



05 May 2017

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Environmental Specialist
Cleanaway Solid Waste Pty Ltd
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Our ref: 41/29798/7919 Rev 2
Your ref:

Dear Wade

New Chum Waste Disposal Facility Environmental Monitoring Annual Reporting Summary for January to December 2016

1 Introduction

GHD Pty Ltd (GHD) was commissioned by Cleanaway Solid Waste Pty Ltd to conduct groundwater, surface water, leachate and landfill gas monitoring and reporting for the January 2016 to December 2016 reporting period at the licensed waste disposal facility (WDF) at 100 Chum Street, New Chum (Lots 268 and 227 on SP 103913).

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 26 May 2016, under the provisions of the *Environmental Protection Act 1994*.

This report summarises the environmental monitoring conducted by GHD (and others where relevant) and provides a list of licence criteria exceedances measured at the New Chum WDF during the January 2016 to December 2016 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 by GHD at the New Chum WDF during the January 2016 to December 2016 reporting period is highlighted in Table 1.

Table 1 Summary of monitoring events

Monitoring Date	Groundwater	Surface Water	Leachate	Landfill Gas
16 to 17 March 2016	✓	✓	✓	
18 March 2016				✓
5 May 2016*	✓			
14 to 15 June 2016	✓	✓		
27 to 28 September 2016	✓	✓		
14 to 15 December 2016	✓	✓		

Notes:* Groundwater well BH11 only (resample)

4 Reporting

A summary of the reports generated by GHD during the January 2016 to December 2016 reporting period are provided in Table 2 below.

Table 2 Report register

Monitoring Event	Report Title	Document Reference
16 to 17 March 2016, 5 May 2016	New Chum Waste Disposal Facility (WDF) – Environmental Monitoring Report – March 2016	41/29798/7704
	Exception Reporting Form	2016 March Exception Report – New Chum (Rev 1)
18 March 2016	New Chum Waste Disposal Facility(WDF) – Landfill Gas Monitoring – Gas Monitoring Report – March 2016	41/29798/7735
14 to 15 June 2016	New Chum Waste Disposal Facility (WDF) – Environmental Monitoring Report – June 2016	41/29798/7788
	Exception Reporting Form	2016 June Exception Report – New Chum

Monitoring Event	Report Title	Document Reference
27 to 28 September 2016	New Chum Waste Disposal Facility (WDF) – Environmental Monitoring Report – September 2016	41/29798/7869
	Exception Reporting Form	2016 September Exception Report – New Chum
14 to 15 December 2016	New Chum Waste Disposal Facility (WDF) – Environmental Monitoring Report – December 2016	41/29798/7893
	Exception Reporting Form	2016 December Exception Report – New Chum (Rev 1)

4.1 Other Environmental Monitoring and Reporting by Other Parties

The environmental monitoring and reporting listed in Table 3 was also conducted during the January 2016 – December 2016 Reporting Period by Cleanaway and other consultants and is listed below to demonstrate reference to relevant conditions of licence EPPR00445713.

Table 3 Additional monitoring and reporting register

Monitoring Event/Report	Date/Reference	Relevant EA Condition
Dust Deposition Monitoring	21 December 2015 to 20 January 2016 – Laboratory Analysis	1-H21 to 1-H23
	20 January 2016 to 19 February 2016 – Laboratory Analysis	
	19 February 2016 to 21 March 2016 – Laboratory Analysis	
	21 March 2016 to 20 April 2016 – Laboratory Analysis	
Waste Composition Survey Report	Waste Composition Survey Report – November 2016 (Letter Report by Epic Environmental B160319-CSW-Waste Composition Report_rev1 dated 29 November 2016)	1-H18 to 1-H20
Gas Flare Emissions Monitoring Report	New Chum Waste Disposal Facility(WDF) – Landfill Gas Monitoring – Gas Monitoring Report – March 2016	1-A18 to 1-A20

5 Environmental monitoring summary

The field and analytical parameters measured for groundwater, surface water and landfill gas during the January 2016 to December 2016 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 5.1 to 5.3 below.

5.1 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 4 below.

