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Our Ref: 202334_REP_029.docx

15 January 2016

The General Manager
Lithgow City Council
PO Box 19
LITHGOW NSW 2790

Attention: Mr Damon Cupitt

PORTLAND WASTE DISPOSAL DEPOT ENVIRONMENTAL MONITORING – DECEMBER 2015

This letter summarises the results of the annual environmental monitoring undertaken on 3 December 2015. The environmental monitoring included:

- Groundwater level measurements; and
- Groundwater quality sampling.

Groundwater Levels

Groundwater levels were recorded at monitoring stations MP1, MP3, MP5, MP8 and MP9. The locations of the monitoring points are provided as an attachment. The quarterly groundwater level measurements are provided as an attachment in **Table 1** and are illustrated below in **Chart 1**.

Groundwater levels fell at all monitoring stations since the previous monitoring conducted in December 2014, with the exception of MP9 which had resumed overflowing in December 2015, having been previously recorded at 0.05 m below the piezometer casing level in December 2014. It is also noted that groundwater was recorded at MP3 in December 2015, having been dry in December 2014. The average fall in groundwater across wells MP1, MP5 and MP8 was 0.27 m

The groundwater levels are indicative of a flow from south-east (914.03 mAHD at MP5) to north-west (908.73 mAHD at MP8). All levels were observed to be consistent with the historical ranges.

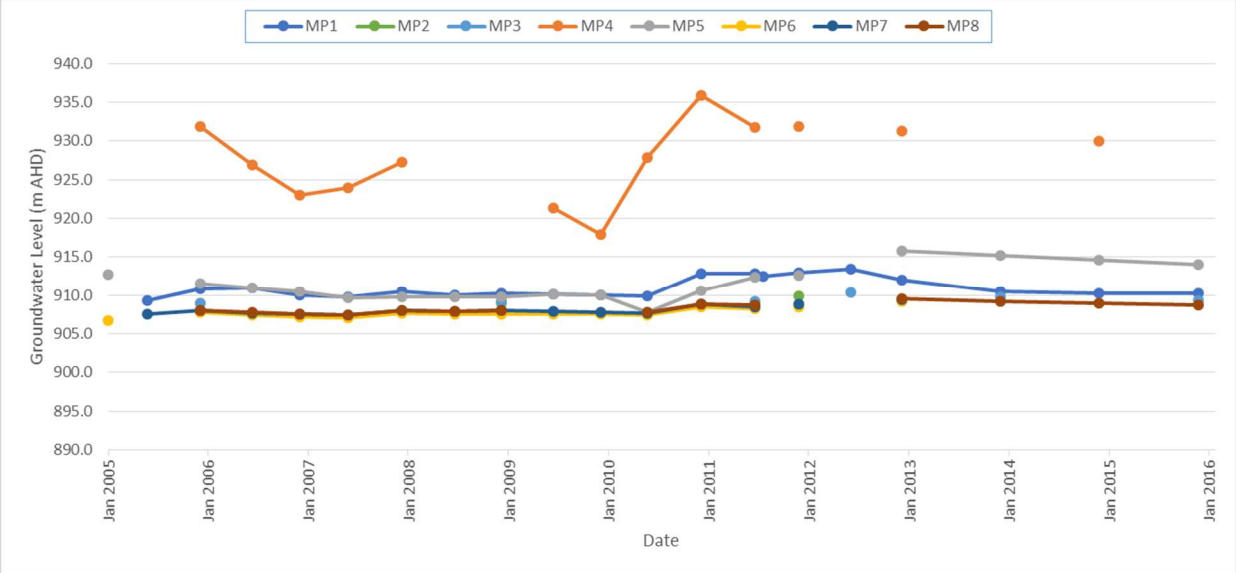


Chart 1: **Portland Waste Disposal Depot - Groundwater Levels**

Groundwater Quality

Groundwater samples were collected from monitoring stations MP1, MP5, MP8 and MP9. It is noted that MP4, MP6 and MP7 are no longer required to be monitored by EPL 10936. Monitoring stations MP2 and MP3 could not be sampled as they were either dry or failed to recharge following purging. Collected groundwater samples were analysed for the annual suite of parameters.

The groundwater quality results are summarised as an attachment in **Table 2**.

