HALIFAX
REGIONAL MUNICIPALITY

11.2.4

Halifax Regional Council
January 15, 2002

TO: Mayor Kelly and Members of Halifax Regional Council

SUBMITTED BY:

George McLellan, Acting Chief Administrative Officer

Dan English, Deputy Chief Administrative Officer

DATE: January 2, 2002

SUBJECT: **Road Salts - Priority Substance List**

ORIGIN

On November 30, 2001, the Federal Minister for the Environment advised that he and the Minister for Health have recommended adding road salts that contain inorganic chloride salts with or without ferrocyanide salts to Schedule 1 (List of Toxic Substances) of the *Canadian Environmental Protection Act*, 1999 (CEPA, 1999). The proposed Order was published in Part 1 of the Canada Gazette on December 1 for a 60-day public comment period.

RECOMMENDATION

It is recommended that :

- Council forward a letter to the Minister of Environment before January 30, 2002, requesting Environment Canada not consider banning road salts as "toxic" under Section 64 of the Canadian Environment Protection Act. Further, that Environment Canada promote the adoption of the Transportation Association of Canada's Salt Management Guide (December 1999) by all Canadian municipalities as the best practices method of addressing the road salt concerns related to patrol yard operations, roadway applications, snow disposal, and ferricyanide controls.

- Council support both operationally and financially the development and implementation of a proactive Halifax Regional Municipality road salt management plan.

BACKGROUND

A copy of the September 21, 2001 report to Council on the road salt issue is attached.

The Department of Environment, based on it's assessment on road salt, is now recommending that road salt be considered CEPA toxic under Section 64 of the Canadian Environment Protection Act. A copy of the Department's announcement is also attached. The Department's recommendation is now subject to a 60 day public comment period until the end of January, 2002. If the recommendation is accepted, this will be followed by a period of 18 months to finalize measures to reduce the impact of road salt on the environment.

DISCUSSION

HRM is very cognizant of their responsibility to use road salts in a responsible manner to minimize their impact on the environment, while at the same time providing safe access to our streets and roads for all HRM citizens. Our snow and ice operation is pro-active on an ongoing basis in championing a sensible salting approach to providing a winter snow and ice service, including proper use and maintenance of salt storage facilities, proper clean-up of snow operation yards and equipment, and controlled placement of salt on HRM roads.

Although the Department of Environment has stated they are not proposing a ban on the use of road salts, staff feel HRM should clearly communicate it's position not to support a ban on road salt, and strongly endorse a managed approach to reducing the impact of road salt on the environment.

Council has previously endorsed the Transportation Association of Canada's Salt Management Guide (December 1999) as the best practices method of addressing the road salt concerns. Based on this, staff are proposing the development and ongoing implementation of a road salt management plan over the next 3 to 4 years based on the Transportation Association of Canada's Salt Management Guide. The management plan will include ongoing training and education of operations staff in sensible salting techniques, upgrading of salt storage facilities, and the application of advanced snow and ice technologies including pre-wetting systems, to reduce the amount of salt required and road weather information systems to permit more effective salting decisions.

BUDGET IMPLICATIONS

Staff will be making funding requests in future Capital Budgets for upgrading HRM's salt and sand storage facilities and for the purchase and implementation of pre-wetting and road weather information sytem technologies.

FINANCIAL MANAGEMENT POLICIES / BUSINESS PLAN

This report complies with the Municipality's Multi-Year Financial Strategy, the approved Operating, Capital and Reserve budgets, policies and procedures regarding withdrawals from the utilization of Capital and Operating reserves, as well as any relevant legislation.

ALTERNATIVES

There are no recommended alternatives.

ATTACHMENTS

- Report to Council dated September 21, 2000 - Road Salts - Priority Substance List.

- Minister of Environment's letter dated November 30, 2001, Recommending Road Salts CEPA Toxic

Additional copies of this report, and information on its status, can be obtained by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

Report Prepared by: P.J. Cochrane, Manager of Streets & Roads

Report Approved by:

Kulvinder Dhillon, P. Eng., Director of Public Works & Transportation

11.2.4

HALIFAX
REGIONAL MUNICIPALITY

Halifax Regional Council
September 26, 2000

TO: Mayor Fitzgerald and Members of Halifax Regional Council

SUBMITTED BY:

K.R. Meech, Chief Administrative Officer

Dan English, Deputy Chief Administrative Officer

DATE: September 21, 2000

SUBJECT: **Road Salts - Priority Substance List**

ORIGIN

Environment Canada has recently issued the attached draft report of the "Assessment of the Substance Road Salts specified on the Priority Substances List". This report proposes "that road salts be considered "toxic" under Section 64 of the Canadian Environment Protection Act" and has invited comments by October 11, 2000. In addition, Councillor Streatch, at the September 19, 2000 Council meeting, requested staff to provide a timely report outlining HRM's position on this matter.

RECOMMENDATION

It is recommended that Halifax Regional Council approve the following:

- That a letter be sent to the Minister of Environment before October 11, 2000, requesting Environment Canada not consider road salts as "toxic" under Section 64 of the Canadian Environment Protection Act. Further, that Environment Canada promote the adoption of the Transportation Association of Canada's Salt Management Guide (December 1999) by all Canadian municipalities as the best practices method of addressing the road salt concerns related to patrol yard operations, roadway applications, snow disposal, and ferrocyanides controls.
- That the Mayor send a letter to the Federation of Canadian Municipalities requesting them to write to the Minister of the Environment in support of this position on behalf of all Canadian municipalities.
- That copies of these letters be forwarded to Environment Canada, and the Transportation Association of Canada.

BACKGROUND

The Environment Canada report is a general assessment of the road salt issue and much of the conclusions are simply expressed but very complicated in reality. The report states that "any measures developed as a result of this assessment must never compromise human safety; selection of options must be based on optimization of winter road maintenance practices so as not to jeopardize road safety while minimizing the potential for harm to environmental organisms". The suggestions regarding salt handling and storage in patrol yards, roadway applications, snow disposal and reduction of ferrocyanides are also basic in nature and staff are generally in agreement with their intent. However, staff believe the labelling of road salt as "toxic" under the Canadian Environment Protection Act will have far reaching consequences which will impact negatively on Halifax Regional Municipality as deeming a substance toxic yields powers to severely limit usage, or in the extreme cases, place the substance on the "virtual elimination" list.

DISCUSSION

While staff fully support the proper use, storage, and disposal of road salts, it is felt that naming it a "toxic" substance will result in possible overreaction to control of it's use. If named "toxic" it will require a much more complicated and costly operations and administration system to manage salt usage including implementation of anti-icing and prewetting alternatives which may reduce the use of road salt requires the use of liquid chemicals which would however incur major equipment and Fleet retrofitting costs. The effectiveness of these alternatives also varies widely based on weather conditions experienced and can create an icing problems in regions such as HRM where the weather conditions are difficult to forecast and change frequently with little or no warning. There are no cost effective non-sodium alternatives to road salts. If stringent control measures are implemented under the Canadian Environment Protection Act, HRM's bare pavement policy for winter snow and ice services may not be achievable with resulting negative consequences to public safety and the economic well being of the community. These measures will also negatively impact on HRM's gravel road dust control program.