Table 4 Statistically Significant Groundwater Results

Monitoring Event	Monitoring Location	Parameter	Concentration	Exceedance
16 to 17 March 2016, 5 May 2016*	BH02	pH	5.88	Site Criteria Minus 1 and 2
	BH06	Zinc	0.485 mg/L	Site Criteria 2 and 3
	BH08	Zinc	0.331 mg/L	Site Criteria 2 and 3
	BH09	Zinc	1.59 mg/L	Site Criteria 3
	BH10	Zinc	0.481 mg/L	Site Criteria 2
14 to 15 June 2016	BH02	pH	6.24	Site Criteria Minus 1
	BH05	Zinc	2.76 mg/L	Site Criteria 2 and 3
	BH06	Zinc	0.435 mg/L	Site Criteria 2 and 3
	BH08	Zinc	0.463 mg/L	Site Criteria 1, 2 and 3
	BH10	Zinc	0.275 mg/L	Site Criteria 1 and 3
27 to 28 September 2016	BH06	Zinc	0.381 mg/L	Site Criteria 1, 2 and 3
	BH07A	Bicarbonate	807 mg/L	Site Criteria 3
	BH11	TOC	10 mg/L	Site Criteria 3
14 to 15 December 2016	BH06	Zinc	0.301 mg/L	Site Criteria 1, 2 and 3
	BH07A	TOC	39 mg/L	Site Criteria 2 and 3
	BH08	Zinc	0.691 mg/L	Site Criteria 3
	BH09	Zinc	0.125 mg/L	Site Criteria 3
	BH10	Zinc	0.536 mg/L	Site Criteria 3
	BH12	TOC	23 mg/L	Site Criteria 3

The groundwater flow direction was reviewed on a quarterly basis in 2016, which indicates a shallow gradient at the site. In the northern portion of Lot 268 groundwater generally flows in an east to north-easterly direction and in a south-easterly direction across the southern portion of Lot 268. There appears to be a groundwater ridge in the north eastern portion of the site (previously indicated to be related to fault lines under the site) that may direct groundwater in the vicinity of wells BH03 and BH11

Key trends are summarised as follows:

Zinc continues to display fluctuating trends at most groundwater monitoring locations across the site, including at upgradient wells BH05 and BH06, cross gradient well BH10 and downgradient wells BH08 and BH09.

- The zinc results at upgradient BH05 were generally within the range of historical trends.
- The zinc results at upgradient BH06 have been following a decreasing trend since September 2015, however remained above Site Criteria 1, 2 and 3 during the 2016 reporting period.
- At BH08, zinc concentrations have continued the fluctuating trend apparent since June 2015, with results fluctuating above and below site criteria in consecutive monitoring events during 2016.
- At BH09, zinc concentrations marginally exceeded Site Criteria 3 in the March and December 2016 rounds. A review of the historical results at BH09 indicated the concentrations within the baseline dataset for zinc are typically low (and less than ten times the limit of reporting) which can lead to small variations being statistically significant.

At BH10, zinc concentrations have been fluctuating at levels above and below the site criteria since June 2015 with peaks in March 2016 (0.481 mg/L) and again in December 2016 (0.536 mg/L). It is noted that zinc typically displays a great degree of variation in concentrations over the historical groundwater datasets and 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 zinc 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 fluctuating trend in zinc levels is observed in up gradient as well as cross and downgradient monitoring locations, with the highest zinc concentrations at the site typically detected in upgradient well BH05.

The pH result at downgradient BH02 was statistically significant in the March and June monitoring rounds in 2016. It is noted that the overall decreasing trend in pH between October 2013 and March 2016 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. The pH levels increased from March 2016 and returned to a more typical range in September and December 2016.

Alkalinity as bicarbonate as CaCO₃ at upgradient well BH07A recorded a peak result in September 2016. Due to the isolated nature of the peak, and the fact that this well is located upgradient of the landfill mass, this fluctuation is not expected to be related to landfilling activities.

