

Background and Operational Summary of City of Edmonton's Snow Storage Sites

History

For at least the past 30 years, the City of Edmonton has used some type of designated site for stockpiling snow. Prior to the construction of modern engineered snow storage sites, such sites were constructed differently than they are today, based on the assumption that meltwater would be slowly generated from melting snow and flow rates would be low; this has since proven to be incorrect. Resulting improvements to snow storage site design and location selection are based on two key factors:

- a better understanding of the environmental impacts of snow removed from city streets and the development of increasing environmental and permitting regulations to mitigate environmental impacts of this snow;
- a better understanding of the physical properties of melting snow and meltwater, resulting in improvements to operational processes and site design requirements for improved site management and regulation.

Prior to the selection of the five present-day snow storage sites that are currently in use, Snow and Ice Control Operations previously used a series of smaller sites for storing snow. As new provincial and federal environmental regulations and regulatory agreements were introduced, use of older sites was discontinued. Based on current snow storage site standards, none of the former sites would be considered suitable for snow storage based on their sizes, locations and lack of necessary infrastructure, without required upgrades to meet regulatory requirements.

Snow Storage Site Operations

Storage sites are situated on large sections of land close to the edges of the city, away from residential areas to reduce the impacts of noise from hauling and dumping operations and to prevent the use of snow piles as recreational areas, as per Alberta Environment and Protected Areas' (AEPA) Snow Disposal Guidelines.

There are currently five storage sites owned and operated by the City of Edmonton, with a combined total storage capacity of 3.65 million cubic metres. Four of the five sites are currently active and available for public use. Storage sites are used for storing snow removed from city streets as part of operations. An estimated 80 to 90 per cent of snow dumped within these sites is from non-City vehicles and contracted services, such as local businesses and contractors and snow from other municipalities.

Attachment 1

The Kennedale site has been non-operational since 2020 as a result of environmental concerns. Site infrastructure upgrades would be required before Administration can resume usage. The combined total storage capacity of the remaining four operational sites is 3.35 million cubic metres. From 2010 to 2020, an average of 1.5 million cubic metres of snow were hauled to the five sites, ranging from 1.36 million to 3.4 million cubic metres per winter.

