Tonkin+Taylor

Job No: 1011469
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Otago Regional Council
Private Bag 1954
Dunedin 9054

Attention: Hilary Lenox

Dear Hilary

Technical Review to Inform Notification Decision: Smooth Hill Landfill - Appendix 10 - Air Quality Assessment

Introduction

1 Dunedin City Council (DCC) proposes to establish a new Class 1 landfill, to be located at Smooth Hill, south of Dunedin Airport. DCC has applied to Otago Regional Council (ORC) for a range of resource consents required for the establishment and operation of the proposed landfill.

2 Tonkin & Taylor Ltd (T+T) has been engaged by ORC to undertake a technical review of the air quality assessment lodged by DCC in support of its resource consent applications.

3 The purpose of this report is to set out the findings of our technical review of DCC's air quality assessment. We understand that our findings will be used to inform ORC's decision regarding notification of the resource consent applications.

4 The following documents have been considered as part of this technical review:

- **Dunedin City Council - proposed Smooth Hill Landfill: Section 92 review - requests for further information:** *Report prepared for ORC by T+T, September 2020* (herein referred to as the s92 request').
- **Revised Appendix 10 - Air Quality Report:** *GHD August 2021. Waste Futures – Smooth Hill Consenting Air Quality Assessment. Report prepared by GHD Limited for Dunedin City Council.* (herein referred to as the 'Air Quality Report').
- **Smooth Hill Landfill further information:** *Provided by ORC as part of its s92 response of 4 August 2021.* (herein referred to as the 'further s92 response').
- **Smooth Hill Landfill – Additional s92 Question responses – Air Quality:** *Technical memorandum prepared by GHD, dated 8 July 2021. Provided by ORC as part of its further s92 response of 4 August 2021.* (herein referred to as the 'GHD technical memo').
- **Smooth Hill Landfill Draft Conditions:** *Provided by ORC as part of its further s92 response of 4 August 2021.* (herein referred to as the 'draft conditions').

5 This technical review has been undertaken by Richard Chilton, Technical Director - Air Quality at T+T. It has been prepared in accordance with T+T's letter of engagement with the ORC dated 12 November 2019.

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Description of the proposal

6 The proposed Smooth Hill municipal landfill is intended to replace the existing Green Island landfill located in Dunedin. The Smooth Hill Landfill is reduced in scale from the original application as follows:

- A footprint of 18.6 ha instead of the original 44.5 ha.
- A gross capacity reduced from 7.9 million m^3 to 3.3 million m^3.
- Net waste capacity from 6.2 million m^3 to 2.9 million m^3.
- The predicted landfill life reduced from 55 years to 40 years.

7 The key discharges from the proposed landfill have correctly been identified in the Air Quality Report as:

- Odour from the placement of waste and fugitive emissions of landfill gas (LFG).
- Combustion emissions from burning of landfill gas in a flare or gas engines.
- Emissions of dust.

8 A LFG collection system will be installed progressively throughout the development of the proposed landfill. Collected LFG will be burnt in a flare. The Air Quality Report states that the application does not include the destruction of LFG in a generator to produce electricity. We note that the many landfills beneficially use LFG to produce electricity and the effects of discharges to air from generators are very similar to those from a flare so the applicant may wish to consider including this option to avoid the need to vary the consent at a later date.

9 A small diesel-fired generator (200 kW electricity output) will be available to power leachate extraction pumps in the event of a mains power failure. We agree with the Air Quality Report (Section 4.1) that the potential adverse effects of the operation of this generator will be negligible given its small size and the nature of the receiving environment.

Receiving environment

10 Section 2 of the Air Quality Report describes the existing environmental setting for the proposed landfill, noting that it is approximately:

- 28 km from the Dunedin CBD; and
- 2.7 km northeast of the coast.

