Impact of Tidal Variations on the Groundwater System Beneath Cork City, SW Ireland

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Cork, the second largest city in Ireland with a population approaching 250,000 within its environs, is situated in the southwest of Ireland, at the mouth of the R. Lee. The Lee drains into Cork Harbour, the second largest natural harbour in the world. The harbour is a glacially eroded, almost completely enclosed body of water, connected by a narrow entrance to the Atlantic Ocean. The area is characterised by a series of E-W anticlines and synclines, the former cored by U. Devonian sandstones and shales and the latter by massive L. Carboniferous limestones. Overburden deposits of variable thickness overlie bedrock, consisting mostly of glacial till, but also sand and gravel particularly infilling deep buried valleys. Despite favourable recharge input, due to a mean annual rainfall of around 1000 mm, saline intrusion can be traced for more than 5 km inland within the gravel aquifer. Groundwater levels are subject to tidal influence, and vary by 2-3 m, whilst river levels vary by 4-5 m. A 24h analysis of groundwater levels, indicates a periodic variation over 6-7 hours, with a slight delay in response (around 1 hour) compared to tidal fluctuations in the river. In addition, saline intrusion affects the chemical composition of the groundwater. Specific conductivity and total dissolved solids vary from 950 to 1100 µS/cm, and 0.6- 0.7 g/l, respectively. Highest values are recorded during high tides, reflecting salt enrichment and a direct connection with surface water. Groundwater temperatures, however, exhibit constant values over the tidal fluctuation.

KEY WORDS: tidal influence, salt enrichment, buried valley aquifer