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Waterloo ON N2L 0A4

May 3, 2024

Project/File: 161414214

Attention: Township of North Dumfries

106 Earl Thompson Road, 3rd Floor
P.O. Box 1060
Ayr, Ontario, N0B 1E0

To Whom It May Concern:

Reference: 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment

1 Introduction

In accordance with the Region of Waterloo's (Region) requirements, a Chloride Impact Assessment (CIA) has been prepared in support of the Cedar Creek Industrial Development (Site). The Site constitutes 18.03 ha of proposed industrial development, bounded by Cedar Creek Road to the north, existing industrial property to the west, and existing agricultural lands to the south and east. The draft plan of the Site can be found on drawing DP-1 in Appendix A.

As part of the winter maintenance program, the Site may be subject to salt loads to mitigate pedestrian slips/falls and vehicular collisions on travel pathways. The Ministry of the Environment, Conservation and Parks (MECP) has deemed that storage and application of road salt is a drinking water threat, as sodium chloride can readily infiltrate the subsurface into the groundwater system. This CIA has been prepared to provide guidelines to ensure that road salt is applied in an environmentally responsible manner. It should be referenced when developing individual salt management plans (SMPs) for each lot of the proposed development at the site plan stage.

The following sections identify practical methodologies that focus on limiting chloride impacts at-source through controlled material application rates and recommended salt application practices. To provide some ability to adapt over time, a further recommendation for monitoring work or "benchmarking" is proposed.

This Assessment is intended as reference source for developing future SMPs, which are to be used as implementation/monitoring tools for Site owners. Individual SMPs should be developed to be adaptive and cyclical to allow the owners to responsibly manage their winter maintenance programs, with the objective of providing safe and effective control of winter ice accumulations on the development property.

2 Source Water Protection

As of July 1, 2016, development within the Region of Waterloo requires compliance with the approved Source Protection Plan (SPP – Draft Updated January 21, 2021) for the Grand River Source Protection Area. In the SPP, policy mapping is used to determine the Wellhead Protection Area (WHPA), the vulnerability score (how vulnerable the area is to contaminants), and the drinking water threats that are

Reference: 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment

significant if present on the Site. The SPP outlines 21 drinking water threats to be addressed through the use of source water protection. The three threats directly related to the use of salt for winter road de-icing are as follows:

- The application of road salt (only a significant drinking water threat if the impervious area is equal to or greater than 80%).
- The handling and storage of road salt.
- The storage of snow.

WHPAs are given a designation between A and D, which are zones that are delineated based on how quickly water moves horizontally through the associated aquifer as follows:

- WHPA-A represents the area withing 100 m of the well.
- WHPA-B to D are areas defined by groundwater travel time to the well of 2 to 25 years, respectively.

Each zone within a WHPA is assigned a vulnerability score to indicate the risk of contamination to a drinking water source. WHPAs are also assigned a vulnerability score from 0-10, with higher scores representing greater risk, based on horizontal and vertical flow. The WHPA designation and vulnerability score, are used together to determine policies that apply to drinking water threats at a particular location.

Intake Protection Zones (IPZ) represent the vulnerability of pollutants being spilled into municipal water intakes that take water from surface water bodies (i.e., rivers and streams). IPZs are categorized in 3 zones based on travel time to the surface water intake and are given vulnerability scores on a scale from 0.8 to 10:

- IPZ 1 is immediately surrounding the intake, including an area 200 to 1000 metres upstream, with a vulnerability of 8.0 to 10.0.
- IPZ-2 is the area where water (and pollutants) can reach the intake in a specified time, usually two hours minimum. It has a vulnerability of 5.6 to 9.0.
- IPZ-3 is all other areas upstream of the intake. Vulnerability scores from 0.8 to 9.0

As illustrated on the *Township of North Dumfries Source Protection Policy Map* in Appendix B, the Site is not in a Wellhead Protection Area (WHPA), but it is in IPZ-3, with a vulnerability score of 2. There are no specific restrictions or requirements for a site with this score, but as shown on the map in Appendix B, the Site is in a significant groundwater recharge area. The majority of flows from the Site are proposed to be infiltrated (see Section 3, below), and as such a CIA and, eventually, individual SMPs, must be prepared. The SPP policies pertaining to the handling and storage of salt and snow are appended for reference (Appendix B).

Reference: 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment

3 Stormwater Management Design

The stormwater management (SWM) design for the Cedar Creek Industrial Development is documented within the *2509 Cedar Creek Road, Ayr, ON Township of North Dumfries Functional Servicing and Stormwater Management Report* (Stantec Consulting Ltd. (Stantec), May 2024). The Site design includes several lot-level soakaway pits and one SWM facility that infiltrates flows from the Site. Runoff from most of the Site is directed to the SWM facility, where discharge for events up to and including the 10-year storm will be infiltrated and overflows will enter an outlet channel to Cedar Creek. Flows from a small portion of the Site and some external lands will be directed around the Site via a storm sewer ("By-Pass Storm Sewer"), to a plunge pool and spreader swale and then discharged to the neighbouring property to the east. Flows from additional external areas are routed around the Site via a swale ("West Road Ditch") that connects to the outlet channel discharging to Cedar Creek. All quantity, quality, and erosion control for the Site will be provided by this SWM facility.

4 Chloride Management

The *Guide to Salt Management for Sidewalks, Parking Lots, and Private Roads* provided by the Region of Waterloo (Appendix C) and the Smart About Salt Council (SASC) was referenced in the preparation of the CIA. The SASC is a not-for profit organization that recognizes industry leaders through certification and offers training to improve salting practices and teach contractors and staff how to effectively balance winter safety and environmental protection. More information can be found at: <https://smartaboutsalt.wildapricot.org/>. Consideration of present and future Site assessment, plan development and operational procedures were also considered in the preparation of this report.

The primary parameter of concern regarding groundwater quality as it relates to potential for human impact, is that of chlorides associated with typical urban road salting practices. Elevated chloride levels in surface water are also of concern, in that increased concentrations can cause ecological impacts.

The timely removal of snow and ice and/or use of salt alternatives will provide effective management of winter ice/snow accumulations, while limiting risk to the environment – specifically contamination of groundwater.

It is recognized that this Assessment is an attempt to limit application of chlorides; however, human safety shall take priority. During extreme weather events, the winter maintenance contractor shall use reasonable judgement to ensure that sufficient ice/snow control is provided for the safety of all persons accessing the Site.

4.1 Traffic and Environmentally Sensitive Areas

Within the proposed development there are areas that will be subject to traffic, both vehicular and pedestrian. Driveways, Site roadways, and parking areas are estimated to constitute approximately 13 ha that will be subject to salt from de-icing applications or salt residue from vehicles and exhaust. This CIA outlines measures to mitigate excessive salt application rates in these traffic and pedestrian areas.

Reference: 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment

As noted above and illustrated in Appendix B, the Site lies within a significant groundwater recharge area.

4.2 Operating Procedures/Application Methods

The Site lies within a significant groundwater recharge area and as such the primary ice/snow control method to be implemented onsite is timely removal of snow and ice from roadways and pedestrian walkways. Since runoff from all areas to be salted will be infiltrated, alternative ice control products should be considered for secondary control (see Section 4.5 for more).

The effectiveness of ice control measures onsite is directly related to atmospheric conditions. Ice control products have product-specific effective temperature ranges and the application of ice control products outside of these temperatures has little to no effect. Sodium chloride, for example, has an effective temperature range between -1°C and 4°C. The winter maintenance contractor should ensure that ice control products are applied within the specified temperature parameters to avoid over-application and over-spending.

While it is difficult to compare typical “lane kilometre” application rates to the Site, effective ice/snow control can be achieved using standard application equipment which can be calibrated to deliver a product at a specified application rate. Pedestrian walkways should also be treated with a calibrated manual spreader. At no time should material be applied by hand (ineffective material dispersion).

4.3 Snow Storage/Disposal

Snow storage areas for the Site are to be determined during the development of individual Site Plans and the associated salt management plans. All snow clearing operations should be carried out in a manner that permits stockpiling of snow onsite in the general locations identified in these Site Plans. Should accumulations begin to affect or impede safe pedestrian/vehicular access, snow removal may be necessary. In all cases where the winter maintenance contractor opts to remove/dispose of excess snow, this material shall be disposed of at an approved snow dump facility.

It is imperative that snow piles be confined to prescribed areas to prevent uncontrolled snow melt from occurring (which could lead to undesirable icing and need for more frequent product/sand application) and entering the infiltration SWM facility or soakaway pits. The defined snow storage areas are to be selected based on the areas that provide the most effective grade/runoff control. Snow storage will be provided at various locations, likely along the periphery of each lot to minimize impact on vehicular and pedestrian traffic and to not impede emergency vehicle access. Any snow storage areas should be graded such that snow melt is directed away from driveways, roadways, and parking areas to prevent refreezing of melt water on these surfaces and a requirement for additional de-icing measures.

It is expected that snow removal and potential de-icing agents will be required across the majority of the Site since it is proposed to contain paved industrial lots. Specific dimensions of areas to be cleared will be defined in individual salt managements plans (SMPs) for each lot during detailed design.

Reference: 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment

4.4 Site Drainage

The Site is currently graded such that all drainage enters a grassed swale on the periphery of the Site before entering the infiltration SWM facility. Each site should be designed to limit the length of the overland flow across impervious surfaces to reduce the likelihood of meltwater re-freezing, limiting further de-icing measures. Additionally, up to 25 mm of rooftop runoff from the Site will be directed to lot-level soakaway pits, thereby reducing water flow and ice formation on pedestrian and vehicular traffic areas, allowing for potential reduction in de-icing measures for most precipitation events, where applicable.

4.5 Alternative Ice Control Products

There are numerous proprietary ice control/winter maintenance products available, each with a specific chemical composition, but they all utilize ionization principles to inhibit ice/snow bonding to the surface asphalt layer. These products differ from standard road salt because they are manufactured from bio-degradable “natural” source alternatives and benefit the environment by limiting the release of sodium chloride into melt water. Some examples of road-salt alternatives are listed below:

- Beet brine: used as pre-treatment for snowfall to reduce chloride usage which has had success as a pilot project in the City of Calgary¹.
- EcoTraction: a commercial product derived from volcanic ash, provides instant traction for vehicles and works at temperatures reaching -50°C².
- Cheese Brine: used as pre-treatment for snowfall and has had success in Polk County, Wisconsin³.

While many of the available natural-source alternatives provide similar performance to that of salt, they can be more expensive and may not be readily available. The use of these alternative products in Canada represents a relatively new technology and as such, it is difficult to assess specific performance of one product against another. To this end, the owners will need to review, compare, and assess the specific product they wish to use. The attached worksheets (*Region of Waterloo/Guide to Salt Management*) in Appendix C are designed to assist with rating the potential benefits of these alternative products.

Traction aids such as sand, grit and non-clumping kitty litter can reduce the potential for slipping on sidewalks and roadways. However, these alternatives can impact the longevity of stormwater management infrastructure (particularly infiltration facilities, and especially if fine-grained materials are used) and as such, timely sweeping of hard-surface areas should be included in the overall maintenance activities of the Site. Using coarse-grained materials as opposed to fine-grained materials can help to limit the impact on the infiltration facilities, since infiltration rates through these materials are known to be higher.

¹ Dormer, D. 2018. CBC News, *Beet brine again used to keep Calgary streets clear of snow and ice*. Retrieved from: https://www.cbc.ca/news/canada/calgary/calgary-beet-brine-snow-ice-control-1.4909615?fbclid=IwAR3XOybKnXiDMHReV_ye9jbSvJhAr2oXZ--xqrO30YHk5diVKi5kgIWTCIw

² EcoTraction, 2019. Retrieved from <http://ecotraction.com/>

³ Chappel, B. 2014 NPR, *Cheese to the Rescue: Surprising Spray Melts Road Ice*. Retrieved from <https://www.npr.org/sections/thetwo-way/2014/01/21/264562529/cheese-to-the-rescue-surprising-spray-melts-road-ice>

Reference: 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment

4.6 Recommended Application Rates

Review of the attached *Guide to Salt Management for Sidewalks, Parking Lots, and Private Roads* (Appendix C) as well as other relevant publications (Transportation Association of Canada/Environment Canada⁴) identifies that private site developments can be a significant source of increased chloride levels. Most Winter Maintenance Programs on private development sites are undertaken by private contractors, using a wide variety of application methods/rates. Since there is a tendency to be overly cautious during the winter months (to mitigate against perceived ice accumulation risks), over-application of salt can be a persistent problem. In instances where salt is necessary to mitigate safety risks to person or property, individual site owners should ensure that winter maintenance contractors participate in and follow the recommendations provided in the Guide (Appendix C) to prevent over application.

