Technical Review

To:	Shay McDonald	**Date:**	12/02/2024
Authority:	ORC	**Ref:**	23009.04B
Consent:	RM21.688 Clutha District Council Mt Cooee		

From	**Role in Audit**	**Internal Reviewer**
Alexandra Badenhop	Surface Water Quality and Quantity	Simon Bloomberg

1 Project Summary

Clutha District Council are planning to expand the landfilling capacity at their Mt Cooee landfill, Balclutha, thus extending the landfill's life by 35 years. I have been asked to provide a technical audit of the surface water quantity and quality aspects, including the wetland of the proposal.

2 Audit Questions

Note that Question 52 indicates that a site conceptual model is still to be developed and this may influence the required monitoring plan.

For all technical matters
Is the technical information provided in support of the application robust, including being clear about uncertainties and any assumptions? Yes, or no. If not, what are the flaws?
Somewhat, the additional data provided has decreased uncertainty, and more clearly stated the inherent uncertainty. There has been a year of groundwater level data collected across the site and a range of water quality monitoring events. Groundwater bores have now been surveyed and additional data provided. Loading calculations provided in Table 3 and Table 6* (WSP, 22/11/23) were based on the estimated leakage rates from the proposed landfill of 2.61 m^3/year, however newer leakage rates of 113 m^3/year were provided in

response to Question 43 (received via email 24/01/2024). This will increase the impact on the neighbouring streams and wetlands, but also possibly on the Clutha River/Matau-au. It is noted that the landfill is located at the bifurcation of the river, and hence the flow on the Matau Branch will be less than the gauged flow from Balclutha used in the calculations. Rather than updating or amending any of these calculations, WSP have chosen to address the issue by recognising the uncertainty, proposing additional monitoring and putting in controls (WSP 27/02/2024).

The proposed additional measure of constructing a woodchip denitrification trench (5vi of WSP 27/02/2024) would only be a useful measure if oxidising conditions were not present within groundwater subject to landfill contamination and if the landfill leachate did not contain any organic carbon, neither of which are likely to be true.

** There appears to be some additional errors in the calculations in this table – for several parameters the predicted concentrations downgradient are less than the baseline concentrations*

Are there any other matters that appear relevant to you that have not been included? Or is additional information needed? Please specify what additional info you require and why [please explain]
No
If granted, are there any specific conditions that you recommend should be included in the consent?
Yes, ongoing groundwater level and water quality monitoring. The proposed consent conditions (Appendix S) lack a clear surface and groundwater monitoring plan as neither the locations nor sampling frequency are provided. It specifies that these must be provided, along with trigger values, in the Landfill Management Plan, however the provided LMP (Appendix V) does not include the landfill extension area and does not consider additional monitoring. Given the water quality management approach (WSP 27/02/2024) is reliant on monitoring and responding to that monitoring, the proposed compliance monitoring schedule should be clarified and updated. It should include the additional groundwater sites they are proposing to monitor. Dissolved Reactive

Phosphorus, dissolved oxygen, Total Organic Carbon, Total Kjeldahl Nitrogen, and sulphate should be included in the monitoring schedule.

'Appendix G Sheet Pile Cut-off Wall Review Report' found that the schematic of the cut-off wall from Royds Consulting (1995) suggests that the sheet pile wall is not continuous across the wall of the valley, with a gap at either end filled with low permeability clay. Based on this finding, they recommended that "Subject to the findings from the monitoring (from BH1 and GW2A), it may be prudent to install further monitoring points along the wall, in particular beyond the ends of the wall where the low permeability clay barrier has been utilised to provide cut-off." In addition, monitoring bores screened at or below the base of the landfill extension area should also be such that any leakage is detected. Note that BH6 is screened above the current base of the pit to the north. The latest provided response indicates that a new bore is to be drilled.

Surface Water Quality and Quantity

Reports to audit: AEE, Appendix G Sheet Pile, Appendix I Groundwater and Surface Water assessment, Appendix S Proposed Conditions of Consent, Appendix V Landfill Management Plan and any other reports/sections of reports that you consider relevant to your understanding

Does the application appropriately identify sensitive areas including affected water bodies (surface, groundwater), wetlands, bores, drinking water supplies? Yes/no.

Yes, other than that it has not been recognised that the landfill expansion area discharges into the Matau Branch of the Clutha River rather than the greater river.

Is the description of the sensitive areas attributes potentially affected by the activity accurate?

Yes, however there is no description of the relative flow in the Matau Branch of the river, which is the main receptor; the landfill is located at the bifurcation of the river, and hence the flow on the Matau Branch will be less than the gauged flow from Balclutha used in the calculations.

Has the Applicant adequately assessed the potential adverse effects on surface water quality and quantity resulting from the discharge of waste and leachate to land? Please explain.

Somewhat, as stated above, loading calculations provided in Table 3 and Table 6* (WSP, 22/11/23) were based on the estimated leakage rates from the proposed landfill of 2.61 m^3/year, however newer leakage rates of 113 m^3/year

were provided in response to Question 43 (received via email 24/01/2024). This will increase the impact on the neighbouring streams and wetlands. Rather than updating or amending any of these calculations, WSP have chosen to address the issue by proposing additional monitoring and putting in controls (WSP 27/02/2024).