Total organic carbon (TOC) concentrations were statistically significant on one occasion at each of upgradient well BH07A, boundary well BH11 and downgradient well BH12 during 2016. TOC results at well BH07A have fluctuated above and below the site criteria over the historical dataset. As this monitoring location is upgradient, these results are not considered to be due to impact from the landfill. The elevated TOC for boundary well BH11 reported in September 2016 decreased back to a level consistent with historical trends in December 2016 indicating that it was likely to be an isolated result. A review of the historical results at BH12 indicated the concentrations within the baseline dataset for TOC are typically low (and less than ten times the limit of reporting) which can lead to small variations being statistically significant. The TOC results are also typically higher in the upgradient well BH07A and comparable in most of the remaining cross gradient, downgradient and boundary wells over the historical dataset. On this basis, the current TOC result for BH12 is not considered to be an indication of impact from the landfill, however will continue to be closely reviewed in future rounds to identify any trends.

Upon review of these key trends and on the basis of the scope 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.

5.2 Surface water

Scheduled pump discharges from onsite surface water bodies occurred prior to and during all monitoring events in 2016. 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. Monitoring location SED-1 represents the surface water discharge location from the landfill for the purposes of licence compliance (since September 2015).

Table 5 Surface water licence criteria exceedances

Monitoring Event	Monitoring Location	Parameter	Concentration	Exceedance	Dates of Pumped Discharge
16-17 March 2016	SED-1	Specific Conductance	3,555 µs/cm	10% greater than upstream location (SMC)	12 hours per week
14-15 June 2016	SED-1	Specific Conductance	2,627 µs/cm	10% greater than upstream location (SMC)	12 hours per week
27-28 September 2016	SED-1	Specific Conductance	3,674 µs/cm	10% greater than upstream location (SMC)	12 hours per week
14-15 December 2016	SED-1	Specific Conductance	4,552 µs/cm	10% greater than upstream location (SMC)	12 hours per week

There were variations in specific conductance (SC) throughout 2016, with all quarterly sampling results indicating a greater than 10% difference in SC between the discharge location (DIS and SED-1) and the upstream location (SMC) resulting in exceedances of 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 DWN).

Further discussion of the surface water results measured at the discharge point (DIS and SED-1) during the 2016 reporting period is included in the relevant reports.

5.3 Landfill Gas

Annual landfill gas monitoring was conducted at the New Chum WMF by GHD on 18 March 2016 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 1-A9 of the licence were measured during the March 2016 monitoring event. However, concentrations exceeding the adopted ambient guideline value of 500 ppm were measured at one grid location on the north-eastern batter of 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 scope of the landfill gas monitoring program, 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 was the measurements at location 8 on the NE batter of Cell 5 where methane was detected at concentrations of >100%LEL which exceeds the nominated assessment criteria of 500 ppm. Monitoring location 8 is located in close proximity to a steel pipe which appears to be protruding from the cap, which may have contributed to the elevated results at this location.

It should be noted that Cleanaway have installed 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).

A discussion of the guideline criteria exceedances are included in the Gas Monitoring Report shown in Table 2.

5.4 Dust monitoring

Cleanaway conducted monthly dust deposition monitoring at the New Chum WDF at seven locations (ND1 to ND7) from 21 December 2015 to 20 April 2016.

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/m²/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/m² /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/m² /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/m²/month to mg/m² /day.

Total insoluble solids results that exceeded the above adopted guideline criteria are summarised in Table 6 below:

Table 6 Dust (as total insoluble solids) that exceeded adopted guideline levels

Year	Month	Unit	Boundary Adopted Guideline Level	ND1	ND2	ND3	ND4	ND5	ND6	ND7 [^]
2015 / 2016	21 December 2015 to 20 January 2016	g/m ² /month	4 ¹	5.1	2.2	1.1	2.5	1.7	1.5	2.0
		mg/m ² /day	120 ²	169.8	73.3	36.6	83.3	56.6	50.0	66.6
2016	20 January 2016 to 19 February 2016	g/m ² /month	4 ¹	6.3	3.3	1.4	4.8	2.8	2.5	1.2
		mg/m ² /day	120 ²	209.8	109.9	46.6	159.8	93.2	83.3	40.0
2016	19 February 2016 to 21 March 2016	g/m ² /month	4 ¹	7.2	4.0	0.8	1.3	8.8	2.7	--
		mg/m ² /day	120 ²	239.8	133.2	26.6	43.3	293.0	89.9	--
2016	21 March 2016 to 20 April 2016	g/m ² /month	4 ¹	8.9	5.4	1.5	1.2	2.7	5.1	--
		mg/m ² /day	120 ²	296.4	179.8	49.0	40.0	89.9	169.8	--

