

### (The) Story Arc Model: Remediating a Gasoline-Impacted, Downstream Site in Central Alberta

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The use of the conceptual site model concept has been adopted across the industry but the role of timing and strategic site management is not usually considered. A story arc model, typically used as a literary device, is proposed to be adapted to illustrate environment site management and remediation activities, where important “plot developments” of the overall “story” are visualized and contextualized using the story arc model concept.

The story arc model will be used to demonstrate how gasoline-impacts were identified through assessment and monitoring within a bedrock aquifer over just under a decade-long program. Hydrocarbon impacts subsequently migrated to a river-bank and were greater than surface water quality guidelines; however, impacts were not identified in the river itself. The nearby river was considered to be the primary receptor of concern and remediation end-points and goals were subsequently established.

The findings of these assessment and monitoring activities initiated a multi-stage remediation program over just under a decade, including ex-situ remediation of the source area, in-situ trials, the installation and implementation of a full-scale multi-phase extraction (MPE) system and off-site peroxide injections. After tailing MPE system performance and attempts to optimize the MPE system were unsuccessful, the MPE system was turned off and on-site peroxide injections were completed.

As of 2018, groundwater quality concentrations generally met risk management end-points at off-lease oxidant injection wells and pore water samples at the river-bank were less than surface water guidelines (the climax of the “good-news” story), justifying further reductions in the remediation program scope (i.e., the resolution). Only polishing at on-lease injection wells remains to be completed.

In anticipation of remediation end-points being met, natural attenuation parameters are being monitoring to establish a long-term record of the degradation of hydrocarbons by naturally occurring microbes. Monitored natural attenuation will likely be used as an alternative to active remediation in the future.

Creating this “good news”, decade-long story arc involved carefully considering short-term and long-term strategies and outcomes on a frequent basis; creating realistic expectations and goals; and letting data drive site management decisions.

Biography: Brent Lennox is a senior hydrogeologist with Waterline Resources Inc. and has over ten years of consulting experience in contaminant hydrogeology, physical hydrogeology, and environmental geoscience, as well as a Master’s of Science in geology. He is particularly focused on contaminant hydrogeology, environmental site assessments, and remediation and has experience with a wide variety of contaminant sources, environmental settings, and remediation approaches.

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