

Hydrogeological Appraisal of Karacahisar Coal Field (Western Turkey): Impacts of Mining on Groundwater Resources Utilized for Water Supply

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Abstract : Lignite coal fields in western Turkey generally occurs in tensional Neogene basins bordered by major faults. Karacahisar coal field in Mugla province of western Turkey is a large Neogene basin filled with alternation of silicic and calcareous layers. The basement of the basin is composed of mainly karstified carbonate rocks of Mesozoic and schists of Paleozoic age. The basement rocks are exposed at highlands surrounding the basin. The basin fill deposits forms shallow, low yield and local aquifers whereas karstic carbonate rock masses forms the major aquifer in the region. The karstic aquifer discharges through a spring zone issuing at intersection of two major faults. Municipal water demand in Bodrum city, a touristic attraction area is almost totally supplied by boreholes tapping the karstic aquifer. A well field has been constructed on the eastern edge of the coal basin, which forms a ridge separating two Neogene basins. A major concern was raised about the plausible impact of mining activities on groundwater system in general and on water supply well field in particular. The hydrogeological studies carried out in the area revealed that the coal seam is located below the groundwater level. Mining operations will be affected by groundwater inflow to the pits, which will require dewatering measures. Dewatering activities in mine sites have two-sided effects: a) lowers the groundwater level at and around the pit for a safe and effective mining operation, b) continuous dewatering causes expansion of cone of depression to reach a spring, stream and/or well being utilized by local people, capturing their water. Plausible effect of mining operations on the flow of the spring zone was another issue of concern. Therefore, a detailed representative hydrogeological conceptual model of the site was developed on the basis of available data and field work. According to the hydrogeological conceptual model, dewatering of Neogene layers will not hydraulically affect the water supply wells, however, the ultimate perimeter of the open pit will expand to intersect the well field. According to the conceptual model, the coal seam is separated from the bottom by a thick impervious clay layer sitting on the carbonate basement. Therefore, the hydrostratigraphy does not allow a hydraulic interaction between the mine pit and the karstic carbonate rock aquifer. However, the structural setting in the basin suggests that deep faults intersecting the basement and the Neogene sequence will most probably carry the deep groundwater up to a level above the bottom of the pit. This will require taking necessary measure to lower the piezometric level of the carbonate rock aquifer along the faults. Dewatering the carbonate rock aquifer will reduce the flow to the spring zone. All findings were put together to recommend a strategy for safe and effective mining operation.

Keywords : conceptual model, dewatering, groundwater, mining operation

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