HRM staff is very cognizant of their responsibility to use road salts in a responsible manner to minimize their impact on the environment, while at the same time providing safe access to our streets and roads for all HRM citizens. Our snow and ice operation is pro-active on an ongoing basis in championing a sensible salting approach to providing a winter snow and ice service, including proper use and maintenance of salt storage facilities, proper clean-up of snow operation yards and equipment, and controlled placement of salt on HRM roads. In fact, HRM's use of salt over the last 3 winters has reduced from approximately 41,000 tonnes in 1997 to 24,000 tonnes in 1999. While the recently mild winters account for much of this reduction, staff's ongoing efforts to use and store road salt sensibly also contributed to these results.

The Transportation Association of Canada in December 1999, developed a Salt Management Guide with input from municipalities across Canada, including Halifax Regional Municipality. Staff have adopted this guide and it's code of practice as its best practices guide to the handling and use of road salts in our snow and ice operations.

Environment Canada does have the powers to regulate without deeming the substance toxic. Staff feel Environment Canada should be strongly encouraged not to consider road salt as toxic under the Canadian Environment Protection Act and promote the adoption of the Transportation Association of Canada's Salt Management Guide as a code of practice for all Canadian municipalities.

BUDGET IMPLICATIONS

The cost implications of road salt being designated as a "toxic" substance under the Canadian Environment Protection Act could be considerable as there is no cost effective alternative and implementing the controls would be a costly administrative process. It is reasonable to suggest that a reduced ability to use road salt would add hundreds of thousands of dollars to HRM's snow and ice operational costs. HRM spent approximately 1.8 million dollars for road salt at $35/tonne in 1999/2000. Examples of non-sodium alternatives are urea at approximately $300/ton and potassium acetate at approximately $1000/tonne.

YEAR 2000 IMPLICATIONS

Any increase in snow and ice program costs would be ongoing for future years.

ALTERNATIVES

There are no recommended alternatives.

ATTACHMENTS

- Environment Canada report summary of the draft report of the "Assessment of the Substance Road Salts specified on the Priority Substance List".

Additional copies of this report, and information on its status, can be obtained by contacting the office of the Municipal Clerk at 490-4210, or Fax 490-4208.

Report Prepared by: P.J. Cochrane, Manager of Street & Road Operations

Report Approved by: _____
Kulvinder Dhillon, Director of Public Works & Transportation

Summary of the Draft Report of the Assessment of the Substance Road Salts Specified on the Priority Substances List

The public comment period for Road Salts will begin on August 12, 2000 and will end on October 11, 2000. Comments received after October 11, 2000, will not be considered.

Prior to the public comment period, each draft Assessment Report has been extensively reviewed internally by senior technical staff, reviewed externally by expert technical peer reviewers and approved by a joint Environment Canada/ Health Canada Management Committee. For a full description of the review process, please consult the introduction of the full draft Assessment Report. Also, please note the cut-off date for consideration of relevant literature taken into account for the report.

Synopsis

Road salts enter the Canadian environment through their storage and use and through disposal of waste snow. Road salts are used for de-icing and anti-icing winter road maintenance, with some use as summer dust suppressants. Inorganic chloride salts considered in this assessment include sodium chloride, calcium chloride, potassium chloride and magnesium chloride; in the environment, these dissociate into the chloride anion and the corresponding cation. In addition, ferrocyanide salts, which are added as anti-caking agents in road salts formulations, were assessed. It is estimated that approximately 4 750 000 tonnes of sodium chloride de-icers were used in the 1997–98 winter and that 110 000 tonnes of calcium chloride are used on roadways in a typical year. When combined, it is estimated that 2 950 000 tonnes of chloride were released to the environment in Canada in the 1997–98 winter season. Very small amounts of other salts were used.

These compounds enter surface water, soil and groundwater after snowmelts, and are dispersed by splash and spray through the air. Chloride ions are conservative which means that the ion follows water without being retarded or lost from flowing water. All chloride ions that enter groundwater can ultimately be expected to reach surface water; it may take from a few years to several decades or more for steady-state groundwater concentrations to be reached.

Because of the widespread dispersal through the environment, environmental concerns can be associated with most environmental compartments. In water, natural background concentrations of salts can be high in some areas of the Prairies and British Columbia. In other regions, concentrations in water are in the order of a few mg/L. 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 meltwater, 13 500 mg/L in wetlands, 8500 mg/L in ditches and streams, 4310 mg/L in small rivers and 150 mg/L in rural lakes and 2000 to 3000 mg/L in urban impoundment lakes. In groundwater, concentrations as high as 2800 mg/L have been associated with storage yards with concentrations of about 400 mg/L being associated with

general area-wide urban inputs. Modelling and field measurements have indicated key concerns in urban areas of high use, notably in southern Ontario, Quebec and the Maritimes. Field measurements have shown that roadway applications in rural areas can also result in increased concentrations of chloride even in lakes a few hundred meters away from roadways.

Toxic effects to aquatic biota have been associated in the laboratory with exposures to chloride concentrations as low as 400 mg/L for non-lethal effects (fungi) and 874, 989 and 1068 mg/L for median lethal effects (fathead minnow embryos, rainbow trout egg/embryos, daphnids, respectively). The No-Observed-Effect Concentration (NOEC) for the 33-day early stage test for survival of fathead minnow was 252 mg/L chloride, with a Lowest-Observed-Effect Concentration (LOEC) (9% reduction in survivorship) of 352 mg/L. Modelling using acute to chronic ratios indicates possible median lethal effects at concentrations as low as 210 mg/L chlorides for daphnids. About 5% of aquatic species would be affected (median lethal concentration) at chloride concentrations of about 210 mg/L, while 10% of species would be affected at chloride concentrations of about 240 mg/L. Changes in populations or community structure can occur at lower concentrations. Because of differences in optimal chloride concentrations for different species of algae, shifts in populations in lakes were associated with concentrations of 12 to 235 mg/L. High concentrations of chloride in lakes can also increase availability of metals and, by preventing seasonal mixing of waters, affect distribution of oxygen and nutrients.

In soils, a limited number of measurements are available which correlate soil concentrations with biological effects or with direct abiotic effects on soils. Modelling studies of the salt concentrations in soil from roadways was done and indicated that impacts should be limited to areas in or close to the rights of way. Studies also indicated that sensitive microorganisms may be affected by soil concentrations of about 60 ppm Na and 90 ppm Cl and above. Soil concentrations exceeding these levels have been reported within about 30 m from the edges of highways in Canada and have also been reported for soils at patrol yards.

