

Long-Term Monitoring of a Thin-Layer Sand Cap in Peninsula Harbour Area of Concern

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Background/Objectives. Peninsula Harbour is located on the north shore of Lake Superior and is identified as an Area of Concern due to historical inputs from the pulp mill and chlor-alkali plant, and historical log booming. Over time these activities resulted in impaired fish and benthic communities, as well as elevated levels of contaminants (specifically mercury (Hg) and polychlorinated biphenyls (PCBs) in sediment and biota. To reduce the risks imposed by the contaminants, thin-layer capping was the selected sediment management option for the Hg and PCB hot spot located adjacent to the mill. In 2012, 15-20 cm of sand was placed over sediment exceeding the remedial target of 3 mg/kg total Hg. In 2017, five-years post-cap, the first full long-term monitoring assessment was completed with the goals of achieving targets for cap stability, cap effectiveness, and ecological recovery.

Approach/Activities. The large grain size of the sand cap presented some challenges, and traditional sample methods used during the pre-cap baseline monitoring were not feasible for the post-cap monitoring. Therefore, alternative technologies were used to collect samples, and for most survey components, divers were used. Cap stability was monitored through sediment grab samples and underwater video. The effectiveness of the cap to meet the area average 3 mg/kg remedial target was assessed through the use of passive samplers (with modified casings to accommodate the large grain size), and surficial sediment. Porewater from the passive samplers was used to assess the migration of total Hg through the cap from the native sediment; sediment cores were collected to verify the porewater measurements. The surficial sediment overlying the sand cap was analyzed for total Hg and compared with the remedial target. Ecological recovery of the cap was assessed by the collection of benthic invertebrates, an estimation of submerged aquatic vegetation coverage, and the collection of sport fish.

Results/Lessons Learned. A preliminary assessment of the results of the Peninsula Harbour long-term monitoring survey has shown that the thin-layer cap has been effective in reducing the total Hg exposure to below the remedial target of an area average of 3 mg/kg Hg in the capped area, thereby lowering the risk to sensitive receptors. In addition, comparisons to historical and pre-cap baseline surveys have indicated that Hg concentrations have been reduced significantly in the cap area. The cap is stable and has essentially eliminated the vertical transport of Hg from the native sediment, up through the cap to the surface-water interface. Natural sedimentation has occurred since the construction of the cap in 2012, further lending to the enhanced natural recovery of the site. Biological surveys have indicated that the cap has been colonized with benthic invertebrates and the coverage of submerged aquatic vegetation continues to increase over time. Further assessment is required to make pre-cap and post-cap comparisons for benthic invertebrate community and fish tissue data. In addition, the

relationship between Hg and MeHg will be explored, as well as the assessment of other contaminants of concern, such as PCBs.