

## REGULAR COUNCIL

TO:            **Mayor & Council**

DATE: **February 2, 2017**

FROM:        **General Manager, Engineering**

FILE: **5400-45**

SUBJECT:     **Review of Snow and Ice Operations**

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## RECOMMENDATION

The Engineering Department recommends that Council receive this report for information.

## INTENT

The intent of this report is to provide an overview of the weather impacts from this winter season and discuss the City's performance and approach to dealing with snow and ice events in general, including identified areas for improvement.

## BACKGROUND

The City's Snow and Ice Control Policy, attached as Appendix "I", was established to reflect the realities of the intermittent icy road conditions and relatively short duration snow events typical for the Southwest Region of British Columbia during winter months. In the interest of public safety as a priority, our resources are mainly equipped to levels required to ensure the effective management of snow and ice accumulations on arterial and major collector roads, as well as on streets with steep hills.

### Weather Trends

For a period of 44 consecutive days spanning December 4, 2016 to January 16, 2017, temperatures were at, or below, 0° Celsius, making it the longest duration for freezing temperatures since the 1984/85 winter season. As reflected in "Metro Vancouver Regional Historic Winter Weather Data" attached as Appendix "II" - Figure 1, the region has experienced only 14 similar long duration cold snaps in the past 100 years, according to Environment Canada historic weather data.

While residents can generally tolerate the types of short duration snow accumulations/icy conditions typical for this region, as the duration becomes more extended and access problems linger residents become less tolerant. The combination of winter weather that typically results in high levels of public demand for snow clearing in residential subdivisions and any level of snow accumulation along with prolonged sub-freezing temperatures becomes difficult for our residents.

As reflected in Appendix “II” - Figure 2, we have experienced only three such winters in the past 25 years where snow accumulations lasted much longer than the typical three day period. In addition, as illustrated in Appendix “II” - Figure 3, regional weather trends over the past 40 years suggest that our winters are becoming increasingly warmer with a downward trend in total snowfall per winter.

### **Snow and Ice Maintenance**

The prolonged freezing temperatures of this winter season created challenges for Lower Mainland municipalities with respect to snow and ice clearing operations. A major contributing factor was the shortage of salt supply within the region. Due to high demand for salt throughout December 2016, local suppliers of municipal road salt had depleted most of their inventory and reserves by the end of December 2016. As a result, several municipalities prematurely ran short of road salt supply.

In contrast, the City of Surrey did not experience a shortage of road salt. The City’s salt supply facility contains a storage capacity of 17,000 tonnes of road salt. The large storage capacity was specifically designed to safeguard the City against intermittent harsh winters.

Overall, the City’s arterial roads and major collectors were very well maintained throughout the cold snap. Our ability to respond well to the snow and ice events was based on several improvements that were introduced subsequent to the previous significant snow season of 2008/09 when record snowfall caused challenges throughout the region.

“City of Surrey Winter Maintenance Quick Facts” attached as Appendix “III” reflects the improvements made to the number of equipment the City uses for snow and ice operations following the 2008/09 winter season. It also reflects effective changes that were made to our operation that have helped to enhance our response to winter storms which include:

1. New Road Salt Storage Facility;
2. Road Brining Operations;
3. Use of Intersection Cameras to Enhance Snow Maintenance Operations; and
4. Customer Communication Enhancements.

While staff responded well to dealing with snow and ice clearing on the City’s arterials and major collector streets, throughout the 44 day cold snap, the City received a high number of service demands from residents for snow and ice clearing in residential subdivisions. In addition, many commercial and residential property owners across the City had not cleared their adjacent sidewalks, which prompted further demands from the public for higher levels of service from the City.

This report identifies lessons learned from this current winter’s experience, along with a number of areas that staff will explore to further improve services moving forward.

## **DISCUSSION**

As noted in the preceding section of this report, the City's policy for snow and ice maintenance focuses mainly on First Priority (arterial streets) and Second Priority (collector roads) routes. Third Priority routes, identified as local residential streets, are typically not serviced for snow and ice clearing, with the exception of an extenuating circumstance, such as roads with steep hills.

### **Local Roads**

Snow removal on Third Priority routes is considered a low priority, since accumulations on residential streets generally result in temporary public inconvenience as opposed to public safety concerns. As noted earlier in this report, a small number of local roads are elevated in priority if they have a significant grade.