Laboratory and field data have correlated damage to vegetation with distance from treated roadways and concentrations of sodium and chloride in plant tissues. Sensitive terrestrial plants may be affected by soil concentrations of about 68 ppm Na and 215 ppm Cl and above, or by tissue concentrations of about 575 ppm Na and 800 ppm Cl and above. Concentrations exceeding these soil levels have been reported within about 30 m from the edges of highways in Canada and in patrol yards, and concentrations exceeding these tissue concentrations have been reported within about 100 m from the edges of Canadian highways. A number of field studies have documented damage to vegetation and shifts in plant community structure near roadways resulting from the use of road salts.

Behavioural and toxicological impacts have been associated with exposure of mammalian and avian wildlife to road salts. Road salt increases the vulnerability of birds to car strike and may poison some birds directly. To relieve thirst, birds may ingest snow which could have negative energetic

consequences; consumption of meltwater containing high concentrations of salt may increase salt ingestion rather than alleviating salt toxicosis. Road salt may also affect wildlife through its impact on habitat, with reduction in plant cover or community shifts that could affect wildlife dependent on these plants for food or shelter.

Ferrocyanides are very persistent but are of low toxicity. However, in solution and in presence of light, they can dissociate and form cyanide. In turn, the cyanide ion (as HCN) may volatilize and dissipate fairly quickly. The ultimate effects of ferrocyanides therefore depend on the complex balance between photolysis and volatilization, which in turn depend on environmental factors. Modelling studies undertaken in support of this assessment, indicate that there is some potential for certain aquatic organisms to be affected by cyanide in areas of high use of road salts, although the likelihood that sensitive organisms would actually be exposed for extended periods in roadside habitats is uncertain.

Based on the available data, it is considered that road salts are entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity, and that constitute or may constitute a danger to the environment on which life depends. Therefore, it is proposed that road salts be considered toxic; under Section 64 of the Canadian Environmental Protection Act, 1999.

Future management should focus on key sources in areas where the assessment has indicated concerns. These relate to patrol yards, roadway applications, snow disposal and ferrocyanides.

The use of de-icing agents is an important component of strategies to keep roadways open and safe during the winter and minimize traffic crashes, injuries and mortality under icy and snowy conditions. These benefits were recognized by the Expert Advisory Panel on the second Priority Substances List (PSL), even as they recommended that this assessment of potential impacts on environmental organisms be conducted. Any measures developed as a result of this assessment must never compromise human safety; selection of options must be based on optimization of winter road maintenance practices so as to not jeopardize road safety, while minimizing the potential for harm to environmental organisms. Any action taken to reduce impacts on environmental organisms is likely also to reduce potential for contamination of groundwater-based drinking water supplies, which is clearly desirable.

Patrol yards: Key concerns relate to contamination of groundwater at patrol yards, discharge to surface water and effects on aquatic biota. In addition, overland flow of salty snowmelt waters can result in direct impacts to surface water and near-field vegetation. Based on surveys and reviews, salt losses from patrol yards are associated with loss at storage piles (which include salt piles as well as piles of sand and gravel to which salts have been added), and during the handling of salts, relating to both storage, and loading and unloading of trucks. The discharge of patrol yard washwater is also a potential source of

salt loss. Measures should therefore be considered to ensure storage of salt and abrasives to reduce losses through weathering, management practices to reduce losses during transfers, and management of stormwater and equipment washwater to minimize releases.

Roadway application: Key environmental concerns have been associated with areas of high salt use and high road density. Regions of southern Ontario and Quebec and the Maritimes have the highest rate of salt use on an area basis and as such have the highest potential for contamination of soils and surface and groundwater by road salts as a result of roadway applications. In addition, urban areas in other parts of the country where large amounts of salts are applied are of potential concern, especially for streams and aquifers which are wholly surrounded by urban areas. In rural areas, surface waters receiving drainage from roadways may also be susceptible to contamination. Any area of Canada where splash or spray from salted roads can be transported through air pathways to sensitive vegetation are a potential concern. Wetlands which directly adjoin roadway ditches and which receive sheet runoff in the form of salty snowmelt waters are also foci for management concerns. Therefore, measures should be considered to reduce the overall use of chloride salts in such areas. The selection of alternative products or of appropriate practices or technology to reduce salt use should be considered while ensuring maintenance of roadway safety.

Snow disposal: Key environmental concerns relate to eventual loss of meltwater into surface water and into soil and groundwater at snow disposal sites. Measures to minimize percolation into soil and groundwater and direct the release of salty snow-melt waters into surface waters which have minimal environmental sensitivity, or via storm sewers could be considered. Mesures should also be considered to ensure sufficient dilution before release.
Ferrocyanides: This assessment indicates that there is a possible adverse exposure for the more sensitive aquatic vertebrates in areas of very high use of road salts. Risks could be reduced by reducing total salt use or reducing content of ferrocyanides in road salt formulations. To reduce the possibility of exposure, producers of road salts could consider reducing the addition rate of ferrocyanide to road salt. Any reduction in total salt use would be expected to result in an equivalent reduction in release of ferrocyanides.

Minister of the Environment

Ministre de l'Environnement

Ottawa, Canada K1A 0H3

MUNICIPAL CLERK'S OFFICE
Distributed to: J. O'Brien
Mayor, Councillors, CAO,
Solicitor D. English
Dec 5/01
DATE

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Dan English
Deputy CAO
Halifax Regional Municipality

HALIFAX REGIONAL MUNICIPALITY
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MAYOR'S OFFICE

November 30, 2001

His Worship Mayor Peter Kelly
Halifax Regional Municipality
P.O. Box 1749
Halifax NS B3J 3A5

Dear Mayor Kelly:

As you know, Environment Canada has carried out a comprehensive science assessment on road salts. I am writing to update you on the status of the assessment.

The science assessment found that high releases of road salts around storage and snow disposal sites, and through run-off and splash from roadways into soils, streams and rivers, pose a serious threat to the aquatic environment, ground water, plants and animals. Therefore, Health Minister Allan Rock and I have recommended adding road salts that contain inorganic chloride salts with or without ferrocyanide salts to Schedule 1 (List of Toxic Substances) of the *Canadian Environmental Protection Act, 1999* (CEPA, 1999). The proposed Order will be published in Part I of the *Canada Gazette* on December 1 for a 60-day public comment period. Enclosed is an information package that explains our decisions in detail.

We recognize the important role that road salts play in keeping Canadian roads safe and efficient during winter. Accordingly, we are neither proposing a ban on the use of road salts nor a course of action that compromises road safety.