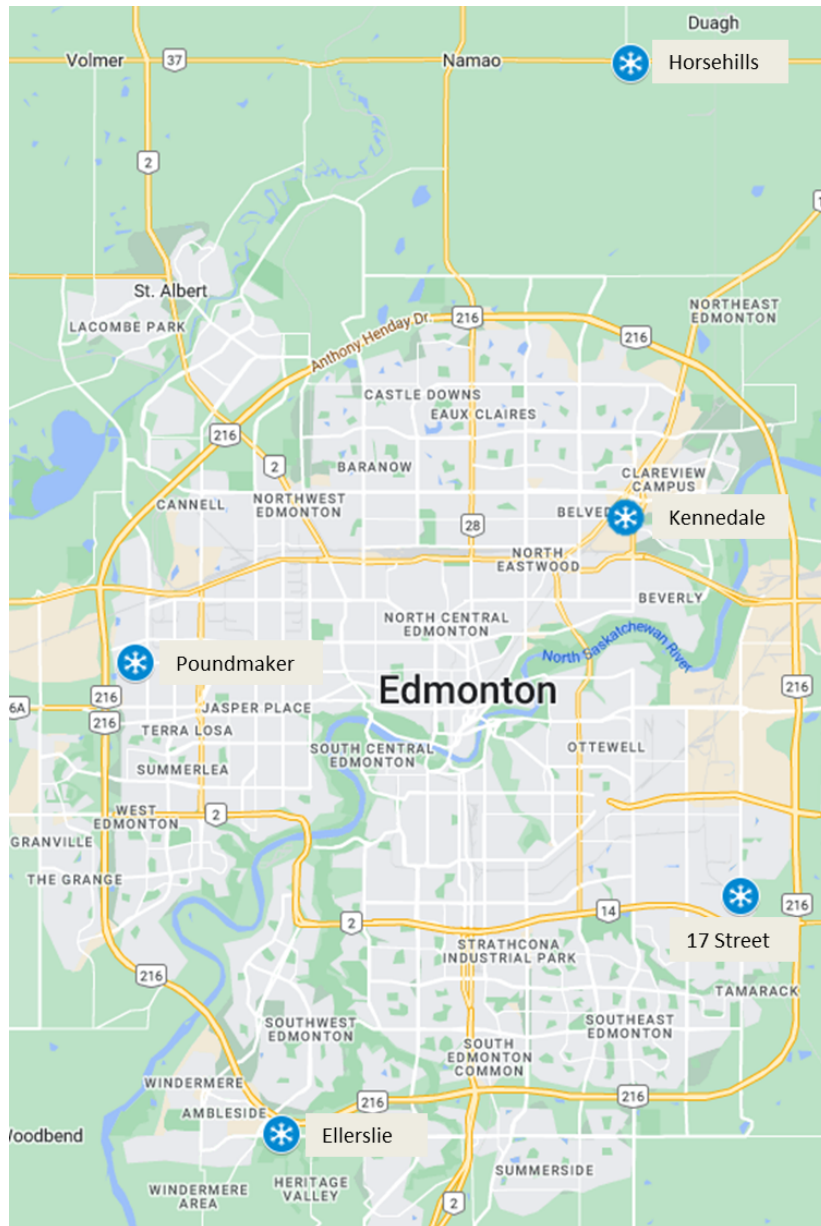


Figure 1. Locations of the five current snow storage sites. The Kennedale site is for City of Edmonton use only.

Table 1. Maximum capacity and peak volumes of all five snow storage sites over the past two seasons.

Maximum capacity and peak snow storage site volumes (m ³) based on bi-weekly aerial surveys			
Location	Maximum Capacity	2020-21 Season	2021-22 Season
Ellerslie	1,000,000	51,396	227,260
17 Street	1,250,000	188,037	781,318
Horsehills	500,000	31,051	362,725
Poundmaker	600,000	162,444	679,871*
Kennedale (City use only)	300,000	10,013	0 (closed)

*Volume greater than maximum capacity

The combined capacity of all five storage sites, when fully operational, should be sufficient to handle the current volumes of snow hauled to these sites. Some sites are used more frequently than others, resulting in site volumes that reach or exceed capacity over the course of a season (Table 1).

Snow hauled to the storage sites is a mix of snow, salt and road abrasives such as sand and gravel. Other contaminants such as metals, hydrocarbons and garbage may also be mixed in with snow removed from streets and parking lots. Snow storage and disposal sites are essential operational assets in cities where snow does not fully melt during the winter season. These are used for stockpiling snow until it melts. Meltwater travels through engineer designed settling ponds where sediments settle out, after which the water is ultimately discharged to water bodies from each site's respective outfall.

Operating costs associated with managing snow storage sites are approximately \$3.2 million per year as stated in the 2021 Snow and Ice Audit report OCA00338, presented at the February 11, 2021 Audit Committee meeting. Administration spends approximately \$180,000 annually monitoring soil, groundwater conditions and surface water quality discharge on all active sites and one former snow storage site.

Managing a snow storage site involves contractor costs for hired equipment as well as the costs associated with environmental testing, utilities, waste removal and site maintenance. The amount of sediment that accumulates in settling ponds at the storage sites requires costly annual maintenance. Sediments at snow storage sites are wet and laden with salt and hydrocarbons. This sediment must be regularly removed, dewatered and disposed of at an approved landfill.

Table 2. Operating costs for each snow storage site by calendar year. Values do not include monitoring costs. Cost tracking for these sites was not completed in 2017.

Location	2018	2019	2020	2021
Ellerslie	\$424,042	\$528,041	\$527,928	\$305,271
17th Street	\$956,672	\$863,720	\$867,465	\$474,600
Horsehills	\$200,305	\$386,555	\$632,487	\$360,066
Poundmaker	\$1,236,752	\$1,190,089	\$1,428,184	\$626,133
Kennedale	\$275,380	\$271,788	\$184,738	\$31,913
Total	\$3,093,151	\$3,240,193	\$3,640,802	\$1,797,983

Snow Storage Site Permits and Registration

All snow storage sites are registered as designated snow storage sites under the provincial *Environmental Protection and Enhancement Act*. Each site has a risk management plan to mitigate environmental impacts to soil and groundwater.

Snow Storage Site Regulatory Monitoring and Reporting Activities

An integral part of managing snow storage sites consists of environmental monitoring and reporting. Administration monitors salt impacts to groundwater and surface water at snow disposal sites and ensures the following activities are completed:

- meltwater quality monitoring
- groundwater and soil monitoring
- monitoring for regulatory compliance and exceedance reporting

Table 3. Administration manages its snow storage sites and conducts environmental compliance testing and reporting in accordance with these regulations and guidelines.