Observations are as follows:

- The pH of MP1 remains slightly acidic at 6.26, whilst pH at locations MP5 , MP8 and MP9 was recorded as being slightly alkaline (at 7.68, 7.25 and 7.50, respectively). MP1 continued to be below the range recommended as suitable for livestock drinking water (6.5 – 8.5 pH units, Markwick, 2007). All laboratory values recorded are consistent with historical ranges.
- The highest electrical conductivity (EC) was recorded at MP9 (3,800 µS/cm). The value recorded at MP5 (1,360 µS/cm) was the lowest of the December 2015 monitoring round. Corresponding total dissolved solids (TDS) ranged from 2,546 mg/L to 911 mg/L, with all recorded concentrations below the 'loss of production' threshold of the livestock drinking water guideline range considered suitable for the most susceptible category, poultry (3,000 to 4,000 mg/L, ANZECC & ARMCANZ, 2000). All EC and TDS values are consistent with historical ranges.
- Alkalinity concentrations were consistent with historical results and ranged from 43 mg/L at MP1 to 628 mg/L at MP9. Alkalinity at all locations, with the exception of MP1, exceeded the guideline hardness value for potential fouling of waters (350 mg/L, ANZECC & ARMCANZ, 2000).
- Ammonia was detected in low concentrations ranging up to 0.13 mgN/L at MP1. All concentrations were consistent with historical results. It is noted that the elevated ammonia

concentration previously recorded at MP1 (4.84 mg/L in December 2014) has significantly reduced.

- The highest nitrate concentration was recorded at MP1 at 2.51 mgN/L. MP9 had the lowest nitrate concentration at below the laboratory limit of reporting (LOR) of 0.01 mgN/L. All values were lower than the livestock drinking water guideline value of 90.29 mgN/L (ANZECC & ARMCANZ, 2000) and were consistent with historical ranges. It is noted that the nitrate concentration at MP1 may be subject to an increasing trend, with the December 2015 concentration being the highest recorded at MP1 since June 2010.
- Chloride ranged up to 348 mg/L at MP9, which is below the concentration recommended for irrigation to moderately tolerant crops (<700 mg/L, ANZECC & ARMCANZ, 2000). All concentrations are consistent with historical ranges.
- Fluoride ranged from 0.1 mg/L at MP1 to 0.3 mg/L at MP5 and MP9.
- Sulfate at MP1 was again the highest at 1,290 mg/L which remains within the range where adverse effects may occur in livestock (1,000 – 2,000 mg/L, ANZECC & ARMCANZ, 2000). All concentrations were consistent with historical results.
- Iron was consistent with established ranges, with the highest value recorded at MP8 (1.76 mg/L) MP4, which was above the maximum concentration recommended as suitable for long-term crop irrigation (0.2 mg/L, ANZECC & ARMCANZ, 2000), along with MP9 (0.77 mg/L). Iron is not considered sufficiently toxic to present a risk to livestock (ANZECC & ARMCANZ, 2000) or human health (NHMRC & NRMMC, 2011), however aesthetic aspects may be evident at concentrations greater than 0.3 mg/L. The iron concentration at MP1 was observed to have reduced from the elevated concentration recorded in December 2014 (6.49 mg/L).
- Calcium results ranging from 107 mg/L at MP1 to 345 mg/L at MP9 were recorded in December 2015. All concentrations were below the livestock drinking water guideline value of 1,000 mg/L (ANZECC & ARMCANZ, 2000) and are consistent with historical ranges.
- Sodium concentrations were all lower than the 460 mg/L recommended for irrigation to moderately tolerant crops (ANZECC & ARMCANZ, 2000). MP9 recorded the highest sodium at 221 mg/L. All values are consistent with established ranges.
- Potassium concentrations were consistent with historical ranges and ranged from 5 mg/L at MP9 to 78 mg/L at MP1.
- Magnesium concentrations ranged from 29 mg/L at MP1 to 217 mg/L at MP9. All concentrations are consistent with historical results.
- Manganese was lowest at MP5 (0.063 mg/L) and highest at MP8 (2.26 mg/L). All values were consistent with established ranges.
- Total organic carbon (TOC) concentrations ranged from 2 mg/L at MP9 to 45 mg/L at MP1. The TOC concentration at MP1 is considered elevated, however has reduced in concentration from 92 mg/L recorded in December 2014. Concentrations will continue to be monitored to identify the development of any adverse trend.
- Total phenols were below the laboratory LOR (<0.05 mg/L) at all groundwater monitoring points.
- Organochlorine and organophosphorus pesticides were also below the laboratory LOR at all groundwater monitoring points.

