



A reactive transport modelling approach to assess the leaching potential of hydraulic fracturing fluids associated with coal seam gas extraction

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Coal Seam Gas production generates large volumes of “produced” water that may contain compounds originating from the use of hydraulic fracturing fluids. Such produced water also contains elevated concentrations of naturally occurring inorganic and organic compounds, and usually has a high salinity. Leaching of produced water from storage ponds may occur as a result of flooding or containment failure. Some produced water is used for irrigation of specific crops tolerant to elevated salt levels. These chemicals may potentially contaminate soil, shallow groundwater, and groundwater, as well as receiving surface waters. This paper presents an application of scenario modelling using the reactive transport model for variably-saturated media HPI (coupled HYDRUS-1D and PHREEQC).

We evaluate the fate of hydraulic fracturing chemicals and naturally occurring chemicals in soil as a result of unintentional release from storage ponds or when produced water from Coal Seam Gas operations is used in irrigation practices. We present a review of exposure pathways and relevant hydro-bio-geo-chemical processes, a collation of physico-chemical properties of organic/inorganic contaminants as input to a set of generic simulations of transport and attenuation in variably saturated soil profiles. We demonstrate the ability to model the coupled processes of flow and transport in soil of contaminants associated with hydraulic fracturing fluids and naturally occurring contaminants.