

CITY OF TORONTO

Transportation Services Division



SALT

MANAGEMENT



PLAN

Executive Summary - August 2016

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SALT MANAGEMENT PLAN:		

INTRODUCTION

1.0 INTRODUCTION

1.1 Overview

Toronto has approximately 5100 kilometres of roads within the framework of a classification system, which provide for the safe, efficient and affordable means of surface transportation for all road users. We rely on this roadway network throughout the year for transport to the workplace, to recreation and leisure facilities, for the transport of goods and services, and for emergency and security services.

Snow and ice conditions on the road system have a dramatic impact on public safety, roadway capacity, travel time and economic costs. User safety, both pedestrian and driver, remains the most important priority within winter maintenance operations, practices and strategies contained in the Salt Management Plan.

Although there is ongoing research into the use of alternatives to road salt (sodium chloride) in winter maintenance, salt continues to be the most cost-effective de-icer across Canada. However, because of the adverse effects that salt has on the environment, the City of Toronto's Salt Management Plan strives to minimize the amount of salt entering the environment by including best salt handling practices and new technologies to ensure its most effective use over the road system.

The review strategy in the Salt Management Plan requires that new technologies be investigated and that trials be conducted on promising developments and discussed in annual assessments.

On December 1, 2001 Environment Canada published the results of a five-year assessment on the effects of road salts on the environment. The assessment concluded that road salts were, in fact, having an adverse effect on freshwater ecosystems, soil, vegetation, and wildlife. In response to the report, Environment Canada assembled the multi-

stakeholder working group that would go on to develop the “*Code of Practice for the Environmental Management of Road Salts*” released in April 2004.

The main objective of the Code of Practice is to ensure environmental protection while maintaining roadway safety. Under the Code, all public entities that use 500 tonnes of road salts per year or more and/or have any environmentally vulnerable areas must prepare a salt management plan within a year of the official release of the Code. The Transportation Association of Canada has also prepared and released a “*Syntheses of Best Practices*” in the fall of 2003 which is intended to be used in conjunction with the Environment Canada’s Code of Practice.

In a proactive response to both the growing environmental concerns regarding road salt, and the assessment undertaken by Environment Canada, the City of Toronto’s Transportation Services began the preparation of a Salt Management Plan in 2001. The Plan was completed in April 2002 and was distributed to managers and operations staff for review and implementation. As an ongoing consequence of the Salt Management Plan, Transportation Services has initiated better handling and washing practices at all City facilities while at the same time continuing to ensure road safety by better managing the City’s use of salt. The initial City of Toronto Salt Management Plan submission was filed with Environment Canada in June, 2005.

The City of Toronto’s Salt Management Plan continues to be updated.

1.2 Purpose of Document

The Salt Management Plan is intended to set out a policy and procedural framework for ensuring that the City of Toronto continuously improves the management of road salt used in winter maintenance operations.

Any modifications to the City's winter maintenance activities must be carried out in a way that provides roadway safety and user mobility consistent with the weather conditions experienced during the snow and ice control season.

The Salt Management Plan is dynamic – allowing the City to phase in new approaches and technologies in a way that is responsive to fiscal demands and needs, and that works to ensure that roadway safety is not compromised.

1.3 Legislative Authority

The City of Toronto is mandated under Ontario Regulation 612/06, Minimum Maintenance Standards for Highways in the City of Toronto, to maintain public roads in a good state of repair. The City's winter operations, standards and guidelines were most recently prescribed in a report to the Public Works & Infrastructure Committee, dated October 28, 2013, titled "Confirmation of Levels of Service for Roadway and Roadside Winter Maintenance Services (see Appendix A).

1.4 Format of Document

Chapter 2.0 of this Plan presents the Policy Direction approved by the City of Toronto Council.

Chapter 3.0 of this Plan presents the Winter Maintenance Policies that are relevant to salt management.

Chapter 4.0 of this Plan presents the summaries of Operational Practices and Strategies for Snow and Ice Control as they relate to the effective management of road salt. This chapter is presented as a series of sub-sections that can be modified as new policies, procedures and practices are introduced and refined.

Chapter 5.0 of this Plan presents the approach to monitoring the implementation of the Plan and to maintaining and updating the Plan.

1.5 Responsibilities

General Manager, Transportation Services – Responsible for ensuring that the Salt Management Plan is developed, maintained, and implemented throughout the City of Toronto.

District Directors, – Responsible for ensuring that the Salt Management Plan is developed, maintained, and implemented within each District of the City of Toronto.

District Road Operations Managers – Responsible for ensuring that the Salt Management Plan is developed, maintained, and implemented in all District Operational Yards of the City of Toronto.

District Senior Engineers, Superintendents and Supervisors – Responsible for ensuring that winter maintenance activities are carried out in a way that complies with the Salt Management Plan.

Winter Maintenance Personnel – Responsible for ensuring that they carry out their winter maintenance duties in accordance with the policies and procedures set out in the Salt Management Plan as directed by their Supervisors.

***SALT
MANAGEMENT
POLICY***

2.0 SALT MANAGEMENT POLICY

2.1 Vision, Mission, Mandate

Vision

The City of Toronto's Transportation Services Division will be recognized as a leader in using de-icers in an environmentally sensitive manner while providing for safe road and sidewalk conditions during the winter season.

Mission

The City of Toronto's Transportation Services Division will optimize the use of de-icers on Toronto's roads and sidewalks while striving to minimize salt impacts to the environment.

Mandate

The City of Toronto's Transportation Services Division is to provide safe winter conditions for vehicular and pedestrian movements as required by level of service policies and funding guidelines established by Toronto City Council.

2.2 Policy Statement

The City of Toronto will provide effective winter maintenance to ensure the safety of users of our road network in keeping with applicable Provincial Legislation and accepted standards, while striving to minimize the adverse effects that road salt can have on our environment. To meet this commitment the City of Toronto will:

- Meet and adhere to the guidelines contained within the Salt Management Plan;
- Strive to review and upgrade, as necessary, the standards contained in the Salt Management Plan on an annual basis to take into account new technologies and developments;
- Work with Environment Canada, other transportation agencies and environmental groups to upgrade best winter practices; and
- Commit to ongoing staff training and education.

2.3 Application

This policy is adopted by the City of Toronto's Transportation Services Division and applies to all employees involved in Winter Maintenance Operations.

