

# **GASOLINE-CONTAMINATED GROUNDWATER: ECOLOGICAL RISK ASSESSMENT (ERA)**

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## **Abstract**

In order to assess the ecological risk resulting from an accidental gasoline spill in the vicinities of an environmental protected area with a marshland and a shallow aquifer, groundwater sampling using low-flow technique was conducted during three campaigns in an eight-month period. The study included eight monitoring wells installed in the affected area and a ninth monitoring well used as a control installed in the same aquifer in an area considered not affected by the accident. Two lines of evidence (LoE) were integrated to estimate the risk. Physic-chemical parameters, BTEX compounds (benzene, toluene, ethylbenzene, m- xylene, p-xylene and o-xylene) and metal concentrations were used to integrate the Chemical LoE. Acute (*Aliivibrio fischeri*, *Daphnia similis* and *Danio rerio*) and chronic (*Desmodesmus subspicatus*) assays, as well as genotoxicity and endocrine disruption biomarkers in *Oreochromis niloticus* were applied to build up the Ecotoxicological LoE. Results from the Chemical LoE indicated extreme risk in all sampling campaigns in groundwater samples from three out of eight monitoring wells (GW4, GW7 and GW8), which exhibited free-phase gasoline. Lead was also found in concentrations exceeding the Brazilian intervention levels in well GW6. Results from the Ecotoxicological LoE converged with those obtained with the Chemical LoE and a high mortality was observed when individuals were exposed to groundwater from GW4, GW7 and GW8 monitoring wells. These wells were considered to be in the hot spot of contamination and therefore, this area should receive priority for remediation efforts. The results indicate that BTEX in groundwater may pose a threat to the ecosystem and residents in the region. This information is considered useful for further evaluation, risk management and future remediation efforts in the area.

## **Keywords**

Ecological risk assessment, Groundwater, Gasoline spill, Biomarkers