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Halifax Regional Municipality
RECEIVED
DEC 10 2001
Director
Public Works & Transportation

Canada

Approximately five million tonnes of chloride salts are released into the Canadian environment each year. Although not toxic to human health, these salts enter surface water, soil and ground water in concentrations and quantities that create negative environmental impacts. Therefore, under CEPA, 1999, Environment Canada must investigate ways to manage releases of road salts in order to reduce their impact on the environment.

Under CEPA, 1999, Environment Canada has two years to develop and propose management measures to reduce the impact of road salts on the environment, and a further 18 months to finalize them. These control measures will be selected and developed with input from the provinces, territories and municipalities, as well as stakeholders such as transportation and road maintenance authorities, industry and environmental groups. My department will form a working group to advise on the selection and development of measures, and will begin stakeholder meetings this winter.

In developing management measures, Environment Canada is considering an approach based on best management practices that will build on existing work by the Transportation Association of Canada in its *Salt Management Guide* and Salt Management Action Plan. A full range of management options will be considered. Possible management measures could focus, for example, on reducing losses at salt storage sites, improved salt application technology and practices, meteorological forecasting tools that could lead to reduced salt use, and the use of alternate products.

I hope that the enclosed materials and my comments will be helpful in addressing any questions that you may have concerning this issue.

Yours sincerely,

David Anderson

David Anderson, P.C., M.P.

Enclosure

Government of Canada

NEWS RELEASE

GOVERNMENT PROPOSAL ON ROAD SALTS RELEASED

OTTAWA, November 30, 2001 A 60-day public comment period starts December 1, 2001, with the publication in the Canada Gazette, Part 1 of the recommendation that road salts, which contain inorganic chloride salts with or without ferrocyanide salts, be added to Schedule 1 under the *Canadian Environmental Protection Act (CEPA)*. The government will make a final decision on this legal step following a complete review and consideration of the comments received. Canadians are welcome to provide comments until January 29, 2002 to Environment Canada.

The government recognizes the importance of road salts in protecting roadway safety and is not proposing a ban on road salts or to put in place any measures that would compromise or reduce road safety.

Consultations will be launched next year on better ways to manage road salts so that harm to the environment is reduced. This follows the release of a comprehensive five-year scientific assessment by Environment Canada that determined that road salts in sufficient concentrations pose a risk to the aquatic environment, plants and animals.

Under CEPA, the government has two years to develop management measures to reduce the impact of road salts on the environment. A broad range of management actions will be studied, including, improved application technologies, and better storage and handling techniques. These measures will be selected and developed by the Government of Canada with input from and building upon work already done by some provinces and territories; and with stakeholders, including municipalities, transportation and road maintenance authorities, the road salt industry and environmental groups. The proposed risk management regime will be presented to the government for a further 60-day consultation period. If the regime is accepted, this will be followed by a period of 18 months to finalize the measures.

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Road salts were identified for a scientific assessment of their impact on the environment in 1995 as a result of recommendations from an expert panel that established the Priority Substances List under CEPA. A five-year study concluded that because of high releases around storage and snow disposal sites and through runoff and splash from roadways into soil, streams and rivers, road salts are harmful to the environment. The assessment was restricted to ecological effects as the expert panel judged that there was no evidence of human health effects.

The assessment report is available on Environment Canada's Green Lane Web site at: www.ec.gc.ca/CEPARegistry.

Canadians wishing to make comments on the recommendation that road salts, which contain inorganic chloride salts with or without ferrocyanide salts, be added to Schedule 1 under the *Canadian Environmental Protection Act* (CEPA) can do so to the Director, Existing Substances Branch, Environmental Protection Service, Environment Canada, Ottawa, Ontario, K1A OH3, by fax: 819-953-4936 or e-mail: PSL.LSIP@ec.gc.ca.

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For further information, please contact:

Kelly Morgan
Communications Advisor
Office of the Minister of the Environment
(819) 997-1441

Assessment Results:
Dr. Robert Chénier
Environment Canada
(819) 953-1680

Risk Management Activities:
Bernard Madé
Environment Canada
(819) 994-3648

(Également disponible en français)

Government of Canada

BACKGROUNDER

SCIENCE ASSESSMENT AND RISK MANAGEMENT OF ROAD SALTS

Road salts were put on the Priority Substances List under the *Canadian Environmental Protection Act* (CEPA) for an environmental assessment in 1995 because of concerns about the large quantities used in Canada and the potential effects of chlorides on the environment. As a result, Environment Canada had a legal obligation to conduct a comprehensive science assessment under CEPA.

The Government recognizes the importance of road salts in protecting roadway safety and is not proposing a ban on road salts or to put in place any measures that would compromise or reduce road safety.

CEPA ensures an open process with full consideration of all environmental and human health risks, as well as socio-economic factors leading to management decisions by formally separating the assessment phase (possibly leading to a finding that a substance is harmful to the environment or to human health) from the management phase (leading to the identification and implementation of management or control measures).

The Science Assessment Report

Road salts are not dangerous to humans. In light of the recommendation from the Ministers' Expert Advisory Panel for an ecological rather than human health assessment of road salts and the lack of evidence of health effects, the assessment was restricted to environmental impacts.

Road salts, which contain inorganic chloride salts with or without ferrocyanide salts, were assessed to determine the nature of the risks that they pose to the environment. The assessment found that approximately 5 million tonnes of road salts are used in Canada every year. Run-off of meltwater from roadways and releases from patrol yards where salts are stored have resulted in high concentrations of chloride in surface water, with concentrations greater than 1000 mg/L being reported regularly in some areas. As well, high chloride concentrations in groundwater are a concern as the groundwater eventually surfaces at springs and contributes further to surface water contamination.

Annual Use of the Most Common Road Salts for 1997 - 1998

Jurisdiction	Sodium chloride (tonnes)	Calcium chloride (tonnes)
British Columbia	142,000	12,600
Alberta	182,000	7,000
Saskatchewan	53,000	2,800
Manitoba	70 000	7,000
Ontario	1,845,000	45,400
Quebec	1,545,000	21,000
New Brunswick	285,000	1,700
Nova Scotia	374,000	5,200
Prince Edward Island	29,000	300
Newfoundland	222,000	800
Yukon	2,000	1,400
Northwest Territories / Nunavut	2,000	2,800
Canada	**4,750,000**	**108,000**

This science assessment concluded that because of high releases around storage and snow disposal sites and through runoff and splash from roadways into soils, streams and rivers, road salts pose a serious threat to the aquatic environment, plants and animals.

RISK MANAGEMENT

Environment Canada will form a working group to advise on the selection and development of measures and will begin stakeholder meetings early in 2002.

A full range of options will be considered. Possible management measures could focus, for example, on reducing losses at salt storage sites, improved salt application technology and practices, meteorological forecasting tools that could lead to reduced salt use, and the use of alternate products. These measures can reduce road salt loss into the environment without affecting road safety.

