Before the Decision Makers appointed by the Canterbury Regional Council

IN THE MATTER OF The Resource Management Act 1991

AND

IN THE MATTER OF Resource Consent Application CRC193563, CRC193564 and CRC193773 by Sol Quarries Limited for a land-use consent to undertake quarrying activities (extraction and cleanfilling); discharge permit to discharge contaminants to air; and a discharge permit to discharge contaminants (cleanfill) onto and into land where they may enter water.

Summary Statement and Supplementary Report of Amber Kreleger on behalf of Environment Canterbury Regional Council

INTRODUCTION

1. I am a Senior Groundwater Scientist employed by Environment Canterbury Regional Council (CRC). I prepared the Technical Addendum on Groundwater Quality which is included in Appendix 2 of the Section 42a Officer's Reports.
2. I would like to give a summary of my report and reply to some to points raised by the Applicant[1] regarding general effects on groundwater quality.
3. I also recommend some changes to the proposed monitoring conditions at the end of my supplementary report, but I will not read those out, unless you prefer me to.

SUMMARY STATEMENT

4. The aquifers below the existing and proposed SOL Quarries are made up of unconsolidated gravels with varying quantities of sand and silt and extend to over 140 m deep.
5. The aquifers are part of the Christchurch Groundwater Protection Zone, a planning zone that serves to protect the high quality, untreated groundwater sources available to Christchurch City as potable water supply.
6. Due to the lack of fine and organic material, the highly permeable aquifer materials have a very limited capacity to filter or treat contaminants, so the groundwater in this area is highly vulnerable to contamination.

[1] Statement of Evidence of Peter Francis Callander, Groundwater Quality

7. Therefore, managing quarry depths to at least one metre above the highest groundwater level is important because it is essentially one of the few available mitigation measures, along with strict clean fill management, to provide some protection of the groundwater quality in the aquifer. A separation helps to minimise the risk of excavators working directly in groundwater and fill materials being periodically saturated with groundwater. But it does not provide for much treatment of contaminants.

8. Results from a groundwater quality investigation around the Miners Road Quarries show that the associated discharges from cleanfill materials can have a measurable effect on aesthetic properties of groundwater in a gravel aquifer. This means that the use of this groundwater for domestic purposes is at risk, as it might change the taste and could cause scale deposition and sum formation.

9. The Miners Road quarries are located 4.5 km to the southwest from SOL Quarries, in a similar hydrogeological setting. Therefore, I consider these results relevant for the proposed SOL Quarries extension site and I expect some degradation in the aesthetic properties of groundwater below the deposition site.

10. This degradation is likely localised and I expect the risk is low for any future concentrations to exceed the aesthetic guidance values (GV) or 50% of the maximum acceptable value for human health (MAV) from the New Zealand Drinking Water Standards 2008 (NZDWS).

11. Although the reduction in aesthetic quality of groundwater is unlikely to pose a risk to human health, it could, in a worst-case scenario for domestic well owners located directly downgradient of the quarry, result in their drinking water being unpalatable or cause scale or scum formation for some domestic uses.

12. Therefore, strict clean fill management and ongoing monitoring of groundwater levels and groundwater quality is crucial, with the groundwater quality monitoring acting as an ‘early warning’ system for nearby downgradient domestic well owners. Of course, monitoring will only pick up issues after the fact and any irreversible effects need to be offset by providing domestic well users with an alternative water supply.

13. I largely agree with the monitoring conditions proposed by the Applicant related to groundwater levels and groundwater quality. I do propose some minor but relevant adjustments to ensure the monitoring achieves adequate protection for the aquifer and nearby domestic well owners. These adjustments are listed at the end of my report.

POINTS RAISED BY THE APPLICANT

14. Mr. Peter Callander provided a Statement of Evidence on behalf of the Applicant regarding the effects on groundwater quality due to the Applicant’s proposal. He presented his summary statement on 7 December 2020.

15. He states that *the effects on groundwater quality from the deposition of cleanfill, as proposed by SOL Quarry, will be less than the effects observed at Miners Road,* because [SOL Quarries] is *a smaller quarry, with stricter controls on excavation depths and allowable cleanfill and is located in an area that has lower background hardness values.*

16. I agree that these might all be indications that hardness in groundwater at SOL Quarries will likely not reach concentrations as high as at Miners Road Quarries due to the proposed cleanfilling activities, but I do think there is quite some uncertainty involved.

17. As can be seen from the Figure 1 in Mr Callander's evidence, groundwater quality data near the SOL Quarries site is absent (for the presented period 2007-2012). Table 1 in Mr Callander's evidence shows only very recent data of the existing SOL Quarry (five measurements over the last two years). The current hardness concentrations are about 50 mg/L.

18. Cleanfilling started fairly recent at the assisting SOL Quarry site and a large part of the quarry is not backfilled yet. Hardness levels in groundwater take time to react to discharges and therefore the recent data should be interpreted with caution.

19. Based on this I don't have any clear expectations on how high the hardness concentrations might get in the future and if they might, in a worst-case scenario, exceed the GV from the NZDWS. The taste threshold GV for hardness is 100 mg/L as CaCO3 (Calcium carbonate).

20. In his Statement of Evidence Mr Callander agrees that, to address any concerns, it is *prudent to require groundwater monitoring and mitigation conditions, similar to those that are currently proposed by CRC.*

21. Based on this information I am confident that my advice on groundwater quality monitoring does not require any adjustments.

GROUNDWATER MONITORING CONDITIONS

22. Mr Callander advises that the trigger level for Conductivity in Table 1 of the consent conditions should be specified as 50 mS/m instead of 50 uS/m. I agree and this should be amended in Table 1 in the consent conditions.

23. He also advises that the bacterial monitoring criteria in Table 1 of the consent conditions should be based on *Escherichia coli* and not Faecal coliform bacteria. I agree and this should be amended in Table 1 in the consent conditions.

24. In their proposed conditions, the Applicant refers to using bore BX23/0520 as the upgradient bore for groundwater quality monitoring purposes[2]. As I have stated in my report (paragraph 89), this bore is not suitable to be used as an upgradient reference bore as it is situated on the existing SOL Quarry site. The groundwater quality in this bore is therefore likely to be affected by the cleanfill activities on the existing quarry and is not representative for background concentrations upgradient of the quarries.

25. I propose the Applicant investigates a suitable location for an upgradient groundwater quality bore, unaffected by the current quarry site or proposed extension site.

26. Both CRC and the Applicant refer to bore M35/0947 as a potential bore for monitoring groundwater levels[3]. After reviewing the evidence from Mr Simon Hedley I realised this well will be used to take water for dust suppression. Therefore, this well is unsuitable for groundwater level monitoring as any take from this bore affects the water levels in the bore.

27. I propose this bore is removed from the consent conditions. The applicant might consider any other bore on the property for water level monitoring purposes or install a new bore in accordance with the proposed consent conditions (26) and (27) for CRC193563.

[2] Proposed condition 13a(i) CRC193773 and 34a(i) CRC193563
[3] Proposed condition 27a(ii) CRC193563

28. The Applicant proposes to only provide an alternative water supply to affected domestic wells '*used for drinking water supply*'[4]. I propose to delete the italic emphasised phrase as a well owner can use their domestic well for any kind of domestic uses. We don't keep track in our CRC database which specific domestic uses are connected to each well, but have to assume they can all be used to supply the owner with drinking water.

[4] Proposed condition 17c(ii) CRC193773 and 38c(ii) CRC193563