4.4.
SNOW MANAGEMENT

March 15, 2018

SUMMARY OF THE AUDIT

OBJECTIVE

Ensure that the city of Montréal (the city) disposes of cleared snow in an efficient and safe manner, in compliance with current laws and regulations.

RESULTS

In addition to these results, we have formulated various recommendations for the business units.

The details of these recommendations and our conclusion are outlined in our audit report, presented in the following pages.

Note that the business units have had the opportunity to formulate their comments, which appear after the audit report recommendations.

The city removes over 13,000,000 m^3 of snow from roads and sidewalks each winter. It has 28 snow disposal dumps to manage this snow, comprising 12 surface sites (including the former Carrière Saint-Michel in Villeray–Saint-Michel–Parc-Extension borough), 8 of which can accommodate snow cleared from private property, and 16 sewer chutes. In accordance with the *Regulation respecting snow elimination sites*, the city was obliged to obtain a certificate of authorization from the Government of Québec to operate these sites and undertook not to exceed certain maximum amounts for snow accumulated at the surface dump sites, also to conduct environmental monitoring of groundwater and meltwater, and to carry out annual maintenance work on these disposal sites.

Although the city is formulating a plan for the use of snow disposal sites, and environmental monitoring is to be the carried out while the boroughs are to maintain the surface sites, this is not being done in accordance with regulatory requirements but based on actions taken in previous years. In order to optimize the use of snow disposal sites and regulatory compliance, we believe that the city should make improvements in the following main areas:

- The snow disposal strategy is quite similar from year to year without any attempt being made to optimize total snow disposal costs, even though the management of snow disposal sites has been the responsibility of the city and not the boroughs for the past two years.
- While the maximum amount of snow that can be accumulated at a site is set out by the certificate of authorization, the city's strategy anticipates, even before the start of each winter season, that some sites will exceed their capacity, which is not in compliance with the certificate of authorization.
- The city cannot claim that the snow disposal is meeting environmental requirements since it is only aware of environmental monitoring commitments related to the certificates of authorization for half of the surface sites.
- For almost three-quarters of surface sites and all sewer chutes, maintenance requirements as set out in the certificates of authorization are unknown. In fact, the maintenance of surface sites by the boroughs is not documented and is done based on the experience of the teams in place.

TABLE OF CONTENTS

LIST OF ACRONYMS

ACS
Agent de communications sociales

BAM
Bureau Accès Montréal

CMM
Communauté métropolitaine de Montréal

SCA
Service de la concertation des arrondissements

SDS
Snow Disposal Site

SIT-Neige
Système intelligent pour le transport de la neige

SIVT
Service des infrastructures, de la voirie et des transports

1. BACKGROUND

Montréal is a northern city that must deal annually with about 200 cm of snowfall between mid-November and the end of March[1]. When there is snow precipitation, the city of Montréal (the city) applies flux (commonly called salt) and/or abrasive (crushed stone) to streets and sidewalks. The city also clears streets and sidewalks in accordance with its snow removal policy. Then the snow removal work begins.

However, due to spreading, road traffic and the everyday activities of citizens, all this snow that has to be cleared is laden with debris (abrasives, garbage, paper, plastic, soil), as well as with oils and mineral fats from vehicles, with ions (chloride, sodium, calcium) from the fluxes used, as well as metals such as lead, manganese, iron and chromium from vehicle corrosion and vehicle exhaust gases[2]. In 1997, the Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs, now the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (Ministère du Développement durable)[3], imposed through the *Regulation respecting snow elimination sites*[4] the following:

> *"Snow that is removed and transported for elimination purposes may be placed for final deposit only at an elimination site authorized by the Minister under section 22 of the Environment Quality Act."*[5]

This regulation applies to surface sites, sewer chutes[6] and snowmelters[7] since in all cases the snow is preloaded and transported by truck.

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1 According to the winter 2015-2016 report of the Service de la concertation des arrondissements, 197.2 cm of snow fell in Montréal that winter. The following year, according to the 2016-2017 winter report of the same Service de la concertation des arrondissements, 226.6 cm of snow fell. These data are for the period from November 15 to March 31 of each winter season. For the 2016-2017 winter season, the city picked up 13,572,627 m^3 of snow, representing 341,793 truck trips across the city.

2 Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques. *Guide d'aménagement des lieux d'élimination de neige* et mise en œuvre du *Règlement sur les lieux d'élimination de neige*.

3 The name of this ministry has changed several times. For the sake of consistency in the text, only the simplified name "Ministère du Développement durable" is used regardless of the ministry's name at the time.

4 CQLR, chapter Q-2, r. 31.

5 Section 22 of the *Environment Quality Act* (CQLR, chapter Q-2) states that no one may erect or alter a structure, undertake to operate an industry, carry on an activity or use an industrial process or increase the production of any goods or services if it seems likely that this will result in an emission, deposit, issuance or discharge of contaminants into the environment or a change in the quality of the environment, unless he first obtains from the Minister a certificate of authorization.

6 A sewer chute is an opening in the ground, covered by a grid, which allows snow to be dumped directly into the sewer collector or on an interceptor in order to send the snow to a wastewater treatment plant. Some sewer chutes can be mechanized with feeding augers that grind up the snow at the chute opening.

7 A snowmelter is a hot water tank into which snow is dumped. Upon contact with the hot water, the snow melts and is then dumped into the sewer. This equipment requires an expenditure of energy to keep the water in the tank at a high enough temperature to melt the snow.

In parallel with the adoption of this regulation, in 1997 the Government of Québec published the *Guide d'aménagement des lieux d'élimination de neige* et mise en œuvre du *Règlement sur les lieux d'élimination de neige* (hereinafter the *Guide d'aménagement des lieux d'élimination de neige*). This document establishes environmental guidelines for discharging wastewater into the environment (e.g., ditch or river), as well as alert thresholds for contamination of groundwater. In the event these are exceeded, the guide states that immediate intervention is required[8]. It also specifies which documents must be presented to the Ministre du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (the Ministre du Développement durable) when applying for authorization to operate a Snow Disposal Site (SDS)[9]. In the specific case of a surface site, the applicant must provide:

- a full description of the monitoring program for surface water (melt) and groundwater, including sampling parameters, periods and frequency, for the entire duration of the program;
- specifications for site operations, including spring cleaning measures and identification of the residue disposal site.

For sewer chutes, applicants do not need to provide an environmental monitoring program. Operational and maintenance specifications are nonetheless required.

Any snow picked up and transported during a snow removal operation in Montréal must be disposed of at a site duly approved by the Ministère du Développement durable, and operated and maintained in compliance with the city agreements mentioned in the application for a certificate of authorization.

The *Regulation respecting snow elimination sites* has no requirements to be followed regarding the quality of snowmelt and groundwater discharged into the environment. However, the *Guide d'aménagement des lieux d'élimination de neige*, as mentioned above, does offer some guidelines for establishing the environmental criteria[10] to be met. These guidelines must be taken into consideration when developing an environmental monitoring program, which must be submitted to the Minister with the application for a certificate of authorization, under section 22 of the *Environment Quality Act*. According to the analysis conducted by the sponsor (the city, in this case) and validated by the ministry, based upon the site location, the sensitivity of the receiving environment, the likelihood of migration of contaminants into the soil and groundwater, the Minister may authorize the operation of the SDS, on condition that it complies with quite stringent environmental criteria, which are different from the guidelines in the *Guide d'aménagement des lieux d'élimination de neige*.

8 This may involve, for example, waterproofing the site by applying a bituminous surface coating or placing a waterproof membrane below the run-off.

9 The term "snow disposal site" here can mean a surface site, a sewer chute or a snowmelter.

10 For example, the guide states that the alert threshold for chlorides in groundwater is 430 mg/L (milligrams per litre) and that snowmelt quality must comply with maximum concentrations of 5 mg/L for mineral oil and grease and 30 mg/L for suspended solids.

Within the territory of the city, all sewer discharges are governed by the *Règlement 2008-47 sur l'assainissement des eaux usées de la Communauté métropolitaine de Montréal (CMM).* However, meltwater from a SDS is excluded from this by-law under section 12.b, which refers to the *Regulation respecting snow elimination sites*. It should be remembered, however, that this provincial regulation does not contain any environmental standards or criteria for the discharge of meltwater or contamination of groundwater, but does require a certificate of authorization to operate the site. Thus, it is the commitments made by a municipality at the time of its application for authorization and accepted by the Minister that have the force of law and dictate the environmental criteria to be met.

Regarding the sharing of snow management responsibilities, it is important to note that:

- Under the *Règlement du conseil de la Ville sur la délégation de certains pouvoirs relatifs au réseau de voirie artérielle aux conseils d'arrondissement*[11], city council delegates the following activities to each borough council:
  - Supervision and monitoring of operational activities on disposal sites, supplying human and equipment resources directly related to site operations, as well as the compilation and administrative management of activities;
  - Preparatory work on Snow Disposal Sites before winter or between snow loads;
  - Cleaning of Snow Disposal Sites;
  - Surveillance of Snow Disposal Sites;
  - Applying usage fees for Snow Disposal Sites.

- The Service de la concertation des arrondissements (SCA) is responsible for planning snow removal operations and the use of SDSs. It is responsible for environmental monitoring and for awarding the contract for this monitoring[12];
- The Division de l'expertise et du soutien technique of the Service des infrastructures, de la voirie et des transports (SIVT) performs environmental monitoring of four surface sites[13] and oversees the monitoring of other sites done externally;
- As operator of the city's wastewater treatment plant, the Service de l'eau, and more specifically the Direction de l'épuration des eaux usées may intervene during a snow clearance phase if operating conditions at both North and South interceptors have

11 *By-law 08-055.*

12 The contract for environmental monitoring of the two surface sites in Saint-Laurent borough was still the borough's responsibility in 2016-2017 as the contract had not yet expired. For 2017-2018, a new contract for environmental monitoring of the two surface sites was awarded by the SCA.

13 46th Avenue (Lachine borough), Angrignon (LaSalle borough), Newman (Saint-Laurent borough) and the Carrière Saint-Michel (Villeray–Saint-Michel–Parc-Extension borough).

been affected by adding snow via the sewer chutes[14]. This department is also responsible for the maintenance and operation of a pumping station located at the bottom of the Carrière Saint-Michel (Villeray–Saint-Michel–Parc-Extension borough) where the city stockpiles some of the cleared snow. This pumping station is necessary since the bottom of the pit is at a lower elevation than the network of collectors bringing wastewater to the North interceptor.

At the time of this audit, the city is using a total of 28 snow SDSs. More specifically, this comprises 12 surface sites (including the Carrière Saint-Michel) of which only one does not belong to the city (the Lafarge site in Montréal-Est), and 16 sewer chutes in the north and south of the Island of Montréal along the entire length of the two interceptors. Tables 5.2 and 5.3 in the appendix show the characteristics and disposal capacities of these 28 sites. Figure 5.4 in the appendix shows their approximate location.

To cover spreading, clearing, loading and removing all of the snow received during a winter season on the city's 10,650 km of roads and sidewalks, the initial budget is over $150M[15], of which $8.8M is dedicated to the maintenance and operation of SDSs.

