Feasibility Analysis of the De-Icing Methods at Dalhousie University

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Abstract

Salt is the primary de-icing agent used on Dalhousie campus. This de-icer has many detrimental effects to many aspects of our ecosystem. Literature research and interviews with pertinent actors have resulted in a list of recommendations that are feasible in an economic and social system, and have the possibility of improving the environmental health of Dalhousie campus. Although currently these are small steps, any large change is economically infeasible.

Introduction

During the winter months the removal of snow and ice from roads, sidewalks, buildings, or any walkway the public may frequent is a very important step in keeping the public safe from harm. Sodium chloride (road salt) is widely used throughout Canada for winter maintenance especially in Nova Scotia where harsh winter conditions occur. On average, Canada uses 5 million tons of salt each year (AESI, 2000). Sodium chloride provides traction and melts ice and snow from temperatures of 0 to –12˚C (CSC, 2004). There are other alternatives to salt such as abrasives (sand), synthetic compounds, and combinations of sand and salt. Although in most cases the alternatives are more expensive and they do not provide the fast removal of ice and snow that salt exhibits.

The mining of road salt takes place in Pugwash, Nova Scotia. The thicknesses of the salt deposits vary and can be as thick as 1500m in some locations (Donahoe, 1999). Underground in the Pugwash Mine, the room and pillar method obtains salt by blasting, drilling, and loading (Donahoe, 1999). After crushing, the mine stockpiles the salt which is then used as road salt. About 90% of the salt mined is used for de-icing and snow removal (Prime, 1991).

Road salt can enter the environment by dissolving into runoff and precipitating into groundwater sources and through splashing becoming airborne. Through excessive use, salt can affect an area's ecology, groundwater, runoff, and soils. Other non-environmental effects include corrosion on automobiles, building foundations, and other structures.

In 1995, road salt was added to the Priority Substances List 2 (PSL2) (AESI, 2000). This list is part of the Canadian Environmental Protection Act (CEPA) assesses

substances for their affects to human health and the environment. Concluding results suggest that road salt is toxic due to its widespread usage by entering the environment affecting ecosystem components such as streams and groundwater (AESI, 2000).

In 1999, a suggestion from the Ministers of the Environment and Health recommended that the Governor in Council add road salts to the Canadian Environmental Protection Act Schedule 1. Refer to Appendix 1 for the entire recommendation. After testing the short and long term environmental effects of road salt it was concluded under Section 64 of the Canadian Environmental Protection Act, 1999, that road salts containing inorganic chloride salts with/out ferrocyanide are toxic (EC, 2002

Dalhousie De-icing Practices

Certain by-laws constituted by the Halifax Regional Municipality hold the University liable in cases of injury or accident to persons or property on the campus. The University must thus maintain its property (such as the roads, pathways, sidewalks, etc) during the winter to prevent accidents from occurring. Sodium chloride is the principle de-icing agent used at Dalhousie University for this maintenance. Appendix 2 illustrates salt usage around Dalhousie University.

In order to analyze the de-icing practices at Dalhousie, we must first define the scope and target of our study. The physical boundaries we used were the area encompassed by the Carleton, Studley, and Sexton (Daltech) campuses; an area of 60 acres. Appendix 3 shows the map of the campus. The economical problems of de-icing at Dalhousie extend past the simple cost of the materials used to remove ice. Other costs include the cost to replant many of the damaged plants and grasses, structural damages to

concrete and foundations due to runoff and increased labour costs to remove salt residues inside buildings and repair damage done by the salt. The ultimate hurdle for the effective implementation of this analysis will be the political problems associated with changes in university spending. Dalhousie operates on a 5-year fiscal plan, and therefore, any economical or environmental benefits from finding another method of de-icing must be acknowledged within that 5-year cycle.

Key Terms

It is also important that we define some of the key terms used throughout this report:

Anti-icing – Anti-icing uses a brine solution to lower the temperature at which water freezes. Anti-icers differ from de-icers because they are applied prior to snowfall to prevent snow and ice from bonding to the pavement. As a general rule it is easier and quicker to prevent bondage from forming than it is to break an already formed bond.

De-icer – When applied to snow and ice covered surfaces a brine solution is created. This solution penetrates through the icy surface lowering the freezing point of the water and disrupting the bonds between the pavement and the ice or snow. Removal equipment is then able to remove the snow and ice more easily.

Pre-wetting – Pre-wetting can be done with either sand or chemicals. The main advantage of pre-wetting is that it prevents the salt from being blown away by the wind. If pre-wetting is done with a chemical, the efficiency of the application is also increased.

Buffer zones – Create a perimeter around plants or specific areas where special care is taken that either salt is not applied or is very little applied when absolutely needed.

Purpose

The purpose of this report is to conduct a feasibility analysis of the snow removal and de-icing methods at Dalhousie University. Research and interviews of various individuals were conducted in order to collect information concerning the problem using a deductive approach. We examined the current system used at Dalhousie and tried to discover ways to make the salting system on campus more environmentally friendly while remaining economically and socially viable.

