



## **Uranium sources in groundwaters within the Leinster Batholith, SE Ireland**

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Uranium is a long-lived radionuclide that occurs at ppm levels in rocks and soils, and at ppb levels in natural waters. It presents a threat to human health in groundwater due to its chemical toxicity (nephrotoxicity) (WHO, 2005). Elevated concentrations of U in private wells (EPA, 2005) have led to concerns about groundwater quality in some rural areas in SE Ireland. Guided by geological and the Geological Survey of Ireland's Tellus stream sediment and stream water geochemical data, preliminary results from private wells in the Leinster granite Batholith (SE Ireland) show elevated uranium concentrations ( $\geq 200$  ppb) at some locations. The data indicate a link between dissolved U and groundwater bicarbonate alkalinity, consistent with results from speciation modelling that indicate a control by anionic uranyl carbonate complexes ( $\text{UO}_2(\text{CO}_3)_2^{2-}$  and  $\text{UO}_2(\text{CO}_3)_3^{4-}$  (UO). Field evidence suggests that limestone-bearing glacial tills and fluvioglacial deposits may be the source of bicarbonate in the groundwater. Batch leaching and column experiments are underway to test the above hypothesis, using a combination of glacial till and crushed granite from the area. In these granite-derived groundwaters, a strong correlation between electrical conductivity and U concentrations indicates that field-based conductivity measurements can be used as a rapid screening tool for elevated uranium contents in this geological setting. The nature of U sources (primary or secondary) is being evaluated by measuring the ( $^{234}\text{U}/^{238}\text{U}$ ) activity ratio of the dissolved uranium. A positive correlation between U concentrations and ( $^{234}\text{U}/^{238}\text{U}$ ) ratios ( $(^{234}\text{U}/^{238}\text{U}) > 1$ , ranging from 1.22 to 1.80) suggest either secondary U-bearing minerals as sources or substantial fractionation of ( $^{234}\text{U}/^{238}\text{U}$ ) ratios during weathering.