Jurisdiction	Regulation	Guideline/Code of Practice
Municipal	EPCOR	Drainage Services and Wastewater Treatment Bylaw 19627
Provincial Environmental Protection and Enhancement Act (EPEA)	Activities Designation Regulation Approvals and Registrations Procedures Regulation	Snow Storage Site Registration 413901-00-00 Snow Disposal Guidelines for the Province of Alberta
	Remediation Regulation and Release Reporting Regulation	• Alberta Tier 1 and Tier 2 Soil and Groundwater Remediation Guidelines • Environmental Quality Guidelines for Alberta Surface Waters • Contaminated Sites Policy Framework
Federal	Canadian Environmental Protection Act (CEPA)/ Fisheries Act	• Code of Practice for the Environmental Management of Road Salts • Transportation Association of Canada (TAC) Syntheses of Best Practices for Road Salt Management • Canadian Environmental Quality Guidelines (various)

Additionally, the City of Edmonton maintains:

- A Salt Management Plan, reviewed and updated annually
- Risk Management Plans for each snow storage site
- A Snow Storage Site Operating Manual with a schedule of maintenance activities, groundwater and surface water monitoring programs for each site
- Snow Storage Registration
- An ENVISO procedure for Snowmelt Water Monitoring and TSS Management

The City provides the following reporting:

- Exceedances to bylaw, or provincial or federal water quality guidelines to the affected regulating bodies, EPCOR, AEPA and Environment Canada, through the ENVISO Spill hotline.
- Annual report to the Government of Canada on salt use and management practices
- Regular reports to both EPCOR and the Alberta Government regarding the monitoring program at the snow storage facilities.

Importance of Dedicated Snow Storage Sites

Given the number of contaminants, such as salt and traction materials in snow cleared from roadways, designated sites are used as a way to contain and mitigate the environmental impacts associated with snowmelt, and to prevent the potential impacts of these materials on parks, school yards and other spaces purpose-built for recreation.

Key structural and location features of snow storage sites that enable the source control and prevention of impacts, and monitoring of impacts that remain after mitigation include:

- hard paved surfaces to minimize movement of contaminants into soil and groundwater and to reduce surface erosion that can occur with non-paved surfaces;
- sufficient space and sun exposure to spread out and move snow piles around, allowing the snow to completely melt between snow seasons and the site to fully dry out;
- sufficient drainage infrastructure to control and regulate the flow of meltwater to an approved drainage system or outflow to ensure proper disposal and avoid flooding;
- constructed settling ponds that reduce the amount of suspended sediment in meltwater. To be effective, ponds must be large enough for the amount of anticipated meltwater based on storage site capacity.

It is recommended that storage sites be located at least 200 metres away from any water body, at least 350 metres away from existing or planned residential housing due to noise generation, and not be located in or near recreational areas due to public health and water quality concerns.

Current Site Challenges

There are a number of capacity and structural challenges presented by the five snow storage sites, as a result of older design standards:

- Erosion of compacted clay surfaces, resulting in sediment that accumulates in settling ponds and high levels of suspended solids in discharge water.
- Settling ponds that require annual inspection and maintenance, including removal and landfill disposal of accumulated sediment.
- Settling ponds that require infrastructure upgrades, such as the addition of heavy-duty pond liners and inlet/outlet discharge modifications.
- Lack of site access control and monitoring to reduce illegal dumping and the amount of site contaminants that require management and disposal.

Planned Upgrades and Cost Recovery Opportunities

The challenges in the above section highlight the critical importance and need for a series of high-priority site upgrades to ensure long-term environmental and regulatory compliance, improved safety and reduced operating costs.

To ensure long-term environmental sustainability and regulatory compliance at all snow storage sites, Administration has identified the need for a series of critical infrastructure upgrades. Installation of hard paved surfaces as well as underground drainage improvements and upgrades to settling ponds are required to address some of the current site impacts to the ground and surface water. Design work is already underway, but future capital funding will be needed to complete the construction and purchasing phase of this project.

These upgrades will include much-needed hard surfacing, improvements to drainage control and upgrades to settling ponds, all of which would reduce the amount of sediments and contaminants being discharged from the sites. This work will also include establishing appropriate telecommunications technology for improved site access control and monitoring to allow for tracking of City and contractor use and materials that are brought on-site. One of the recommendations in the 2021 Snow and Ice Control Audit Report was to explore revenue generation opportunities, such as implementing snow site user tipping fees for non-City users. These users include snow removal contractors, private businesses, landscape management businesses, neighbouring municipalities and the general public. Implementing these technologies would enable the City to support:

- Reduced future operating and monitoring costs through infrastructure efficiencies.
- Better site monitoring and access control processes.
- Implementation of future user fees that would cover some of the operational and environmental monitoring and liability costs associated with snow storage and disposal.
- Offset operational and environmental management costs through charging tipping fees for non-City vehicles.

Benefits to redesigning the sites, such as proper paving and drainage, include operational and cost efficiencies and an improvement in the quality of the water released into the stormwater system. Currently, the annual cost to remove and dispose of accumulated sediment in settling ponds and to re-grade the remaining clay surfaces of the snow storage pads for the four sites exceeds \$2 million.

Attachment 1

Improved site design and function would bring the City into better alignment with environmental regulations, as well as the Greener As we Grow commitment to use growth as a catalyst for good design and conscientious decisions. Benefits will include reduced operating and monitoring costs through reduced soil, groundwater and surface water impacts, and reduced potential environmental liabilities, including the protection of natural areas and reducing waste.