Climate Change and Urban Groundwater Recharge

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Climate change and urban groundwater recharge are areas of science which have generally not been studied in detail and include significant variability and uncertainty. Due to the numerous variables involved in climate change, models generate large uncertainty in their predictions. The multitude of variables involved in groundwater recharge makes this part of the hydrological cycle very difficult to track and predict. Urban groundwater recharge, the largely overlooked side of this valuable water resource, is even less understood, which is commonly related to the generally lower groundwater use in urban areas than in rural areas.

This paper is brief summary of a preliminary investigation into climate change and urban groundwater recharge (Dean 2006). The objectives were to conceptually investigate climate change and urban groundwater recharge, provide a literature review of the groundwater resources in the Port Phillip region of Victoria (Figure 1) and qualitatively analyse groundwater observation bore data and hydrological data from the Port Phillip region to determine possible relationships or general trends.

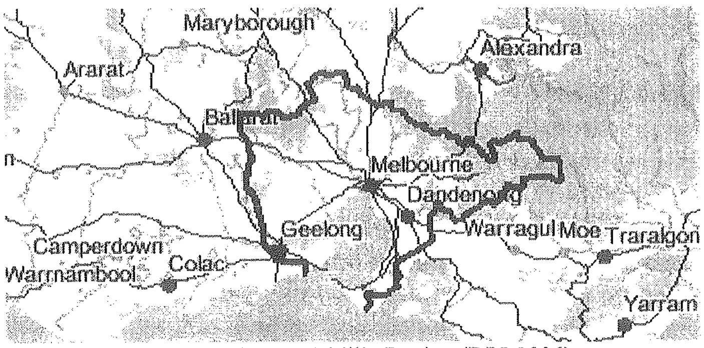

Figure 1 The Port Phillip Region (DPI 2006)

In an urban environment such as Melbourne it could be expected that the effects of urbanisation commonly lead to a reduction in recharge, although this may not necessarily be the case. In comparison, the potential effects of climate change on recharge are difficult to quantify. A decrease in groundwater recharge linked to climate change could affect the quality and quantity of groundwater resources in the Port Phillip region, exacerbating the potential for saline intrusion and decreased groundwater yield.

The bore data used in this study focused on bores in the Brighton Group aquifer system of south-east Melbourne and the Sylvan bores in a region of Newer Volcanics basalt and scoria (Leonard 1992). All data was obtained through the Victorian Water Resources Data Warehouse website (DSE 2006). Daily rainfall and pan evaporation was obtained from the SILO database for the Monash University Clayton campus (pers. comm. Tony Ladson). The 'net flux' was calculated as rainfall minus pan evaporation, primarily as a screening technique. The groundwater level data was normalised to the long-term mean minus one, and compared to net flux trends (Figure 2), allowing a visual assessment of groundwater head versus climate.

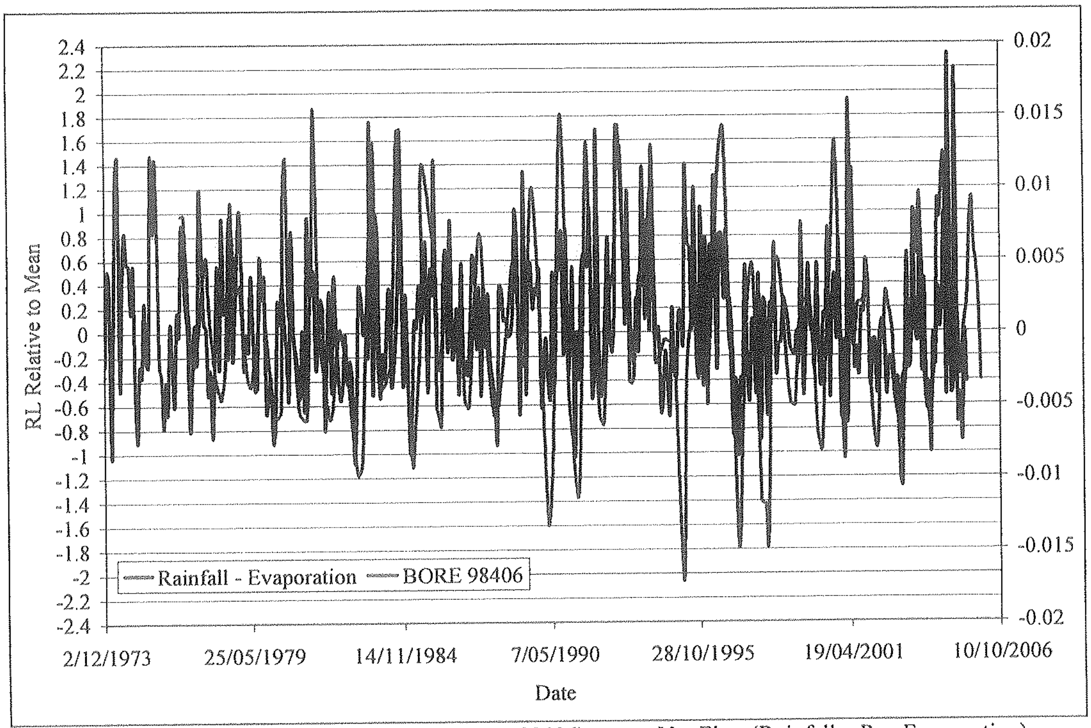

Figure 2 Normalised groundwater level (Bore 98406) versus Net Flux (Rainfall – Pan Evaporation)

The bore data analyses showed that groundwater in the Port Phillip region was reasonably sensitive to fluctuations in rainfall, seen seasonally and across the years. For the bores analysed no real consensus on any net downward or upward trend in levels was noticed via the qualitative approach employed. A more rigorous hydrologic analysis and modelling of the data could possibly facilitate further understanding of the relationshiops between climate and urban groundwater recharge, especially the use of time series statistical techniques. This preliminary investigation has shown that groundwater resources are linked to climate though clear relationships require further work, thereby providing the basis for a more comprehensive study into climate change and urban groundwater recharge.

References

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