

## **2**

### **WINTER MAINTENANCE PROGRAM**

**The Transportation Services Committee recommends:**

- 1. Receipt of the presentation by Brian Titherington, Director of Roads; and**
- 2. Adoption of the recommendation contained in the following report dated May 28, 2012, from the Commissioner of Transportation and Community Planning.**

#### **1. RECOMMENDATION**

It is recommended that this report be received for information.

#### **2. PURPOSE**

This report provides information on the Region's Winter Maintenance Program for Regional roads. This report summarizes current practices, identifies issues that will change the way the Region maintains roads and outlines potential strategies for future winter maintenance required to address these changes.

#### **3. BACKGROUND**

##### **Winter maintenance is critical to ensuring mobility for Regional road users**

The Region's Winter Maintenance Program includes snow plowing, sanding and salting on approximately 3,500 lane kilometres that make up the Regional road network. Winter road maintenance is critical to ensuring mobility for the public, transit, commercial vehicles and emergency services. The Region's Winter Maintenance Program relies on Regional maintenance staff and contracted services using computerized equipment and real-time data to manage winter events quickly and efficiently while minimizing negative impacts to the environment.

##### **The Winter Maintenance Program adheres to a Bare Pavement Policy and is regulated by the Minimum Maintenance Standards as defined under regulation**

In August 1994, Council approved the Bare Pavement Policy. The overriding operating principle of the Bare Pavement Policy is to return paved Regional roadways to bare

pavement condition as soon as reasonably possible following winter storm events. Winter storm events include snowfall, freezing rain, blizzards and ice storms and can result in snow accumulation, ice on snow and black ice conditions.

In November 2002, Ontario Regulation 239/02 came into force. This regulation, which is referred to as the “Minimum Maintenance Standards” was developed to provide municipalities with a defence against liability from actions arising with regard to levels of care on roads and bridges. The Minimum Maintenance Standards are amended from time to time, most recently in 2010.

Among other things, the “Minimum Maintenance Standards” guide the acceptable maintenance standards for roadways during winter and non-winter periods in Ontario. The minimum maintenance standards for a given road are dictated by the classification of the road. The Minimum Maintenance Standards provide the criteria to classify roads based on average traffic volumes and the posted speed limit. Classifications range from one to six, with Class One roads having higher average traffic volumes and higher posted speeds. Based on the classification of a given road, the Minimum Maintenance Standards dictate the frequency that the road needs to be patrolled and the response times to address icy and snow covered conditions.

**In order to meet Minimum Maintenance Standards and Regional policy, internal and contracted resources are used**

The Regional road network is patrolled 24 hours-a-day, seven days-a-week during the winter season which is generally from mid-October to mid-April and staff need to be on call to respond rapidly to winter weather. This level of service requires a large resource pool given the relative unpredictable nature of winter weather, the size of the Regional road network and the minimum response times dictated by the Minimum Maintenance Standards.

To address this resource need, the Region supplements internal year-round Regional staff with external seasonal resources. The split is approximately 30/70 between internal and external resources. This approach has been successful in allowing for responsiveness in service delivery during the winter season while ensuring internal Regional staff are busy on non-winter work year-round.

**The key to a successful Winter Maintenance Program is accurately forecasting winter events to ensure the deployment of appropriate response by staff**

The Region’s Winter Maintenance Program relies on real-time weather forecasting technology and equipment to predict the nature and location of winter events. This information enables staff to make informed decisions with respect to the deployment of the appropriate response resources.

The Region uses Road Weather Information Systems to assist in forecasting specific weather events. Road Weather Information Systems' stations provide the Region with real-time site conditions including pavement temperature, pavement condition, salt concentration, wind speed, wind direction, atmospheric temperature and humidity. A typical Road Weather Information Systems' site, including descriptions of the various components is shown in *Attachment 1*. The Region currently owns four Road Weather Information Systems' stations, which were installed between 2000 and 2003. The cost of each station is approximately \$75,000 to purchase and \$2,800 to operate annually. The location of these stations is shown in *Attachment 2*.

To further assist in identifying the appropriate response, Regional road patrol trucks are equipped with infrared pavement temperature sensors and have on-board laptop computers to provide real-time access to road weather information systems. This equipment provides more information to assist in selecting an appropriate localized response that is more accurate than the Road Weather Information Systems' stations which cover large geographic areas.

### **There are a number of tactics used to achieve the Minimum Maintenance Standards and the Bare Pavement Policy**

The Winter Maintenance Program uses a combination of techniques depending on the nature of the winter event. The techniques include anti-icing; spreading material on roads to remove snow and ice; snow clearing and snow removal.

Anti-icing is used in advance of winter events to prevent snow and ice from bonding to the road. Anti-icing enables the Regional winter maintenance team to meet the Minimum Maintenance Standards and Bare Pavement Policy more quickly than applying material after a winter event has started.