Surface Water Sampling

Surface water samples were not collected from monitoring station SW1 at the time of the December monitoring round as the monitoring point was not discharging. No discharge events have occurred since the discharge sample was collected in January 2015. The location of this monitoring station is illustrated in **Figure 1**.

Conclusions

The results for this annual monitoring round generally indicate minimal in groundwater conditions at the Portland Waste Disposal Depot since the previous monitoring conducted in December 2014.

A difference in groundwater quality between the upgradient location at MP5 and downgradient locations is apparent. Concentrations of sulfate, calcium, chloride, iron, manganese and TDS are relatively elevated at downgradient locations MP8 and MP9, whilst chloride, ammonia, potassium, nitrate and TOC are relatively elevated at MP1. Further, alkalinity and pH are lower at downgradient location MP1, in comparison to MP5.

pH at MP1 was consistent with historical results but remains more acidic than the range recommended for livestock drinking water. The sulfate level at MP8 and MP9 may pose a health risk to susceptible livestock.

Water consumed by livestock which is outside the pH guideline range may cause digestive upsets resulting in rejection of the water, suppressed appetite, consequent loss of production and ultimately death (Markwick, 2007).

Sulfate which exceeds the upper limit of the guideline range (2,000 mg/L) may cause chronic health problems in livestock, particularly diarrhoea and dehydration in young stock.

No discharge events have occurred from monitoring point SW1, as such no samples have been required to be collected.

Total alkalinity at the concentrations recorded at MP5, MP8 and MP9 is likely to result in potential fouling of waters, which can decrease yield as a result of clogging, encrustation and scaling, This may not be attributable to landfill activities as elevated alkalinity was recorded at the upgradient location MP5.

Geolyse notes the anticipated groundwater flow direction is towards the north or north-west. Potential receptors of groundwater aquifer may include groundwater bores and surface water bodies, including creeks (permanent or ephemeral) and dams. An unnamed tributary of Williwa Creek is located approximately 230 m north-west of the site and a farm dam is located approximately 50 m north of the site. No registered groundwater bores are located within a 1 km radius of the site.

The next routine monitoring round is scheduled for December 2016 with surface water to be collected biannually during discharge. If you have any queries regarding the above information please do not hesitate to contact us.

