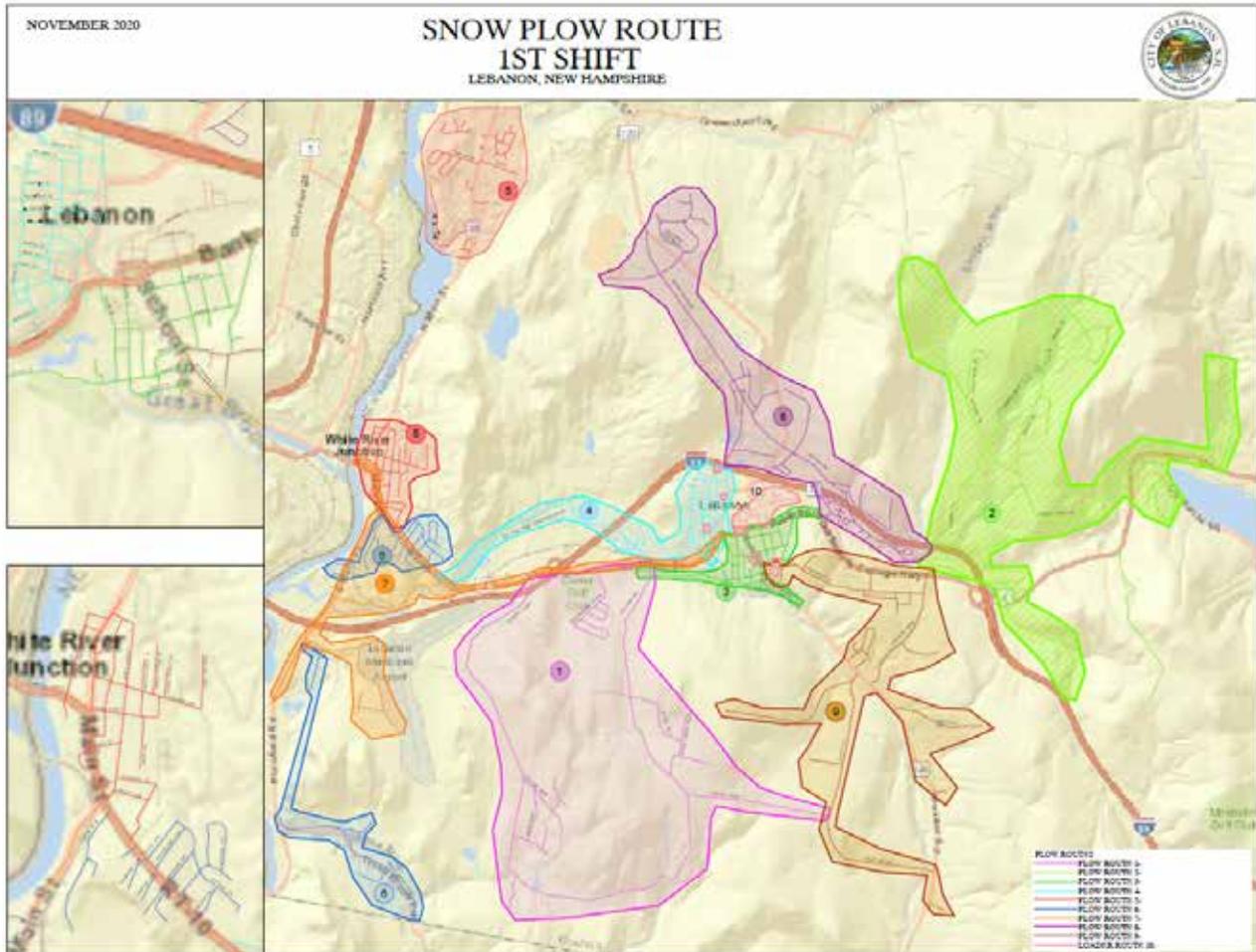


# CITY OF LEBANON



## Winter Maintenance Snow Removal and Ice Control Plan

December 2020



## **City of Lebanon Department of Public Works**

### **Snow Removal & Ice Control Plan**

Winter weather in New England is difficult to predict. There are many variables affecting winter maintenance operations such as type of precipitation, air and pavement temperature, traffic, wind, time of day and day of week.