In developing management measures, Environment Canada will consider a best management practices approach through a code of practice or guideline that would build on existing work being undertaken in the provinces and territories and on measures identified by the Transportation Association of Canada in its *Salt Management Guide* and *Salt Management Action Plan* (www.tac-atc.ca).

Areas for Reduction in the Release of Salts

Patrol Yards: Key concerns relate to contamination of groundwater at patrol yards, which in turn can be associated with problems of groundwater quality, discharge to surface water and effects on aquatic biota. In addition, run-off can result in direct impacts on surface water and on vegetation. Salt losses from patrol yards are associated with loss at storage piles—including salt piles as well as piles of sand and gravel to which salts have been added—and during the handling of salts, relating to both storage and loading of trucks.

Measures would be considered to ensure appropriate storage of salts and abrasives to help reduce losses through weathering, management practices to reduce losses during transfers, and management of stormwater and equipment washwater to minimize releases.

Snow Disposal: Key environmental concerns relate to eventual loss of meltwater into surface water and into soil and groundwater at snow disposal sites. Measures would be considered to minimize percolation into soil and groundwater and direct release into water.

Roadway Application: Key environmental concerns have been associated with areas of high salt use and high road density, especially in urban areas. However, in rural environmentally sensitive areas, surface and ground waters receiving drainage from roadways may also be susceptible to contamination. The selection of appropriate technology and practices or alternative products to reduce salt use will be considered subject to the overriding priority of maintaining roadway safety.

Best management practices for general use could include the use of better salt application technologies such as electronic spreader controllers, anti-icing, pre-wetting, and road weather information systems. Some of these practices prevent ice formation and lead to reduced use of salts while actually improving road safety. New technologies for general use have shown significant reductions of as much as 20 percent or more in the quantities of salts applied while improving road safety.

Ferrocyanide Salts: Ferrocyanide salts are added as anti-caking agents in certain road salt formulations. The science assessment indicated possible adverse exposure for the more sensitive aquatic vertebrates in areas of very high use of road salts. To reduce possible exposure, producers of road salts could consider reducing the ratio of ferrocyanide added to road salt. Any reduction in total salt use would be expected to result in an equivalent reduction in release of ferrocyanides.

Optimizing the Use of Road Salts

Considerable effort is being made by road authorities at all levels to improve the management of road salts. Some jurisdictions are well advanced in introducing technologies whereas others are just beginning to investigate these practices. The assessment of road salts and initiatives by some provinces and territories and the Transportation Association of Canada have heightened the interest in better road salt management and have been the incentive for greater action across Canada.

Best management practices at salt storage facilities could significantly reduce environmental impacts without affecting road safety. However, the amount used in a season depends on the weather and severity of the winter.

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For further information, please visit Environment Canada's Green Lane Web site at: **www.ec.gc.ca** or contact:

Bernard Madé
Environment Canada
(819) 994-3648

(Également disponible en français)

ROAD SALTS
Frequently Asked Questions

Is the Government of Canada banning the use of road salts?

No. The Government of Canada will not ban road salts.

Road safety is our top priority. Accordingly, the environmental risk management strategy for road salts will focus on the development of best practices respecting storage, spreading and disposal while ensuring that road safety is not compromised.

What are the next steps for managing road salts?

A 60-day public comment period is underway on the recommendation that road salts, which contain inorganic chloride salts with or without ferrocyanide salts, be added to Schedule 1 under the *Canadian Environmental Protection Act (CEPA) 1999*. The recommendation will be published in the Canada Gazette, December 1, 2001. The government will make a final decision on this important legal step following a complete review and consideration of the comments received.

Under CEPA, the government has two years to develop management measures to reduce the impact of road salts on the environment. A broad range of management actions will be studied, including, improved application technologies, and better storage and handling techniques. These measures will be selected and developed by the Government of Canada with input from and building upon work already done by some provinces and territorities, along with stakeholders, including municipalities, transportation and road maintenance authorities, the road salt industry and environmental groups. The stakeholder meetings will start early in 2002. The proposed risk management regime will be presented to the government for a further 60-day consultation period. Following approval, the government has a further 18 months to finalize the measure.

What are the environmental concerns associated with road salts?

The five year comprehensive science assessment determined the release of road salts into the environment in very high amounts leads to environmental problems. More than five million tones of road salts are used in Canada each year to mitigate ice and snow conditions on roads and are necessary for road safety. However, the heavy use of road salts can lead to damage to vegetation, as is most obvious with road-side vegetation damaged by salt splash. They have also been associated with damage to organisms in soil, to birds and to other wildlife. Almost all chloride ions from road salts find their way eventually into waterways, whether by direct runoff into surface water or by moving

through the soil and groundwater. In surface water, road salts can harm freshwater plants, fish and other organisms that are not adapted to living in saline waters.

Why are you using the *Canadian Environmental Protection Act to reduce the impact of Road Salts*?

This science assessment of road salts has concluded that road salts that contain inorganic chloride salts with or without ferrocyanide salts are entering the environment in such large amounts that they pose a risk to fish, lake and stream ecosystems, plants, animals and birds. For that reason, they are proposed for addition to Schedule 1 of the *Canadian Environmental Protection Act* so that risk management measures to reduce the impact of road salts on the environment can be developed while at the same time, ensuring that road safety is not compromised.

ROAD SAFETY

What is Transport Canada's (TC) Role?

Transport Canada's primary role is to oversee the safety of Canada's transportation system.

Provincial/territorial and municipal governments are primarily responsible for construction, operation and maintenance of Canadian highways.

Does Transport Canada have any road safety concerns about Canada's roadways as a result of the decision to declare road salts a toxic substance?

Transport Canada recognizes the importance of road salts in protecting roadway safety. Road salts play a large role in keeping Canadian roads safe and efficient during winter. Winter maintenance activities, including the use of road salts, keep transportation moving and help to reduce injuries and loss of life.

At the same time, the department supports any action such as Environment Canada's proposal which is aimed at protecting the environment and reducing the impact of roads salts on the environment.

Road salts, due to a variety of reasons, are the de-icer of choice and will continue to be used by road authorities. For that reason, the Risk Management process under the Canadian Environmental Protection Act (CEPA) for road salts, through stakeholder consultation, will determine measures to reduce the impact of road salts on the environment without compromising road and driver safety.

Transport Canada will be part of the stakeholder consultation process through its participation in the Transportation Association of Canada (TAC) working group on road salts management.

What is Transport Canada's involvement with Intelligent Transportation Systems such as Road Weather Information Systems (RWIS)?

Transport Canada is working with Environment Canada, the Provinces and Territories to develop a national approach to implementing Road Weather Information Systems (RWIS) because it reduces the requirement for road salt use.