11 Within 3.5 km of the Landfill footprint, there are 15 sensitive locations comprising 12 residences and 3 commercial premises. Only two of these existing residences are within 1 km, with the closest being 380 m and the other at 605 m from the landfill footprint. The Air Quality Report has also identified two properties near the landfill where sensitive receptors (i.e., dwellings) could be established as a permitted activity – these are 810 m and 970 m from the landfill boundary. This relatively low density of sensitive activities is consistent with an overall low sensitivity receiving environment (although the sensitivity of individual dwellings to odour effects is high).

12 Winds have been measured on site since July 2020. Data presented in the Air Quality Report[1] indicate the prevailing winds are from the west-southwest and that light winds (which are of most importance for odour propagation) tend to occur from the west and east.

13 Section 2.3 of the Air Quality Report discusses background air quality around the landfill site, and describes there being no significant odorous activities. Furthermore, it describes the site as having air quality that is "excellent" – i.e., background air contaminant concentrations will be low and consistent with the site's rural location.

14 Overall, we agree with the Air Quality Report's description of the receiving environment.

[1] For the period of July 2020 to March 2021.

Assessment of odour effects

15 Odour is the key air quality effect typically associated with the operation of municipal landfills.

16 Section 4.1 of the Air Quality Report has correctly described the key sources of odour that may be associated with the operation of the landfill. Of note is that bulk greenwaste (which can be a source of odour) will not be accepted. However, some incidental greenwaste may be comingled with other waste from time to time.

17 Consideration of the FIDOL factors is required (MfE 2016) when determining whether an odour is 'offensive or objectionable', These are the ***f***requency, ***i***ntensity, ***d***uration and ***o***ffensiveness (hedonic tone of the odour – how pleasant or unpleasant the odour is) experienced at a particular ***l***ocation when taking into account that location's sensitivity to the odour. This provides an objective framework for evaluating the effects of odours, and considers infrequent high strength and highly unpleasant acute odours, as well as frequent exposure of low strength moderately unpleasant chronic odours.

18 The frequency and duration of odour impacts depends on both the:

- Frequency that the odour is generated, and
- Frequency of worst case wind conditions that could transport that odour towards a sensitive location.

19 The intensity of odour impacts depends on the:

- Strength of odour at the point of discharge, and
- The separation distance to a sensitive location – the concentration of odour will decrease with increasing distance as a function of dilution and dispersion by the wind. In this regard, cold calm downslope wind conditions (katabatic) wind conditions are typically worst case meteorological conditions for dispersion of odours from ground level sources

20 The offensiveness of an odour depends on how pleasant or unpleasant the odour is. However, odours associated with landfills are generally considered to be unpleasant.

21 The sensitivity of a location depends on its use. Residential dwellings and the adjoining curtilage are generally accepted as being highly sensitive to odour impacts from industrial or waste facility discharges. Similarly, retail premises, education and medical facilities and places of worship are all highly sensitive. Rural land generally has a low sensitivity to odours of a rural character. Furthermore, for rural land, people are typically much less frequently present at a given location compared to more sensitive land use types.

22 T+T largely agrees with the Applicant's assessment that potential odour effects associated with the routine receipt of waste that is not highly odorous is acceptable (and therefore not offensive or objectionable) at sensitive receptor locations beyond the site boundary. This has been further supported by the odour dispersion modelling presented in the Air Quality Report.

23 Notwithstanding the conclusion regarding the receipt and handling of general waste that is not highly odorous, T+T considers the key risk in terms of the potential for offensive or objectionable odour relates to the receipt of highly odorous wastes or exposure to landfill gas that has migrated beyond the site boundary.

24 Detailed analysis of complaints data in relation to the operation of DCC's existing Green Island Landfill has been provided in the Air Quality Report and the GHD technical memo. These confirm the key odour issue for that landfill relates to the receipt of highly odorous waste and landfill gas (including excavating old refuse to install gas extraction wells).

