



THE CITY OF
CALGARY
ROADS

TAC Environmental Achievement Awards Submission

Hold the Salt: Paving the way for better road salt storage

March 31, 2005

Summary

The City of Calgary is setting a new standard in its efforts to prevent the release of stored road salts to the environment. The City's state-of-the-art 194th Avenue Roads Maintenance Depot encompasses structures and practices that minimize the risk of wind erosion, run-off and leaching of road salt products. Traditionally, municipal road maintenance yards have provided uncovered storage of sanding chips (96% fine gravel and 4% salt), often on permeable surfaces. The gradual release of salt product from these stockpiles can have an adverse effect on wildlife, vegetation, soil, surface water and groundwater.

Measures implemented at the 194th Avenue Depot are proving successful in containing stored road salts, thereby protecting local watersheds and aquifers as well as the surrounding soil, flora and fauna from salt contamination. The site is helping re-define salt storage operations at all existing Calgary yards and will serve as a model for future road maintenance facilities. Construction of the depot began in 2000 and the site became operational in the winter of 2003/2004.

Project Description

During the last few years, The City of Calgary has been pleased to contribute to the development of TAC's *Syntheses of Best Practices* on winter maintenance and

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Environment Canada's *Code of Practice* for the environmental management of road salts. Even before these formal efforts to guide the use of road salt in Canada began, The City was exploring ways to implement new, more responsible salt management practices. Realizing that remediation of salt-contaminated soils, surface water and groundwater is difficult, labour-intensive and costly, the focus was on prevention.

In the late 1990s, the operational need for an additional road maintenance depot presented The City of Calgary with an opportunity to take a leadership role in setting the standard for more environmentally sound road salt storage facilities. After securing departmental funding of \$1-million a year over three years and finding an available location, designs were drawn up, approvals were obtained and construction on the 194th Avenue Depot proceeded in stages beginning in 2000.

The \$3.5-million depot includes two large tent structures, one for salt and one for sanding chips. The salt storage tent is 18 m by 48 m and is enclosed on three sides. The sanding chip tent is walled on all four sides and measures 28 m by 86 m. These tents prevent precipitation from reaching stockpiled product, thereby preventing salt run-off. They also inhibit wind erosion. The tents were built on a perimeter of interlocking concrete blocks, between which The City has placed a PVC liner to keep moisture from seeping in around the base of the structures.

The entire storage area, including the tents and a contained calcium chloride brine tank, is separated from the rest of the depot to enhance containment and is built on an impermeable surface consisting of compacted clay and asphalt, both of which prevent salt from seeping into the soil and groundwater beneath the depot.

A number of groundwater monitoring wells have been constructed on the site. These will be tested regularly to monitor the effectiveness of the control measures in protecting groundwater.

The City built a containment pond, also lined with compacted clay, adjacent to the storage area to contain any run-off from the road salt storage area. Within the clay liner is a one-inch layer of bentonite clay and sand to further prevent seepage of salt product. Any contaminants that reach the pond can be pumped out and properly disposed of. Sediments are likewise prevented from escaping the site as they run off and settle into the pond.

Wetlands are known for their ability to filter out storm water contaminants. In the spring of 2005, The City will further enhance the 194th Avenue site by constructing a lower “wetland” pond, also lined with compacted clay, to provide natural treatment of site run-off. The engineered wetland will also regulate the rate of discharge of run-off into a swirl chamber. The swirl chamber will be installed at the outfall to capture sediment and allow containment of hydrocarbons and other contaminants.

Some degree of salt release to the environment at road salt storage sites is inevitable. With all of the measures implemented at the 194th Avenue Depot, however, the chance of salt release at this site is dramatically diminished.

Tangible Environmental Benefits/Results

The adverse affect of road salts on plants and wildlife is well documented.

“Toxicity data indicate that about 10 percent of aquatic species will be adversely affected by prolonged exposure to chloride concentrations greater than 240 milligrams per litre (mg/L), with changes in populations or community structures occurring at even lower concentrations. Algae are particularly sensitive, with shifts in lake populations associated with concentrations as low as 12 mg/L.” (*Environment Canada, Science and Environment Bulletin: Environmental Impacts of Road Salts, Jan/Feb 2002*)

The 194th Avenue Depot’s proximity to a natural wetland proved an added challenge in developing the site. As an important habitat for a wide range of plants and animals, the adjacent wetland amplified the need for a comprehensive, meticulous approach to implementing salt release prevention measures. That approach is now paying off.

Since March 2004, The City has conducted monthly tests on the water in the containment pond. Results to date show a dramatic decrease in salt content in the run-off compared to run-off at traditional sites. Environment Canada indicates chloride concentrations as high as 82,000 milligrams per litre have been found in melt water from salt storage depots. The highest recorded chloride concentration in run-off from the 194th Avenue Depot measured 1,009 milligrams per litre. It should be noted that seasonal fluctuations occur, resulting in a wide range of values. Concentrations at the depot have registered as low as 80.4 milligrams per litre. As a testament to the water quality in the containment pond, The City of Calgary used water from the pond in the fall of 2004 to irrigate nearby newly planted seeds and vegetation. Monitoring results will be submitted as part of The City's annual report to Environment Canada under the *Code of Practice* reporting mechanism.

Water in the groundwater monitoring wells strategically placed around the site will be tested regularly for salt contamination. A baseline environmental assessment was conducted in 2004 to document the current conditions of the site. This benchmark data will be reviewed when The City vacates the site to determine how much contamination, if any, has occurred during the time the depot was in operation.

