

**IN THE MATTER OF**

the Resource Management Act  
1991

**AND**

**IN THE MATTER OF**

applications by Central Plains Water  
Trust to:

Canterbury Regional Council for  
resource consents to take and use  
water from the Waimakariri and  
Rakaia Rivers and for all associated  
consents required for the  
construction and operation of the  
Central Plains Water Enhancement  
Scheme

Selwyn District Council for resource  
consents to construct and operate  
the Central Plains Water  
Enhancement Scheme

**AND**

**IN THE MATTER OF**

a notice of requirement by Central  
Plains Water Limited to:

Selwyn District Council for the  
designation of land for works  
associated with the construction and  
operation of the Central Plains  
Water Enhancement Scheme

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**SUPPLEMENTARY EVIDENCE OF JULIAN JAMES WEIR  
SPECIFIC PREDICTED EFFECTS ON GRAVEL EXTRACTORS  
15 OCTOBER 2009**

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## INTRODUCTION

1. I understand that, subsequent to my presentation of supplementary evidence, the Commissioners verbally requested additional information on the specific effects predicted in the areas where gravel extractors operate. The following has been prepared in response to this request.
2. I have assessed the predicted mounding in two gravel pit areas, the Yaldhurst-West Melton area, and the McLeans Island area.

### The Yaldhurst-West Melton Area

3. ECan's monitoring bore M35/1080 is located near the gravel pits in the Yaldhurst-West Melton area and has been used as an indicator well for assessing the potential effects on the gravel extractors. Measured groundwater levels from this bore were used as part of calibrating the regional groundwater model, with a good match between measured and modelled. It was also a bore used for eigen modelling. The location of this bore is presented in Figure 1, attached.
4. The maximum groundwater mounding predicted in bore M35/1080 by the numerical model is approximately 1.7 m under the original 'CPWES' scenario and 1.3 m under the 'CPWES No Dam' scenario. Eigen modelling predicted a maximum mound of approximately 2 m under the original 'CPWES' scenario and 1.5 m under the 'CPWES No Dam' scenario.
5. I understand that the depth of gravel excavation is restricted (among other conditions) based on measured groundwater levels. Specifically, excavation is not permitted below an elevation set 1 m above the highest measured groundwater level at the site. To assess how this lower limit of excavation is predicted to vary with the proposed scheme, the calculated mounding at bore M35/1080 has been superimposed onto measured groundwater levels for both the 'CPWES' and the 'CPWES No Dam' scenarios. This is plotted in Figure 2 along with the measured groundwater levels and the maximum measured groundwater level. As verbally discussed in my presentation of Supplementary Evidence, the numerical model runs have now fully completed, and therefore information for M35/1080 is presented for the full 40-year simulation period (1967-2006).
6. Based on Figure 2, the historical maximum measured groundwater level is predicted to be exceeded on five occasions over the 40 year simulation period (i.e. 12.5% probability). Each exceedance lasts for a period of between 4-8 weeks and occurs once within any year. The height of exceedance is less under the 'CPWES No Dam' scenario than under the 'CPWES' scenario. The maximum recorded level is not

predicted to be exceeded after 1996. This is because from this year onwards, groundwater levels have typically been lower than average, similar to the 1980's and early 1970's. If climatic conditions followed a similar pattern to the last 12 years, then it would be unlikely that the historical high measured groundwater levels would be exceeded.

