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Draft Water Resources (Jersey) Law

Evidence submitted to the Shadow Scrutiny Panel on behalf of the Environment & Public Services Committee by Dr. Denis Peach, Groundwater Systems and Water Quality Programme Manager, British Geological Survey.

Introduction

I am the head of the groundwater research and survey work for the British Geological Survey and a hydrogeologist of over 30 years experience. I am a Vice President of the Geological Society of London and chairman of the UK Groundwater Forum. I am familiar with small island hydrogeology having worked in the Fiji islands and Bahamas as a hydrogeologist for nine years. Prior to that I worked for (inter alia) the water resources 'regulator" in the UK

The British Geological Survey has been involved with the study of the water resources of Jersey since 1989, when during the 1989 – 1992 drought period the government considered the situation serious enough to invoke Emergency Measures, in the summer of 1989, in order to ensure conservation of the remaining resources for the public good. Since this time BGS has completed several studies and published numerous reports on various aspects of the water resources of Jersey. The 1989 drought provided the first recognition that the water resources of Jersey, which had sustained the island for centuries might be insufficient at times and in the future. It was recognised that detailed knowledge of the quantities available for supply to man and the environment and the quality of these resources would be needed. This knowledge would be needed to manage the conservation, protection and equitable allocation of the resources between competing demands such as public supply, agriculture, industry and the environment. Management of natural water systems is required when demands reach the point that protection and allocation become important for the socio-economic well-being of the population.

Water use and supply on Jersey

Public water supply, the responsibility of Jersey New Waterworks Company, is mainly provided from surface water abstractions and storage reservoirs. It has been estimated (Robins, NS, 2000) that about 85% of the dwellings are reached by mains water. The volume supplied has shown a steady increase during the 1990's and by 1998 the supply had exceeded 7000 Ml per annum. Additional supplies in the private sector derive from a variety of sources, including groundwater abstraction. Quantification of these supplies is problematic because of the absence of regulation but estimated direct groundwater abstraction for 1989 – 1991 is 3600 Ml per annum.

Clearly demand varies from wet to dry years and hot to cool summers due to variation in agricultural and domestic requirements. Although these figures were estimates in the 1990's, they are likely to be under-estimates in 2004 and can be expected to rise due to increases in domestic water use to provide for an increasing population with higher life style expectations.

Where does the water come from?

With the exception of some use of roof catchments intercepting rainfall, the water demands, both public and private, on Jersey, are met from the integrated surface and groundwater hydrological system. This is a shallow, island wide, integrated system in which much of the surface water found and abstracted from streams derives from groundwater fed springs and seepages.

The bedrock geology of Jersey is composed predominantly of very old volcanic and crystalline igneous rocks, with some fine grained sedimentary rocks. All these hard rocks have been subject to varying degrees of structural deformation and metamorphosis which has resulted in a very weakly permeable geology. The only substantive permeability is found in the few tens of metres below the ground surface where fractures remain open. The fractures, for the most part become closed at depth and the effective base of the aquifer is normally much less than 100 m below ground level. This hard rock aquifer can be thought of as the thin (about 25 m) layer of saturated rock immediately below the high water table.

Overlying this bedrock aquifer is a variable succession of much younger unconsolidated deposits which include varied beach sands and shingles, wind blown sands and silts, and head (transported weathering products, hill creep and solifluction deposits). Of these the sandy deposits like those sands behind St. Ouen's Bay, St. Aubins Bay and the Royal Bay of Grouville form aquifers of higher permeability and storage than the bedrock aquifer, but being coastal are vulnerable to sea water intrusion and of limited areal extent.

After satisfying the water demand of evapo-transportation the remaining effective rainfall can be divided into surface run off, supplying streams, and recharge to groundwater. This groundwater flowing through the aquifer remains in storage until it discharges into streams via seepages and springs, discharges to the sea at the coast, or is abstracted from wells and boreholes.

The groundwater flow directions on Jersey are controlled by the groundwater level gradients across the island and inferred flow paths. Groundwater levels are high in the north with flow radial towards the coasts but clearly supplying the north-south stream valley system with baseflow (Robins, NS and Smedley, PL, 1998).