Yours faithfully
Geolyse Pty Ltd

BRENDAN STUART
Environmental Scientist

No. of Attachments – 4: Figure 1 – Environmental Monitoring Point Locations

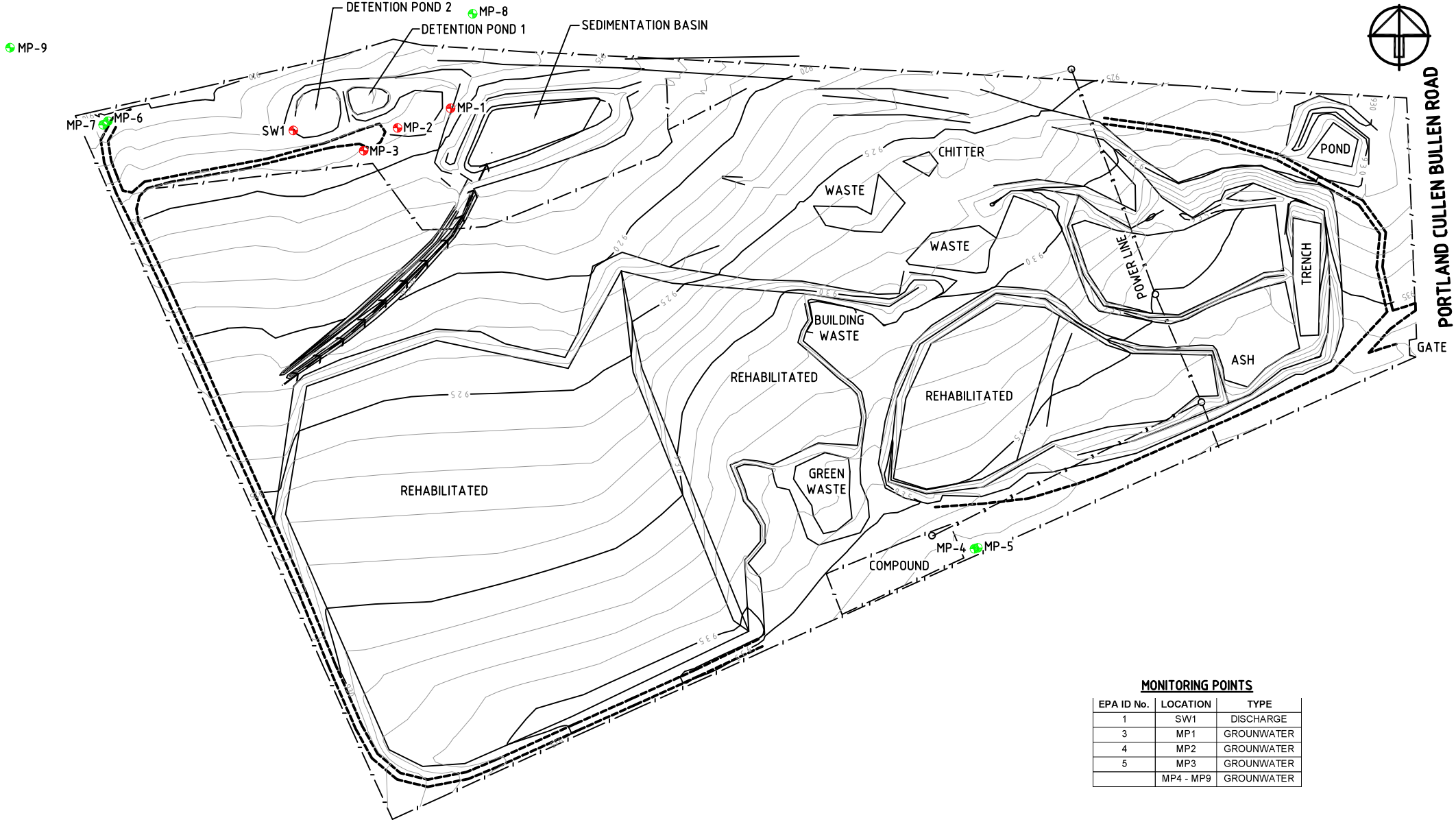
Table 1 – Reduced Groundwater Levels

Table 2 – Results of Laboratory Analysis

ALS Environmental Laboratory Report

References:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality and the Agriculture and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ), 2000, '*Australian and New Zealand Guidelines for Fresh and Marine Water Quality*'. Australia.
- Markwick, G 2007, '*Water requirements for sheep and cattle'*, Primefact 326, New South Wales Department of Primary Industries, Australia.
- National Health and Medical Research Council and the Natural Resource Management Ministerial Council (NHMRC & NRMMC), 2011, '*National Water Quality Management Strategy: Australian Drinking Water Guidelines'*, Australia. (updated 2015)



MONITORING POINTS

EPA ID No.	LOCATION	TYPE
1	SW1	DISCHARGE
3	MP1	GROUNWATER
4	MP2	GROUNWATER
5	MP3	GROUNWATER
	MP4 - MP9	GROUNWATER

LEGEND:

- EPA MONITORING POINT
- ADDITIONAL MONITORING POINT

0 20 40 60 80 100

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No	DATE	DRAFTING CHECK	PM CHECK	DETAILS
A	15/09/08	-	-	ISSUED TO CLIENT
B	11/05/11	LRP	AGB	ISSUED TO CLIENT
C	01/11/12	MDH	KBF	ISSUED TO CLIENT