This analysis is very important in the sustainability of the Dalhousie ecosystem. By decreasing the amounts of sodium chloride used on the University property, a greener university will emerge.

Methods

The feasibility analysis of finding an alternative to the current salting practices used on Dalhousie campus was completed through the collection of data by quantitative and qualitative methods. Archival research was a large component of our study including the examination of previous studies completed on de-icing methods and their feasibility such as a study conducted by the University of Waterloo in 1998. This information provided us with a base of knowledge that we extended on with interviews our own research.

Our Sample

Specific core actors at Dalhousie have a profound influence on the system itself. It is the actions of these actors that we targeted for interviews; the University maintenance staff and custodial workers who apply the salt to the stairs of buildings and sidewalks, and clean the hallways and foyers of the University where excessive salt stains occur. Ocean Contracting is the outside company who plows and salts the parking lots and sidewalks. The director of Environmental Health, William (Bill) Louch, who enforces the application of salt and ensures the safety of staff and students also has a significant role. Bob Cleveland is the Assistant manager of Environmental Services and is responsible for grounds maintenance, shoveling walkways (there are over 500 walkways on campus), and calling in outside contractor (they are on a call-in basis). If accidents unfortunately occur, reports are made to the University's Health Services.

Procedure

The group developed questions for surveys as a research tool in order to conduct the feasibility analysis of the snow removal and de-icing methods at Dalhousie University. The questions (Appendix 4) were laid out in order to collect information concerning the snow removal and de-icing methods. The questions varied depending on the individual being interviewed.

Interviews were conducted in a face-to-face manner when possible. In certain instances this was not an option. In those circumstances we resorted to a telephone interview. At the beginning of the interview, the interviewer introduced himself or herself and explained their purpose and intentions. During the questioning, the

interviewer recorded the responses. After the interview was completed, the group sent a follow up thank-you email to the participant.

During the interviews, we inquired whether s/he knew of any other person(s) that may be able to provide us with relevant information to our study. This approach is referred to as the snowball method and proved very practical for this particular study. It is classified as a non-probabilistic sample since the probability of choosing the sample unit is unknown (Palys, 2003).

Instrumentation

As previously discussed we administered questionnaires in a face-to-face environment, however if that was not possible, phone interviews sufficed. We chose this type method of analysis for its high response rate and flexibility. As Palys (2003) suggests, self-administered questionnaires enable you to clarify any ambiguities that may arise at the time of question and the interviewee can respond in privacy, whereas other questionnaires such as email or mail-out may not give such a high response rate and the questions may not be answered to your satisfaction.

Appendix 5 contains the specific interview questions administered, as well as the respective answers. Providing this extensive information about our procedures helps ensure that our study has a certain level of reliability. However, because we used the snowball approach discussed earlier, if our study was replicated in the future the results may vary. Many studies on salt use and its alternatives have been conducted in the past. In reviewing these studies we found that many of our findings and conclusions were similar, providing confidence in the validity of our work.

Limitations and Delimitations

The limitations of this study restrict the amount of information and data we could collect. Time was a significant factor because there was a limited time allowance for completion of this study. Years could be devoted to an in-depth study of this issue: we only had a few months.

Another limitation was not receiving responses from key persons in the snow and ice removal industry. This limited the amount of information gathered for the analysis.

The delimitations of the study consisted of the spatial boundaries of the Dalhousie Campus which includes Carleton, Studley, and Sexton (Daltech) campuses. This enabled us to set boundaries that allowed us to only interview people involved in the maintenance of those specific areas.

Results

The feasibility analysis of the current salting practices used on Dalhousie campus was completed through the collection of data by quantitative and qualitative methods. This results section reveals data collected by conducting interviews and collecting research from the library and the internet and are listed below.

Archival Research - Effects of Salt on the Surrounding Ecosystems

Road salt use can have several adverse impacts. The main areas, with a brief overview of the impacts, are listed below:

Environmental Impacts

Salt is applied on roads to lower the freezing point of water. It also melts through snow and ice to form liquid brine below the surface of the snow preventing bondage of ice to pavement. As traffic breaks through the surface of the snow/ice it is reduce to a plowable slush that is gradually moved to the roadsides. To those concerned with only the safety and maintenance of roads, there is no need to track the route of salt any further. Unfortunately salt does not stop working once it is plowed off the roads and it can have both short and long term effects which pose a threat to the local environment.

Vegetation Impacts

Damage from salt to vegetation is mainly caused by chlorides (Spangenberg, 1997). The most visible and immediate impact of salt is on roadside vegetation. Brown needles on spruce and pines are a common sight along roadsides. Though this damage is usually limited to road facing branches, there are cases where the whole tree may die from salt exposure. This damage is not restricted to coniferous trees but also applies to deciduous. Salt reaches deciduous tree through direct deposition on leaves as well as absorption through the roots. Absorption of sodium and chloride creates osmotic imbalances that restrain the amount of water absorbed by roots, reducing root growth (Wegner and Yaggi, 2001). The degree of salt impact depends on many factors such as the drainage of topography, soil quality, the age and species of plants, the amount of road salt applied, the weather conditions in the specific area as well as the distance from road to plant (Salt Institute, 2003). Damage is usually limited to tens of meters but can range as high as hundreds when weather is windy and the landscape exposed (Blomqvist,

2003). Planting salt resistant trees and shrubs could minimize the impacts of salt and salt spray on vegetation.