The attached Guide and the information provided by the Region of Waterloo online (https://www.regionofwaterloo.ca/en/living-here/winter_maintenance_tools.aspx) seek to build awareness of the potential impacts of excessive salt application through the use and implementation of salt application tracking worksheets (i.e., benchmarking). A key component of this CIA is the emphasis on the eventual tracking of salt use onsite, with the goal of adapting application rates to provide effective control of winter ice/snow while limiting environmental impact.

Stantec Consulting Ltd. (Stantec) has undertaken several reduction/management studies for the Region of Waterloo^{5,6,7} which focus primarily on road salt management rates for Regional and City roads with minor analysis of private sites. The analyses suggest that reasonable assumptions for the annual mass application of road salt are 44 tonnes/2-ln-km for primary roads (provincially, regional, and important city arterials), 22 tonnes/2-ln-km for secondary roads (collector and township roads), and 2.2 tonnes/2-ln-km for local roads. Typical application rates for parking lots were presented in the range of 11 to 14 tonnes/ha/year.

4.7 Reasonable Use Concept, Groundwater Recharge Rates, and Chloride Loading

To quantify potential chloride impacts to groundwater, the MECP's Reasonable Use Concept (RUC) was referenced for this CIA. The RUC provides a framework for assessing the impacts of chloride on groundwater. RUC suggests that the maximum concentration of chloride that should be present in groundwater is 250 mg/L (Ontario Drinking Water Quality Standard (ODWQS) for chloride). Testing of a groundwater sample taken from the Site in January 2024 indicates that the current chloride concentration is 190 mg/L, or 76% of the ODWQS.

⁴ Transportation Association of Canada (www.tac-atc.ca)/Environment Canada (www.eg.gc.ca)

⁵ Stantec, 2002. Road Salt Management and Chloride Reduction Strategies Phase 1: Road Salt Management Study Final, Kitchener, ON. Stantec Consulting Ltd. 2002.

⁶ Stantec Consulting Ltd. 2005. Road Salt Management and Chloride Reduction Study: Phase 2: Evaluation of Chloride Reduction Options. Prepared for the Regional Municipality of Waterloo. December, 2005.

⁷ Stantec Consulting Ltd. 2009. Upper Blair Creek Functional Drainage Study, Final Report. 2009.

Reference: 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment

Two calculations are required to determine the amount of chloride that can discharge from the Site into the adjacent/downstream system. The first calculation provides an indication of the maximum chloride concentration that could be added to the groundwater from the Site in “pristine” conditions (i.e., no development onsite or in proximity) without negatively impacting the adjacent property. The second calculation addresses the permissible input from the Site, accounting for loadings from surrounding development. Further descriptions of these calculations, how they were applied to the Site, and the results are attached (Appendix D).

The attached calculations show that although the current groundwater chloride concentration at the Site (i.e., 190 mg/L) does not exceed the ODWQS, it does exceed the maximum chloride concentration that would be acceptable in the groundwater beneath the adjacent property (132.5 mg/L). This means that chloride loadings from existing surrounding development have increased concentrations in groundwater at the Site to beyond the point that the RUC can be met (i.e., the final calculation shows a negative concentration). This suggests that no salt should be applied within the Site; however, human safety shall take priority and given the costs associated with salt-alternatives, it is assumed that salt will be distributed.

Mass balance calculations were completed for this CIA (Appendix D) to determine the estimated impact of salting within the Site. As noted above, typical annual salt application rates for parking lots range from 11 to 14 tonnes/ha/yr., therefore an average value of 12.5 tonnes/ha/yr. was chosen for this analysis. As runoff from all areas to be salted will be directed to infiltration facilities, it was further assumed that 100% of chloride from the applied salt will enter the groundwater system. The estimated groundwater concentration based on this analysis is 726 mg/L. During the detailed design stage, more testing may be considered to verify the groundwater chloride concentrations on a lot-level basis.

Given the above, the application of salt should be minimized to the greatest extent possible and the timely removal of snow from walkways, roadways, and parking areas as well as the use of salt alternatives shall be employed as the primary methods for Site snow/ice control; however, the winter maintenance contractor shall use reasonable judgement to ensure that sufficient ice/snow control is provided for the safety of all persons accessing the Site. As such, the Site owner should ensure to hire winter maintenance contractors that are Smart About Salt™ certified and follow guidelines set out in Transportation Association of Canada (TAC) document: *The Synthesis of Best Practices of Road Salt Management, Section 10 – Salt Use on Private Roads, Parking Lots and Walkways*⁸. Specific to application rates, the guidance document outlines the following best management practices:

- Weather forecasts should be monitored to inform the required application rates.
- Application equipment should be calibrated to ensure it functions as intended.
- Staff should be educated/trained to ensure proper procedures are followed.
- Indicators should be developed and followed to ensure the owner adheres to the specified application rates.

⁸ Transportation Association of Canada, 2013. *Synthesis of Best Practices of Road Salt Management*. Retrieved from <http://www.tac-atc.ca/sites/tac-atc.ca/files/site/doc/resources/roadsalt-10.pdf>

Reference: 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment

- The application rates should be reviewed by senior management annually to confirm desired results are achieved.

For more details on the TAC Road Salt Management Practices for private sites, see the link in the footnote.

4.8 Training

It is recommended that the winter maintenance contractor be Smart About Salt® certified. Information on training and certification can be found online (see Section 4 for details). A Certified Contractor is a snow and ice contracting company that meets the SASC criteria. In part, this means successful completion of the "Essentials of Salt Management" course within the past five (5) years. Note, a Trained Operator, an individual who has successfully passed the Smart About Salt Council "Essentials of Salt Management" training test, is not considered a Certified Contractor.

4.9 Benchmarking

Based on the preceding information, it is evident that while it is desirable to limit the application of chlorides, there are many other factors that will influence lot-level salt management plans. For example, the use of natural or environmentally "friendly" products may seem a logical choice, yet the actual benefits are difficult to quantify.

To ensure that individual SMPs are effectively managing salt use on the Site, it is recommended that the Site owners review the effectiveness of previous winter maintenance operations annually with the goal of identifying deficiencies and/or improvements. This would also be an opportunity for the owners to review/consider alternative ice control products which would in turn be evaluated the following year. This cyclical approach (review/recommend/re-assess) would allow the SMPs to become living documents to responsibly guide the maintenance needs of the Site.

The worksheets in the attached *Guide to Salt Management for Sidewalks, Parking Lots and Private Roads* (Appendix C) can be utilized as a monitoring tool to track, assess, and revise salt management strategies annually.

5 Conclusions and Recommendations

The preceding analysis and supporting documentation provide a CIA that can be used for the Site as a whole (including shared internal roadway) as well as a reference when developing more comprehensive and adaptive SMPs for the individual lots. Overall conclusions and recommendations based on this initial analysis are as follows:

- The subject Site is not located in any wellhead protection areas (WHPAs) but is in Intake Protection Zone 3 (IPZ-3) and is in a significant groundwater recharge area.
- All runoff from the Site parking and roadway areas will be infiltrated and as such it must be assumed that 100% of chloride from salt will enter the groundwater system.

Reference: 2509 Cedar Creek Road Industrial Development, Chloride Impact Assessment

- The existing groundwater chloride concentration is 190 mg/L, 76% of the ODWQS of 250 mg/L.
- Typical salt application rates for private sites are 12.5 tonnes/ha/yr. on average, which will result in groundwater chloride concentrations of 726 mg/L.
- Due to the proposed infiltration measures, position of the Site within a significant groundwater recharge area, and presence of existing chlorides, the following measures/actions are recommended to minimize impacts on the groundwater:
 - The winter maintenance contractor is to be Smart About Salt ® certified.
 - Timely removal of snow and ice should be the primary de-icing control method for this Site.
 - Salt should only be used when deemed necessary by the winter maintenance contractor.
 - Salt usage should be carefully tracked using the attached worksheets (or similar).
 - Use of sand as a supplement/alternative and other salt-alternatives should be considered and utilized to the greatest extent possible, with timely sweeping of hard-surface areas included in the overall maintenance activities of the Site to reduce their impacts to the infiltration facility.
 - The Site owner should meet annually with the winter maintenance contractor to review and assess winter maintenance operations, with the objective of effectively managing salt application on the Site.
- Individual SMPs shall be developed for each site at the site plan approval stage.
- It is recognized that this plan is an attempt to limit application of chlorides; however, human safety shall take priority, therefore during extreme weather events, the winter maintenance contractor shall use reasonable judgment to ensure that sufficient ice/snow control is provided for the safety of all persons accessing the subject Site.

All of which is respectfully submitted,

STANTEC CONSULTING LTD.

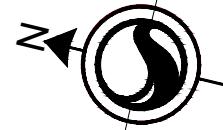
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Attachments: Appendix A: Draft Plan of Site (DP-1)
Appendix B: Township of North Dumfries Wellhead Protection Areas Map, Region of Waterloo Source Protection Policies
Appendix C: Region of Waterloo Salt Management Guideline – Tracking, Assessment and Reporting Worksheets
Appendix D: Chloride Impacts to Groundwater (RUC and Mass Balance Calculations)

APPENDIX A

Draft Plan of Site (DP-1)

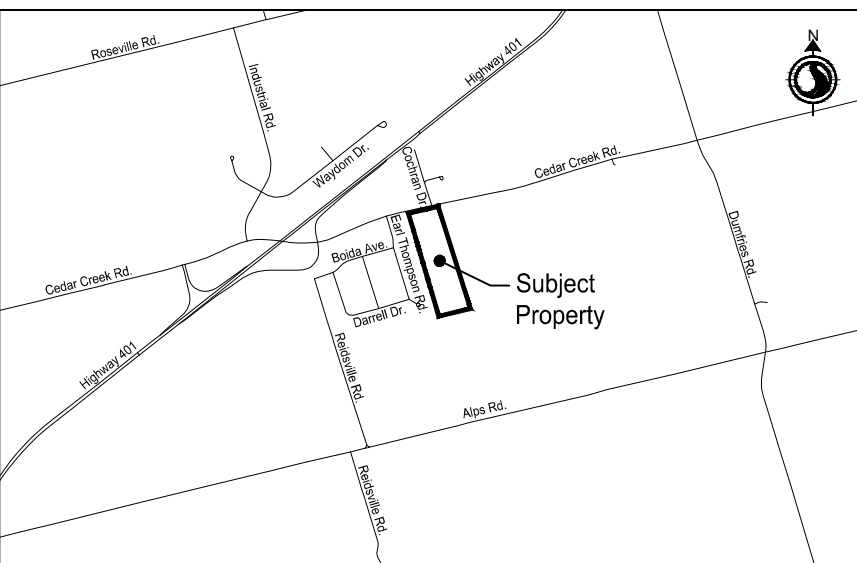


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Key Map NTS.



Legal Description

Part of Lot 29,
Concession 10,
Township of North Dumfries,
Regional Municipality of Waterloo

Information Required

Under Section 51(17) of the Planning Act,
R.S.O. 1990 c.P.13 as Amended

- a) - As Shown
b) - As Shown
c) - As Shown
d) - As Listed Below
e) - As Shown
f) - As Shown
g) - As Shown
h) - Municipal Water
i) - As Shown
j) - Municipal Sanitary and Storm Sewers
k) - None

Surveyor's Certificate

I hereby certify the boundaries of the subject lands and their relationship to the adjoining lands have been accurately and correctly shown.

Signed _____
O.L.S. Name
Stantec Consulting Ltd.

Date _____

Owner's Certificate

I hereby authorize Stantec Consulting Ltd. to submit this Draft Plan of Subdivision on my behalf.

Signed _____
Owner Name
Company Name

Date _____

Land Use Schedule

Lots/Blocks	Land Use	Area (ha)
Lot 1	Industrial	2.001
Lot 2	Industrial	1.966
Lot 3	Industrial	1.966
Lot 4	Industrial	1.967
Lot 5	Industrial	1.967
Lot 6	Industrial	1.967
Lot 7	Industrial	1.966
Block 8	Stormwater Management Facility	2.011
Block 9	Street A	2.202
TOTAL		18.039ha

1st Submission for Draft Plan	TR	MD	2024.01.12
Revision	By	Appd	YYYY.MM.DD
File Name: 161414214_X-OP_CONDO	JJ	JJ	MD
	Dwn.	Dsgn.	Chkd.

Permit-Seal

APPROVED: _____ DATE: _____
I hereby certify that this plan was prepared under the supervision of a registered professional planner.
Under the authority of the Ontario Professional Planners Institute Act, 1994.

