Use of Cement-Based Binders for Chemical Stabilization of Metals-Impacted Railbed Materials

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Between 1924 and 1978, rail cars carrying slurried ore concentrate from former mining operations in the Sudbury District of Ontario were staged on rail yards and spur lines operated by Canadian Pacific (CP). Leakage from the rail cars contributed to the accumulation of metals in the rail beds and the adjacent shallow soils, sediments and ditch surfaces. Infiltration of rainwater and surface water has contributed to leaching of metals that have expressed in a series of drainage ditches which flow off-site and into the Onaping River watershed. Various remedial and containment strategies to control surface water leaching of metals from the railbed materials, such as agricultural lime application, have been evaluated and in some cases, subjected to field trials. These were generally concluded to be impracticable or shown to have limited long-term effectiveness.

A remedial options evaluation identified stabilization as a potentially applicable technology, having seen application in the remediation of metals-impacted soils in contaminated sites applications and waste management. In 2014, bench-scale treatability studies using cement-based stabilization were performed to assess the effectiveness of this treatment approach in decreasing the leachability and mobility of metals. This bench-scale evaluation suggested that the leachability of metals could be reduced by up to 99.9% as compared with the untreated materials. In 2015, the remedial evaluation was expanded to a field-scale trial to evaluate the implementation and performance of a cement-based soil stabilization program along an affected section of railbed. Soil was removed along a portion of the railbed, mixed with hydraulic slag cement and returned to the excavation. Monitoring of the performance of the stabilized railbed area is ongoing.

This presentation will provide details regarding the project challenges, the design and implementation of the stabilization approach, as well as its performance to date.