

Winter Remediation of PHC-Contaminated Soils from the Shoreline of a Flowing Channel Located in Northern Manitoba

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Roughly 20 km north of Lake Winnipeg and 35 km west of Norway House Cree Nation lies Eight-Mile Channel (8MC). The channel was constructed between 1972 and 1975 to enhance flows through Manitoba Hydro's downstream generating stations. Unfortunately, construction resulted in petroleum hydrocarbon (PHC) contamination at an area along 8MC referred to as Grid 264.

During construction, Grid 264 was the site of two large fuel storage tanks. Years later, investigations at the site delineated approximately 4,000 m³ of PHC impacts contained in a continuous parcel to a maximum depth of 4.5 m below grade. By 2007, strong channel currents had eroded the shoreline several meters inland positioning it over the midline of the contaminated parcel.

In addition to the submerged contaminants, geographic and climatic conditions in the region presented serious challenges. Grid 264 is located where 8MC met Playgreen Lake, with the latter prone to sudden development of waves measuring up to 1.5 m in height. Therefore, freeboard on cofferdams would have to exceed this height to prevent swamping. Furthermore, the site is located on the opposite side of the Nelson River from the only regional highway.

To address freeboard and mobilization concerns, project planners chose to conduct the remediation during winter months. Manitoba Hydro retained a local First Nation contractor to construct the 53-km construction road, including a 3-km crossing of the Nelson River. The road was completed in early January 2008 and a 40-person construction camp was established near the work area.

Aqua Dams were selected to provide hydraulic isolation of the work area. Aqua Dams are tubular, inflatable bladders that, when filled with water, sink and rest on the bottom of a water body. To our knowledge, these had never before been utilized during winter in Manitoba. Project planners had hoped that the Aqua Dam would hold back the roughly 3.1 m height of water once frost fused the Aqua Dam's base to the channel bottom. However, the channel current prevented this. Therefore, the Aqua Dam was supplemented by a clay and silt cofferdam along its inner face.

The work area was enlarged well beyond the limits of contamination to permit stable 9-to-1 excavation slopes ensuring worker safety. Unseasonably cold temperatures quickly drove frost deep into the exposed channel

bottom allowing steeper excavation slopes and reduced excavation volumes. The frost also ensured that the excavated soil was frozen and therefore did not require dewatering and treatment of the supernatant.

Excavated soil was hauled to a single-use contaminated soil treatment cell located roughly 5 km to the northwest of Grid 264 along existing roads. Subsequent ongoing monitoring of sentinel groundwater wells has not detected any impacts beyond the treatment cell. In the end, roughly 7,500 m³ of frozen soil was excavated and hauled to the cell and, apart from continuing soil treatment, the project was complete by mid-March 2007. Complete soil treatment is expected to require another two to four years.

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Mr. Smith has contributed to and managed many environmental remediation projects throughout Manitoba and northwestern Ontario. These have included in-situ and ex-situ applications, natural attenuation studies, risk assessments, vapour inhalation reviews, delineation programs, and hydrogeological studies. These projects have frequently involved consultation and coordination with First Nations communities. Mr. Smith also routinely contributes to wastewater infrastructure renewal projects in his position with Manitoba Hydro.