Soil impacts

It is the chloride in salt that effects vegetation but damage is also done by the sodium which can affect the soil's structure which in turn will cause more plant destruction (Spangenberg, 1997). Exposure to salt harms soil bacteria, which leads to compromised soil structure and thus inhibits erosion control (Wegner and Yaggi, 2001). It has been shown in reports that the rate of road salt application is positively correlated with salt concentrations in roadside soils. De-icing agents can be absorbed by soils even when they are frozen (D'Itri, 1992).

Surface and Groundwater Impacts

As snow melts, sodium and chloride enter the groundwater system. All chloride ions that enter groundwater can ultimately be expected to reach surface water. As the Canadian Environmental Proctection Act states:

> High concentrations of chloride related to use of road salts on roadways have been measured in water. For example with reported maxima of about 19 000 mg/L in road runoff, 89 000 mg/L in melt water, 13 500 mg/L in wetlands, 8 500 mg/L in ditches and streams, 4 310 mg/L in small rivers and 150 mg/L in rural lakes and 2 000 to 3 000 mg/L in urban impoundment lakes. (2000)

The most common time of contamination occurs during the first flush of spring snowmelt (CEPA, 2000).

Aquatic Biota Impacts

As ground and surface waters flow into water bodies the decrease in water quality will affect the aquatic biota. Salt tolerance of fishes ranges from 400 to 30 000 mg/l, greater than the concentration of sea water. Rainbow trout, however, are particularly sensitive to salt and can not survive in salt concentrations grater than 1000 mg/l (Wegner and Yaggi, 2001). The main area of concern is not necessarily the larger aquatic life but the microinvertebrates upon which the more tolerant species feed. In stream studies it was shown the benthic diversity decreased as salinity increased and at peaks in salt run off from roads salt-tolerant invertebrates dominated. In the presence of higher salinity, sediments release toxic metals that impair distribution and cycling of oxygen nutrients (Wegner and Yaggi, 2001).

Human Health

The main area for concern of salt affecting human health is through our drinking water. The literature reviewed all agreed that contamination of water from road salt is most often a result of improper storage. In the USA approximately $10 million is spent annually to mitigate the effects of salt on drinking water supplies (TRB, 1996). This expense is declining as storage facilities improve. The Environmental Protection Agency (EPA) established that the Secondary Maximum Contaminant Level (SMCL) for chloride is 250 milligrams per liter (parts per million). The EPA had recommended that sodium levels in water not exceed 20 milligrams per liter, but there is no set standard. Provinces generally set their own standards and in an independent study done on waterways in

Toronto, it was found that the area's rivers and creeks contained 2 to 29 times the provincial limit of salt content (Chua, 2004).

Sodium in drinking water is considered harmless according to Environment Canada since approximately only 1-2% of our sodium intake is through water. However, for those on salt-restricted diets an elevated sodium level in drinking water could be a health concern. Sodium restricted-diets are associated with certain heart conditions, circulatory or kidney diseases, or cirrhosis of the liver (Private Well Series, 2003). The U.S. Public Health Service recommends that concentrations of chloride in potable water should be 25mg/l with a maximum concentration of 250mg/l (D'Itri 1992):

Environment Canada completed a five-year health report on the effects of road salt in 2001. The report states that there are no human health effects from road salt (Chua, 2004). However, a study done in 1986 in the United States, discovered there appeared to be a connection between the amount of road salt used and number of cancer deaths. This study suggests that there may be a link between road salt use and cancers of the breast, lungs, bladder, intestine, esophogus, throat and rectum (Chua, 2004).

The environmental impacts of salt are relevant as our definition of feasibility includes social, economic and environmental aspects of salt use. It is clear that salt has many negative environmental effects, but the question still remains whether there is an alternative that is less environmentally damaging. The only alternative to salt Dalhousie has tried is Ice-Ban. This alternative will be the first discussed followed by brief description of some other de-icers and anti-icers on the market.

Ice Ban

Ice ban is a liquid snow and ice control agent made from the concentrated liquid residue of corn and the processing of other agricultural products. It is a biodegradable liquid that can be spread directly on roads or with a mixture of sand or salt (CERF, 2003). Ice ban is much more environmentally friendly than salt, in fact it is proposed to actually deliver valuable nutrients to the soil and may even enhance vegetation growth. Ice ban has the ability to perform as an anti-icer or as a de-icer and is not corrosive to metals (Earth Friendly Chemicals, 2003). Ice Ban is approximated at $100/ton (EPPG, 2002) and is effective to temperatures as low as - 40˚C (CERF, 2003).