The use of de-icers, such as salt, is an important component of the Region's Winter Maintenance Program; however, salt also has negative impacts on the environment. In 2004, York Region developed a Salt Management Plan to reduce the use of salt as part of the Winter Maintenance Program. This plan was developed in response to Environment Canada's request for all road salt users to develop salt management strategies. The Region's Salt Management Plan was approved by Council in October of 2004.

Snow plowing is the most common and preferred method to clear snow and ice from Regional roads. Snow plows clear snow and ice from Regional roads by casting snow onto the adjacent boulevards or into the adjacent roadside ditches. Plowing is the preferred method of removing snow and ice as it immediately achieves the Bare Pavement Policy and minimizes some of the negative environmental impacts caused by road de-icing chemicals and spreading materials such as salt; however, plowing is not effective at removing ice that is already bonded to the pavement. The current practice of most winter maintenance agencies, including the Region, is the use of salt and sand to combat ice that is already bonded to the pavement.

Salt and sand, or a combination of both materials, can be spread onto roads to reduce the impacts of slippery ice surfaces. Salt works to remove ice by breaking the bond between ice and the road surface while sand acts as an abrasive to increase friction without actually removing the ice. As per the Council approved Salt Management Plan, Regional vehicles are equipped with electronic spreader controls to improve the accuracy of material application when spreading salt and sand on Regional roads.

### **Snow removal is not the same as plowing the snow onto the road side**

Snow plowing refers to pushing snow from the travelled portion of the road to the boulevard or shoulder area where it is stored. Snow removal involves the use of a combination of equipment including plows, loaders, skid-steer machines and trucks to physically remove the snow from the road corridor and store the snow at a dump or disposal site.

Most Regional roads currently have sufficient snow storage on the boulevard and shoulder area which means that only limited amounts of snow have to be removed. Locations where snow storage space is limited require the removal of snow banks that have to be hauled to local municipal snow dump locations.

There is a need for snow removal in communities where the road corridors are narrower, typically in older areas such as the section of Yonge Street in Richmond Hill or on Main Street in Newmarket. New subdivisions designed with laneways also have limited snow storage space, increasing the need for snow removal in some local municipalities.

### **Snow removed from Regional and local roads is primarily taken to temporary snow dumps**

Removed snow is placed at a temporary snow dump or in a snow disposal facility. A temporary snow dump is a location such as a parking lot or sports field where temporary snow is piled and eventually melted by warmer temperatures. All snow dumps and disposal facilities located in York Region are currently owned and operated by the local municipalities. Most of these locations have been used for many years but have not been engineered to meet current environmental standards. This means the salt laden snow is allowed to melt with the uncontrolled run-off finding its way into the environment through the ground or a watercourse. A snow disposal facility is an engineered snow dump that attempts to manage the run-off of the contaminated melting snow. The Town of Richmond Hill has a state-of-the-art snow disposal facility located at its yard north of Elgin Mills Road, to the west of Leslie Street. The Region does not own any snow dump or disposal facilities.

Where required, the Region's current snow removal process requires additional snow equipment such as blowers which are not otherwise needed. Built up snow along the road

side is pushed into the road and is then loaded onto trucks by blowers. The loaded trucks haul the snow to the nearest temporary snow dump or snow disposal facility.

### **Municipal partnering is an important element of the Winter Maintenance Program**

As a general rule, the Region is responsible for Regional roads and local municipalities are responsible for local roads; however, there are a number of winter maintenance agreements between the Region and local municipalities that empower the most logical authority to maintain roads based on factors such as geographic proximity or practical route designs. The agreements are entered on a cost recovery basis. An example of this type of agreement occurs in Richmond Hill where the Region maintains Richmond Hill's portion of Yonge Street, between Major Mackenzie Drive and Elgin Mills Road. This arrangement makes sense given that the Region already maintains the sections of Yonge Street to the north and south of this section.

## **4. ANALYSIS AND OPTIONS**

### **The number of lane kilometres needing maintenance will increase by 50 per cent over the next 20 years**

The Regional road network is growing as a result of a continued investment in improved network capacity and connectivity through the 10-year Roads Capital Program. Over the past 20 years, the Regional Road network has been growing at annual rate of approximately 4.5 per cent. Based on road network improvements included in the 10-year Roads Capital Program and the Transportation Master Plan, the Regional road network is targeted to grow at a rate of 3 per cent per year over the next 20 years. This equates to a 50 per cent increase in total lane-kilometres to be maintained over the next 20 years relative to the current network.

These projections do not include any roads which could be uploaded from local municipalities or downloaded from the Provincial government. Although these types of transfers are difficult to predict, they will also increase the number of lane-kilometres that the Region will need to maintain.

### **As the Regional road network grows, more resources will be required to maintain current levels of service**

As the Regional road network grows, increased resources will be required to maintain current service standards. Additional combination plow/salt/sander trucks will be required to clear and spread material to the roadways. Other equipment which is currently not necessary may be required to maintain cycling and pedestrian facilities which are often narrow and difficult to access. The larger road network also increases travel distances for vehicles to and from existing Regional yard facilities which increases

operational costs. Winter maintenance vehicles are currently staged from the four existing Regional yards.

