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902 Aubrey Road, Wanaka 9305 Ph. 027 437 9044

8th August 2024

Otago Regional Council
Private Bag 1954
Dunedin 9054

Attention: Brittany Watson
Consents Planner

**Memorandum: Technical Review of the Assessment of Effects of
Discharges to Air: Waste Management Fairfield Closed
Landfill**

Preliminary

Waste Management NZ Ltd has applied for consent to continue to discharge contaminants to air from the Fairfield, Dunedin closed landfill. The existing consent expires in September 2024.

The Western Landfill was closed in 1996 and the Eastern Landfill stopped receiving waste in 2017. A landfill gas (**LFG**) collection and flaring system has been installed in the Eastern Landfill.

Tonkin and Taylor Limited (**T&T**) has prepared an assessment of effects of the discharges to air from the landfill.

Otago Regional Council (**ORC**) has commissioned Specialist Environmental Services Limited (**SESL**) to undertake a technical review of the assessment of effects for the discharge. This memorandum report reviews the assessment prepared by T&T and specifically responds to questions raised by the ORC processing planner. The response to these questions is detailed in the following sections.

The technical review has been undertaken by the author, John Iseli, on behalf of SESL. I have over 30 years of experience in the field of air quality in New Zealand and have undertaken numerous assessments and reviews relating to discharges to air from landfills, transfer stations and waste management activities. I am experienced in the use

of the various modelling and qualitative assessment tools typically used for such analyses. I confirm that the findings expressed are my own conclusions and I have not delegated review work to any other party.

I visited the landfill site on 2nd May 2024, accompanied by Ms Watson of ORC, Waste Management staff and Ms Taylor of Planz. We walked over the surface of the capped Eastern Landfill, observed the LFG flares operating and viewed the location of monitoring wells and the nearest existing neighbouring dwellings.

ORC Question 1: Are all relevant sensitive receptors correctly identified and described in the Air Quality assessment report?

The nearest existing sensitive receptors (dwellings at the end of Blanc Avenue) have been appropriately identified in the T&T report. These dwellings are located to the northwest of the Eastern Landfill.

The land immediately north of the Eastern Landfill has been zoned residential and will likely be developed in future. The report describes this residential land as approximately 150m north of the landfill boundary. The southern boundary of this residential zone has similar elevation to the northern extent of the landfill where some LFG monitoring currently occurs to assess potential LFG migration. I consider that this residential land has the highest potential to experience any odour associated with LFG during drainage flow conditions, due to proximity and elevation.

Q2: Is the modelling and assessment methodology undertaken by T& T appropriate and in line with best practice?

T&T has modelled PM₁₀ emissions from the three LFG flares using the CALPUFF model. Prognostic meteorological data from the WRF model was processed in CALMET. I consider that the modelling approach is appropriate in this case, given the complex terrain and proximity to the coast. Standard default assumptions were adopted in the model.

The maximum off-site PM₁₀ concentrations are relatively small at 0.4µg/m³ (24-hr average). This is consistent with expectations given the small scale of the emission sources that are central to the Eastern Landfill site.

The modelling assumed that all three flares are operating at maximum capacity continuously. I agree with T&T that this is likely to result in conservative predictions and actual concentrations at neighbouring properties are expected to be less.

Q3: 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?

I am satisfied that the technical information is sufficiently robust given the scale and significance of the discharge.

Undertaking a qualitative assessment of odour effects is standard practice for this type of discharge. The complaints record has been considered (none have been received in relation to the closed landfill) and mitigation by LFG collection and flaring has been taken in to account. The assessment is also informed by the LFG monitoring that has occurred under the existing consent. This monitoring has not identified significant lateral migration of LFG to date.

Q4: Do you agree that a dispersion modelling assessment for combustion products such as nitrogen oxides, sulphur dioxides and carbon monoxide is not required due to the very low level of discharge and expected negligible off-site effects?