The City of Lebanon Department of Public Works (DPW) snow removal and ice control plan is based on the goal of obtaining bare and dry pavements at the earliest practical time following the end of a storm. It is virtually impossible to provide bare pavement during a winter storm and the DPW does not attempt to do so. Judgment based on experience is essential in conducting and timing remedial work to overcome ice and snow hazards. As each storm situation varies, it is important to emphasize that this plan be used as a guideline to assist supervisors in making well informed, judgment decisions in the exercise of their snow removal and ice control responsibilities. A rigid application of this plan is impossible given the varying conditions that exist in each storm across the 100 miles of City roadways. No plan could be prepared that could dictate set procedures under all the variants.

Traffic and posted speed are the primary factors in determining the level of winter maintenance service with the road grade also being an important factor. The main runs, hills and other heavily traveled sections are maintained in such a manner that bare pavement is produced as soon as practical after termination of a storm. On City roads with low traffic, the DPW attempts to provide some bare pavement, but not necessarily from shoulder to shoulder, within a day or two after a storm ends.

It is impractical to develop specific rules on winter maintenance operations due to the numerous variables involved in winter storms. The judgment of the snow operations supervisor governs the type, quantities and application schedule of materials used to control snow and ice. It is the intent of the DPW to use the minimum deicing or anti-icing material needed to restore safe travel conditions as soon as practical following termination of winter storms. Chemical de-icing, salting and sanding units are equipped with calibrated mechanical applicators/spreaders that accurately control the application rates of materials. Employees are instructed in the proper dispensing of the necessary quantity at the appropriate time.

The winter-maintained City roadways are comprised of three roadway types defined as follows:

**Type 1a – Main Runs** These roadways consist primarily of Routes 4, 10, and 120 (these are Hanover Street, Miracle Mile, Mechanic Street, Seminary Hill, Glen Road, Main Street, South Main Street, North Main Street, School Street, Bank Street, Airport Road, LaHaye Drive and Mascoma Street.). The goal is that these roads should have full width bare pavement as soon as practical after a winter storm terminates.

**Type 1b- Other (Hills, Primary Access)** These are the hill areas and consist of Slayton Hill Road, Poverty Lane, Hardy Hill Road, Eastman Hill Road, Daisy Hill Road and LaPlante Road. They should have full width bare pavement as soon as practical after a winter storm terminates.

**Type 2** – Residential and other roads. These are all other roads with goal that they be cleared as soon as practical after a winter storm terminates.

**Type 3 – Gravel Roads** Roadways which are gravel. These gravel roads include all or sections of Sunset Rock Road, Great Brook Road, Loomis Road, “CAP” Road, Marie’s Way, Farnum Hill, Mill Road, Mount Vernon Avenue, Lereau Court and East Wilder Road. Gravel roads will be cleared of snow and sanded as soon as practical following a storm event.

These designations have been determined by traffic primarily but have been modified to include consideration of posted speed, highway grade, truck volume, accessibility to hospitals and emergency services, school zones, school bus routes, special events, second and/or third shifts at major industrial complexes and major commercial traffic.

### **1- SNOW OPERATIONS:**

Snow removal and ice control usually requires the timely application of either chemicals, abrasives or a chemical-abrasive mixture to roadway surfaces in combination with aggressive snow plowing operations. Choice of material is dependent upon the weather and road conditions. Occasionally conditions such as low temperatures do not require material application. Materials available include the following:

**Sodium Chloride** – The use of sodium chloride (common salt) combined with snow plowing is an effective, economical and safe snow and ice control method. Salt is most effective for melting purposes at temperatures above 20 degrees F., with reduced melting ability as the temperature drops. In general, the purpose of salt is to (1) reduce adherence of snow to the pavement, (2) keep the snow in a “mealy” condition and thereby permit nearly full removal by plowing, and (3) prevent the formation of ice or snow ice (hard pack). Salt is not intended to take the place of snowplows. It is economically and environmentally unacceptable to attempt to melt snow accumulations that are plowable.

**Liquid Magnesium or Calcium Chloride as alternative de-icers.** Liquid chlorides are chemicals which melts ice at lower temperatures than sodium chloride. Liquid chlorides are also beneficial in retaining de-icing material on the roadway by increasing the adhesion of the material to the roadway. The City is presently applying a non-corrosive and environmentally friendly chemical such as Magnesium Chloride (ProMelt Ultra 1000) in liquid form and will continue to try new products as they come on the market in an effort to provide an affordable and acceptable level of service while being environmentally responsible.

