
5 Groundwater Resources

5.1 Overview

The Environment Agency licence groundwater abstraction in Doncaster for a number of purposes including:

- Agricultural use, including irrigation (50 abstraction points)
- Industrial processes, including cooling (31 abstraction points)
- Public water supply (11 abstraction points)
- Mineral washing (4 abstraction points)
- Lake and pond level maintenance (1 abstraction point)

In addition, there are a number of unlicensed abstraction boreholes, mainly for domestic supplies. An extract from the BGS Wellmaster database of water wells and boreholes is shown on (Figure 12); these include licensed and unlicensed wells and boreholes, and not all sources may currently be in use.

Groundwater is abstracted from a various subsurface strata within the Doncaster region, including:

- Carboniferous Limestone Supergroup (not present at surface)
- Pennine Coal Measures Group (mainly in the the Mexborough Rock)
- Permian Yellow Sands, Cadeby and Brotherton formations
- Triassic Sherwood Sandstone Group
- Quaternary superficial deposits

The most important of these aquifers are considered below. More detail is given in Allen et al. 1997 and Jones et al. 2000.

5.2 Permian Yellow Sands, Cadeby and Brotherton Formations

The hydrogeology of the Permian strata is controlled by lithology and structure. Variations in lithology result in changes in hydraulic conductivity and hence transmissivity and yield. However, the greatest control on the aquifer properties is the extent of the fracturing. As a consequence aquifer properties are unpredictable. The Yellow Sands Formation has been an important aquifer throughout the area and its presence in colliery shafts often posed considerable flooding problems for the coal mining industry. The Cadeby Formation is also a significant aquifer.

5.3 Triassic Sherwood Sandstone Group

The Triassic Sherwood Sandstone Group is the most important aquifer in the Doncaster area. Groundwater flow is predominantly within fractures, although intergranular flow and storage is significant. The fluvial sequences which form most of the Sherwood Sandstone Group aquifer fine upwards from pebbly sandstone to sandstone and siltstone. Extensive mudstone horizons, resulting from the settling of flood overbank deposits, also occur. Channel deposits may be continuous for distances of up to tens of kilometres. The result of this deposition is that hydraulic conductivity in the aquifer may be directional: values are likely to be higher along and down the channels. Fine-grained layers within the sandstones have lower permeabilities, and can act as confining layers. There is a general northerly decrease in grain size due to the fact that much of the sedimentation occurred from braided rivers flowing northwards from the Armorican massif. The lateral persistence of individual fine-grained bands can be highly variable. Lateral facies changes can cause deposits to change from being aquifers to aquitards.

The water table beneath Doncaster is typically 5 to 15 m below ground level. As the aquifer is generally unconfined, the vulnerability is regarded as moderate to high. The Environment Agency considers current abstraction status to the east of

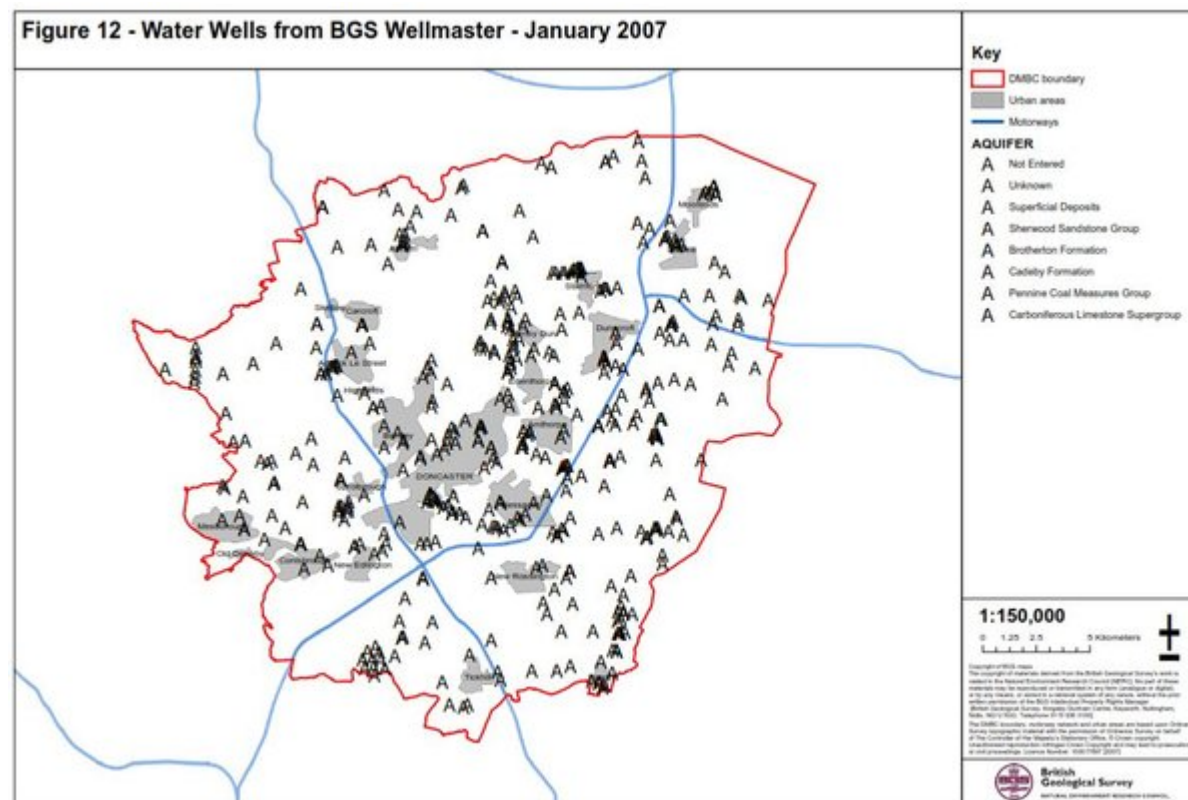
the city as being unsustainable.

Doncaster's public water supply is drawn from 11 sites operated by Yorkshire Water located mainly to the east of the city. At each site there are two, or more commonly three, large diameter boreholes. These typically penetrate either close to the base or into the lowest third of the Sherwood Sandstone aquifer (with depths of 120 to 241 m). Private abstraction, mainly for industrial uses, is also from boreholes across the city and its fringes.

Following the wet autumn and winter of 2000–2001 water levels in many aquifers rose to exceptionally high levels and remained high for extended periods of time. Associated with this rise, concentrations of nitrate in abstracted groundwater have increased considerably. Against this background, Yorkshire Water has detected a possible upturn in trace pesticide concentrations in blended water from the Triassic Sandstone aquifer for supply in the Doncaster area. A recent programme of analysis of groundwater from individual boreholes has shown that a number have been affected by pesticides, possibly from both agricultural and amenity use.

5.4 Quaternary superficial deposits

The cover of Quaternary deposits in the Doncaster area is complex and contains a wide range of lithologies with differing hydraulic conductivities. Some provide hydraulic connectivity with the Sherwood Sandstone aquifer and others act as an aquitard. These deposits include river terraces, silts and clays, peat and alluvium. In some locations multiple lithologies are found superimposed, resulting in inter-bedded layers of varying transmissivity.



(Figure 12) Water Wells from BGS Wellmaster — January 2007.