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Calcium Magnesium Acetate (CMA)

CMA is granulated and is a chemical formulation of dolomitic lime and acetic acid (Cyrotech, 1998). CMA was first identified as a low corrosion, environmental

alternative to road alt by the U.S. Federal Highway Administration in the late 1970's. CMA, like salt, is effective from temperatures as low as -7˚Celsius but it has some unique performance characteristics. For example, CMA has the corrosiveness of tap water, is safe on concrete, reduces chloride corrosion, is low in toxicity and is biodegradable.

Calcium Chloride

Calcium chloride melts at much lower temperatures than salt. Controlled studies have shown it is effective to -25 ˚C. Calcium chloride is exothermic releasing heat as it melts to speed the salt's melting process (Envirotech Services, 2004). It is less harmful to vegetation than salt but it is very corrosive to metal and to the insides of building. Calcium chloride also leaves residue on carpets and shoes.

Magnesium chloride

Magnesium chloride is less corrosive and less damaging to the environment than calcium chloride, but there seems to be less extensive research on the environment effects of magnesium. This creates a greater potential for unknown risks. Magnesium is effective at temperatures as low as -15˚C (PCC, 2004).

Overview of De-icing Agents

The following table provides a summary of the information for the different deicing agents discussed above:

De-icer Information						
Common chemicals for de-icing	**Lowest effective temperature**	**Approximate Cost**	**Damage to plants**	**Soil damage**	**Water pollutant**	**Damage to concrete/metals**
Common salt	-9°C	$51/ ton	High	High	Yes	Yes
Ice-Ban	-40°C	$100/ ton	Extremely low	Low	Unsure	No
Calcium magnesium acetate (CMA)	-30°C	$900/ ton	Low	Low	No	No
Calcium chloride	-20°C	$300/ ton	Medium	Medium	Yes	Yes
Magnesium Chloride	-9°C	$300/ ton	Medium	Low	Yes	Yes

(Wegner and Yaggi, 2001)

Interviews

Interviews were the other source of information for this feasibility analysis. The research question sheets used during the interviews can be found in Appendix 4.

Interview with Contracting Company

Sheri Lyon conducted an interview with a representative of Ocean Contracting. The question and answer sheet used during the interview can be found in Appendix 4A. The interview was conducted over the phone due to the inability to get to their office. From the interview, we learned that Ocean Contracting is responsible for removing snow and ice from the parking lots and sidewalks. The roads around Dalhousie are maintained

by the municipality. Ocean Contracting use a variety of machines to plow the snow such as loaders and back hoes and dispensers to distribute the salt. A brief training session (usually a day) where the basics are taught is given before employees go out on the job. Most people working at Ocean Contracting have been there for approximately 10 years during which time the methods have remained the same.

They use salt to de-ice Dalhousie properties. They did however indicate that if the chance for a more environmentally friendly chemical was opportune they would try it.

Interview with Custodians

Jessica Finney conducted three interviews with custodial staff responsible for the maintenance of all buildings on the Carleton and Studley campuses. The first interview was with a custodian responsible for the buildings from the Killam Library to the Tupper building. The question and answer sheet used during the interview can be found in Appendix 4B. During the winter months, at least 16 hrs/day of additional work is needed to maintain a clean atmosphere. This increase in maintenance work makes it impossible to conduct other project work. The extra work includes cleaning baseboards, walls, glass, floors, stairwells, and carpets numerous times a day rather than a couple of times per week as other times of the year. The salt usage affects the floor wax which has to be reapplied a couple of times throughout the winter months. The custodian felt that salt is necessary but that its use could be reduced if people wore appropriate footwear.

The next interview was with a custodian in charge of the maintenance of Howe Hall, the Chemistry and McDonald buildings, Sheriff Hall, Eliza Richie, and the Dalplex. The question and answer sheet used during the interview can be found in Appendix 4C.

During the winter months, they use a special product called “Natures Pride Four Seasons” to help remove the salt residue. Some extra work is needed which includes cleaning baseboards, walls, mats, floors, and carpets more frequently than other times of the year. The salt leaves scratches on the floor depending on the type of salt and during the winter months an additional $15 000 is required for maintenance (which includes costs for labour and products). Also, corrosion around the doors is common. He reported that excessive amounts of salt are dispersed over icy areas for immediate/faster results. Some alternatives are making their way to the market however they are not environmentally friendly. An environmentally friendly version is expected to be released next year. These alternatives have been tried around some areas, however financial constraints have prevented widespread use.

The next interview was with a custodian in charge of the maintenance of Life Science Center, Dunn, Chase and Henry Hicks buildings. The question and answer sheet used during the interview can be found in Appendix 4D. During the winter months, extra work required depends on the amount of snowfall and if heavy, approximately 1 hour/day/person is needed. Extra work includes extra mopping and using of floor machine more frequently. If the floor is a no finish floor, they usually withstand the ware; however, if it is a soft tile then more scrubbing is required. An extra $1000-2000 in seals and waxes are spent during winter months. To protect the buildings an increase of runners and mats around entrances could help cut down residue.