RWIS allows for alternative treatment of roads. The system uses weather and road data from automated weather reporting stations installed along the roadway which also has special sensors embedded in and below the road, to assist weather forecasters in predicting icing conditions before they occur.

Road maintenance crews can use this information to decide if road treatment is necessary, the time to treat, what chemicals or mixtures to use, and how much is required.

RWIS provides timely road information to weather forecasters and maintenance crews and can play an important role in enhancing safety, efficiency, and sustainability of Canada's transportation system.

How will road safety be maintained? Will there be a need for monitoring?

To address any concerns from provinces and municipalities regarding road safety, Environment Canada (EC) has assured Transport Canada that the Management Options Stage, of which risk management is a component, to be led by EC, will include appropriate mechanisms to maintain road safety within the framework of a clear, transparent and flexible process. This is important given the broad range of stakeholders who use road salt and the important role that road salt plays in keeping our roads safe.

Transport Canada considers that progress towards a managed salt strategy and reduced usage requires tracking the changes of specific indicators and comparing them to baseline indicators established at the outset. Road safety would be one of these indicators.

Transport Canada will be part of the stakeholder consultation process through its participation in the Transportation Association of Canada (TAC) working group on road salts management.

What is Transport Canada's role regarding the storage of road salts which are shipped through Canadian port facilities?

The responsibility for the storage of road salts at most Canadian port facilities is with the shipper or owner of the goods.

At port facilities administered by Transport Canada, the storage of road salts is controlled by the department.

Transport Canada will conform with any potential new requirements that may arise related to the management of road salts.

Would TC be concerned if a road authority chose to ban road salt?

TC recognizes benefits of road salt as an effective tool contributing to safer winter driving conditions. Road authorities make their own decisions on the application and use of this material. TC does not regulate road maintenance nor does it specify what is to be used.

In light of the knowledge that the effective removal of ice and snow from pavements significantly reduces the number of collisions during winter conditions, TC would be concerned if road salt was banned without the implementation of another effective de-icing agent or procedure.

Transport Canada expects that Environment Canada will work with stakeholders to assist them in making reasoned decisions within a carefully planned management framework as the best way to achieve both department's common objectives - improved environmental protection for Canadians while maintaining safety.

HUMAN AND ENVIRONMENTAL HEALTH

Under CEPA, what is the difference between harm to the environment, and harm to human health?

Road salts are not dangerous to humans. The principal problem for humans is the effect they have on the taste of contaminated waters. The assessment was restricted to environmental impacts.

Organisms in the environment have different susceptibility to different substances, including salts. Exposure of these organisms to levels well below what may be considered safe for humans may result in direct or indirect harmful effects. As a result, a substance which is not considered harmful to human health as defined by the new *Canadian Environmental Protection Act*, can be determined to be harmful to the environment.

How are road salts not harmful to human health?

There is no demonstrated link between the use of road salts and an adverse human health effect. Humans are exposed to road salts principally through well water that can be affected by road salts. Road salts can affect the taste of roadside well waters, sometimes to the point where the water is not drinkable, as sodium and chloride levels become sufficiently high. Sodium and chloride are not known to cause harm to humans; in fact, the Canadian Drinking Water Guidelines are based on taste, which is affected at levels well below those that might be of concern for human health.

Other substances in road salts (including ferrocyanide and certain metals) are only present at trace levels. It has also been suggested that increased sodium intake might contribute to hypertension in humans, but the evidence is considered inconclusive and drinking water usually only contributes a very small fraction of people's total intake, most of which comes from food.

MANAGEMENT MEASURES

What kinds of measures will be adopted to reduce the impact of road salts on the environment?

Management options will involve only those measures that will not jeopardize road safety.

Possible management options could focus, for example, on reducing losses at salt storage sites, better engineering of snow dumps to control run-off, improved salt application technology and meteorological forecasting tools and the use of alternate products in environmentally sensitive areas.

In developing management instruments, Environment Canada is considering a best management practices approach through a code of practices or guideline that would build on work that has been done by some provinces and territories along with the Transportation Association of Canada in its Salt Management Guide and Salt Management Action Plan.

Best management practices for general use could include the use of better salt application technologies such as electronic spreader controllers, anti-icing, pre-wetting and road weather information systems which prevent ice formation and lead to reduced use of salt and actually improve road safety.

Provinces, territories, road authorities and stakeholders will be consulted in the choice and development of the management instruments.

What steps have already been taken by road authorities to improve the management of road salts?

Considerable effort is being made by road authorities at all levels to improve the management of road salts. Some jurisdictions are well advanced in introducing technologies such as electronic spreader controllers, anti-icing, pre-wetting and road weather information systems, whereas others are just beginning to investigate these practices. The assessment of road salts and initiatives by the Transportation Association of Canada have heightened the interest in better management of road salts and have been the incentive for greater action across Canada.

How much do you think we could cut back on our use of road salts?

New technologies for roadway applications have shown significant reductions of as much as 20 percent or more while improving road safety. However, the amount used in a season depends on the weather and severity of the winter. Improving management practices at salt storage facilities and snow disposal sites could significantly reduce local and regional environmental impact without affecting road safety at all.

SCIENCE ASSESSMENT

Why did the Government of Canada assess road salts?

Road salts is one of the 25 substances added to the *Canadian Environmental Protection Act's* Priority Substances List (CEPA PSL) in December 1995. It was added at the recommendation of the Ministers' Expert Advisory Panel which included members from various governments and stakeholder groups. The Panel's report noted:

> "The Panel recognized the benefits associated with the use of road salts. However, these substances have negative effects on the environment. Large volumes are released through road salting, particularly in Ontario, Quebec and the Atlantic provinces. There is evidence of adverse local environmental effects to groundwater and to plant and animal life following exposure. Algae and benthic fauna have been shown to be particularly sensitive to changes in chloride ion concentrations, resulting in a reduction of fish populations. The Panel recognizes that there has been considerable progress in upgrading storage facilities. However, given the widespread exposure to these substances, and their release in large volumes into the Canadian environment, the Panel believes that an assessment is needed to determine their ecological effects."

What does it mean to be placed on the Priority Substances List (PSL)?

Substances that are on the PSL are a priority for *assessment*. Their presence on the PSL does not restrict any activity relating to the substance. If, following the assessment, it is determined that a substance is indeed harmful to the environment, then it can be added to Schedule I of CEPA 1999 - and is considered for development of management and control actions.

What environmental assessment process was used for road salts?

Environment Canada and Health Canada are responsible for the environmental and health assessment of priority substances. For the environmental assessment of road salts, an Environmental Resource Group of government and non-government experts was formed to prepare supporting documentation providing a detailed review of data and presenting analyses pertinent to the risk assessment. Following external science reviews, an Assessment Report summarizing the scientific conclusions and recommendations was released in August 2000 for a 60-day public comment period. Comments were considered, and the Ministers of Environment and Health recommended that road salts be added to Schedule 1 under the new *Canadian Environmental Protection Act* so that management options to reduce their impact on the environment could be developed.