The city also allows contractors who clear snow from private property (e.g., shopping centres, STM and AMT parking lots, MTQ service routes, as well as the grounds of large private companies) to dispose of their snow at certain designated snow disposal sites. The city provides them with eight surface sites for this purpose[16]. The use of these sites is subject to fees that vary according to the type of trucks used by the contractor (6, 10 and 12 wheel, semi-trailer and trailer). Contractors must obtain snow deposit coupons appropriate to each type of truck from one of the seven boroughs[17] authorized to sell them. These coupons can be used at any of the designated sites. For the 2016-2017 winter season, a total of 677,790 m^3 of snow was dumped at the designated sites.

14 Adding a volume of snow to an interceptor may lower the temperature of the wastewater arriving at the plant and therefore affect treatment efficiency. The presence of this snow in the interceptor at the foot of a sewer chute can also significantly limit the flow of wastewater to the plant.

15 Based on the SCA's 2016-2017 winter report, the city had a provisional budget of $157.5M for the 2016-2017 season. However, because of the large amount of snow precipitation, the cost of all the operations was $171M.

16 See table in Appendix 5.2., which presents the characteristics and disposal capacities of all surface sites, and identifies those accessible to private contractors.

17 These include the boroughs of Anjou, Lachine, LaSalle, Pierrefonds-Roxboro, Rivière-des-Prairies–Pointe-aux-Trembles, Saint-Laurent and Villeray–Saint-Michel–Parc-Extension.

2. PURPOSE AND SCOPE OF THE AUDIT

In accordance with the *Cities and Towns Act*, we conducted a performance audit on snow disposal management in compliance with the Canadian Standards on Audit and Assurance Engagement (CSAE) 3001 in the CPA Canada Handbook – Assurance.

The objective of this audit was to ensure that the city disposes of cleared snow efficiently, safely and in compliance with applicable laws and regulations.

The role of the Auditor General of Ville de Montréal is to provide a conclusion regarding the purpose of the audit. To do so, we have collected a sufficient amount of relevant evidence on which to base our conclusion and to obtain a reasonable level of assurance. Our evaluation is based on criteria we have deemed valid for the purpose of this audit. They are presented in Appendix 5.1.

The Auditor General of the city of Montréal applies the *Canadian Standard on Quality Control* (CSQC 1) of the CPA Canada Handbook – Assurance. Consequently, the Auditor General maintains a comprehensive quality control system that includes documented policies and procedures on compliance with applicable ethical, professional standards and legal and regulatory requirements. She also complies with the rules of independence and the other ethical rules of the Code of Ethics of Chartered Professional Accountants, which are based on the fundamental principles of integrity, professional competency and diligence, confidentiality and professional conduct.

Our audit covered compliance with laws and regulations governing the use of SDSs and sewer chutes, and the operation of these sites from January 2015 to December 2017. Our audit did not deal with spreading, clearing and loading activities, but only the disposal of snow, which nevertheless includes the planning of SDSs, the preparation and maintenance of these disposal sites and the environmental monitoring required according to the certificates of authorization obtained from the Ministère du Développement durable. For some aspects, data prior to these years were also considered. Our audit was primarily carried out from June to December 2017, but we also took into account data that we received up to January 2018.

This work was performed primarily with the following business units:

- Service de la concertation des arrondissements;
- Service de l'eau;
- Service des infrastructures, de la voirie et des transports;
- Saint-Laurent borough;
- Le Sud-Ouest borough;
- Villeray–Saint-Michel–Parc-Extension borough.

When our work was completed, a draft report was presented for discussion purposes to the managers in question in each of the audited business units. The final report was then forwarded to the Direction générale and to each of the business units involved in the audit in order to obtain action plans and timetables for their implementation. A copy of the final report was also submitted for information purposes to the directors of the boroughs not directly targeted by our audit, so they could implement the recommendations if appropriate, as well as to the Service des finances.

3. AUDIT RESULTS

There were two aspects to our audit. The first concerned the snow management strategy currently being used in Montréal. The second was a determination of whether the snow disposal activities were in compliance with the requirements that the city must follow.

3.1. SNOW MANAGEMENT STRATEGY OF THE CITY OF MONTRÉAL

We looked at the city's current and future capacity to properly dispose of snow during a winter season. We were also interested in the impact that this snow disposal strategy could have on the operation of the wastewater treatment plant. Since, at some disposal sites, the city accepts snow that is not coming from roads and sidewalks (i.e., snow originating from private property), we sought to determine whether the city was properly controlling the origin of this snow and was billing private users appropriately. Lastly, we sought to determine, given that disposal was the last of the four steps (after spreading, clearing and loading) and that it enabled citizens and drivers to move about safely in the winter in Montréal, whether there was sufficient accountability to various administration officials to ensure they were aware of the city's ability to manage all this snow.

3.1.1. INFRASTRUCTURE CURRENTLY USED

As part of our audit, we wanted to ensure that the city had sufficient infrastructure to dispose of snow in compliance with the authorizations it obtained from the Ministère du Développement durable. We also tried to determine how a SDS is connected to a given snow removal sector.

3.1.1.1. CAPACITY OF THE INFRASTRUCTURE TO DISPOSE OF SNOW

3.1.1.1.A. BACKGROUND AND FINDINGS

According to a summary of the use of various SDSs provided to us by the SCA, during the last full winter season to elapse while we were producing this report (2016-2017), most of the snow was disposed of at surface sites (77.7% of the volume), and one quarter of all the snow (24.9%) at the Carrière Saint-Michel (Villeray–Saint-Michel–Parc-Extension

borough). The maximum amount of snow that the city can accumulate at each of these 12 sites is recorded in the certificate of authorization that the Ministère du Développement durable issued to the city. We obtained copies from the city of the 12 letters from the Ministère du Développement durable approving the operation of these surface sites. Each one specifies the geographic location of the site. They list the documents submitted by the city at the time of each application for a certificate of authorization (documents that were an integral part of the certificate of authorization as mentioned in the letters) and finally they specify the maximum amount of snow that the city can accumulate there. Table 1 shows the total amount of snow dumped at each surface site for the 2015-2016 and 2016-2017 seasons, compared to the maximum capacity noted in the certificate of authorization. It should be noted that the total amount of precipitation between November 15, 2015, and March 31, 2016 (2015-2016 season) was lower at 197.2 cm than the average of 214.7 cm[18], whereas 2016-2017 was higher than average at 226.6 cm. Overall, for both the 2015-2016 and 2016-2017 seasons, the city dumped less snow at the surface sites than what was approved by the Ministère du Développement durable. However, since authorizations apply to a particular SDS, we must conclude that in 2016-2017 the city exceeded the approved capacities at 4 of the 12 surface sites. Although the excess is not very large for the 46th Avenue site (Lachine borough), it is more significant for the sites at Angrignon (LaSalle borough), Thimens (Saint-Laurent borough) and Langelier (Saint-Léonard borough). However, as we will see in the section on accountability, since the city does not communicate to the Ministère du Développement durable the volumes collected annually for each site, this Ministère is not informed about such non-compliances. However, it should be noted that the Ministère du Développement durable can request this information from the city at any time.

18 The 2015-2016 report produced by the SCA gives an average of 214.7 cm of snow without, however, specifying the period over which this average was established. The 2016-2017 report refers to an average of 190 cm over the last 40 years. Given that the city takes into consideration an increase of about 1.5 cm of precipitation per year, the average presented in the 2015-2016 report should be for a shorter and more recent period than the last 40 years. Nevertheless, in both cases, the precipitation for 2016-2017 was greater than these averages, while the total for the 2015-2016 season was either higher or lower than average, depending on which value is used.

TABLE 1 – VOLUME OF SNOW ACCUMULATED AT SURFACE SITES

NAME	BOROUGH	MAXIMUM CAPACITY ALLOWED IN THE CERTIFICATE OF AUTHORIZATION (m^3)	2015-2016 SEASON (m^3)	2016-2017 SEASON (m^3)	EXCEEDED MAXIMUM ALLOWABLE
Ray-Lawson	Anjou	2,450,000	885,155	1,461,997	No
46th Avenue	Lachine	250,000	144,104	254,270	Yes, in 2016-2017 (+ 1.7%)
Angrignon	LaSalle	1,500,000	974,424	1,599,106	Yes, in 2016-2017 (+ 6.6%)
Lafarge	Montréal-Est (related municipality)	1,500,000	591,035	895,698	No
Highway 13	Pierrefonds-Roxboro	53,550	13,404	34,426	No
Château-Pierrefonds	Pierrefonds-Roxboro	200,000	111,701	195,644	No
Armand-Chaput	Rivière-des-Prairies–Pointe-aux-Trembles	1,400,000	617,724	1,060,876	No
Sartelon	Saint-Laurent	345,000	129,400	192,748	No
Thimens	Saint-Laurent	478,210	419,806	624,353	Yes, in 2016-2017 (+ 30.6%)
Langelier	Saint-Léonard	700,000	620,029	1,012,110	Yes, in 2016-2017 (+ 44.6%)
Newman	Sud-Ouest	375,000	277,977	315,825	No
Carrière Saint-Michel	Villeray–Saint-Michel–Parc-Extension	5,040,000	2,313,186	3,605,174	No
TOTAL		**14,291,760**	**7,097,945**	**11,252,227**	**NO**

Source: Letters authorizing the operation of SDSs and synthesis of volumes compiled by the SCA for two full seasons.

Snow precipitation in Montréal tends to increase by an average of 1.5 cm per year. This could put pressure on the capacity of the city to manage cleared snow: not on the total capacity, but locally by individual sites. An increase in precipitation could result in some sites reaching their capacity more often, or exceeding it.

Based on data of snow precipitation in Montréal between November 15 and March 31 every year from 1978 to 2017[19] (40 years), the amount of snow that fell in 2016-2017 ranks

19 The overall data for this period is compiled from data provided in the city's annual snow clearing reports for the 2013-2014, 2015-2016 and 2016-2017 seasons. The 2014-2015 season is not included in this ranking because the reports obtained from the SCA do not show the precipitation for that season.

13th among the winters with the highest amounts of snowfall. Over the last ten years, five winters[20] have had precipitation greater than the winter of 2016-2017, in which four surface sites exceeded their allowable snow dumping capacity. The situation of exceeding capacity in the 2016-2017 season is therefore not exceptional, and it is very likely that the city will be regularly subjected to situations in which certain surface sites exceed the amounts allowed in their certificate of authorization.[21] [22]

In 2013-2014, since the city had received a total of 248.1 cm of snow from November 15 to March 31, it had to open temporary sites to dump snow from the Verdun and Ville-Marie boroughs, without however obtaining authorization from the Ministère du Développement durable[23]. After the city notified the ministry in January 2014, the latter requested that the snow be removed from these temporary sites and that the boroughs' sewer chutes be used instead.

During our audit work, due to the heavy snow accumulations at the start of the 2017-2018 season, the city was obliged to ask the Ministère du Développement durable, on February 1, 2018, for its authorization to stockpile snow at the Hippodrome site and the Solution site (LaSalle borough) for capacities of 2,000,000 m^3 and 600,000 m^3, respectively. On February 8, 2018, the Ministère du Développement durable granted the city a temporary exception (until April 30, 2018) to use these sites, stating that *[TRANSLATION] "snow chutes and snow disposal sites (SDSs) should take precedence."*

20 2007-2008 season (ranked #1), 2012-2013 season (#5), 2010-2011 season (#6), 2013-2014 season (#9) and 2008-2009 season (#12).

21 As of January 31, 2018, during our audit work, the city had already received 142.8 cm of snow for the 2017-2018 winter season, while the average by January 31 over 40 years was 115.8 cm.

