LIGNITE MINING

How do iron ochre and sulphate enter fresh water?

The lignite mine in Lusatia requires a massive water table drawdown in order to prevent flooding of the pits. The groundwater level needs to be lowered to a depth of 100 metres below the ground surface. Owing to the water table drawdown, the mineral pyrite (FeS2, also known as “fool’s gold”), which is present in the subsoil, comes into contact with oxygen. Following the closure of surface mines and the termination of mine draining measures, the pyrite is flushed by the rising groundwater. Contact with oxygen and water sets a weathering process in motion that results in dissolved iron, sulphate and acidification. When the groundwater rises again, the weathering products are flushed out and enter the fresh water of Lusatia and the Spree. The Spree is also contaminated via seepage from the spoil deposits within and outside the surface mines and directly as a result of surface mine drainage. The dissolved iron then flocculates in the neutral waters in the form of iron hydroxide (known as iron ochre). Depending on the speed and flow and how long it has been there, it becomes deposited on the river bed as iron hydroxide sludge. In the case of high water, it can be flushed from the river bed and carried further afield. The natural level of iron hydroxide in the fresh water of Lusatia is 1 to 2 mg/l. At higher concentrations, the contamination is visible as a brown colour.

The discharge of ferrous water to the fresh water can result directly in depletion of fauna and influence the flora in the fresh water owing to toxic effects. For example, concentrations of 2 to 3 mg/l in dissolved divalent iron can lead to a complete loss of fry. High concentrations of iron flakes can clog the gills of fish. Deposits of iron hydroxide mud on the river bed cause soil life and aquatic plants to die, which in turn has an effect on the subsequent food chain. Excessive acidification is lethal for most animals and plants in fresh water.

After the closure of surface mines the sulphate, which is formed by pyrite oxidation, is likewise flushed out when the groundwater rises again and is carried into newly formed lakes and the Spree. Large quantities of sulphate also enter the Spree from the dumps of the active mine in Saxony and Brandenburg. Sulphate is less problematic for plants and animals, but in the medium term poses a threat to the drinking water supply of the capital Berlin via the Spree. The threshold value for sulphate in drinking water is 250 mg/l.

Sulphate is highly inert and is carried a very long way in flowing water. Long-term consumption of water with high sulphate content can result in disturbances to our digestive systems. In addition, sulphate can damage older concrete structures, such as bridges, in particular. High sulphate content can also lead to increased algae growth in lakes which the Spree flows through and therefore destroy ecological restoration achievements to date.

Further information:

Expert opinions:

http://www.lmbv.de/index.php/studien-zur-eisenbelastung.html

Talks and background information:

http://www.klare-spree.de/front_content.php?idcat=257

Answer of the Brandenburg federal state government to a brief enquiry of the Alliance '90/The Greens group in the Brandenburg federal state parliament:

http://gruene-fraktion-brandenburg.de/positionen/energie-und-klimaschutz/volltext-energie-und-klimaschutz/article/veraenderte_gewaesserqualitaet_durch_braunkohletagebaue/

LMBV's (Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft mbH) current answers concerning iron clogging of the Spree:

http://www.lmbv.de/index.php/Nachrichtenleser/items/aktuelle-antworten-der-lmbv-auf-fragen-der-frankfurter-allgemeinen-zeitung-zur-verockerung-der-spree.html