The City's snow and ice maintenance initiatives proved beneficial in terms of the City providing timely clearing of First and Second Priority routes, ensuring the safe movement of traffic throughout Surrey. In this regard, City crews consistently provided thorough coverage of these routes and received well-deserved praise from the public in addition to favourable news coverage. However, due to the intermittent nature of the snow and rain events followed by the unusually long periods of sub-freezing temperatures, many residential streets across the City were covered in ice. This generated a high number of service requests from residents demanding snow and ice clearing on their streets.

Given that our Policy has been to focus on Third Priority routes only after First and Second Priority routes are completed and the snow threat has subsided, we were not able to commence servicing residential streets until December 14, 2016 (after approximately 10 days following the initial December 4 snowfall and onset of subfreezing temperatures).

The City is not equipped to service local streets for snow and ice clearing. We carry out this work to the best of our ability with the resources available, prioritizing service requests received on certain priorities such as waste collection days, steepness of road grade, potential medical concerns, etc.

In order to service residential streets to the same levels of service provided on First and Second Priority routes, the City would need to significantly increase its equipment, resources and implement fundamental changes to on-street parking. Across Surrey, on-street parking on both sides of the street is permitted on the majority of local roads. For the purpose of snow removal operations, this severely restricts snow plow passage and does not permit for the deposit of plowed snow. In many cities across Canada where local roads are plowed, parking is typically limited to one side of the street only during the winter season. This allows for safe and unhindered passage of snow plows, as well as for the depositing of snow on the opposite side of the street where parking is restricted. Residents are then required to remove snow blockages from their driveway to access the road. It is suggested that implementing similar provisions in Surrey would be an intensive process, and would likely not be embraced by a majority of property owners, many of which rely on on-street parking. It also would not be worthwhile, given that snow accumulations do not typically last more than three days in the region.

Snow plows are designed to be operated at 50 – 60 km per hour. Plowing on local roads in subdivisions would require a reduction to a safe operating speed of less than 20 km per hour, and would require backhoes and loaders to clear cul-de-sacs. Based on the combined reduction in speed required to operate safely, and the higher frequency of turning around (i.e., three-point-turns) at dead ends, it is estimated that servicing local roads may be 4 – 5 times more costly per lane km than doing so for high priority roads. Accordingly, this would increase the total cost to provide snow clearing service from the 2016/17 winter season expenditure of \$3.5 million to an estimated cost of \$9 million for the same level of service. This cost does not include the clearing of residential driveways where plowed snow is deposited.

Engaging external contractors in lieu of the City investing in additional equipment may be a less expensive alternative, but would still require the City to pay a minimum retainer each year to ensure contractor availability at costs that would be undoubtedly higher than our current budget.

Given the higher costs associated with these approaches, and in consideration of the relatively low frequency of long duration winter storm events in this region, investing in additional equipment and resources to deal with the clearing of snow on residential streets, or engagement of contractors for this purpose is not recommended. Most years, the additional equipment would not be required due to infrequent snow accumulations, and would therefore sit idle. Similarly, the engagement of contracted serviced would be infrequent.

Notwithstanding the above, staff are reviewing alternative approaches to improving our current response time for residential streets in the event of a similar winter season with long duration snow and ice events.

### **Sidewalks and Parking Lots**

As per City of Surrey Bylaw, snow and ice clearing of sidewalks is the responsibility of the adjacent property owner. This is a long-standing Bylaw in Surrey and mirrors similar requirements in municipalities within the region and many cities across Canada. This Bylaw is necessary since, otherwise, it would take a significant number of resources and time to clear sidewalks across the City.

Over the course of the six week period extending December 4, 2016 to January 16, 2017, our Bylaw Enforcement officers issued a total of 1,043 warnings to property owners to shovel their adjacent sidewalk. A total of 81 fines were ultimately issued for non-compliance, which included 49 commercial properties and 32 residential properties. These included citations where it was discovered that the property owners shoveled snow from their parking lot, strata or sidewalk onto the City right-of-way, making either pedestrian or vehicle passage a challenge.

The City places out annual reminders to property owners of their obligations to shovel their frontage sidewalks via local media (social media, website, newspaper ads, etc.). The messaging also reminds the public to ensure that the snow is not piled onto City right-of-way. Given the high number of service request demands from the public asking that the City shovel their frontage sidewalk, and the many observations made where parking lot owners had shoveled the snow onto the travel portion of the road or piled it onto an adjacent sidewalk, it is apparent that many citizens are not aware of their obligations under the Bylaw.