2.4 Conditions

The following principles will guide the ongoing process to upgrade the Salt Management Plan:

- The Plan is activity-based and follows an Environment Management System framework consistent with the principles of continual improvement. It includes the following elements:
 - Periodic Review and Analysis of Industry Practices;
 - Implementation and Documentation of the Plan;
 - Education and Training of Staff;
 - Monitoring and Analysis;
 - Management Review;
 - Environmental Review; and
 - Practices and Policy Revision.
- The Plan will be reviewed and refined on an on-going basis.

2.5 Implementation

The goal of the Policy Statement is to promote the continuous development of practices and procedures to improve winter maintenance activities while striving to reduce the effects of salt on the environment.

***WINTER
MAINTENANCE
POLICIES***

3.0 WINTER MAINTENANCE POLICIES

3.1 Introduction

The major activities related to winter maintenance are:

- Salt and sand storage;
- Salt/sand spreading;
- Snow plowing (roads, sidewalks, laneways);
- Snow removal and disposal from City streets;
- Snow clearing at bus stops; and
- Windrow programme for residential driveways.

3.2 Winter Operations – Road De-Icing and Plowing

The City's level of service policy for roadway de-icing, roadway plowing and driveway windrow opening is provided in Appendices 1 & 2 of the October 28, 2013, report to the Public Works and Infrastructure Committee and subsequently adopted by Toronto City Council. That report is attached to this document as Appendix A.

Within this framework, District Road Operations Managers are allowed some latitude regarding frequency and timing of applications. Application rates have now been harmonized across the City, which were established through past practices within our urban environment.

Direct liquid application was introduced during the winter season of 2003-2004. Our current program includes different scenarios for direct liquid application. The standard application rate is 100 litres per lane km. Liquid salt brine may be applied to, hills and bridges during shoulder seasons in advance of a forecast frost event, hills and bridges during the winter season or to designated plow routes in advance of a forecast snow event where it is anticipated that road plows will be activated. Road Operations staff pay close attention to RWIS data and to the regular weather forecasts as provided by the weather forecast provider. With this technique, liquid chemicals are applied prior to a storm and they are allowed to work on roads before snow accumulates on the road and plowing is required. It is not our practice to apply liquid in the absence of a forecast event. Guidelines were laid out so that anti-icing was not to occur more than twelve hours prior to the forecast event as determined by RWIS data or weather forecasts. This was intended both to allow the weather forecast to be as accurate as possible and to ensure that applications would remain on the road. It should be noted that the City does not have at this point, the capability to liquid anti-ice the entire road network or any road classification in its entirety. The focus for anti-icing at this stage is solely on bridge decks and “priority locations” around the City.

Our present guideline is to apply a solid or solid/pre-wetted de-icer once snow starts to accumulate or “stick” on expressways, arterial roads, and collector roads. This proactive strategy reduces the amount of material that would be lost if solid de-icer was applied onto dry pavement prior to a storm. This also ensures timely applications on major expressways and arterials (i.e. within the first hour of any significant snow or ice accumulation). Timely application of chemicals is critical to preventing snow from sticking to roads. Without the timely application of chemicals, snow could easily bond to roads and in turn become difficult to plow, potentially causing road hazards. As snow accumulates, it is plowed to maintain safe driving conditions. The City still uses traditional methods on local roads that allow for an initial application of de-icer (salt) followed by plowing when storms end or accumulate to a prescribed threshold (8

cm). The development of the capability to apply pre-wet salt to local roads is currently a work in progress and several districts are making significant advances.

Currently the City of Toronto application rates for the application of dry salt on expressways, arterials, and collector roads are; 70kg/lane-km, 140 kg/lane-km and 180 kg/lane-km. Pre-wetting was first introduced to the Winter Maintenance Depots in 2003-2004 when 1/3 of the arterial road salt trucks were equipped with pre-wetting. A further 1/3 of arterial road salt trucks were outfitted with pre-wetting equipment for the winter of 2004-2005 and the final 1/3 were equipped for the winter of 2005-2006. A full 100% of the salt trucks in Winter Maintenance Depots 1 - 14 are now equipped with pre-wetting. The introduction of pre-wetting on salt trucks saw a phased-in reduction of the straight granular application rates of up to 15%. A 10% reduction in dry application rates on all trucks equipped with pre-wetting was achieved in 2004/2005 and reductions of 15% were achieved in limited trials in Toronto – East York District. Whenever pre-wet salt is applied there is now a standard 10% reduction in the dry application rate. The current rate of pre-wetting on conventional side discharge spreaders is 6% by volume.

3.3 Pilot Projects

Since the introduction of the SMP the city has continued to explore new and emerging technologies through a series of pilot projects. Liquid pilot projects first began in 2001 with the retrofitting of three trucks for pre-wetting and direct liquid applications. There are now approximately 200 trucks equipped with liquid capability that can be traced back to this initial pilot project. Subsequent pilot projects have focused on pre-wetting and direct liquid application while using alternative liquids with several objectives; to find a liquid pre-wetting agent that would lower the eutectic temperature of salt/salt brine, to reduce salt usage, and to better manage the application of salt. In addition to the work with liquids, pilot projects have dealt with the introduction of GPS/AVL, innovative plow blades,

spreader control technologies, combination salter/plow units and snow removal operations.

3.4 Snow Removal and Disposal

As a result of snow plowing operations, snow accumulates at the side of roads as windrows. The City initiates snow removal operations when these windrows reach volumes that create a nuisance or hazard to pedestrians and motorists, to maintain capacity for subsequent snowfalls, or after a designated Type 4 storm.

Experience over the years has shown that the City must have the capability and capacity to remove and dispose of 150,000 loads of snow in a two-week period. There is currently a capacity shortfall of approximately 50,000 loads. Snow removal operations involve the use of in-house mobile and stationary melters, snow blowers, front-end loaders and trucks in conjunction with various contracted equipment.

Over the years the City has used 30 different land disposal locations, two portable stationary melters, five mobile melters and one sewer snow disposal site to dispose of snow. Many of the snow disposal sites had environmental and operational constraints. Concerns over the potential environmental impacts of these sites led to a Snow Disposal Study in the year 2002. As part of this process, the disposal sites were evaluated on the basis of environmental and technical criteria. As a result of this study, the City has closed several sites and has improved the environmental protection measures at those sites that will continue to operate. There are currently only five snow disposal sites in the City of Toronto.