22 According to the data published by the city on February 5, 2018, five surface sites had already exceeded their capacity even though the 2017-2018 winter season had not yet ended. This includes the surface sites at Angrignon (LaSalle borough) (109.0 %), 46th Avenue (Lachine borough) (111.7 %), Langelier (Saint-Léonard borough) (115.5 %), Thimens (Saint-Laurent borough) (121.8 %), Newman (Le Sud-Ouest borough) (128.2 %).

23 The SCA stated in its 2013-2014 report that, after a very large snow removal operation (56 cm of snow) that occurred in late December 2013, the sewer chutes were not able to dispose of the snow fast enough (the trucks were arriving too quickly for the capacity of the chutes). The city had to open temporary surface sites.

RECOMMENDATION

3.1.1.1.B. **We recommend that the Service de la concertation des arrondissements take steps to obtain environmental authorizations from the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques to use temporary Snow Disposal Sites in cases where certain regular sites have reached their capacity.**

BUSINESS UNIT'S RESPONSE

3.1.1.1.B. ***Service de la concertation des arrondissements***

[TRANSLATION] Establish a snow removal blueprint to assess needs and propose strategies to implement for average and ten-year winters. ***(Planned completion: Early 2019)***

3.1.1.2. METHOD OF LINKING A SNOW CLEARING SECTOR AND A SNOW DISPOSAL SITE

3.1.1.2.A. BACKGROUND AND FINDINGS

The fact that the city has had seasons in which the capacities of certain surface sites have been exceeded while other sites have not yet reached their capacity leads us to question the method being used to link the SDSs to snow clearing sectors in the 19 boroughs.

The snow disposal strategy set out by the SCA is divided into two periods, including a development period before the winter season and an adjustment period during snow removal operations. The city's 19 boroughs are divided into numerous snow clearing sectors.

BEFORE A SNOW CLEARING SEASON

Based on the maximum capacities stated in the certificates of authorization, and on the history of sewer chute use, the SCA plans the volumes of cleared snow that each SDS should theoretically receive during a given winter. According to the SCA, planning is essentially the same from year to year. Some adjustments may be required to take into consideration a chute that may not be available that year.

We have obtained the snow disposal strategy for the winter of 2016-2017 (November 23, 2016 version, i.e., before the start of the 2016-2017 snowfall season). For every sector of each borough, and based on previous years, the SCA estimates the snow volume that will need to be managed. Each sector is then associated with a SDS (surface site or sewer chute). We note, however, that although some surface sites are theoretically not used to

their full capacity (a safe planning approach), leaving a certain latitude in case of heavy precipitation, the strategy set out for the Château Pierrefonds (Pierrefonds-Roxboro borough) and Langelier (Saint-Léonard borough) surface sites in fact anticipated that their maximums would be exceeded (103% and 116%, respectively). According to the SCA, the excess at the Langelier site (Saint-Léonard borough) was not critical[24], because in addition to the surface site there is a sewer chute for occasional use[25] that allows it to manage 100,000 m^3 to 150,000 m^3 per winter. This would render the theoretical volume of snow to dispose of at this site above the maximum capacity approved by the Ministère du Développement durable. However, the letter from the Ministère du Développement durable confirming authorization for the site's snow management states that the ministry authorized a project consisting of *[TRANSLATION] "setting up and operating a snow disposal site including a mechanical snow chute with a maximum total capacity (site + chute) of 700,000 m^3 of snow per season".* Therefore, because of this sewer chute, the SCA cannot count on an additional disposal capacity of 100,000 m^3 to 150,000 m^3.

While the annual work of developing a strategy consists of making adjustments to the strategies from previous years, we did not obtain any criteria or assessment grid that could have been used in the past to determine which sectors should be transporting their snow to which SDS. However, based on data obtained from the SCA, before 2015, when the boroughs were responsible for managing SDSs within their own territory, they were trying to minimize the direct costs of snow disposal[26], namely operational and transport costs (using the nearest SDS) while favouring the SDSs on their territory. We note that in the data:

- The westernmost sectors of LaSalle borough send their snow to their Angrignon surface site (LaSalle borough) at the eastern end of the borough, although the Saint-Pierre 1 sewer chute (Lachine borough) is much closer. This may serve to demonstrate that historically the SDSs within a borough's own territory have been favoured;
- Outremont borough sends its snow to the Angrignon surface site in LaSalle borough (a distance of 14.9 km from the centroid of the sector), when in fact the Carrière Saint-Michel (Villeray–Saint-Michel–Parc-Extension borough) is much closer at just 8.5 or 10.2 km from the centroid, depending on which route is used.

In both cases, if we follow the SCA's logic, the choice should be to favour the shortest distance between the sector being cleared and a SDS. In addition to these two cases, we noticed that in a 2016 call for tender for snow clearance of roads and sidewalks in seven boroughs, 7 of 20 sectors (35 %) were not associated with the closest SDS.

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24 The strategy provided for a volume of snow to be disposed of at the Langelier surface site (Saint-Léonard borough) of 812,958 m^3, whereas the certificate of authorization limits the accumulation to 700,000 m^3. There would therefore be an excess of 112,958 m^3 beyond that of the planning phase of the snow disposal strategy.

25 This sewer chute is not included by the SCA in its list of 16 sewer chutes (see Table 5.3. in the appendix), since it is considered secondary equipment for occasional use, on a surface site that is regarded as the main infrastructure for snow disposal at this location.

26 According to the SCA, it can cost from $0.25 to $0.50 per m^3 to dispose of snow in a sewer chute compared to $1.10 per m^3 at a surface site.

In addition to the direct costs, disposing of snow in sewer chutes involves some indirect costs, especially when there is a blockage[27] in the chute, rendering it inoperable for a certain length of time. It then becomes necessary to divert the trucks to another chute or surface site. Contractors are compensated if the distance they have to travel is greater, or paid less if the distance is shorter. The maintenance costs of mechanized sewer chutes must also be taken into consideration.

Now that the SCA has been responsible since 2015 for managing and planning the use of the SDSs, it has stated that, in trying to minimize overall costs (direct and indirect), it would like to identify the optimal amounts of snow in each snow clearing sector to be disposed of by each SDS. However, this project is not yet at the review stage[28].

DURING A SNOW CLEARING SEASON

The city obviously has no control over the amount of snow that falls in its territory in any given winter, nor over the speed at which it accumulates. Therefore adjustments have to be made to the snow disposal strategy during the snow clearing season. As mentioned above, surface sites can fill up faster than expected, sewer chutes can block, or an order can come from the wastewater treatment plant to reduce the use of sewer chutes (i.e., reduce the rate of snow dumping), due to a drop in the temperature of wastewater arriving at the plant that could affect the performance of wastewater treatment.

The issue for the city is therefore being able to react promptly during a snow clearing period, in order to redirect trucks to other SDSs, and to do it logically, efficiently and without creating problems elsewhere. As of now, there is no tool to permit this adjustment in real time. Up to the 2016-2017 season, the SCA had two employees responsible for the snow disposal strategy. They would do the work assignments in real time using their knowledge of the field, but without any specific procedure or official decisional grid. However, these individuals have now retired. The new SCA team is considering the development of a snow management tool to permit decision-making in real time, but this has not yet been done. In the absence of such a tool, less than optimal decisions may be made, resulting in slower snow removal operations, reduced future capacity to accept snow at various surface sites for the rest of the winter season, or even exceeding the maximum amount of snow allowed for a given surface site.

Since 2014, the city has been using the Système intelligent pour le transport de la neige (SIT-Neige), which includes telemetry equipment to manage transactions related to

27 A snow chute can become blocked if the snow being dumped is compacted or heavy, or if the load is dumped too quickly down the chute. Rapid dumping of many truckloads one after another can also lead to there not being enough time for the snow in the chute to melt or be carried away by water running in the interceptor

28 During our audit, the SCA mentioned that it was searching for mathematical tools to help it carry out this optimization.

loading snow onto trucks, then disposing of it[29]. This system was implemented to meet two requirements:

- guaranteeing the origin of the snow loads and thereby preventing any loads emanating from private sites from being billed to the city;
- managing SDS operations in real time based on unexpected events, such as a blocked chute.

At the time of our audit (November to December 2017), although the SCA is able to consult the SIT-Neige database in terms of truck loading history and in real time, a decision-making application has not yet been developed.

In light of these various observations, the current approach for developing a snow disposal strategy places the city in a situation in which it cannot guarantee compliance with the requirements of the certificates of authorization (lack of room for manoeuvre for certain surface sites). Nor have we seen any evidence that this strategy is economically optimal for the city. Lastly, a loss of expertise, coupled with the absence of a real-time decision-making application, prevents the SCA from optimally adjusting its disposal strategy during a snow loading period.

RECOMMENDATIONS

3.1.1.2.B.	**We recommend that the Service de la concertation des arrondissements document its methodology for developing a snow disposal strategy, indicating which criteria should be optimized and providing sufficient margin of safety to avoid capacity overruns at surface sites.**
3.1.1.2.C.	**We recommend that the Service de la concertation des arrondissements review its snow disposal strategy in order to optimize, based on data from previous years, the Snow Disposal Site for each sector, specifically based on the capacities of surface sites and sewer chutes, and on the direct and indirect operating costs of these Snow Disposal Sites.**

29 The snowblowers are equipped with GPS and the snow transport trucks with pagers. When snow is loaded onto trucks, the snowblower transmits its GPS coordinates to the truck's pager, as well as its ID. Once the loaded snow truck arrives at the SDS, it transmits the data contained in its pager to a receiver at the site gate. The city is then able to know the time of every loading and unloading, the ID of the snowblower that loaded the truck, the truck ID and the SDS. Also, since the volume of every truck is known before a winter season, the city would know the volume of snow delivered by this truck.

3.1.1.2.D.	**We recommend that the Service de la concertation des arrondissements develop a timeline to implement the real-time management project for transporting snow loads to various Snow Disposal Site, in order to be able to react quickly and effectively when the unexpected happens during snow clearing operations.**

BUSINESS UNIT'S RESPONSES

3.1.1.2.B.	***Service de la concertation des arrondissements*** *[TRANSLATION] The Service de la concertation des arrondissements will document the development method for its disposal strategy and work on improving its knowledge of the volume of snow stored in its sites (measurement by drone) to give itself a safety margin.* ***(Planned completion: September 2018)***
3.1.1.2.C.	***Service de la concertation des arrondissements*** *[TRANSLATION] Study the optimal distribution of snow by site, based on existing production data.* ***(Planned completion: November 2018)*** *Develop IT tools to automate the distribution.* ***(Planned completion: 2019-2020)***
3.1.1.2.D.	***Service de la concertation des arrondissements*** *[TRANSLATION] Establish a schedule for the introduction of an improved version of the Système intelligent du transport de la neige or the implementation of a new system.* ***(Planned completion: October 2018)***

3.1.2. ANTICIPATING CHANGES IN INFRASTRUCTURE

3.1.2.A. BACKGROUND AND FINDINGS

Various projects beyond the city's control are going have an impact on certain SDSs, to the point of rendering some no longer usable[30]. This is the case with the Anbar sewer chute (Le Sud-Ouest borough), which is located in the reconfiguration sector of the Turcot interchange, also the Stinson sewer chute (Saint-Laurent borough), which is on land to be

30 It is worth noting that operating a SDS governed by the *Regulation respecting snow elimination sites* is considered to be an industrial activity within the meaning of the *Land Protection and Rehabilitation Regulation (Q-2, r. 37)* and any site that ceases activity must proceed, under section 31.51 of the *Environment Quality Act*, carry out a characterization study of the site where the activity has taken place, and do this within six months after the end of the activity.

expropriated for the Réseau électrique de Montréal (REM)[31], and the 46th Avenue surface site (Lachine borough), which has to be replaced due to a Hydro-Québec project being built on the current site. In addition, the SCA wants to increase the capacity of the surface sites at Angrignon (LaSalle borough) and Château Pierrefonds (Pierrefonds-Roxboro borough). The SCA is in talks with the Ministère du Développement durable to determine which projects will require a new certificate of authorization or a modification of the current certificate.

