Location of aquifer

South Galway, Kinvara, Ireland

Reported by
Laurence Gill

Type of medium (Karst, porous, fracture)
Karst

Type of aquifer (phreatic or confined)
phreatic

Main lithology - (e.g. gravel, sand and clay)
Pure bedded Dinantian limestone

Hydrochemistry: fresh or saline
fresh

Saltwater intrusion: lateral from sea or lakes – upconing
none measured although quantitative tidal influence on turlough levels8 km inland can be measured during periods when the turloughs are shallow.

Aquifer geometry: hydraulic characteristics
Low-lying and coastal karst fed from allogenic recharge from Devonian Old Red Sandstone (Slieve Aughty) Mountains to the east. Extensively karstified limestone, gently inclined (dipping 2-3 degrees to the south) pure bedded carboniferous limestone layers of several hundred meters in thickness, well-developed shallow epikarst layer of approximately 5-10m in thickness. Karstification has occurred many times since the beginning of the Dinantian period, with the most significant development during the Tertiary period (65 to 2 Ma). Dissolution and glacial processes during the Quaternary and Holocene periods have further altered and shaped the landscape. The cyclical raising and lowering of sea levels in Galway Bay throughout the Quaternary has produced the multi-glacial sequence of overflow conduits that drain the Gort Lowlands today with evidence of a multi-level conduit system. The 500 km^2 catchment drains north-west from the mountains across the Gort lowlands to inter-tidal springs at the sea in Galway Bay at Kinvara.

Aquifer parameters: storage - annual water pumping - (in MCMA - millions cubic meters, annually)
Most recent estimates of main spring discharge at Kinvara (based on calibrated modelling) are from 5 to 16 m^3/s (see McCormack et al., 2014)

Depth of aquifer (water level and bottom) - water level 5- 30 m - aquifer depth - 50-200 m
water level 0 – 5 m: aquifer depth (~30 to) metres above sea level, but paleo-karst down to 300m below sea level.

Major chemistry (anions - ?; Cations - ?)
Na (15-35 mg/l), Mg (4-8 mg/l), Ca (75-90 mg/l

Major salinity sources
none

Population
The town of Gort (~2600) and then just rural population – farms etc

Aquifer status: special features - e.g. thermal springs, major faults,…
Groundwater flow rates within the region have been recorded using tracer tests at 50-150 m/hour under baseflow conditions (Drew and Daly, 1993). Intertidal springs discharging into the bay**.**

Investigation methods - e.g. water level measurements, EC (electrical conductivity profiles), TDEM (geophysical), chemical and isotopic methods, age determination, IR survey, seepage meters (for Submarine Groundwater Discharge, SGD)
Continuous water level measurements of the inland turloughs have been carried out since 2002 to develop a numerical model of the conduit network (Gill et al. 2013a,b) This predicts the SGD into the bay which has been calibrated against EC measurements in the bay (McCormack et al., 2014) and also by other researchers using radon (Schubert et al., 2015).

Numerical hydrological modeling
Karst conduit network developed (see: Gill et al and McCoramck et al

Monitoring methods applied and duration - water level measurements, EC (electrical conductivity profiles - seasonal)
Continuous water level measurements of the inland turloughs have been carried out since 2002 (Cunha Pereira et al., 2011; Gill et al. 2013b; Naughton et al., 2012).

Management methods
n/a

Aquifer management actions
na/a

Identification of existing or potential problems
Serious flooding has occurred in Nov. 2009 and Dec 2015, leading to demands for flood management drainage works.

References
Cunha Pereira H., Allott N., Coxon C., Naughton O., Johnston P.M., Gill L.W. (2011). Phytoplankton of turloughs (seasonal karstic Irish lakes). Journal of Plankton Research 33(3), 385-403.

Gill L.W., Naughton O., Johnston, P.M. (2013a). Modeling a network of turloughs in lowland karst. Water Resources Research 49(6), 3487-3503.

Gill L.W., Naughton O., Johnston P.M. (2013b). Characterisation of hydrogeological connections in a lowland karst network using time series analysis of water levels in ephemeral groundwater-fed lakes (turloughs). Journal of Hydrology 499, 289-302.

McCormack T., Gill L.W., Naughton O., Johnston P.M. (2014). Quantification of submarine/intertidal groundwater discharge and nutrient loading from a lowland karst catchment. Journal of Hydrology 519, 2318-2330.

Naughton O., Johnston P.M., Gill L.W. (2012). Quantifying groundwater flooding in Ireland: the hydrological characterisation of ephemeral karst lakes (turloughs). Journal of Hydrology 470-471, 82-97.