PROJECT: PORTLAND WASTE DISPOSAL DEPOT

FILE REFERENCE: O:\Projects\202334_01B_EV01.dwg

APPROVAL AUTHORITY: ENVIRONMENTAL PROTECTION AUTHORITY
EPL: 10936

CLIENT: LITHGOW CITY COUNCIL
180 MORT STREET,
LITHGOW NSW 2790

DRAWING: ENVIRONMENTAL MONITORING POINTS

PROJECT NUMBER: 202334 DRAWING NUMBER: 01C_EV01 REV. C

SOURCE: CRAVEN, ELLISTON & HAYES (LITHGOW) PTY.LTD. CONSULTING LAND, ENGINEERING AND MINING SURVEYORS

TABLE 1 EPL 10936 PORTLAND WASTE DISPOSAL DEPOT

Ground Water Levels: 3-Dec-15

Piezometer Details:

	Ground Elev (mAHD)	Stickup (m)	Elevation Top PVC (mAHD)	Date	Measured	GWL (mAHD)	Well Depth	Well Base	Water Column
MP1	913.700	0.4	914.100	3/12/2015	3.84	910.26	6.0	908.09	2.17
MP2	913.600	0.2	913.800	3/12/2015	NMWL	-	5.5	908.30	nil
MP3	914.200	0.6	914.800	3/12/2015	5.45	909.35	5.9	908.90	0.45
MP4	937.200	0.8	938.000	3/12/2015	NMWL	-	23.5	914.50	nil
MP5	937.200	0.8	938.000	3/12/2015	23.97	914.03	31.5	906.50	7.53
MP6	910.500	0.7	911.200	3/12/2015	NMWL	-	13.6	897.65	nil
MP7	910.700	0.7	911.400	3/12/2015	NMWL	-	8.7	902.75	nil
MP8	911.800	0.5	912.300	3/12/2015	3.57	908.73	13.2	899.10	9.63
MP9	903.800	1.1	904.900	3/12/2015	-0.05	904.95	16.7	888.20	16.75

Definitions:

Stickup: Height of piezometer pipe above ground surface

Ground Elevation: Actual elevation of ground at the piezometer relative to an arbitrary datum. All ground elevations are measured to the same datum, hence piezo GWLs are relative to each other.

GWL: Actual elevation of groundwater at the piezometer relative to an arbitrary datum.

Measured: Depth of groundwater measured from the top of the bore casing.

NMWL: No measureable water level.

	MP1		**MP2**		**MP3**		**MP4**		**MP5**		**MP6**		**MP7**		**MP8**		**MP9**	
Date	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)	Measured	GWL (mAHD)
11-Jan-05	NMWL		NMWL		NMWL		NMWL		25.32	912.68	3.75	906.75	3.68		NMWL		NMWL	
1-Jun-05	4.74	909.36	NMWL		NMWL		14.30		26.21		3.92		3.84	907.56	NMWL		NMWL	
13-Dec-05	3.31	910.79	NMWL		5.87	908.93	6.12	931.88	26.45	911.55	3.48	907.72	3.40	908.00	4.30	908.00	-0.05	904.95
20-Jun-06	3.10	911.00	NMWL		NMWL		11.14	926.86	27.05	910.95	3.77	907.43	3.70	907.70	4.57	907.73	-0.05	904.95
11-Dec-06	4.08	910.02	NMWL		NMWL		14.97	923.03	27.50	910.50	3.99	907.21	3.90	907.50	4.81	907.49	0.10	904.80
5-Jun-07	4.33	909.77	NMWL		NMWL		14.04	923.96	28.38	909.62	4.12	907.08	4.04	907.36	4.94	907.36	0.26	904.64
19-Dec-07	3.57	910.53	NMWL		NMWL		10.70	927.30	28.25	909.75	3.52	907.68	3.42	907.98	4.31	907.99	-0.05	904.95
30-Jun-08	4.06	910.04	NMWL		NMWL		NMWL		28.22	909.78	3.65	907.55	3.55	907.85	4.45	907.85	-0.05	904.95
16-Dec-08	3.80	910.30	4.90	908.90	5.65	909.15	NMWL		28.21	909.79	3.62	907.58	3.45	907.95	4.25	908.05	-0.05	904.95
23-Jun-09	4.02	910.08	NMWL		NMWL		16.67	921.33	27.86	910.14	3.64	907.56	3.55	907.85	4.45		-0.05	904.95
14-Dec-09	4.11	909.99	NMWL		NMWL		20.02	917.98	27.95	910.05	3.72	907.48	3.63	907.77	4.52		0.27	904.63
1-Jun-10	4.21	909.89	NMWL		NMWL		10.19	927.81	30.20	907.80	3.80	907.40	3.71	907.69	4.48	907.82	0.00	904.90
15-Dec-10	1.23	912.87	NMWL		NMWL		2.15	935.85	27.37	910.63	2.70	908.50	2.62	908.78	3.44	908.86	-0.05	904.95
29-Jun-11	1.30	912.80	NMWL		5.65	909.15	6.21	931.79	25.67	912.33	2.98	908.22	2.91	908.49	3.62	908.68	-0.05	904.95
27-Jul-11	1.57	912.53	NMWL		NMWL		NMWL		NMWL		NMWL		NMWL		NMWL		NMWL	
6-Dec-11	1.14	912.96	3.85	909.95	NMWL		6.09	931.91	25.40	912.60	2.67	908.53	2.59	908.81	Bore Damaged		-0.05	904.95
13-Jun-12	0.70	913.40	NMWL		4.48	910.32	NMWL		NMWL		NMWL		NMWL		NMWL		NMWL	
16-Dec-12	2.09	912.01	NMWL		NMWL		6.73	931.27	22.22	915.78	1.99	909.21	1.92	909.48	2.77	909.53	-0.05	904.95
11-Dec-13	3.57	910.53	NMWL		4.98	909.82	NMWL		22.79	915.21	NMWL		NMWL		3.16	909.14	-0.05	904.95
4-Dec-14	3.80	910.30	NMWL		NMWL		8.00	930.00	23.43	914.57	NMWL		NMWL		3.33	908.97	0.05	904.85
3-Dec-15	3.84	910.26	NMWL		5.45	909.35	NMWL		23.97	914.03	NMWL		NMWL		3.57	908.73	-0.05	904.95