Notes:

1. NSW EPA, (1996) Environmental Guidelines
2. QLD EHP, (2014) Guideline
3. ND7 sample location vandalised prior to collection on 21 March 2016

Based on communications with Cleanaway, the following comments are provided in relation to the dust monitoring results for the 2016 reporting period:

- Dust monitoring location ND1 is located at the Site entrance adjacent to Chum Street. As such the results at this location are influenced by both onsite activities and by dust generated by heavy vehicle movements along Chum Street.
- Cleanaway has commenced entrance upgrade works at the site which will assist with minimisation of dust generated by onsite activities and are expected to substantially improve the dust monitoring results at ND1.
- The entrance upgrade works will be completed by the end of June, 2017. The relevant components of this project are:
 - Sealing of the main haul road with bitumen from the site entrance, 400m into site.
 - Sealing of the light vehicle car park with bitumen.
 - Extension of the paved areas in front of the new weighbridge.
 - Installation of a wheel bath for all vehicles exiting the operational areas to drive through before they access the main sealed haul road.
 - These works will have no impact on the dust generated by heavy vehicle movements along Chum Street which is a public road

6 Conclusion

The frequency of the environmental monitoring conducted at the New Chum WDF during the January 2016 to December 2016 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 April 2016.

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 4 and specific conductance surface water results at the discharge location (DIS and SED-1) as indicated in Table 5.

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 and fluctuating zinc results during 2016 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:

- While results at multiple wells are statistically significant, the zinc 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 fluctuating trend in zinc levels is observed in up gradient as well as cross and downgradient monitoring locations, with the highest zinc concentrations at the site typically detected in upgradient well BH05.

Other statistically significant results this reporting period (including TOC, pH and bicarbonate as CaCO₃) are not currently considered to present a cause for concern.

Surface Water

Scheduled pump discharges from surface water bodies occurred prior to and during all monitoring events in 2016. Monitoring location SED-1 represents the surface water discharge location from the landfill for the purposes of licence compliance (since September 2015).

Variations in specific conductance between the discharge location (DIS and SED-1) and the upstream location (SMC) occurred in all quarterly sampling events during the 2016 reporting 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, one measurement exceeding the adopted ambient guideline criteria were measured around Cell 5. Cleanaway have installed 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).

Dust

Dust results (reported as insoluble matter) exceeding the adopted guideline levels were reported at a number of monitoring locations between January and May. The continuation of routine dust monitoring would also be beneficial to confirm if elevated dust generation continues at the site. GHD understands that Cleanaway intend to engage a suitably qualified consultant to review the dust monitoring program including the location of the dust monitoring locations at the completion of the entrance upgrade works.