Staff are exploring methods to provide improved customer outreach and engagement, with the goal of significantly increasing awareness of property owner responsibility under the Bylaw. Staff will also explore where it may be justified for the City to:

- a) Increase business property owner compliance to snow clearing, particularly in high pedestrian commercial areas across the City;
- b) Increase Bylaw Enforcement activities during snow events for the purpose of increasing awareness and compliance;
- c) In the interest of public safety:
  - i. Identify and maintain key pedestrian linkages (i.e., sidewalks, pathways, etc.) located adjacent to urban forests or other City owned lands where snow clearing is not provided; and
  - ii. Take on the clearing of certain sidewalks and walkways under special circumstances.

### **Snow Clearing at City Facilities**

The City presently operates 82 facilities, not including parks or properties managed by the Realty Services Division.

The Community and Recreation Services (CRS) Division manages snow and ice control at all the Community and Recreation Services Facilities and several other civic facilities, such as City Hall, the Operations Centre, Animal Shelters, Libraries, etc., from 3 p.m. to 7 a.m. Monday to Friday and all day on weekends. The work is coordinated by two zone coordinators who are informed by each respective facility coordinator, based on the types of programming and opening hours of the specific recreation facilities. This service is not budgeted for and carried out by private contractors. CRS had previously developed a plan of action to deal with heavy snowfall and ice conditions in 2008; however, while many aspects of their plan have worked well, CRS has identified a number of areas for improvement that deal specifically with the management of their parking lots and adjacent walkways. The details of their plan are attached as Appendix "IV".

The Parks Division of the Parks, Recreation & Culture Department carries out snow and ice control directly at the three City Cemeteries and at public parks that have 50+ public buildings located within them Monday to Friday during business hours. Snow and ice control is also carried out in the parking lots and pathways that service artificial turf fields after removal of snow from the fields.

When public building areas have been completed, the Parks Division moves to snow and ice control on pathways and sidewalks bordering parkland. With 108 km of public sidewalks fronting parkland and 245 km of internal park pathways, it is understood that the Parks Division is able to only remove snow and ice from key areas, focusing on priority areas such as those parks adjacent to elementary schools, and parks such as Holland Park where the park pathways serve key neighbourhood connections.

### **Potholes**

Prolonged subfreezing temperatures typically result in an increased number potholes forming. Accordingly, this winter season municipalities across the region have been challenged dealing with a very sharp increase in potholes, with Surrey being no exception.

Potholes typically form due to a poor sub-base and/or compaction during initial construction where, subsequently, cracks occur and water enters the road through the cracks, saturating the sub-base and making the road surface weaker at that spot. The constant weight of vehicles travelling on the surface eventually causes the pothole to form. Freezing temperatures can accelerate the problem where water entering the cracks will crystalize, increasing in size, and forcing the top layer of asphalt to break away.

Within the 44 day period of this winter season's cold snap, City crews repaired over 2,100 potholes, compared to the same 44 day period one year ago when we repaired only 800 potholes.

The City becomes aware of potholes through customer service requests. Once a request is received, crews will repair the pothole within 24 hours. The vast majority of potholes are discovered by City crews themselves throughout their daily travels.

In cold weather, crews use a petroleum-based pliable material called "cold mix" as a temporary measure to repair the pothole. The cold mix is placed in the pothole and compacted. It immediately hardens, allowing traffic to drive over the pothole. A proper repair is subsequently made in the spring when the weather is warmer and drier.

On average, City crews repair approximately 9,000 potholes each year. During the previous significant winter season (2008/09), crews repaired over 13,000 potholes.

Our budget to repair potholes is approximately \$1.2 million per year. Our costs were slightly under budget for the 2016 calendar year. While it is too early to predict cost impact for 2017, it is likely that our total pothole repair count number will be higher than an average year due to the unusually long duration of sub-freezing temperatures we have been experiencing.

### **Snow and Ice Maintenance Budget**

The Engineering Department's 2016 Winter Maintenance Budget was \$3.5 million. While 2016 expenditures have not been finalized, staff anticipate that we will fall within budget. The 2017 Winter Maintenance Budget is slightly higher at \$3.6 million. Given that this budget is based on a calendar year, it is too early to project year-end expenditures. If seasonal temperatures remain with us for the balance of this winter season, as well as the winter months of late 2017, we will likely fall within our allocated budget again for 2017.

The winter maintenance budget also includes an Emergency Fund reserve of \$5 million that is drawn upon to supplement the regular snow clearing budget in years when above average snowfall occurs. In years when the annual snow clearing budget is not fully expended, some of the residual funds are deposited in the Emergency Fund to ensure that the Fund remains viable over time.

