

*Subsidence and sinkholes above flooded potash mines in  
Northern Germany*

## 1. Introduction

Ever since Justus von Liebig wrote his famous paper entitled "Organic chemicals and their use in agriculture and physiology" and referred to the need to renew inorganic nutritional substances in the soil, others have worked on developing processes to create potassium chloride-based fertilisers for plants from crude potash salts. The first potash factory started work in October 1861 in the Central German town of Staßfurt and since then potash salts have also been mined from salt domes in Northern Germany. Potash salt mining initially underwent a very stormy growth. Up to 1967 German counted a total of 239 shafts sunk in potash salts, the majority of them built in the period 1890 to 1910.

Following concentration on the best deposits, Germany now has only six potash salt mines still in operation. Annual production is around 4.5 million t  $K_2O$ , making Germany the third largest potash producer in the world.

Over the years, as potash salt mining has developed, mines in Germany have been hit by a number of uncontrolled water influxes which have resulted in spectacular subsidence and the creation of sinkholes. I shall be describing flooded potash mines in Vienenburg, Hedwigsburg and Ronnenberg, all located within the region covered by the mining office of Clausthal (figure 1), - in which there is currently only a single potash mine still in operation, at Sigmundshall near Hannover – and shall look into the causes and the surface effects of the flooding and describe the conclusions reached by the mining authorities.

## 2. Flooding of the Vienenburg and Hedwigsburg mines

At Vienenburg I potash mine, an influx was reported as early as in the year the mine itself started working, 1886, at a depth of 230 m in cainite with a rate of 5 l/min. This was regarded as being insignificant, and for 40 years remained more or less unchanged with regard to its quantity and its chemical composition.