Sustainable Remediation of Dissolved Phase Hydrocarbons at an Active Fuel Service Station Using an Integrated In-Situ Remedial System

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In 2012, petroleum hydrocarbons were identified in the potable water supply for a kiosk at a retail fuel service station, which prompted a comprehensive soil and groundwater investigation to immediately address and control the risk to human health and the environment. The soil and groundwater investigation identified a widespread hydrocarbon plume across the site, which extended beneath the kiosk and fuel service infrastructure. The subsoils were classified as a fine-grained clay and hydrocarbon contamination was at an average depth of 2.3 metres below grade (mbg), at the approximate groundwater interface.

The remedial action plan was designed to provide a sustainable and non-intrusive approach, thereby limiting costly disposal fees and operational down-time of the retail fuel service station. The concept behind the integrated in-situ remedial system design was to allow for several in-situ methods to be integrated into one remedial system. The system included the installation of an innovative well design network for independent or simultaneous implementation of multi-phase vapour extraction, groundwater recovery and on-site treatment, air sparging, nutrient and/or oxidant amendment.

The remedial system was initially operated for 10 months during 2015 and 2016 and recovered 112,000 L of contaminated groundwater, which was discharged to the municipal sewer system, following on-site treatment using a carbon filtration system. Mass balance calculations indicated that 3,000 kg of hydrocarbons were removed through vapour and groundwater recovery over this time frame. Groundwater sampling completed in August 2016 indicated that the dissolved phase hydrocarbon concentrations were reduced by 80% across the site since the May 2015 baseline sampling event. In-situ biodegradation of dissolved hydrocarbons was also occurring as indicators of denitrification and anaerobic reduction were evident.

Moving forward, we are evaluating the use of recovered and treated groundwater to be utilized for amendment preparation and delivery for the final in-situ polishing of the site. There is a distinct advantage to re-using the recovered and treated water, which will maintain consistency with the site groundwater chemistry as well as allowing for the re-introduction and distribution of indigenous bacteria to the site, while minimizing waste generation. Based on the site groundwater chemistry of the site, we feel a tailor-made in-situ amendment combined with the indigenous bacteria population will promote optimal conditions to complete the site remediation.