A larger road network also puts more pressure on our existing yard facilities in terms of space for parking winter maintenance and employee vehicles, as well as storage space for winter de-icing and anti-icing materials including sand and salt.

**As the Region continues to become more urbanized, there is less space available to store snow**

Roads in urbanized areas provide mobility for numerous modes and therefore more frequently include cycling facilities, increased urban design treatments and lanes that are dedicated for transit and high occupancy vehicles. The increased focus on accommodation for all modes of transportation as well as the urban design of Regional corridors creates competition for space within the available right-of-way. As a result, there is little space remaining for snow storage and therefore a greater need to remove snow in these urban corridors.

**York Region is involved in preliminary testing of a new technology to potentially improve the deployment of winter response tactics**

A small group of winter maintenance practitioners including the Region, the Ontario Ministry of Transportation (MTO), contractors and other municipalities have commenced with preliminary testing of Maintenance Decision Support System (MDSS) - a winter maintenance tool designed to assist staff in selecting the most appropriate response tactics to manage a winter storm. The Maintenance Decision Support System software was designed for the United States (US) Department of Highways and has been used for several years throughout the northern US states including Iowa, Maine, Michigan, New York, Ohio and Wisconsin. Reports from the US Department of Highways indicate that the use of Maintenance Decision Support System can provide additional guidance to assist informed decision making for responses to winter storm events. Regional staff are testing this software and evaluating the predictions against actual results experienced in the field over the winters of 2012 and 2013 to determine the benefits of using this software.

**The Region is developing a long-term Roads Maintenance Operational plan to address emerging issues and plan for future needs**

The strategy for Regional maintenance facilities, including the location and sizing of future yards, will be addressed in a Long-Term Roads Maintenance Operational Plan which will be initiated in fall 2012. This plan will address anticipated requirements for yards' snow disposal facilities, and maintenance equipment to address changing Regional needs.

### **The Region is working with the local municipalities to address emerging issues related to snow removal and disposal**

As the rapid transit corridors begin to come on line next year, there is increased pressure for snow removal within the Region. The Region is working with the local municipalities to address emerging issues related specifically to snow disposal. It is expected that the strategy will address the need for more snow disposal facilities as well as the need to explore snow melting. A plan is necessary to address the increasing need for snow removal as well as increasing environmental requirements associated with temporary snow dumps.

Alignment with local municipalities on snow removal will help ensure the appropriate service level is achieved for road users including pedestrians and cyclists within tighter timelines to ensure mobility in the urban corridors.

### **Property available for snow disposal facilities is limited in urban areas**

In order to keep transportation costs manageable, snow disposal facilities need to be located within reasonable proximity to the location from where the snow is removed. The experience in other jurisdictions is to keep facilities within 5 kilometres of where the snow is removed. The Region will begin to explore opportunities to secure properties located in the built-out intensification areas where snow removal is anticipated to be necessary. The location of snow disposal facilities is also complicated by incompatibilities for any adjacent residential communities (i.e. noise, increased traffic, etc.).

The scarcity of land available for snow disposal facilities means that the Region and the local municipalities will need to work together to maximize their shared use. New snow disposal sites can be purchased in partnership with municipalities with operational agreements to meet multiple jurisdictional needs.

### **Snow disposal facilities must meet environmental requirements and guidelines**

The long term Roads Maintenance Operational Plan will consider that temporary snow dumps currently used may require retrofits to address emerging environmental requirements. The increased environmental requirements will increase the costs of replacing temporary snow dumps with proper snow disposal facilities. Snow disposal facilities will need to meet numerous regulations and guidelines from Federal, Provincial and local agencies.

## **Link to Key Council–approved Plans**

### **From Vision to results: 2011-2015 Strategic Plan**

- Continue to prioritize new capital infrastructure projects to support managed growth and optimize community benefit
- Continue to partner with all levels of government to facilitate the delivery of environmentally-sustainable infrastructure.
- Improve mobility for users on Regional transportation corridors

### **Regional Official Plan**

- To create high-quality, sustainable communities.
- To ensure streets support all modes of transportation including walking, cycling, transit, automobile use, and efficient movement of goods.
- To plan and protect future urban and rural streets to accommodate transportation demands.

## **5. FINANCIAL IMPLICATIONS**

This report summarizes a number of planned changes to the Regional road network which are going to increase the costs associated with the Region's Winter Maintenance Program. These changes include:

- More roads and the introduction of rapidways within existing Regional corridors.
- New techniques and resources to remove snow that can no longer be stored in large boulevards or in roadside ditches.
- Increased expectations to quickly remove snow from rapid transit corridors as well as other built-up Regional corridors.
- Increased enforcement of environmental impacts associated with temporary snow dumps.