### **SUMMARY OF REVIEW ITEMS**

Based on this reports, the following summarizes the areas that staff will review to improve on our snow and ice clearing services:

1. Review the City's response time for snow and ice clearing services on Third Priority routes (residential streets) in the event of a prolonged snow event and investigate alternative solutions;

2. Increase business property owner compliance to snow clearing, particularly in high pedestrian commercial areas across the City;
3. Increase Bylaw Enforcement activities during snow events for the purpose of increasing awareness of property owner responsibility and compliance;
4. In the interest of public safety:
  - a. Identify and maintain key pedestrian linkages (i.e., sidewalks, pathways, etc.) located adjacent to urban forests or other City owned lands where snow clearing is not provided; and
  - b. Investigate the City potentially taking on the clearing of certain sidewalks and walkways under special circumstances;
5. Review how the City can better service its own frontage sidewalks and parking lots at Civic facilities and parks.

Staff will subsequently report back to Council later this year following the conclusion of the above review.

## CONCLUSION

This current winter season has been one of the coldest on record for the Metro Vancouver Region with prolonged snow accumulations, sub-freezing temperatures and icy road conditions.

While these types of winter weather events are not common for the region, as suggested by historic weather data, the City has proven it has the appropriate level of equipment, manpower and supplies to ensure that snow and ice events are effectively managed on our priority routes

However, prolonged icy road conditions on residential streets had generated a high number of service demands from residents for snow and ice clearing, along with complaints of icy sidewalks. This report addresses these issues and includes a summary of items that City staff will review and subsequently report back to Council.

Fraser Smith, P.Eng., MBA  
General Manager, Engineering

RAC/cc

Appendix "I" - City of Surrey Snow and Ice Control Policy  
Appendix "II" - Metro Vancouver Regional Historic Winter Weather Data  
Appendix "III" - City of Surrey Winter Maintenance Quick Facts  
Appendix "IV" - Community and Recreation Services Ice Control and Snow Removal Plan  
Summary



# CITY POLICY

No. H-22

**REFERENCE:**

REGULAR COUNCIL MINUTES  
28 JANUARY 1991  
PAGE 5

**APPROVED BY:**

CITY COUNCIL

**DATE:** 10 MARCH 1997 (RES.R97-622)**HISTORY:**

28 JANUARY 1991  
14 JANUARY 1991  
9 JANUARY 1978

**TITLE: SNOW & ICE CONTROL**

1. Sanding/Salting and Snow plowing operations shall be conducted according to the following priorities:
  - a) First Priority: Arterial roads, major collector roads, bus routes and hilly areas (regardless of road classification) are given first priority. Sanding and plowing are carried-out, around the clock, as long as poor conditions exist.
  - b) Second Priority: Secondary through roads in residential areas. These local roads exist between the arterial or major collector road grid. They are typically over 200 meters in length and connect local traffic with either an arterial or major collector roadway. All secondary priority work is performed during normal work hours only.
  - c) Third Priority: All remaining residential roads. Third priority routes will be only done as directed by the General Manger of Engineering or his delegate. The General Manager of Engineering shall inform Council of the decision to address third priority routes. These areas will be dealt with in a systematic manner starting with the more significant roads, hill areas, specific problem locations (as identified by the public and Area Managers). All third priority work is performed during normal work hours.
2. First priority routes are maintained until the conditions are under control; only then are resources redirected onto second priority routes. Surfaces shall be maintained as bare as possible through continued use of assigned personnel and equipment.
3. Once conditions are under control on secondary routes resources can be directed to third priority routes.
4. Third priority routes are only addressed under the direction of the General Manager of Engineering or his delegate.



5. As soon as conditions deteriorate on any of the previous priority routes, resources are moved back to those routes.
6. All sanding/salting and plowing operations with the exception of first priority routes are to be completed within normal working hours unless directed by the General Manager (or designate) of Engineering. First priority routes are addressed around the clock.
7. Snow removal and snow plowing occurs when the snow depth exceeds 10 centimeters (4 inches).
8. Snow removal from sidewalks is the responsibility of the adjacent property owners.

