

Groundwater in the Aylesbeare Group

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Comprising channel sands and floodplain mudstones of the Exmouth Formation and fluvial mudstones of the overlying Littleham Formation (Henson 1971), the Aylesbeare Group is hydrogeologically classified as an aquiclude. It confines the Lower Permian sandstones and breccias and underlies the sandstones and pebble beds of the Sherwood Sandstone Group, thereby separating the two major groundwater systems of south-west England. Nevertheless, the Aylesbeare Group supports many local groundwater abstractions throughout its outcrop area (Davey 1981).

Water level contours (Fig. 1) show groundwater movement to be predominantly westwards and south-westwards from the Budleigh Salterton Pebble Bed ridge. Hydraulic gradients reflect the head losses incurred by flow through less permeable strata, 1 in 25 to 1 in 50 being typical in the Littleham mudstones, whereas 1 in 120 is more usual in the Exmouth Formation. There is also southerly flow from the breccias north of Sampford Peverell and the eastern margin of the outcrop is beyond the groundwater divide, with flow towards the Otter Valley.

The occurrence of exploitable groundwater resources is dictated by the presence of arenaceous units. Selwood *et al.* (1984) suggested 60% of the Exmouth Formation's 225m thickness comprises sandstones whereas 90% of the Littleham Formation is mudstone. Although much groundwater movement is through fissures, these are likely to be more "open" in the sandstones and "closed" in the mudstones. The need to penetrate sandstone to afford reliable yield has often necessitated deep boreholes. At Tiverton Junction, a 121m deep well only encountered sandstones at 97-100m and 105-111m and a well at Whimble penetrated 293m of unspecified "clays and marls with interbedded sandstones" above Carboniferous strata.

Hydraulic properties vary widely and a borehole penetrating a Littleham Formation sandstone unit may give a better yield than one predominantly in the mudstones of the Exmouth Formation. Throughout the Group, well completion tests of 224 hours duration at discharge rates of 0.006-0.11Mld, give specific capacity values of 1-140M³/d/m, with no discernible grouping between the two formations. A 100m deep borehole drilled in 1988 near Woodbury village penetrated a few separately identifiable sandstone and siltstone units up to 1m thick within an otherwise undifferentiated sequence. A 72-hour pumping test at 0.4Mld indicated aquifer transmissivity to be 40-45m²/d, with field permeability 0.4-0.6m/d. Laboratory tests undertaken on similar materials (Davey 1981) estimate intergranular permeability to be 0.00005-0.01m/d and comparison with field data shows the importance of fissure flow.

Aylesbeare Group wells generally yield potable groundwater but sodium and chloride levels occasionally exceed EEC guidelines. The ferruginous nature of the sediments may cause iron to exceed its 0.2mg/l maximum admissible concentration and the agricultural activity of East Devon raises nitrate levels towards its 25mg/l limit. Individual boreholes at Whimble, Clyst Hydon and near Kentisbeare give sulphate in excess of 1000mg/l and calcium up to 560mg/l whereas 15-50mg/l and 30-90mg/l respectively are more typical. Such high concentrations in similarly interbedded clastic sequences elsewhere often result from the presence of evaporites, either as discrete horizons or as a constituent of the cementation.

Davey, J.C. 1981. The Hydrogeology of the Permian Aquifers in Central and East Devonshire. *Unpublished PhD Thesis, University of Bristol.*

Selwood, E.B., Edwards, R.A., Simpson, S., Chesher, J.A., Hamblin, R.J.O., Henson, M.R., Riddolls, B.W. and Waters, R.A. 1984. The Geology of the country around Newton Abbot. *Memoir of the British Geological Survey, Sheet 339.*

Henson, M.R. 1971. The Permo-Triassic Rocks of South Devon. *Unpublished PhD Thesis, University of Exeter.*

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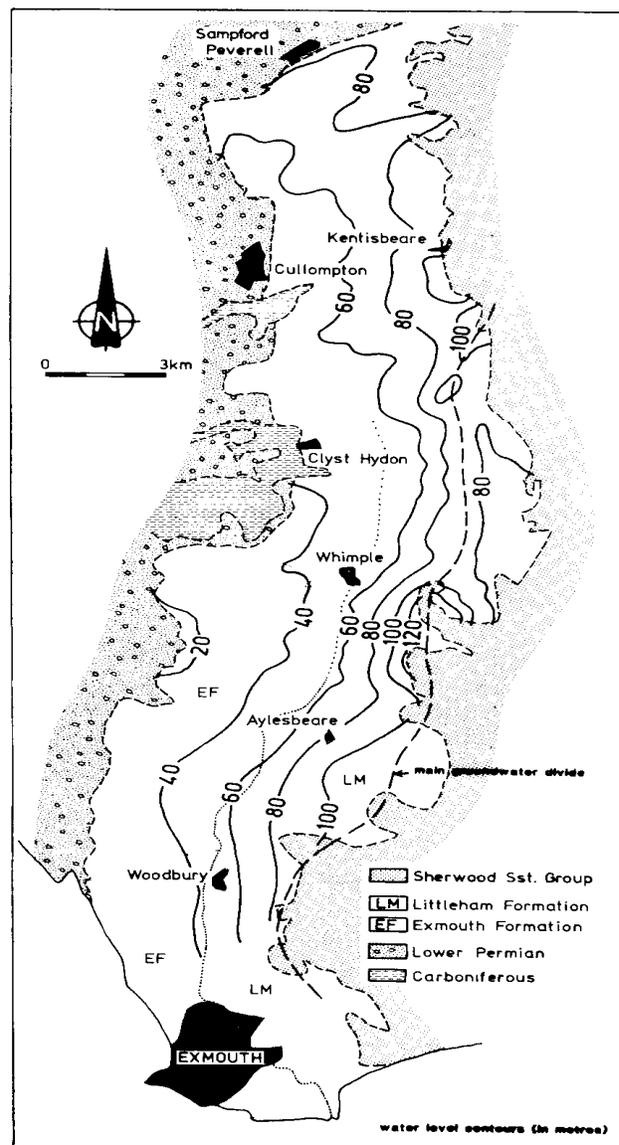


Figure 1. Water level contours across the Aylesbeare Group outcrop in East Devon.