Yes. I have calculated NO₂ emission rates from the flares based on US EPA AP42 emission factors. The NO₂ emission rate is 2.7 times the PM emission rate, indicating a peak off-site concentration of approximately 1µg/m³ (24-hr average). This value is 1% of the relevant NZ guideline. I agree that effects of NO₂ discharged from the flares will be less than minor. I also consider that effects of SO₂ and CO will be negligible.

The application concluded that based on landfill gas monitoring data, there are no indicators to suggest that subsurface lateral migration of landfill gas beyond the landfill is occurring.

***(a) Does the T&T report adequately assess the risk of offsite migration of landfill gas?
(b) Is sufficient monitoring undertaken or proposed to understand whether offsite migration of landfill gas is occurring and, the adverse effects on the environment including persons?***

The T&T report relies on the analysis of LFG migration in the Pattle Delamore Partners (PDP) report attached as Appendix 5 of the AEE. The PDP report concludes that “the risk to nearby residents from subsurface LFG migration from the landfill areas is acceptably low”. It is unclear if this conclusion also applies to future residents on the residentially zoned land to the north of the site.

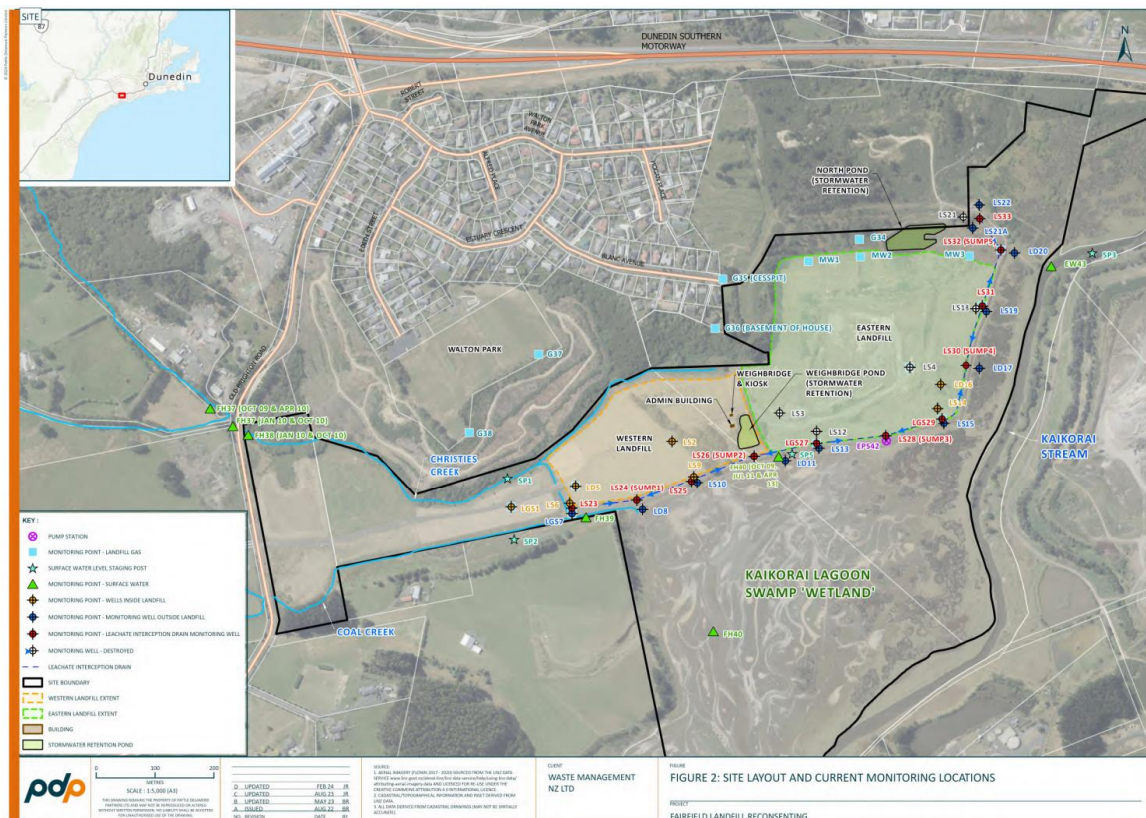
PDP have analysed the existing quarterly LFG monitoring data gathered from numerous locations within and around the landfills. As expected, the monitoring indicates that only minor LFG emissions are being generated from the Western Landfill that has been closed for 27 years. With regard to existing dwellings, LFG monitoring has occurred in a cesspit at the end of Blanc Avenue and in the basement of the house at 34 Blanc Avenue. This monitoring did not indicate the presence of significant LFG concentrations.

