PRIVATE SNOW DISPOSAL SITES (On-Site Snow Storage Only)

Operations Guidance---draft

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In the United States about 100 million tons of sand and 10 million tons of salt are applied to roads annually, and similar practices are commonly used on private parking lots. When snow is removed from these surfaces during plowing and snow disposal operations, part of the sand and salt applications are also removed, along with additional pollutants released by traffic. When the snow melts and discharges from snow stored at the snow disposal sites, some of these pollutants are carried away with the melt water. In addition to chloride and sediment pollutants, the high salt content of the melt water can also increase mobilization of the more toxic form of certain metals. Unchecked, these pollutants can clog drainages, damage pavements, promote noxious growths, kill or stunt ornamental and natural vegetation, contaminate surface and ground water supplies, and reduce important and valuable fish stocks.

Fortunately, a growing understanding of snow melt water processes provides operators with valuable insight into practicable methods that can be used to economically control pollutants released from snow disposal sites, both public and private. In both Canada and the United States much new research has been directed at street deicing and snow disposal practices and their effects on the environment. Locally the Municipality of Anchorage has also focused its attention on these issues and has made progress in understanding and improving winter street maintenance and snow disposal practices. Private (on-site snow storage only) and commercial (off-site snow storage) snow disposal operations can benefit from these hard-won lessons. "Best management practices" taken as a whole are not only an optimal way to prevent environmental impacts but are also often the most beneficial approach from a business cost perspective as well. The following discussion summarizes best management practices for private (on-site snow storage only) snow disposal.

Municipal operators have discovered that the most cost-effective "best practices" include approaches that are applied at both the source of the plowed snow and at the disposal site. Like their municipal counterparts, operators responsible for plowing and on-site storage of snow from private parking lots and driveways are frequently responsible for application of winter surface treatments as well. Careful maintenance practices, including timing and types of salt and sand applications, will greatly reduce the ultimate pollutant load hauled to the snow disposal site—and reduce operation costs as well. After all, if you are plowing up salt and sand (that you have applied at great expense), its no longer helping improve traction across your client's driveway or parking lot. Similarly, control of discharges of sediment and pollutants from a private snow storage site to the Municipal storm drain system is the responsibility of the site owner and operator. Up-front and practicable control of these pollutants, then, saves money and avoids fines and costly cleanup.

Though little specific information is available for privately operated on-site snow disposal operations, the pollutant sources and physical processes are similar to those that have become well documented for Municipal and commercial sites. Operational guidance for private sites can be generally based on the current understanding of the pollutants and processes observed at these larger sites. Private operators will have to adjust actual practices to reflect the specific characteristics of different operational needs, snow sources and disposal sites, but the following practices are generally applicable.

- ## Use Best Deicing Materials

  Buying the cheapest product is not always the least expensive practice, as each of us knows from experience in everyday life. The same is true in winter maintenance of parking lots and driveways. More is not always better and the cheapest is not always the least expensive: applying "smart" is the key. Consider the following uses:

Use magnesium chloride for small parking lots and sidewalks.
Though it costs more, a molecule of magnesium chloride ($MgCl_2$) has two chloride ions and provides twice as much chloride as a molecule of sodium chloride (NaCl). Magnesium chloride is also effective at lower temperatures than sodium chloride. It is far less damaging to lawns and ornamentals (because magnesium replaces the sodium) and is less corrosive than sodium chloride, reducing capital and maintenance costs of landscaping, pavement and equipment. Conversely, the sodium ion (Na) in sodium chloride can not only kill landscape vegetation outright, but can also permanently ruin the soil.

Use coarser aggregate for "sanding".
Use of a coarser aggregate to improve winter traction on parking lots and sidewalks will reduce loss of effectiveness due to burial with continued snowfall or displacement by traffic (thus reducing need for re-application) and requires smaller additions of "antifreeze" salt to keep it free-flowing during application. It is also easier to spread uniformly. All these factors can greatly reduce total sand volumes required to achieve a similar effect (the Municipality has reduced total sand use by almost half since changing to a coarser sand specification).

- **Use Best Winter Maintenance Practices.**

When and how you apply deicers to remove or loosen ice from sidewalks and driveways makes a big difference in how well they work, how much you apply, and ultimately how much it costs you. Minimize those areas that you treat to keep snow-and ice-free, but for those areas that must be kept bare, consider these practices:

<u>Lightly</u> apply deicers just before or just as snow begins to fall.
This will help prevent a bond forming between the ice and the surface, making it easier to later simply shovel or plow the ice from the surface.

Do <u>not</u> apply deicers during a snowfall.
They may appear to work briefly immediately upon application, but with continued snowfall will rapidly dilute and refreeze to form an even icier surface, and will ultimately be removed during plowing.

Apply deicers to melt snow and ice at the end of the storm.
Application will be most effective immediately *after you have removed the last of the newfallen snow.* This is because to work, salt deicers not only require some moisture (to dissolve the salt) but also some heat. The heat, which is what actually melts the snow (calcium chloride is an exception because it releases heat as it dissolves in an *exothermic* reaction), may come from warming ambient temperatures, the sun's heat, or traffic. Applying deicers at the end of a snow storm takes advantage of these processes. You will use less deicer and have greater effect because temperatures will still be warm from the retreating storm front and the deicer will maintain greater antifreeze potency as the snow and ice melts.

Sweep or shovel surfaces free of slush and melted snow as soon as possible.
A given concentration of salt is effective down to a certain temperature—as temperatures fall following a storm, melted ice will refreeze, necessitating continuing ice removal expenses.

