environment during winter maintenance operations.

Any modifications to the Region's winter maintenance activities must be carried out in a way that provides roadway safety and user mobility consistent with the weather conditions experienced during the snow and ice season.

The Region is committed to exploring new approaches and technologies in winter maintenance activities to reduce the amount of road salt entering the environment and to ensure that roadway safety is not compromised.

2.2 Responsibilities

The following Transportation and Works staff members will be responsible for introducing the Salt Management Plan:

Director, Roads Transportation – Responsible for ensuring that the Salt Management Plan is developed, maintained, and implemented throughout the Region.

Manager, Road Maintenance – Responsible for ensuring that the Salt Management Plan is developed, maintained, and implemented throughout the Region.

Patrol Supervisors – Responsible for ensuring that winter maintenance activities are carried out in a way that complies with the Salt Management Plan.

Winter Maintenance Personnel – Responsible for ensuring that they carry out their winter maintenance duties in accordance with the policies and procedures set out in the Salt Management Plan, as directed by their Supervisors.



Vehicle GPS Unit

5.3 Equipment Calibrations

All of the Regional winter operation vehicles are calibrated at the start of season, and again mid way through the season, and whenever material analysis shows abnormal material application. The following application rates are currently used:

- 70 kg/lane km for frost
- 130 kg/lane km for rural, mid speed two-lane sections
- 170 kg/lane km for rural, mid to high speed two-lane sections
- 220 kg/ lane km for urban and rural high speed multi-lane sections with high A.A.D.T. (Annual average daily traffic)

5.4 Improved Record Keeping

The Region's Roads Maintenance Division staff and contractors are committed to recording where and when all of their material is used, as well as the amounts that are taken out with each trip. This information is used to calculate and keep track of salt usage and distribution over the whole road system.

5.0 Monitoring & Updating the Salt Management Plan

5.1 Overview

The Salt Management Plan will be updated and reviewed each year, with new technologies and progressive advances added. With the improved monitoring, and record keeping our Road Maintenance Division will achieve all the guidelines set by the Salt Management Plan.

5.2 Vehicle Global Positioning Systems (GPS)

The Region has GPS installed in all of its winter maintenance vehicles. The use of the GPS system enables our staff to monitor these vehicles. This keeps track of the location and application rate where all the road salt material is spread. Along with making sure all the Regional Roads are covered, more importantly it helps to monitor how much material is used, and where it is spread.

In the future, we hope to control the application rates relative to the truck location (i.e. salt sensitive areas). This will ensure that reduced salt application rates are achieved in these areas. This will contribute to the Region's ability to control the amount of road salt used on the road surface. The GPS allows for the recording and analysis of the following data:

Spreader/Plowing Trucks

- Material spread rates
- Plow up, plow down
- Truck speed
- Material used
- Vehicle location
- Start and finish time

Patrol Vehicles

- Road conditions
- Pavement temperature
- Air temperature
- Precipitation type
- General comment
- Vehicle location

2.3 Policy Statement

The Region has in effect a bare pavement policy that was adopted for all of the paved sections of the Regional road system. Since the adoption of the bare pavement policy, the Region developed a Quality Control Action Plan to ensure salt is only applied in a controlled and effective manner when required, in the right amount, at the right time and in the right place.

The plan includes the following major points:

- **Monitor salt use** - Application records are required each time material is applied to the road.
- **Application rates** - Rates are set for individual road sections based on the annual average daily traffic, speed and number of lanes.
- **Training of operators** - All equipment operators are trained on the policies for material usage and winter plowing operations.

2.4 Application

The Transportation Association of Canada has recommended that a Salt Management Plan should contain best management practices to protect the environment from the negative impacts of road salts, while it fulfills its obligation to provide safe efficient and cost-effective roadway systems. The guiding principals of the plan are outlined below:

- Salt Management Policy and Objectives
- Operational Practices
- Documentation
- Training
- Monitoring, Record Keeping, Reporting and Analysis
- Management Review

Adoption of the Salt Management Plan will formalize the Quality Control Plan process that has been in existence since the adoption of the bare pavement policy in 1994.

