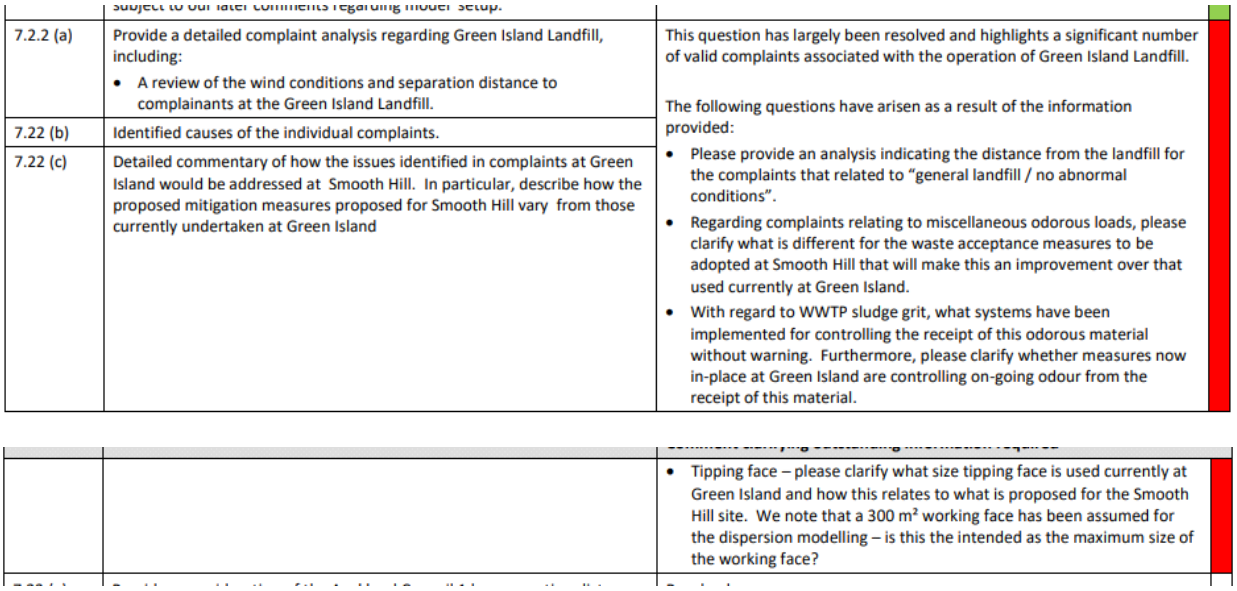
Technical Memorandum

July 8, 2021

To	Anderson Llyod	**Tel**	027 746 7752
Copy to	Nick Eldred	**Email**	Peter.stacey@ghd.com
From	Peter Stacey	**Ref. No.**	12529451
Subject	Smooth Hill Landfill – Additional s92 Question responses – Air Quality		

This Technical Memorandum provides a response to a number of questions provided by ORC in a s92 request. s92 questions were first provided in late 2020 with a number of follow up questions in June 2021. In this memorandum a "snip" of the question (including both the original and follow up question) has been provided along with GHDs response.



	subject to our later comments regarding model setup.	
7.2.2 (a)	Provide a detailed complaint analysis regarding Green Island Landfill, including: • A review of the wind conditions and separation distance to complainants at the Green Island Landfill.	This question has largely been resolved and highlights a significant number of valid complaints associated with the operation of Green Island Landfill. The following questions have arisen as a result of the information provided: • Please provide an analysis indicating the distance from the landfill for the complaints that related to "general landfill / no abnormal conditions". • Regarding complaints relating to miscellaneous odorous loads, please clarify what is different for the waste acceptance measures to be adopted at Smooth Hill that will make this an improvement over that used currently at Green Island. • With regard to WWTP sludge grit, what systems have been implemented for controlling the receipt of this odorous material without warning. Furthermore, please clarify whether measures now in-place at Green Island are controlling on-going odour from the receipt of this material.
7.22 (b)	Identified causes of the individual complaints.	
7.22 (c)	Detailed commentary of how the issues identified in complaints at Green Island would be addressed at Smooth Hill. In particular, describe how the proposed mitigation measures proposed for Smooth Hill vary from those currently undertaken at Green Island	
		• Tipping face – please clarify what size tipping face is used currently at Green Island and how this relates to what is proposed for the Smooth Hill site. We note that a 300 m² working face has been assumed for the dispersion modelling – is this the intended as the maximum size of the working face?

