River	Catchment area (km^2)	Mean gauged flow ($m^3\ s^{-1}$)	Max. daily flow ($m^3\ s^{-1}$)	95 percentile flow ($m^3\ s^{-1}$)	95/ mean
Tamar	917	22.40	321.56	1.94	0.087

Casual observation shows that larger catchments tend to have larger mean channel flows. However, comparison of the Scottish River Spey with the Thames shows similar figures, yet the Thames catchment is around three and a half times larger. The cause is higher in-catchment precipitation for rivers which rise in the Grampian Highland region. A pronounced difference may be observed in mean flows between the smaller catchments of the Tamar (Cornwall-Devon border) and the Stour (Essex) which are of similar area, the latter in one of the driest parts of the country. Maximum mean daily flow gives a good indication of the high flow situation; the highest values are for the Scottish Rivers Spey and Tay, reflecting high precipitation and rapid runoff, and for the Thames, which has the largest catchment. Ineson and Downing (1964) estimated the groundwater catchment area of the River Itchen in Hampshire to be some 20% larger than that of the surface catchment for the portion of the catchment underlain by chalk, a situation confirmed by observation of the regional hydrogeological map (e.g., IGS/SWA, 1964). A more recent figure, derived from the Catchment Management Plan for the same part of the catchment (above the Highbridge and Allbrook gauging station) is around 45%, or 35% if the entire area of the catchment is included as far south as Southampton (NRA, 1979). Low flows in the catchment have caused problems for the water quality, habitats and fish populations (EA, 1992e). At the time of writing, the condition of the rivers Test and Itchen was found to be 'unfavourable' with a new partnership initiative being created to address some very difficult problems (Test and Itchen Catchment Partnership 2014).

The groundwater contribution to the main river channel above the Allbrook gauges is frequently from beyond the dry valley and winterbourne (seasonal) stream system which defines the surface catchment over most of the area, especially in the eastern part of the catchment. Since 1976, flow augmentation from groundwater in the upper catchment has been employed to support low summer and autumn flows, and this is further described in Chapter 5. The contrasting catchment sizes are shown in Figure 2.6.

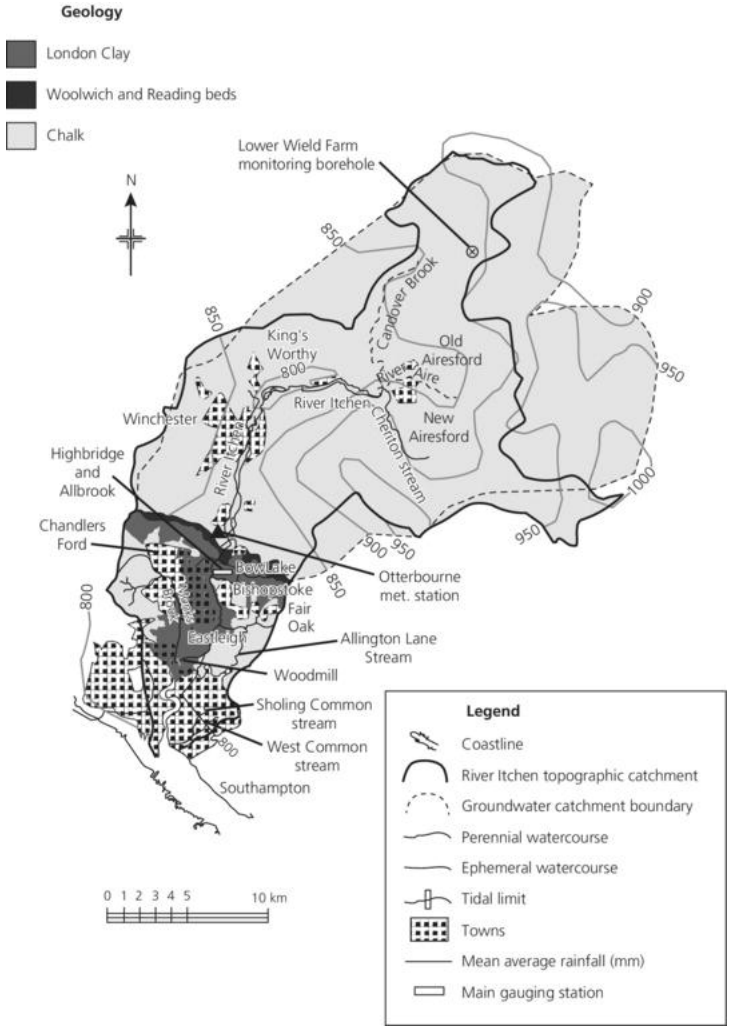

Figure 2.6 Surface and groundwater catchments on the Itchen. (Redrawn from NRA, 1992e, p. 12).

The reliance of management on catchments (or river basins) arises from a historical reliance upon hydrological research applicable at that scale. Newson (1992a, Ch. 8; Newson 2008) states that rational management is not only likely to ask the question 'how', as do scientists, but is also very concerned with 'what if'. The development of catchment scale models with the advent of powerful numerical computation techniques enables scenarios to be explored, assisting in the proactive management of resources including 'what if' scenarios of surface and groundwater management.

Surface water abstraction from rivers, natural lakes and reservoirs is the largest source of water in many areas of Britain. Reservoirs are artificial means of impounding surface waters and may have a number of functions including storage, regulation of flow, power generation through hydroelectric schemes, and flood alleviation. Frequently, two or more functions are combined. The management of river catchments may be