

Before Independent Commissioners Appointed by the Canterbury Regional Council and Selwyn District Council

In the matter of The Resource Management Act 1991

And

In the matter of Applications by **Fulton Hogan Limited** for all resource consents necessary to establish, operate, maintain and close an aggregate quarry (**Roydon Quarry**) between Curraghs, Dawsons, Maddisons and Jones Roads, Templeton

REBUTTAL EVIDENCE OF NICHOLAS CHARLES ELDRED ON BEHALF OF FULTON HOGAN LIMITED

GROUNDWATER

DATED: 21 OCTOBER 2019

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Introduction

1. My full name is Nicholas Charles Eldred. I hold the position of Geotechnical Business Group Manager at GHD Limited, an engineering and environmental consultancy. I have been employed by GHD since December 2018. As well as managing a business group, I am responsible for providing hydrogeology and geotechnical advice and project management services to clients throughout New Zealand and the South Pacific.
2. Before joining GHD in 2018 I worked for AECOM in the USA for six years in a similar role to my current role with GHD. Prior to that I was the Water Infrastructure Development Manager for Meridian Energy based in Christchurch from 2006 through 2012 and was responsible for developing a range of irrigation and hydro electrical projects. Between 1992 and 2012 I worked for URS NZ Ltd in Auckland and Christchurch as a hydrogeologist and engineering geologist in a variety of roles.
3. I have a Master of Science degree in Geomaterials and a Bachelor of Science degree in Engineering Geomorphology from Queen Mary College, University of London.
4. I have 30 years of experience working in hydrogeology and engineering geology as a consultant as well as six years working for Meridian Energy as a developer of water infrastructure projects.
5. Relevant areas of my experience include:
 - (a) Review of groundwater level conditions for the Seadown Quarry near Timaru:
 - (b) Manager overseeing several proposed irrigation developments in the South Island including the Hunter Downs Irrigation Scheme, scheme associated with the Waiau and Hurunui rivers, and scheme associated with the Lower Waitaki River:
 - (c) Technical evaluation of groundwater effects associated with numerous waste water irrigation schemes in Canterbury from meat works and milk factories; and
 - (d) Technical evaluation of groundwater effects associated with a range of civil engineering projects including: Project Aqua Hydro Electric scheme (Lower Waitaki); Second Manapouri Tailrace Tunnel;

numerous pipelines across the major New Zealand urban centres; and Macraes Mine in Otago.

6. I confirm I have read and agree to comply with those parts of the Environment Court Practice Note that bear on my role as an expert witness.

Scope

7. In relation to my rebuttal evidence I have considered the following documents:
 - (a) The Section 42A Reports of Dr L Scott, and D Just; and
 - (b) Applicant evidence of E Van Nieuwkerk, K Bligh and V Mthamo.
8. In my rebuttal evidence I address issues raised by the following submitters:
 - (a) M Flanagan who raises concerns on Page 3 of his submission regarding the practicality of the proposed mitigation for possible rising groundwater levels.
 - (b) Templeton Residents Assoc. prepared by J Eagar who raises similar concerns in paragraph 41 through 46.
 - (c) I also note Dr L Scott has related concerns over the proposed mitigation measures on this topic in paragraph 39 of her evidence.
9. With respect to this Proposal, I was contacted by Counsel for Fulton Hogan recently. My involvement has included reviewing the available evidence on groundwater (Regional Council's, Fulton Hogan's and submitters) and the conclusions reached. In terms of rebuttal evidence specifically, I have been involved in numerous groundwater projects across the Canterbury Plains including irrigation schemes, waste water disposal schemes and groundwater abstractions. In many cases I have evaluated issues similar to those being addressed in rebuttal including long term groundwater level changes from irrigation (including the initial evaluation of the Central Plains Water scheme) and groundwater quality impacts.

M Flanagan

10. In the evidence of M Flanagan on Page 3 concern is raised regarding the proposed mitigation for potential rising groundwater levels. Mr Flanagan is concerned that the proposed mitigation of adding fill and raising the level of

the quarry floor in response to possible future rising groundwater levels is not realistic.