Interview with Grounds Crew

Justine Lywood conducted an interview with Steve Ducette. The question and answer sheet used during the interview can be found in Appendix 4D. This interviewee participant was determined through the snowball method. Mike Murphy of facilities management advised Justine that Mr. Ducette would be able to provide useful information. Through this face-to-face interview, we discovered that there are no specific guidelines in place for the application of salt. Dalhousie does use Ice-ban as an alternative to sodium chloride (salt), but only in very specific areas where specifically requested. These areas include in front of the Dalplex where small children frequent, as well as on the president's stairs. Grounds crew did not have any suggestions to reduce salt use, but made it clear they were more than willing to work with us if were found any significant findings that may reduce the amount of salt used on campus. The prevailing concern was safety. Whatever alternatives are proposed they must be, at a minimum, as safe as salt.

Interview with William Louch

Vince Ng conducted a phone interview with William Louch who is associated with the safety office of Dalhousie. The question and answer sheet used during the interview can be found in Appendix 4E. This interview focused on the legal obligations Dalhousie has to its students regarding the safety of its pathways during the winter. Under normal circumstances Dalhousie is obligated to have sidewalks cleared within 24 hours of the snowfall. Students wishing to bring action against Dalhousie for negligence

to provide safe walkways do so through Dalhousie before the complaint is sent to the University's insurance agency.

Interview with Bob Cleveland

Andrew Holloway and Amy Campbell conducted an interview with Bob Cleveland who is the Assistant manager of Environmental Services. He is responsible for grounds maintenance, ensuring walkways are cleared, and calling in the outside contractor. The question and answer sheet used during the interview can be found in Appendix 4F.

The Ground's crew responds to walkways, shoveling and salting. Dalhousie contracts an outside company to remove snow since it is cheaper than buying the equipment. There is no form of training however the grounds crew make sure they are not using too much salt. The current budget allowed for contracting at the university is $190,000. That figure does not include the salaries for the grounds crew.

The chemical used to remove ice is road salt since alternatives are too expensive. Dalhousie purchases salt by the truckload which is considerably cheaper than $50/pound (the cost of some alternatives). In the past four years the University has used the following amounts of salt:

2000-2001 –690 metric tons of salt used

2001-2002 – 459.45 metric tons of salt used

2002-2003 – 519.21 metric tons of salt used

2003-date – 300 metric tons of salt used

There have been no major changes in the way Dalhousie removes snow and ice over the years. Sometimes pathways that are not used are closed in an effort to conserve salt. However, people call and complain so they are cleared.

Discussion

Overview of Findings

The purpose of this report was to conduct a feasibility analysis of the snow removal and de-icing methods at Dalhousie University. Through research we discovered that Dalhousie University is doing everything possible to be environmentally friendly while remaining economically viable. Interview results supported our initial notion that the primary constraint determining what de-icing method is used on Dalhousie campus is funds. Dalhousie does not have unlimited funds, nor can Dalhousie jeopardize the safety of its students; therefore creating a balance with a budget and environmental implications while keeping Dalhousie's legal obligations of safety in mind creates a small region of feasibility.

Recommendations

As noted in Methods certain information is lacking due to both time constraints and response rate in particular areas of our study. We attempted to gain knowledge of specific vegetation species on Dalhousie campus; unfortunately, we were not able to obtain this information. Specific vegetation species are known to be more sensitive to chlorides than others. If any of these species habit Dalhousie campus then it would be beneficial to reduce their exposure to salt. This could be achieved in a variety of ways. Most simply, the amount of salt used in their proximity could be reduced. If this is not an

option buffer zones could be created, or salt applied close could be pre-wetted to prevent salt splash and spray from coming in contact with these species. A list of sensitive species is listed below:

Sensitive	More Tolerant
Eastern White Pine	Honeylocust
Yew	Pfitzer Juniper
Japanese Barberry	Alpine Currant
Dogwood	Mock Orange
Spirea	Bush Cinquefoil
Rhododendron/Azalea	Common Snowberry
Filbert	Mulberry
Sugar maple	White oak
Larch	White poplar
Red maple	Hawthorn
Italian poplar	Honey locust
Sycamore maple	Scotch elm

(Blomqvist, 2001)

Another step Dalhousie should take is to implement guidelines specifying the amount of salt allowed for distribution. It was reveled through the interview with Mr. Ducette that there are no clear guidelines addressing the amount of salt to be used or a correct timing to apply it. Implementing clear policies on when and where to apply salt could increase the efficiency of the system.

Another suggestion is to start “pre-wetting” salt with water. This reduces the chances of the salt spreading to areas it could do harm.

The last recommendation is to begin “sweeping” up the salt piles before the spring rain season reducing the amount of salt entering the water system. This practice would be beneficial throughout the entire winter, but is essential before spring rain.