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
GHD Pty Ltd

Attachment A – Monitoring Locations Map

Attachment A – Monitoring Locations Map

483,500

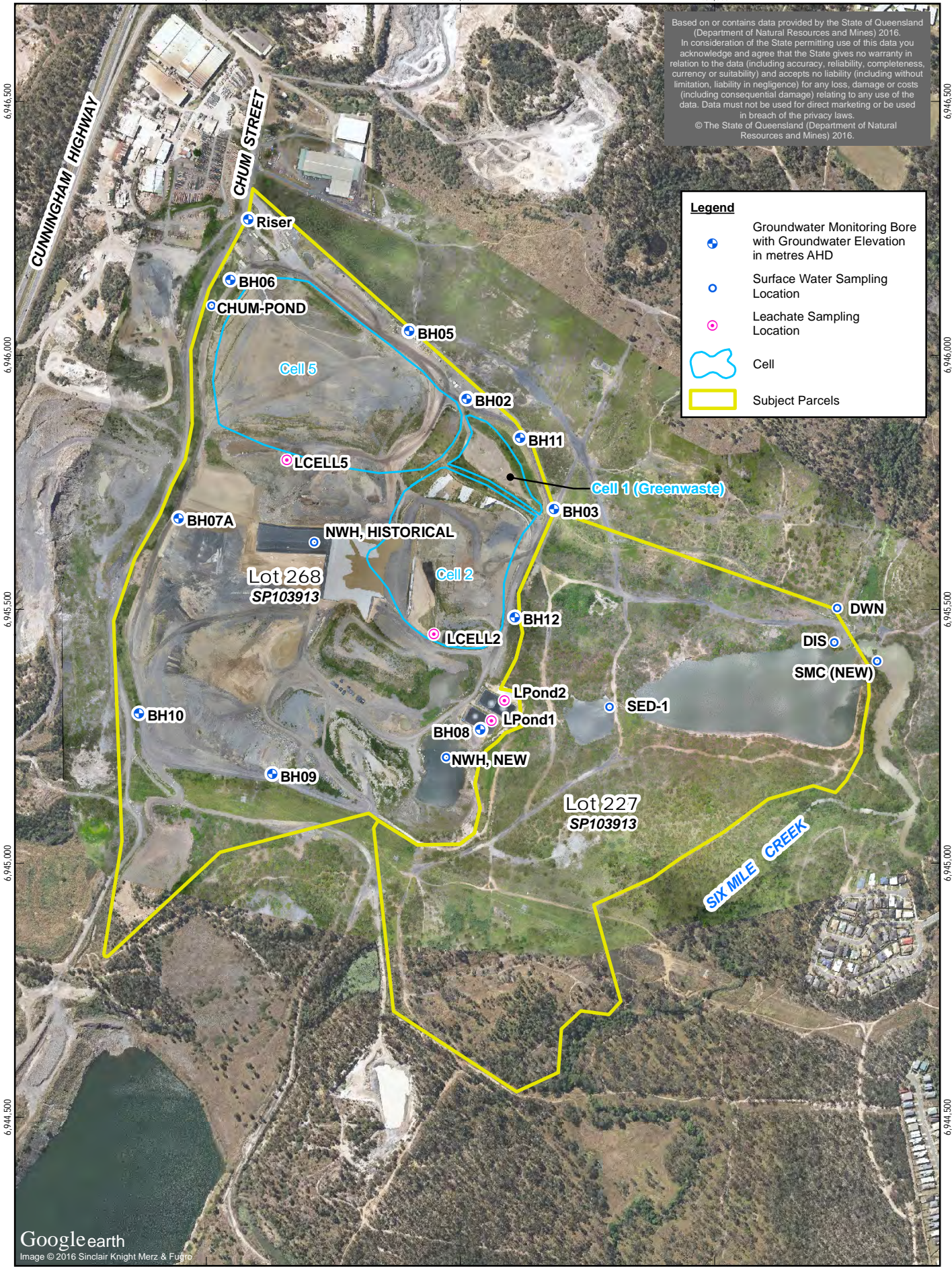
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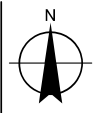
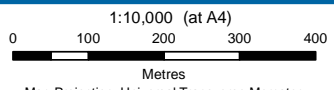
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Legend

- Groundwater Monitoring Bore with Groundwater Elevation in metres AHD
- Surface Water Sampling Location
- Leachate Sampling Location
- Cell
- Subject Parcels



Googleearth
 Image © 2016 Sinclair Knight Merz & Fugro

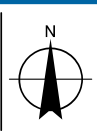
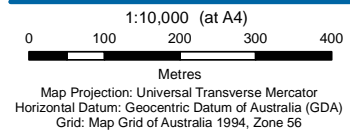


Cleanaway Waste Management Limited Job Number 41-29798
 100 Chum Street, New Chum, 4303. Revision A
 Date 09 Nov 2016

Monitoring Locations Figure 1

N:\AU\Gold Coast\Projects\41\29798\GIS\Maps\MXD\41-29798-10_newChumMonLocs_nov2016_revA.mxd 145 Ann Street Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com
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 Data Source: DNRM - Cadastre (2014), Google Earth Pro - Imagery Date - Sept 2013, addition client supplied imagery (21 Jan 2015), GHD - Ground Water Monitoring and Surface Water Sampling Locations (2016). Created: jvc

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Cleanaway Waste Management Limited
100 Chum Street, New Chum, 4303.
Dust Deposition Monitoring Locations
Job Number: 41-27447
Revision: B
Date: 04 Mar 2015
Figure 2