Please provide analysis indicating the distance from the landfill for the complaints that relate to "general landfill/no abnormal conditions".

Significant site improvements to both operational procedures and infrastructure at Green Island have progressively been implemented over a number of years. As of December 2019, the improvements at Green Island Landfill were completed and it is from this point in time that GHD consider that odours from the landfill operation are appropriately controlled. Of note, the most significant upgrades to Green Island are as follows:

- Improved LFG collection efficiency
    - LFG destruction increasing more than 3-fold from 2016-2020
    - Coverage of the gas-field network over recent waste increasing from 55% to 90%
- Covering of the central leachate drain

- Installation of a fixed and automated odour suppression system on high fenceline between closest neighbours and active landfill area.
- Liming of some biosolids loads, and continuing to transfer majority of highly odorous materials to site in sealed tubes.

Following these upgrades only one complaint has been received which was defined as 'general landfill/no abnormal conditions', however GHD has reviewed all of the complaints received since January 2019 to demonstrate how the improvements have resulted in a lower number of complaints from this odour source.

During the period 01 January 2019 to 28 March 2021, nine complaints have been categorised as being attributed to "general landfill/no abnormal conditions". Eight of these were made in 2019 and one in 2021, it is important to note is that no complaints were received during 2020 that related to odour from this source. All of the complainants were located within 1,000 m of Green Island, with the exception of two complaints, which did not have any information regarding location.

Based on the complaint record, odour complaints during normal operations are localised to within 1,000 m of Green Island Landfill. While this may be the case at Green Island it is anticipated that odour from the normal operation of Smooth Hill will be more tightly controlled. This is primarily due to the changes in waste acceptance procedure, from a manual process (currently used at Green Island) to the manifest procedure proposed for Smooth Hill (this is detailed further in the following answer), this will essentially allow site staff time to prepare and, in some cases, pre-emptively act on incoming odourous loads. Additionally, Smooth Hill Landfill will not accept the quantities of putrescible waste currently received at Green Island due to the collection and diversion of kerbside food waste to a new organics sorting facility located within Dunedin (the location of this facility is still to be confirmed).

These key changes, in addition to the expected improvements associated with the design of a modern landfill will likely reduce the occurrence of off-site nuisance odour from normal operations to a level below that of Green Island. Consequently, there is the expectation that odours generated by Smooth Hill from the normal operation of the landfill will not cause odour nuisance effects at the nearest receptor locations.

Regarding 'misc odourous loads', clarify what is different for the waste acceptance measures adopted at Smooth Hill that make this an improvement from what is implemented at Green Island.
Currently Green Island's system involves a manual receipt and processing of waste acceptance applications, and has decades long history of receiving a variety of special & hazardous wastes from a variety of long-term local industries.The landfill operator therefore does not have full complete knowledge of individual operators who deliver waste and are not advised prior to receipt of all types of loads that may enter. There are therefore occasions when the landfill operator will receive a surprise load without sufficient time to prepare for the receipt of that odourous load.

Smooth Hill will adopt a manifest system which involves a formal documentation and approval process for waste acceptance. This is expected to increase the likelihood of the landfill operator being advised of odourous loads ahead of arrival, which will allow measures to be undertaken to reduce the potential for odour nuisance - such as allowing this type of waste to be placed/mixed with general refuse as a priority over other waste deliveries.

In the event of odourous material being delivered to Smooth Hill which has been identified by landfill operators as having the potential to create odour nuisance, the landfill operator will have the ability to work with suppliers to develop measures to minimise odour nuisance from this type of waste. For example, waste operators may be required to use sealed containers to transport waste to site and/or waste may require pre-treatment prior to arrival, such as treating bio solids with lime, as is now a requirement at Green Island.

In addition, waste providers will be formally notified of waste acceptance criteria at Smooth Hill, to provide clarity as to the expectations of waste acceptance prior to delivery.
With regard to sludge/grit, what systems have been implemented for controlling the receipt of this odourous material without warning. Furthermore, please clarify measures in place at Green Island to control on going odour from the receipt of this material.