The City of Toronto sees melting as opposed to snow disposal sites as the way of the future as regards Snow Removal. Where possible, the objective is to melt the snow either onsite or as close to the site as possible. To this end, the City purchased a 350 tons/hr melter in 2005 and two 150 tons/hr mobile melters in 2010.

3.5 Sidewalk Snow Clearing

Mechanical sidewalk snow clearing is required along selected eligible sidewalks in the City as adopted by Council at its meeting of July 24 to 26, 2001 and as reported to the Works Committee on September 4, 2001. These levels of service were reconfirmed in October, 2008 and in October, 2013 through separate reports to the Public Works and Infrastructure Committee. Some 6000 km of sidewalk from the 7945 km total are to be mechanically cleared.

The standard of service adopted by Council provides for the clearing of sidewalks approximately twenty four times per winter season. The operation is generally deployed at a total accumulation of 2cm on high pedestrian volume sidewalks and at a total of 8cm on low pedestrian volume sidewalks. Some discretion is necessary in light of prevailing and forecast weather conditions. The entire operation is to be completed within approximately 13 hours of the end of a Type 1(up to 5cm) snowfall, although in high pedestrian traffic areas this may vary due to the need to undertake the work at night for safety reasons. This operation provides a basic level of service, clearing a walking path of about 1.2 m in width, although not to bare pavement, as surface undulations must be accommodated for. District Managers are allowed latitude in cases of freezing rain. Salt/Sand mixtures appropriate to the conditions are used as required after plowing to provide grit and traction on sidewalks. This salt/sand mixture is placed at an application rate of 100kg/sidewalk km. Criteria established to assist with the determination were as follows:

- (i) Streets greater than 8 m in width;
- (ii) Sidewalks greater than 1.5 m in width;
- (iii) Sidewalk not immediately adjacent to the street;
- (iv) Parking not immediately adjacent to the sidewalk; and
- (v) No obstructions such as utility poles, planters, or retaining walls, immediately adjacent to, or within, the sidewalk that would create significant potential for damage or an operating

- safety concern for the equipment operator or members of the public;
- (vi) Consideration to be given to whether the mechanical clearing could be done in a contiguous area. Figure 3.5.1 shows the boundaries of the different levels of possible sidewalk snow clearing.

Within the Toronto & East York District, most sidewalks adjacent to local roads do not meet established guidelines and, as such, adjacent residents are required under existing by-laws to clear the snow from sidewalks. The attached schematic map highlights that the implementation of local sidewalk snow clearing in the central areas of the City would present significant challenges due to the preponderance of narrow streets and sidewalks, amount and location of on-street parking, location of above ground utilities and retaining walls, planters, landscaping, garbage collection from the sidewalk, street furniture and lack of boulevard, or front yard snow storage space. There are vast areas where a North York District-style sidewalk plowing operation is not feasible. As well, there are other areas where some streets and blocks are feasible, while others are not.

***MONITORING
AND UPDATING
THE SALT
MANAGEMENT PLAN***

4.0 MONITORING

4.1 Overview

This chapter of the Plan includes table summaries of current practices to allow benchmarking to track future improvements and changes to the Plan.

An annual Management Review will take place as part of the implementation of the Plan. The Salt Management Plan will be updated as needed to include changes in Divisional Policy, as well as to summarize new strategies and techniques deployed. The monitoring will also allow Transportation Services to measure and report upon progress towards established goals and standards outlined in Chapter 4 – Operational Practices and Strategies.

The following areas will be included in the annual analysis and review:

- Management Practices
 - Level of service
- Equipment
 - Fleet Audit
 - Calibration Audit
- Materials
 - Salt Usage Summaries
 - Storage Facilities Audit – Salt and Salt/Sand Mixtures
- Storm Response Summary
 - Weather Forecast Equipment Summary
- Snow and Ice Control Training Summary
- Snow Removal and Disposal Summary
- Liquid Trials
- Winter Maintenance Subcommittee

- Technology Review
 - Equipment Summary
 - Methodology Review
- Communications Summary
- Environmentally Sensitive Areas
- Monitoring Programme - Chloride Level Monitoring

4.2 Management Practices – Application Rates

Current application rates are summarized in Appendix A. This section will summarize any studies where application rates were varied and present any proposed changes to the Policy.

4.3 Equipment Audits

4.3.1 Salter Fleet Audit

This section summarizes the total number of salt spreader units across the City (Table 4.3.1) in terms of location, in-house vs. private ownership and what equipment, such as electronic spreaders, spinners, etc. are on the spreaders. Table 4.3.2 summarizes the extent of pre-wetting, anti-icing and calibration being done.

**Table 4.3.1
SALTER FLEET AUDIT
(2016)**

YARD/DEPOT FACILITY		SALTER FLEET REVIEW						
LOCATION	OWNERSHIP CITY - C	Salters		Ownership	Electronic Controllers	Dual Spinners	Single Spinners	Rear Discharge
		In-use	Spare					
TORONTO-EAST YORK AREA 1								
Depot 1 – 777 Bayview Ave.	C	11	1	CONTRACT	12	12	0	0
Depot 6 – 7 Leslie St.	C	14	1	CONTRACT	15	15	0	0
433 Eastern Avenue Yard	C	10	2	INHOUSE	12	3	0	9
TORONTO AND EAST YORK AREA 2								
Depot 7 – 677 Wellington	C	13	1	CONTRACT	14	14	0	0
1401 Castlefield Ave. Yard	C	4	3	INHOUSE	7	3	3	1
1116 King St. Yard	C	5	0	INHOUSE	5	0	3	2
ETOBICOKE-YORK DISTRICT								
Depot 5 - 40 Boncer Dr.	C	22	1	CONTRACT	22	22	0	0
Depot 9 - 49 Toryork Dr.	C	18	1	CONTRACT	19	21	0	0
Depot 10 - 150 Disco Rd	C	11	1	CONTRACT	12	12	0	0
Toryork Yard - 61 Toryork Dr.	C	0	0	INHOUSE	0	0	0	0
320 Bering Avenue Yard	C	0	0	INHOUSE	0	0	0	0
NORTH YORK DISTRICT								
Depot 2 - 64 Murray Rd.	C	18	1	CONTRACT	19	19	0	0
64 Murray Rd. Yard	C	1	0	INHOUSE	1	0	0	1
Depot 3 - 195 Bermondsey Rd	C	16	1	CONTRACT	17	17	0	0
Depot 12 - 2750 Old Leslie St.	C	8	1	CONTRACT	9	9	0	0
Oriole Yard - 2751 Old Leslie St.	C	1	0	INHOUSE	1	0	0	1
Depot 11 - 86 Ingram Dr.	C	8	1	CONTRACT	9	9	0	0
SCARBOROUGH DISTRICT								
Depot 4 - 1 Nantucket Blvd.	C	18	1	CONTRACT	19	19	0	0
Depot 8 - 70 Nashdene Rd.	C	14	1	CONTRACT	16	16	0	0
Depot 13 – 1050 Ellesmere Rd	C	6	1	CONTRACT	7	7	0	0
Depot 14 - 891 Morningside Ave.	C	6	1	CONTRACT	7	7	0	0
Ellesmere Yard – 2000 Midland	C	2	0	INHOUSE	2	2	0	0
Morningside Yard – 891 Morningside	C	2	0	INHOUSE	2	2	0	0
TOTAL(S)	22	210	19		229	207	6	14
SUMMARY		ALL – /229			229/229	227/229	6/229	14/229
PERCENTAGE (%)	100%	--			100	90	3	6