Further substantiation of this conceptual understanding of a thin finite shallow weakly permeable aquifer can be found by study of borehole hydrographs. Many of these show seasonal rise and fall of the water levels in response to seasonal rainfall-recharge. Levels often decline in summer and autumn to reach a recession base-level beyond which little natural drainage occurs. Yields reduce and some abstraction boreholes dry, either due to the reduction in saturated thickness of the aquifer towards zero or the decline in hydraulic conductivity with depth (Robins, NS and Smedley, PL, 1998).

Interpretation of the natural groundwater chemistry indicates that the groundwaters sampled from boreholes are young. They are oxidising with high redox potentials and dissolved oxygen concentrations. pH values are lowest in the north and increase away from the high ground where highest rainfall is seen. Stable oxygen and hydrogen isotope ratios in the Jersey groundwaters are comparable to values for modern recharge determined from other areas under similar climatic conditions. Similarly the frequent presence of pollutants, in particular nitrate from agricultural fertilizers, points to the groundwater in storage being largely composed of modern recharge.

Streams support strong flows from run-off after rains but in the spring and early summer are sustained by groundwater discharge from springs.

How much water is available?

In the 1990's a catchment was instrumented above the Grands Vaux reservoir in Trinity, to monitor the hydrological cycle so that more reliable estimates of the water balance could be made. Statistical baseflow separation (Blackie et al, 1996) indicated that two thirds of the stream flow was derived from groundwater baseflow (i.e. the baseflow index for the study catchment was 0.66). Extrapolation of the results from the upper Trinity catchment enabled an island wide estimate of rainfall and groundwater recharge according to measured rainfall and known land-use distribution. This water balance calculation was made for the period from 1968-69 to 1995/96.

For this period the Jersey wide mean annual rainfall was 884 mm of which 227 mm was stream flow (run-off plus baseflow) and 130 mm was recharge to groundwater. The mean baseflow index was calculated to be

0.58 so annual average baseflow can be estimated to be 132 mm accounting for groundwater recharge.

Comparison of this long term mean gross recharge with estimated demands on groundwater and baseflow indicates that just over half the available resource is used by man (Robins NS and Smedley, PL 1998).

In average and wetter than average years the demand can be met, but in dryer years there can be a net loss and as groundwater storage is used up water levels will fall and baseflows to streams will be affected.

It is clear that in dryer than average years (50% of the time) the aquifer and consequently the resources may be under severe stress. Under these circumstances it would appear sensible to apply some proportionate regulation. In developed countries and very many developing countries this is effected by the implementation of appropriate legislation.

Equitable allocation

In the dryer years we see that groundwater baseflow which provides about half of the stream flows used for public supplies become stressed. As

demands rise the situation will deteriorate. The vast majority of the population in Jersey receive their domestic water supplies from the public system. Domestic water supplies are normally given the highest priority so it would also seem reasonable to put in place regulations to ensure that the resources used to provide these supplies are protected and conserved for the public.

At the same time regulation of existing uses need to be respected and moreover protected against from other derogation.

Furthermore the water resources of Jersey sustain an ecological and geomorphological environment enjoyed by the people of Jersey and its many visitors; at present, however, the water environment has no defence against over exploitation.

All these demands on these scarce and highly variable water resources of Jersey require a fair deal, equitable allocation and protection against over-exploitation by one interest. This can only fairly be implemented with:

a. Knowledge of the resources
b. Knowledge of the uses

c. Appropriate controls of location, amounts, and methods of exploitation of the resources

This can be satisfactorily achieved by implementation of the proposed legislation.

Benefits of water resources regulation

The most obvious benefit of regulating water resources is the security that can then be assured to all users that they will have protection, under the law, for their use and that the priorities for the allocation of rights follow sensible, agreed principles.

A sensible proportionate approach will help the States of Jersey protect the environmental heritage and biodiversity for the public good and future generations. It is my understanding that the States have a policy that, although not part of the EU, they will implement the spirit of the environmental legislation that EU Member States are following. This includes the Water Framework Directive which puts considerable emphasis on ecological status in water resources. It is a requirement of the Directive to protect, conserve and regulate the environment to allow

improvements to achieve "good ecological status" in surface waters. The proposed legislation will allow progress towards this objective.

Finally, the proposed water resources legislation will allow the Government and people of Jersey to be prepared for the changing climate, demographic growth, land use and industrial growth, because it provides a degree of control of the use of a precious and limited resource.