### Metro Vancouver Regional Historic Winter Weather Data

Figure 1: Metro Vancouver Region: Winters with the Longest Cold Snaps in the Past 100 Years

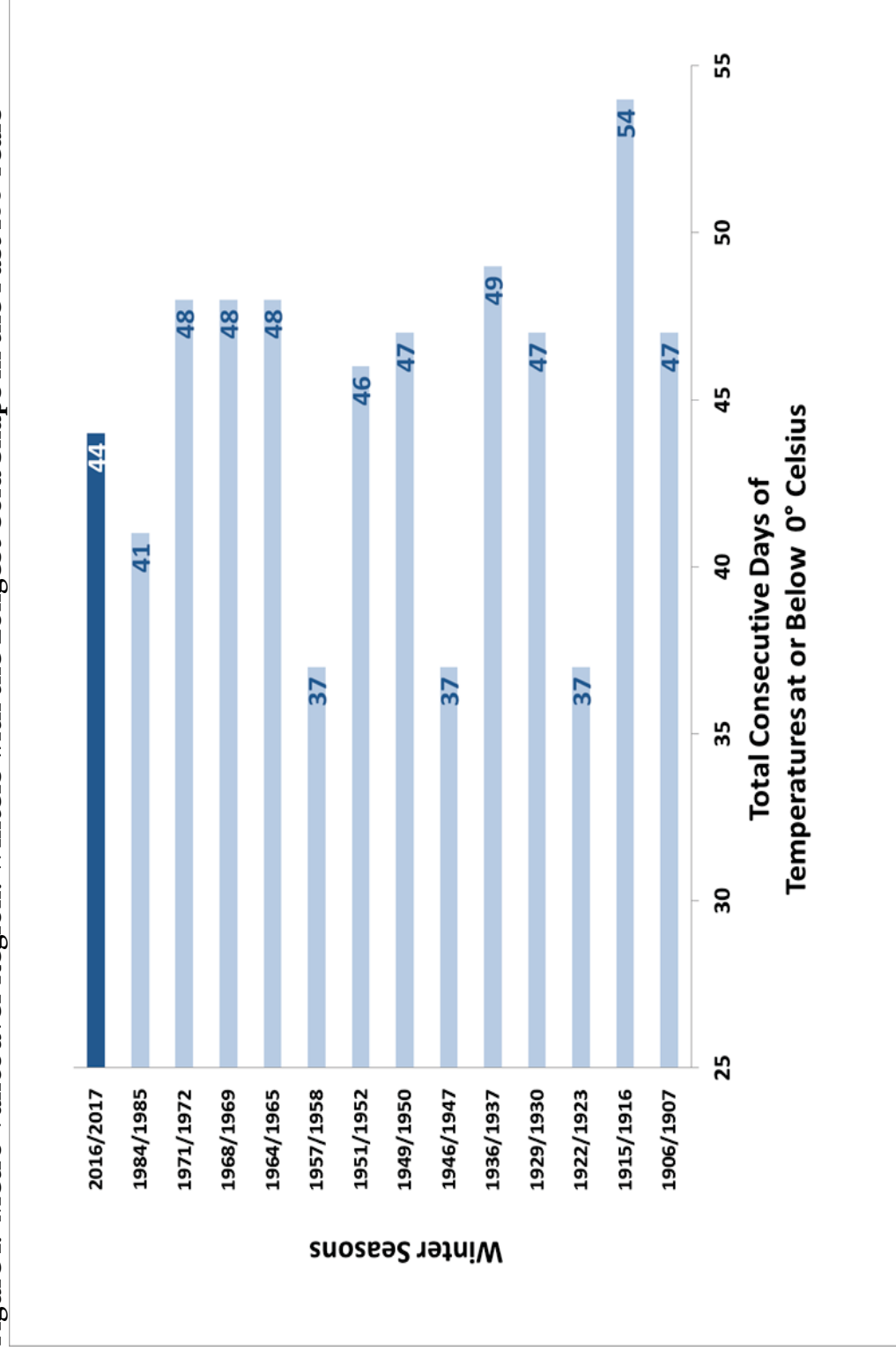


Figure 2: Metro Vancouver Region Winter Weather: Past 25 Years

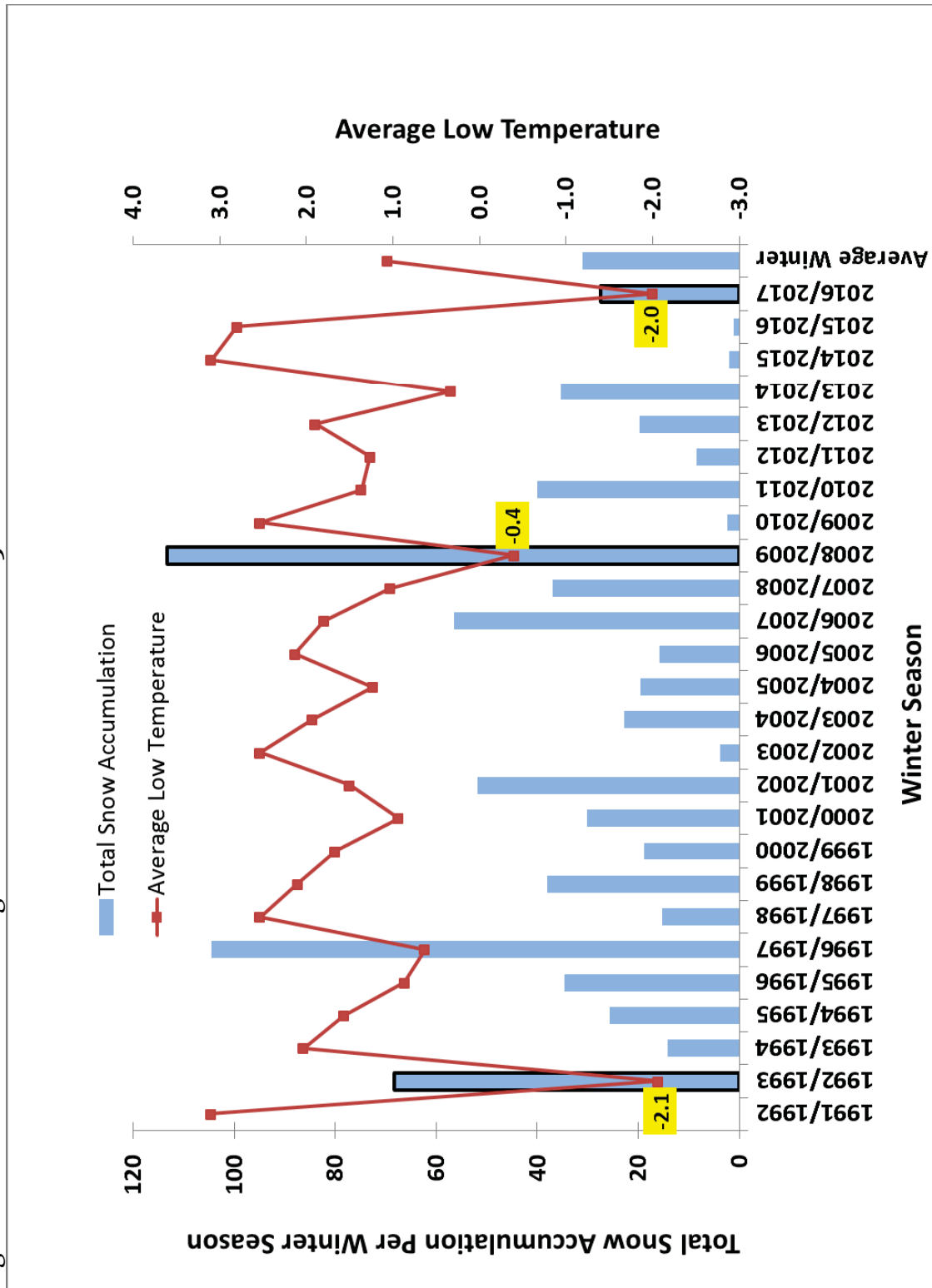
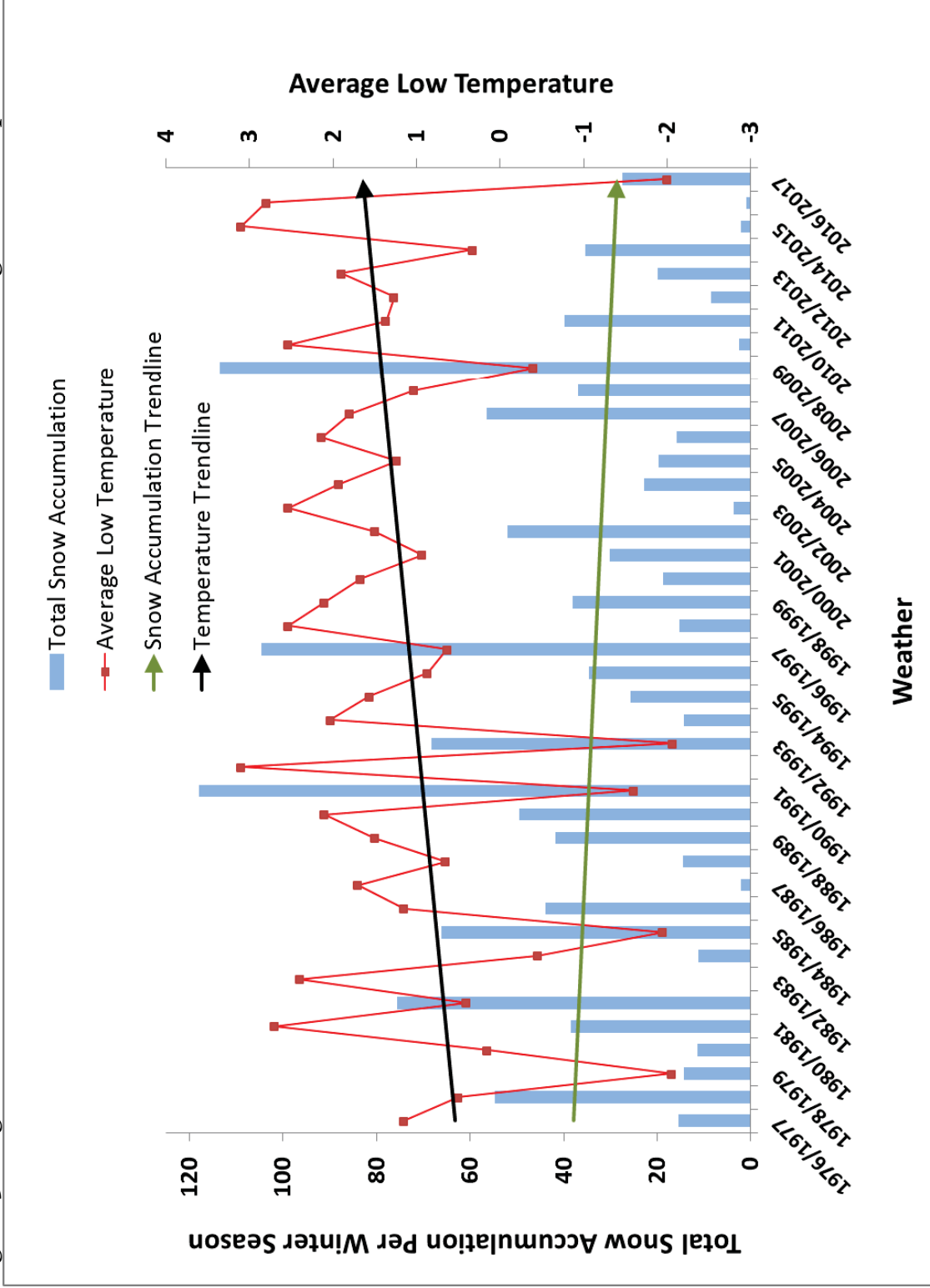


