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Dear Wade

New Chum Waste Disposal Facility Environmental Monitoring Annual Reporting Summary for January to December 2015

1 Introduction

GHD Pty Ltd (GHD) was commissioned by Cleanaway Solid Waste Pty Ltd to conduct groundwater, surface water, leachate, dust monitoring and reporting for the January 2015 to December 2015 reporting period at the licensed waste disposal facility (WDF) at 100 Chum Street, New Chum (Lots 268 and 227 on SP 103913). A site plan identifying the monitoring locations included in this monitoring program is attached.

The monitoring program has been established to assess compliance with the relevant conditions (Schedules) of the Environmental Authority (licence) EPPR00445713. This licence was issued by the Department of Environment and Heritage Protection (EHP) on 5 June 2013, under the provisions of the *Environmental Protection Act 1994*.

This report summarises the environmental monitoring conducted by GHD and provides a list of licence criteria exceedances measured at the New Chum WDF during the January 2015 to December 2015 reporting period.

2 Regulatory compliance

This annual reporting summary is in compliance with the requirements of Schedule H17 of the licence as outlined below:

- *Any monitoring data compiled, collected or recorded as required by conditions of this environmental authority must be evaluated, summarised and reported to the administering authority on an annual basis with the annual return. Each annual monitoring report must be given to the administering authority with the annual report in a clear summarised format.*

3 Environmental monitoring events

The environmental monitoring conducted at the New Chum WDF during the January 2015 to December 2015 reporting period is highlighted in Table 1.

Table 1 Summary of monitoring events

Monitoring Date	Groundwater	Surface Water	Leachate	Landfill Gas	Dust
2 January to 3 February 2015					✓
3 February to 4 March 2015					✓
3 to 4 March 2015	✓	✓	✓		
6 March 2015				✓	
4 March to 2 April 2015					✓
4 April to 4 May 2015					✓
4 May to 4 June 2015	✓	✓			
21 to 22 September 2015	✓	✓	✓		
2 to 3 December 2015	✓	✓			

4 Environmental monitoring summary

The field and analytical parameters measured for groundwater, surface water and landfill gas during the January 2015 to December 2015 reporting period were generally consistent with the respective datasets and as such typically complied with the licence criteria. Exceptions to these consistent results and a brief description of the respective monitoring events are outlined sections 4.1 to 4.3 below. In addition, dust deposition monitoring was also undertaken during the current reporting period. Non-compliant dust deposition results are outlined in sections 4.4.

4.1 Groundwater

The field and analytical results measured at the groundwater monitoring wells were generally consistent with the respective data sets for individual monitoring locations with the exception of those parameters and locations outlined in Table 2 below.

Table 2 Statistically Significant Groundwater Results

Monitoring Event	Monitoring Location	Parameter	Concentration	Exceedance
3 to 4 March 2015	BH02	pH	pH 6.03	Site Criteria minus 1 & 2
	BH05	Zinc	3.23 mg/L	Site Criteria 2 & 3

Monitoring Event	Monitoring Location	Parameter	Concentration	Exceedance
	BH09	Zinc	0.346 mg/L	Site Criteria 2 & 3
2 to 3 June 2015	BH02	pH	pH 6.13	Site Criteria Minus 1
	BH03	Ammonia as N	0.77 mg/L	Site Criteria 3
	BH07A	TOC	65 mg/L	Site Criteria 3
	BH08	Zinc	0.752 mg/L	Site Criteria 3
21 to 22 September 2015	BH02	pH	pH 6.05	Site Criteria Minus 1
	BH06	Zinc	0.508 mg/L	Site Criteria 3
	BH08	Zinc	0.804 mg/L	Site Criteria 2 & 3
2 to 3 December 2015	BH02	pH	pH 6.02	Site Criteria 1 & 2
	BH06	Zinc	0.485 mg/L	Site Criteria 2 & 3
	BH08	Zinc	0.723 mg/L	Site Criteria 2 & 3
	BH10	Zinc	0.306 mg/L	Site Criteria 2

A trend in elevated zinc results was reported at a number of up gradient monitoring wells in 2015. The zinc results at BH05 and BH09 were generally within the range of historical trends while the zinc results at BH06, BH08 and BH10 recorded overall increasing trends in concentration in the current reporting period. It is noted that zinc typically displays a great degree of variation in concentrations.