As part of these amendments to the SDSs, no technology choices have yet been stopped. The SCA states that it would like to take this opportunity to examine various technologies, particularly high-efficiency melters that would allow meltwater to be discharged into the sewer system, rather than specifically to the interceptors, and thus better distribute the supply of SDSs throughout the territory[32]. As presented in the following section, the use of sewer chutes raises issues for the wastewater treatment plant. The indirect costs of these issues should be considered by the SCA in its analysis of the various available snow-disposal technologies. However, no study has yet been done on behalf of the city to determine which technologies would be most suitable from both an economic and environmental perspective.

RECOMMENDATIONS

3.1.2.B. **We recommend that the Service de la concertation des arrondissements develop, for every planned relocation, expansion or new snow management infrastructure project, a schedule of the steps to be taken in order to obtain, within the required deadlines, the authorization from the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, in order to be able to operate new Snow Disposal Sites with appropriate and functional equipment.**

3.1.2.C. **We recommend that the Service de la concertation des arrondissements conduct a study of the environmental and economic impacts over the entire life cycle of the various technologies considered for snow management to ensure that any new infrastructure is consistent with the city of Montréal's sustainable development approach.**

31 The Réseau électrique métropolitain of the Infrastructure Branch of the Caisse de dépôt et placement du Québec (CDPQ Infra).

32 According to the SCA, there are new types of melters that have less impact on the environment than those using fossil fuels such as diesel. Also, the use of more snow disposal sites within the territory could reduce distances for transporting snow and therefore greenhouse gas emissions. However, no such study has been presented to us by the SCA to support this thinking.

BUSINESS UNITS' RESPONSES	
3.1.2.B.	***Service de la concertation des arrondissements*** *[TRANSLATION] Systematically write up a project sheet that includes a detailed plan, including obtaining the authorization certificate.* ***(Planned completion: July 2018)***
3.1.2.C.	***Service de la concertation des arrondissements*** *[TRANSLATION] Establish a methodology for site development plans, taking into account the overall cost and the environmental impact over the entire life cycle.* ***(Planned completion: September 2019)***

3.1.3. IMPACT OF SEWER CHUTES ON WASTEWATER COLLECTION AND TREATMENT INFRASTRUCTURE

3.1.3.A. BACKGROUND AND FINDINGS

Although it may seem simpler to dump snow into sewer chutes than at surface sites (less land, no environmental monitoring, lower direct costs), we wanted to obtain the point of view of the Service de l'eau, and more specifically, of the Direction de l'épuration des eaux usées, on the impact of using sewer chutes.

Using sewer chutes may have a negative impact on wastewater treatment when the temperature of wastewater arriving at the treatment plant drops significantly. The Direction de l'épuration des eaux usées states that the average wastewater temperature in the interceptors is usually between 7°C and 8°C[33]. However, treatment becomes ineffective when the temperature drops below 2°C[34]. This is why the wastewater treatment plant has adopted a standard operating method[35] that allows it to intervene in snow unloading in the event of excessive cooling of the wastewater. When the temperature of the wastewater arriving at the treatment plant is between 2.0°C and 2.5°C, temperature monitoring goes into standby mode to possibly activate one of the four alert levels defined in this standard

33 A study conducted by the École Polytechnique in 1990 on behalf of the city evaluated the temperature of wastewater in the North interceptor as 7.5°C.

34 The *Guide d'aménagement des lieux d'élimination de neige* et mise en œuvre du *Règlement sur les lieux d'élimination de neige* states that *[TRANSLATION] "the dumping of snow, meltwater or runoff water into a sewer network must not result in exceeding the discharge targets of the treatment plant effluent."* This means that the treatment plant's performance must not be affected by the use of the sewer network in disposing of snow.

35 MSO-3000-005, last revised in January 2010.

operating method[36]. When an alert is activated, the plant operator communicates this alert to the Centre de services 311, which immediately informs the borough snow disposal managers. Each alert level triggers a reduction in the rate of snow unloading into a sewer chute. The plant can also request that one or more chutes be shut down completely if an ice jam should form in the interceptor. An ice jam is indicated by a high water level upstream from a chute and a very low water level downstream from the same chute. Les Directions des travaux publics at the Saint-Laurent and Le Sud-Ouest boroughs have confirmed to us that they do receive requests to reduce the rate of snow dumping into chutes without being able to formally quantify it.

Note that standard operating method MSO-3000-005 is not entirely representative of the situation described by the Direction de l'épuration des eaux usées. MSO-3000-005 states that an interceptor maintenance worker is responsible for monitoring compliance with requests to reduce the rate of snow dumping and for reporting back to the treatment plant. However, according to this department, interceptor maintenance personnel are no longer assigned to the field in this way.

If the temperature variance for the treatment plant is properly controlled by a standard operating method limiting the use of chutes, it then becomes an issue for the snow disposal strategy. As soon as the treatment plant imposes a restriction on the rate of dumping into sewer chutes, the SCA must revise the disposal strategy by redirecting the trucks to surface sites in order to avoid slowing down snow loading operations. In this regard, given that the SCA is also planning new SDSs to meet certain particular external constraints, we consider that these various issues related to the operating conditions of the treatment plant and the interceptors should be taken into consideration by the SCA in its analysis of prospective technologies.

RECOMMENDATIONS

3.1.3.B. **We recommend that the Service de la concertation des arrondissements in collaboration with the Service de l'eau, include in its criteria for analyzing various prospective technologies for new Snow Disposal Sites the operational constraints that the wastewater treatment plant may impose in order to minimize any negative impact between the operation of a Snow Disposal Site and the performance of the wastewater treatment plant.**

36 Level 1: temperature between 1.5°C and 2.0°C for 30 minutes, there is a 25% reduction of snow dumping into the sewer chutes. Level 2: temperature between 1.0°C and 1.5°C for 30 minutes, a 50% reduction of snow dumping is imposed. Level 3: temperature below 1.0°C for 30 minutes, a 75% reduction of snow dumping is imposed. Level 4: stop snow dumping in case of an ice jam in the interceptor.

3.1.3.C.	**We recommend that the Service de l'eau update the standard operating method (MSO-3000-005) for restricting the use of sewer chutes based on the temperature of wastewater at the treatment plant so that the method reflects the roles and responsibilities of the various stakeholders actually involved.**

BUSINESS UNIT'S RESPONSES

3.1.3.B.	***Service de la concertation des arrondissements*** *[TRANSLATION] Study, in collaboration with the Service de l'eau, the constraints to take into consideration for the various snow management technologies, to minimize the negative effects on the treatment plant.* ***(Planned completion: June 2019)*** ***Service de l'eau*** *[TRANSLATION] We want to reiterate the full collaboration of the Direction de l'épuration des eaux usées and our commitment to providing the Service de la concertation des arrondissements with the full support, involvement and expertise required for the analysis and implementation of various snow disposal technologies.* ***(Planned completion: June 2019)***
3.1.3.C.	***Service de l'eau*** *[TRANSLATION] The MSO-3000-005 (a standard operating method) was updated.* ***(Planned completion: May 2018)***

3.1.4. MANAGEMENT OF SNOW FROM PRIVATE SOURCES

The city has made available to contractors who clear snow on private property eight designated surface sites where they can dump their snow loads. These sites are located in the following boroughs:

- Anjou (Ray-Lawson site);
- Lachine (46th Avenue);
- LaSalle (Angrignon site);
- Pierrefonds-Roxboro (Château Pierrefonds site);
- Rivière-des-Prairies–Pointe-aux-Trembles (Armand-Chaput site);
- Saint-Laurent (Thiemens and Sartelon sites);
- Villeray–Saint-Michel–Parc-Extension (Carrière Saint-Michel site).

A contractor wishing to use these sites must purchase snow deposit coupons at the Bureaux Accès Montréal (BAM) of the boroughs mentioned above. These coupons can be used at any of the designated sites.

The price of snow disposal coupons is set out in *By-law 16-065*[37] *concerning fees*, which is adopted each fiscal year. The fees shown vary based on the type of truck used by the contractor (6, 10 and 12 wheel, semi-trailer and dump truck). A coupon is usable for one dumping only. For the 2017-2018 fiscal year, the fees for each dumping are as follows:

- For a 6-wheel truck: $23;
- For a 10-wheel truck: $34,50;
- For a 12-wheel truck: $46;
- For a semi-trailer truck: $69;
- For a dump truck: $46.

Private use of the city sites is subject to regulations the city has adopted to reduce the environmental impact. When purchasing snow dumping coupons, the contractor must sign a form authorizing the dumping of snow at a city site, to confirm it has been advised that the snow it will dump must be free of any polluting material or objects. Also, as a precautionary measure, snow dumped from private property is not mixed with snow that is cleared from streets and sidewalks and transported by the city. This snow is pushed into a reserved space at each authorized surface site and is not discharged into the sewer chutes. It is also no longer blown onto a mound of snow with the powerful snow blowers that the city uses for its own loads. In this way the city reduces the possible risk of breaking its equipment, since snow from private land is often loaded onto a truck using a mechanical shovel and may contain debris that can damage snow blowers or block sewer chutes with bulky objects, thus delaying snow clearing operations.

3.1.4.1. APPLICATION OF THE BY-LAW AND FEES

3.1.4.1.A. BACKGROUND AND FINDINGS

Generally, when a contractor goes to a borough's BAM to purchase snow disposal coupons, the Agent de communications sociales (ACS) fills out a form that records all the relevant information about the contractor and the transaction.

The ACS then deposits the money and issues a receipt containing all the data needed to identify the transaction.

37 City council, *By-law 16-065*, adopted December 14, 2016, for the 2017 fiscal year. Chapter X: Sites de déversement de la neige, Section 117 deals with pricing and Section 117.1 identifies sites designated for snow dumping purposes.

Sales are also recorded in an Excel "House Style" document, specific to each borough, for each type of truck.

The same document helps in maintaining the inventory of snow deposit coupons.

New coupons are ordered from the SCA, which is responsible for printing them and distributing them to boroughs that have made requests. It maintains a summary inventory of all snow deposit coupons (organized by type of truck), i.e., those ordered from the supplier, those used in the SIT-Neige and those in stock at the SCA and in the boroughs.

To support our review of the processing method for snow disposal coupons, and keeping in mind that in our initial sample Le Sud-Ouest borough does not have a surface site designated to receive snow from private properties, we have added two additional boroughs: Anjou and Rivière-des-Prairies–Pointe-aux-Trembles. As with the Saint-Laurent and Villeray–Saint-Michel–Parc-Extension boroughs, they sell coupons and their surface sites are designated to receive snow from private sources.