Table 4.3.2
SALTER FLEET AUDIT – PRE-WETTING,
ANTI-ICING & CALIBRATION (2016)

YARD/DEPOT FACILITY		SALTER OPERATIONS			
LOCATION	OWNERSHIP CITY – C	Pre-wetting Equipment	Yard Anti-Icing Capability	Calibration	Methods
TORONTO- EAST YORK AREA 1					
Depot 1 - 777 Bayview Ave.	C	11	2	12	B/E
Depot 6 - 7 Leslie St.	C	14	2	15	B/E
433 Eastern Avenue Yard	C	8	2	12	B/E
TORONTO- EAST YORK AREA 2					
Depot 7 – 677 Wellington	C	13	1	14	B/E
1401 Castlefield Ave. Yard	C	0	1	1	B/E
1116 King St. Yard	C	0	0	0	B/E
ETOBICOKE YORK DISTRICT					
Depot 5 – 40 Boncer Dr.	C	22	2	23	B/E
Depot 9 - 49 Toryork Dr.	C	19	2	19	B/E
Depot 10 - 150 Disco Road	C	11	0	12	B/E
Toryork Yard - 61 Toryork Dr.	C	0	0	0	n/a
320 Bering Avenue Yard	C	0	0	0	n/a
NORTH YORK DISTRICT					
Depot 2 - 64 Murray Rd.	C	19	2	19	B/E
64 Murray Rd. Yard	C	1	1	1	B/E
Depot 3 - 195 Bermondsey Rd.	C	17	2	17	B/E
Depot 10 - 2750 Old Leslie St.	C	9	0	9	B/E
Oriole Yard - 2751 Old Leslie St.	C	1	1	1	
Depot 11 - 86 Ingram Dr.	C	9	0	9	B/E
SCARBOROUGH DISTRICT					
Depot 4 - 1 Nantucket Blvd.	C	19	1	19	B/E
Depot 8 - 70 Nashdene Rd.	C	16	2	16	B/E
Depot 13 – 1050 Ellesmere Rd	C	7	0	7	B/E
Depot 14 - 891 Morningside Ave.	C	7	0	7	B/E
Ellesmere Yard – 2000 Midland Ave	C	2	0	2	B/E
Morningside Yard – 891 Morningside Ave	C	2	0	2	B/E
TOTAL(S)	22	205	23	229	19
SUMMARY	C – 21/21	205/229	Y – 15/22	229/229	B/E – 19/19
PERCENTAGE (%)	100	90	68	100	100

B – Calibration Box E – Electronic S – Scale

4.4 Material Usage Audit

4.4.1 De-icer and Abrasive Usage

This section currently documents salt usage for the City, the Districts and the Arterial Roads. The purpose of this section is to compile the necessary data to assess areas of over use and measure progress in salt management. Salt use is presented in tabular form (Tables 4.4.1.1 to 4.4.1.6) and in graphical form (Figures 4.4.1.1 to 4.4.1.4).

Table 4.4.1.1 Toronto-East York District-Salt Usage

YEAR	DEPOT 1 Arterials	DEPOT 6 Arterials	DEPOT 7 Arterials	TEY DISTRICT TORONTO AREA 1-Locals	TEY DISTRICT TORONTO AREA 2-Locals	TOTAL
1999 - 2000	6,023.00	4,722.00	4,594.00	20,357.00	# 15,288.56	50,984.56
2000 - 2001	10,352.00	8,932.00	6,816.00	15,905.00	# 17,277.4	59,282.40
2001 - 2002	6045.55	3575.05	2,432.66	2,011.80	5,155.76	18,866.34
2002 - 2003	12,828.00	10,039.07	7,567.99	20826.94	20,449.99	71,711.99
2003 - 2004	9,229.35	8,580.77	6,837.51	6,030.31	11,838.62	42,516.56
2004 - 2005	8,712.31	9,276.96	6,782.00	4,152.22	10,459.00	39,382.49
2005 - 2006	6,458.90	5,483.74	3,558	2,833.94	3924.08	22,258.66
2006 - 2007	6,597.55	8,604.00	4,873	5,767.07	6,445.32	32,286.94
2007 - 2008	10,553.23	12984.97	7,296.00	9,756.36	10,000.00	50,590.56
2008 - 2009	7,766.00	9,277.00	6,300.00	7,834.00	7,800.00	38,977.00
2009 - 2010	3,979.43	4,960.50	2,640.00	4,198.50	4,381.00	20,159.43
2010 - 2011	8083.72	10,770.00	8259.00	11,439.15	6654.87	45,206.74
2011 - 2012	3157.34	3450.12	2480	3980.69	3598.32	16,666.47
2012 - 2013	6348.00	7489.00	5870.00	8203.00	5643.00	33553.00
2013 - 2014	10218.04	12980.11	10765.00	14751.37	12163.63	60878.15
2014 - 2015	7143.01	8520.22	7917.00	9293.29	8729.79	41603.31
2015 - 2016	4106.00	6035.00	8150.00	4091.00		22382.00