Figure 3: Region Winter Weather Trends: Annual Snow Accumulation and Average Low Temperatures



## City of Surrey Winter Maintenance Quick Facts

### Equipment:

- Our Snow and Ice Clearing equipment has nearly doubled since the 2008/09 Winter.

<u>Equipment Type:</u>	Number of Units	
	<u>2008/09 Winter</u>	<u>2016/17 Winter</u>
Dump Trucks:	20	24
Crane Trucks:	1	1
One-Ton Trucks:	9	22
Graders:	3	5
*Brining Units:	0	10
<b>Total Snow Clearing Equipment:</b>	<b>33</b>	<b>62</b>

\*in 2009 we piloted 3 brining units (not included in above numbers). Each year, we convert 10 of our dump trucks into Brining (anti-icing) units during cold, dry weather. Once snow falls, the 10 dump trucks are converted back to snow plowing/salt spreading units.

### Total Kilometers of Road in Surrey (2017):

- 2,031 km

### Surrey Snow & Ice Priority and “Lane” Kilometres:

- Priority 1: 1,500 lane km
- Priority 2: 1,200 lane km
- Priority 3: 1,800 lane km
- Total: 4,500 lane km

### 2017 Winter Maintenance Budget:

- \$3.6 million – includes plowing, salt spreading, anti-icing and salt supply

### Road Salt Quick Facts:

- City of Surrey Road Salt Storage Facility Capacity: 16,000 metric tonnes
- Road salt use in a typical winter: 6,000 metric tonnes
- Road salt use last winter (2015/2016 winter season): 4,000 metric tonnes
- Road salt use this winter (so far): 17,000 metric tonnes