TABLE 2 EPL 10936 PORTLAND WASTE DISPOSAL DEPOT - RESULTS OF LABORATORY ANALYSIS
DECEMBER 2015

			Sample ID	MP1	MP5	MP8	MP9
			Sample Date	3/12/2015	3/12/2015	3/12/2015	3/12/2015
Group	**Analyte**	**LOR**	**Units**	PS	PS	PS	PS
pH by PC Titrator	pH Value	0.01	pH Unit	**6.26**	**7.68**	**7.25**	**7.5**
Conductivity by PC Titrator	Electrical Conductivity @ 25°C	1	µS/cm	**1520**	**1360**	**3120**	**3800**
Alkalinity by PC Titrator	Bicarbonate Alkalinity as CaCO3	1	mg/L	**43**	**463**	**488**	**628**
	Carbonate Alkalinity as CaCO3	1	mg/L	< 1	< 1	< 1	< 1
	Hydroxide Alkalinity as CaCO3	1	mg/L	< 1	< 1	< 1	< 1
	Total Alkalinity as CaCO3	1	mg/L	**43**	**463**	**488**	**628**
Chloride by Discrete Analyser	Chloride	1	mg/L	**223**	**34**	**283**	**348**
Fluoride by PC Titrator	Fluoride	0.1	mg/L	**0.1**	**0.3**	**0.2**	**0.3**
Sulfate as SO4 - Turbidimetric	Sulfate as SO4 - Turbidimetric	1	mg/L	**333**	**232**	**1000**	**1290**
Major Cations - Dissolved	Calcium	1	mg/L	**107**	**133**	**325**	**345**
	Magnesium	1	mg/L	**29**	**55**	**140**	**217**
	Potassium	1	mg/L	**78**	**6**	**6**	**5**
	Sodium	1	mg/L	**84**	**73**	**161**	**221**
Ionic Balance by PCT DA and Turbi SO4 DA	Ionic Balance	0.01	%	**2.54**	**1.85**	**4.96**	**4.68**
	Total Anions	0.01	meq/L	**14.1**	**15**	**38.6**	**49.2**
	Total Cations	0.01	meq/L	**13.4**	**14.5**	**34.9**	**44.8**
Ammonia as N by Discrete analyser	Ammonia as N	0.01	mg/L	**0.13**	**0.02**	**0.04**	**0.02**
Nitrate as N by Discrete Analyser	Nitrate as N	0.01	mg/L	**2.51**	**0.08**	**0.06**	< 0.01
Nitrite and Nitrate as N (NOx) by Discrete Analyse	Nitrite + Nitrate as N	0.01	mg/L	**2.51**	**0.08**	**0.06**	< 0.01
Nitrite as N by Discrete Analyser	Nitrite as N	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Dissolved Metals by ICP-MS - Suite A	Iron	0.05	mg/L	**0.12**	< 0.05	**1.76**	**0.77**
	Manganese	0.001	mg/L	**0.545**	**0.063**	**2.26**	**1.01**
Total Organic Carbon	Total Organic Carbon	1	mg/L	**45**	**6**	**3**	**2**
Total Phenol by Discrete Analyser	Phenols (Total)	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
OC Pesticides by GCMS	alpha-BHC	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Hexachlorobenzene (HCB)	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	beta-BHC	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	gamma-BHC	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	delta-BHC	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Heptachlor	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Aldrin	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Heptachlor epoxide	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	trans-Chlordane	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	alpha-Endosulfan	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	cis-Chlordane	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Dieldrin	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	4.4`-DDE	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Endrin	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	beta-Endosulfan	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	4.4`-DDD	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Endrin aldehyde	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Endosulfan sulfate	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	4.4`-DDT	2	µg/L	< 2	< 2	< 2	< 2
	Endrin ketone	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Methoxychlor	2	µg/L	< 2	< 2	< 2	< 2