Complaints regarding the WWTP sludge and grit have reduced significantly in response to the pre-treatment of sludge and improvements to both the transportation and acceptance of this type of waste. In addition to the pre-treatment of sludge with lime other operational improvements have been made including:

- Transporting known odorous loads (such as waste from Tahuna WWTP) in fully sealed purpose-built containers, rather than general purpose sludge skip. Staff also apply lime over the top of the container before closing the lid;
- Requiring that loads are receiving loads prior to 3 pm in order to enable placement to be completed before the end of the day;
- Avoiding the receipt of loads in the weekends, where there are less staff onsite and therefore a reduced ability to respond swiftly if required; and
- A change in acceptance of fellmongery loads where smaller loads are received over multiple days as opposed to previously accepting large volumes at once which proved difficult to manage.

Since 2020, Green Island has received two complaints regarding WWTP sludge and grit, with both complainants located less than 500 m from the landfill. Considering the number of receptors located in close proximity to the landfill and the considerable amount of time people spent in their homes during 2020, due to New Zealand Covid-19 restrictions, GHD considers this to be a relatively low number of complaints, particularly compared to the number complaints received prior to these changes. This suggests that Green Island is currently able to control this source of odour adequately with the improvements applied thus far.

Tipping face – Clarify what size tipping face is used currently at Green Island and how this relates to what is proposed for the Smooth Hill site.

The tipping face at Green Island is typically between 750 m^2 and 1,000 m^2.

Considering the improved modern design of Smooth Hill and that a large proportion of putrescible waste will be diverted, it is considered feasible that the tipping face at Smooth Hill can be reduced to a size of approximately 300 m^2. While it is expected that every effort will be made to maintain the tipping face at or below 300 m², some level of tolerance may be required on occasions to allow for operational flexibility. This means there will be times when the tipping face will increase beyond 300 m², however it is unlikely to ever extend beyond an area of 1,000 m².

GHD notes that the odour modelling provided in the s92 response was based on a tipping face of 300 m², with the model predicting a 99.5%ile odour 1-hour average concentration at the nearest receptor of 0.13 OU/m³. If the tipping face was to increase to 1,000 m², the maximum odour concentration at the nearest receptor could be conservatively assumed to increase to 0.43 OU/m³ (0.13 x 1000/300). This value is still well below the odour assessment criteria of 2 OU/m² and consequently suggests that if the tipping face was to increase in size from time to time, it is unlikely to be a significant contributing factor to off-site odour nuisance.

	distance and how this is accounted for in the odour assessment.	
7.2.4 (a)	Provide an assessment of odour effects associated with activities that fall outside of 'normal operations' and describe in detail how those measures will be addressed at the proposed Smooth Hill landfill. This question should be addressed in conjunction with our comments below regarding mitigation measures.	Section 5.1.5 provides a very high-level description of 8 measures that would be done in the event of abnormal odours. These are largely repeated again in Section 13.1.3. Given the large number of such events giving rise to odour complaints associated with Green Island landfill it remains an important consideration to understand the potential odour effects of these events. While the possible causes of abnormal odours have been identified, no assessment has been provided of the potential effects of abnormal odour discharges and consequently this matter remains unanswered.
7.2.4 (b)	We are aware that the landfill gas from Green Island landfill has high	**Yes**

Understand the potential odour effects of abnormal events.

Complaints associated with abnormal operations are typically attributed to highly odourous loads and operational issues – such as the failure of the landfill gas (LFG) collection system or excavating old waste to install new gas collection infrastructure.

Notable improvements to the LFG collection system and associated LFG engine have been undertaken in recent years following poor performance and unreliability of the system. Upgrades to the LFG collection system include:

Installing additional wells progressively to the piped network;
Installation of a flare connected to two gas-wells in an area of the landfill that were previously isolated from the main piped network; and
Upgrades to the gas engines and back up flares to improve reliability and performance. Ongoing servicing and regular maintenance checks of these LFG destruction equipment has been adopted.

The upgrades to the LFG network have resulted in an increase to in the coverage of the gas field network from 55% to 90% and a gas destruction efficiency of more than three times the efficacy measured prior to the upgrade. Following the upgrade to the LFG system in late 2019 there has not been any odour complaints pertaining to landfill gas odour. By maximising the extraction and destruction of LFG, nuisance odour occurrences from this source appear to be appropriately Controlled.