**Abrasives.** Abrasives (sand and fine mineral aggregates) are used primarily for immediate traction on hills, curves, intersections, railroad crossings and other areas to increase traction and minimize the use of salt. Sodium chloride, liquid chloride or an appropriate mixture of the two are usually added to abrasives in amounts dependent upon existing weather conditions.

### **Application of De-Icing Materials**

The use of chemicals, abrasives or chemical-abrasive mixtures is dependent not only on present roadway and weather conditions, but also on anticipated changes in these conditions and fiscal or logistical constraints experienced by Lebanon DPW. The effects of peak traffic periods, approaching nightfall or daybreak, precipitation type, and predicted end of storm, are considered and evaluated prior to selecting the proper materials and rate of application.

Adverse roadway conditions existing during periods of low temperatures, which are predicted to rise, would generally be treated in accordance with the recommendations for the higher temperature. If the time of day, trend and weather forecast is such that a drop in temperature may reasonably be expected, treatment would generally be in accordance with the recommendation for the lower temperature. Chemicals or abrasives should not be used at low temperatures if the pavement is dry and snow is blowing off the pavement as such use would be wasteful and may be counterproductive.

### **Rates of Application**

A liquid chloride and sodium chloride mixture are the chemicals of choice for most storm situations and are used to prevent snowpack and ice build-up on the pavement and to aid removal of any build-up that occurs. The following instructional guidelines are recommended to adequately maintain highways under most conditions:

<b>Recommended Snow and Ice Treatments per Lane Mile</b>			
<b>Conditions</b>	<b>Temperature</b>	<b>Type 1A &amp; 1B &amp; 2</b>	<b>Type 3</b>
Sleet & Freezing Rain	Variable	Salt 300 lbs. per lane mile and/or abrasive as needed. Salt-Sand Mix maybe used in freezing rainstorms,	Sand
Snow	20° F and up	Salt 300 lbs. per lane mile and if appropriate combined application of chemical chloride de-icing materials. NOTE: A pretreatment of chloride de-icing chemicals will be applied in advance of the storm event if conditions are appropriate.	Sand
Snow	Below 20° F	Salt 300 lbs. per lane mile and application of chemical chloride de-icing materials. NOTE: A pretreatment of chloride de-icing chemicals will be applied in advance of the storm event if conditions are appropriate.	Sand

De-Icing liquid and solid chlorides are normally applied to the middle 1/3 of pavement width and on the high side of banked curves. Spread width may be increased or decreased depending on the action of traffic. Materials are applied early in the storm so that a brine develops on the pavement and prevents build-up of packed snow. It takes much less deicing chemical to remove compacted snow when the treatment is placed between the pavement/snow layer than if it is placed on top of the snow. If snow continues and accumulates on the pavement, plowing should continue and additional chemical or mix treatments should be made if compaction develops.

There are many additional circumstances which will necessitate modification to these treatments. Some of these circumstances are:

1. Rising or falling temperatures.
2. When pavement is very cold and dry and snow is falling, chemicals are typically not applied. Plowing and treatment of icy spots, if they develop, is recommended.
3. An abrasive-chemical mix may be needed at extremely low temperatures, under extremely damp conditions or on very lightly traveled highways. Under these conditions the effectiveness of chlorides is reduced, and abrasives may be needed for traction.

## **Spreading Practices**

Each spreading unit is calibrated to ensure that selected rates of application are attained. Timing of the initial application during each storm is very critical. It should be delayed until there is enough accumulation on the pavement to hold and contain the material spread. However, the pavement may become glazed prior to this time and may require an earlier treatment.

Portions of each plow run are unique due to various physical conditions and will require a greater application rate or an additional application during some storms. However, these areas should be judged and treated separately and not used as a barometer to evaluate and subsequently direct complete applications over the entire section. In order to conduct an efficient operation, periodic observations of the pavement surface conditions are performed.

Width of material spread (throw plus roll) should be restricted. Reduction of the spread width by windrowing chlorides will increase the concentration of the chemical where it is needed and therefore increase the effectiveness of the application. Spreading operations should generally be conducted at speeds less than 25 mph. Air turbulence created at speeds greater than 25 mph makes it difficult to retain all the material discharged within the desired width. Spinner and belt speeds and spread pattern must be adjusted to obtain the correct spread rate and to retain the material within the lane (s) where the additional material is required.

## **Special Attention for Bridges**

Bridge decks normally freeze or glaze sooner than adjacent pavement sections, especially in the late fall and early winter. Special care and good judgment are required in the use of de-icing chemicals on all bridge decks.

