[Monitoring of Coal Seam Gas Depressurisation using Geophysical Methods]

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MONITORING OF COAL SEAM GAS DEPRESSURISATION WITH GEOPHYSICS

GEOPHYSICAL MONITORING OF COAL SEAM GAS

ABSTRACT

Coal seam gas has emerged as a major industry in Australia over little more than a decade. Resource production inevitably relies on the extraction of groundwater from coal seams to depressurise coal measures, and allow natural gas flow. Current groundwater monitoring of a coal seam gas project uses expensive borehole sampling programs that can only provide point information, and improved monitoring of water extraction is suggested for existing and future wells.

This paper is a first stage feasibility study for surface magnetotelluric, and surface self-potential monitoring of a coal seam gas depressurisation event. The monitoring techniques used in this study directly measure fluid connectivity and dynamics to estimate the degree of porosity and permeability in a coal seam. In combination, the monitoring can provide both large scale and localised sub-surface fluid-flow modelling potential. The processes and its equipment are a practical, inexpensive and mobile solution for the expanding coal seam gas industry.

In this study synthetic modelling has been used with coal seam conditions, prototype self-potential monitoring equipment is constructed, and various monitoring equipment are tested in the field. Synthetic modelling has provided encouraging results, showing that a depressurisation event based in a Surat Basin Walloon Measures, southern Queensland, Australia geological model could be successfully monitored using magnetotelluric and self-potential methods. The prototype self-potential logger operated with a high level of precision, successfully mapping localised electrodes change of electric field at an aquifer pump test site; and the E-Logger instrument successfully recorded electric field data for magnetotelluric monitoring.

Overall, results present a great deal of potential for the combined effectiveness of magnetotelluric and self-potential monitoring methods in a coal seam gas depressurisation setting. Further studies, in particularly on-site depressurisation monitoring testing, is required to draw on more conclusive evidence.

KEYWORDS

Coal Seam Gas, Groundwater, Magnetotellurics, Self-Potential.

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