Since the upgrades to the LFG system there has only been one complaint pertaining to abnormal operations which has been associated with 'misc odourous load'. Considering that Smooth Hill will have an appropriately designed LFG system and adopt a manifest system for waste acceptance it is expected that odour complaints from abnormal operations will be comparable (if not improved) from that recently documented at Green Island.

It is worth noting that since the beginning of 2020 (following the site upgrades in December 2019) there were a total of nine odour complaints. Of these nine complaints 5 were attributed to the excavation of old waste. Excavation of old waste is considered normal operation and is completed for a variety of reasons, most commonly to install leachate drainages or, to retrofit gas laterals. While this is typical of many operating landfills in New Zealand, this practice is not commonly completed in modern engineered landfills,

such as Smooth Hill, and is therefore expected to occur at a reduced frequently, when compared to Green Island.

7.5 (b)	Provide a more detailed discussion on mitigation measures that are proposed and how those measures conform to the "best practice operations standards", measures currently in place at Green Island, and current industry practice. This should include details relating to contingency measures and highly odorous wastes.	Section 5.1 of the updated air assessment simply refers to the LMP. However, no discussion is given in the report or the LMP describing how the landfill would meet current industry best practice operating standards regarding odour control. Measures described in the LMP are relatively general in nature such as 'needing to minimise the working face as far as practicable', or that monitoring would be carried out 'regularly' – this type of wording provides little clarity as to what is expected.

How will the landfill operation meet current industry best practice operating standards:

GHD is unaware of any New Zealand 'best practice' documents on the management of odour from landfills. However, GHD has reviewed the guidance provided in the following documents:

Technical Guidelines for Disposal to Land, 2018. Waste Management Institute New Zealand (WasteMINZ);
Siting, design operation and rehabilitation of landfills, 2015. Environmental Protection Authority Victoria;
Assessing planning proposals within the buffer of a landfill, 2017. Environmental Protection Authority Victoria; and
Odour management, 2011. Environment Agency United Kingdom.

GHD considers that the odour mitigation measures recommended in the above guidance documents have been captured in those proposed for the Smooth Hill. A summary of these measures are presented below.

WasteMINZ:	Minimise the working face, the use of daily cover and immediate attention to odourous waste loads; Odorous waste to be delivered prior to putrefaction or, if appropriate, to treat the waste to combat odours before delivery. Loads not complying with these requirements should be refused entry and returned for treatment; Application of deodorant chemicals by spray near the working face, or in areas of excavation in old waste. Excavations into old waste should be kept to a minimum; Regular inspections and maintenance of gas wells and pipework; LFG should be controlled by an appropriately designed collection and destruction system. Any damage to the collection system should be repaired immediately; Appropriately designed leachate storage, treatment and disposal; and Appropriately designed leachate storage, treatment and disposal.
EPA Victoria (both documents) :	To divert suitable wastes from landfill through adequate sorting; Only allowed wastes are deposited; Pre-treatment of waste prior to landfilling, intended to reduce the long-term risk posed by the waste and to improve general landfill performance; To place waste in a manner that is mechanically stable, controls litter and that maximises the degree of compaction; Control the migration of landfill gas; and To ensure that wastes are covered appropriately.
Environmental Agency UK:	Managing inventory; and Controlling evaporation by reducing the surface area of odourous material and avoid disruptive activities such as shredding or screening, which dramatically increase exposed surface area and emissions, unless adequate containment is provided.

In addition to the above guidance documents, GHD has compared the proposed mitigation measures with other similar landfill applications in New Zealand. Namely, the applications prepared for Dome Valley Landfill by Tonkin and Taylor, 2019 and AB Lime's Landfill prepared by Jacobs New Zealand Limited, 2020.

GHD notes that the majority of proposed mitigation measures provided in the Smooth Hill application are comparable to those provided in the Dome Valley and AB Lime applications.

Given that the mitigation measures proposed for Smooth Hill incorporate those outlined in the above guidance documents as well as two recent landfill applications, GHD considers that the mitigation measures proposed for Smooth Hill are consistent with best practice operating standards in New Zealand.

Ultimately more detailed measures will be included in the LMP that give effect to the conditions of consent. At this point only a draft LMP framework has been developed, which provides a starting point for the completion of a final plan for approval of ORC as part of detailed design, and before construction commences. As set out at section 5.15 of the AEE 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.

Regards

Peter Stacey
Technical Director – Air Quality