The financial impacts of the above changes are not yet quantified; however, the magnitude of impacts can be estimated based on the experiences of urban municipalities who are already addressing these issues such as Toronto and Ottawa. Based on the 2010 Performance Benchmarking Report, which is part of the annual Ontario Bench Marking Initiative (OMBI), urban municipalities that perform regular snow removal have annual operating costs which are approximately 20% more in per kilometre than what the Region currently experiences. This cost increase only accounts for operating costs, exclusive of staffing resources, as there would also be increased capital costs for property, and equipment depending on the strategies used to address increasing winter maintenance needs.

York Region's 2012 Operational Budget for Winter Maintenance is \$14.4 M. Any increased resources for the Winter Maintenance Program will be included in future Road Operating budget proposals. The financial impact of any required resource increase will be presented to Council for approval.

## **6. LOCAL MUNICIPAL IMPACT**

The Winter Maintenance Program is expected to evolve with the growing Regional and local road networks. As a result, continued support through municipal partnerships will be necessary to meet the needs of both the Region as well as the local municipalities.

## **7. CONCLUSION**

York Region currently meets and, in some cases, exceeds standards outlined in the Region's Bare Pavement Policy and the Province's Minimum Maintenance Standards. As the Region grows and becomes more urbanized the characteristics of our roadways will evolve, promoting the need to increase our Winter Maintenance Program. The development of a long-term Roads Maintenance Operational Plan will address emerging issues and outline our recommended approach for future winter maintenance.

For more information on this report please contact Brian Titherington, Director, Roads at Ext. 5901.

The Senior Management Group has reviewed this report.

*(The two attachments referred to in this clause are attached to this report.)*

# **Winter Maintenance Program**

**Presentation to  
Transportation Services Committee**  
(Reference Agenda Item D2)

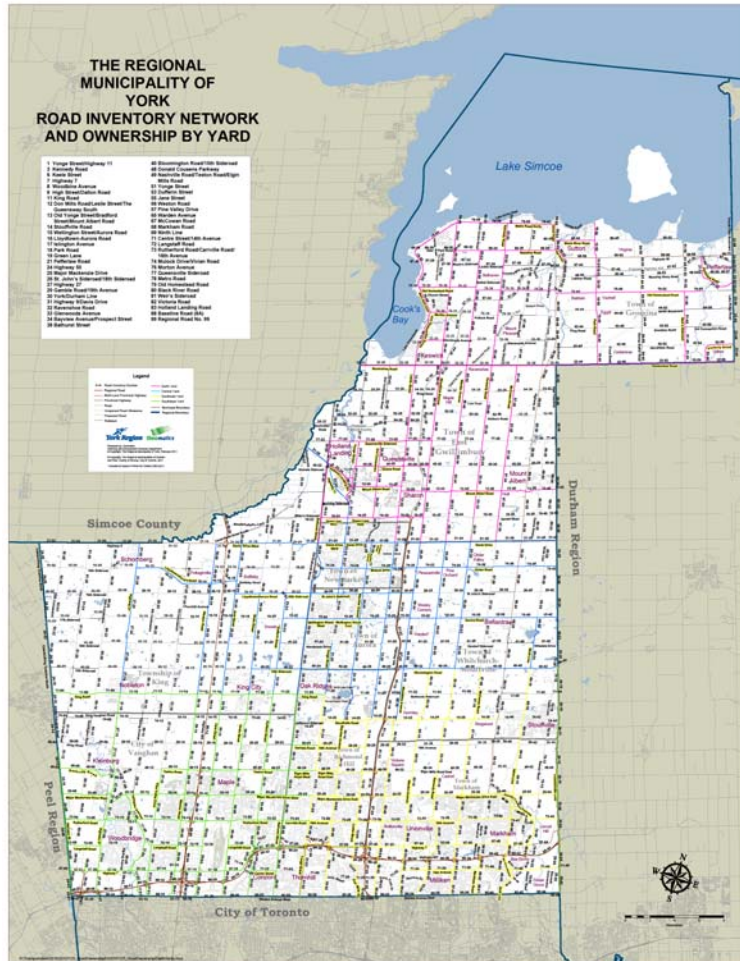
**Brian Titherington**  
**June 13, 2012**

# Outline and Purpose

- ❑ Current practices
- ❑ Emerging issues that will change current practices
- ❑ Implications of potential changes



# Winter maintenance is critical to ensuring Regional mobility



- ❑ 3,500 lane-kilometres
- ❑ Bare Pavement Policy
- ❑ Minimum Maintenance Standards

# The program is guided by York Region policy and Provincial regulations

## **Snow accumulation (Ont Reg. 239/02/10)**

The followings chart shows:

- (1) When snow becomes greater than what is set out in the chart, deploy resources to clear the snow
- (2) Snow should be cleared within the time set out
- (3) Snow must be cleared to a depth less than or equal to the depth set out
- (4) The snow must be cleared to within a distance of 0.6 metres inside the outer edges of the roadway
- (5) For a Class 4 or 5 highway with two lanes, snow must be cleared to a width of at least 5 metres

| <b>Class of Highway</b> | <b>Depth</b>  | <b>Time</b>     |
|-------------------------|---------------|-----------------|
| <b>1</b>                | <b>2.5 cm</b> | <b>4 hours</b>  |
| <b>2</b>                | <b>5 cm</b>   | <b>6 hours</b>  |
| <b>3</b>                | <b>8 cm</b>   | <b>12 hours</b> |
| <b>4</b>                | <b>8 cm</b>   | <b>16 hours</b> |
| <b>5</b>                | <b>10 cm</b>  | <b>24 hours</b> |

# Service levels are achieved using a mix of internal and external resources



# Key to success is to accurately forecast winter events

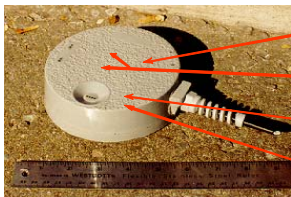
## Road Weather Information System (RWIS)



### 1. Atmospheric data

- Wind speed and direction
- Precipitation (Yes/No)
- Temperature & Relative Humidity
- Telemetry devices
- Visibility, amount of precipitation
- Camcorders, traffic counters

### 2. Road Surface Sensor



- Road surface temperature
- Presence of moisture
- Residual chemical factor
- Calculated freezing point T

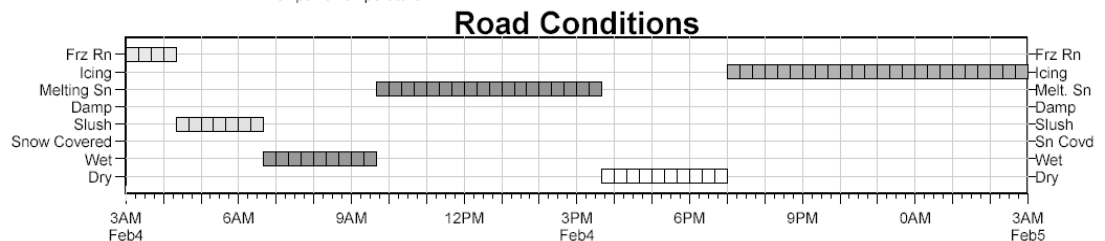
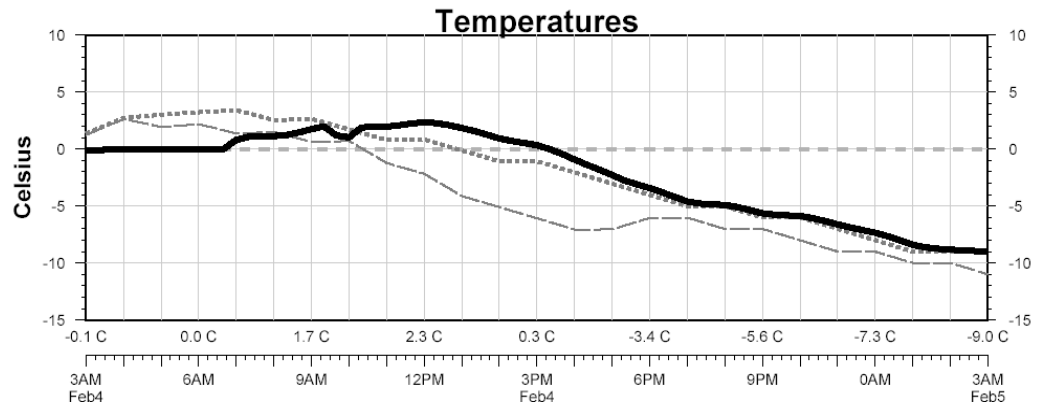
### 3. Sub-surface Sensor (T)

- 40 centimetres



## RoadCast Site: Schomberg

Tuesday February 4 2003, 3:00 AM EST



# Key to success is to accurately forecast winter events (continued)



Infrared  
Pavement  
Sensor



# A number of tactics are employed to address winter events

- ❑ Anti-icing
- ❑ Salt and sand spreading
- ❑ Snow plowing and removal



# Anti-icing is used in advance to prevent snow and ice from bonding with the road



# Snow plowing is the most common and preferred method to clear snow



# Snow plowing is not effective at removing snow that is already bonded to the road



# Only limited snow removal is currently necessary

Today



Future?