25 Smooth Hill Landfill will be of a modern design, with modern landfill gas extraction and treatment an integral part of the design. Given this, we agree with the Air Quality Report and the GHD technical memo that odour associated with landfill gas should not be a significant

issue in the same way that it has been for the Green Island Landfill. We also note that extensive conditions relating to the operation of the landfill gas extraction system, landfill gas monitoring and the operation of the flare are proposed by the Applicant.

26 Most odour complaints recorded for Green Island Landfill have related to the receipt of highly odorous wastewater treatment biosolids. According to the GHD technical memo, this has been substantially improved because of pre-treatment of the biosolids with lime prior to being transported to the landfill. A more rigorous waste acceptance criteria for highly odorous loads has been proposed by the Applicant and its draft conditions reflects this.

27 Draft conditions have also been put forward in terms of the receipt and handling of highly odorous waste. These measures are considered by T+T to be generally appropriate and will significantly reduce the potential frequency, duration, and intensity of possible odour impacts. However, we consider additional consent requirements would be appropriate that:

- Limit the time of day when highly odorous loads can be received to avoid early mornings when winds can be very light or calm which is a worst case for odour dispersion.
- Include a definition of what constitutes highly odorous wastes.
- Require the management plan to include specific procedures for the pre-acceptance, handling and placement of highly odorous wastes, including contingency measures in the event of an unexpected odorous load.
- Specify the key requirements of the procedures for the receipt of highly odorous wastes (for example immediate burial, availability of odour suppressant sprays, etc).

28 The Air Quality Report acknowledges that there is the potential for nearby receptors to experience odour from the landfill from time-to-time. Overall, the Air Quality Report concludes that it is *"unlikely that odours detected at nearby receptors will be considered 'offensive or objectionable'"* and that "*odour impacts on nearby receptors are not considered to be significant"*.

29 In our experience, off-site odours can occur from time-to-time at distances of up to approximately 1 to 1.5 km from even well-run landfills. However, the greatest risk of odour effects would be at receptors within about 500 m (noting that this is not an absolute distance and could be lower or higher depending on factors such as terrain and meteorology). These odours are generally related to abnormal events, such as the receipt of unexpected loads of highly odorous wastes or fugitive LFG emissions. With good controls in place and adequate separation distance, it is our experience that the frequency, intensity and duration of odours from these events can be managed so that the effects do not meet the threshold of being offensive or objectionable. The management measures and conditions proposed by the Applicant should help to minimise the likelihood of offensive or objectionable odours occurring.

30 No clear determination is made within the Air Quality Report, nor the revised AEE, as to whether the potential adverse air quality effects are deemed 'less than minor', 'minor' or 'more than minor' to assist in determining notification in accordance with Section 95E of the Resource Management Act (RMA). However, the overall conclusion reached in the AEE regarding all effects considered is that they are 'minor'.

31 In relation to odour effects, we consider that a high standard of odour management will be required to avoid offensive or objectionable odour effects on the closest neighbours. While a range of appropriate measures are proposed to address this, we consider it is reasonable to conclude the potential odour effects on dwellings within 500 m of the Smooth Hill Landfill will be **'minor'**, but not 'less than minor'.

Assessment of combustion emissions

32 The key combustion emissions from the operation of the proposed landfill are from the flaring of LFG. Destruction of LFG using engines that can then generate electricity was also canvased in the Air Quality Report, but it is understood that the use of engines does not form part of this application.

33 Combustion emissions will also occur from the operation of vehicles and machinery on site. T+T agrees with the Air Quality Report that these emissions are negligible.

34 The Air Quality Report includes estimates of the rate of generation of LFG from the proposed landfill. The purpose of these estimates is to enable contaminant emission rates to be determined as inputs to a dispersion model. We consider the approach used to estimate LFG generation rates and the predictions provided are reasonable for this purpose. The Air Quality Report describes that:

- LFG generation is likely to start occurring from 2028 and will continue for many years after waste placement ceases in 2066. The peak LFG generation rate of 1,177 m^3/hr will occur in 2067 (the year of landfill closure).
- LFG management using flares (or engines) will be required for many decades.

