E-news Express

Snow Melt Water Quality and Treatment at Engineered Snow Disposal Sites

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The City of Edmonton uses five engineered snow disposal sites to store snow that is collected from roadways and parking lots. Melt water from the storage sites is treated using detention ponds to reduce environmental impacts. As part of Edmonton's "The Way We Green" initiative, Transportation Services engaged the Edmonton Waste Management Centre of Excellence (EWMCE) to investigate potential environmental impacts in melt water and to improve treatment efficiency from detention ponds. Curtis Faucher, a Research Engineer Intern at the EWMCE and Master of Science student at the University of Alberta, is working on this project, using the results and findings to form his Master's thesis. This collaborative project between EWMCE, Transportation Services, and the University of Alberta solves practitioner-based problems, and builds capacity of highly qualified personnel in an interdisciplinary field.

Curtis John Faucher, EIT

A Research Engineer Intern at the EWMCE, Curtis is working on innovative solutions to eliminate, treat, or manage residual materials from roadways. He is a recent environmental engineering graduate with over 6 years of experience building water and wastewater treatment facilities throughout Alberta.

The snow melting process is dynamic, particularly in large snow piles at engineered snow disposal sites. Salts (as measured by electrical conductivity), water, and suspended solids are released from the piles over three general phase as shown in Figures 1 and 2.

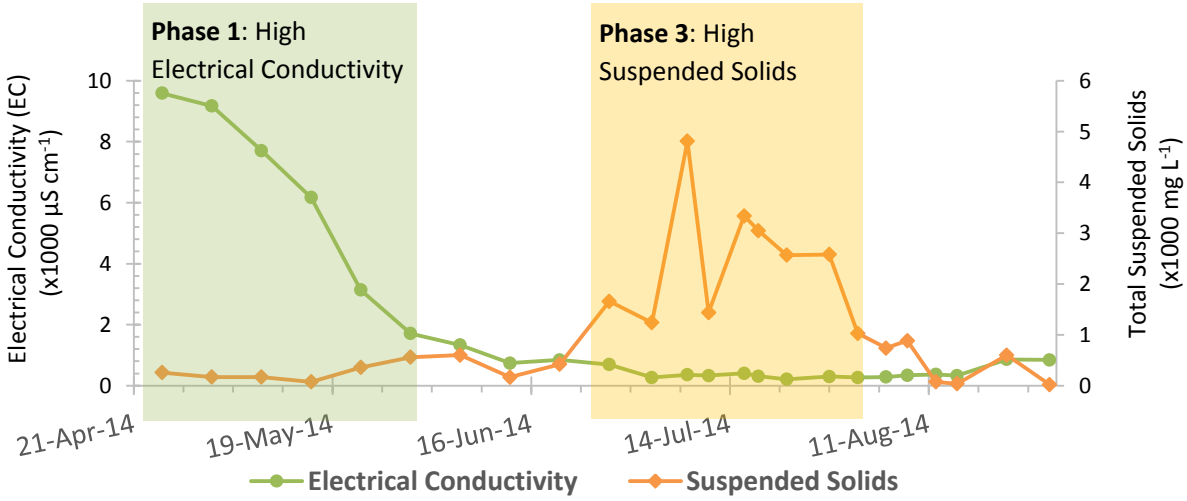

Figure 1 – Release of soluble and solids constituents from an Edmonton snow pile

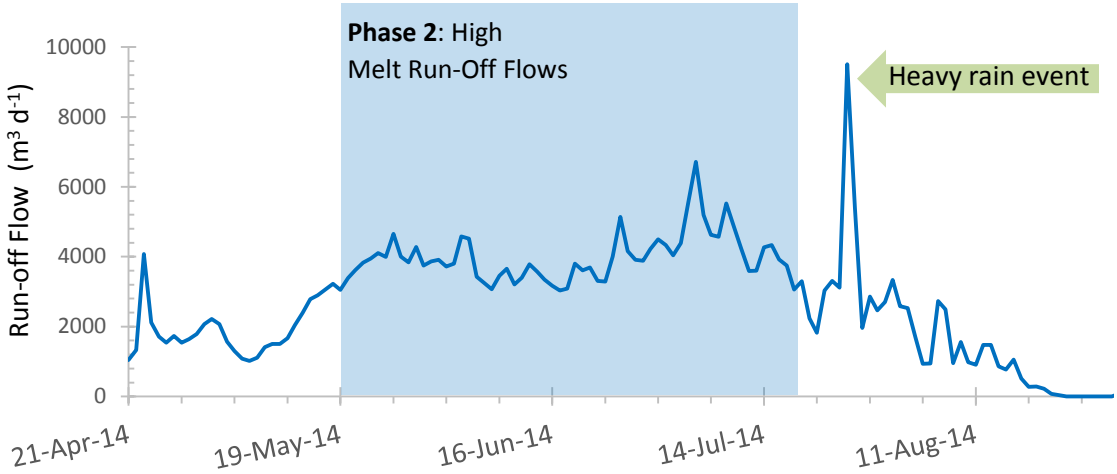

Figure 2 – Release of water from an Edmonton snow pile

Phase 1: High Electrical Conductivity *(Figure 1)*

When snow piles begin to melt, the melt water has a high electrical conductivity because of a high level of ions concentrated by freeze-thaw exclusion. Freeze-thaw exclusion occurs as ice crystals melt then reform causing impurities to move to the edges of the crystals. These impurities, such as ions, accumulate in the passing melt water as the water begins to migrate down through the pile. The majority of the ions are de-icing salts that are collected with the snow.

Figure 3 – Snow disposal detention pond for treating melt water

Phase 2: High Melt Run-Off Flows *(Figure 2)*

Higher temperatures and longer sun exposure provide more energy that increases melting rates resulting in high run-off flows from the snow piles.

Phase 3: High Suspended Solids *(Figure 1)*

As snow piles collapse and begin to fragment, solids such as sand and clay particles previously held in the snow are released. These solids are then entrained in the water; carrying with them metals and organics that are adsorbed onto their surface.

Current practices for the design and operation of an engineered snow disposal facility focus on addressing high water flows by using detention ponds as a primary treatment unit. The detention ponds remove large settleable solids. To further reduce overall environmental impacts, EWMCE and its partnerships continually investigate more robust practices in treating and removing electrical conductivity (e.g. ions) as well as suspends solids (e.g. metals and organics) from their snow sites.

Research Engineer Intern Program

EWMCE's Research Engineer Intern (REI) program provides an unique opportunity to individuals like Curtis. The REI program allows interns to complete advanced studies, while providing advanced technical services to municipalities. The program is an equal split between research and technical services.

The next phase of this project is: (1) to provide a detailed characterization of the snow melt water quantity and quality (e.g. composition and settling parameters); and (2) to identify any limitations of the current technologies used to meet the treatment objectives (environmental quality objectives).

Results from this study will provide a foundation for a larger research project aimed at improving the water quality treatment of snow melt water sites in Western Canada. The knowledge gathered furthers best management practices for engineered snow disposal sites that can be used by other municipalities, especially those with similar cold climate conditions.

The EWMCE excels at providing applied research to support effective and efficient practitioner-based solutions in a cooperative environment. We provide services in problem definition, preparation of funding applications, project management, training, experimentation, presentations, reporting, and marketing.

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