27 February 2024

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Sent via: Shay.McDonald@orc.govt.nz

Response to additional Section 92 questions regarding the Groundwater Assessment: Consent Application RM21.668 – Mt Cooee Landfill, Balclutha

Dear Shay,

Thank you for the additional questions we received on 13 February 2024 in relation to the Groundwater Assessment for Clutha District Council's resource consent application RM21.668 to renew resource consents associated with the Mt Cooee Landfill in Balclutha.

Please find our responses to your questions below.

Groundwater and Surface Water Assessment

The groundwater peer reviewers for the Mt Cooee Landfill consent application (e3 Consultants NZ Ltd) have raised the possibility that leakage from the landfill may impact upon the wetland area that is located adjacent to the Kaitangata Highway, and even the Clutha River / Mata-au. This query arises due to the recalculation of leachate leakage rates after allowing for liner wrinkles. This recalculation increased the possible leakage from 2.6 m^3/year to 113 m^3/year.

In regard to the additional queries, WSP comments as follows:

1. The extent of leakage through the liner system will be dependent upon a number of factors, of which the liner wrinkles are one. Other factors include the construction quality assurance and the specification of the compacted soil liner component. The liner wrinkle calculation does depend upon a number of assumptions around the spacing of wrinkles, length of wrinkles, size of liner defects etc. In that sense, liner leakage is best viewed as a range.

2. The underlying geology at the site is greywacke. At 2-3 metre depth, this is unweathered. A thin mantle of more weathered rock is found near the surface. Most of this has been quarried out to form the landfill void (refer to Cross Section C-C (page 27 of the "*Mt Cooee Landfill: Assessment of Effects on Groundwater and Surface Water*")). Water movement through the underlying rock is largely governed by fracture zones and is variable. The fresh greywacke (i.e. unweathered) has permeabilities in the range 5.2 – 9.0x10^{-7} m/s.

3. The contributing catchment to the Kaitangata Highway appears from the groundwater contours to extend back to the north-eastern corner of the extension area. Boreholes BH5 and BH6 intercept this groundwater flow.

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4. The calculations of possible impact on water quality in any surface expression of the groundwater have not allowed for attenuation and absorption of leachate contaminants in the compacted clay landfill liner layer, or in the natural soils of the weathered greywacke. No specific testing of this has been done.

5. Recognising the possibility that leachate leakage could track towards the wetland area, we propose the following additional measures to provide secondary containment and an ability to intercept any contaminated groundwater:

(i) The landfill invert will be on the unweathered greywacke. Any major fracture zones exposed in this by the landfill subgrade preparation works will be mapped, ripped, excavated and then backfilled with liner grade clay.

(ii) The floor will be graded to a central low point under the centre leachate drain. A groundwater drain will be constructed into the subgrade rock at this point running under the landfill and exiting out at the western / downhill end past the toe bund. This will serve two functions by:

a) providing a preferential flow path for any leakage trapped between the clay liner and the subgrade rock; and

b) intercepting any flow from the north-eastern corner of the landfill that tracks along the surface of the subgrade rock.

Any discharge from this drain would be to surface water into the wetland area, unless water quality monitoring dictates otherwise, in which case it would be directed to the leachate system.

(iii) Monitor groundwater quality in monitoring well BH5 and a new monitoring well closer to the landfill's southern edge.

(iv) Set a Trigger Action Response Plan for the boreholes and underdrain. This would be based upon current groundwater quality (baseline) and include a hierarchy of triggers for any significant increase in contaminants which could be indicative of leachate leakage. Specifically, these set of triggers would be based upon an increasing level of discharge volume and contaminant concentrations in the underdrain system, as proposed above to an observable increase of contaminants in the downgradient monitoring wells.

(v) Pumping of groundwater to remove and treat contaminants (or discharge to sewer) is a possible contingency action. In our opinion, this is highly unlikely to ever be required and monitoring will confirm this.

(vi) A further possible contingency measure would be to construct a woodchip denitrification trench along the wetland margin where groundwater is discharging. The principal contaminant in the leachate will be nitrogen. In the leachate, this will be as ammoniacal nitrogen and after passing through the groundwater system, this will have largely converted to nitrate. A carbon rich filter trench is a proven method to reduce nitrate in groundwater (*Schipper et al*).

6. The possible effect on the Clutha River / Mata-au of any discharge via the groundwater system can be discounted as insignificant and unmeasurable. The mean discharge of the Clutha River / Mata-au at Balclutha is 614 m^3/s, and if we estimate approximately

20% goes down the Matau branch, that would equal 123m^3/s X 365 days x 86,400 = 3.8 billion m^3 of water per year. Assuming a maximum of 113 m^3/year of leakage, the dilution is of 34 million times. And that assumes that all the leachate contaminants reach the Clutha River / Mata-au without any attenuation / degradation in the groundwater system.

If you have any queries or require further information, please contact me (phone 03 373 2031 direct or email aileen.craw@wsp.com). I look forward to your response.

Kind regards,

Aileen Craw
Senior Planner