

Groundwater

Contact: brian.mark@fulcrumfirst.com

www.fulcrumfirst.com

Water, found in rocks, deep underground, below an impermeable strata, can be plentiful, pathogen free and of good quality. At present, in England and Wales, 20% of water is obtained from underground sources. This leaflet is intended to supply the necessary information required to find and abstract this water at an acceptable cost.

Advantages

- * Conditions in aquifers are inhospitable to microorganisms and so it can be assumed that abstracted water is pathogen free. However, on rare occasions Oocysts of *Cryptosporidium*, a protozoan parasite has been known to penetrate through and survive in Groundwater.
- * Pollutants in surface waters are naturally filtered out as they percolate through the earth into underground layers and so many of the pollutants found in surface water are absent in ground water.
- * Deep aquifers are rarely affected by drought, unlike wells, which obtain water from above the impermeable strata.
- * Many ground water supplies have dissolved gases that prevent the water tasting 'flat'. Some supplies have so much dissolved carbon dioxide that the water is 'fizzy'. - This is often bottled and sold as 'naturally carbonated'.
- * Ground water is generally considered to be healthier to drink than treated surface water. Cancer statistics tend to support this belief.
- * Once the equipment for abstracting the ground water is in place, the ongoing cost is low. - approximately 10 pence a cubic metre. The price will be dependent on the filtration required.

Disadvantages

- * Finding the ground water can be difficult. The geology of some areas have been well researched which makes the job easier. Confined aquifers, deep beneath impermeable strata is the most dependable.
- * The cost depends on the type of rock to be drilled through and the depth of the aquifer. Shale is cheaper than granite. The cost for drilling, casing and pumping for relatively shallow boreholes, to a depth of 60 Metres or under, will be approx. £120 per Metre. Drilling beyond a depth of 60 Metres requires sophisticated drilling equipment and costs substantially more.
- * If pollutants do seep through to the aquifer, purification is then extremely difficult due to lack of detoxifying microorganisms. 15% of abstracted ground water is contaminated with over the limit level of Bentazone, a pesticide.
- * Water percolating through areas with high concentrations of iron or manganese can be discoloured due to sediments. The water, although not poisonous, tends to stain and does not have an acceptable taste. This can be dealt with by using specific filtration units.
- * Some aquifers have seasonal variations of a few metres in water level. This may affect the rate of abstraction.

Legislation

Private supplies are legislated by both EC and UK Regulations.

EC Regulations:
The Protection of Ground water (80 / 68 / EEC)
The quality of water intended for human consumption (80 / 778 / EEC)

UK Regulations:
'Private Water Supplies 1992 in England and Wales'.
This incorporates the 1989 Water Supply Regulations which specify the EEC standard plus another eleven parameters. The quality of the supply for domestic use or food production must meet the more stringent UK standards. In certain circumstances a special permit can be sought for relaxations to the EC standards over certain non-toxic substances.

Who Regulates
Monitoring the supply is the responsibility of the local authority and the maintenance and repair is the responsibility of the owner or user. Obtaining a private supply encourages the user to adopt a water protection policy concerning the disposal of solvents, use of pesticides and so on. Boreholes should be well maintained and protected since they offer a point of contamination from surface water. Particular care should be taken when abstracting from coastal or estuarine aquifers as it may encourage contamination by saline intrusion. The Environment Agency regulates rates of abstraction.

For information on filtration, storage and disinfection, see Fulcrum leaflet 'Alternate Water Supplies, Groundwater, Rainwater'.

How to Obtain an Abstraction License

In order to extract water from the ground it is necessary to obtain a full licence from the Environment Agency (EA). The licensing arrangement is in place so as to regulate environmental protection of ground water. There is a danger of contamination or depletion of underground aquifers and the EA have established a system to ensure responsible water usage. The following procedure is necessary to ascertain whether there is suitable potable water at the required site and to obtain a licence for abstracting that water. It may sound complex but don't be put off. -In reality water abstraction is simple and has significant benefits.

How much water?

Obtain an estimate of how much water is required for the site. The pattern of water usage is as important as knowing the total amounts required. Estimates should be in the form of rates of maximum hourly, daily and annual requirements. Any seasonal variation should be noted. For domestic purposes it can be assumed that the requirement will be 150 litres per day, 5 litres of which is used for drinking and cooking. There will not be a great seasonal variation. On a diurnal base, there will be a heavier requirement in the morning and evening. For a visitor's centre, the calculation should be based on 10 litres per visitor. 1 litre drinking and 9-litre toilet flush. The diurnal water usage will be at a maximum during the day and, depending on the type of visitor's centre, there will be a seasonal variation.

Water quality

Investigate water quality obtained from other boreholes in the region that may or may not be from the same aquifer. This will give an indication of quality but no guarantee. The Environment Agency can supply this information, free of charge, from their public register. The ground water abstraction officer will supply the leaflets, "Searching for ground water", "Ground Water investigation", "Abstraction Licensing and Water Resources" and "Annual Abstraction Charges"

Water features

Investigate the geology, quantity of water and effects of abstraction on other water sources. This 'water features' survey should give an idea of whether it is worth

proceeding with a test drill. This survey is a desk top search carried out by Geological Survey Companies. Contractors may offer to carry out this work as part of their quotation. It should cost just over £100. In order to carry out the survey they require an OS location of the site and the maximum daily abstraction rates. Their advice will depend on accumulated knowledge from other boreholes in the area. In some well-researched areas it should be possible to suggest the best place to develop a source and whether it is worthwhile proceeding. The information obtained in the 'water features' survey will be required for the consent application. It is important to contact the Environment Agency at this stage so as to ensure that all their requirements are fulfilled in the 'water features' survey. On some sensitive sites it may be necessary to provide a more substantial environmental impact study. It is also important to contact the local authority at an early stage. Sometimes the abstraction, or works related to it, requires planning permission. The EA will liaise with them if necessary. It is important to read the leaflet "Searching for ground water", so as to understand the EA environmental concerns.

Test pumping

Fill in form WR32, Water Resources Act 1991 Section 32. This is an application for consent to drill and test pump a borehole. The contractor should be able to help with the technical requirements in the application. Conducting a pumping test will involve drilling a small diameter rig at different depths into the

ground and seeing how much water can be abstracted. This requirement is laid out in the document, "Test pumping of water wells BS 6319 (1992)". This will give an idea of whether the source can supply the required amount of water and the quality of the water. This information will help when selecting the best method for abstraction- the pump type and depth. The EA will advise on which measurements are required for the monitoring programme. This is described in the leaflet 'Ground Water investigation'.

Abstraction Licences

Apply for a full abstraction licence. There is an application charge. A draft application should be drawn up with the local licensing officer. Notice of application must be given to the statutory water undertakers for the area. The details must be advertised in a local paper on two successive weeks. An application package will give full details. A formal application should then be made to the EA. This will take 3 to 6 months. The licence will be subject to abstraction conditions set by the EA as laid out in the leaflet, "Abstraction Licensing and Water Resources".

Charges

'Annual Abstraction Charges' explains the annual charge which depends on the volume, the source, the season and the purpose for which the water is authorised. The exemption to license requirement is for the abstraction of less than 20 cubic metres per day {=20,000 litres = 4400 gallons} from underground strata for the domestic purpose of one household.