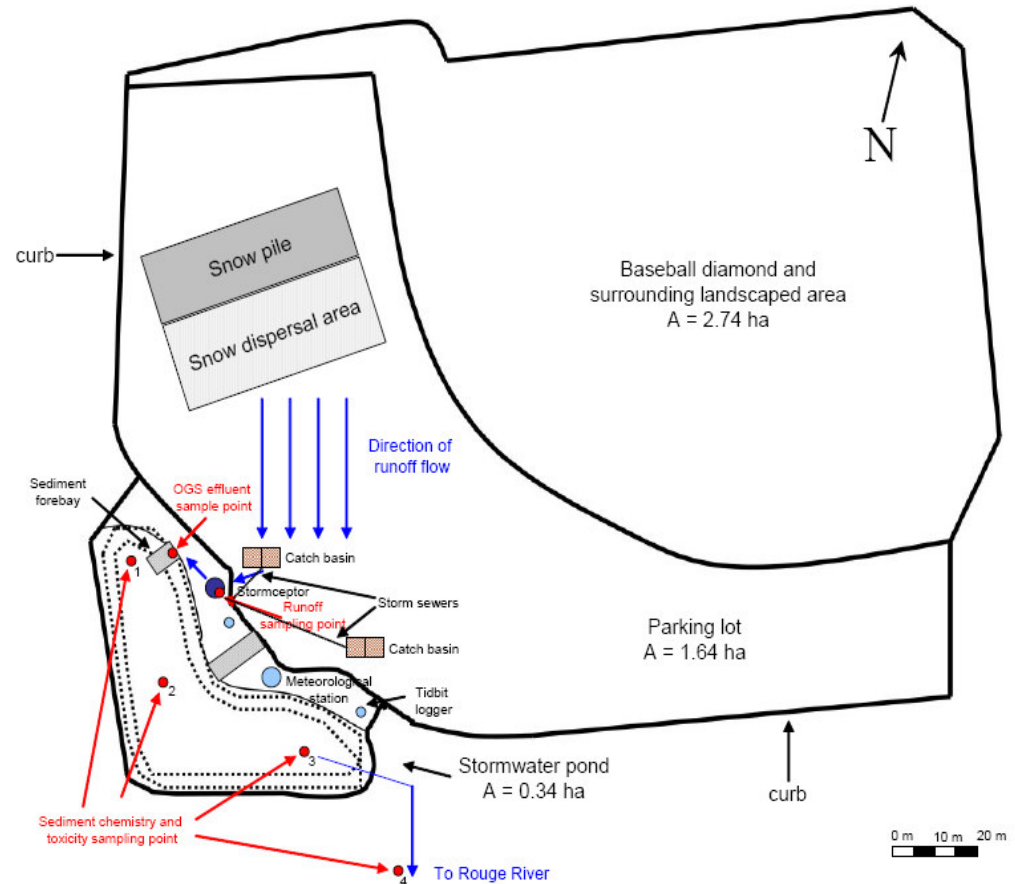


# Removed snow is taken to locally operated temporary snow dumps

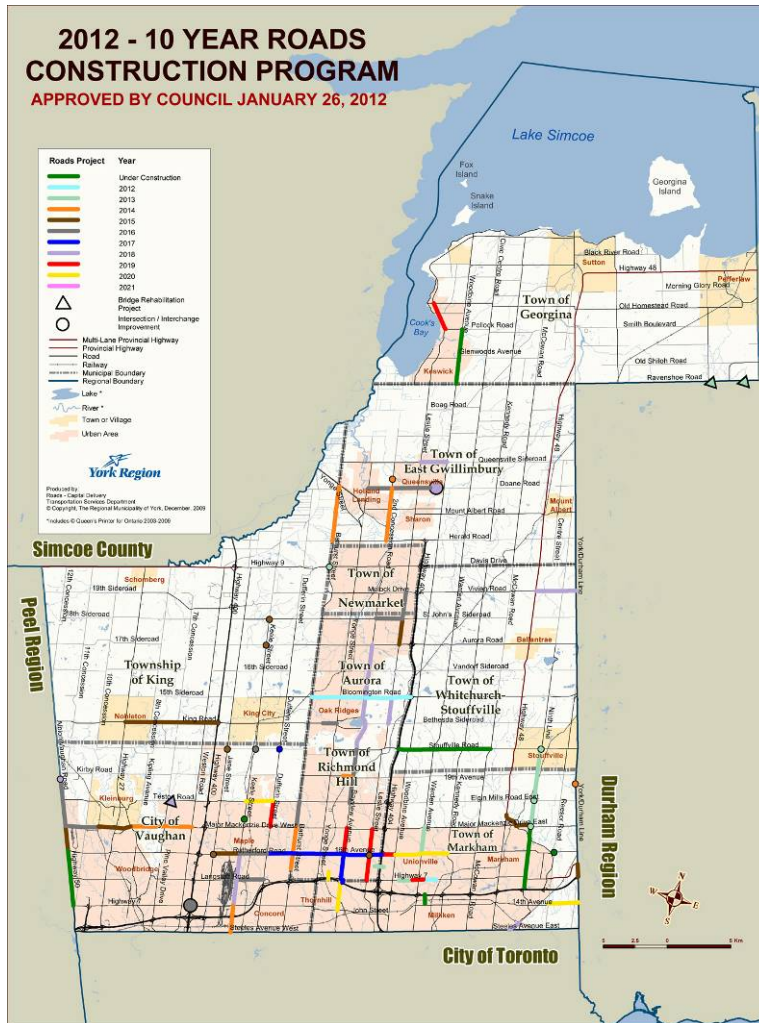
## Temporary Snow Dumps



## Richmond Hill Facility



# The number of lane-kilometres will increase by 50 per cent over the next 20 years



□ Growing 4% per year over last 20 years

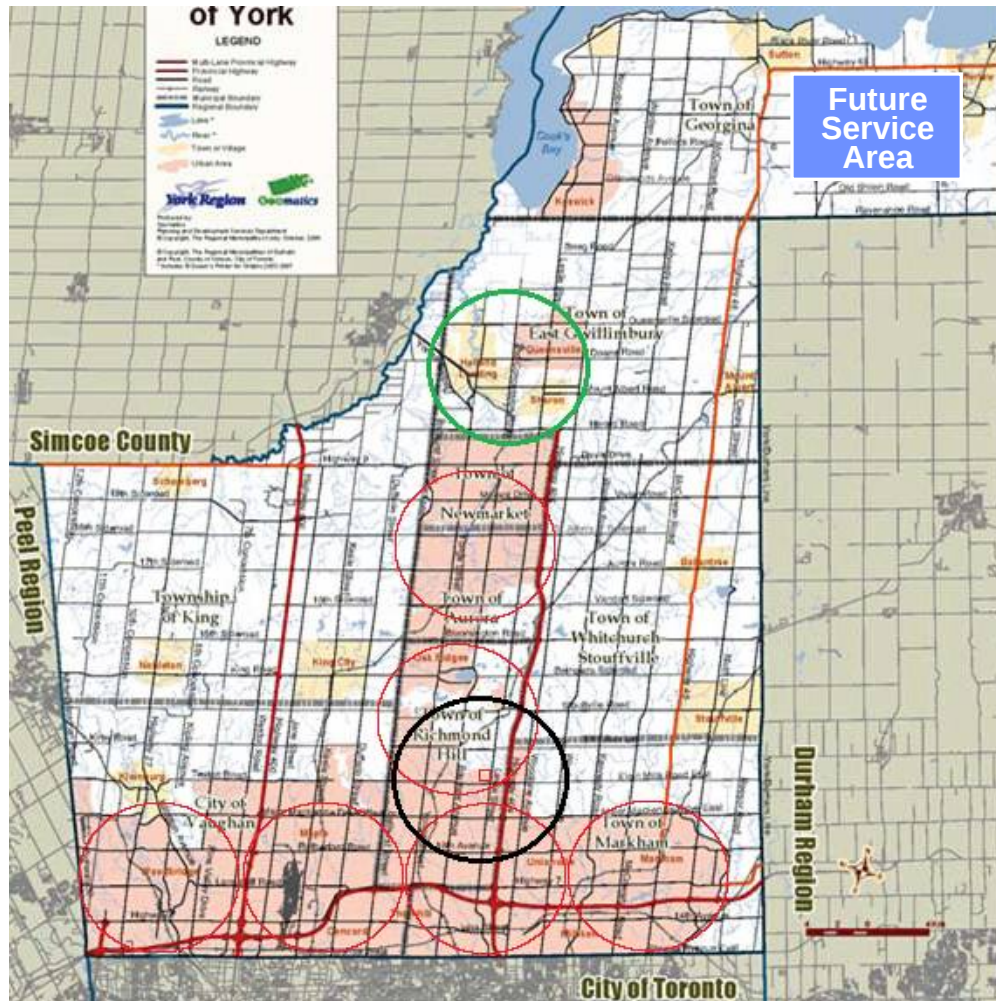
□ Planned to grow at 3% per year over next 20 years

# As roads urbanize, there is less space available to store snow

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# Property available for snow disposal is limited in urban areas



# **Planned changes will increase costs associated with winter maintenance**

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- ❑ Road network is increasing in size (more roads) and complexity (urbanization and new Rapidways)
- ❑ Requires more resources and new methods to maintain existing service levels
- ❑ Likely need to increase service levels to meet increasing expectations, particularly along Rapidways
- ❑ Increased costs to adhere to current environmental standards

**Urbanized municipalities with similar conditions have 20% higher per km operational maintenance costs**

# Next Steps

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- ❑ Development of near and mid-term winter maintenance strategies
- ❑ Continued support through municipal partnerships
- ❑ Development of a long-term Roads Maintenance Operations Plan

# Road Weather Information System (RWIS)



## 1. Atmospheric data

Wind speed and direction

Precipitation (Yes/No)