If there are environmental concerns, why has Environment Canada not acted already to control road salts?

While many different reports of damage from road salts have been identified from various jurisdictions, it was important to come up with an overview of potential concerns. Large quantities of information were reviewed and analyzed to characterize the use of road salts, the concentrations in the environment in Canada, and the broad range of effects that can be associated with this environmental exposure. Road salts are important for roadway safety and it is essential to understand where, when, and how road salts can pose a risk in order to make responsible management decisions.

How open is Environment Canada's risk assessment process?

Environment Canada engages public input at various stages of its risk assessment and management activities. Road salts were added to the Priority Substances List on the recommendation of a stakeholder expert advisory panel. The assessment was led by Environment Canada with the active participation of scientists from federal and provincial governments, industry, and academia. Updates on the assessment were sent regularly to individuals and organizations who had indicated an interest in the assessment. Updates were posted on Environment Canada's Green Lane Web site.

Presentations on the assessment process were made regularly to public works groups and other association meetings in Canada. The assessment report and proposed conclusions were released in August 2000 for a formal public comment period. Comments were considered and the Ministers have recommended addition to Schedule 1 of CEPA. Management approaches will be identified through an open process involving extensive stakeholder participation.

Summary of the Report of the Assessment of the substance Road Salts specified on the Priority Substances List

Road salts are used as de-icing and anti-icing chemicals for winter road maintenance, with some use as summer dust suppressants. Inorganic chloride salts considered in this assessment include sodium chloride, calcium chloride, potassium chloride and magnesium chloride. In the environment, these compounds dissociate into the chloride anion and the corresponding cation. In addition, ferrocyanide salts, which are added as anti-caking agents to some road salts formulations, were assessed. It is estimated that approximately 4.75 million tonnes of sodium chloride were used as road salts in the winter of 1997–98 and that 110 000 tonnes of calcium chloride are used on roadways in a typical year. Very small amounts of other salts are used. Based on these estimates, about 4.9 million tonnes of road salts can be released to the environment in Canada every year, accounting for about 3.0 million tonnes of chloride. The highest annual loadings of road salts on a road-length basis are in Ontario and Quebec, with intermediate loadings in the Atlantic provinces and lowest loadings in the western provinces.

Road salts enter the Canadian environment through their storage and use and through disposal of snow cleared from roadways. Road salts enter surface water, soil and groundwater after snowmelt, and are dispersed through the air by splashing and spray from vehicles and as wind-borne powder. Chloride ions are conservative, moving with water without being retarded or lost. Accordingly, almost all chloride ions that enter the soil and groundwater can ultimately be expected to reach surface water; it may take from a few years to several decades or more for steady-state groundwater concentrations to be reached. Because of the widespread dispersal of road salts through the environment, environmental concerns can be associated with most environmental compartments.

In water, natural background concentrations of chloride are generally no more than a few mg/L, with some local or regional instances of higher natural salinity, notably in some areas of the Prairies and British Columbia. High concentrations of chloride related to the use of road salts on roadways or releases from patrol yards or snow dumps have been measured. For example, concentrations of chloride over 18 000 mg/L were observed in runoff from roadways. Chloride concentrations up to 82 000 mg/L were also observed in runoff from uncovered blended abrasive/salt piles in a patrol yard. Chloride concentrations in snow cleared from city streets can be quite variable. For example, the average chloride concentrations in snow cleared from streets in Montreal ranged from 3000 to 5000 mg/L for secondary and primary streets, respectively. Waters from roadways, patrol yards or snow dumps can be diluted to various degrees when entering the environment. In the environment, resulting chloride concentrations have been measured as high as 2800 mg/L in groundwater in areas adjacent to storage yards, 4000 mg/L in ponds and wetlands, 4300 mg/L in watercourses, 2000 to 5000 mg/L in urban impoundment lakes and 150 to 300 mg/L in rural lakes. While highest concentrations are usually associated with winter or spring thaws, high concentrations can also be measured in the summer, as a result of the travel time of the ions to surface waters and the reduced water flows in the summer. Water bodies most subject to the impacts of road salts are small ponds and water courses draining large urbanized areas, as well as streams, wetlands or lakes draining major roadways. Field

measurements have shown that roadway applications in rural areas can result in increased chloride concentrations in lakes located a few hundred metres from roadways.

The potential for impacts on regional groundwater systems was evaluated using a mass balance technique that provides an indication of potential chloride concentrations down-gradient from saltable road networks. The mass balance modelling and field measurements indicated that regional-scale groundwater concentrations of chloride greater than 250 mg/L will likely result under high-density road networks subject to annual loadings above 20 tonnes sodium chloride per two-lane-kilometre. Considering data on loadings of road salts, urban areas in southern Ontario, southern Quebec and the Atlantic provinces face the greatest risk of regional groundwater impacts. Groundwater will eventually well up into the surface water or emerge as seeps and springs. Research has shown 10 to 60% of the salt applied enters shallow subsurface waters and accumulates until steady-state concentrations are attained. Elevated concentrations of chlorides have been detected in groundwater springs emerging to the surface.

Acute toxic effects of chloride on aquatic organisms are usually observed at relatively elevated concentrations. For example, the 4-day median lethal concentration (LC_{50}) for the cladoceran *Ceriodaphnia dubia* is 1400 mg/L. Exposure to such concentrations may occur in small streams located in heavily-populated urban areas with dense road networks and elevated road salt loadings, in ponds and wetlands adjacent to roadways, near poorly managed salt storage depots, and at certain snow disposal sites.

Chronic toxicity occurs at lower concentrations. Toxic effects on aquatic biota are associated with exposures to chloride concentrations as low as 870, 990 and 1070 mg/L for median lethal effects (fathead minnow embryos, rainbow trout eggs/embryos and daphnids, respectively). The No-Observed-Effect Concentration (NOEC) for the 33-day early life stage test for survival of fathead minnow was 252 mg chloride/L. Furthermore, it is estimated that 5% of aquatic species would be affected (median lethal concentration) at chloride concentrations of about 210 mg/L, and 10% of species would be affected at chloride concentrations of about 240 mg/L. Changes in populations or community structure can occur at lower concentrations. Because of differences in the optimal chloride concentrations for the growth and reproduction of different species of algae, shifts in populations in lakes were associated with concentrations of 12 to 235 mg/L. Increased salt concentrations in lakes can lead to stratification which retards or prevents the seasonal mixing of waters, thereby affecting the distribution of oxygen and nutrients. Chloride concentrations between 100 and 1000 mg/L or more have been observed in a variety of urban water courses and lakes. For example, maximum chloride concentrations in water samples from four Toronto-area creeks ranged from 1390 to 4310 mg/L. Chloride concentrations greater than about 230 mg/L, corresponding to those having chronic effects on sensitive organisms, have been reported from these four water courses through much of the year. In areas of heavy use of road salts, especially southern Ontario, Quebec, and the Maritimes, chloride concentrations in groundwater and surface water are frequently at levels likely to affect biota, as demonstrated by laboratory and field studies.