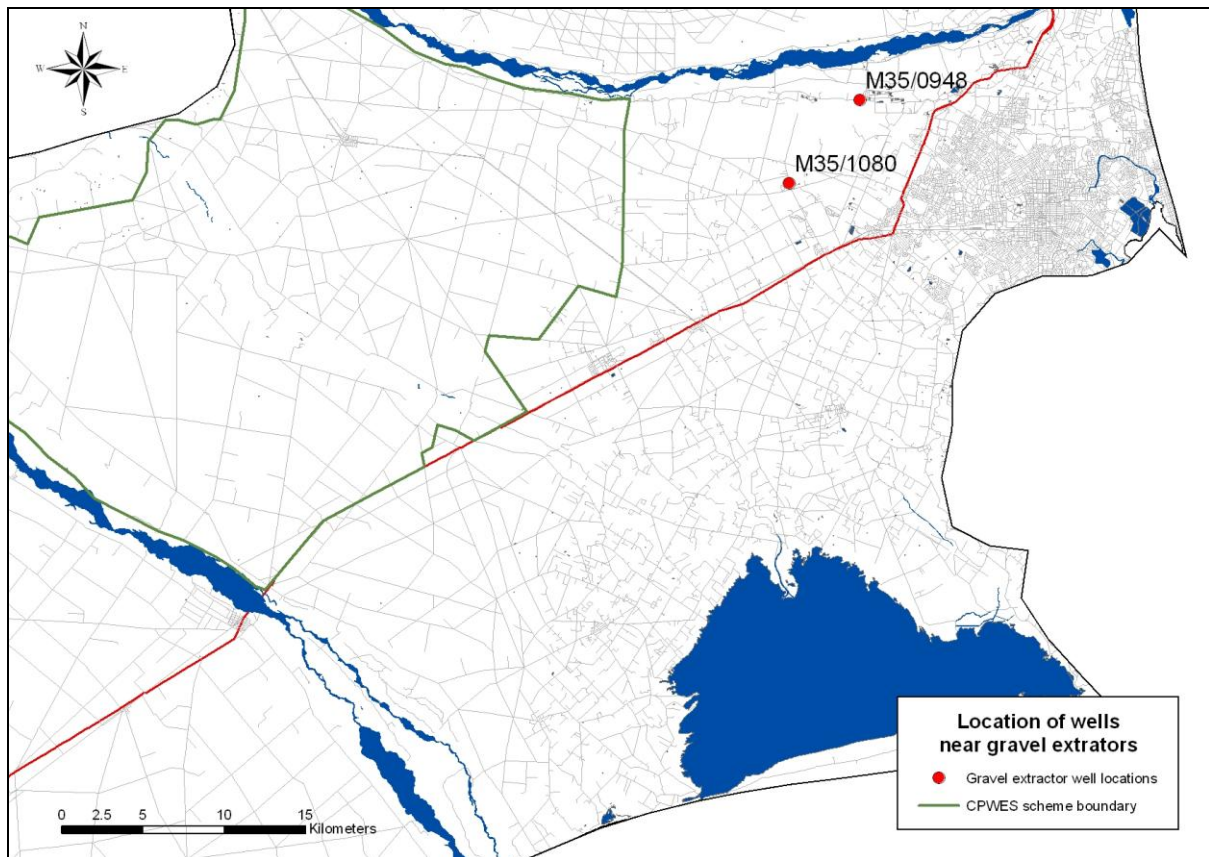
### **McLeans Island Area**

7. The McLeans Island area is in close proximity to the Waimakariri River. Consequently, this river regulates groundwater mounding and the predicted mounding is much less than in the Yaldhurst-West Melton area. ECan's monitoring bore M35/0948 is located in this area, and measurements from this bore have also been used to calibrate the regional groundwater model. Measured and modelled groundwater levels match well at this location, though the numerical model slightly over predicts the seasonal variation compared to measured. This is conservative for predicting the potential mounding. The location of this bore is presented in Figure 1, attached.
8. The maximum groundwater mounding predicted in bore M35/0948 by the numerical model is approximately 0.3 m under the original 'CPWES' scenario and 0.2 m under the 'CPWES No Dam' scenario. No eigen model has been constructed for this location.
9. Figure 3 presents the measured groundwater levels in bore M35/0948 as well as the measured plus predicted mounding for both scenarios, and the maximum measured groundwater level. For this location, the historical maximum groundwater mound was predicted to be exceeded only twice over the period, with both occurrences occurring in the mid 1970's when groundwater levels were the highest recorded. Based on Figure 3, the probability of exceeding the maximum recorded groundwater levels in this area is very low (i.e. 2.5%, or one year in 40) with the operation of the CPWES, particularly in its revised form ('CPWES No Dam').

### **Timing of Effects**

10. The above predictions assume that the scheme is fully operational at the start of the simulation. As discussed in paragraph 195 of my main evidence, the groundwater model predicts that the aquifer system would take approximately 3-5 years to reach a new transient equilibrium after an instantaneous commencement of the full scheme. Approximately 90% of the effects would occur in the first 2-4 years.
11. Once a new equilibrium is reached, the numerical model predicts that maximum groundwater levels each year (under the fully operational scheme) occur

approximately 1-2 months later than under the status quo scenario in the areas of M35/1080 and M35/0948.



