

Groundwater Characterisation at chloralkali site

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Groundwater on Chloralkali sites may present very contrasting geochemical settings regarding mercury occurrence and forms. The contrasts are due to the high reactivity of mercury, the industrial processes involved in groundwater contamination and / or local specific natural (bio)geochemical environment.

One study conducted at a chloralkali site showed, depending on the part on the site, contrasted conditions such as:

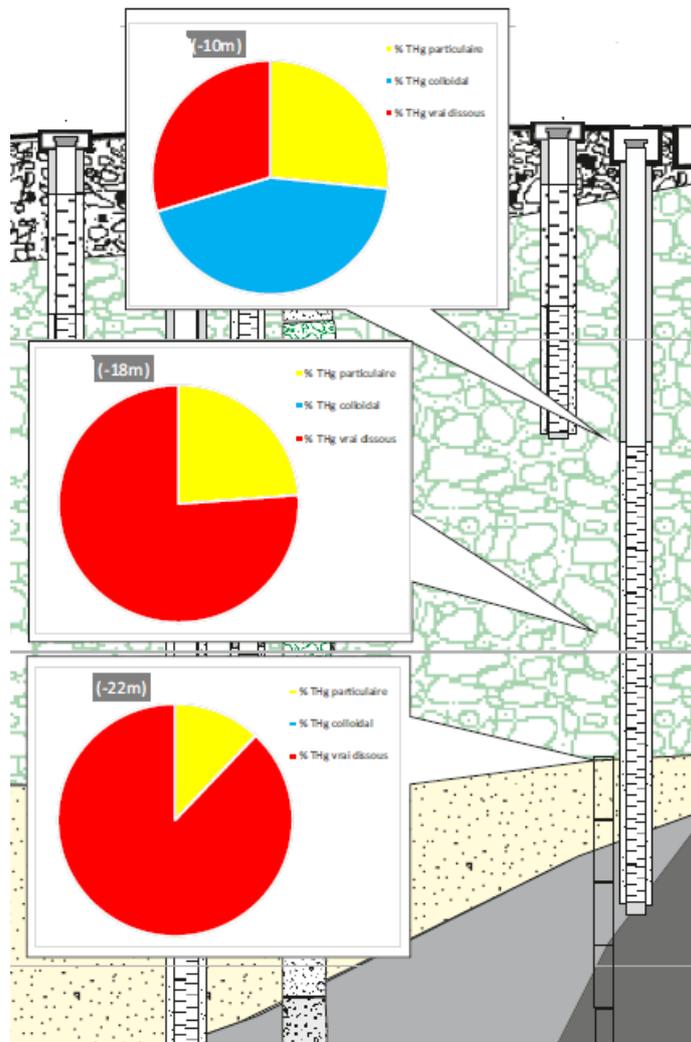
- pH below 2 in some parts of the site and pH above 13 on others;
- Very low and very high conductivities were also observed (up to 40 000 $\mu\text{S}/\text{cm}$);
- High oxidative condition in some parts and reductive one in others,
- Groundwater temperature ranging from 5°C to 25°C

The historical study of the site also informed that forms of mercury lost during the exploitation time are different as well as the loss mechanism: low intensity leakages, or massive leakages of solutions of high density, which can lead to their migration in depth (case of mercurial brines).

A good groundwater characterization is needed first for risk assessment, then –if necessary- to choose the best available remediation technique:

- Groundwater plume and the geometry of the aquifer had to be characterized in depth and with several sampling points (multilevel approach);
- The speciation of mercury (Hg^0 , reactive Hg, particular Hg) may be measured in the different labile fractions: dissolved, colloidal and particulate.

Environmental space and time fate of mercury in these conditions may be of high complexity. Mercury may migrate in the groundwater flow dissolved sorbed on organic or inorganic particles of different sizes and / or as micro or nano droplets. These Hg^0 droplets can be present in the initial mercury brine lost by leakages. On the other hand, they may appear in the aquifer by reductive (bio)chemical reactive processes involving dissolved species of mercury (Cl, OH, Hg^{2+} complexes). These reactions cause a drastic reduction of mercury solubility in water leading to the production of droplets of different sizes.



Mercury partition between dissolved, colloidal and particulate fractions