11. By way of background the project proposes the following approach:
 - (a) Managing the quarry depth to one metre above the expected Seasonal High Water Table (SHWT) is generally expected to provide protection of groundwater quality from surface operations. Mr Van Nieuwkerk establishes an expected SHWT in paragraphs 40 through 50 of his evidence based on a range of available information. I concur with his approach.
 - (b) In paragraph 50 of his evidence Mr Van Nieuwkerk recognizes there is some uncertainty in establishing the SHWT. Furthermore, he notes that climate change and the Central Plains Water scheme may also impact long terms trends – both upwards and downwards. He recommends that the SHWT and maximum quarry depth is reviewed every five years. I concur with this recommendation.
 - (c) Proposed Condition 6 in Mr. Bligh’s evidence reflects Mr Van Nieuwkerk’s recommendation in regard to a five years review based on site specific data. However, I note Mr Bligh has only allowed for a review after the first five years of operation while Mr Van Nieuwkerk recommends a review every five years. I agree with Mr Van Nieuwkerk and recommend the proposed condition is changed accordingly.
 - (d) Proposed Condition 8 and 9 provide mitigation measures in the event that groundwater rises so that the separation between the excavated quarry floor and the groundwater level is less than 1 metre.
 - (e) Condition 8 requires the consent holder to apply “virgin materials” (aggregate sourced from within the site, opposed to imported cleanfill) in any area to re-establish a 1m separation. Condition 9 requires machinery to be moved away from these areas while backfilling is taking place.
12. Mr Flanagan is concerned that if groundwater levels do rise at some time in the future and large areas of backfill are required this will be unrealistic for Fulton Hogan to achieve and they would appeal the condition. He believes that the only realistic way to mitigate the risk is to increase the buffer layer now to allow for expected groundwater rise.

13. In response to Mr Flanagan I note the following:
- (a) The recommended consent condition that requires the SHWT to be reviewed every five years will allow the maximum quarry floor level to be adapted in response to observed changes. While an increase in groundwater levels in the area in response to increased irrigation associated with the Central Plains Irrigation scheme is possible, other factors may mitigate these potential effects, such as reduction in overall aquifer recharge due to climate change. Therefore, I believe an adaptive response is appropriate.
 - (b) I also note that following completion of quarrying in any given area Fulton Hogan propose to rehabilitate the quarry floor through the placement of cleanfill followed by at least 300 mm of topsoil. Therefore, the 1 metre buffer will represent a minimum thickness for the buffer layer at the end of extraction. Following rehabilitation the buffer layer will be increased by at least 300mm following the placement of topsoil and probably significantly more through the placement of cleanfill. Therefore, any increase in the SHWT following rehabilitation will need to be significant to require placement of further “virgin materials”.
 - (c) With respect to the anticipated response of groundwater levels to the Central Plains Water (CPW) scheme, a significant amount of work was completed by CPW on this topic. The studies concluded that the groundwater response within the catchment area of the scheme may be significant – potentially up to several metres. However, Templeton is located downstream and to the east of the scheme. While some response may occur in this area, numerical modelling completed by CPW did not specifically provide estimated values. The modelling and reported¹ data suggests values will be less than 2 metres beyond the scheme boundaries but specific data for Templeton is not available.
 - (d) In my opinion, part of the reason why CPW have not made specific predictions regarding groundwater level changes beyond the scheme boundary is that the complexity of the groundwater system makes this difficult. As discussed in paragraph 11 (b) of my evidence and E Van Nieuwkerk, any modest groundwater response to CPW in this area may be offset by other factors such as climate change impacting recharge,

¹ Central Plains Water Limited – Baseline Groundwater Level Assessment – Page 36.

increased drainage to spring fed streams and drains, and changes in groundwater abstraction by wells. Therefore, given the uncertainties the adaptive approach outlined above is appropriate.

J Eagar – TRA Representative

14. J Eagar raises similar concerns to M Flanagan regarding the adequacy of a 1 metre buffer to protect groundwater quality in Paragraph 42 of her evidence.
15. She notes in Paragraph 43 that this concern is supported by the 2016 decision with respect to the Canterbury Aggregates Producers Group (CAPG) where an additional 1 metre was added to the buffer as an allowance for the possible Central Plains Water effects discussed earlier in my evidence.
16. In paragraph 45 she raises similar concerns to M Flanagan regarding it being unrealistic to raise the floor with backfill for large areas.
17. As described above, I believe the proposed five year review combined with the placement of rehabilitation materials will address these concerns and is an appropriate adaptive approach to the possible issue.

Dr L Scott

18. In paragraph 35 and 36 of her evidence Dr Scott agrees with the approach adopted by E van Nieuwkerk to calculate the SHWT and notes the assessment looks relatively conservative.
19. In paragraphs 37 to 39 of her evidence Dr Scott discussed the uncertainties regarding future changes to groundwater levels and concludes by noting that the proposed consent condition to refine the groundwater level estimates after the first five years of monitoring would be unlikely to provide a high level of confidence regarding changes further in the future.
20. As mentioned earlier in my evidence, I agree with E Van Nieuwkerk's recommendation that the SHWT is reviewed every five years and recommend Condition 6 is edited accordingly. I believe this will also address Dr Scott's concern.

Nicholas Charles Eldred

21 October 2019