

Water supply in rural Scotland

Developing and protecting minor aquifers

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For centuries, groundwater has traditionally been an important source of potable water across much of rural Scotland. In spite of the availability of abundant surface water, constantly flowing springs and shallow wells up to 10 m in depth have always been much prized, as in other parts of the world. Many surface water-courses, particularly in the Highlands, are coloured brown by peat. They may, from time to time, be locally contaminated by animals and can dry up during periods of low rainfall. However, shallow groundwater is normally clear and contains few bacteria. It may also be present directly beneath a dwelling, avoiding long piping systems to the nearest suitable stream. During long, dry summers and cold winters, when surface waters may be frozen, most wells and springs will continue to provide a reliable supply.

The majority of private groundwater supplies are derived from areally restricted superficial deposits such as valley gravels and gravelly layers in tills. In addition, many types of bedrock, ranging from highly permeable sandstone to basalt and granite have been increasingly exploited in recent years by the drilling of boreholes to depths of 30 m or more. Springs occur where groundwater outflows at the surface and can be derived from the full range of superficial deposits and rock types.

Well developed, permeable floodplain gravels with a shallow depth to water are generally the most reliable sources for a supply in that they have the capacity to store large volumes of groundwater. However, groundwater storage capacity can be very low in tills and many types of bedrock because of limitations in the amount of void space available to hold water. This can lead to

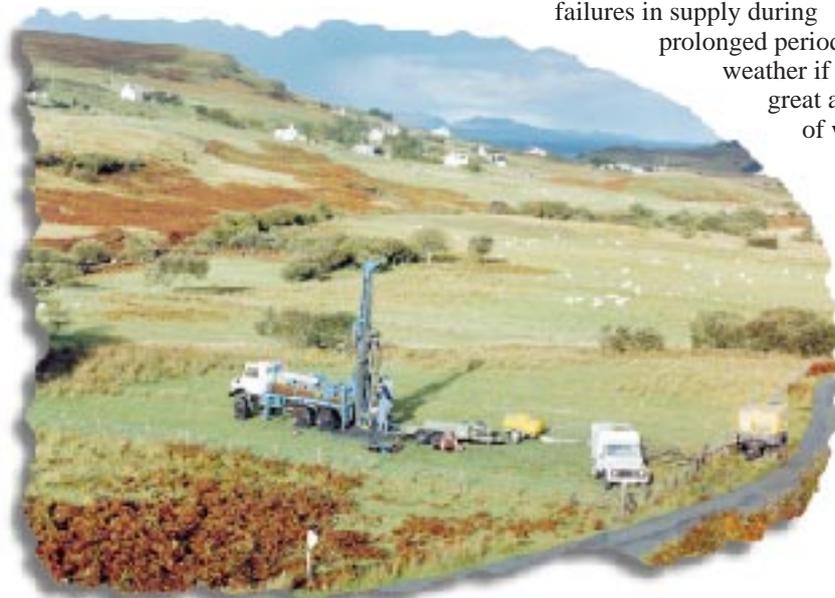
failures in supply during prolonged periods of dry weather if too great a volume of water is

abstracted and the water table drops below the base of the well. Certain springs can also suffer from reduced or zero discharges in dry weather where they are located on high ground and are derived from minor granular layers or narrow fractures within bedrock.

Recent reductions in yield have been attributed to developments at the surface, including new drainage systems, afforestation, road building and housing schemes. In some cases a larger consumption of water is responsible for wells drying up. The increased use of agricultural fertilisers has been blamed for high concentrations of nitrate in shallow groundwater and bacterial contamination has occurred as a result of septic tank systems being located too close to existing supplies.

The BGS, in conjunction with the Scottish Environment Protection Agency (SEPA) has recently begun improving knowledge of where groundwater is exploited for potable and other uses through the creation of a groundwater database. Over the next few years, it is intended to locate and record many more sources in all types of aquifer. Not only will this work improve understanding of the basic characteristics of minor aquifers, but the information will also be used to form a nationwide network of monitoring points both for water level and water quality measurement.

New legislation requires improvements in the quality of water for public supply and has led to the need for a large number of upgrading schemes in the Highlands requiring the expenditure of many millions of pounds. As a result the Scottish water authorities have been studying the groundwater option in several communities. Where a suitable supply is obtainable from local aquifers, a significant saving in investment can be made compared to the installation of sophisticated surface water treatment plants. From the results of work carried out by the water authorities with assistance from the BGS, the exploitation of rural groundwater under certain circumstances is also now regarded as a viable option for the improvement of small community public supply. A thorough knowledge of the factors involved in the sustainability of rural groundwater supplies and their protection is essential if further development of the resource is to take place.



Drilling for groundwater on the Isle of Skye.