Our audit consisted of reviewing the coupon sales process, their redemption, the receipts issued and the sales support files and documents. Based on the data and documentation obtained from these boroughs, we make the following observations:

- Saint-Laurent borough does not use the same form as the other boroughs and therefore contractors that buy their snow disposal coupons there are not informed that the snow they dump in the designated sites must be free of any polluting material or objects. In the event of a dispute or litigation, it could prove more difficult to sanction the contractor;
- The Excel documents used to record transactions with contractors are specific to each borough. They show relevant sales information by type of truck as well as the number of coupons ordered and sold. The same files are used to maintain inventory.

When they are redeemed, the cash register codes make it possible to identify which coupons have been sold by truck type at points of sale in former city boroughs. For boroughs of the former suburban municipalities, a single code is used in their cash registers. Based on information we obtained, in 2018 the Service des finances plans to harmonize the revenue collection system in all the boroughs to facilitate maintenance of the inventory of snow disposal coupons.

RECOMMENDATION

3.1.4.1.B. We recommend that the Saint-Laurent borough, in order to defend itself against litigation, look into the opportunity of using the same form for registering contractors as the other boroughs, so as to be able to advise contractors of their responsibilities regarding the quality of snow dumped into city of Montréal sites, namely that it must be free of polluting materials or objects.

BUSINESS UNIT'S RESPONSE

3.1.4.1.B. ***Saint-Laurent borough***

[TRANSLATION] According to the Service à la clientèle section head, the form was modified during winter 2017-2018 to comply with this report. ***(Planned completion: March 2018)***

3.1.4.2. MANAGEMENT OF USE OF SNOW DUMPING COUPONS AND ACCESS CONTROL

3.1.4.2.A. BACKGROUND AND FINDINGS

As with snow cleared from city streets and sidewalks, the process for controlling access to sites designated for the dumping of snow from private property is supported by the SIT-Neige through its Lynx application, which uses a database of information related to access control. The Lynx application permits electronic compilation of snow transport data, as well as access to a dashboard and to multiple data that can be used for detailed analyses. The SIT-Neige management software aims to optimize snow clearing operations (loading, transport and disposal of snow) and oversight of the city's snow removal billing. Snow brought from private properties has already been paid for through the purchase of snow disposal coupons.

When a truck transporting snow from private properties arrives at the site booth, the driver hands in a snow disposal coupon containing a unique barcode, which is then scanned. The detachable stub is returned to the contractor, and the other part is sent to the SCA through the borough. Data concerning the transaction is automatically recorded in the système Lynx, including the transaction number, date and time of dumping, volume dumped and ID of that designated site. The snow disposal coupon is unique and can only be used once, for a single dumping.

The Lynx application permits the SCA to track the use of sites designated for collecting snow from private property in terms of volume dumped and coupons used for each site. Site access is controlled on two levels:

- during operations when trucks enter the site, via the snow dumping coupon handed in at the booth. If a coupon has already been used, the truck cannot access the site;
- during quality control at the SIT-Neige carried out by the SCA team, which reviews any transactions with anomalies that may be flagged by the system (e.g., a duplicate coupon).

As part of our audit, we reviewed the records of snow brought from private properties following the first snowstorm of December 2017; this comprised 1,277 records (of private dumping).

Our audit sought to determine whether any records or data were missing, whether the system flagged any anomalies or whether any non-designated sites were being used. Based on our examination, no anomalies were detected and the sites used were indeed designated to receive snow brought from private properties.

3.1.5. ACCOUNTABILITY RELATED TO APPLICATION OF THE SNOW DISPOSAL STRATEGY

3.1.5.A. BACKGROUND AND FINDINGS

As shown above, implementing the snow disposal strategy in Montréal involves several entities within the city administration, from public works in the boroughs to the SCA, and from the SIVT to the Service de l'eau. Thus we were interested in learning whether every department was able to appreciate the results of the collective work involved in snow disposal. Annually, in the month of May or June, the SCA produces a report on its snow removal activities for the winter season just ended. This report is used to develop a presentation that is made to the borough managers of public works and the city's executive committee. As mentioned earlier, this presentation was made public for the 2015-2016 and 2016-2017 winter seasons. In addition to snow disposal, the report also covers weather data and the amount of snow received, as well as snow loading activities, towing, contract management and the development of technologies such as SIT-Neige. As for snow disposal, these reports discuss the volume of snow disposed of, and whether there were any issues such as ice jams in the sewer chutes. There is no information about environmental compliance of the SDSs in these annual reports.

Furthermore, we noted some divergence between the snow disposal data presented in these reports and the SCA's internal data extracted from the SIT-Neige, as follows:

- The 2015-2016 winter report states that the volume of snow disposed of was 8,854,544 m^3, whereas internal SCA data indicated 867 m^3 (difference of 3.7%);
- The 2016-2017 winter report[38] states that the city disposed of 627 m^3 of snow, whereas SCA data for the 2016-2017 season indicated 14,482,425 m^3 (difference of 6.7%);
- The 2016-2017 winter report, produced by the SCA in 2017 and detailing the winter activities under its responsibility, states that the surface sites at Highway 13 (Pierrefonds-Roxboro borough) and 46th Avenue (Lachine borough) were at full capacity during the winter. However, according to the data shown in Table 1, the Highway 13 surface site was only at 64.3% of its maximum allowed capacity at the end of winter. The report makes no mention of the surface sites at Thimens (Saint-Laurent borough), Langelier

38 A summary of this report is presented annually to the city's executive committee. For the 2015-2016 season, the report was presented to the executive committee on May 18, 2016, while the 2016-2017 report was presented to the executive committee on June 7, 2017. Copies of these two presentations were made public on the Internet for these executive committee meetings.

(Saint-Léonard borough) and Angrignon (LaSalle borough), which were clearly over the authorized capacity.

Also, when comparing the winter report produced by the SCA with the presentation made to the executive committee for the 2016-2017 winter season, we noted a divergence in snow accumulation capacities at the surface sites. The 2016-2017 report states that the snow disposal strategy had worked well and the SCA identified few episodes of sewer chute blockages, but that some surface sites were full during the season and some transportation contracts had to be transferred to other SDSs. The presentation made to the elected officials stated that the SDSs had met the needs of the city. While overall it is true that the SDSs had proved sufficient, individually there were capacity overruns at four surface sites (see Table 1). We believe that the elected officials and the entire administration concerned with snow disposal should have an accurate picture of the disposal capacity of each SDS in order to make suitable decisions about adding any new SDSs in the city, or about changing the current connections between snow clearing sectors and the SDSs.

RECOMMENDATIONS

3.1.5.B. **We recommend that the Service de la concertation des arrondissements include, in its winter report and in the presentation made to the executive committee on snow clearing in Montréal, all the relevant data related to environmental monitoring of Snow Disposal Sites, in order to provide accountability on the environmental compliance of this infrastructure.**

3.1.5.C. **We recommend that the Service de la concertation des arrondissements ensure that any information contained in its winter report and in its presentation to the executive committee be reliable and representative of the data actually measured during operations, in order to provide an accurate picture to the elected officials and the administration as a whole.**

BUSINESS UNIT'S RESPONSES

3.1.5.B. ***Service de la concertation des arrondissements***

[TRANSLATION] Add a "Site Management" section to the winter report. ***(Planned completion: June 2018)***

3.1.5.C. ***Service de la concertation des arrondissements***

[TRANSLATION] Complete the winter report structure to provide information that is more representative of the data measured during operations. ***(Planned completion: June 2018)***

3.2. COMPLIANCE OF SNOW DISPOSAL ACTIVITIES

In the previous section, we looked at the city's ability to manage the disposal of cleared snow. In this section, we seek to determine whether the disposal of cleared snow is being done in compliance with provincial and municipal regulations.

3.2.1. GOVERNMENT REQUIREMENTS

3.2.1.1. LACK OF KNOWLEDGE OF THE CITY OF MONTRÉAL'S COMMITMENTS

3.2.1.1.A. BACKGROUND AND FINDINGS

As presented in Tables 5.2. and 5.3. in the appendix, the city has obtained authorizations from the Ministère du Développement durable within the meaning of section 22 *of the Environment Quality Act* for all the SDS it uses[39]. These authorizations were obtained between 1991 and 2015. At the time of the applications, the city had to submit an environmental monitoring program, which it undertook to follow (for surface sites only), as well as specifications for the maintenance that would be done. Authorization from the Ministère du Développement durable to use a SDS is conditional on the city's compliance with these commitments.

Since 2015, the SCA has been responsible for managing information related to the SDSs and awarding contracts for environmental monitoring (or to have this monitoring done internally by the SIVT). In order to determine the commitments that the city had made with respect to the SDSs, the SCA sought to obtain their certificates of authorization. By the end of 2017, it had been able to obtain from the boroughs some letters from the Ministère du Développement durable confirming the authorization to use a SDS site for 20 of the 28 infrastructures[40]. However, these letters do not specify the commitments made by the city.

The SIVT has the city's letters of commitment for maintenance of the SDSs or environmental monitoring to be undertaken for 6 of the 11 surface sites (54.5%)[41] [42]. Only 3 of these letters of commitment also provide details on maintenance work to be done at the

39 For the Lafarge (Montréal-Est) surface site, Lafarge Canada Inc. obtained authorization from the Ministère du Développement durable because this company owns the site.

40 The missing letters pertain to certain sewer chutes.

41 A document was provided to us for a 7th SDS (Carrière Saint-Michel in Villeray–Saint-Michel–Parc-Extension borough). However, it does not reflect the city's commitment but rather is a call for tenders for the environmental monitoring of this site. There is no indication that the monitoring required in this call for tenders is consistent with the city's commitments to the Ministère du Développement durable.

42 The 12th surface site, Lafarge, does not belong to the city. The city is therefore not responsible for its environmental monitoring.

surface sites. The SCA does not have any commitment letters or other documents that were filed by the city when applying for authorizations for sewer chutes.

Due to the difficulty in tracking down all the documents related to applications for authorization for the SDSs, the SIVT approached the Ministère du Développement durable in March 2017 to obtain the content of the certificates of authorization. However, in May 2017, the officials responsible for access to information at the Ministère du Développement durable deemed the city's application inadmissible, because it did not specify *[TRANSLATION] "the locations for which [the City wanted] documents and the list of documents required for each location"*[43]. The SIVT then notified the Ministère du Développement durable that it was withdrawing its request and would make new, more specific applications. However, at the time of our audit (November-December 2017), the SIVT had still not made those requests. Considering that the SCA has a copy of each letter (the certificates of authorization) authorizing the city to use the surface sites and certain sewer chutes (see Table 5.3.), and that these letters do list the documents that had been submitted by the city when applying for the certificates of authorization, it should be possible, in our opinion, for the SIVT to set out more precisely its request for information from the Ministère du Développement durable.

Thus, at the time of our audit, the city was not able to specifically describe the parameters to be followed and the thresholds to be respected for surface water and groundwater protection for nearly half (5/11) of the surface deposits, maintenance commitments for almost three quarters (72.7 %) (8/11) of the above-ground deposits, or maintenance commitments for all of the sewer chutes (16/16). As we will see later, this does not mean that the city conducts no environmental monitoring or maintenance of its SDSs. However, it is not in a position to confirm whether the monitoring and maintenance comply with the certificates of authorization.

