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Report to Environment Committee
from Andrew Jones, Groundwater Scientist

Progress Report on the Review of the Minimum Foreshore Water Level in the Waiwhetu Aquifer

1. Purpose

To inform the Committee of progress on the review of the minimum foreshore water level for the Waiwhetu Artesian Aquifer, Lower Hutt.

2. Background

The Waiwhetu Artesian Aquifer in the Lower Hutt Groundwater Zone provides about one third of Wellington's daily public water supply needs. The aquifer is also an important resource for eight private users in the Petone and Seaview areas. It is the only fully allocated groundwater system in the Wellington Region.

Because the aquifer is hydraulically connected with the sea, saline water may be drawn into the aquifer if abstraction is not carefully managed. The intrusion of seawater could have a significant detrimental effect on the high quality of the water in the aquifer and may render the system unsuitable for potable supply without treatment.

To prevent seawater intrusion, a critical water level of 1.4m above mean sea level (amsl) measured at the McEwan Park monitoring bore is enforced. This critical level determines how much water can be allocated from the aquifer.

Future abstraction from the aquifer is forecast to increase therefore there is a need to ensure that the critical level employed is as robust as possible. However, any change in the level will affect the sustainable yield of the aquifer and a significant reduction in yield would seriously affect the operation of the bulk public water supply network.

3. How Was the Existing Level Derived?

Department of Scientific and Industrial Research scientists, Donaldson and Campbell, derived the existing level in 1977. Donaldson and Campbell correlated water levels in

the aquifer at Somes Island with water levels at McEwan Park. Using this correlation they calculated that when the 24 hour mean water level at McEwan reached 1.4m amsl, seawater would begin to enter the aquifer through a submarine spring immediately south of Somes Island.

While the correlation appears reasonable at face value, there are two significant problems:

- the correlation cannot be reproduced with confidence using recent data, and
- the correlation assumes that the only point of seawater intrusion is the Somes Island spring.

4. Reproducing Donaldson and Campbell's Correlation

Donaldson and Campbell's original correlation was based on water level data gathered between 25 January 1973 and 6 March 1973. These data, and data covering longer and more recent periods, were used to produce additional water level correlations.

A critical level of 1.4m amsl was obtained from a correlation made using data that covered Donaldson and Campbell's original time period, however, the high level of confidence reported by Donaldson and Campbell could not be duplicated. Correlations made using more recent data also exhibited a moderate to poor fit and showed significant seasonal variation in the calculated critical level. These correlations suggest that the critical level should be set between 2.2m and 3.2m amsl. Adoption of a such a higher value would reduce the sustainable yield of the aquifer.

5. The Somes Island Spring Assumption

The moderate to poor fit for all correlations indicates that the assumption that the Somes Island spring is the key seawater intrusion site is overly simplistic. Discharge from other locations must play an important role in the dynamics of the aquifer system. A good understanding of discharge from the aquifer is currently the greatest limiting factor for the establishment of an updated critical level.

The discharge from the aquifer has been the focus of a study by Victoria University Masters student Steve Harding. Mr Harding's thesis is due to be completed this year and is expected to greatly increase our knowledge of the aquifer.

6. Is the Aquifer Currently Safe from Seawater Intrusion?

Despite the shortcomings of the existing level, chemical analyses of the groundwater undertaken in 1993, and similar analyses performed since 1996 show no evidence of seawater intrusion.

If the current moderate abstraction rate from the aquifer continues, the existing level, coupled with the chemical monitoring programme, should be sufficient to safeguard

the quality of the aquifer. The chemical programme is a vital check of any critical level and is soon to be bolstered by the installation of a continuous electrical conductivity meter in the McEwan Park monitoring bore.

However, if abstraction increases as forecast, the limitations of the existing level may become more significant and a more robust level will have to be set.

7. Where To From Here?

With the completion of Mr Harding's thesis, a discharge mechanism for the aquifer will be defined. I expect to take this definition and use it to refine the existing computer model for the aquifer to determine an appropriate critical level or equivalent mechanism to safeguard against seawater intrusion. Further work will be undertaken over the next three years.

8. Communications

The results of this investigation will be distributed to all users of the aquifer because any change in the level will affect the sustainable yield of the system. The Resource Policy Department will also be advised, as the adoption of a new critical level will require an amendment of the Regional Freshwater Plan.

9. Recommendation

That the report be received and its contents noted.

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