Accumulations of snow along gutter lines and sidewalk or catwalk areas of all bridges should be removed when accumulation of snow and/or ice affects highway safety. Removal operations should commence on the high side of bridges on banked curves to minimize snowmelt and re-freezing or glazing of the travel lanes.

## **1 – Roadway Plowing Operations**

Plowing operations are generally initiated when roadway conditions start to deteriorate and will continue until the storm has ended and roadways have been cleared. Widening and intersection view clearing is performed following the end of the storm as necessary, and generally during daylight hours when best visibility prevails.

For light accumulation snowfalls, snow squalls, and so-called “Alberta Clippers” of short duration, plowing may begin immediately and may include simultaneous applying salting, de-icing chemicals and/or sanding to provide the desired results quickly and efficiently.

Frozen precipitation including sleet and the build-up of ice caused by freezing rain are special situations, and not subject to procedures indicated above. When a changeover from snow or sleet to freezing rain is predicted or anticipated, snow and/or sleet is left on the pavement to capture the freezing rain thereby preventing a glare ice situation, which without question is the most treacherous condition that occurs on highways. Treatment includes application of de-icing chemicals and salt at a rate of 300 pounds per lane mile as needed throughout the storm. Heavy rain tends to wash off applied liquid chlorides, salt or sand, making it difficult to keep the pavement ice-free.

It is the policy of DPW to perform snow removal and ice control operations in a consistent and impartial manner throughout the City. There are a few plowing procedures that are frequently misunderstood. To clarify our actions, the following policies and procedures are explained:

Within the City of Lebanon, it is important to understand that there are others involved in Snow Control Operations. The Department of Public Works does snow removal for most of the City however the State of New Hampshire Department of Transportation (NHDOT) is responsible for some roadways within the City of Lebanon, called “Compact Limits”. The NHDOT is responsible for:

1. Route 120 from the Hanover town line to the Stop sign at the intersection of Hanover Street, just past Exit 18,
2. Route 10 (North Main Street) from “Alards Furniture” to the Hanover line,
3. Route 12A from Applebee’s Restaurant to the Plainfield town line (just past Old County Road),
4. Route 4 from the intersection of Bank Street. and Bank Street. Extension. to the Enfield town line (approximately ¼ mile past Ruddsboro Road – north side of Mascoma Lake)
5. Route 4/Route 4A intersection to the Enfield town line (along south side of Mascoma Lake) and Payne Road.
6. Route 120 from approximately 178 Meriden Road to the Plainfield town line (just beyond sawmill)
7. Etna Rd. from Route 120 to Hanover /Village of Etna.
8. The Town of Enfield, through a cooperative agreement, is responsible for winter maintenance of the Lebanon portion of Methodist Hill Road and the Town of Plainfield maintains Old County Road. The Town of Plainfield also maintains the section of Methodist Hill Road nearest Plainfield.

## **1.1 Mailboxes and Other Structures within the Highway Right-Of-Way**

Occasionally mailboxes or other devices are damaged by snow plowing operations due to poor visibility, the mailbox being buried in a snowbank or the weight/volume of the snow being plowed. This damage is not deliberate and in most cases is unavoidable. Mailboxes should be located outside of the snowplow zone. At the discretion of the department, DPW will repair, replace or re-erect mailboxes that are located within the highway right-of-way. DPW will work with the box owners to locate the box in the safest possible location and offer advice on its design to minimize potential damage. This may require a temporary winter installation and a more permanent installation in the spring.

## **1.2 Widening or Pushing Back Snowbanks**

Following storms with heavy snowfall or when several storms result in substantial snow banking, DPW will undertake a roadway widening procedure, which will push back the snowbanks and haul snow from downtown areas. This is a necessary operation because it accomplishes the following:

- (A) Provides room for future snow storage.
- (B) Reduces or prevents melted snow from running out onto the roadway pavement and creating icing conditions.
- (C) Increases safe sight distance at intersections.
- (D) Maintains a uniform line by eliminating protrusions at driveways and intersections.

Unfortunately, there is no way to prevent depositing snow in previously cleaned driveways or walkways except to leave a hazardous projecting mound of snow. With hundreds of driveways of all sizes and descriptions along our roadways it is impossible to clear these individual drives.