For three of the four environmental monitoring reports for the 2016-2017 winter season produced by the SIVT for the surface sites (Carrière Saint-Michel in the Villeray–Saint-Michel–Parc-Extension borough and 46th Avenue in the Lachine, Angrignon and LaSalle boroughs), the city does not have the letters of commitment and therefore does not officially know what needs to be followed. However, the report for the Carrière Saint-Michel site (Villeray–Saint-Michel–Parc-Extension borough) states that the monitoring consists of *[TRANSLATION]"carrying out an analytical program established in accordance with the requirements formulated by the* [Ministère du Développement durable] *in a letter dated November 17, 2008."* This communication refers to the letter from the Ministère du Développement durable, which authorized use of the site, but does not contain any parameters for monitoring. The reports for the sites at 46th Avenue (Lachine borough) and Angrignon (LaSalle borough) state that the monitoring consists of "*carrying out an analytical program based on the requirements formulated by* [the SCA] *together with the certificate of authorization issued by the* [Ministère du Développement durable]". Here again, without knowing the City's commitments for these sites, it cannot be said that the monitoring requirements communicated by the SCA to the SIVT are consistent with the certificate of authorization.

43 Excerpt from the response from the Regional Access Representative for the Ministère du Développement durable dated May 12, 2017 and addressed to the SIVT.

According to the SCA, there was an informal agreement between the Ministère du Développement durable and the city, allowing the latter to undertake environmental monitoring of the SDSs in similar fashion to what was done in the past, without having the city's actual commitments. However, the SCA was unable to provide us with this agreement.

In light of these findings, it is clear to us that the city operates the majority of surface sites without knowing with certainty the environmental monitoring commitments that were made and by replicating what had been done in previous years without knowing whether they were compliant. Regarding site maintenance, the city is only aware of what is required for 3[44] out of the 27 SDSs for which it is responsible.

RECOMMENDATIONS

3.2.1.1.B.	**We recommend that the Service des infrastructures, de la voirie et des transports obtain information from the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques specifically for Snow Disposal Sites for which the city of Montréal does not have details regarding environmental monitoring and maintenance, in order to ensure that the monitoring carried out meets the commitments made by the city to the Government of Québec.**
3.2.1.1.C.	**We recommend that the Service de la concertation des arrondissements, in the event it is unable to track down all the environmental monitoring commitments, enter into a formal agreement with the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques on a continuation of the monitoring, on the basis of previous monitoring, to ensure that it will be carried out in accordance with the requirements of this ministry.**

44 Newman (Le Sud-Ouest borough), Highway 13 (Pierrefonds-Roxboro borough) and Château Pierrefonds (Pierrefonds-Roxboro borough).

BUSINESS UNITS' RESPONSES

3.2.1.1.B. ***Service des infrastructures, de la voirie et des transports***

[TRANSLATION] The Service des infrastructures, de la voirie et des transports serves as technical support for its proponent responsible for the snow disposal sites, that is, the Service de la concertation des arrondissements.

Commitment letters from the city supporting certificates of authorization issued by the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques are under the responsibility of the Service de la concertation des arrondissements. It is up to the SCA to submit requests for access to information to the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques for the missing letters, in light of the issues related to this process.

At the request of the Service de la concertation des arrondissements, the Service des infrastructures, de la voirie et des transports will help inventory the missing letters and provide technical support to verify the environmental monitoring programs under way with those stipulated in the city's commitments. ***(Planned completion: At the request of the Service de la concertation des arrondissements)***

3.2.1.1.C. ***Service de la concertation des arrondissements***

[TRANSLATION] Refer to the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques to confirm the continuation of the monitoring currently under way. ***(Planned completion: June 2018)***

3.2.2. ENVIRONMENTAL MONITORING

3.2.2.A. BACKGROUND AND FINDINGS

While the SCA cannot state with certainty what must be monitored from an environmental perspective for each of the surface sites, the fact remains that monitoring is being systematically done for each of these sites. We obtained copies of the environmental monitoring reports for the years 2015-2016 and 2016-2017 for the eleven sites belonging to the city[45]. As part of our audit work, we focused on the SDSs in the boroughs of Saint-Laurent, Le Sud-Ouest and Villeray–Saint-Michel–Parc-Extension, for a total of 4 surface sites (Sartelon and Thimens in Saint-Laurent borough, Newman in Le Sud-Ouest

45 For the Ray-Lawson site (Anjou borough), we obtained the reports for the years 2014-2015 and 2016-2017.

borough and Carrière Saint-Michel in Villeray–Saint-Michel–Parc-Extension borough). The city is aware of environmental monitoring commitments only for surface sites in Sartelon (Saint-Laurent borough) and Newman (Le Sud-Ouest borough). We sought to determine whether the environmental monitoring that is being done for these two surface sites complies with the requirements of the Ministère du Développement durable and the certificates of authorization.

REQUIREMENTS TO BE MET

For the Newman surface site (Le Sud-Ouest borough), the city must meet groundwater concentration levels equivalent to surface water resurgence or sewer infiltration criteria[46]. For meltwater, which is discharged into the sewer, the borough undertook at the time to meet the criteria set out in the CMM's new *By-law 2008-47*[47]. This is a commitment that goes beyond regulatory requirements since snowmelt is excluded from *By-law 2008-47*[48]. However, the city had committed to follow up as per the by-law.

For the Sartelon surface site (Saint-Laurent borough), there is no requirement to monitor meltwater, even though the authorization was issued in 2002, prior to the coming into force of the CMM's *By-law 2008-47* and thus under former *By-law 87*, which did not exclude meltwater[49]. It must be understood, however, that once an undertaking is accepted by the Ministère du Développement durable, it prevails over the by-laws and that the commitment may be different from the by-law in effect at the time of the application. For groundwater, higher alert (and thus less stringent) thresholds have been set than those recommended in the *Guide d'aménagement des lieux d'élimination de neige*[50]. This means there could be a higher concentration of contaminants in the groundwater before the city has to do remedial work on the site, such as paving it.

We have chosen to go into these two examples in detail here to demonstrate that there is not necessarily an accordance between the by-law in force at the time of the application for authorization and the final requirements to be met by the city as set out in the certificate of authorization. This further justifies, in our view, the need for the city to track down the environmental monitoring commitments relating to the five surface sites for which it lacks information (see Table 5.2. in the appendix).

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46 Since groundwater can eventually discharge into surface water, contaminated groundwater can become a source of contamination for surface water. It is for this reason among others that the Ministère du Développement durable established maximum concentrations not to be exceeded in groundwater.

47 The borough's commitment had been made between the transition between the former *By-law 87* and the new *By-law 2008-47* with respect to clean water.

48 We observed that, in the vast majority of environmental monitoring reports, the city relied on *By-law 2008-47* to determine whether meltwater discharges into the sewer were in compliance with the by-law when they were excluded.

49 The CMM's former By-law 87 did not, as is now the case with By-law 2008-47, contain a section excluding snowmelt from the by-law. This melted snow therefore needed to, in theory, comply with the quality requirements set out in the old by-law.

50 With the exception of iron, for which the commitment is to a lower level than the alert thresholds in the guide. For the other substances monitored, the commitment levels are higher than the alert thresholds in the guide.

COMPLIANCE WITH REQUIREMENTS

We compared the content of the environmental monitoring reports for the two surface sites at Sartelon (Saint-Laurent borough) and Newman (Le Sud-Ouest borough) with the city's commitments in terms of parameters followed, criteria or thresholds, sampling frequency and number of sampling points, in order to determine whether the city's monitoring[51] conforms to the commitments. We have drawn the following conclusions from this comparison:

- The city is doing (or is having done) more sampling and analysis than it should, according to its commitments:
  - At Newman (Le Sud-Ouest borough), the city should do four samplings for snowmelt monitoring (two between March and April and two between May and July). In fact, it does five between March and April and two to three between July and January of the following year. This is the sampling frequency called for in the *Guide d'aménagement des lieux d'élimination de neige* for groundwater and not for meltwater;
  - At Sartelon (Saint-Laurent borough), although meltwater monitoring is not required, the city does nine follow-ups between May and October.
- The city has had testing done that is not required[52]:
  - At Newman (Le Sud-Ouest borough), meltwater is tested for mercury, although this is not a requirement;
  - At Sartelon (Saint-Laurent borough), while analysis of meltwater is not required, the city has samples tested for more than a dozen substances including mineral oils and fats, suspended solids, chromium, copper and lead.
- The criteria used to determine whether there is environmental compliance are not those set out in the letters of commitment:
  - At Sartelon (Saint-Laurent borough), rather than comparing the analysis results to the criteria in the letter of commitment, they are compared to the alert thresholds in the *Guide d'aménagement des lieux d'élimination de neige*. These thresholds are lower than the commitment criteria (and therefore more demanding). This means that the city has less room for manoeuvre. However, according to the results of analyses in 2015-2016 and 2016-2017, with the exception of chlorides, the results were below the alert thresholds and therefore below the commitment criteria. In light of this, the change in the basis for comparison has no impact on the conclusions of the environmental monitoring.

51 Monitoring for Sartelon (Saint-Laurent borough) is done by an outside firm while Newman's (Le Sud-Ouest borough) is done directly by the SIVT.

52 Based on the laboratory analysis costs provided to us by the SIVT, the cost of these additional analyses is marginal as part of the snow disposal budget. The issue is therefore not economic in nature, but rather reflects a lack of guidance in the environmental monitoring of surface deposits.

It should be noted that the conclusions of the environmental monitoring reports do not raise any problematic issues with snow management, except that surface sites do contribute to chloride contamination in groundwater. Both the SIVT and the external firms responsible for environmental monitoring recommend continuing this monitoring each year. From an environmental perspective, monitoring reports give no indication that the operations of surface sites are non-compliant with the requirements in the certificates of authorization.

However, the fact is that with surface sites for which the city has letters of commitment there are discrepancies between the actual monitoring being done and the monitoring that is required. This leads us to conclude that environmental monitoring is not being properly supervised.

RECOMMENDATION

3.2.2.B. **We recommend that the Service de la concertation des arrondissements create a grid setting out the environmental monitoring required for each surface site, along with the parameters to be followed, the alert thresholds, the number of sampling points and the sampling frequency to ensure the compliance of all environmental monitoring being carried out.**

BUSINESS UNIT'S RESPONSE

3.2.2.B. ***Service de la concertation des arrondissements***

[TRANSLATION] Establish a grid summarizing the environmental monitoring to be carried out at each storage site.
(Planned completion: Early 2019)

3.2.3. MAINTENANCE OF SNOW DISPOSAL SITES

3.2.3.1. REGULAR AND RECURRING MAINTENANCE OF SNOW DISPOSAL SITES

3.2.3.1.A. BACKGROUND AND FINDINGS

Both the surface sites and sewer chutes must be regularly and routinely maintained before each winter season to ensure proper operation and disposal of cleared snow in accordance with environmental requirements. To obtain an authorization from the Ministère du Développement durable, the city had to submit specifications, in accordance with the *Guide d'aménagement des lieux d'élimination de neige,* for the operation of sites, including spring cleanup measures. As we stated earlier, of the 27 SDSs for which the city is responsible, the SCA has commitment letters containing maintenance requirements for only

three surface sites (Highway 13 and Château Pierrefonds in Pierrefonds-Roxboro borough and Newman in Le Sud-Ouest borough).

In the three boroughs we audited, none of the Directions des travaux publics has a general description specifying the maintenance work that must be done, at least before each winter season or items that must be monitored to ensure they are functioning properly. These departments say that maintenance work is the same each year and is done based on the experience of the teams in place.