35 The Air Quality Report has assessed the effects of emissions from a ground flare that is 8 m tall and 2.5 m in diameter and information has been provided on how the flare will conform to the requirements of the NES_{AQ}.

36 Emissions from the operation of the flare have been assessed using an appropriate dispersion model (CALPUFF/CALMET), with predicted contaminant ground level concentrations beyond the site boundary being low and well within relevant human health air quality criteria. Our review has sought clarification on emission parameters, several model settings and meteorological inputs, and we consider these have been addressed. On this basis we consider the potential air quality effects associated with landfill gas combustion to be **'less than minor'**.

Assessment of dust emissions

37 The Air Quality Report correctly describes that dust emissions may be generated from several activities, such as earthworks associated with the construction of the facilities, vehicle access, cell stages, stockpiling of fill or aggregate and vehicle movements on unpaged surfaces. Dust may also be generated by wind entrainment of dusty material from exposed surfaces. T+T considers the Air Quality Report has reasonably canvased potential sources of dust emissions typically associated with the construction and operation of a municipal landfill. In our experience, dust impacts are seldom a reported air quality issue from the operation a landfill implementing good practice dust control measures. Overall ,we consider the potential for offensive or objectionable dust effects to be **'less than minor'**.

Mitigation

38 A key focus of the T+T review regarding odour has been on the control of highly odorous wastes, as the receipt and management of such waste is one of the most common causes of odour nuisance effects associated with landfills. Notably, this also appears to have been the case with DCC's existing Green Island Landfill, where a significant number of odour nuisance complaints, including those that are from locations 1 km or more from the landfill, have related to the receipt and handling of such waste.

39 The original report relied on the details of odour mitigation being documented in the Landfill Management Plan (LMP) and that 'best practice operation standards' would be implemented. However, the LMP was only in a very draft format with little detail.

Landfill Management Plan

40 The GHD technical memo sets out further details regarding best practice odour mitigation measures in a general sense, which are broadly appropriate in T+T's view. The GHD technical memo notes that it is *"common practice to prepare a full LMP post consent to enable the LMP procedures to align with the detailed design, landfill developer/operator needs and facilitate compliance with the conditions of approved resource consents."*

41 In this case, the assessment of odour effects in the Air Quality Report relies heavily on the adoption of best practice odour control measures. The further information supplied, including the updated proposed conditions, has to a large degree resolved our concerns about the lack of detail about odour control measures. However, we consider that a more complete and comprehensive Landfill Management Plan addressing the control of odour, and particularly the receipt and management of highly odorous wastes, should be provided prior to any Council Hearing should the application proceed to one.

Proposed conditions

42 The proposed conditions relating to air discharges are broadly appropriate subject to some refinement to address specific matters. The conditions are sufficiently advanced to enable this technical review to be completed for the purpose of determining notification requirements.

43 The applicant has proposed the following general limit condition to avoid offensive or objectionable odour or dust effects:

"[34] There shall be no objectionable odour, or nuisance deposits of particulate matter at any building used for residential activity as a result of any of the consent holder's activities on the site."

44 We recommend that condition 34 would be more appropriately worded in line with MfE guidance[2] which is set out in italic text below. This text relates to an offensive or objectionable 'effect':

"There shall be no noxious, dangerous, offensive or objectionable odour or dust to the extent that it causes an adverse effect at or beyond the boundary of the site."

Conclusion

45 Overall, we consider the potential air quality effects associated with the proposed Smooth Hill Landfill will be 'minor' based on the potential for odour effects.

[2] MfE 2016. Good Practice Guide for Assessing and Managing Odour. Ministry for the Environment.

Applicability

This Report been prepared for the exclusive use of our client Otago Regional Council , with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

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