Limited monitoring has occurred to assess potential lateral migration from the Eastern Landfill to the north, towards the residential zoned land most at risk. Wells MW1-3 are within the northern edge of the landfill so do not provide relevant data for this purpose. Sentinel well G34 is located further north, beyond the landfill, and provides relevant information. PDP note that monitoring at this well since 2006 shows no obvious signs of

subsurface migration (maximum 0.3% CH₄). I note that one measurement at this well in January 2019 recorded 4ppm H₂S and 180ppm CO, but the corresponding CH₄ result was small. Similar, slightly elevated H₂S and CO readings were taken at G36 (cesspit) and G36 (basement) on the same date.

PDP state that generally low permeability soils in the area assist in preventing lateral subsurface migration.

Bearing in mind the limited information to date and the likely future development of the residential zone to the north, I consider that it would be appropriate to include two additional LFG monitoring wells (sometimes referred to as probes) screened to at least 3m deep along the northern site boundary of the Eastern Landfill. Suggested locations are at the site boundary to the north of MW1 and MW3 shown on the plan below, taken from the PDP report. Monitoring of these wells would allow further confirmation that the risk of subsurface migration is low, prior to residential development occurring.



Do you agree with the Air Quality Assessment which concludes that it is unlikely that offensive or objectionable odour effects will occur beyond the site boundary? Why/why not?

Based on the available information, I agree that objectionable or offensive odour effects are unlikely to occur beyond the site boundary. This conclusion is supported by the following:

- The monitoring to date indicates that lateral migration of LFG is limited.
- The Eastern Landfill is capped and LFG capture and flaring occurs, consistent with good practice.
- The provision of three flares includes a redundancy component to allow maintenance/repairs of a flare if necessary.
- Complaints have not been received in relation to the existing discharge from the closed landfill.
- The Eastern Landfill has now been closed for 7 years and it is expected that LFG production will gradually decline over time, with a change to passive venting in the order of 20 years after closure.
- Observations during the site visit.

Have the cumulative effects of the discharge activity been appropriately assessed? Please explain.

T&T consider that any cumulative effects caused by this discharge will be minor. I agree that odour emissions from the nearby active Green Island landfill and the wastewater treatment plant are likely to dominate local odour impacts. Complaints have been recorded in relation to the active landfill discharge.

Given the mitigations proposed (LFG capture and flaring), I consider that the contribution from the closed landfill to cumulative effects of odour is likely to be small.

Do you agree with the air quality assessment on the frequency, intensity, duration, offensiveness and location of the odour (Table 6.1 of the Air Quality assessment provided by T&T).

The assessment of FIDOL factors undertaken by T&T is generally appropriate in relation to existing sensitive receptors. They state that “due to the topography, sensitive locations will not be downwind of the landfill under worst case katabatic wind conditions”. I agree in relation to existing dwellings, but not in relation to the residential area immediately north of the Eastern Landfill that will be developed in future. This area has potential to be affected by drainage flows from the Eastern landfill.