## **2 - Snow Hauling**

After the initial storm response, it is often necessary to remove snow from selected areas of the City. Snow hauling is done on an "as-required" basis and, typically, as time allows. Snow hauling is done primarily with City forces and augmented by contract trucks. Therefore, the same personnel responsible for plowing, de-icing/salting/sanding operations are also responsible for snow hauling.

Snow hauling typically begins after a storm.

In general, the priorities for snow hauling are as follows:

Business District, School Zones, City streets with sidewalks.

It must be stressed that this is a guide only. Snow hauling areas may have to be changed depending on conditions.

It is not possible to haul snow off every street. Some streets are designated "No Parking" and simply "pushed back" (i.e. with no snow hauling).

### **3 - Signalized Intersections**

At those locations where there are steep highway grades law enforcement officials or authorized DPW employees may put traffic signals on flash for the duration of the storm.

### **4 - Sidewalks**

Due to resource constraints and storm conditions, sidewalks plowing start at approximately the same time as street plowing starts. The City of Lebanon attempts to clear all sidewalks on a priority basis.

Sidewalks receive winter snow control services by two distinct methods. In urbanized and more densely populated areas, snow control routes have been developed and a piece of equipment specifically designed for the task is assigned to the route, providing both plowing and liquid chloride/sanding/salting services. In less populated areas, with sidewalks along collector and arterial streets, plow service may be provided on the sidewalk by utilizing the street plow unit equipped with a wing plow. The street is initially plowed and widened with the street plow, and, as a final pass, the snow is pushed back further off the sidewalk using the wing plow. De-icing liquid chlorides, sanding and salting service is less consistent on sidewalks cleared with wing plows.

Those sidewalks that are kept plowed in winter are maintained in a manner similar to street plowing, according to a priority system. High priority sidewalks are those in the central business district, around schools and churches, and on other heavily traveled pedestrian routes.

#### **4.1 Sidewalks - Level of Service**

Due to the many factors affecting sidewalk plowing, it is virtually impossible to institute a prescribed service level, as identified for streets. During and following a snowstorm, sidewalk snow resources are applied to sidewalk plowing, application of liquid chlorides, sanding and salting on the routes established. However, depending on the storm conditions, very different results may be achieved. Currently, our goal can be stated as having all sidewalk routes completely cleared of snow in a timely fashion after the end of a snowstorm, however, there will be times when sidewalk clearing may take longer due to the amount of snow fall or frequency of storms.

It is impossible to achieve the same results on sidewalks as on streets because of the very different nature of traffic. Vehicle traffic, in combination with san/chloride/salting and plowing, can result in bare conditions on streets. Pedestrian traffic does not assist snow control efforts on sidewalks in the same way. Sidewalk conditions are more subject to the weather and less affected by snow control efforts

The City's ability to maintain sidewalks is enhanced by acquiring better equipment, but the existing conditions are still largely determined by the weather. The nature of winter weather in Lebanon tends to produce freezing rain and rain, as well as snow, as temperatures fluctuate around the freezing mark. This type of weather can produce

severe icing conditions on both streets and sidewalks, but the ability to control the surface conditions on sidewalks is less. Melting snowbanks during the day, subsequent freezing at night, etc., can also cause more icing regardless of the number of times a sidewalk is treated with liquid chlorides, salt or sand.

It must be emphasized, however, that the conditions can be different for those sections receiving the same service after each storm due primarily to weather conditions. Once icy conditions are established, the situation tends to be compounded in a cumulative way by subsequent winter storms. The amount of effort can be great in terms of repeat applications of liquid chlorides, sand and/or salt when this occurs but has little perceived impact on the surface condition of the sidewalk.

#### **4.2 Sidewalks - Plowing Operations**

Typically, plowing on sidewalks does not commence until conditions dictate, which may be accumulation of snow are in excess of two (2) inches.

Plowing continues according to the route until all sidewalks on the list have been completed. As noted previously, in severe conditions or when storms are close together or under heavy snow fall conditions, it may not be possible to complete the list before starting at the beginning again. After heavy snowfalls, sidewalk machines may be equipped with snow blowers instead of plows to service the sidewalk routes. The machines will be slower to complete the route with a blower, but heavier accumulations can be better handled.

Speed, equipment availability, and persistence is the key to keeping sidewalk routes maintained. The sooner a route can be cleared after a storm, the better the chances of keeping the whole route in good condition. The longer it takes to clear a route, the greater the chances for the snow to become packed, turn to ice, etc. Subsequent winter storms, rain, freezing rain, freezing temperatures, can all act to produce unfavorable conditions on sidewalks.