Estimated seasonal figure

Table 4.4.1.2 Etobicoke-York District-Salt Usage

YEAR	DEPOT 5	WEST DISTRICT Locals	TOTAL
1999 – 2000	9,283.96	26,478.66	35,762.62
2000 – 2001	13,163.80	28,771.44	41,935.24
2001 – 2002	9,907.83	2,529.89	12,437.72
2002 – 2003	11,085.77	29,976.75	41,062.52

YEAR	DEPOT 5		DEPOT 9		ETOBICOKE-YORK DISTRICT INHOUSE Locals	TOTAL
	Arterials	Collectors	Arterials	Collectors		
2003 - 2004	3,303.29	5,692.63	5,938.99	4,295.28	3,156.53	22,386.72
New District Boundary Changes in 2004 – 2005 season						
2004 - 2005	2,463.11	6,054.03	4559.20	12,340.68	6,035.80	31,452.82
2005 - 2006	2,417.26	4,373.42	5,038.50	6569.62	2437.73	20,836.53
2006 - 2007	3579.78	4745.28	5275.39	6992.96	4900.81	25,494.22
2007 - 2008	5634.60	9,621.28	8,538.10	14,741.58	10,464.61	49,000.82
2008 - 2009	6896.18	7860.15	9495.47	7340.48	6614.90	38,207.18
2009 - 2010	3,078.35	4,014.63	5,661.44	4,726.58	2,168.97	19,649.92
2010 - 2011	6578.87	4607.78	6742.29	6406.09	7247.80	31582.83
2011 - 2012	2303.98	1613.68	2045.91	2769.85	592.67	9326.09
2012 - 2013	5144.86	3429.91	7154.42	5556.93	5382.34	26668.46
2013 – 2014	11013.06	7342.04	12427.07	8284.72	7358.50	46425.39
2014 - 2015	6319.66	6212.74	6481.23	3910.37	3912.40	26835.40
2015 - 2016	5046.46	3468.37	4857.37	2529.09	2878.75	18790.04

Table 4.4.1.3 North York District-Salt Usage

YEAR	DEPOT 2	DEPOT 3	NORTH DISTRICT	TOTAL
1999 – 2000	6,773.40	4,110.60	10,529.00	21,413.00
2000 – 2001	10,467.00	5,987.00	15,968.80	32,422.80
2001 – 2002	4,328.58	2,660.12	7,190.03	14,178.73
2002 – 2003	13,008.92	11,499.77	23,844.83	48,353.52

YEARS	DEPOT 2 Arterials	DEPOT 3 Arterials	NORTH DISTRICT		TOTAL
			INGRAM DEPOT	ORIOLE DEPOT	
			Locals	Locals	
2003 – 2004	5,960.92	3,664.18	4,440.23	5,309.46	19,374.79
2004 – 2005	10,269.00	10,449.57	8,969.61	10,874.29	40,562.47

2005 – 2006	6,056.27	4,788.37	4,725	8,783.24	24,353.52
2006 - 2007	6,412.55	4,547.24	7,852.64	8,987.28	27,799.71
2007 - 2008	12,182.42	8,394.33	9283.57	14,182.33	44,042.65
2008 - 2009	14,707.19	14,024.50	6554.24	9,990.68	45,276.61
2009 - 2010	5,817.56	7,013.50	3,855.83	5,521.87	22,208.76
2010 - 2011	10,359.93	9686.51	3541.16	5623.19	29,210.79
2011 - 2012	6467.32	6643.21	3662.47	4044.30	20,817.30
2012 - 2013	12015.44	12128.63	2416.15	2990.87	29551.09
2013 – 2014	22296.44	18824.51	3607.40	4360.06	49088.14
2014 - 2015	14422.84	13153.00	4603.12	5223.18	37402.14
2015 - 2016	8098.54	9488.92	2201.19	3182.60	22971.25

Table 4.4.1.4 Scarborough District-Salt Usage

YEAR	DEPOT 4 Arterials	DEPOT 4A Locals	ELLESMERE & MORNINGSIDE YARDS In-House Locals	TOTAL
1999 - 2000	11,104.00	0.00	23,605.00	34,709.00
2000 - 2001	17,273.27	12,519.87	13,160.97	42,954.11
2001 - 2002	5,913.71	2,838.40	2,638.20	11,390.31
2002 - 2003	24,595.12	12,778.52	9,728.13	47,101.77

YEAR	DEPOT 4 Arterials	DEPOT 8 Arterials	ELLESMERE & MORNINGSIDE YARDS In-House Locals	TOTAL
2003 – 2004	9,163.77	9,436.43	5,273.80	23,874.00
2004 – 2005	16,245.70	12,845.04	7,304.55	36,035.29
2005 – 2006	12,886.86	8,324.92	6,012.74	27,224.52
2006 - 2007	10,342.59	9,436.81	4,720.52	24,499.92
2007 - 2008	21,037.09	18,399.28	12,574.41	52,010.47
2008 - 2009	23,277.15	17,998.21	9,244.40	29,686.80
2009 - 2010	13,286.24	8,775.80	5,983.78	28,045.82
2010 - 2011	25,075.80	15,952.81	11,782.93	52,811.54
2011 - 2012	13,344.74	9,666.65	5,228.40	28,239.79
2012 - 2013	17,804.83	12,738.07	6,036.43	36,579.33
2013 – 2014	24548.77	21774.07	15881.32	62204.16
2014 - 2015	18582.37	13188.86	7973.52	39744.75
2015 - 2016	9239.62	9379.98	5376.71	23996.31