The limited monitoring undertaken at sentinel well G34 indicates that lateral migration of LFG towards the residential zone to the north is not significant. Provided that additional LFG monitoring occurs at the northern boundary of the Eastern Landfill, I consider that there will be sufficient information and monitoring to support the conclusion that existing and future sensitive receptors are likely to experience less than minor odour effects.

The landfill is in a polluted airshed (as modelled by Mosgiel and Milton air quality data). Do you agree with the assessment against the NES-AQ regulation 17?

The dispersion modelling predicts a maximum off-site PM₁₀ GLC of 0.4µg/m³ (24-hour average) caused by the flare discharges. This prediction is expected to be conservative

and is well within the NESAQ Regulation 17 limit of 2.5µg/m³ (24-hour average). I therefore agree that this regulation does not restrict granting of consent.

Is the proposal consistent with the NZ Emissions Reduction Plan guidance?

I agree with T&T that the proposal is consistent with this guidance. The collection and flaring of LFG destroys methane (CH₄) that has significantly greater impact on climate change than CO₂. This mitigation is standard practice for recently closed landfills.

Taking into account your answers above, in your opinion, are there any offsite receptors that are affected by odour to a minor or more than minor degree? Please clearly identify which receptors you consider to be affected, to what degree, and why.

I consider that there is sufficient information to conclude that any odour effects at off-site receptors are likely to be less than minor. Consequently, no affected parties have been identified.

Please comment on the suitability of the proposed monitoring programme relating to air quality? (Groundwater, Surface Water and Landfill Gas Monitoring Plan- Appendix 1) and, the proposed mitigation controls relating to air quality- see section 7, table 7.1 and 7.2. of T & T report.

As discussed in response to earlier questions, I consider that two more LFG monitoring probes should be installed along the northern boundary of the Eastern Landfill. With that addition and ongoing monitoring at the two existing sites at the end of Blanc Avenue, I consider that the proposed air quality monitoring programme as set out in the suggested consent conditions is appropriate.

Please comment on the suitability of the proposed consent conditions which relate to air quality. Do these conditions cover all air quality matters that would normally be addressed for a closed landfill? Please explain. See appendix 8.

The conditions proposed are generally appropriate and cover the mitigation and monitoring necessary to address key air quality matters. Some amendments to these conditions are recommended as follows:

- Condition 4 should be amended to require ORC certification of the future change to a passive venting system (similar to the certification requirement in Condition 11(b)). A suitably qualified and experienced person should be required to prepare a report and certify that the criteria in the AMP have been met.
- Condition 5 should be amended to reference Conditions 9 to 12.
- Condition 6. The second clause that allows default certification after one month based on lack of response should be deleted. It is important that ORC certifies changes to the AMP.

- Condition 11. Monitoring wells G35 (cesspit) and G36 (basement) will need to be added to the list, plus the recommended two new monitoring wells along the northern boundary of the Eastern Landfill to complement current monitoring in G34. An updated monitoring location plan will be required from the applicant accordingly, for attachment.

Subject to these amendments, I consider that the conditions are adequate given the scale and significance of the discharge.

Are there any other matters that appear relevant to you that have not been included? Please specify what additional info you require and why. Please explain.

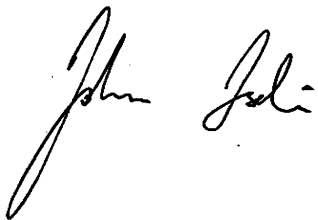
No. I note that confirmation will be required from the application regarding the additional LFG monitoring recommended, with an updated monitoring location plan to be provided.

If granted, are there any specific conditions that you recommend should be included in the consent beyond what the applicant has proposed?

This is covered by the amendments to conditions I have suggested above.

Please contact me if you require any clarification of the above matters.

Yours sincerely

A handwritten signature in black ink, appearing to read 'John Iseli'. The signature is fluid and cursive, with the first name 'John' being larger and more prominent than the last name 'Iseli'.

John Iseli
Principal Air Quality Consultant