In the June 2015 and September 2015 monitoring rounds, samples from BH06 and BH09 (where the greatest degree of variation had typically been reported) were filtered in the laboratory at 0.1 µm in an attempt to remove colloidal matter that may be contributing to the variability in results. Results did not report a significant degree of variation between total dissolved samples at 0.1 µm filtration which suggest that the fluctuations in zinc results is due to natural variation and not attributed to colloidal matter within the water samples. In consideration of the following multiple lines of evidence, zinc concentrations are likely to be attributed to geological conditions and not an indication of impact from the landfill:

- While results are statistically significant, the concentration increases were typically less than an order of magnitude higher than historical results.
- The trend in zinc results was not reported for any other parameter.
- The trend is limited to up gradient monitoring locations only.

The pH result at BH02 (6.02 pH units) was statistically significant in all four monitoring rounds in 2015. It is noted that this does not appear to have significantly impacted other parameters at BH02 and that the results remain within the range of values reported at other up and down gradient groundwater monitoring locations, albeit at the lower end of typically concentrations.

Ammonia as N at BH03 and TOC and BH07A also recorded peak results on one occasion that are not considered to present a cause for concern due to the isolated nature of the peaks.

On the basis of the limits of the current monitoring program, there does not appear to be any previously unidentified deterioration in groundwater quality or increasing trends in contaminant concentrations that require further investigation or management action at this point in time.

An assessment of the groundwater flow direction on a quarterly basis indicates a shallow gradient with groundwater in the northern portion of the generally flowing in a south easterly and northern direction and in the southern portion in a southerly and south easterly direction. There appears to be a ridge in the north eastern portion of the site that directs groundwater in the north eastern corner of the site to the west. Recent monitoring events also suggest that BH9 may be down gradient and not up gradient however, based on the shallow gradient further assessment is required to confirm this.

4.2 Surface water

Scheduled pump discharges from surface water bodies occurred prior to and during all monitoring events in 2015. The holding capacity of the onsite sediment pond identified as NWH is maintained by pumped discharges to the intermediate sediment pond (SED 1) which gravity feeds into Void 10 (DIS). Although these pumped discharges are rainfall dependant it is estimated that pumping occurs for approximately 12 hours per week.

It is considered that SED-1, recently included in the surface water monitoring program provides a more appropriate representation of water quality discharge from the landfill and has now been adopted as the discharge location for the purposes of licence compliance. This change was included in the September 2015 and December 2015 monitoring events.

Table 3 Surface water licence criteria exceedances

Monitoring Event	Monitoring Location	Parameter	Concentration	Exceedance	Dates of Pumped Discharge
3 March 2015	DIS	Specific Conductance	2,142 µs/cm	10% greater than upstream location (SMC)	Daily prior to and during sampling
3 June 2015	*No criteria exceedances were observed during this event*				Daily prior to and during sampling
22 September 2015	*No criteria exceedances were observed during this event*				12 hours per week
3 December 2015	SED-1	Specific Conductance	3,385 µs/cm	10% greater than upstream location (SMC)	12 hours per week

Irrespective of the pumping regime between NWH and SED-1, variations in specific conductance between the discharge location (DIS and SED-1) and the upstream location (SMC) occurred in the 2015 monitoring period that exceeded the licence limits. A review of specific conductance results indicate that higher concentrations are typically recorded at the on-site pond (NWH) and the discharge location (SED-1) than at the upstream (SMC), downstream (DWN) and Void 10 (DIS).

While some variation in specific conductance was noted, general water quality characteristics recorded for discharge point (SED-1), upstream (SMC) and downstream location (DWN), did not suggest that discharge from the site had a significant impact on the water quality in the receiving environment. This consistency may also be a result of the likely hydraulic link between Void 10 (DIS) and the creek (SMC and DWM).

4.3 Landfill Gas

Annual landfill gas monitoring was conducted at the New Chum WDF on 6 March 2015 which included monitoring at the following locations:

- Ambient gas monitoring around, underneath (portable structures), and within any service pits associated with the site structures as well as within and around the perimeter of the Site Supervisor's office, weighbridge, lunchroom and toilet block along the northern boundary of the Work Compound.
- Ambient surface monitoring conducted on a maximum grid spacing of 30 m across the surface of operational landfill Cell 5 and closed green waste cell (Cell 1).
- Ambient gas monitoring at 18 nominated locations evenly spaced around the site boundary (Boundary Monitoring).