Table 4.4.1.5 Salt Usage – Arterial Roads

YEAR	SALT SPREAD IN TONNES									
	DEPOT 1	DEPOT 2	DEPOT 3	DEPOT 4	DEPOT 5	DEPOT 6	DEPOT 7	DEPOT 8	DEPOT 9	TOTAL
1986 – 1987	5,272.65	5,754.03	6,340.66	7,672.03	5,530.65	4,369.62	4,018.48	N/A	N/A	38,958.12
1987 – 1988	5,103.41	6,332.46	7,502.54	7,238.55	5,219.21	4,089.71	4,011.51	N/A	N/A	39,497.39
1988 – 1989	4,033.09	6,930.81	6,459.99	6,952.13	6,487.64	4,242.00	4,243.79	N/A	N/A	39,349.45
1989 – 1990	7,130.00	9,553.22	9,978.97	11,244.20	9,781.43	5,940.84	6,852.75	N/A	N/A	60,481.41
1990 – 1991	4,743.10	10,552.19	9,313.00	7,567.30	10,410.86	5,877.37	6,783.76	N/A	N/A	55,247.58
1991 – 1992	5,297.36	8,532.35	8,192.33	8,219.48	7,347.81	3,978.14	5,723.97	N/A	N/A	47,291.44
1992 – 1993	7,817.34	12,543.17	10,394.03	11,703.91	9,583.83	5,504.69	7,698.75	N/A	N/A	65,245.72
1993 – 1994	8,139.89	11,015.42	11,830.93	11,079.77	9,869.07	6,300.12	9,237.40	N/A	N/A	67,472.60
1994 – 1995	3,604.61	5,774.62	5,615.95	5,838.74	4,559.76	2,694.48	3,601.05	N/A	N/A	31,689.21
1995 – 1996	6,256.72	9,023.69	7,443.40	8,752.61	7,129.09	3,837.37	4,809.87	N/A	N/A	47,252.75
1996 – 1997	7,530.00	12,582.00	8,426.00	10,749.00	9,093.90	5,629.00	6,436.28	N/A	N/A	60,446.18
1997 – 1998	3,738.00	6,448.67	6,500.00	6,375.20	5,527.41	2,927.00	5,376.51	N/A	N/A	36,892.79
1998 – 1999	7,118.00	12,548.82	7,000.00	9,606.00	9,596.12	5,985.00	5,585.19	N/A	N/A	57,439.13
1999 – 2000	6,023.00	6,773.40	4,110.00	11,104.00	9,283.96	4,722.00	4,594.00	N/A	N/A	46,610.36
2000 – 2001	10,352.00	10,467.00	5,987.00	17,273.27	13,163.80	8,932.00	6,816.00	N/A	N/A	72,991.07
2001 – 2002	6045.55	4,328.58	2,660.12	5,913.71	9,907.83	2,962.71	2,432.66	N/A	N/A	34,251.16
2002 – 2003	12,828.00	13,008.92	11,499.77	24,595.12	11,085.77	10,039.07	7,567.99	N/A	N/A	90,624.64
New District Boundary Changes and Contracts beginning in 2003-2004 season										
2003 – 2004	9,229.35	5,960.92	3,664.18	9,163.77	3,303.29	8,580.77	6,837.51	9,436.43	5,938.99	62,115.21
2004 – 2005	8,712.31	10,269.00	19,449.57	16,245.70	2463.11	9,276.96	6,782.00	12,845.04	4559.20	90,602.89
2005 - 2006	6,458.90	6,056.27	4,788.37	12,886.86	2417.26	5,483.74	3,558.00	8324.92	5,038.50	55,012.82
2006 - 2007	6,597.55	6,412.55	4,547.24	10,342.59	3,579.78	8,604.00	4,873	9,436.81	5,275.39	59,668.91
2007 - 2008	10,553.23	12,182.42	8,394.33	21,037.09	5,634.60	12,984.97	7,296.00	18,399.28	8,538.10	105,020.02
New Contracts beginning in 2008-2009 season.										
2008 - 2009	7,766.00	14,707.19	14,024.50	23,277.15	14,756.33	9,277.00	6,300.00	17,998.21	16,835.97	124,932.35
2009 - 2010	3,979.43	5,817.56	7,013.50	13,286.24	7,092.98	4,960.50	2,640.00	8,775.80	10,387.97	64,493.98
2010 - 2011	8083.72	10,359.93	9686.51	25,075.80	6578.87	10,770.00	8259.00	15,952.81	6742.29	101,508.90
2011 - 2012	3157.34	6467.32	6643.21	13,344.74	3917.66	3450.12	2480	9,666.65	4815.76	53,942.80

2012 - 2013	6348.00	12015.44	12128.63	17,804.83	5144.86	7489.00	5870.00	12,738.07	7154.42	86,693.25
2013 – 2014	10218.04	22296.44	18824.51	24548.77	11013.06	12980.11	10765.00	21774.07	12427.07	144847.07
2014 - 2015	7143.01	14422.84	13153.00	18582.37	6318.66	8520.22	7917.00	13188.86	6481.23	95727.19
New Contracts beginning in 2015-2016 season.										
2015 - 2016	4106.00	8098.54	9488.92	9239.62	5056.46	6035.00	8150.00	9379.98	4857.37	64411.89

Table 4.4.1.6 Total Salt Usage by Districts and City-Wide

YEAR	SALT SPREAD IN TONNES				
	Toronto-East York	Etobicoke-York	North York	Scarborough	TOTAL
1986 – 1987	47,723.14	17,343.65	35,364.69	23,949.43	124,380.91
1987 – 1988	33,925.63	20,495.21	37,351.00	27,849.55	119,621.39
1988 – 1989	43,641.88	28,166.64	36,770.80	19,807.13	128,386.45
1989 – 1990	65,973.59	27,794.43	43,132.19	28,412.20	165,312.41
1990 – 1991	48,267.23	37,278.86	45,365.19	23,132.30	154,043.58
1991 – 1992	29,755.47	22,040.81	37,324.68	23,407.48	112,528.44
1992 – 1993	41,611.78	27,526.83	47,437.20	31,896.91	148,472.72
1993 – 1994	43,048.41	31,568.07	45,546.35	29,483.77	149,646.60
1994 – 1995	24,035.14	24,377.76	27,190.57	19,526.74	95,130.21
1995 – 1996	38,039.96	24,485.09	37,867.09	27,584.61	127,976.75
1996 – 1997	49,500.65	32,185.90	41,008.00	34,890.00	157,584.55
1997 – 1998	35,260.29	17,545.41	27,948.67	21,184.20	101,938.57
1998 – 1999	45,763.55	37,242.12	36,548.82	20,856.00	140,410.49
1999 – 2000	50,984.56	35,762.62	21,413.00	34,709.00	142,869.18
2000 – 2001	59,282.40	41,935.24	32,422.80	42,954.11	176,594.55
2001 – 2002	18,886.34	12,437.72	14,178.73	11,390.31	56,893.10
2002 – 2003	71,711.99	41,062.52	48,353.52	47,101.77	208,229.80
New District Boundary Changes and Contracts beginning in 2003-2004 season					
2003 – 2004	42,516.56	22,386.72	19,374.79	23,874.00	108,152.07
2004 – 2005	39,382.49	31,452.82	40,562.47	36,035.29	147,433.07
2005 – 2006	22,258.86	20,836.53	24,353.42	27,224.52	94,673.33
2006 – 2007	32,286.94	25,494.22	27,799.71	24,499.92	89,112.17
2007 – 2008	50,590.96	49,000.82	44,042.65	52,010.47	195,644.90
New Contracts beginning in 2008-2009 season.					
2008 – 2009	38,977.00	33,189.38	45,276.61	29,686.80	147,129.79
2009 – 2010	11,579.93	19,649.92	22,208.76	28,045.82	81,484.43
2010 – 2011	45,206.74	31,582.83	29,210.19	52,811.54	158,811.30
2011 – 2012	16,666.47	9326.09	20,817.30	28,239.79	75049.65
2012 – 2013	33553.00	26668.46	29551.09	36,579.33	126,351.90
2013 – 2014	60878.15	46425.39	49088.41	62204.16	218596.1
2014 – 2015	41603.31	26835.40	37402.14	39744.75	145585.60
New Contracts beginning in 2015-2016 season.					
2015 – 2016	22,382.00	18790.04	22971.25	23996.31	88139.60