- **Locate On-Site Snow Disposal Sites Effectively**

Avoid storing snow at locations within areas served by potable ground water wells.
Salt in snow melt water is highly mobile, and mobilization of other pollutants can be promoted by high salt content. The cost for mitigating effects on ground water wells from inappropriately located or operated snow disposal sites will greatly outweigh any savings in snow hauling costs.

Avoid storing snow adjacent to residential and commercial properties.
Operations at snow disposal sites typically include "high-stacking" snow. Snow also includes some sediment, trash and debris that become more noticeable as seasonal melting progresses. Because both these conditions can be visual nuisances to the site's residential and commercial neighbors, visual separation from these land uses is preferred. Where sites are located adjacent to these land uses, incorporate trees and dense vegetation along the site perimeter to act as visual and noise buffers and maintain as low a snow storage profile as possible. A low stored snow profile not only minimizes visual impacts but also will reduce impacts (and treatment costs) from salt released in the melt water.

Avoid draining snow storage sites to small lakes or streams.
Salt in melt water is very "conservative"—it does not react or adsorb to other materials and so is very mobile. The best means of treatment are through minimization of initial concentrations (control initial salt application), minimization of leaching during melting (minimize the depth of stored snow), and by dilution. Because salt in melt water from snow disposal site is at times concentrated, small waterbodies may not provide sufficient dilution, resulting in impacts to the receiving waters.

- ## Operate Snow Disposal Sites Effectively

Minimize leaching of chloride and maximize melt water detention and infiltration.
The first melt water occurring at a snow disposal site can have very high salt concentrations. As each drop of melt water seeps vertically through a snow pile, salt is leached from the entire column of snow through which the drop of water flows. Early in the melt process, when the snow mass has all its original salt content, this leaching can increase salt in the melt water to concentrations much greater than that of the original pile. Conversely, as melting progresses, and when much of the salt has already been leached, salt concentrations in the melt water can become much smaller than that of the original plowed snow. A lower stored snow profile (a thinner pile) reduces the amount of snow that a drop of melt water passes through and thus reduces leaching and the peak salt concentration. As a general practice place the snow in piles having larger footprints and lower profiles (do not exceed pile depths of 20 feet) to minimize the effects of salt leaching.

Preventing the first melt water from flowing offsite right away ("detaining" it) provides an opportunity for early, salt-rich melt water to be diluted by later melt water that has progressively lower salt concentrations. Infiltration likewise helps prevent rapid mobilization of initial salt-rich melt water, and, in addition, traps sediment onsite. Promote these effects by using as snow storage sites those areas having non-paved surfaces where possible (but only where potable ground water resources will not be put at risk), and grade the surface to encourage shallow impoundment of melt water onsite. Where snow storage/disposal must take place on pavement, place the snow on the lowest point on the pavement surface, and, as possible, direct melt water so that it will be 'detained' on adjacent or nearby (on-site) permeable surfaces before discharge.

Minimize mobilization of onsite sediments.
Fine sediments are common contaminants in plowed snow and can be easily mobilized during melting. However, seasonal on-site snow melt in Anchorage is by nature a slow and hydraulically 'low-energy' process and there are many opportunities for practicable on-site treatment for this pollutant. The following are the basic elements of a best management practices plan for this pollutant. Place the first plowed snow of the year at the lowest point on the site, filling upslope from the initial fill point throughout the rest of the winter season. Stack hauled snow in a compact mass to a uniform thickness, maintaining steep sides and a relatively broad base (do not pile snow to depths greater than 20 feet). Maintain a vegetated site surface where possible. Armor and protect all drainage channels crossing the site and treat melt water, particularly for turbidity and salt, prior to its exit off-site. Placement of hauled snow at the low point should encourage ponding around the melting snow mass and minimize the length of flow paths for melt water draining across the site. Because much of the sediment in melt water is generated by the collapsing snow mass, stacking the snow with very steep sides minimizes the amount of snow surface area that is most subject to this type of erosion. Piling the snow in a compact mass to uniform depths across a broad base (low stored snow heights) can significantly help reduce

leached chloride concentrations in the early meltwater released from the stored snow. Vegetated site surfaces help trap fine sediments, metals, and petroleum pollutants. For this reason it is important to promote spring re-vegetation by limiting site access and otherwise preventing trafficking and disturbance of the wet ground surface. Where snow disposal must take place on pavement, placing snow across as broad a footprint as possible, at uniform depths and at the low point on the site remains important. In these cases it even more important to minimize the drainage path from the melting snow mass to the nearest storm drain inlet or ground surface discharge point. Where melt water flow exits a paved surface onto ground, dissipate flow energy by directing flow across a rock or grass apron. In all cases, providing unobstructed, armored melt water channels is important to minimize erosion. Flag dedicated site drainage channels so that hauled snow is not accidentally placed in them, creating the potential for diverting flow to more erodable surfaces. Armor the main channels: depending on site grade and the volume of melt water, grass or very small aggregate may provide adequate armor. Where melt water is not adequately treated through detention, site layout and operational practices, further treatment in on-site sedimentation basins or oil/grit separators may be required.

Clean snow disposal sites at the end of the snow melt season.

Plowing snow inevitably incorporates some trash and debris. During active snow melt this debris remains wet and relatively immobile. At the end of the melt season, remove trash and litter from the site, and perform maintenance on drainage channels and sediment traps. If it is necessary to regrade the site, complete re-grading early and limit summer access to promote re-vegetation. Sweep all paved surfaces as soon as they become free of snow and impounded water (do not sweep sediments into the impounded water) and clean any melt water pollutant treatment devices (e.g., oil/grit separators, sedimentation basins, etc.).