Client/Project
CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title
CONCEPTUAL DRAFT PLAN
OF VACANT LAND CONDOMINIUM

Project No. 161414214
Scale 1:1250
Revision 0
Sheet 1 of 1
Drawing No. DP-1

COCHRAN DRIVE

EXISTING INDUSTRIAL

CEDAR CREEK ROAD

EXISTING AGRICULTURAL

LOT 4 INDUSTRIAL 1.967ha

LOT 5 INDUSTRIAL 1.967ha

LOT 6 INDUSTRIAL 1.967ha

LOT 7 INDUSTRIAL 1.966ha

BLOCK 8 SWM FACILITY 2.011ha

BLOCK 9 COMMON ELEMENT 2.202ha

STREET 'A'

EXISTING INDUSTRIAL

APPENDIX B

**Township of North Dumfries Wellhead Protection Area Map,
Region of Waterloo Source Protection Policies**

User identified location

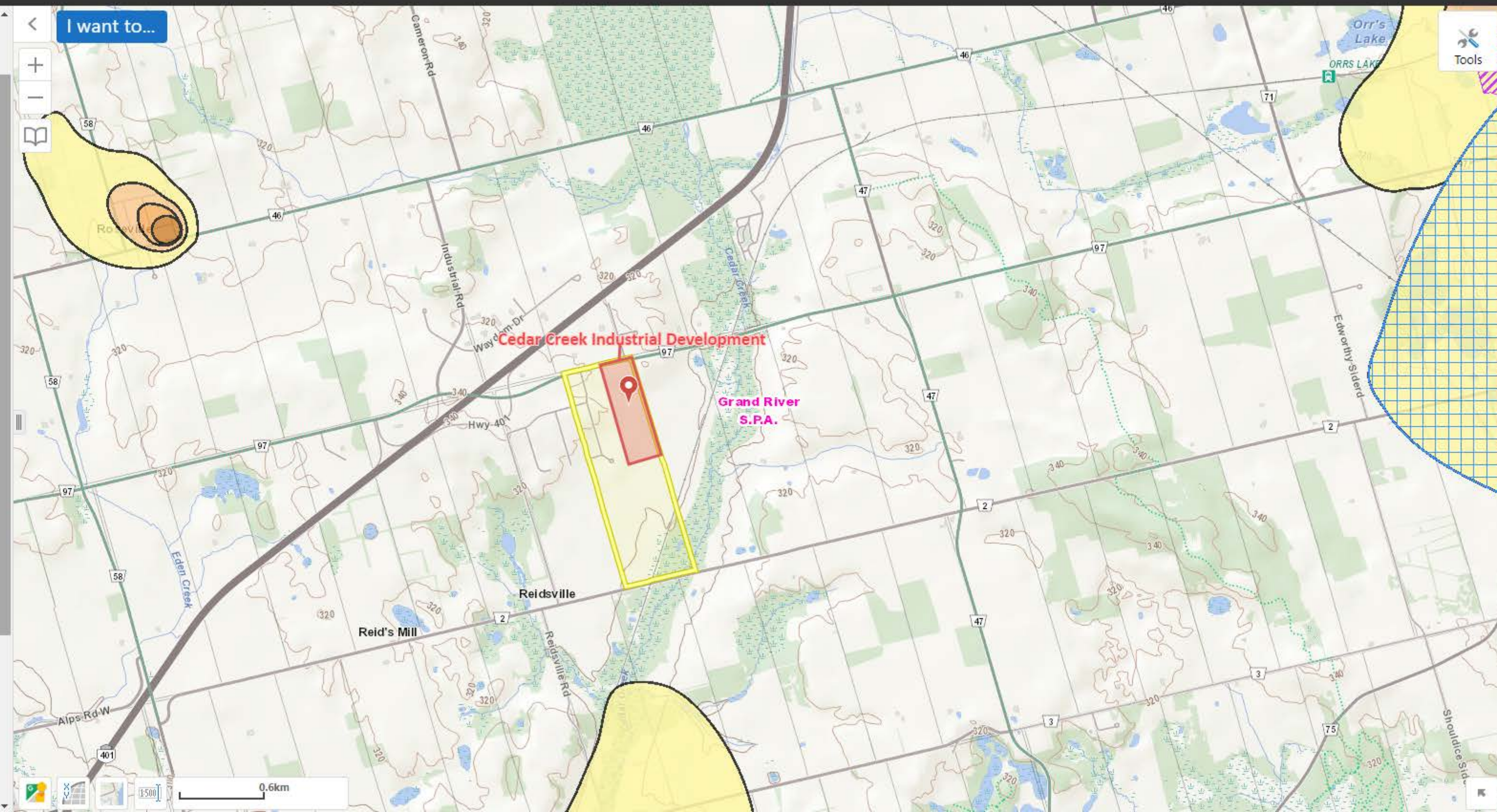
Water Quality Policy Search by SPA PTTW

Zoom in to confirm your location and results

Latitude: 43.33114 Longitude: -80.43065
UTM Zone: 17
Easting: 546156.7 Northing: 4797745.86
Upper Tier Municipality: **REGIONAL MUNICIPALITY OF WATERLOO**
Lower Tier Municipality: **TOWNSHIP OF NORTH DUMFRIES**
Township Concession and Lot: **DUMFRIES CON 10 LOT 29**
Assessment Parcel Address: **2509 CEDAR CREEK RD**
Assessment Roll #: **30010200060320000000**
MECP District: **Guelph**
MECP Region: **West Central Region**

Source Protection Details for Location

Source Protection Area: **Grand River**
[View Source Protection Plan](#)
 Wellhead Protection Area: **No**
 Wellhead Protection Area (WHPA-E): **No**
 Intake Protection Zone: **3** ; score is **2**
 Issue Contributing Area: **No**
 Significant Groundwater Recharge Area: **Yes** ; score is **N/A**
 Highly Vulnerable Aquifer: **No**
 Event Based Area: **No**
 Wellhead Protection Area Q1: **No**
 Wellhead Protection Area Q2: **No**
 Intake Protection Zone Q: **No**
 Significant Drinking Water Threats at this location:
 Threats list by zone can be found at this [link](#).
 Information is current as of: **August 9, 2023**



Policy Number	Policies Addressing Prescribed Drinking Water Threats within the Regional Municipality of Waterloo
	<p>b. Future:</p> <ul style="list-style-type: none"> i. Application; <ul style="list-style-type: none"> i. In Wellhead Protection Area B where the vulnerability is equal to ten (10); ii. In Wellhead Protection Area E where the vulnerability is greater than eight (8). ii. Handling and Storage; <ul style="list-style-type: none"> i. In Wellhead Protection Area B where the vulnerability is equal to ten (10).
<p>RW-CW-33</p> <p><i>Existing/Future a)Incentive b)Education&Outreach</i></p>	<p>To promote best management practices and to provide guidance about the importance of source water protection:</p> <ul style="list-style-type: none"> a. The Regional Municipality of Waterloo shall develop and implement an incentive program for persons engaging in the activity of the existing application and storage of pesticide in the following areas: <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. In Intake Protection Zone One (1); In Wellhead Protection Area E where the vulnerability is greater than eight (8). b. The Regional Municipality of Waterloo shall develop and implement an education and outreach program for persons engaging in existing and new application and storage of pesticide in the following areas: <ul style="list-style-type: none"> i. In Intake Protection Zones Two (2) and Three (3) where the vulnerability is greater than eight (8);
<p>12. The Application of Road Salt 13. The Handling and Storage of Road Salt</p>	
<p>RW-CW-34</p> <p><i>Future Part IV-Prohibit</i></p>	<p>To ensure the new application of road salt does not become a significant drinking water threat where this activity would be a significant threat, this activity is designated for the purpose of Section 57 of the <i>Clean Water Act, 2006</i> and is prohibited within the following vulnerable areas and for the following activities:</p> <ul style="list-style-type: none"> a. Future: <ul style="list-style-type: none"> i. Application of salt on roadways related to the development of new roads that would occur as the result of the approval of a <i>Planning Act</i> or <i>Condominium Act</i> application; <ul style="list-style-type: none"> i. In Wellhead Protection Area A; ii. In Intake Protection Zone One (1). ii. Application of salt on new parking lots that would occur as the result of the approval of a <i>Planning Act</i>, <i>Condominium Act</i> or Ontario Building Code application; <ul style="list-style-type: none"> i. In Wellhead Protection Area A, for large parking lots; ii. In Intake Protection Zone One (1), for medium and large parking lots.

Policy Number	Policies Addressing Prescribed Drinking Water Threats within the Regional Municipality of Waterloo
RW-CW-34.1 <i>Existing/Future Part IV-Prohibit</i>	<p>To ensure the existing and future handling and storage of road salt ceases to be or does not become a significant drinking water threat where this activity is or would be a significant threat, this activity is designated in accordance with Section 57 of the <i>Clean Water Act, 2006</i> and is prohibited within the following vulnerable areas and for the following activities:</p> <p>a. Existing:</p> <ul style="list-style-type: none"> i. In Wellhead Protection Area A where the vulnerability is equal to ten (10), for any uncovered storage of any amount and covered for amounts greater than or equal to one (1) tonne of salt or greater than or equal to one thousand (1000) liters of brine ; ii. In Intake Protection Zone One (1), for any uncovered storage of any amount and covered for amounts greater than or equal to one (1) tonne of salt or greater than or equal to one thousand (1000) liters of brine; iii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas, for any uncovered storage of any amount. <p>b. Future:</p> <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10), for any uncovered storage of any amount and covered for amounts greater than or equal to one (1) tonne of salt or greater than or equal to one thousand (1000) liters of brine; ii. In Intake Protection Zone One (1) for any uncovered storage of any amount and covered for amounts greater than or equal to one (1) tonne of salt or greater than or equal to one thousand (1000) liters of brine; iii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas, for any uncovered storage of any amount.
RW-CW-35 <i>Existing/Future Part IV-RMP</i>	<p>To ensure the existing and/or future application of road salt does not become or ceases to be a significant drinking water threat where this activity is or would be a significant threat, this activity shall be designated for the purpose of Section 58 of the <i>Clean Water Act, 2006</i> and a Risk Management Plan shall be required within the following areas and for the following activities:</p> <p>a. Existing:</p> <ul style="list-style-type: none"> i. Application of Salt on Roadways; <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas ii. Application on Parking Lots; <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10), for medium or large parking lots; ii. In Intake Protection Zone One (1), for medium and large parking lots; iii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas, for medium and large parking lots. iv. . <p>b. Future:</p>

Policy Number	Policies Addressing Prescribed Drinking Water Threats within the Regional Municipality of Waterloo
	<ul style="list-style-type: none"> i. Application of Salt on Roadways that would occur as the result of the approval of a <i>Planning Act</i>, <i>Condominium Act</i>, or Ontario Building Code application or upon completion of an Environmental Assessment in accordance with the Environmental Assessment Act; <ul style="list-style-type: none"> i. In Wellhead Protection Area B where the vulnerability is equal to ten (10); ii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas except for Wellhead Protection Area A. ii. Application on Parking Lots that would occur as the result of the approval of a <i>Planning Act</i>, <i>Condominium Act</i> or Ontario Building Code application; <ul style="list-style-type: none"> i. In Wellhead Protection Area A, for medium parking lots; ii. In Wellhead Protection Area B where the vulnerability is equal to ten (10), for medium or large parking lots; iii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas except for Wellhead Protection Area A, for medium and large parking lots. <p>The Risk Management Plan for application of salt on large and medium parking lots shall contain, as a minimum, management practices that achieve a performance standard equivalent to that of an accredited site under the Smart About Salt program to reduce the impact of de-icing activities and for new parking lots include design considerations for driving areas and sidewalks to reduce impacts to drinking water sources.</p> <p>The Risk Management Plan for application of salt on roadways shall include, as a minimum, measures to ensure application rate, timing and location reduce the potential for surface water runoff and groundwater infiltration and meet the objectives of Environment Canada's Code of Practice for Environmental Management of Road Salts including identification of areas where significant threats can occur as Vulnerable Areas and management practices in these areas.</p>
RW-CW-35.1 <i>Existing/Future Part IV-RMP</i>	<p>To ensure that the storage of road salt does not become or ceases to be a significant drinking water threat where this activity is or would be a significant threat, this activity shall be designated for the purpose of Section 58 of the <i>Clean Water Act</i>, 2006 and a Risk Management Plan shall be required within the following areas and for the following activities:</p> <ul style="list-style-type: none"> a. Existing: <ul style="list-style-type: none"> i. Storage; <ul style="list-style-type: none"> i. In Wellhead Protection Area A where the vulnerability is equal to ten (10) for covered storage in amounts less than one (1) tonne of salt or less than one thousand (1000) L of brine; ii. In Wellhead Protection Areas B where the vulnerability is equal to ten (10), for any uncovered storage of any amount and covered for amounts greater than or equal to one (1) tonne of salt or greater than or equal to one thousand (1000) liters of brine; iii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas except Wellhead Protection Area A, for covered storage in amounts greater than or equal to one (1) tonne of salt or greater than one thousand (1000) L of brine;