Table 4.4.1.7 Salt Brine Used By District (Pre-wetting & DLA)

BRINE USAGE(litres)						
SEASON	Toronto-East York District Area 1	Toronto-East York District Area 2	Etobicoke- York District	North York District	Scarborough District	TOTAL
2002 - 2003	n/a	570.00	n/a	n/a	58 745.60	59 315.60
2003 - 2004	355.34	68 685.53	n/a	242 948.22	200 164.71	512 153.80
2004 - 2005	638,000	243,000.00	682,394.00	440,152.60	227,743.10	2,231,339.00
2005 - 2006	312,157	250,224.20	610,739.86	276,361.50	388,676.17	1,838,158.60
2006 - 2007	424,073	216,902.50	390,416.69	451,884.90	419,507.09	1,902,784.00
2007 - 2008	658,873.00	300,000.00	797,622.31	543,111.90	272,332.40	2,571,939.61
2008 – 2009	542,005.00	204,000.00	909,553.74	480,000	160,877.80	2,296,435
2009 – 2010	311,439.00	201,174.70	712,554.13	393,911.10	62,156.46	1,681,235.39
2010 - 2011	573,512.00	231,867.50	749,391.98	389,274.95	260,989.24	2,205,036.67
2011 - 2012	578,921.50	218,999	942386.80		769,773.95	2,510,081
2012 – 2013	523732.00	254427.00	1445837.7	723,076.00	474,763.80	3,421,836
2013 – 2014	371515.10	161112.60	1015625.86		309957.40	1858210.96
2014 - 2015	492876.00	140322.20	1226257.84	784347.00	101286.30	2745089.34
2015 – 2016	1018724.00	334393.00	1626469.44	1647855.83	389473.10	5016915.37

4.4.2 Materials Storage

Tables 4.4.2.1 to 4.4.2.4 summarize the existing in-house and private materials storage facilities and provide an indication of the conditions identified at these facilities.

4.4.2.1 SALT STORAGE FACILITIES (2016)

YARD/DEPOT FACILITY		FACILITIES AUDIT								
		SALT STORAGE REVIEW								
LOCATION	OWNERSHIP CITY – C	Salt Storage	Salt Structure	Floor Impervi ous	Loading Inside	Door / Overhang	Lighting	Ventilation	Loading Pad	Grade Pad
TORONTO-EAST YORK AREA 1										
Depot 1 – 777 Bayview Ave.	C	Y	Y	Y	N	Y	Y	Y	Y	Y
Depot 6 – 7 Leslie St.	C	Y	Y	Y	N	Y	Y	Y	Y	Y
433 Eastern Avenue Yard	C	Y	Y	Y	Y	N	Y	Y	Y	Y
TORONTO-EAST YORK AREA 2										
Depot 7 – 677 Wellington St. W.	C	Y	Y	Y	N	Y	Y	Y	Y	Y
1401 Castlefield Ave. Yard	C	N								
1116 King St. Yard	C	N								
ETOBICOKE-YORK DISTRICT										
Depot 5 – 40 Boncer Dr.	C	Y	Y	Y	N	Y	Y	Y	Y	Y
Depot 9 – 49 Toryork Dr.	C	Y	Y	Y	N	Y	Y	Y	Y	Y
Depot 10 – 150 Disco Road	C	Y	Y	Y	N	Y	Y	Y	Y	Y
Toryork Yard – 61 Toryork Dr.	C	N								
320 Bering Avenue Yard	C	Y	Y	Y	N	N	N	N	Y	Y
NORTH YORK DISTRICT										
Depot 2 – 64 Murray Rd.	C	Y	Y	Y	N	Y	Y	Y	Y	Y
64 Murray Rd. Yard	C	N								
Depot 3 – 195 Bermondsey Rd.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y
Depot 10 – 2750 Old Leslie St.	C	Y	Y	Y	Y	Y	Y	Y	Y	Y
Oriole Yard – 2751 Old Leslie St.	C	N								
Depot 11 – 86 Ingram Dr.	C	Y	Y	Y	N	Y	Y	Y	Y	Y
SCARBOROUGH DISTRICT										
Depot 4 – 1 Nantucket Blvd.	C	Y	Y	Y	N	Y	Y	Y	Y	Y
Depot 8 – 8270 Sheppard Ave	C	Y	Y	Y	N	Y	Y	Y	Y	Y
Depot 13 – 1050 Ellesmere	C	Y	Y	Y	N	Y	Y	Y	Y	Y
Depot 14 – 891 Morningside Ave.	C	Y	Y	Y	N	Y	Y	Y	Y	Y
TOTAL SITES	21	21	16	16	16	16	16	16	16	16
SUMMARY	C – 21/21	Y – 16/21	Y – 16/16	Y – 16/16	Y – 4/16	Y – 14/16	Y – 16/16	Y – 16/16	Y – 16/16	Y – 16/16
PERCENTAGE (%)	100	76	100	100	25	88	100	100	100	100

 - Not Applicable

TABLE 4.4.2.2
SALT STORAGE FACILITIES – OUTDOOR STORAGE
(2016)