Has the applicant proposed appropriate methods to limit contaminants, particularly leachate, entering surface water?

Yes, but this should have been included primarily in the landfill design review. Additional design points included in WSP 27/02/2024 are appropriate:

- Grading of landfill base and leachate capture
- Fracture zones on the landfill base to be mapped, ripped and filled with liner grade clay
- Additional groundwater diversion and capture beneath the clay liner and subgrade rock that can be monitored for signs of contamination.

Have the adverse effects of the discharge of stormwater containing contaminants to the Clutha River/Mata-Au been adequately assessed? Please explain.

Somewhat, the design of the stormwater management plan seems appropriate for the conditions in terms of the design storms; however I have not checked calculations to verify that the design will be sufficient for the intended rainfall events. In principle, the concepts of separating clean and dirty water have been followed to protect water quality. However, whilst the silt ponds have been monitored in the past, none of this data was included in the assessment.

The assessment states that "From monitoring data collected to date (Table 15), there are no apparent impacts on water quality from monitoring at SW2 relating to stormwater discharges, and therefore, we do not anticipate further activities to increase adverse stormwater discharge effects", however the s92 response states that no sampling has been completed as the tributary was dry during compliance monitoring events. This indicates that the monitoring conducted to date was not designed to assess stormwater events.

Have the cumulative effects of the discharge activities been appropriately assessed? Do you agree with the assessment? Please explain.

No, the updated leachate leakage rates for the proposed expansion have not been considered in conjunction with the other loading calculations as they

have not been updated, however in general they have been assessed. The assessment relies on the large dilution capacity of the Clutha River to reduce impacts, but also recognises that the biggest effects on the environment are already occurring due to the current landfill operation. The newer landfill operations will have less effect due to landfill design.

Has the Applicant proposed appropriate surface water monitoring for the duration of the consent? Please explain.

Somewhat, surface water monitoring should include the stream flowing through the wetland, and the monitoring point on the Clutha should be downstream of the landfill boundary, as SW2 alternative is upgradient of the proposed landfill extension.

The proposed schedule is not very clear and does not provide monitoring frequency for surface water. Dissolved Reactive Phosphorus, Dissolved Oxygen, Total Organic Carbon, Total Kjeldahl Nitrogen, and sulphate should be included in the monitoring schedule. See above discussion regarding conditions.

Do you agree with the Applicant's conclusions as to the level of adverse effects on surface waterbodies? Please explain.

Somewhat, rather than updating or amending any of the calculations regarding the level of adverse effects, WSP have chosen to address the issue by proposing additional monitoring and putting in controls to minimise the adverse effects on surface waterbodies. This is a reasonable approach, if the monitoring locations are sited appropriately and the monitoring frequency is sufficient to provide the triggers required.

Do you agree with the conclusions reached in Appendix I Groundwater and Surface water assessment? Please explain.

Yes, although there have been some changes to the assessment as addressed by additional responses, as noted in previous questions.

- Groundwater quantity is not expected to be affected any more than it already is by the existing system, nor by the proposed expansion.
- The reduction in groundwater levels around the wetland is uncertain, however the underdrain capturing groundwater and redirecting in beneath the landfill is an appropriate mitigation.
- Water quality impacts from the existing landfill are expected to remain similar to historic impacts since the tributary was diverted around the

landfill. Given the large dilution capacity of the Clutha River, impacts are not measurable within the river (although it is noted that most of the leachate is discharged through the Balclutha treatment plant, and therefore upstream of the upstream measuring point.

- Leachate quantity from the proposed expansion area may impact downgradient groundwater as the projected volumes are higher than those documented in Appendix I. However, continuous monitoring of the groundwater underdrain could serve as an early warning and allow for appropriate mitigations to be adopted.

Has the applicant appropriately assessed the effects of the groundwater take on the hydrological functioning of the nearby Natural Wetland? Please explain.

No, based on the groundwater level data provided in the s92 response, I do not think the groundwater conceptual model is correct; I think the wetland is responding to shallow perched groundwater, and is not likely a fully connected system along the eastern extent of the landfill site. This is also supported by the geotechnical report (Appendix F), which divides the site into two distinct geological areas based on the thickness of alluvium. However, this means that the wetland is less likely to be affected by drawdown from the landfill. The suggestion of adaptive management of the wetland is appropriate, and capture and release of groundwater from the underdrain should mitigate any impacts of groundwater take.

Do you consider that the proposed conditions of consent relating to groundwater are appropriate? Please explain.

Somewhat, the proposed monitoring conditions in Part C of Appendix S are not consistent with other proposed monitoring conditions in the spreadsheet provided "Proposed Compliance Monitoring Analyses Schedule" which need greater clarification as per answers to previous questions, particularly with reference to WSP 27/02/2024. Continuous monitoring of the proposed groundwater monitoring would provide an appropriate early warning sign of any leakage issues. No other conditions pertaining to groundwater were specified within Appendix S.