Policy Number	Policies Addressing Prescribed Drinking Water Threats within the Regional Municipality of Waterloo
	<p>b. Future:</p> <ul style="list-style-type: none"> i. Storage; <ul style="list-style-type: none"> i. In Wellhead Protection Area A where the vulnerability is equal to ten (10) for covered storage in amounts less than one (1) tonne of salt or less than one thousand (1000) L of brine; ii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas except Wellhead Protection Area A, , for covered storage in amounts greater than or equal to one (1) tonne of salt or greater than one thousand (1000) L of brine. <p>The Risk Management Plan for the handling and storage of salt or brine shall contain, as a minimum, management practices that achieve a performance standard equivalent to that of an accredited site under the Smart About Salt program to reduce the impact of de-icing activities and for new parking lots include design considerations for roads and sidewalks to reduce the impact.</p>
RW-MC-36 <i>Future Land Use Planning</i>	<p>The Regional Municipality of Waterloo and Area Municipalities shall amend their Official Plans to state that <i>Planning Act</i> and <i>Condominium Act</i> applications proposing new roads as part of a subdivision and condominium applications where salt could be applied may be permitted subject to study in accordance with the Regional Implementation Guideline for Source Water Protection Studies and a Regional Salt Impact Assessment to the satisfaction of the Regional Municipality of Waterloo:</p> <ul style="list-style-type: none"> i. In Wellhead Protection Area B where the vulnerability is equal to ten (10); ii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas except Wellhead Protection Area A..
RW-CW-37 <i>Existing/Future a) Incentive b) Education & Outreach</i>	<p>To provide guidance about the importance of source water protection and to promote best management practices:</p> <ul style="list-style-type: none"> a. The Regional Municipality of Waterloo shall develop and implement an incentive program for persons engaging in the following existing activities in the following areas: <ul style="list-style-type: none"> i. Application of salt on large or medium-sized parking lots: <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. In Intake Protection Zone One (1); iii. Where a Chloride and/or Sodium issue has been identified, in all Wellhead Protection Areas.; ii. Storage of salt: <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. Where a Chloride and/or Sodium issue has been identified, in all Wellhead Protection Areas for storage in amounts greater than or equal to one (1) tonne of salt or greater than one thousand (1000) liters of brine <p>The incentive program shall encourage the implementation of the best management practices that form the core of the Smart About Salt program to reduce the impact of winter de-icing activities.</p>

Policy Number	Policies Addressing Prescribed Drinking Water Threats within the Regional Municipality of Waterloo
	<p>b. The Regional Municipality of Waterloo shall develop and implement an education and outreach program for persons involved in the existing and new application and handling and storage of salt in the following areas:</p> <ul style="list-style-type: none"> i. Application of salt on large or medium-sized parking lots: <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. In Intake Protection Zone One (1); iii. Where a Chloride and/or Sodium issue has been identified, in all Wellhead Protection Areas.; ii. Storage of salt: <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas. iii. Application of salt on small parking lots and on roadways: <ul style="list-style-type: none"> i. Where a Chloride and/or Sodium issue has been identified, in all Wellhead Protection Areas; ii. In Intake Protection Zone One (1). <p>The education and outreach programs shall encourage the implementation of the best management practices that form the core of the Smart About Salt program to reduce the impact of winter de-icing activities.</p> <p>c. The Area Municipalities, in conjunction with the Regional Municipality of Waterloo, shall develop and implement an education and outreach program for persons involved in the application and storage of salt in the following areas:</p> <ul style="list-style-type: none"> i. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas. <p>The education and outreach program shall include messages about best salt management practices to protect drinking water in their winter maintenance bylaw promotion.</p>
RW-CW-39 <i>Existing Specify Action</i>	Where a Chloride and/or Sodium Issue has been identified, the Regional Municipality of Waterloo and Area Municipalities shall review and, if necessary, revise their Salt Management Plans for the application of salt on roadways in all Wellhead Protection Areas. The Salt Management Plan shall include, as a minimum, measures to ensure application rate, timing and location reduce the potential for salt-related surface water run-off and groundwater infiltration and meet the objectives of Environment Canada's Code of Practice for Environmental Management of Road Salts including the salt vulnerable area mapping to include areas where significant threats can occur.
RW-NB-39.1 <i>Existing Specify Action</i>	Where a Chloride and/or Sodium Issue has been identified, the Ontario Ministry of Transportation should review and, if necessary, revise their Salt Management Plans for the application of salt on roadways in all Wellhead Protection Areas. The Salt Management Plan should include, as a minimum, measures to ensure application rate, timing and location reduce the potential for salt-related surface water run-off and groundwater infiltration and meet the objectives of Environment Canada's Code of Practice for Environmental Management of Road Salts including the salt vulnerable area mapping to include areas where significant threats can occur.

Policy Number	Policies Addressing Prescribed Drinking Water Threats within the Regional Municipality of Waterloo
RW-CW/NB-40 <i>Existing/Future Specify Action</i>	<p>The Regional Municipality of Waterloo and Area Municipalities and the Ontario Ministry of Transportation shall enhance road design measures in Environmental Assessments to modify, widen or expand existing roads and/or design/develop new roads to minimize the impact from any application of salt on roadways related to the development of new roads in the following area:</p> <ul style="list-style-type: none"> i. In Wellhead Protection Area B where the vulnerability is equal to ten (10); ii. Where a Chloride and/or Sodium Issue has been identified, in all Wellhead Protection Areas. The assessment should make recommendation for enhanced measures to protect drinking water sources to be carried through detailed design and construction of the road.
14. The Storage of Snow	
RW-CW-41 <i>Existing/Future Part IV-Prohibit</i>	<p>To ensure the existing and/or future storage of snow ceases to be or does not become a significant drinking water threat where this activity is or would be a significant threat, the activity is designated for the purpose of Section 57 of the <i>Clean Water Act, 2006</i> and is prohibited within the following vulnerable areas and for the following activities:</p> <ul style="list-style-type: none"> a. Existing: <ul style="list-style-type: none"> i. Storage; <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. In Intake Protection Zone One (1); iii. In Intake Protection Zones Two (2) and Three (3) and Wellhead Protection Area E where the vulnerability is equal to nine (9); iv. Where a Chloride, Sodium and/or Nitrate Issue has been identified, in all Issue Contributing Areas where the vulnerability is greater than or equal to six (6), with an area greater than or equal to 0.5 hectares. b. Future: <ul style="list-style-type: none"> i. Storage; <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. In Intake Protection Zone One (1); iii. In Intake Protection Zones Two (2) and Three (3) and Wellhead Protection Area E where the vulnerability is equal to nine (9); iv. Where a Chloride, Sodium and/or Nitrate Issue has been identified, in all Issue Contributing Areas where the vulnerability is greater than or equal to six (6), with an area greater than or equal to 0.5 hectares.
RW-CW-42 <i>Existing/Future Part IV-RMP</i>	<p>To ensure the existing and/or future storage of snow does not become or ceases to be a significant drinking water threat where this activity is or would be a significant threat, this activity shall be designated for the purpose of Section 58 of the <i>Clean Water Act, 2006</i> and a Risk Management Plan shall be required in the following areas and for the following activities:</p> <ul style="list-style-type: none"> a. Existing:

Policy Number	Policies Addressing Prescribed Drinking Water Threats within the Regional Municipality of Waterloo
	<ul style="list-style-type: none"> i. Storage; <ul style="list-style-type: none"> i. Where a Chloride, Sodium and/or Nitrate Issue has been identified, in all Issue Contributing Areas where the vulnerability is greater than or equal to six (6), with an area greater than or equal to 0.05 and less than 0.5 hectares. b. Future: <ul style="list-style-type: none"> i. Storage; <ul style="list-style-type: none"> i. Where a Chloride, Sodium and/or Nitrate Issue has been identified, in all Issue Contributing Areas where the vulnerability is greater than or equal to six (6), with an area greater than or equal to 0.05 and less than 0.5 hectares. <p>The Risk Management Plan shall include, as a minimum, measures to reduce risk based on an assessment of criteria in the Ministry of the Environment, Conservation and Parks implementation of Guideline B-4 (Snow Disposal and De-icing Operations in Ontario 2011) including measures that minimize the impact of surface and sub-surface drainage in selection of suitable sites for disposal.</p>
RW-CW-43 <i>Existing</i> <i>a) Incentive</i> <i>Existing/Future</i> <i>b) Education & Outreach</i>	<p>To provide guidance about the importance of source water protection and to promote best management practices;</p> <ul style="list-style-type: none"> a. The Regional Municipality of Waterloo shall develop and implement an incentive program for persons involved in existing storage of snow in the following areas: <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. Where a Chloride, Sodium and/or Nitrate Issue has been identified, in all Issue Contributing Areas. b. The Regional Municipality of Waterloo shall develop and implement an education and outreach program for persons involved in existing and future storage of snow in the following areas: <ul style="list-style-type: none"> i. In Wellhead Protection Areas A and B where the vulnerability is equal to ten (10); ii. Where a Chloride, Sodium and/or Nitrate Issue has been identified, in all Issue Contributing Areas. <p>The education and outreach program should encourage the use of beneficial management practices that ensure that the activity does not become or ceases to be a threat to drinking water.</p>
RW-NB-44 <i>Future</i> <i>Specify Action</i>	<p>The Ontario Ministry of the Environment, Conservation and Parks should consider an approval process for storage of snow in Wellhead Protection Areas where this activity can be a significant drinking water threat following Guideline B-4 (Snow Disposal and De-icing Operations in Ontario, 2011) including measures that minimize the impact of surface and sub-surface drainage for any new storage of snow.</p>
15. The Handling and Storage of Fuel	
RW-CW-45	To ensure the existing and/or new handling and storage of a fuel ceases to be or does not become a significant drinking water threat where this activity is or would

APPENDIX C

**Region of Waterloo Salt Management Guideline – Tracking,
Assessment and Reporting Worksheets**



**Region of Waterloo
Salt Management Strategy**

Guide to Salt Management

For Sidewalks, Parking Lots and Private Roads

**Version 1.1
Fall 2006**

Prepared for the
Regional Municipality of Waterloo by:

Ecoplans Limited

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1.0 Path to Safe Drinking Water

The residents of the Regional Municipality of Waterloo (the Region) get their drinking water primarily from groundwater which is monitored both for its quantity and quality. The Region is concerned because data reveals that chloride levels are increasing in these groundwater supplies. Past studies have indicated a link between salt use associated with winter maintenance activities and these increasing chloride levels.

The federal government through Environment Canada developed a *Code of Practice for the Environmental Management of Road Salts*. The Code of Practice encourages public road authorities to develop Salt Management Plans for their operations. Many public road authorities across Canada, including the Province of Ontario and the Region of Waterloo, have taken the steps necessary to develop their own Salt Management Plans.

1.1 Province of Ontario

In recent years the Ministry of Transportation, Ontario (MTO) has been testing new winter maintenance methods, equipment and materials and has coordinated and conducted a number of trials and pilot projects. In 2005 the MTO developed a Salt Management Plan to help further improve its management of road salt and reduce the impacts of its winter maintenance operations on the environment.

1.2 Region of Waterloo

The Region and local municipalities have developed both a Winter Maintenance Policy and Procedures and individual Salt Management Plans that have resulted in a large number of initiatives to improve salt management and protect its groundwater resources within the Region.

1.3 Doing Your Part

The drive to have public road authorities improve their management of road salt is well underway and significant improvements have already been made. However, the management of salt in the private and institutional sectors has lagged behind the public sector. The Region is hoping to change that. This Guide is one step in achieving better salt management by the private sector.

Hard numbers regarding the amount of salt used by private companies and institutions are not available. A few studies and anecdotal evidence show that a significant amount of the salt entering the environment is applied on private and institutional sidewalks, parking lots and roads. We need the managers of these private and institutional sites to do their part to reduce salt use.

2.0 A Salt Management Strategy

This “Guide to Salt Management” has been developed to help private companies and institutions assess their facilities and winter maintenance practices, identify potential salt management strategies and develop a site specific salt management plan. Upon implementation companies and institutions will begin reducing their salt impact on the environment. **Maintaining safe driving and walking conditions will remain a priority throughout the process.**

2.1 *Keys to Success*

Experience shows that the following “Keys to Success” are fundamental to successfully developing and implementing a Salt Management Plan.

