

A close-up photograph of a blue snow blade clearing snow from a dark, textured surface. The blade is positioned diagonally, moving from the top right towards the bottom left. The snow is being pushed away, revealing the dark surface underneath. The background is a bright, snowy surface.

# **Snow Management/ Disposal Facilities**

*Lessons Learned from Inception to Operations*

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# Outline

1. Background on Snow Disposal and Designed Facilities
2. Site Selection
3. Design
4. Permitting
5. Construction
6. Post-Construction Monitoring and Maintenance

# A Growing Concern

## Environment Canada & Health Canada

- Road salts added to Priority Substance List under the Canadian EPA

## Environment Canada

- Developed “Code of Practice for the Environmental Management of Road Salts”
  - Requirements for SMPs

## Guidelines on Snow Disposal and De-icing Operations in Ontario

2001

2003

2004

2010

2011

## Transportation Association of Canada

- Published road salt and winter maintenance operations BMPs

## Environment Canada

- Reviewed Code of Practice
  - 96% of required municipal and provincial authorities comply
  - <30% of vulnerable areas have SMPs

# Common Pollutants Transported in Snow

- Salts
- Salt Additives (Sodium, Ferrocyanide and Chromates)
- Heavy Metals
- Petroleum Products
- Bacteria
- Soil Material
- Litter



# Sources of Pollutants in Removed Snow<sup>1</sup>

- Vehicular deposition
- De-icing agents
- Roadway deterioration
- Litter
- Airborne fallout



# Snow Storage Practice

- Snow removal is desired in urbanized area
- Removed snow dumped – none/minimal controls to strong level of control
- Practices:
  - Gravel/paved surfaces to surface water receptors
  - Gravel/paved surface to sanitary
  - Agreements with farmers
  - Works yards/informal dumps
  - Use of park spaces/parking lots
  - Designed pads with stormwater controls
- Informal survey of “Southern Ontario” – south of Orillia – mixed practices
- Several municipalities have minimal controls
- Some have good controls – Richmond Hill, Ottawa, Kitchener, Guelph



# Site Selection - Lessons Learned

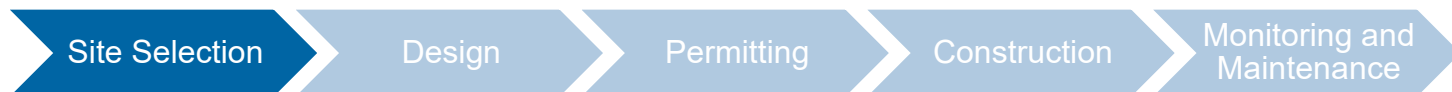
## Pre-Planning

- Needs (approximate size, location, travel distances)
- Search of owned properties
- Can consider purchase (longer time frame)
- Compile short list of properties that meet initial criteria



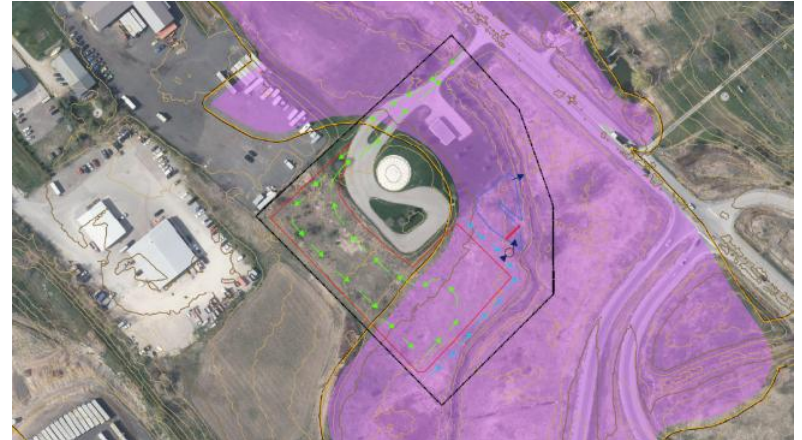
**Conduct Detailed Site Selection Evaluation** – multi-criteria evaluation matrix

**Environmental Impact** – sensitivity of surface water receptors, dilution potential, proximity to Natural Heritage Systems, proximity to potential identified species at risk habitat, options for sanitary discharge



# Site Selection

**Noise** – basic rule of thumb is to be at least 500 m from a residential area, consider future site use (zoning) of adjacent properties



**Source Water Protection** – vulnerability of site and surrounding area, permeability of surficial soils, proximity to wellhead protection areas

**Available Area** – for future expansions, proximity of site to future projects

**Accessibility** – traffic access, proximity to City Centre, access to necessary utilities

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# Site Selection

**Drainage Factors** – quantity of snow to be considered in relation to the downstream receivers discharge

**Cost** – capital to establish site, operational costs, hauling costs

**Ease of Permitting** – number and complexity of permits required, likelihood of agency acceptance

**Alternative Use of the Site** – potential for other uses such as equipment storage, vehicle parking, street sweepings, soil storage, recreational use

**Visual Considerations** – snow piles are usually unsightly and can last well into the summer



# Design – Lessons Learned

**Pre-Design Studies** – especially geotechnical

**Traffic Flow** – backup for tractor trailers, separate entry and exit of the pad if possible

**Surface Treatment** – pros and cons of potential surface treatment alternatives (i.e., asphalt, concrete, roller compacted concrete, gravel) – type of equipment used