Conclusion

The environmental impacts of road salt have been receiving an increasing amount of attention. Dalhousie’s increasing efficiency within the last five years of the amount of salt used is impressive and reassuring that the issue is being taken seriously. In an interview it was expressed that it is not expected that Dalhousie will take a stance and eliminate the use of salt on campus unless salt is first added to the harmful substances list. We hope that Dalhousie will take that stance. We believe it is inevitable that in the near future salt will become classified a harmful substance by CEPA, and therefore urge Dalhousie to be an environmental campus leader. To eliminate the use of salt, not on the grounds that it is required by law, as will be the case if it is considered a harmful substance, but because it is known to have detrimental environmental effects.

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Appendix 1

Obtained from the Canada Gazette Part 1 pg. 4335; Saturday December 1, 2001.
< http://canadagazette.gc.ca/partI/2001/20011201/pdf/g1-13548.pdf>

Order Adding Toxic Substances to Schedule 1 to the Canadian Environmental Protection Act, 1999
Canadian Environmental Protection Act, 1999

Publication of Final Decision on the Assessment of A Substance — Road Salts — Specified on the Priority Substances List (Subsection 77(6) of the *Canadian Environmental Protection Act, 1999)*

Whereas a summary of a report of the assessment of the substance *road salts* specified on the Priority Substances List is annexed hereby,
Notice therefore is hereby given that the Ministers of the Environment and of Health intend to recommend to Her Excellency the Governor in Council that *road salts that contain inorganic chloride salts with or without ferrocyanide salts* be added to the List of Toxic Substances in Schedule 1 to the *Canadian Environmental Protection Act, 1999*.
Notice furthermore is hereby given that consultations will be held on the development of a regulation or instrument respecting preventive or control action in relation to *road salts that contain inorganic chloride salts with or without ferrocyanide salts*.

DAVID ANDERSON
Minister of the Environment
ALLAN ROCK
Minister of Health

Appendix 2 – Pictures of Salt Usage around Dalhousie University

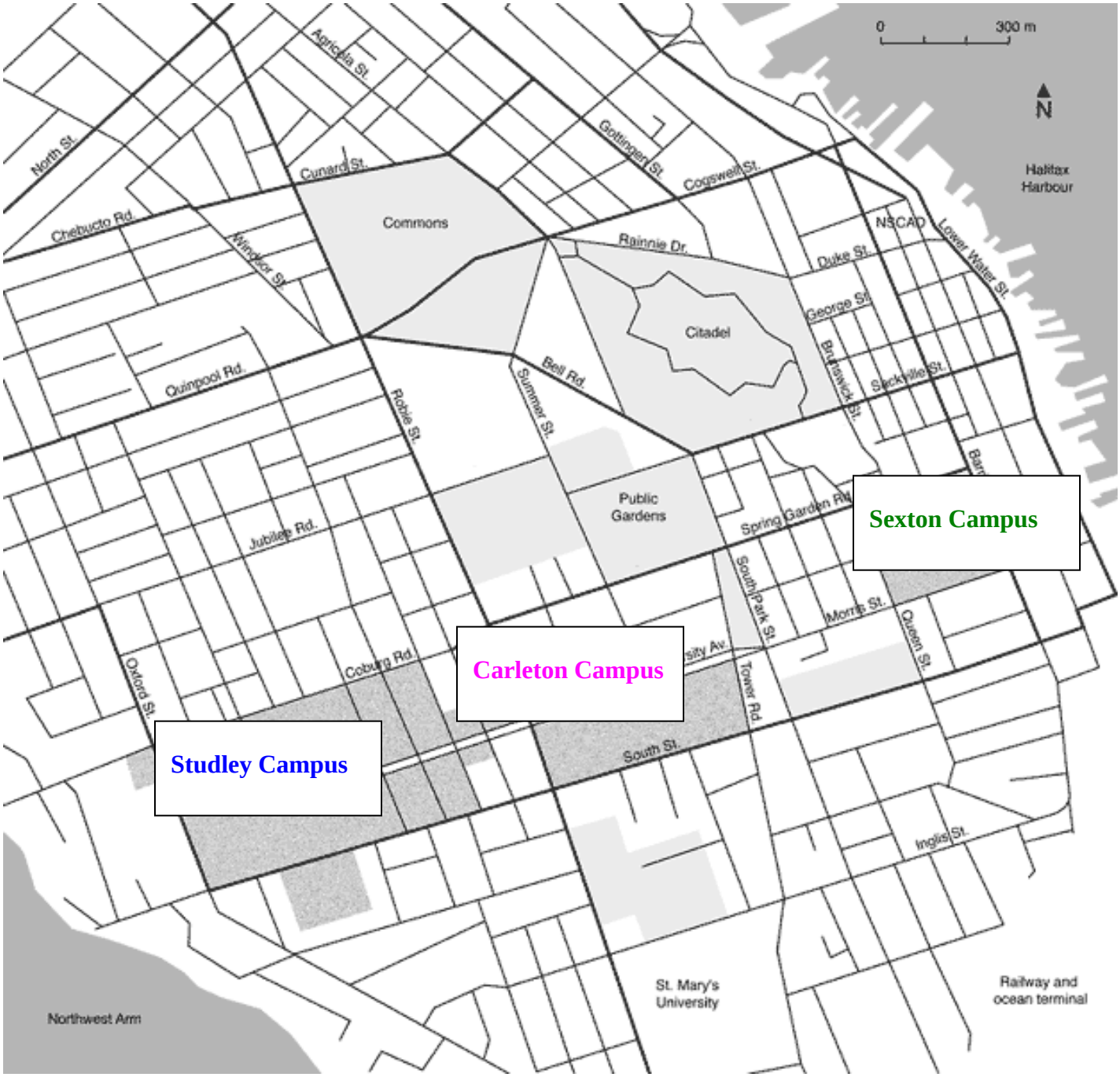
Salt pile in front of the Chase Building located on the Studley Campus. Shoe for scale.