Strong Leadership

Changing winter maintenance practices, like other change management initiatives, requires a “Champion” who can lead and inspire your organization to improve. Identifying someone within your organization to “champion” the cause of salt management is a key first step towards developing and implementing a successful salt management plan.

A Team Effort

Salt Management Plans, as with most things, have rarely succeeded when they were imposed on someone. You can only reduce salt use if the ideas, innovations, enthusiasm and energy of all groups involved are brought to the table and included in the plan. A successful plan will come from a team effort involving facility owners and managers, staff and employees and contractors.

Education and Training

Education is key. People need to understand how safe winter conditions can be achieved with less salt. To help you understand what can be done the worksheets and guidance documents in this Guide are supported by educational and background materials.

2.2 *Who Should Use This Guide?*

This Guide is intended to be used by **facility owners and managers** that have responsibilities for maintaining private or institutional facilities during the winter.

If you have the following responsibilities this Guide is for you:

- managing winter maintenance contracts or contractors;
- managing the application of snow and ice control materials (salt, liquids, sand, etc.);
- managing plowing operations; and/or
- managing snow removal, storage and disposal.

2.3 Where to Find Help?

Four electronic educational guides on the nature of snow, ice and surface management are included to provide you with the necessary and relevant background. Please refer to these as you develop your Plan to improve your knowledge in a specific area or provide to your staff/contractors as part of their on-going education.

1. Where does all that ice on the roads and parking lots come from? **‘Sources of Ice’** will help you understand the process of ice formation and in identifying the obvious and not so obvious Sources of Ice.
2. Much of your snow removal effort is to deal with snow that drifts onto your site from adjacent areas. **‘Drifting 101’** has been included to assist you in identifying and resolving drifting problem areas.
3. Believe it or not you can make salt work for you. **‘Salt Science 101’** will help you understand just what happens when you put salt down on pavement. Knowing how salt works will help you to use it more effectively.
4. Canadians have learned a lot about controlling snow and ice. The **‘Snow and Ice Control Guide’** builds on Salt Science 101 helping you to:
 - get the most out of the tools available to you;
 - maintain safe driving and walking conditions; and
 - reduce your impact on the environment.

You can review these Guides at the start or refer to them as you need. We have also provided a Glossary of Terms at the end of this Guide.

3.0 Salt Management Process

3.1 The Process

Figure 1 shows the process for developing and implementing your Salt Management Plan.

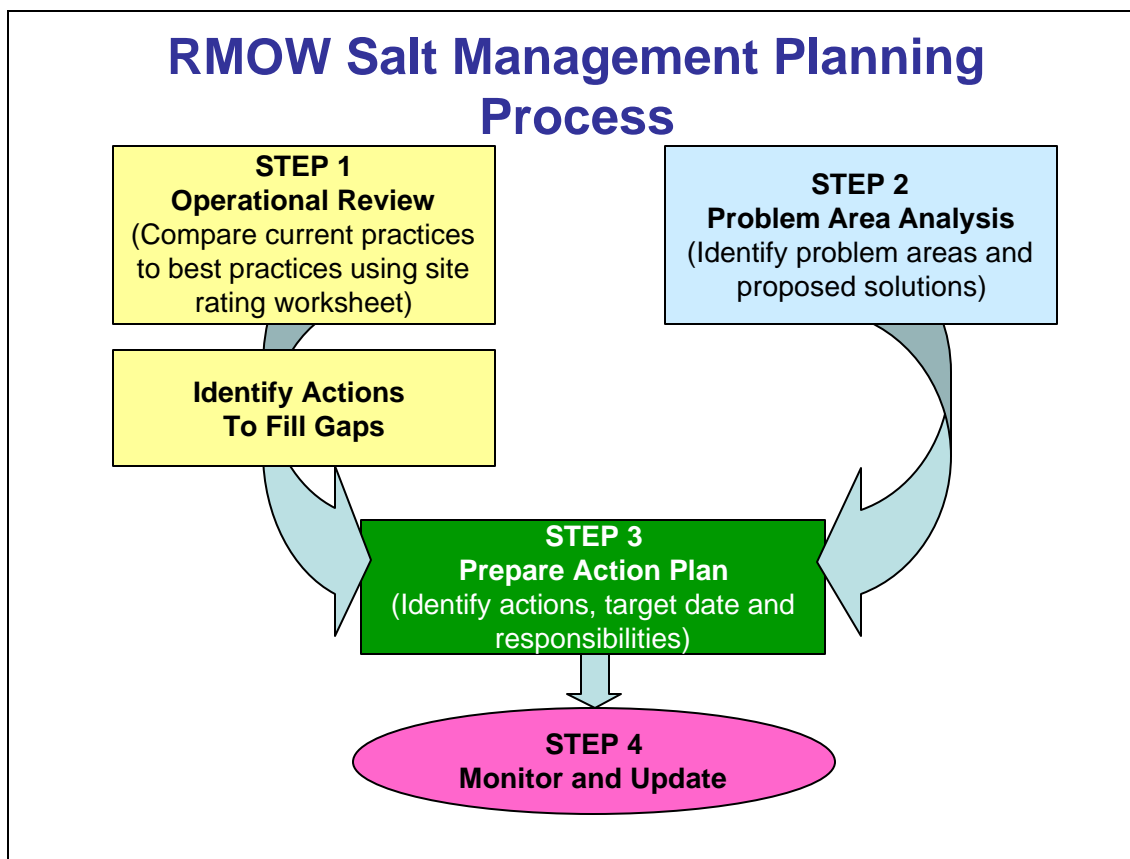


Figure 1 – RMOW Salt Management Planning Process

Table 1 provides an overview of the Worksheets and Guides that accompany each step of the process. The Worksheets are contained in Appendix A. The Guides are an educational document and electronic PowerPoint presentations on specific topics.

Table 1 – Worksheets and Supporting Materials

Worksheets		Supporting Materials	
Step 1		Operational Review	
Worksheet 1 – Operational Review helps you to rank your current practices and to develop action plans to improve your operation.		The Educational Guide provides information on Management Strategies, Best Practices and Problem Area Response Strategies related to salt management.	
Step 2		Site Description and Problem Area Analysis	
Worksheet 2 – Site Description and Problem Area Analysis helps you to map and describe your site. High salt use and other problem areas and low traffic use areas will be identified, documented and marked on the site map.		Sources of Ice This guide provides information on what are the most common causes of ice formation at a site. Photographs of typical ice formation areas and situations are included.	
		Drifting 101 This guide to snow drifting and drift control explains: why drifting is of concern; the principle causes of snow drifting; areas that are prone to drifts; and typical methods of controlling drifting.	
Step 3		Action Plans	
Worksheet 3 – Action Plans combines the actions and solutions from Worksheets 1 & 2. Target dates and responsibilities are assigned to each Action Plan. The plan provides for 5 years of monitoring so you can track your progress toward improving salt management on an annual basis.		Salt Science 101 This guide discusses the What, When, Where, Why and How of salt use.	
		Snow and Ice Control Guide This guide discusses techniques for snow removal and ice control including alternative methods.	
Additional		Contracting Methods	
		Section 5 of the Educational Guide discusses various contracts and contracting methods and their potential impact on salt use and management. An example “ Snow Contract ”, prepared by Landscape Ontario, has been provided (with permission) in Appendix B of the Educational Guide.	

3.2 Salt Management Plan Monitoring and Reporting

The Salt Management Plan is structured to allow ongoing monitoring of your progress towards best practices and improved salt management. The Region is also tracking which private companies and institutions complete Salt Management Plans and their progress on implementing these Plans.

3.3 Reporting Information to the Region

Once you have completed your Salt Management Plan, please complete the Reporting Form (Appendix A) and forward it to the following address:

Salt Management Plans
c/o Water Services
150 Frederick Street, 7th Floor
Kitchener, ON N2G 4J3

The Reporting Forms and the information included on them will be treated as confidential.

3.4 Ongoing Plan Monitoring

The Plan is to be reviewed annually and the progress toward achieving the various action plans noted. Worksheet 3 includes a section for documenting your action plan status for 5 years. Please provide an updated reporting form to the Region each time you review your Plan.

The implementation and improvement of your Salt Management Plan will promote the continuous development of practices and procedures to improve winter maintenance activities and procedures while striving to reduce the effects of salt on our environment. The Plan is a dynamic document. It is to be reviewed and refined on an on-going basis and embraced at all levels of the organization. All personnel are responsible for ensuring that this Plan is implemented, monitored, improved and updated.

4.0 Worksheet 1 – Operational Review

4.1 Purpose

This Worksheet is Step 1 in the preparation of your Salt Management Plan. It is intended to assess your current winter maintenance operations and associated activities.

4.2 Operational Review

The information required for Step 1 (Worksheet 1 – Operational Review) focuses on your winter maintenance operations and practices that have an impact on salt usage and the management of salt.

Worksheet 1 has a series of headings and practices down the left side. Beside each practice are ratings from 4 (best) to 1 (worst) and a description of what would qualify for each rating. Rating 4 briefly describes the best practices.

Review the Rating descriptions for each practice and select a Rating that best matches your current operations. Copy the selected Ratings to the “Your Rating” column to the right of each practice. If a specified practice does not apply to your operation, please indicate ‘N/A’ (not applicable). If you currently contract winter maintenance services, such as plowing or snow removal, you are encouraged to work with your contractor to complete this worksheet instead of indicating ‘N/A’

For practices that receive a Rating of 4; congratulations, you are following best practices. Please ensure that you maintain these practices in your Action Plan.

For practices that receive a Rating of 1 or 2 review the best practices listed under Rating 4. In the Action Plan column to the right briefly describe the action(s) you need to take to improve your operations and move your practices toward best practices. If you feel that the practices identified under the Rating 4 category are realistic for your facility (for example, it may be cost-prohibitive or the technology may not be excessive) please includes these comments on your Plan.

For practices that receive a Rating of 3, review the best practices listed under Rating 4. The differences are most likely minor in scale and may only require a slight adjustment or addition to your current practices. In the Action Plan column to the right briefly describe the adjustment you would make to bring your practices up to a rating of 4 (best practices). If you feel that the practices identified under the Rating 4 category are realistic for your facility (for example, it may be cost-prohibitive or the technology may not be excessive) please includes these comments on your Plan.

5.0 Worksheet 2 – Site Description and Target Areas

5.1 Purpose

This Worksheet is Step 2 in the preparation of your Salt Management Plan. It is divided into two sections: The first section is intended to help develop a general site description and prepare a map of the maintained area for each site. The second section is used to identify high salt-use and low traffic areas.

5.2 Site Description and Mapping

The first section of Worksheet 2 includes an area to provide a full description of the site and a grid area to prepare a map of the site. If you already have a map of the site you may use it. Large facilities may find it useful to divide the site up into several areas and repeat the process for each area. A site description will provide the facility

manager, the staff and contractor maintaining the site with a clear understanding of the area to be maintained, what needs to be done and what does not have to be done.

The map should include all significant features on the site and, if possible, immediately surrounding the site including:

- buildings including entrances and the location of any downspouts;
- paved areas including parking and connecting roads;
- sidewalks and any wheelchair access areas;
- significant vegetation and grassed areas;
- site entrances and exits and surrounding streets;
- location of all site drainage features;
- winter maintenance material storage and loading areas; and
- north point and an indication of the scale of the map.

The map will be used to locate and identify high salt-use and low traffic areas.

5.3 Identification of Target Areas

Target areas are priorities for improving salt management and can be broken down into two categories:

- high salt-use areas; and
- low traffic areas.

High salt use areas

Most sites have areas that just seem to need more salt than normal to keep the ice under control. Identifying these high salt-use areas allows you to focus your salt management efforts and find ways to eliminate the problem and control ice. You can then take back control of the area and possibly reduce the amount of salt needed.

Mark on the site map the areas where you have had to use more salt than normal to control ice and snow. Typically these areas include:

- low lying areas where puddles form and areas that have poor drainage;
- around catch basins that have heaved or become clogged and have poor drainage;
- uneven, rutted, damaged or potholed pavement where water cannot drain away properly;
- building entrances and exits;
- cracked or heaved sidewalks;
- areas too narrow to plow properly and additional chemicals are used to remove the accumulated snow and ice (sometimes called “chemical plowing”);
- areas where significant drifting occurs and additional plowing or materials are needed at times;
- traffic entrances and exits;

- parking areas where vehicles are left overnight not allowing the area to be plowed properly or material applied uniformly;
- an area where a roof downspout drains onto pedestrian or traffic areas causing icing;
- areas where meltwater from snow storage and disposal areas flows across or collects;
- pedestrian ramps and stairs;
- handicap access areas;
- entrances and exits to covered or underground parking structures; and
- open roof tops of parking structures.