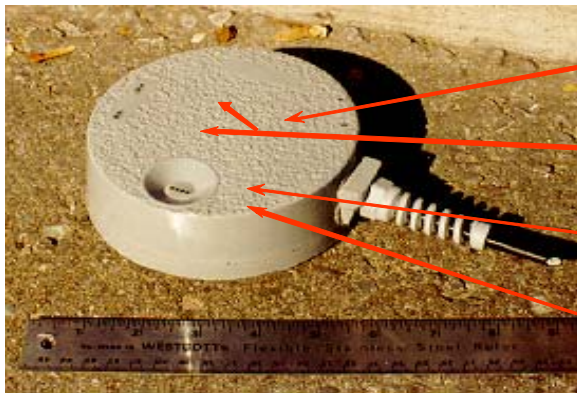
Temperature & Relative Humidity

Telemetry devices

Visibility, amount of precipitation

Camcorders, traffic counters

## 2. Road Surface Sensor



Road surface temperature

Presence of moisture

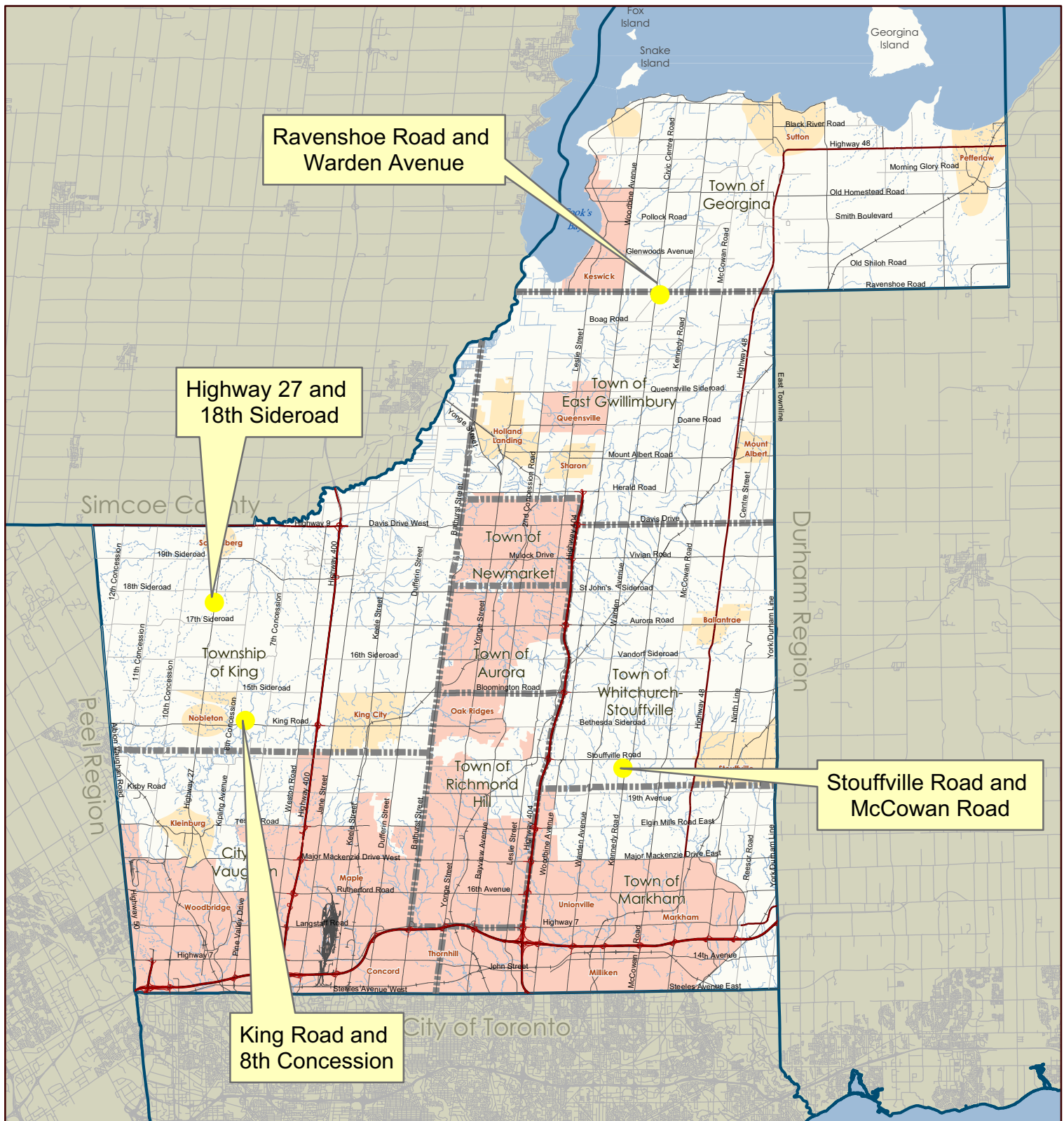
Residual chemical factor

Calculated freezing point T

## 3. Sub-surface Sensor (T)

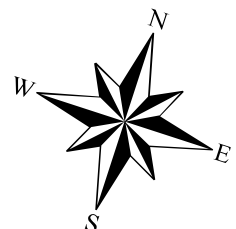
- 40 centimetres





## Location Plan

4 Existing Region RWIS Stations



0 3.75 7.5 15 22.5 30 Kilometers