YARD/DEPOT FACILITY		FACILITIES AUDIT OUTSIDE SALT STORAGE	
LOCATION	OWNERSHIP CITY – C	Loaded On Impervious Pad	Salt Pile Covered
TORONTO-EAST YORK DISTRICT AREA 1			
Depot 1 – 777 Bayview Ave.	C		
Depot 6 – 7 Leslie St.	C		
433 Eastern Avenue Yard	C		
TORONTO-EAST YORK DISTRICT AREA 2			
Depot 7 – 677 Wellington St. W.	C		
1401 Castlefield Ave. Yard	C		
1116 King St. Yard	C		
ETOBICOKE-YORK DISTRICT			
Depot 5 – 40 Boncer Dr.	C		
Depot 9 – 49 Toryork Dr.	C		
Depot 10 - 150 Disco Road	C		
Emery Yard – 61 Toryork Dr.	C		
320 Bering Avenue Yard	C		
NORTH YORK DISTRICT			
Depot 2 – 64 Murray Rd.	C		
64 Murray Rd. Yard	C		
Depot 3 – 195 Bermondsey Rd.	C		
Depot 11 – 2750 Old Leslie St.	C		
Oriole Yard – 2751 Old Leslie St.	C		
Depot 12 – 86 Ingram Dr.	C		
SCARBOROUGH DISTRICT			
Depot 4 – 1 Nantucket Blvd.	C		
Depot 8 – 8270 Sheppard Ave	C		
Depot 13 – 1050 Ellesmere Rd	C		
Depot 14 - 891 Morningside Ave.	C		
TOTAL SITES	21	0	0
SUMMARY	C – 21/21		
PERCENTAGE (%)	100		

 - Not Applicable

TABLE 4.4.2.3
SAND/SALT STORAGE REVIEW
(2016)

YARD/DEPOT FACILITY		FACILITIES AUDIT SAND/SALT STORAGE REVIEW				
			Inside Storage		Outside Storage	
LOCATION	OWNERSHIP CITY – C	Salt/Sand Storage	Inside Structure	On Impervious Pad	Pad	Tarped
Toronto-East York District – Area 1						
Depot 1 – 777 Bayview Ave.	C	Y	Y	Y		
Depot 6 – 7 Leslie St.	C	Y	Y	Y		
433 Eastern Avenue Yard	C	Y	Y	Y		
Toronto-East York District – Area 2						
Depot 7 – 677 Wellington St. W.	C	N				
1401 Castlefield Ave. Yard	C	Y	Y	Y		
1116 King St. Yard	C	N				
ETOBICOKE-YORK DISTRICT						
Depot 5 – 40 Boncer Drive.	C	Y	Y	Y		
Depot 9 – 49 Toryork Dr.	C	Y	Y	Y		
Depot 11 - 150 Disco Road	C	Y	Y	Y		
Toryork Yard – 61 Toryork Dr.	C	N	Y	Y		
320 Bering Avenue Yard	C	N				
NORTH YORK DISTRICT						
Depot 2 – 64 Murray Rd.	C	Y	Y	Y		
64 Murray Rd. Yard	C	Y				
Depot 3 – 195 Bermondsey Rd.	C	Y	Y	Y		
Depot 11 – 2750 Old Leslie St. *	C	Y	Y	Y		
Oriole Yard – 2751 Old Leslie St.	C	N				
Depot 12 - 86 Ingram Dr. *	C	Y	Y	Y		
SCARBOROUGH DISTRICT						
Depot 4 – 1 Nantucket Blvd.	C	Y	Y	Y		
Depot 8 – 8270 Sheppard Ave.	C	Y	Y	Y		
Depot 13 – 1050 Ellesmere Rd.	C	Y	Y	Y		
Depot 14 – 891 Morningside Ave.	C	Y	Y	Y		
TOTAL SITES		21	16	16		
SUMMARY		C - 21/21	Y – 16/21	Y – 16/16		
PERCENTAGE (%)		100	76	100		

 -Not Applicable

TABLE 4.4.2.4
FACILITIES AUDIT – SITE DRAINAGE ISSUES
(2016)

YARD/DEPOT FACILITY		FACILITIES AUDIT SITE DRAINAGE ISSUES			
LOCATION	OWNERSHIP CITY – C	Vehicle Washing On Site	Washing Inside/Outside	Oil/Water Separator	Drainage
Toronto-East York District Area 1 1					
Depot 1 – 777 Bayview Ave.	C	Y	OUTSIDE	Y	STORM
Depot 6 – 7 Leslie St.	C	Y	OUTSIDE	Y	STORM
433 Eastern Avenue Yard	C	Y	INSIDE	Y	SANITARY
Toronto-East York District Area 2					
Depot 7 – 677 Wellington St. W.	C	N			
1401 Castlefield Ave. Yard	C	N			
1116 King St. Yard	C	Y	INSIDE	Y	SANITARY
ETOBICOKE-YORK DISTRICT					
Depot 5 – 40 Boncer Dr.	C	Y	OUTSIDE	Y	STORM
Depot 9 – 49 Toryork Dr.	C	Y	OUTSIDE	Y	STORM
Depot 11 - 150 Disco Road	C	N			
Toryork Yard – 61 Toryork Dr.	C	Y	INSIDE	Y	SANITARY
320 Bering Avenue Yard	C	Y	INSIDE	Y	SANITARY
NORTH YORK DISTRICT					
Depot 2 – 64 Murray Rd.	C	Y	OUTSIDE	Y	STORM
64 Murray Rd. Yard	C	Y	INSIDE	Y	STORM
Depot 3 – 195 Bermondsey Rd.	C	Y	OUTSIDE	Y	STORM
Depot 11 – 2750 Old Leslie St.	C	Y	OUTSIDE	Y	STORM
Oriole Yard – 2751 Old Leslie St.	C	Y	INSIDE	Y	SANITARY
Depot 12 - 86 Ingram Dr.	C	Y	OUTSIDE	Y	STORM
SCARBOROUGH DISTRICT					
Depot 4 – 1 Nantucket Blvd.	C	Y	OUTSIDE	Y	STORM
Depot 8 – 8270 Sheppard Ave	C	N			
Depot 13 – 1050 Ellesmere Rd	C	Y	OUTSIDE	N	SANITARY
Depot 14 – 891 Morningside Ave.	C	Y	INSIDE	Y	STORM
TOTAL SITES	21	21	22	22	22
SUMMARY	C – 21/21	Y – 17/21	O – 9/17	Y – 16/17	SAN-6/17
PERCENTAGE (%)	100	81	53	94	35

 - Not Applicable