Identify each area on the map and provide a short description of the concern. For each target area develop a Solution for reducing salt use in the area and an Action Plan. Write the Solutions and Action Plans on Worksheet 2 below each problem in the sections indicated and transfer the Action Plans to Worksheet 3.

Low traffic use areas

Most sites have some type of cyclical use patterns. Examples of low traffic areas are:

- Employee parking lots that are full during the weekdays, have partial use on the weekends and are empty overnight.
- Shopping mall parking lots that are crowded on most weekends and over the holidays but are partially empty during most of the winter.

Many facilities close low traffic areas during the winter to reduce maintenance costs and liability. This also reduces salt use.

Identifying the traffic, parking and pedestrian patterns for a site can help in identifying areas of low traffic (both pedestrian and vehicle) during the late fall, winter and early spring months. Once low traffic areas have been identified the opportunity for closure or restricted access should be assessed.

Simply putting up a sign is usually not enough to ensure an area is closed or access restricted. Physical barriers are typically used along with signs. It is a good idea to check with your insurance company or lawyer to ensure the closure does not increase your exposure to liability. Also remember that fire routes, building fire exits, fire hydrants and some maintenance access roads need to be kept clear and accessible during the winter.

Some typical low traffic use areas with closure and alternate use opportunities include:

- a portion of a parking lot not typically used over the winter months;
- a remote or overflow parking lot that is rarely used during the winter months;
- an outdoor courtyard, patio or lounge area used primarily during the summer months; and
- a portion of a landscaped pedestrian area connecting two buildings;

Closure of low traffic use areas:

- will reduce plowing needs and the amount of material that is applied to the site, potentially reducing winter maintenance costs.
- will reduce or eliminate plowing and other winter maintenance damage, reducing landscaping maintenance and site repair costs.
- may allow associated pedestrian areas to be closed as well, reducing sidewalk maintenance requirements and damage.

Closure of outdoor gathering or landscaped areas:

- reduces the manual maintenance and material requirements in what are usually high material use areas.

Restricting access to a parking area:

- may allow the area to be used to store and dispose of excess snow from other areas of the site, reducing snow hauling and handling costs.
- adjacent to certain sidewalks may eliminate snow being plowed onto the sidewalk and then pushed back onto the parking lot reducing manual maintenance and material needs.

As part of your site review you should mark each low use area on the map and provide a short description. You then need to develop a Solution and an Action Plan for each area to be closed or restricted. Write the Solutions and Action Plans on Worksheet 2 below each problem in the sections indicated. Transfer the brief description and Action Plans to Worksheet 3.

6.0 Worksheet 3 – Action Plans

6.1 Purpose

This Worksheet will complete your Salt Management Plan. The headings and practices from Worksheet 1 are repeated on this Worksheet with a few additional ones added. The Problem Areas and Low Traffic Use Areas from Worksheet 2 are also included. The Action Plans from Worksheets 1 & 2 will be copied to Worksheet 3 and additional Action Plans will be added. A target year and responsibilities will be assigned for each Action Plan.

6.2 Action Plans

Worksheet 3 – Action Plans - is relatively straight forward to complete but may take some time and thought before all the Action Plans are developed.

- Copy the Action Plans identified in Workbook 1 – Operational Review to the corresponding rows and columns of Worksheet 3.

- There are a few additional categories in Workbook 3 so take some time and complete the Action Plans for them as needed.
- Copy the Problems Areas and corresponding Action Plans identified in Workbook 2 – Site Description and Problem Area Analysis to the corresponding rows and columns of Worksheet 3.
- Use the blank rows in Workbook 3 to add any additional Action Plans that you may want to carry out.

Many of your current practices are good salt management practices. These should be noted and the Action Plan would be to continue these practices. You may also identify actions that do not match what you are currently doing and would be new to your operation. Identify them and add them in on the right side in the appropriate section.

Target Year

Once the Action Plans are set, determine a target implementation year for each. Few facilities or contractors can update everything in one season. Existing contracts may also limit what can be done immediately. Some targets may have to wait until a contract is up or can be renegotiated. Remember to be realistic about your implementation dates.

If you are going to try a new practice for the first time you may want to do a pilot project first. This lets you learn in a low risk area before applying the practice to your whole site. Once the trials are complete you can revisit the salt management plan and adjust the targets to expand the pilot or fully implement the new practice.

Assigned Responsibilities

Identify the person responsible for overseeing the implementation of each Action Plan. While identifying a specific person is good, it is usually better to identify a particular position as some targets may take years to implement.

7.0 Additional Resources

A significant amount of research and work has been done to assist public sector road authorities to manage their road salt better. Salt Management Plans have been in place for years in many municipalities. Much of the information is also relevant to the private sector.

7.1 Regional Information

Information on the Region's Road Salt Management Strategy can be found at:

Region of Waterloo Water Services Web site

<http://www.region.waterloo.on.ca/water>

You can also contact the Region of Waterloo Water Services at 519-575-4426 and the receptionist will direct you to the appropriate staff.

7.2 On-line Resources

The following salt management resources have been developed for use primarily by public sector road authorities. The principals involved and goals discussed are similar to this Guide and should provide additional insight into the issue of salt management.

Environment Canada Road Salt Working Group

<http://www.ec.gc.ca/nopp/roadsalt/en/index.cfm>

The primary purpose of the Road Salt Working Group is to review and comment on materials prepared by Environment Canada, share information, transfer technology and ideas, and develop a common approach to addressing environmental issues related to the use of road salts in Canada.

Working group members represent a wide range of stakeholders, including federal, provincial, territorial and municipal governments, environmental organizations, insurance companies and the salt industry.

The Road Salt Working group was instrumental in helping to develop the Code of Practice for the Environmental Management of Road Salts. The website includes:

- the Code of Practice for the Environmental Management of Road Salts;
- information on road salt, its use and its impact on the environment;
- Success stories and case studies on implementing road salt management in the public sector; and
- a "Best Management Practices for Salt Use on Private Roads, Parking Lots and Sidewalks" document.

Transportation Association of Canada (TAC)

<http://www.tac-atc.ca>

The Transportation Association of Canada is a national association with a mission to promote the provision of safe, efficient, effective and environmentally and financially sustainable transportation services in support of Canada's social and economic goals. The association is a neutral forum for gathering or exchanging ideas, information and knowledge on technical guidelines and best practices. Three documents specific to Salt Management are available through TAC:

- **Salt Management Guide**

<http://www.tac-atc.ca/english/pdf/catalogue-06.pdf>

A comprehensive reference tool that addresses three key themes: transportation in relation to Canada's economy and quality of life, road salt and the environment and salt management practices. The 275+ page Guide includes nine Syntheses of Best Practices dealing with the design of road maintenance yards, drainage and storm water management, good housekeeping practices, pavement design, road and bridge design, vegetation management, winter maintenance equipment and salt management plans. The Guide also includes the Road Salt and Snow and Ice Control Primer, which explains to a more general audience, the relationship between road salt practices and road safety.

The Guide is available for purchase in both hardcover binder and electronic form (CDROM) as well as on-line.

- **Road Salt and Snow and Ice Control Primer**

<http://www.tac-atc.ca/english/pdf/saltprimer.pdf>

The Primer explains to a more general audience, the relationship between road salt practices and road safety. It is available on-line, free of charge, in electronic format.

- **Syntheses of Best Practices – Road Salt Management**

<http://www.tac-atc.ca/english/information/services/readingroom.cfm#syntheses>

The Syntheses of Best Practices are available on-line, free of charge in electronic form covering nine topics; Salt Management Plans; Training; Road and Bridge Design; Drainage and Stormwater Management; Pavements and Salt Management; Vegetation Management; Design and Operation of Road Maintenance Yards; Snow Storage and Disposal; and Winter Maintenance Equipment and Technologies.

Ontario Good Roads Association (OGRA)

<http://www.ogra.org/Winter/winter.asp?itemcode=OGRA-WTMT-SMGT>

The OGRA has a Winter Maintenance - Salt Management section on its web site that includes:

- a simple public sector salt management plan template;
- examples of some public sector storm response guidelines; and
- information on the annual Snow and Ice Colloquium.

7.3 Glossary of Terms

This glossary of terms has been provided to help you in deciphering some the unfamiliar terms or jargon used in this document and by the snow and ice control industry.

Abrasive A solid material placed on a slippery surface to improve traction for walking and driving. Abrasives may consist of natural materials such as sand, gravel, and chips; or manufactured materials.

Anti-icing A proactive snow and ice control practice whereby a pavement surface is treated before a bond can form between frost, snow or ice and the pavement. *(In the United States the term is sometimes used to refer to a proactive snow and ice control strategy whereby straight brine or other snow and ice control liquid is sprayed directly on the road in advance of a storm.)*

Bond A strong connection that forms between a snowpack or ice and the pavement making removal by plowing difficult. The application of a freeze point depressant to the pavement helps break this bond (see deicing) or prevent the formation of the bond (see anti-icing).

Brine A solution of water and salt. The brine solution most often used for snow and ice control is a 23.3% solution of Sodium Chloride (road salt) and water sometimes called a eutectic brine solution.

CaCl₂ Calcium Chloride

Calibration Action taken to verify the operation and accuracy of equipment against a known standard. All material application equipment, both mechanical and electronic, should be checked and calibrated before the start of each season to ensure the material application rate is correct. Other tools, sensors and measuring devices such as, infra red temperatures sensors and brine concentration measuring devices, should also be checked and calibrated regularly.

Deicing A reactive snow and ice control strategy of applying a freeze point depressant on top of snow or ice during or after a storm to break an ice/pavement bond that has already formed. It is generally accepted that solid forms of freeze point depressants work better than liquid forms with this strategy.

Dew Moisture that forms on a surface when water vapour in the air condenses.

Dew Point The temperature at which water vapour in the air condenses and forms water droplets.

Direct Liquid Application (DLA) DLA is a proactive method of snow and ice control in which a concentrated liquid freeze point depressant is sprayed directly on the pavement surface usually before or at the start of a winter storm event. DLA is also known as liquid anti-icing in some Provinces and in the United States.

Effective Working Temperature The lowest temperature that is considered to be appropriate for the use of a freeze point depressant that provides a sufficient likelihood that refreeze will not occur.

Endothermic A freeze point depressant that requires heat to change from solid to a liquid. The heat is taken from its surroundings lowering the temperature slightly in its vicinity. Sodium Chloride (salt) is an example of an endothermic freeze point depressant.

Exothermic A freeze point depressant is exothermic if it gives off heat when it forms a liquid. The heat is transferred to its surroundings raising the temperature slightly in its vicinity. Magnesium Chloride and Calcium Chloride are examples of exothermic freeze point depressants.

Engineered Product A product that is manufactured under controlled conditions to ensure consistent characteristics, quality and performance.

Eutectic Point The lowest freeze point that can be achieved for a given solution of water and a freeze point depressant. This is the bottom of the “V”-shaped curve on a phase diagram.

Freeze Point The temperature at which a liquid will change to a solid.

Freeze Point Depressant A material (e.g. salt) that will lower the freeze point of a solution. Used for snow and ice control to either prevent or break the ice/pavement bond that forms on driving and walking surfaces.

Frost Ice crystals that form when dew condenses on a surface that is below freezing.

Ground Speed Oriented Electronic Controllers Electronic devices used to control the amount of material that is applied using a truck/tractor mounted mechanical spreader. The amount of material being applied is automatically adjusted according to the ground speed of the vehicle. This allows for application of a known, consistent amount of material regardless of the speed of the vehicle. Many public sector road authorities are installing these on their spreader fleets to better monitor and control their road salt use. Most modern controllers have the ability to collect, store and transmit application rate data allowing material use to be closely monitored and managed better.

Infrared Thermometer (IRT) A device used to quickly measure pavement temperatures and trends. Comes in both hand held and vehicle mounted (with digital readout in the cab) versions.

MgCl₂ Magnesium Chloride

Mix *See Sand/Salt Mixtures below*

NaCl Sodium Chloride

Pavement Temperature The temperature of the surface of a paved area (e.g. parking lots, roads, sidewalks, stairs). The area may be paved with materials such as concrete, asphalt or paving stones.

Phase The state of a material (i.e. solid, liquid or gas).

Phase Change A transition from one state to another. For example a change from a solid to a liquid such as melting ice, or solid sodium chloride forming brine.

Phase Diagram A diagram that relates the freeze point of a solution to the concentration of the solution. It illustrates the phases of a material that exist in a mixture at various temperatures,

Pre-treatment A technique whereby materials are mixed at the time they are stockpiled. For example a liquid may be added to solid salt as it is stockpiled to enhance its performance when it is placed on a paved surface.

