

# 20 years flooding of an underground-ISL mine – lessons learned and challenges remaining

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## **ABSTRACT**

In the beginning of the 1990ies mine closure and the necessary remediation was initiated at the former Königstein mine following 25 years of mining a uranium deposit within a sandstone aquifer in a densely populated region in Eastern Germany. The hydrogeological and hydrogeochemical conditions resulting from the former in-situ leach operation as well as local demands and the regulatory framework strongly influence the remediation progress. Following a phase to determine the remediation concept a stepwise flooding was initiated in 2001 accompanied by an intensive monitoring programme and comprehensive R&D-activities. This broad data collection was aimed to increase the understanding of the relevant processes and thereby significantly to reduce the adverse impact of the flooding.

The paper outlines the specific conditions at the former mine site to give the background for the challenges faced in the remediation of this ISL-mine. A controlled stepwise flooding with a technical system in place to ensure hydraulic control of mine water was conducted over the past 20 years. This led to a better understanding of the general flow conditions in the mine and the hydraulic interaction to the surrounding aquifers as well as the geochemical processes determining the release of contaminants but also their possible retardation. This approach gave the opportunity to continuously validate hydraulic and geochemical predictions during the monitored flooding to further reduce uncertainties allowing to shape the approach now followed to achieve the final flooding of the mine.

In conclusion the achieved state of flooding and system understanding is summarized. Challenges still remain to further contain the contaminants within the mine and its close surrounding parts of the aquifer during the next steps of flooding. The concept and the remaining uncertainties but also the requirements of the necessary permitting process are described.