*Figure 1: Locations of representative wells near gravel extractor sites*

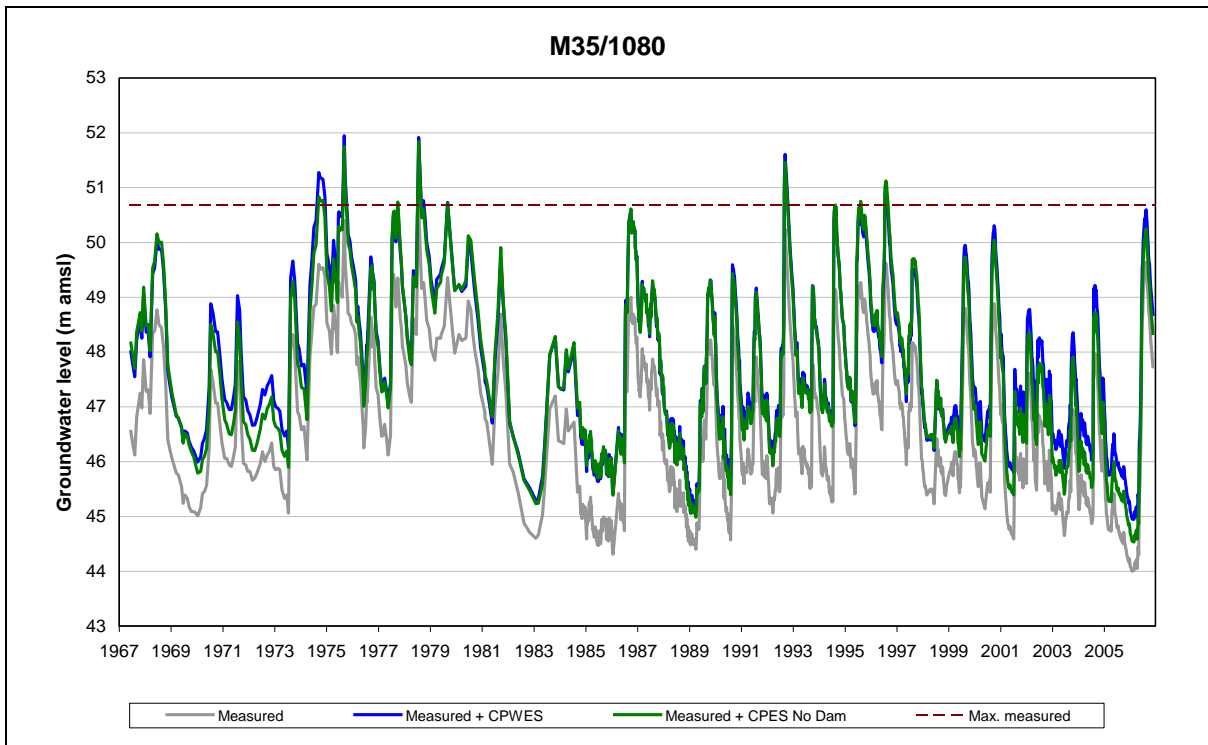


Figure 2: Measured and measured plus predicted mounded groundwater levels at M35/1080

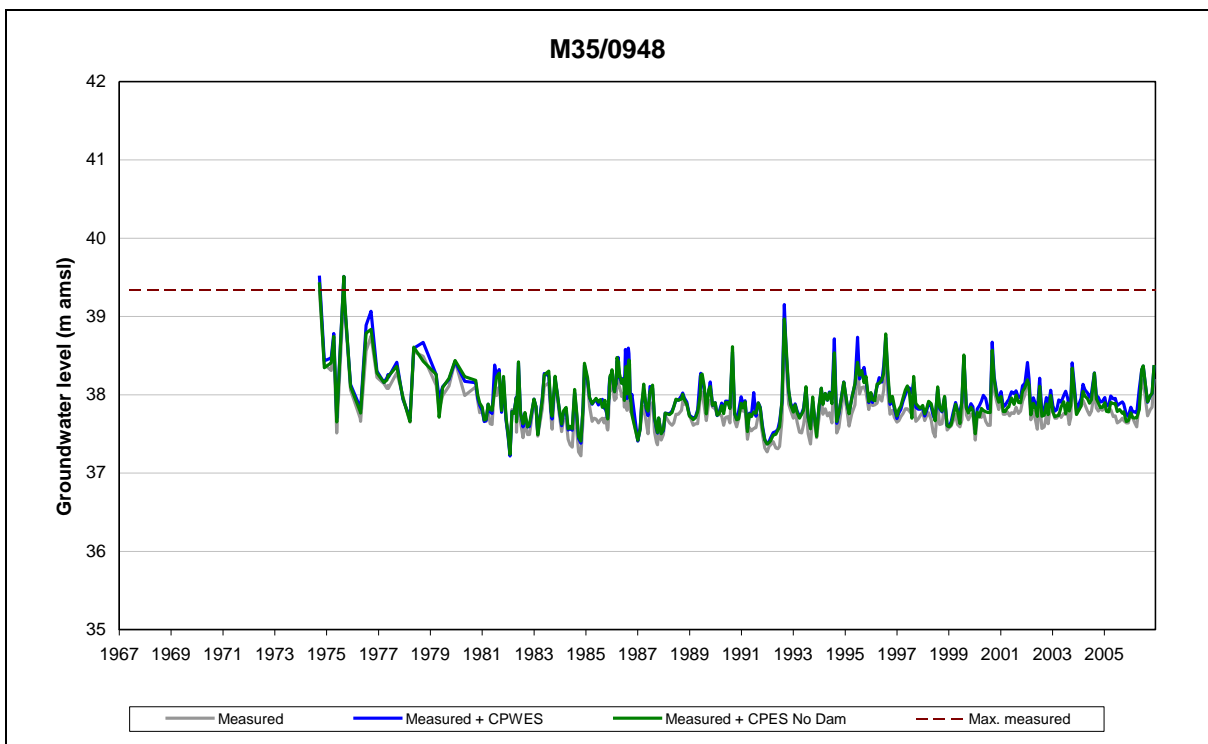


Figure 3: Measured and measured plus predicted mounded groundwater levels at M35/0948