Pre-wetting A technique whereby a concentrated liquid freeze point depressant is sprayed onto solid salt or sand at the time it is placed onto the pavement surface. Also known as on-board pre-wetting. Applying a liquid to the solid material helps the solid material “stick” to the road surface and not bounce away onto the shoulder. Liquid applied to a solid chemical also begins the process of brine formation and allows the chemical to act quicker.

Reaction Time The time taken for a freeze point depressant to enter into solution and begin melting frost, snow or ice.

Refreeze The freezing of a solution containing a freeze point depressant resulting from the pavement temperature dropping below the freeze point, or the concentration of the freeze point depressant being diluted resulting in the freeze point rising.

Residual Chemical Dry freeze point depressant remaining on the pavement surface after all the moisture has evaporated. This residual will dissolve when new moisture is added either as dew, rain or snow. This residual provides some anti-icing capabilities.

Road Salt Chloride-based freeze point depressants including Sodium Chloride, Calcium Chloride, Magnesium Chloride, and Potassium Chloride.

Road Weather Information System (RWIS) A network of automated weather reporting stations providing 'real time' data on weather conditions at or near the road surface to assist with the prediction of icy conditions. The weather stations are equipped with environmental sensors and may be embedded in the road surface or mounted on nearby towers.

Saddle Tanks Small containers (usually plastic) that are attached to spreader truck to transport liquid anti-icing materials for pre-wetting or anti-icing operations.

Salt Management Plan A detailed plan of how salt users propose to improve the management of their use of road salt through the introduction of best salt management practices. These plans take into consideration all activities potentially resulting in the release of road salts into the environment, including storage, application of salts on roads, and disposal of snow containing road salts.

Sand/Salt Mixtures Common sand that has been mixed with a freeze point depressant to prevent the sand from freezing while it is being stored. A minimum mix of 3-5% salt by volume is usually sufficient to prevent freezing.

Secondary Containment Measures to prevent the release of stored liquids in the event of a failure of the primary containment tank. This is usually either a secondary wall around the primary tank (i.e. double walled containers) or an impermeable floor and dyke constructed around the storage tank(s).

Totes Totes are small portable tanks used to move and store liquids. Small amounts of liquids used for snow and ice control are generally handled in totes delivered using flatbed trucks. Small portable pumps are used to transfer the liquids to tanks on-board the spreaders.

Treated The placement of aggregate or a freeze point depressant to pavement surfaces.





Appendix A

Worksheet 1 – Operational Review

Corporation _____ Site address _____

Person Completing this Worksheet _____

ACTIVITY	RATING					YOUR RATING	ACTION PLAN
	4 - BEST	3	2	1 - WORST	N/A		
EQUIPMENT							
Equipment Calibration	Equipment is calibrated at start of each season. and Equipment calibration is checked. and Equipment is recalibrated whenever delivery system is serviced. and Calibration records are kept.	Equipment is calibrated at start of each season. and Equipment is recalibrated whenever delivery system is serviced.	Equipment is calibrated at start of each season but never checked.	Equipment is not calibrated.			
Equipment Washing	Equipment is swept clean of dry salt before washing. and Equipment is washed and inspected after each event. and Washwater is managed and disposed of properly.	Equipment is washed regularly. and Washwater is managed and disposed of properly.	Equipment is washed regularly. and Washwater is allowed to drain away off-site or into the ground.	Equipment is not washed. or Equipment is periodically rinsed off.			



ACTIVITY	RATING					YOUR RATING	ACTION PLAN
	4 - BEST	3	2	1 - WORST	N/A		
Material Application Controls	All vehicles used to apply material are equipped with ground speed oriented electronic controllers. and The application rates are known.	Material is applied using a variety of spreaders from mechanical to electronic. and Most of the material application rates are known.	All material is applied with mechanical, broadcast type, spreaders. and The application rates can be reasonably estimated.	All material is applied with simple, mechanical, single speed, broadcast type, spreaders. or The application rates are unknown.			
MATERIALS							
Salt Use Record	Salt use is tracked by event and location. and Salt use is reviewed to assess compliance with BMPs. and Practices are reviewed to reduce salt use.	Salt use is tracked by event and location. and Salt use is reviewed to assess compliance with BMPs.	Annual salt use is tracked and compared year-to-year.	Salt use is not tracked.			
Use of Liquid Materials	Direct liquid application is used. and All salt is used pre-wetted. and All sand is used pre-wetted.	All salt is used pre-wetted. and All sand is pre-wetted.	All salt is pre-treated.	No liquids are used.			



ACTIVITY	RATING					YOUR RATING	ACTION PLAN
	4 - BEST	3	2	1 - WORST	N/A		
Use of Alternative and Non-Chloride Materials	Alternative non-chloride materials are used instead of salt where warranted. and Areas are monitored for negative impacts.	Alternative, lower-chloride materials are used instead of salt where warranted.	Alternative materials, blended with salt, are used in some areas.	No alternative materials are used.			
Sand / Salt Mix Ratio	Sand / salt mixtures with less than 6% salt are used. and Sand / salt mixtures are stockpiled at less than 6% salt.	Sand / salt mixtures with less than 20% salt are used. and Sand / salt mixtures are stockpiled at less than 20% salt.	Sand / salt mixtures with over 20% salt are used.	Sand and salt are mixed by operators as needed (mix ratios are unknown).			
MATERIAL STORAGE							
Salt Storage	All salt is stored on impermeable pad. and All salt is covered by a roof. and All salt impacted drainage is collected and properly disposed of.	All salt is stored on impermeable pad. and All salt is covered by a roof.	All salt is stored on impermeable pad. and All salt is covered by a tarp.	Salt is stored outside exposed to the elements.			
Sand/salt Mix Storage	All mix is stored on impermeable pad. and All mix is covered by a roof. and All salt impacted drainage is collected and properly disposed of.	All mix is stored on impermeable pad. and All mix is covered by a roof.	All mix is stored on impermeable pad. and All mix is covered by a tarp.	Sand/salt mix is stored outside exposed to the elements.			



ACTIVITY	RATING					YOUR RATING	ACTION PLAN
	4 - BEST	3	2	1 - WORST	N/A		
Liquid Storage	No liquid is stored on-site.	All liquid is stored in a tank or totes on impermeable pad. and Collision protection is provided. and Secondary containment is provided.	All liquid is stored in a tank or totes on impermeable pad and Collision protection is provided.	All liquid is stored in a tank or totes on permeable pad.			
Material Storage Over Summer	No material is stored over the summer months.	All material is securely stored in tanks or on an impermeable pad covered with a roof.	All material is stored in tanks or on an impermeable pad covered with a tarp.	All material is stored in simple tanks/totes or outside exposed to the elements.			
Good Housekeeping Practices	Site inspections are conducted regularly. and The material storage and handling areas are well maintained.	Site inspections are conducted irregularly. and The material storage and handling areas are maintained.	No site inspections are done. and Some maintenance is done at the site.	No site inspections are done. and Minimal maintenance is done at the site.			
MATERIAL HANDLING							
Material Delivery	All salt and sand / salt mix is delivered using covered trucks. and All salt and sand / salt mix is unloaded indoors.	All salt and sand / salt mix is delivered and unloaded exposed to the elements. and Delivered material is moved under a roof immediately after delivery.	All salt and sand / salt mix is delivered and unloaded exposed to the elements. and Delivered material is covered soon after delivery.	All salt and sand / salt mix is delivered regularly in small loads, unloaded and left exposed to the elements.			



ACTIVITY	RATING					YOUR RATING	ACTION PLAN
	4 - BEST	3	2	1 - WORST	N/A		
Material Handling and Loading	All material handling, loading and unloading operations occur indoors.	Materials are loaded in vehicles just prior to use. and Any materials left in vehicles after an event are unloaded and returned immediately to their stockpiles.	Materials are loaded into vehicles well ahead of an event. and Materials are left in covered vehicles. or Materials are left in vehicles parked indoors.	Materials are loaded into vehicles well ahead of an event. and Materials are left in vehicles exposed to the elements.			
MATERIAL APPLICATION							
Timing	Salt is applied prior to or at the start of the storm to prevent formation of the snow/pavement bond. and Salt is allowed time to work before plowing begins.	Salt is applied early in a storm to help prevent and break the snow/pavement bond.	Salt is applied after a snow pack has formed.	Salt is used to burn off the snow so plowing is not required.			
Application Rates	The application rate is adjusted to suit the current and forecast conditions. and Pavement temperatures assist in determining the material to use and the application rate and The application rates are known and documented.	The application rate is adjusted to suit the current and forecast conditions. and The application rates are known.	The amount of material applied is adjusted to suit conditions and The application rate is estimated.	A single application rate is used for all conditions. and The application rate is not known.			



ACTIVITY	RATING					YOUR RATING	ACTION PLAN
	4 - BEST	3	2	1 - WORST	N/A		
PLOWING							
Plowing	Plowing is used to remove accumulated snow before it becomes a hazard. and Plowing is timed to allow applied materials time to work. and Snow is plowed so as to avoid problems with meltwater or snowdrifting.	Plowing is used to remove accumulated snow before it becomes a hazard. and Plowing is usually timed to allow applied materials time to work.	Plowing is used to remove accumulated snow before it becomes a hazard.	Plowing is only used when the accumulation of snow becomes a hazard.			
SNOW MANAGEMENT							
Snow Disposal	Snow is not hauled or disposed of off-site. and Snow is not moved to a common area on site. and On-site snow banks are located appropriately to avoid problems with meltwater.	Excess snow is hauled to a properly designed and maintained snow disposal site. or Excess snow is moved to a designated and properly maintained location on-site.	Excess snow is hauled to known and designated off-site snow disposal sites. or Excess snow is moved to a convenient location on-site and allowed to melt.	Excess snow is hauled off-site to unspecified locations. and Off-site locations are not designated as snow disposal sites.			
Snowdrift Control	Multiple snowdrift control measures are in place. and On-site snowdrifting has been minimized.	Some snowdrift control measures are in place. and Some plowing is required to control snowdrifts.	Snowdrifts are controlled by frequent plowing as needed.	Snowdrifts are controlled by applying salt and plowing when possible.			



ACTIVITY	RATING					YOUR RATING	ACTION PLAN
	4 - BEST	3	2	1 - WORST	N/A		
DECISION-MAKING SUPPORT TECHNOLOGY							
Weather Forecasts	Specialty weather forecasts are used. and RADAR information is used. and Staff is trained in interpreting weather information and forecasts. and Staff respond to forecasts and are prepared before an event occurs.	Local weather forecasts from Radio, TV and the Internet are monitored regularly. and RADAR information is used. and Staff respond to forecasts and are prepared before an event occurs.	Radio, TV and the Internet are the primary source of weather and storm event information. and Staff respond to forecasts are generally prepared at the start of an event.	Radio and TV are the primary source of weather and storm event information. and Staff respond to conditions as they change outside.			
RWIS	RWIS information and forecasts are regularly used by decision-making staff. and RWIS site(s) installed in strategic location(s).	RWIS information and forecasts are regularly used by decision-making staff.	RWIS information and forecast are periodically checked and used to verify decisions made.	RWIS information and forecasts are not used.			
IRTs	IRT information is used by decision-making staff. and The accuracy of the IRTs is verified annually.	IRT information is used regularly by all decision-making staff.	IRTs are available to staff. and The information is rarely used.	IRTs are not used.			



ACTIVITY	RATING					YOUR RATING	ACTION PLAN
	4 - BEST	3	2	1 - WORST	N/A		
TRAINING							
Salt Management Training	Supervisors are trained in best salt management practices. and Operators are trained in best salt management practices. and Annual salt management refresher training is held. and Training records are maintained.	Supervisors are trained in best salt management practices. and Operators are trained in best salt management practices.	Supervisors are trained in best salt management practices.	No salt management training is carried out.			
Winter Maintenance Operations Training	Supervisors are trained in winter maintenance and storm response practices. and Operators are trained in winter maintenance and storm response practices. and Annual storm response refresher training is held. and Training records are maintained.	Supervisors are trained in winter maintenance and storm response practices. and Operators are trained in winter maintenance practices.	Supervisors are trained in winter maintenance practices.	No winter maintenance training is carried out.			



