



BTEX in the Sand River Aquifer – Evidence of Natural Anoxic Decomposition of Plant Matter

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Operators of thermal in-situ oil and gas projects in Alberta are required to manage potential thermal impacts through thermal groundwater monitoring programs. The heating of intersected aquifers from steam injection wells completed into deeper target formations can mobilize chemical constituents that are naturally present in host sediments.

At a project located in the northeast of Alberta, concentrations of BTEX were detected in a thermal monitoring well located on an operating thermal well pad and installed in an aquifer approximately 40 m below surface. However, no significant increases in groundwater temperature were observed and an investigation was conducted to determine the source and extent of the hydrocarbons.

Potential sources relating to operations were investigated and ruled out as the source of BTEX in groundwater. During subsequent drilling and installation of additional thermal monitoring wells, dark organic material was observed at the top of the aquifer, and samples were collected. Analysis of the material showed heavier hydrocarbon fractions present, but no BTEX. PHC chromatograms indicated a plant source of hydrocarbons.

A laboratory experiment was designed to stimulate the breakdown of plant hydrocarbons at select soil samples collected in the aquifer, to evaluate whether this would produce BTEX, and provide a link between these and the BTEX detected in groundwater. Results showed that samples containing biogenic hydrocarbons were able to produce BTEX in high concentration at 25°C, with a profile that matched the groundwater samples. It was concluded that BTEX can naturally occur in the aquifer due to natural conditions and is not primarily influenced by temperature.

This presentation will describe the project scenario, the experimental program and the literature supporting the conclusions.

Phil Richards

Phil Richards, Ph.D., M.Chem., M.Res is a chartered senior forensic chemist with over 20 years of experience as a professional chemist. He is qualified as an expert as an analytical chemist at the Court of the Kings Bench in Alberta. He specialises in chemical data interpretation, in particular source characterisation and the fate and transport of organic contaminants.

Kayla Mukli

Kayla Mukli is an environmental technologist and project manager with over 8 years of experience in environmental consulting. Kayla specializes in hydrogeological and contaminant assessments, providing a strong technical background and leadership role on complex projects. Her expertise includes detailed core logging and well installation, aquifer testing and data interpretation, and groundwater monitoring and sampling.