No exceedances of the licence criteria outlined in Schedule B9 of the licence were measured during the March 2015 monitoring event. However, concentrations exceeding the adopted guideline value of 500 ppm were measured at five grid locations in and around Cell 5. The adopted guideline value is outlined in the Queensland Department of Environment and Heritage Protection, (EHP) *Guideline, ERA 60 - Waste Disposal, Landfill siting, design, operation and rehabilitation* (EHP, 2012).

Noting the extent and limitations of the landfill gas monitoring, it was concluded that methane is generally not escaping the site via the final and intermediate cover layers of Cell 5 and the Green Waste Cell landfill units in significant concentrations (along the grid lines and at the heights monitored). Notable exceptions to this apparent trend were three measurements at Cell 5 (locations 21, 29, 38, 116 and 120) where methane was detected at concentrations exceeding the nominated assessment criteria of 500 ppm. Monitoring location 21 is located in close proximity to the leachate extraction pump, which may have contributed to the elevated results at this location. No apparent cause for elevated methane concentrations at the remaining locations was identified.

It should be noted that Cleanaway engaged Run Energy to install a landfill gas extraction system within Cell 5 and the Green Waste Cell (Cell 1) along with the installation of a landfill gas flare to manage the landfill gas generated at the operational Cell 5 and the closed green waste cell (Cell 1). Whilst the extraction system and the landfill gas flare have been installed, the system was yet to be fully commissioned at the time of monitoring.

4.4 Dust monitoring

GHD conducted monthly dust deposition monitoring at the New Chum WDF at seven locations (ND1 to ND7) from January to May 2015. In May 2015, routine dust monitoring ceased.

The collection and replacement of the dust deposition sample bottles was undertaken in accordance with the requirements of *Australian Standard AS 3580.10.1 Methods for sampling and analysis of ambient air, Method 10.1: Determination of particulate matter – Deposited matter – Gravimetric method* (2003). The sample bottles were submitted to ALS Environmental (NATA accredited) for depositional dust analysis which included; total solids, soluble matter, total insoluble matter, combustible matter, ash content and calculated rainfall/volume.

In the absence of specified licence criteria, the results were compared to the guideline values outlined below:

- **4 g/m^2/month** as outlined in the NSW EPA, (1996) *Environmental Guidelines: Solid Waste Landfills*, which are derived from DECC NSW (2001) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales.* This guideline is specific to landfill operations and allows for the direct comparison to the laboratory results.
- **120 mg/m^2 /day** as outlined in the Queensland Department of Environment and Heritage Protection (EHP) *Guideline, Application requirements for activities with impacts to air, Version 2, April 2014* which incorporates trigger levels consistent with the environmental objectives of the QLD, Environmental Protection Policy (Air) 2008. This is a more generic trigger value for a wide range of dust generating activities and requires the laboratory results to be converted into mg/m^2 /day averaged over one month. The conversion factor of 33.3 outlined in Section 9.2 of AS 3580.10.1: 2003 was used to convert the laboratory results of g/m^2/month to mg/m^2 /day.

Total insoluble solids results that exceeded the above adopted guideline criteria are summarised in Table 4 below:

Table 4 Dust (as total insoluble solids) that exceeded adopted guideline levels

Monitoring Event	Monitoring Location	Adopted Guideline Level	Result
2 January 2015 to 3 February 2015	ND1	4 g/m^2/month[1]	4.1
		120 mg/m^2/day[2]	136.5
	ND2	4 g/m^2/month[1]	4.4
		120 mg/m^2/day[2]	146.5
	ND3	4 g/m^2/month[1]	4.7
		120 mg/m^2/day[2]	156.5
	ND5	4 g/m^2/month[1]	8.6
		120 mg/m^2/day[2]	286.4
	ND6	4 g/m^2/month[1]	7.7

Monitoring Event	Monitoring Location	Adopted Guideline Level	Result
		120 mg/m^2/day[2]	256.4
	ND7	4 g/m^2/month[1]	5.8
		120 mg/m^2/day[2]	193.1
3 February 2015 to 4 March 2015	ND1	120 mg/m^2/day[2]	129.9
	ND5	4 g/m^2/month[1]	7.1
		120 mg/m^2/day[2]	236.7
	ND6	4 g/m^2/month[1]	6.4
		120 mg/m^2/day[2]	213.1
	ND7	4 g/m^2/month[1]	4.1
		120 mg/m^2/day[2]	136.5
4 March 2015 to 2 April 2015	ND1	4 g/m^2/month[1]	16.2
		120 mg/m^2/day[2]	277
	ND2	4 g/m^2/month[1]	12.3
		120 mg/m^2/day[2]	210
	ND5	4 g/m^2/month[1]	8.0
		120 mg/m^2/day[2]	137
	ND6	4 g/m^2/month[1]	8.8
		120 mg/m^2/day[2]	150
2 April 2015 to 4 May 2015	ND1	4 g/m^2/month[1]	5.4
	ND5	4 g/m^2/month[1]	5.0