### **Additional Improvements to our Snow and Ice Operations since 2008/09:**

1. **New Road Salt Storage Facility:** Over the course of a typical winter season, the City uses approximately 6,000 tonnes of road salt. During the 2008/09 winter season, the City used over 14,000 tonnes of road salt. We had struggled (then) to keep up to salt demands due to the lack of local supply combined with our previous salt storage capacity of 4,000 tonnes. As a result, the City's new salt storage facility, constructed in 2010, contains a storage capacity of 17,000 tonnes to safeguard the City against intermittent harsh winters.
2. **Road Brining Operations:** Salt Brining allows crews to apply a brine/salt solution to the surface of major roads in advance of forecasted snow and ice conditions. The brine application dries on the road, with the residual salt taking effect immediately when snow begins to fall or when freezing temperatures occur (i.e., activated by the moisture). This approach reduces the accumulation of snow and ice on treated pavement surfaces, which increases the window of time for our crews to effectively mobilize snow and ice services when snow events occur.
3. **Intersection Cameras:** By accessing the City's network of intersection cameras, the City's Central Dispatch staff, situated within the Operations Centre, can instantaneously observe (live) snow impacts across the City during a snowfall event. Rather than simply remain on the same snow plow route for the duration of a shift, the snow maintenance fleet are dispatched to areas that may require more attention to increased snowfall, i.e., due to high elevations, dropping temperatures, etc. The use of intersection cameras for this purpose has provided for one of our most significant efficiency increases.
4. **Customer Communication Enhancements:** Over the past 8 years, the City has introduced several improvements in the manner to which residents can communicate with staff, including access to submitting service requests 24/7 via the use of the My Surrey App and City website, as well as posting concerns via the City's social media channels. Conversely, the use of social media and the City website by staff to push out time sensitive information, both during and after regular business hours, has helped to keep the public informed in a timely manner.

## APPENDIX “IV”

### Community and Recreation Services Ice Control and Snow Removal Plan Summary

In 2008, an *Ice Control and Snow Removal Plan* (the “Plan”) was developed for the Community and Recreation Services (CRS) Division of the Parks, Recreation & Culture Department. The purpose of the Plan was to ensure that the facilities within the CRS Division provided safe access and egress for staff and patrons during inclement weather.

The Plan is reviewed and edited annually, informed by feedback from all parties at a post winter season debriefing. Prior to the next season, the Plan is revised and reviewed by a staff committee.

The Plan is comprised of two main elements:

1. **Parking Lots:** Clearing of parking lots and access roads are carried out by a combination of Parks Division staff and CRS Division staff. Parks Division staff service many of our sites during business hours Monday to Friday, excluding holidays. The CRS Division coordinates the contractors at facilities not located within a park. The CRS Division also coordinates contractors during evenings, weekends and holidays, as well as during the week to supplement Parks staff during significant snowfall events.
2. **Walkways:** At most locations, the clearing of the entrances, pedestrian corridors and sidewalks are done by CRS facility staff.

The Plan now includes a number of Civic Facilities such as City Hall, Old City Hall, Crown Counsel parking lot, the Operations Centre, Libraries and the Animal Shelter.

### Overview of the Plan

There are four levels of staff involvement:

1. CRS facility staff are responsible for ensuring that snow clearing tasks are completed at their facility. Salt spreaders, snow shovels and, in some locations, snow throwers are utilized.
2. CRS facility staff are responsible for overseeing the plan at each specific site. They report to the Town Centre Coordinators, communicating on priorities, conditions and progress.
3. Town Centre Coordinators amalgamate information from all facilities in their Town Centre and report to the Zone Coordinator on Town Centre conditions and priorities.
4. Zone Coordinators compile all information from the Town Centre Coordinators and develop daily plans for the contractors.

Comments for the 2016/2017 Season to date:

- The Plan worked well, but the nature of ongoing snow and ice events over a considerable period of time has revealed some gaps in the plan, which will be reviewed in upcoming debriefing meetings;
- Communication of the Plan and the structure of the Plan is effective;
- CRS Division coordination of contractors with the Parks Division has been positive and helps to streamline efforts; and
- Salt, sand and de-icer were in short supply at times for both contractors (in bulk) and for staff; however, interruptions from lack of supplies were infrequent and short in duration.

The cost for the contractor services to date for the 2016/17 season is \$192,000. This amount does not include the costs incurred by CRS Division for staffing and supplies, nor does it include the cost of the Parks Division staff and equipment.

Recommendations:

- Complete a comprehensive debriefing with all stakeholders;
- Decentralize the responsibility of overall coordination to specific Divisions:
  - Civic Facilities;
  - Libraries;
  - Arts and Heritage;
  - Animal Shelter;
  - Bylaws;
  - RCMP; and
  - Parks;
- Increase the number of contractors so as not to over burden one contractor; and
- Develop plans for each division that flows from a master “City Plan”.