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Salt-Clay Interactions: Reducing Sediment Loads and Erosion at Snow Storage Sites

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High total suspended solids (TSS) discharge to settling ponds at City of Edmonton snow storage sites is costly to clean out and occasionally results in unacceptable releases to the environment. A test program was conducted to observe the settling behaviour of sediments under simulated site conditions. When clay minerals are exposed to sodium chloride in meltwater they adsorb sodium ions, repel each other, disperse into suspension when disturbed and resist settling. Particles that resist settling are susceptible to erosion, stay suspended longer and transport further. The test results have operational implications from which strategies were developed to reduce sediment discharges to the ponds and improve future snow storage site design. The settling observations and monitoring data allowed us to predict when suspended sediments in meltwater will be problematic using chloride concentrations or specific conductivity as an indicator parameter. Potential mitigative strategies during problematic times include berms to provide additional retention time for sediment-laden meltwater, minimizing physical disturbance of the clay liner, and using divalent cationic additives to improve settling (such as gypsum). Recommended design changes for future operations include isolation of the clay liner from the surface, selection of clay-free liner material and/or hard surfacing which would significantly reduce the sediment volumes in the settling pond, reduce maintenance costs and reduce environmental impacts from total suspended solids.

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Wanda is the General Supervisor of Geoenvironmental Engineering in the Engineering Services Section of the City of Edmonton. She has a multi-disciplinary background in geological engineering, civil engineering and chemistry, and specializes in applied geochemistry at environmentally impacted sites. Wanda develops contaminant-specific geochemical characterization programs which are used to evaluate contaminant source terms, to assess and predict groundwater evolution, to critically assess remedial technologies and to develop mitigative strategies. This applied technology is used at contaminated legacy sites and active operations that deal with chemicals and industrial wastes.