Good housekeeping best management practices were developed and are being rolled out. These measures minimize releases of salt to the environment by improving safe handling practices. They prescribe how:

- Salt is ordered and delivered;
- Sanders are loaded and unloaded;
- Sanding equipment is cleaned;
- Liquid calcium chloride is handled.

A recent minor spill at the 194th Avenue Depot helped confirm The City's ability to effectively manage the problem of potential salt releases at the salt storage facility. In

December 2004, The City suspected the containment pond had captured a calcium

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chloride brine release resulting from an equipment malfunction on the on-site brine tank. ROADS collected a sample from the containment pond for testing, and water from the pond was pumped out to provide additional storage in the event of precipitation or the proliferation of melt water. Test results after pumping indicated that a minimal amount of salt had entered the pond.

Intangible Environmental Benefits/Results

Efforts to protect the environment have a strong impact on the social fabric of our communities. Protecting our watersheds is an important strategy for sustaining citizens' enjoyment of our natural resources and protecting the quality of life of those who rely on groundwater for day-to-day subsistence. As such, all Calgarians benefit from The City's efforts to keep contaminants from the 194th Avenue Depot out of the Pine Creek Watershed and local aquifers. These efforts also help protect the water source of many rural residents south of the city.

Ensuring that the natural environment adjacent to the depot remains healthy and thriving will benefit future residents of the subdivision planned for the other side of the wetland. In addition, all residents of Calgary can take pride in this project as evidence that their city is implementing and continually improving its environmental performance.

The financial benefits of this project lie more in long-term cost prevention than in immediate savings. The measures in place at the 194th Avenue Depot prevent salt contamination of soil and groundwater, thereby precluding the need for a potentially costly salt clean-up at such time as The City moves off the site. And reducing the wind and water erosion of salt product from stockpiles helps conserve The City's road salt supplies.

Demonstration of Efforts and Commitment

Municipal staff was informed about this site in an article in the November 2004 issue of ROADS' internal newsletter, IN-ROADS. Information about the new depot has been

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issued to the media. The public was invited to comment on the project as part of Alberta Environment's approval process. Citizens can access the snow and ice control portion of the ROADS Web site to learn about The City of Calgary's use of road salts and new salt management practices, including the benefits of the new 194th Avenue Roads Maintenance Depot. ROADS plans to conduct a guided tour of the site for participants at the Transportation Association of Canada Annual Conference being held in Calgary in September 2005.

This project could not have been realized without the assistance of other partners and City of Calgary business units. The Municipal District of Foothills approved the development permit. Alberta Environment issued regulatory approval for the storm water pond and outfall structure. The City of Calgary, Parks reviewed an initial biophysical impact assessment for the site. The City of Calgary, Wastewater assisted in reviewing the design of the ponds and liaised with Alberta Environment for regulatory approvals for the pond and outfall structure. Since Wastewater also occupies a portion of the site, it will contribute funds and material to complete site enhancement this spring and will play a role in managing and maintaining the ponds. Parks' Integrated Pest Management department partnered with ROADS to beautify the site by planting trees, shrubs and special grasses.

Innovation: "Going the Extra Mile"

When the operational need arose for a new roads maintenance depot in Calgary, The City seized the opportunity to design, build and operate a leading-edge facility from a road salt management perspective in advance of any regulatory requirements. And while The City had brought in one or another salt management measure at its other yards to help prevent the release of salt to the environment (e.g. covered storage, impermeable surfaces, bermed or contained brine tanks), what makes the 194th Avenue Depot

innovative is the holistic approach of implementing all of these measures in one place, raising the bar on responsible salt storage to an unprecedented level.

Other Meritorious Considerations

The City of Calgary recognizes that it has a significant influence on the local and surrounding environment. The burgeoning municipality is committed to demonstrating leadership in complying with applicable legislation, conserving resources to prevent pollution and continually improving its environmental performance. The City's Environmental Policy states:

“The City of Calgary is committed to becoming an environmentally sustainable community by providing the leadership to conserve, protect and improve the environment for the benefit of Calgarians and the regional community. The City of Calgary will integrate sustainable social, economic and environmental objectives into a co-ordinated decision-making process to maintain high standards of living, social harmony and environmental quality.” *(Approved by City Council, December 2001)*

The 194th Avenue Depot exemplifies The City's leadership in environmental sustainability and long-term water quality, as environmental considerations were central to the implementation of this project. Not only is The City committed to ensuring that its operations comply with environmental legislation and regulations, the standards for salt storage at the 194th Avenue Depot were developed in anticipation of any regulatory requirements.

Environmental measures implemented at the new depot also reflect The City's efforts to avoid the impact of development on Calgary's wetlands, as stated in The City's wetland policy. On May 17, 2004, City Council approved the Wetlands Conservation Plan making Calgary one of the first municipalities in Canada to adopt a wetland protection policy. The policy defines priorities and best practices for wetland protection in order to maintain wetlands for the benefit, use and enjoyment of present and future Calgarians and visitors.

Based on sound salt storage practices at the 194th Avenue, The City is evaluating all of its road maintenance yards and implementing various upgrades to reduce the risk of salt release to the Bow River and Elbow River Watersheds from other locations.

Attachments:

1. Site map/Pictures
2. Article from November 2004 IN-ROADS Newsletter
3. Web site communication
4. Road Salt Management: Best Management Practices
5. The City of Calgary's Environmental Policy