3.0 Winter Maintenance Policies

3.1 Introduction

The major activities related to winter maintenance are:

- Salt and sand storage
- Salt / sand spreading
- Anti-icing

3.2 Salt and Sand Storage

The Roads Transportation Branch operates four road maintenance yards that have material storage sheds that allow for the storage of salt under cover. Presently, three of the four roads maintenance yards have drive-thru salt sheds that allow for the loading and unloading of salt inside. This limits the amount of salt exposed to the environment during a winter storm by containing all spillage within the shed.

All loading and unloading of road salt shall be done within the drive-thru salt sheds at the following road maintenance yards:

- Southwest
- Central
- North

The Southeast Yard shall minimize the exposure of road salt to the environment by removing all spilled salt on a continuous basis during a winter event operation.

4.4 Liquid Salt Brine Manufacturing

A 2,000 gallon brine making unit has been installed at our North Road Maintenance Yard to manufacture in-house liquid salt brine for use as an anti-icing agent. The Southwest, Central and the Southeast Road Maintenance Yards are supplied with natural brine from a contracted source for their anti-icing operations.

4.5 Winter Event

This section presents general recommendations for successful winter operation practices that can be employed for various combinations of precipitation and pavement temperature and traffic volumes.

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 must be timely. The exact effective range of salt varies, being dependent on many factors. Salt applied 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.

The provided (**Appendix C**) table shows the recommended treatments for bare and centre bare pavement.



Liquid Salt Brine Storage Tower



Brine Maker

4.3 Anti-icing Program

This section presents general recommendations for successful anti-icing practices that can be employed for various combinations of precipitation and pavement temperature and traffic volumes.

Anti-icing is the application of a chemical solution (salt brine) to the pavement before a storm 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.

The anti-icing program is designed to address the following types of winter storms and road conditions:

- Light snow storm
- Light snow storm with period(s) of moderate or heavy snow
- Moderate or heavy snow storm
- Frost or black ice
- Freezing rain storm
- Sleet storm

Guidance on maintenance actions for each event are provided in the **(Appendix B)** tables for several pavement temperature ranges and for initial and subsequent operations. Temperature trend, an important factor, is also indicated. Liquid application rates are suggested where appropriate.



Anti Icing Truck

3.3 Salt / Sand Spreading

The Region shall utilize electronic spreader controls in all of the Regional and contractor combination plow/sander trucks. These systems allow for accurate placement of sand and salt ensuring improved material application, downloading of activity information, and the programming of variable rate material applications, as conditions dictate.

The Region's winter road salt and sand distribution rates are shown in **(Appendix A)**. These rates are based on road type (urban/rural) and traffic volumes.

3.4 Anti-Icing

The Region has implemented an anti-icing program for roads with an annual average daily traffic greater than 20,000 vehicles per day (majority of multi-lane and some two-lane roads). This represents approximately 1,450 lane kilometres of the Regional road system.

The anti-icing program is designed to address the following types of winter storms and road conditions:

- Light snow storm
- Light snow storm with period(s) of moderate or heavy snow
- Moderate or heavy snow storm
- Frost or black ice
- Freezing rain storm
- Sleet storm

4.0 Operational Practices & Strategies

4.1 Overview

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

4.2 Weather Monitoring

The Region currently has five RWIS stations located in key geographic areas to address different weather patterns. Environment Canada supplies a site specific precipitation forecast at 6:00 am and 3:00 pm for each location everyday. To enable our Patrollers to plan and combat a storm, the patrol trucks have been equipped with new leading edge technology. This technology allows the Road Patrollers to have the ability to monitor the RWIS stations. These sites provide real time information on road conditions to the Patrollers over the internet in the patrol truck. The Patrol 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.

Patrol Truck Weather Monitoring Equipment



RWIS Tower
& Road Sensor Puck

RWIS technology provides specific weather and precipitation forecasts. Five stations are currently installed at Stouffville Road and McCowan Road, Woodbine Avenue and Ravenshoe Road, King Road and Mill Street, York/Durham Line and ETR 407 and Highway 27 north of King Sideroad 17. Through the five stations, we are able to get real time site conditions including:

- Pavement temperature
- Pavement condition
- Salt concentration
- Wind speed and direction
- Atmospheric temperature and humidity