MAINTENANCE OF SURFACE SITES

In Saint-Laurent borough, for example, employees ensure that snow dump sites and access roads are graded, and fill in holes as needed. In 2010, the borough awarded a contract to:

> *[TRANSLATION] "completely resurface the cross ditches and sedimentation basin and remove all vegetation from them [...] remove surface materials and dispose of them away from the site in a designated area; weed and uproot all areas alongside the ditches of the Sartelon dump site to remove plants such as cattails and warblers on either side of the ditch and cut weeds on the surface of the dump deck; also level the cleaned surfaces using a grader."*[53]

In 2015 and 2016, the borough awarded smaller-scale contracts for maintenance of the Sartelon surface site (Saint-Laurent borough). This involved weeding the ditches and site deck of the site and grading the surface. Thus, the last major maintenance of the Sartelon sedimentation basin (Saint-Laurent borough) dates back to 2010 and the Direction des travaux publics does not have a new date planned for this maintenance.

For the Newman surface site in Le Sud-Ouest borough, the Direction des travaux publics said it maintains the surface and access roads (grading and filling holes). However, we were unable to obtain evidence of this work. The site's settling basin is also emptied and cleaned annually. The SCA has confirmed the 2017 cleanup in a series of photos taken before and after the work.

Lastly, regarding Villeray–Saint-Michel–Parc-Extension borough, the Direction des travaux publics states that it maintains loading docks, access roads and huts. However, once again, we were not able to obtain evidence of such work being done each year.

MAINTENANCE OF SEWER CHUTES

Villeray–Saint-Michel–Parc-Extension borough does not have any sewer chutes on its territory. At Le Sud-Ouest borough, the Direction des travaux publics states that it does

53 Excerpt from the estimate applicable to the re-profiling of ditches and cleanup of site at Sartelon snow dump (Saint-Laurent borough), call for tenders 10-533, Saint-Laurent borough.

not do any maintenance on the chutes as they are simply openings covered with a grid at the road level into which snow is dumped. Since the SCA has not located any documents constituting applications for authorization of the sewer chutes, we cannot confirm that the lack of maintenance on the sewer chutes in Le Sud-Ouest borough is in compliance with the certificate of authorization or not.

In Saint-Laurent borough, the sewer chutes, unlike in Sud-Ouest borough, are mechanized. This means that the snow lands on feeding augers that grind it up before it falls into the chute and flows toward the interceptor.

In 2013, Saint-Laurent borough awarded a five-year contract for maintenance, repair and supply of spare parts for the Stinson and Jules-Poitras 2 snow chutes. The previous contract, also for five years, had been awarded in 2008. According to the borough's Direction des travaux publics, mechanized chutes require more maintenance than passive chutes, but they have one advantage: by grinding up the snow, there is less risk of a blockage occurring in the chute. The five-year maintenance contract is valued at $1,590,000 and covers four chutes (two at Stinson and two at Jules-Poitras 2). This represents an average annual maintenance cost per mechanized chute of $79,500. In our opinion, this cost should be taken into account in analyzing the optimization of the snow disposal strategy and possible solutions for future SDSs. The cost should be compared with the cost of a potential loss of a passive chute if the chute is blocked by the formation of a block of snow or ice.

SPECIFIC MAINTENANCE REFERRED TO IN THE CERTIFICATE OF AUTHORIZATION

In the three boroughs audited, we were aware of maintenance commitments only for the Newman surface site (Le Sud-Ouest borough)[54]. The city has to test the watertightness of the retention basin once a year, correct the situation in the event of a leak and forward a test follow-up report to the Ministère du Développement durable. Both the borough's Direction des travaux publics and the SCA have stated that such a test was done recently, but they could not provide any evidence of it. The only evidence we obtained that such a test was done in the past is a copy of a communication sent to the Ministère du Développement durable in 2011, informing that the test had been completed, that a leak had been detected and sealed, and that a new test had confirmed the watertightness of the basin.

However, for the Newman surface site (Le Sud-Ouest borough), the letter of commitment stated that if, during the first five years of operation, there was evidence of chloride migration into the water table (as demonstrated by environmental monitoring reports), the city would waterproof the site. This commitment dates back to 2011. A little over five years later, in June 2017, the city issued a call for tenders for roadwork at the Newman site. The

54 Since the SCA does not have the entire file containing the application for authorization for Newman (Sud-Ouest), we cannot conclude whether this is the only maintenance requirement for this surface site.

technical specifications refer to the installation of a base and a surface layer of bituminous asphalt. The completion of this work will allow the city to meet its commitment. The specification also mentions the injection of polyurethane resin into the cracks in the retention basin. Waterproofing work (asphalting the site) was also carried out in 2016 at the Sartelon surface site (Saint-Laurent borough).

The city's letter of commitment for the Sartelon surface site (Saint-Laurent borough) contained an item that is not related to environmental monitoring or regular maintenance. The city had to decontaminate two parcels of soil on the site. This decontamination was done the same year that authorization was obtained to operate the site as a surface dump for cleared snow.

SUPERVISION OF MAINTENANCE OF SNOW DISPOSAL SITES

Every year the SCA conducts a tour of the SDSs to examine the condition of the sites. If necessary, the SCA submits a report to the borough concerned with its maintenance recommendations for maintenance to be carried out on the SDS infrastructure and the site. It is important to mention that, although maintenance of the SDSs has been delegated to the boroughs, the SCA defrays the costs assumed by the boroughs for this maintenance[55]. Les Directions des travaux publics of the boroughs of Saint-Laurent and Villeray–Saint-Michel–Parc-Extension confirmed these visits. We obtained access, through Villeray–Saint-Michel–Parc-Extension borough, to an inspection report that the SCA issued on May 31, 2016 for the Carrière Saint-Michel surface site. The borough was unable to provide accountability to the SCA in relation to the latter's recommendations.

At the time of our audit, the SCA was opening an operations file for each of the SDSs. The idea was to develop a worksheet for each SDS that would detail, in addition to the technical features of the SDS (exact location, storage capacity or sewer discharge capacity), the work required during winter operations and the maintenance needed during the summer. In the absence of a guide for SDS maintenance in the audited boroughs, an operations file system of this nature would allow the SCA to supervise the maintenance.

SITE MAINTENANCE ISSUE

In light of our findings, we consider that, in the audited boroughs, work has been carried out, both major and non-routine as indicated in the letter of commitment (soil decontamination, waterproofing of site surface). Regarding recurring maintenance activities, we must conclude that this was not only not done, but that the boroughs cannot demonstrate that it was done. Here the city's ability to demonstrate, if required, to the Ministère du Développement durable that the sites are being properly maintained is in question. It should be noted that in 2013 the city received a non-compliance citation from the Ministère du Développe-

55 *By-law 08-055, By-law concerning the delegation to borough councils of certain powers relating to the arterial road system.*

ment durable for not maintaining ditches and settling areas at the Highway 13 surface site (Pierrefonds-Roxboro borough). If the amount of the fine for such non-compliance is not high[56], it jeopardizes the city's reputation as these administrative sanctions are in the public domain and paid for out of public funds.

RECOMMENDATIONS

3.2.3.1.B.	**We recommend that the Service de la concertation des arrondissements complete its operations file project by including maintenance programs for Snow Disposal Sites that the boroughs must undertake, in accordance with the maintenance requirements stated in the certificates of authorization obtained from the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques.**
3.2.3.1.C.	**We recommend that the boroughs of Saint-Laurent, Le Sud-Ouest and Villeray–Saint-Michel–Parc-Extension provide some accountability to the Service de la concertation des arrondissements demonstrating that maintenance work for the operation of a Snow Disposal Site has been carried out.**
3.2.3.1.D.	**We recommend that the Service de la concertation des arrondissements take into consideration the costs of maintenance of mechanized sewer chutes and also costs associated with blockages in a passive sewer chute when analyzing future snow management infrastructures, to stimulate informed thinking on the choice of Snow Disposal Sites to be set up within the city of Montréal in the future.**
3.2.3.1.E.	**We recommend that Le Sud-Ouest borough forward annually the results of the watertightness test on the retention basin of the Newman surface site to the Service de la concertation des arrondissements so that the latter can submit it to the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques in accordance with the commitment made by the city of Montréal.**

BUSINESS UNITS' RESPONSES

3.2.3.1.B. ***Service de la concertation des arrondissements***

[TRANSLATION] Gradually establish an operating file for each of the 28 LENs. ***(Planned completion: In 2020)***

56 The city was fined $2,500 in 2013 for non-compliance related to lack of maintenance on a surface site.

3.2.3.1.C. ***Saint-Laurent borough***

[TRANSLATION] A report on the progress of the maintenance work at the snow disposal sites will be submitted to the Service de la concertation des arrondissements at the beginning of the work and updated periodically. The work can begin when all the snow accumulated during the winter is melted. The borough is already invoicing the Service de la concertation des arrondissements for the work carried out by the borough. ***(Planned completion: August 2018)***

Sud-Ouest borough

[TRANSLATION] **Action completed:** *In 2017, the settling basin was cleaned up (weeded) entirely by the Service de la concertation des arrondissements.*

Action to be planned: *The engineer in charge at the Service de la concertation des arrondissements is keeping us informed about discussions under way to develop a framework agreement on this matter.*

Action to be undertaken: *If the suggested framework agreement is not concluded in 2018, the borough proposes the following action, as well as confirmation of needs by the Service de la concertation des arrondissements within 30 days of this report: a submission was requested on April 11, 2018, by the Voirie du Sud-Ouest technical agent for watertightness and cleaning tests to be carried out in both basins (combined contract for watertightness and cleaning tests).* ***(Planned completion: August 2018)***

Villeray–Saint-Michel–Parc-Extension borough

[TRANSLATION] After receiving the inspection report drawn up by the Service de la concertation des arrondissements, the borough of Villeray–Saint-Michel–Parc-Extension will take corrective action and do the maintenance required for the proper functioning of the site.

The borough manager will present an accountability report to the Service de la concertation des arrondissements as quickly as possible after the completion of the identified maintenance work. ***(Planned completion: April 2018)***

3.2.3.1.D. ***Service de la concertation des arrondissements***

[TRANSLATION] Develop a methodology to take into account the overall cost of sewer chutes. ***(Planned completion: June 2019)***

3.2.3.1.E. ***Sud-Ouest borough***

[TRANSLATION] **Action completed:** *In 2011, a watertightness test was conducted by a firm and a crack was repaired. A second test confirmed the basin's watertightness in 2011. Since 2011, however, the borough has had no additional information.*

Action to be planned: *The engineer in charge at the Service de la concertation des arrondissements is keeping us informed about discussions under way to develop a framework agreement on this matter.*

Action to be undertaken*: If the suggested framework agreement is not concluded in 2018, the borough proposes that the Voirie du Sud-Ouest technical agent request that watertightness and cleaning tests be carried out in both basins (combined contract for watertightness and cleaning tests).* ***(Planned completion: August 2018)***

3.2.4. ACCOUNTABILITY RELATED TO GOVERNMENT REQUIREMENTS FOR THE SNOW DISPOSAL SITES

3.2.4.A. BACKGROUND AND FINDINGS

We have previously addressed the issue of internal accountability within the city between the various stakeholders in the snow disposal strategy. We also looked to see if the city was reporting to the Ministère du Développement durable regarding snow disposal.