As noted previously, some sidewalks are cleared by a street snowplow using its wing plow. This activity follows initial street plowing and widening operations.

#### **4.3 Sidewalks – De-icing Liquid Chlorides, Sanding & Salting Operations**

Once sidewalks have been plowed or cleared of snow, de-icing chemicals, salting and sanding operations commence, beginning at the top of the list. De-icing liquid chloride chemicals, sanding and salting operations may be applied prior to a storm event, or after the whole route is complete with snow plowing. Applying of chemicals after the snow removal operations is the opposite sequence than that followed for arterial and collector streets, where liquid chlorides, salt and/or sand are applied first, then plowed. The same sidewalk machine handles the application of liquid chlorides, salting and sanding and plowing operations on sidewalks.

De-icing liquid chemicals, salting and sanding may become a daily process on sidewalks once icy conditions occur. Due to the freeze/thaw cycles that can occur,

sanding is an effective operation to provide some degree of traction on City sidewalks.

De-icing liquid chemicals/Sanding/salting is less frequent on sidewalks cleaned by wing plow. This service may be provided by street-salter/deicer or sidewalk machine if one can be made available. Use is made of a 1 Ton truck or 6 cubic yard truck to re-supply sidewalk sanders in the field, during heavy sanding operations.

## **5 - Parking Lots**

Due to resource constraints and storm timing, only the upper and lower parking lots (behind City Hall) are plowed during a storm, all other parking lots are generally not plowed until the end of the storm

Priority one: Upper and Lower parking lots behind City Hall (areas determined as necessary due to the presence of parked vehicles)

Priority two: Police Station and Fire Stations

Priority three: Storrs Hill Ski Area, Riverdale park by skating rinks and All Cemeteries

City parking lots receive winter snow control services by two distinct methods. The upper and lower parking lot areas have been identified as part of a primary route, providing both plowing and liquid chloride/sanding/salting application services. All other parking lots are plowed when a piece of equipment becomes available.

The upper and lower parking lots are kept plowed and serviced in a manner similar to street plowing, according to a priority system.

### **5.1 Parking Lots - Level of Service**

Due to the many factors that affect the plowing of parking lots, it is virtually impossible to institute a prescribed service level, such as identified for streets. Following a snowstorm, all snow resources are applied to streets and sidewalk plowing, liquid chemicals, sanding and salting on the routes established. However, depending on the storm conditions, very different results may be achieved. Currently, it is DPW's goal to have all parking lots completely cleared of snow within 24 hours after the end of a snowstorm.

It is impossible to achieve the same results in the parking lots as on streets because of the very different nature of traffic. Vehicle traffic, in combination with liquid chloride application, salting and plowing, can result in bare conditions on streets. Vehicle traffic within a parking lot does not assist snow control efforts on parking lots in the same way. Parking lot conditions are more subject to the weather and less affected by snow control efforts.

The level of service can only be stated in terms that snow plowing and applications of liquid chlorides/sanding and salting activities begin in the parking lots after every storm and continue until completed or another storm intervenes.

## **5.2 Parking Lots - Plowing Operations**

Typically, plowing in parking lots does not commence until accumulations are in excess of two (2) to three (3) inches. Access routes through the parking lots are plowed through by plow trucks as they pass through to allow access.

Plowing continues according to the priorities until all parking lots on the list have been completed. As noted previously, in severe conditions or when storms are close together, it may not be possible to complete the list before starting at the beginning again. After heavy snowfalls, the loader with plow may be required to service the parking lots.

Speed, equipment availability, and persistence is the key to keeping parking lots maintained. The sooner a lot can be cleared after a storm the better the chances of keeping the whole lot in good condition. The longer it takes to clear a parking lot, the greater the chances for the snow to become packed down, turn to ice, etc. Subsequent winter storms, rain, freezing rain, freezing temperatures, can all act to cause unfavorable conditions in the parking lots.

## **5.3 Parking Lots – De-icing Chemicals, Sanding and Salting Operations**

Once the parking lots have been plowed or cleared of snow, de-icing with liquid chlorides/salting, sanding operations may commence.

De-icing chemicals, salting, sanding may become a daily process in parking lots once icy conditions occur. Due to the freeze/thaw cycles that can occur, sanding is an effective operation to provide some degree of traction in City parking lots.

**END**