

ANTHROPOGENIC-INFLUENCED CHANGES IN A GROUNDWATER ENVIRONMENT IN URBANISED AREA OF OLD MINING ACTIVITY (TARNOWSKIE GÓRY REGION, POLAND)

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ABSTRACT

The highly industrialised and urbanised region of Tarnowskie Góry (southern Poland) has been subjected to very intensive and long lasting (from XII century till the beginning of XX century) mining activity resulting in there being about 20,000 shafts and fore-shafts, 150 km of mine workings and 9 edits located there. Exploited silver and lead ores that occurred in Triassic limestones and dolomites formed the resourceful karst-fractured aquifer - the most important source of potable water for the entire region. Intensive and varying drainage together with rapid development of the Upper Silesian region in XIX and XX centuries has caused problems with the availability of good quality potable water. After mines closure some shafts have been utilized as groundwater intakes while a lot of new deep wells have been drilled. A particularly interesting example (established in old mining workings in 1884) is the oldest and biggest groundwater intake called "Staszic". It consists of two shafts, two wells, edit and an interesting system of water off take. The intake infrastructure is situated in the old mine workings at depths of 46 and 67 m. This intake with maximum yield of 1500 m³/h (in late -1980s) has been the most important drainage centre for this area. Intensive drainage and the overlapping impact of various sources of contamination located in the town area have caused significant quantitative and qualitative changes within this aquifer. Observed groundwater quality deterioration (local exceeding standards concentration of TCE, PCE and boron) resulted in gradual closing of many groundwater intakes (including "Staszic"). Currently, an approximate 70% reduction of pumping since the beginning of the 1990s together with increasing recharge due to higher precipitation have caused progressive groundwater rebound (about 5 -10 metres) and succeeding modification of hydrodynamic conditions in this area. A progressive rise of the groundwater table can negatively impact the historical "Staszic" intake, the "Black Trout Edit" (very interesting tourist attraction offering 600 m long punt trip between two shafts) and the surface water.

Recently observed changes in the groundwater flow system within Triassic aquifer for the period 1992-2002 are presented in this paper. Mathematical modelling has been applied in order to predict what will happen with the groundwater table in the Triassic aquifer after the final closing of the most important groundwater intake - "Staszic". Taking into account recent observations and historical water flow data in the "Black Trout Edit" and Drama river, the volume of artesian water flowing out from the "Staszic" intake to nearest "Black Trout Edit" and results of mathematical modelling; authors suggest that from an environmental perspective the optimum would be to present a partial closure of the "Staszic". Using the above solution, contaminated by TCE I PCE, artesian groundwater flowing out from this intake will still be discharged to nearest edit and finally to Drama river. The worst solution would be a complete intake closure.