

AQUEOUS GEOCHEMISTRY OF ARSENIC AND OTHER METALS WITHIN GROUNDWATER IN NORTH EAST IRELAND

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Recently the presence of arsenic within groundwater has been reported in Ireland at a national scale showing patterns of persistently elevated concentrations around sedimentary geological formations [1]. This research was focused on investigating this in more detail at a regional scale to help in the understanding of the aqueous geochemistry of arsenic. A preliminary hydrogeological and geochemical study was undertaken as a baseline survey to determine groundwater flow patterns in 100 groundwater sources. Following this initial assessment, a more detailed sampling regime using low-flow groundwater sampling techniques using the 'clean hands, dirty hands' methodology was implemented to collect samples for trace metals and anions from groundwater sources. Metal(oid)s were analysed using ICP-MS in addition to anions (Cl⁻, SO₄²⁻, F⁻ and S²⁻) by spectrophotometry (in clean room conditions). Redox sensitive groundwater parameters (pH, Eh, temperature and conductivity) were also determined in the field using electrochemistry. Alkalinity was determined using the titration technique. Groundwater concentrations were illustrated using interval mapping using ArcGIS® 10.2 (ESRI®, Colorado) for both the preliminary screening and detailed monitoring. Box-plots were generated to show the varying concentrations in bedrock (Silurian metasedimentary bedrock generally had higher concentrations compared to limestone). While preliminary results show that arsenic is consistently elevated at low-to-medium concentrations more detailed hydrogeochemical studies in combination with speciation studies (combination of field and laboratory based methodologies) are currently being undertaken in order to determine the mobilisation mechanism and speciation of arsenic and other geochemical parameters within the groundwater system in this region. Additionally this will assist in identifying the geochemical conditions that are responsible for mobilisation of arsenic.

[1] McGrory *et al.* (2017) *Science of the Total Environment* **579**, 1863-1875.