Application of road salts can also result in deleterious effects on the physical and chemical properties of soils, especially in areas that suffer from poor salt, soil and vegetation management.

Effects are associated with areas adjacent to salt depots and roadsides, especially in poorly drained depressions. Effects include impacts on soil structure, soil dispersion, soil permeability, soil swelling and crusting, soil electrical conductivity and soil osmotic potential. These can have, in turn, abiotic and biotic impacts on the local environment. The primary abiotic impact is the loss of soil stability during drying and wetting cycles, and during periods of high surface runoff and wind. Biological impacts relate primarily to osmotic stress on soil macro- and microflora and fauna, as well as salt-induced mobilization of macro- and micronutrients that affect flora and fauna.

A number of field studies have documented damage to vegetation and shifts in plant community structure in areas impacted by road salt run-off and aerial dispersion. Halophytic species, such as cattails and common reed-grass, readily invade areas impacted by salt, leading to changes in occurrence and diversity of salt-sensitive species. Elevated soil levels of sodium and chloride or aerial exposure to sodium and chloride result in reductions in flowering and fruiting of sensitive plant species; foliar, shoot and root injury; growth reductions; and reductions in seedling establishment. Sensitive terrestrial plants may be affected by soil concentrations greater than about 68 mg sodium/kg and 215 mg chloride/kg. Areas with such soil concentrations extend linearly along roads and highways or other areas where road salts are applied for de-icing or dust control. The impact of aerial dispersion extends up to 200 m from the edge of multi-lane highways and 35 m from two-lane highways where de-icing salts are used. Salt injury to vegetation also occurs along watercourses that drain roadways and salt handling facilities.

Behavioural and toxicological impacts have been associated with exposure of mammalian and avian wildlife to road salts. Ingestion of road salts increases the vulnerability of birds to car strikes. Furthermore, intake calculations suggest that road salts may poison some birds, especially when water is not freely available during severe winters. Road salts may also affect wildlife habitat, with reduction in plant cover or shifts in communities that could affect wildlife dependent on these plants for food or shelter. Available data suggest that the severity of road kills of federally protected migratory bird species (e.g., cardueline finches) and the contribution of road salts to this mortality have been underestimated.

Ferrocyanides are very persistent but are of low toxicity. However, in solution and in the presence of light, they can dissociate to form cyanide. In turn, the cyanide ion may volatilize and dissipate fairly quickly. The ultimate effects of ferrocyanides therefore depend on the complex balance between photolysis and volatilization, which in turn depend on environmental factors. Modelling studies undertaken in support of this assessment indicate that there is a potential for certain aquatic organisms to be adversely affected by cyanide in areas of high use of road salts.

Based on the available data, it is considered that road salts that contain inorganic chloride salts with or without ferrocyanide salts are entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity or that constitute or may constitute a danger to the environment on which life depends. Therefore, it is concluded that road salts that contain inorganic chloride salts with or without ferrocyanide salts are "toxic" as defined in Section 64 of the *Canadian Environmental Protection Act, 1999* (CEPA 1999).

The use of de-icing agents is an important component of strategies to keep roadways open and safe during the winter and minimize traffic crashes, injuries and mortality under icy and snowy conditions. These benefits were recognized by the Ministers' Expert Advisory Panel on the Second Priority Substances List, even as they recommended that this assessment of potential impacts on the environment be conducted. Any measures developed as a result of this assessment must never compromise human safety; selection of options must be based on optimization of winter road maintenance practices so as not to jeopardize road safety, while minimizing the potential for harm to the environment. Any action taken to reduce impacts on the environment is also likely to reduce potential for contamination of groundwater-based drinking water supplies, which is clearly desirable.

Future management should focus on key sources in areas where the assessment has indicated concerns. These relate to patrol yards, roadway application, snow disposal and ferrocyanides.

Patrol yards: Key concerns relate to the contamination of groundwater at patrol yards and the discharge to surface water. In addition, overland flow of salty snowmelt waters can result in direct impacts to surface water and near-field vegetation. Based on surveys and reviews, salt losses from patrol yards are associated with loss at storage piles (which include salt piles as well as piles of sand and gravel to which salts have been added), and during the handling of salts, relating to both storage and loading and unloading of trucks. The discharge of patrol yard washwater is also a potential source of release of salts. Measures and practices should therefore be considered to ensure storage of salts and abrasives to reduce losses through weathering, to reduce losses during transfers, and to minimize releases of stormwater and equipment washwater.

Roadway application: Key environmental concerns have been associated with areas of high salt use and high road density. Regions of southern Ontario and Quebec and the Atlantic provinces have the highest rate of salt use on an area basis and as such have the highest potential for contamination of soils, groundwater and surface water by road salts as a result of roadway applications. In addition, urban areas in other parts of the country where large amounts of salts are applied are of potential concern, especially for streams and aquifers that are wholly surrounded by urban areas. In rural areas, surface waters receiving drainage from roadways may also be susceptible to contamination. Areas where splash or spray from salted roads can be transported through air to sensitive vegetation are a potential concern. Wetlands that directly adjoin roadway ditches and that receive runoff in the form of salty snowmelt waters are also potential management concerns. Therefore, measures should be considered to reduce the overall use of chloride salts in such areas. The selection of alternative products or of appropriate practices or technology to reduce salt use should be considered while ensuring maintenance of roadway safety.

Snow disposal: Key environmental concerns relate to eventual loss of meltwater into surface water and into soil and groundwater at snow disposal sites. Measures to minimize percolation of salty snowmelt waters into soil and groundwater at snow disposal sites should be considered. Practices to direct the release of salty snowmelt waters into surface waters that have

minimal environmental sensitivity, or into storm sewers could be considered. Measures should also be considered to ensure sufficient dilution before release.

Ferrocyanides: This assessment indicates that there is a possible adverse exposure for the more sensitive aquatic vertebrates in areas of very high use of road salts. Risks could be reduced by reducing total salt use or reducing content of ferrocyanides in road salt formulations. To reduce the possibility of exposure, producers of road salts could consider reducing the addition rate of ferrocyanides to road salts. Any reduction in total salt use would be expected to result in an equivalent reduction in release of ferrocyanides.

The full Assessment Report may be obtained from the Priority Substances List Assessment Report Page (www.ec.gc.ca/cceb1/eng/final/index_e.html) or from the Inquiry Centre, Environment Canada, Hull, Quebec K1A 0H3 (1-800-668-6767).