**Sensitivity of Groundwater** – liners, sub-drains

**Site Security** – to prevent unwanted dumping



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# Design – Lessons Learned

**Lighting** – for safety purposes, majority of loading typically overnight, reduce scatter

**Location of infrastructure within the storage pad** – minimize potential for truck operators to hit/damage

**Slope of Storage Pad** – ideally between 1 to 2% maximize sediment retained on pad, minimize depressions

**Treatment train approach to stormwater design** – level spreaders, vegetated filter strips, vegetated swales, OGS & wet ponds, salt tolerant vegetation



Site Selection

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# Permitting – Lessons Learned

**Municipal Class EA** – Schedule A for most

**Environmental Compliance Approval (ECA) for sewage works** – early pre-consultation, objectives vs. limits, may require Waste ECA

**Conservation Authorities Act**

**Municipal Approvals** – site plan approvals, potential rezoning, noise studies

**Downstream receiver of stormwater** – may require approvals to discharge (i.e., to a sanitary sewer), agreement with WWTP



# Construction – Lessons Learned

**Pre-qualify Specialties** – GCL, block mats...

## Thorough site investigations

- Verify existing drawings with field investigations
- Underlying geotechnical conditions to undergo thorough investigation

**Detailed specifications** – either detailed or performance based, not both

**Payment Items** – clarity in measurements, what is included, units



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# Monitoring & Maintenance

**Background data (water quality and quantity)** - pre-construction data in the receiver becomes important when understanding impact of the snow disposal facility on downstream receivers (data collected during the winter months is critical)

## What could you be monitoring for?

- Groundwater and Surface Water
- Continuous and discrete measurements

## What water quality parameters may be of interest?

- Chloride
- Total Suspended Solids (TSS)
- pH
- Heavy Metals



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# Monitoring & Maintenance

## Multi-parameter Water Quality Sonde – Chloride, Conductivity, Temperature

- Continuous data set
- High frequency of calibrations required for accurate chloride data
- Data drift over time without high calibrations

## Non-vented Datalogger – Level, Temperature, Conductivity

- Continuous data set
- Low frequency of calibrations required



Cannot continuously measure Total Suspended Solids (TSS). Literature suggest a linear relationship exists between Conductivity and TSS. Recommended to collect data over multiple years if interested in developing a relationship.

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# References to Learn More

Ministry of the Environment, Conservation and Parks –  
Guideline on Snow Disposal and  
De-icing Operations in Ontario

<https://www.ontario.ca/page/guidelines-snow-disposal-and-de-icing-operations-ontario>

Transportation Association of Canada – Syntheses of Best  
Practices Road Salt Management – Section 8.0 Snow  
Storage and Disposal

<https://www.tac-atc.ca/sites/tac-atc.ca/files/site/doc/resources/roadsalt-8.pdf>

Assessment of Operation of the Town of Richmond Hill's  
Snow Storage Facility (RHSSF): Final Report

Guidelines on Snow Disposal and  
De-icing Operations in Ontario

Legislative Authority:  
Ontario Water Resources Act, RSO 1990, Section 30  
Environmental Protection Act, RSO 1990, Section 9  
Environmental Assessment Act, RSO 1990, Section 5  
February, 2011  
Last Revision Date:  
February, 2011  
PIB58271e

**Syntheses of Best Practices  
Road Salt Management**

**8.0 – SNOW STORAGE AND DISPOSAL**

This is one of a series of Syntheses of Best Practices related to the effective management of road salt by water management operators. The Synthesis is provided to assist in developing program Salt Management Plans. The Synthesis is not intended to be used prescriptively but is to be used in concert with the legislation, methods, devices and procedures of relevant jurisdictions and individual organizations. Syntheses of Best Practices have been produced on:

1. Salt Management Plans	8. Snow Storage and Disposal
2. Training	9. Winter Maintenance Equipment and Technologies
3. Road, Bridge and Facility Design	10. Salt Use on Private Roads, Parking Lots and Sideways
4. Storage	11. Successes in Road Salt Management: Case Studies
5. Pavements and Salt Management	
6. Operation Management	
7. Design and Operation of Maintenance Tanks	

For more detailed information, please refer to TAC's Salt Management Guide (2011).

**REPRODUCTION**

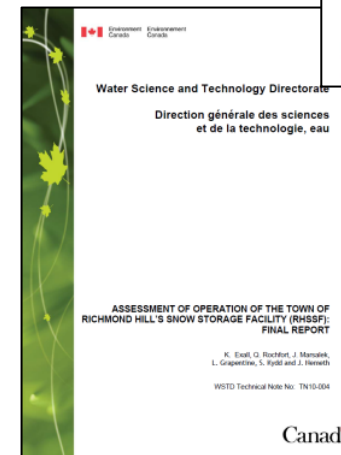
Over the course of winter and multiple plowing operations, snow can build up along roadways and in parking lots. Areas with limited space for stored snow may develop large snow banks that can:

- obscure the line of sight of drivers
- reduce vehicle visibility and available parking
- create a hazard to pedestrians
- form uneven coating drifts to harm snow plowers, and
- fill snow storage areas thus interfering with future plowing operations.

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[www.ghd.com](http://www.ghd.com)