Steps in behind Killam Library of the Studley Campus. Stained white from the excessive use of salt.

Walkway in behind the Chemistry Building of the Studley Campus. Stained white with piles of salt dispersed throughout.

Dunn Parking Lot of the Studley Campus. Again, pavement is stained white. This picture was taken after a rain storm.

Appendix 3 – Map of Dalhousie Campuses – Sexton, Studley and Carelton.



< http://www.dal.ca/~arch/images/map_halifax2.gif>

Appendix 4 – Interview Questions

4A: Outside Contractor

1) *What responsibilities does your company have in terms of snow/ice removal at Dalhousie?*
   -totally responsible, take care of snow on sidewalks and parking lots, not roads or stairs
2) *What are the current practices for removing snow on Dalhousie Campus?*
   -loaders (large and small), back hoe, plow, salt dispenser
3) *Does your company give any formal training concerning ice/snow removal?*
   -brief day course, most have been on job for 10 years
4) *What de-icing chemicals are used on Dalhousie properties?*
   -salt
5) *If there were opportunities to use less environmentally harmful chemicals at Dalhousie, would Dalhousie and your company switch to these materials?*
   -yes
6) *Are you aware any environmental impacts of the materials used? Are there any plans to use less harmful chemicals?*
   -no not really
7) *Do you see any problems with attempting to change the salting techniques used at Dalhousie?*
   -May prevent damage
8) *Over the past couple of years, have there been any major changes in the ways your company and Dalhousie removes the snow and ice from campus, and do you have any changes that you would like to implement?*
   -past 10 years it has stayed the same

4B: Custodian 1

1) *What buildings do you look after?*
   -Howe Hall, Chemistry, McDonald, Sheriff, Eliza, Dalplex
2) *How many custodians work in your area?*
   -29 FT and PT
3) *Is extra work required in the winter to clean up the slat that is tracked into buildings?*
   -hard to tell because of winter conditions, use cleaning product called Natures Pride Four Seasons to take out residue
4) *If yes, how many extra hours of work do you have to do?*
   -5-10%
5) *What sort of extra work do you do?*
   -clean more often the splash, doors, mats, baseboards, carpets
6) *Have you noticed any effects of salt on the insides of buildings (e.g. corrosion, impacts on carpets, floors)?*
   -scratches floors, type of salt makes a difference
   -corrosion around doors
7) *How much damage ($/yr) would you say is done to the buildings in your area as a result of salt damage?*

-just maintain halls, that effects how much finish you use, $15000 = finishes, labour, products

8) *What is done, or could be done, to protect the insides of buildings from the effects of salt?*
   -spray on alternatives coming out on market, not environmentally friendly yet comes out next year, not sure about cost, cuts down on residue
9) *Do you have any additional comments regarding the use of sand/salt on campus?*
   -Redx- alternative with less residue, didn't work still had residue

4C: Custodian 2

1) *What buildings do you look after?*
   -Killam to Tupper
2) *How many custodians work in your area?*
   -2PT, 17 FT, 3@30hrs
3) *Is extra work required in the winter to clean up the slat that is tracked into buildings?*
   -more work
4) *If yes, how many extra hours of work do you have to do?*
   -16hrs/day at least, no time for project work
5) *What sort of extra work do you do?*
   -wash floors numerous times/day instead of 2-3 times a week, mats washed 2-3X winter, doorframes and glass need extra cleaning, baseboards, stairwells, cleaning carpets
6) *Have you noticed any effects of salt on the insides of buildings (e.g. corrosion, impacts on carpets, floors)?*
   Wax comes off, liquid under mats
7) *How much damage ($/yr) would you say is done to the buildings in your area as a result of salt damage?*
   - I don't know
8) *What is done, or could be done, to protect the insides of buildings from the effects of salt?*
   -I don't know
9) *Do you have any additional comments regarding the use of sand/salt on campus?*
   -salt necessary to keep ice down, safety purposes, if people wore proper shoes, ice alternatives cost ineffective, get complaints about floors, ongoing issue.