The SCA mentioned sending environmental monitoring reports annually to the Ministère du Développement durable for the 11 surface sites for which the city is responsible. We had evidence of this for the 2016-2017 follow-ups.

Of the city's six commitment letters for environmental monitoring of surface sites, five state that the city must submit an annual environmental monitoring report to the Ministère du Développement durable for each surface site. However, the city sends environmental monitoring reports for the 11 surface sites it owns without knowing whether the commitment letters it does not have for five of these depots specify such a requirement. This is a measure that we consider prudent and transparent on the part of the SCA.

However, in the commitment letter for the maintenance of the Newman surface site (Le Sud-Ouest borough), the city must also report on the watertightness test for the retention basin to the Ministère du Développement durable. As discussed above, the only evidence of such information being provided to the Ministère du Développement durable dates back to 2011 when this had to be done annually.

RECOMMENDATION

3.2.4.B. **We recommend that the Service de la concertation des arrondissements submit to the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques a report presenting the results of the watertightness test on the retention basin at the Newman surface site (Le Sud-Ouest borough) in order to comply with the requirements related to the certificate of authorization for the operation of this surface site.**

BUSINESS UNIT'S RESPONSE

3.2.4.B. ***Service de la concertation des arrondissements***

[TRANSLATION] Plan the operations of the watertightness tests in the Newman retention basin. ***(Planned completion: December 2018)***

4. CONCLUSION

Under the *Regulation respecting snow elimination sites*, it is mandatory to obtain authorization from the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (Ministère du Développement durable) in order to dispose of cleared snow, both at surface dump sites and sewer chutes. The process to obtain authorization is governed by the *Environment Quality Act*, which imposes conditions to be met for the operation of the snow disposal infrastructure. For surface sites, the requirements include environmental monitoring to determine whether snow disposal affects the quality of groundwater and surface water, as well as annual maintenance to ensure the site is functioning properly. For sewer chutes, there are no requirements for environmental monitoring, except for maintenance. The environmental criteria to be met for surface sites are based on the regulations in effect at the time of the application for authorization, but also pertain to site-specific conditions. Thus, environmental monitoring does not have to be conducted systematically based on the regulation at the time of application or on current regulations. It is the content of the certificate of authorization and the commitments made by the applicant (the city) at the time of the application that have to be relied on.

The city has 28 Snow Disposal Sites for the 8,000,000 m^3 to 14,000,000 m^3 of snow it clears each winter from its own streets and from certain private properties, for which contractors must pay fees to use the designated sites. All these Snow Disposal Sites have been approved by the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques. Since 2015, planning for the use of these Snow Disposal Sites and the environmental monitoring of surface sites have been carried out by the Service de la concertation des arrondissements. The boroughs are responsible for doing maintenance work.

Generally speaking, as part of our audit work, we observed that the city does have a snow disposal strategy, that it conducts environmental monitoring of surface sites and that the boroughs do some maintenance of surface sites and sewer chutes, which are mechanized. However, there is room for a number of improvements so that the city can ensure that the disposal of snow is undertaken in full compliance with its commitments to the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, and in an optimal way, for all Snow Disposal Sites. We base this on the following facts:

- The city does not have the content of all the certificates of authorization for the surface sites and sewer chutes. For almost half of the surface sites (5/11), it has no guarantee that its environmental monitoring is complying with the certificates of authorization. The city conducts environmental monitoring of surface sites by replicating the monitoring program used in previous years. For most surface dumps (8/11) and all sewer chutes (16/16), it cannot guarantee that the maintenance performed is in compliance with the commitments made to the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques;

- Maintenance of surface sites is not documented, either in terms of what needs to be done or what has been done. The city is therefore unable to rigorously demonstrate that it has a maintenance program in place for its Snow Disposal Sites;

- The snow disposal strategy, which designates a priority disposal site for each area to be cleared in a borough, changes little from year to year. Before the Service de la concertation des arrondissements took over the management of this strategy with the boroughs, the latter were responsible for the management of Snow Disposal Sites on their territory. The current strategy remains tainted by this type of fragmented small-scale management, rather than being optimized on a territorial scale based on the disposal capacities of the various Snow Disposal Sites and the direct and indirect costs of these infrastructures;

- While the city cannot of course control the amount of snow it receives during a winter, its snow disposal strategy does lack flexibility for some of the surface sites. Consequently the maximum permitted amount of snow dumped at certain sites is sometimes exceeded by the end of a season. During the 2016-2017 winter season, the surface sites at 46th Avenue (Lachine borough), Angrignon (LaSalle borough), Thimens (Saint-Laurent borough) and Langelier (Saint-Léonard borough) exceeded the allowable snow accumulation capacity according to their certificate of authorization;

- Sometimes the city has to redirect snow loads to disposal sites other than those originally planned. However, the city is not equipped to optimally re-allocate Snow Disposal Sites in real time;

- The city reports annually to the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques by submitting environmental monitoring reports for all surface sites under its responsibility. However, the report produced internally by the Service de la concertation des arrondissements with respect to snow removal activities says nothing about environmental compliance and exceeding the capacity of surface sites.

Lastly, regarding access to the sites, the city's Système intelligent pour le transport de la neige can control access to its sites for trucks transporting snow from city streets and sidewalks, as well as from private property. To this end, the issuance of single bar-coded snow deposit coupons that contractors have to procure in order to dump their snow has enabled the city to establish reliable mechanisms for:

1. controlling access to designated dumps for private snow dumping;
2. ensuring that the use of these sites is subject to the current rates, and that this is based on the type of truck used, by registering the single snow dump ticket.

5. APPENDICES

5.1. OBJECTIVES AND EVALUATION CRITERIA

OBJECTIVE

Ensure that the city disposes of cleared snow in an efficient and safe manner, in compliance with current laws and regulations.

EVALUATION CRITERIA

- Existence of a city-wide snow management program.
- Snow dump sites and sewer chutes comply with government and municipal requirements and regulations in force within the territory of the city.
- Reliable mechanisms are in place to ensure that regulations are enforced with respect to snow disposal by businesses or private citizens when using surface sites.
- Maintenance and preparation activities for efficient, compliant and safe winter operations of surface sites and sewer chutes are conducted annually.
- Fees associated with the issuance of coupons allowing the use of snow dumps are duly paid by applicants based on current rates.
- Existence of access control mechanisms to ensure that the city only manages snow removed on its territory or that revenues from access fees are collected.
- Regular reporting mechanisms are in place to monitor effective management of snow dumps.

5.2. CHARACTERISTICS AND DISCHARGE CAPACITIES OF SURFACE SITES FOR SNOW DISPOSAL

NAME	BOROUGH	PRIVATE SNOW ACCEPTED	CAPACITY (m^3)	YEAR CERTIFICATE OF AUTHORIZATION OBTAINED[A]	KNOWN COMMITMENTS		ENVIRONMENTAL MONITORING PERFORMED
					ENV. MONITORING	MAINTENANCE	
SURFACE SITES IN BOROUGHS AUDITED							
Sartelon	Saint-Laurent	Yes	345,000	2002	Yes	No	External
Thimens	Saint-Laurent	Yes	478,210	2004	No	No	External
Newman	Sud-Ouest	No	375,000	2011	Yes	Leak test	SIVT
Carrière Saint-Michel	Villeray–Saint-Michel–Parc-Extension	Yes	5,040,000	2008	No	No	SIVT
SURFACE SITES IN UNAUDITED BOROUGHS							
Ray-Lawson	Anjou	Yes	2,450,000	2002	No	No	External
46th Avenue	Lachine	Yes	250,000	1997	No	No	SIVT
Angrignon	LaSalle	Yes[B]	1,500,000	1998	No	No	SIVT
Highway 13	Pierrefonds-Roxboro	No	53,550	2007	Yes	Regular cleaning of basin	External
Château Pierrefonds	Pierrefonds-Roxboro	Yes	200,000	2003	Yes	Regular cleaning of basin	External
Armand-Chaput	Rivière-des-Prairies–Pointe-aux-Trembles	Yes	1,400,000	2004	Yes	No	External
Langelier	Saint-Léonard	No	700,000	2000	Yes	No	External
PRIVATE SURFACE SITE USED BY CITY OF MONTRÉAL							
Lafarge	Montréal-Est (related municipality)	No	1,500,000	1999	The city is not responsible for maintenance and environmental monitoring of this surface site.		

[A] Year in which last certificate of authorization was obtained; other certificates of authorization may have been previously requested.

[B] Although the city by-law, at the time of our audit (November-December 2017), does not mention that the Angrignon site accepts snow from private property, the city website identifies it in this way. For 2018 the by-law includes the Angrignon site.

Sources: Letters of authorization for operating the Snow Disposal Site, *By-law 16-065*. Environmental monitoring reports.

5.3. CHARACTERISTICS AND DISCHARGE CAPACITIES OF SEWER CHUTES FOR SNOW DISPOSAL

NAME	BOROUGH	PRIVATE SNOW ACCEPTED	CAPACITY (m^3/H)	YEAR CERTIFICATE OF AUTHORIZATION OBTAINED[A]	KNOWN COMMITMENTS[B]
SEWER CHUTES IN AUDITED BOROUGHS					
Jules-Poitras 2	Saint-Laurent	No	1,050	2005	No
Stinson	Saint-Laurent	No	1,925	1998	No
Anbar	Sud-Ouest	No	No record exists[C]		No
Butler	Sud-Ouest	No	2,150	2000	No
SEWER CHUTES IN UNAUDITED BOROUGHS					
Jules-Poitras 1	Ahuntsic-Cartierville	No	1,250	N/A[D]	No
Millen	Ahuntsic-Cartierville	No	1,300	N/A[D]	No
Poincaré	Ahuntsic-Cartierville	No	N/A[E]	N/A[D]	No
Sauvé	Ahuntsic-Cartierville	No	1,070	N/A[D]	No
Saint-Pierre 2	Côte-des-Neiges–Notre-Dame-de-Grace	No	1,100	N/A[D]	No
Saint-Pierre 1	Lachine	No	2,100	N/A[D]	No
De Lasalle	Mercier–Hochelaga-Maisonneuve	No	1,610	1997	No
Lausanne	Montréal-Nord	No	1,200	1991	No
Verdun	Verdun	No	2,700	2003	No
Iberville	Ville-Marie	No	390	N/A[D]	No
Fullum	Ville-Marie	No	2,250	1996	No
Riverside	Ville-Marie	No	1,100	2015	No

[A] Year in which last CA was obtained; other CAs may have previously been requested.

[B] No letters of commitment from the city with regard to the applications for authorization. The city does not consider that there are any, since environmental monitoring is not possible for sewer chutes. Environmental monitoring is not required for this type of Snow Disposal Site. However, it is necessary to include an infrastructure maintenance plan when applying for authorization. This is a commitment that the city must honour.

[C] No presentation sheets for the Anbar sewer chute were provided by the Service de la concertation des arrondissements.

[D] The CSA did not track down the certificates of authorization.

[E] The sewer chute presentation sheet provided by the Service de la concertation des arrondissements for Poincaré does not contain data on its snow management capacity.

Sources: Letters of authorization for operating the Snow Disposal Site, *By-law16-065*, Snow Disposal Site presentation sheets produced by the Service de la concertation des arrondissements.

5.4. LOCATION OF SNOW DISPOSAL SITES ON THE CITY OF MONTRÉAL'S TERRITORY