ACTIVITY	RATING					YOUR RATING	ACTION PLAN
	4 - BEST	3	2	1 - WORST	N/A		
OTHER							
Emergency Response Plan for Salt Spills	An emergency response plan for salt spills is developed. and Staff is trained on the plan and prepared to handle a salt spill.	How to respond to a salt spill has been discussed with staff. and Staff is prepared to handle a salt spill.	No response plan has been developed and Staff is prepared to handle a salt spill.	No response plan has been developed and Staff is not prepared for a salt spill.			
Contract				The contract assigns all of the liability to the contractor. and The decision to apply salt is up to the contractor. and The contract has a flat fee for plowing and a per tonne fee for salt use.			



Worksheet 2 – Site Description and Target Area Analysis

Site Description		
	Site name or ID #:	
	Site Address: (physical address including lot or street # and nearby major intersection)	
	Site Description: (include the size of the traffic areas (ha. or m ²) and pedestrian areas (length or area), and any significant features)	
High Salt Use and Other Problem Areas		
	Area # on Map	Brief Description of Problem
	Solution	Action Plan
	Area # on Map	Brief Description of Problem
	Solution	Action Plan
Area # on Map	Brief Description of Problem	
Solution	Action Plan	



Site Map

Site ID# or Name: _____

A large rectangular area filled with a light gray grid, intended for drawing or mapping a site. The grid consists of 30 columns and 40 rows of squares.



High Salt Use and Other Problem Areas

	Area # on Map		Brief Description of Problem
	Solution		Action Plan
	Area # on Map		Brief Description of Problem
	Solution		Action Plan
	Area # on Map		Brief Description of Problem
Solution		Action Plan	
Area # on Map		Brief Description of Problem	
Solution		Action Plan	
Notes:			



Low Traffic Use Areas		
	Area # on Map	Brief Description of Problem
	Solution	Action Plan
	Area # on Map	Brief Description of Problem
	Solution	Action Plan
	Area # on Map	Brief Description of Problem
	Solution	Action Plan
Area # on Map	Brief Description of Problem	
Solution	Action Plan	
Notes:		



Worksheet 3 – Salt Management Action Plan

Salt Management Plan

Corporation _____

Site Address _____

Contact Name _____

Phone _____ Fax _____

Email _____

Plan Dates

Is there an existing Salt Management Plan? YES ☐ NO ☐

Date of Initial Plan _____

Revision Date _____

Date RMOW was Notified _____



The (Corporate Name) _____ recognizes the importance of effective salt management while providing safe and passable conditions for our staff and patrons. We are committed to introducing best practices in salt management and continuous improvement as set out in the following plan. We will review the progress on our plan annually and revise it as necessary to achieve effective salt management.

Approved: _____

Date: _____

Area serviced by this Salt Management Plan _____

Activity	Current Status	Goal	Responsible Position	Target Year	Year 1	Year 2	Year 3	Year 4	Year 5
Identifies the operational activity to which the Action Plan refers.	Your status at the time of preparation of the initial plan. Record your ranking or give a brief description. Refer to Worksheets 1 and 2.	A statement of what you wish to achieve (e.g. 100% of salt stored under cover on impermeable pad).	Identifies who is responsible for implementing the change.	Identifies the year in which the change is to be implemented.	These columns are for the purposes of monitoring progress towards achieving the stated goals. They are completed each year as part of the annual review and update of the plan.				
EQUIPMENT									
Equipment Calibration									
Equipment Washing									
Material Application Controls									



Activity	Current Status	Goal	Responsible Position	Target Year	Year 1	Year 2	Year 3	Year 4	Year 5
MATERIALS									
Tonnes of Salt Used Annually ¹									
Salt Use Record									
Use of Liquid Materials									
Use of Alternative and Non-Chloride Materials ²									
Sand / Salt Mix Ratio									
MATERIAL STORAGE									
Salt Storage (covered)									
Salt Storage (drainage)									
Tonnes of Salt Stored On-site									
Sand/salt Mix Storage (covered)									
Sand/salt Mix Storage (drainage)									

¹ Report the total amount of salt used in all forms (liquids and solids).

² Provide a list of the alternative and non-chloride materials used in snow and ice control.



Activity	Current Status	Goal	Responsible Position	Target Year	Year 1	Year 2	Year 3	Year 4	Year 5
Tonnes of Sand/salt Mix Stored On-site									
Liquid Storage									
Liters of Liquid Stored On-site									
Material Storage over Summer									
Good Housekeeping Practices									
MATERIAL HANDLING									
Material Delivery									
Material Handling and Loading									
MATERIAL APPLICATION									
Timing									
Application Rates ³									

³ Each operation has to determine its own application rates. The rates should be reviewed and compared to industry standards to ensure they are appropriate. Application rates should vary by pavement temperature and snow and ice condition.



Activity	Current Status	Goal	Responsible Position	Target Year	Year 1	Year 2	Year 3	Year 4	Year 5
PLOWING									
Plowing									
SNOW MANAGEMENT									
Snow Disposal									
Snowdrift Control									
DECISION-MAKING SUPPORT TECHNOLOGY									
Weather Forecasts									
RWIS									
IRTs									
TRAINING									
Salt Management Training									
Winter Maintenance Operations Training									



Activity	Current Status	Goal	Responsible Position	Target Year	Year 1	Year 2	Year 3	Year 4	Year 5
OTHER									
Emergency Response Plan for Salt Spills									
Contract ⁴									
LOW TRAFFIC AREAS									

⁴ Ensure the contract has been reviewed by a lawyer and is acceptable to, and agree upon by, both parties.



Activity	Current Status	Goal	Responsible Position	Target Year	Year 1	Year 2	Year 3	Year 4	Year 5
HIGH SALT USE AREAS									



Salt Management Plan Reporting Form

The (Corporate Name) _____ is committed to introducing best practices in salt management and continuous improvement as set out in its salt management plan.

Site Name and Address: _____

Year Original Plan Completed: _____ Revision Number: _____

Area Serviced

Parking Lot Area (m²): _____ Road Area (m²): _____ Sidewalk Area (m²): _____

Material Stored on Site:

None: _____ Salt (tonnes): _____ Litres of Liquid: _____

Sand/Salt Mix (tonnes): _____ Sand/Salt ratio of mix: _____

Material Used:

Seasonal total salt used (tonnes): _____

Total area serviced (m²): _____

Number of winter events: _____

Application rate (tonnes of salt / m² /event): _____

I confirm that the information presented in this Salt Management Plan was supplied voluntarily and that the practices considered or implemented are developed in accordance with our Health and Safety Policies. I recognize that the Salt Management Plan Guide is to be used for guidance only. I release the Regional Municipality of Waterloo and its employees and agents from any liability resulting from the completion or implementation of this Salt Management Plan. I have the authority to bind the organization and certify that the information presented herein is accurate.

Name: _____ Position: _____

Address: _____

Phone: _____ Fax: _____ Email: _____

Signature: _____ Date: _____

Snow Removal Contractor Information

Name: _____

Phone: _____



Activity	N/A	Current Rating	Target Rating	Target Year	Comment If Target Rating Less than 3			
Equipment Calibration								
Equipment Washing								
Material Application Controls								
Salt Use Record								
Use of Liquid Materials								
Use of Alternative/Non-Chloride Materials								
Sand / Salt Mix Ratio								
Salt Storage (covered)								
Salt Storage (drainage)								
Sand/salt Mix Storage (covered)								
Sand/salt Mix Storage (drainage)								
Liquid Storage								
Material Storage over Summer								
Good Housekeeping Practices								
Material Delivery								
Material Handling and Loading								
Timing								
Application Rates								
Plowing/Blowing								
Snow Disposal								
Snowdrift Control								
Weather Forecasts								
RWIS								
IRTs								
Salt Management Training								
Winter Maintenance Operations Training								
Emergency Response Plan for Salt Spills								
Target Areas – Plans		<i>Include comments on your plans for Target Areas below.</i>						

Please complete both sides of this Salt Management Plan Reporting Form and return it to:

*Regional Municipality of Waterloo, Water Services Division
7th Floor 150 Frederick St., Kitchener ON N2G 4J3
Fax: 519-575-4452*

APPENDIX D

**Chloride Impacts to Groundwater
(RUC and Mass Balance Calculations)**

Chloride Impacts to Groundwater - 2509 Cedar Creek Road - 161414214

Reasonable Use Concept (RUC) Description and Calculations

To quantify potential chloride impacts to groundwater, the MECP's Reasonable Use Concept (RUC) was referenced for this CIA. The RUC provides a framework for assessing the impacts of chloride on groundwater.

Two calculations are required to determine the amount of chloride that can discharge from the site into the adjacent/downstream system. The first calculation addresses the total chloride impact from all sources of contamination. The second addresses the permissible impact from the site.

The maximum chloride concentration that would be acceptable in the groundwater beneath the adjacent property is calculated in accordance with the following relationship:

$$C_m = C_b + x(C_r - C_b)$$

Where:

C_m = maximum chloride concentration that would be acceptable in the groundwater beneath the adjacent property

C_b = background chloride concentration in the groundwater before it had been affected by human activity

C_r = maximum chloride concentration of chloride that should be present in the groundwater. This is the Ontario Drinking Water Standard (ODWS) and for chloride is 250 mg/L

x = constant that reduces contamination to a level that is considered to have a negligible effect on the use of water. For chloride, $x = 0.5$

For this site, the assumed background chloride concentration of groundwater was assumed to be 15 mg/L, therefore Reasonable Use equates to:

$$C_m = 15 \text{ mg/L} + 50\%(250 - 15) \text{ mg/L} = 132.5 \text{ mg/L}$$

The maximum concentration of chloride originating from the site that can be permitted to reach the adjacent property without exceeding C_m can be calculated in accordance with the following relationship:

$$C_w = C_m - C_p - C_o$$

Where:

C_w = maximum concentration of chloride originating from the site

C_p = concentration of chloride in the groundwater at the time of assessment (from current samples)

C_o = potential chloride increase from other sources with a high degree of probability (e.g., imminent or ongoing neighbouring development)

For this site, the ambient chloride concentration at time of assessment (C_p) was taken to be 190 mg/L in accordance with recent Site sampling, therefore Reasonable Use equates to:

$$C_w = 132.5 \text{ mg/L} - 190 \text{ mg/L} - 0 \text{ mg/L} = -57.5 \text{ mg/L}$$

C_b assumed to be the 15mg/L in accordance with Region of Waterloo Guidelines (2013) in the absence of historical data onsite.

C_p assumed to be the greatest concentration recorded onsite during recent groundwater sampling (January 2024).

A negative **C_w** value indicates that the existing site exceeds the target chloride concentration beneath the adjacent property (C_m) without additional salt application.

Chloride Impacts to Groundwater - Cedar Creek Road (161414214)
Mass Balance Calculations

Division of Site	Area	Local Road length	Salt Application Area	Road Salt Application Rate	Remaining Salt Application (typical rates)	Total Salt Applied (typical rates)	Chloride Application To Impervious Area	Percentage of Chloride Infiltrated	Total Chloride Infiltrated	Total Recharge	Volume Infiltrated	Groundwater Chloride Concentration
	(ha)	(2lane-km)	(ha)	(tonnes/2-lane-km/yr)	(tonnes/ha/yr)	(tonnes/yr)	(tonnes/yr)	(%)	(tonnes/yr)	(mm/yr)	(L/yr)	(mg/L)
	A	B1	B2	C1	C2	C3	D	E	F	G	H	I
Local Roads	2.20	0.7	-	2.20	-	1.5	1.00	100	1.00	696	15,312,000	65.2
Industrial Site	13.80	0.0	11.10	-	12.50	138.8	89.91	100	89.91	696	96,048,000	936.1
SWMF	2.00	0.0	0.00	-	0.00	0.0	0.00	100	0.00	696	13,920,000	0.0
Total:	18.00							Total:	91		125280000	
Average Groundwater Concentration =												726 mg/L

- Column Descriptions
- A) From Conceptual Draft Plan of Subdivision (DP-1)
 - B1) From Conceptual Draft Plan of Subdivision (DP-1)
 - B2) Assumes 80% of the proposed industrial area will be salted
 - C1) Assumes Region of Waterloo application rate for local roads of 2.2 tonnes / 2-lane-km (provided by Region of Waterloo, 2012)
 - C2) Assumes Region of Waterloo average application rates for condominium developments (typically in the range of 11 to 14 tonnes/ha/year, provided by Region of Waterloo, 2012)
 - C3) Impervious Area (B1/B2) x allowable application rate (C1/C2)
 - D) Total salt application (C3) x percentage of Chloride in salt (0.648)
 - E) Percentage of Chloride Infiltrated (almost all because it is directed to the infiltration facility)
 - F) Total Chloride applied (D) x percentage infiltrated (E)
 - G) Total Site GWR recharge from Water balance analysis
 - H) Total recharge (G) * total catchment area (A)
 - I) Total chloride infiltrated (F) / total volume of water infiltrated (H)