4D: Custodian 3

1) *What buildings do you look after?*
   - Life Science Center, Dunn, Chase and Henry Hicks
2) *How many custodians work in your area?*
   -8FT
3) *Is extra work required in the winter to clean up the slat that is tracked into buildings?*
   -yes extra work
4) *If yes, how many extra hours of work do you have to do?*

- This depends on the amount of snowfall, if heavy approximately 1 hour/day/person is required. This is approximately 20 hours /day equaling 3-4days. If the snowfall is light it is the same hours but fewer days.

5) *What sort of extra work do you do?*
- Extra work includes extra mopping, and use of floor machine more frequently, there are only 3 floor machines

6) *Have you noticed any effects of salt on the insides of buildings (e.g. corrosion, impacts on carpets, floors)?*
-If the floor is a no finish floor they are usually fine. If it is a soft tile then often the salt removes the waxes and seals therefore the require more scrubbing….ask jes about notes here!!!!

7) *How much damage ($/yr) would you say is done to the buildings in your area as a result of salt damage?*
- $1000-2000 in seals and waxes (around Christmas) per application.

8) *What is done, or could be done, to protect the insides of buildings from the effects of salt?*
- An increase of the amounts of runners and matting used around entrances. These cut down on dragging.

9) *Do you have any additional comments regarding the use of sand/salt on campus?*
-Previously worked at SMU in 1986-1988 and there they also used salt. Custodial Supervisors have asked to cut down on salt piles but when attempted they receive call of ice patches and due to liability concerns must go out and salt. Dalhousie has already looked into alternatives but they were three to four times more expensive.

Interview with William Louch

1. *What does the Environmental Health and Safety office do?*
-They provide advice to the University on
Accident prevention
Injury/illness prevention
Chemical usage at Dal
Chemical disposal
2. *Does Dalhousie consider salt as a hazardous material?*
-No. Dalhousie considers salt as a non toxic substance.

3. *What legal liabilities does Dal have regarding salting on campus and what ramifications does it have if there are improper salting techniques?*
-They have an obligation to maintain sidewalks to a reasonable standard. This means that the sidewalks must be cleared within 24 hours of the snowfall (under normal circumstances – The storm last month was a definite unusual circumstance). The actual legal aspects are very complicated. Dalhousie faces a 3 fold legal liabilities:
Employees: as a employer, any injuries due to slip and fall are directed to the Workers Compensation board. The employee can not sue Dalhousie directly, as all legal actions must be filed with the WCB.

Students/General public: Claims are filed through Dal, and then passed through to their own insurance agency. CURIE (Canadian University Reciprocal Insurance Exchange) is a conglomerate insurance agency that was formed by a coalition of Canadian universities to address insurance and liability coverage fifteen years ago.

4. *With the government of Canada reviewing the toxicity of salt, is Dalhousie considering using an alternative to it? And if so what would it be?*
   -As long as Dalhousie considers salt as a non-toxic material, there will be no major changes to the salting regime.
5. *Are there guidelines to using salt as a de-icing agent on campus?*
   -Not under the jurisdiction of the EH&S board. Everything is contracted out to Ocean Contracting.

4F: Interview Questions with Bob Cleveland

1) *What is your position at Dalhousie University?*

-Assistant manager of Environmental Services

2) *What responsibilities do you have in terms of snow/ice removal at Dalhousie University?*

-Responsible for grounds maintenance, shoveling walkways (there are over 500 walkways on campus). Responsible for calling in outside contractor (they are on a call-in basis). He gets "ball-rolling" in the night if its necessary for "outsourcing".

3) *What are the current practices for removing snow on Dalhousie Campus?*

-Gound's crew responds to walkways, shoveling and salting. Go everywhere where the bobcats can't. Parking lots and roads are done by an outside contractor.

b) If it is an outside contractor, what are the costs benefits to this?
-Dalhousie could not afford to but the equipment that the contractor has.

4) *Do you have any form of training for the custodial staff that is actually doing the snow removal?*
-No, its pretty basic stuff so there is no form of training. Its common sense, many people have been working for years. Have to make sure they aren't using too much salt.

5) *What is the current budget allotment for snow/ice removal at Dalhousie University?*
-$190,000 for contracting. That does not include our people.

6) *Do you have any input into the budget for snow/ice removal?*
-The budget used to be part of his department, but it was removed a few years ago and put under the security department
-He authorizes the spending. Some of the money for the contractor comes from parking pass sales.

7) *What de-icing chemicals are used on Dalhousie properties?*
-Just road salt. Others are too expensive. Alternatives can be up to $50 a pound, and Dal buys by the truckload. They have tried some alternatives when they were given for test runs but they are just too expensive.
-In 2000-2001 – used 690 metric tons of salt
2001-2002 – 459.45

2002-2003 – 519.21
2003-date – 300 tons. So they are using less this year than others

8) *Have there been any major changes in the ways Dalhousie University removes snow and ice from campus, and do you have any changes that you would like implement?*
-No changes. More staff would be helpful. Sometimes it takes days to clear pathways and people complain if snow isn't removed. He only has 16 staff at his disposal. They have tried to close off some paths that weren't used as much, to conserve salt but people call and complain so they clear them all.