Notes:

1 – NSW EPA, (1996) Environmental Guidelines

2 – QLD EHP, (2014) Guideline

An increase in total insoluble matter was observed at the site during the 2015 dust monitoring events with a number of exceedances reported during each monitoring event. Cleanaway indicated that two to three water trucks routinely operated at the site to manage dust associated with site activities such as Cell 5 bulk earth works, general site traffic and landfill operations. Dry, windy conditions during the monitoring period are likely to have contributed to the number of exceedances reported. A review of results in consideration of prevailing wind direction indicates that exceedances were typically reported at

both upwind and downwind locations. This suggests that it is possible that offsite sources may also be contributing to the number of elevated results.

5 Conclusion

The frequency of the environmental monitoring conducted at the New Chum WDF during the January 2015 to December 2015 reporting period was in accordance with the relevant Schedules of the Environmental Authority. This included quarterly groundwater and surface water monitoring and annual leachate and landfill gas monitoring. Additionally, dust deposition monitoring was completed between January and May 2015.

The field and analytical results measured during these environmental monitoring events were generally consistent with the respective datasets at individual monitoring locations and therefore typically complied with the licence criteria. The only exceptions to the consistent results were the statistically significant groundwater results highlighted in Table 2 and specific conductance surface water results at the discharge location (DIS and SED-1) as indicated in Table 3.

Groundwater

On the basis of the limits of the current monitoring program, there does not appear to be any previously unidentified deterioration in groundwater quality or increasing trends in contaminant concentrations that require further investigation or management action at this point in time.

Elevated zinc results during 2015 are considered to be attributed to regional geological conditions and not a result of impacts from the landfill based on the following multiple lines of evidence:

- Filtration of selected samples at 0.1 µm filtration on two occasions (May and September 2015) at two locations (BH06 and BH09) indicated that variations in concentrations were not likely to be attributed to colloidal matter within the water samples.
- While results are statistically significant, the concentration increases were typically less than an order of magnitude.
- The trend was not reported for any other parameter.
- The trend is limited to up gradient monitoring locations only.

Surface Water

Pumped discharges from the site reportedly occurred prior to each monitoring event in 2015. Prior to the September 2015 sampling event the discharge location was changed from DIS (within Void 10) to SED-1 which is located upstream of Void 10 closer to landfill operations. Sample location SED-1 was considered a more appropriate representation of water quality discharge from the landfill.

Variations in specific conductance between the discharge location (DIS and SED-1) and the upstream location (SMC) occurred in the March 2015 and December 2015 monitoring period that exceeded the licence requirements. While some variation in specific conductance was noted, general water quality characteristics recorded for discharge point (SED-1), upstream (SMC) and downstream location (DWN), did not suggest that discharge from the site had a significant impact on the water quality in the receiving

environment. This consistency may also be a result of the likely hydraulic link between Void 10 (DIS) and the creek (SMC and DWM).

Landfill Gas

Although the annual landfill gas measurements complied with the licence criteria, five measurements exceeding the adopted guideline criteria were measured in and around Cell 5. Cleanaway engaged Run Energy to install a landfill gas extraction system and associated gas flare to manage the landfill gas generated at the operational Cell 5 and the closed green waste cell (Cell 1). The gas extraction system and landfill gas flare were not fully commissioned at the time the time of monitoring.

Dust

Dust results (reported as insoluble matter) exceeding the adopted guideline levels were reported at a number of monitoring locations between January and May. While dry windy conditions and possible offsite influences have likely contributed to the results a review of site operations and dust suppression frequency should be considered. The continuation of routine dust monitoring would also be beneficial to confirm if elevated dust generation continues at the site.

Overall Conclusion

On the basis of the nature, extent and frequency of the current monitoring program, there does not appear to be any previously unidentified deterioration in groundwater or surface water quality or increasing trends in contaminant, landfill gas concentrations that require further investigation or management action at this point in time.

Regards
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