	Total Chlordane (sum)	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Sum of DDD + DDE + DDT	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Sum of Aldrin + Dieldrin	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
OP Pesticides by GCMS	Dichlorvos	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Demeton-S-methyl	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Monocrotophos	2	µg/L	< 2	< 2	< 2	< 2
	Dimethoate	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Diazinon	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Chlorpyrifos-methyl	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Parathion-methyl	2	µg/L	< 2	< 2	< 2	< 2
	Malathion	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Fenthion	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Chlorpyrifos	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Parathion	2	µg/L	< 2	< 2	< 2	< 2
	Pirimphos-ethyl	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Chlorfenvinphos	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Bromophos-ethyl	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Fenamiphos	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Prothiofos	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Ethion	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Carbophenothion	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5
	Azinphos Methyl	0.5	µg/L	< 0.5	< 0.5	< 0.5	< 0.5

µS/cm	microsiemens per centimetre
mg/L	milligrams per litre
µg/L	micrograms per litre
LOR	limit of reporting
PS	primary sample

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1537995**	Page	: 1 of 5
Client	: **LITHGOW CITY COUNCIL**	Laboratory	: Environmental Division Sydney
Contact	: MR BRENDON STUART	Contact	:
Address	: PO BOX 19 LITHGOW NSW, AUSTRALIA 2790	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: bstuart@geolyse.com	E-mail	:
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: 202334, Portland Landfill	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: 075309-ENVR	Date Samples Received	: 04-Dec-2015 09:00
C-O-C number	: ----	Date Analysis Commenced	: 04-Dec-2015
Sampler	: DEAN LAVERS	Issue Date	: 11-Dec-2015 15:55
Site	: ----		
		No. of samples received	: 4
Quote number	: ----	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Organics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MP1	MP5	MP8	MP9	----
				Client sampling date / time	03-Dec-2015 12:30	03-Dec-2015 08:30	03-Dec-2015 09:15	03-Dec-2015 11:00	----
Compound	CAS Number	LOR	Unit		ES1537995-001	ES1537995-002	ES1537995-003	ES1537995-004	--------
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.26	7.68	7.25	7.50	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		1520	1360	3120	3800	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		43	463	488	628	----
Total Alkalinity as CaCO3	----	1	mg/L		43	463	488	628	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		333	232	1000	1290	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		223	34	283	348	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		107	133	325	345	----
Magnesium	7439-95-4	1	mg/L		29	55	140	217	----
Sodium	7440-23-5	1	mg/L		84	73	161	221	----
Potassium	7440-09-7	1	mg/L		78	6	6	5	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.545	0.063	2.26	1.01	----
Iron	7439-89-6	0.05	mg/L		0.12	<0.05	1.76	0.77	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.1	0.3	0.2	0.3	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.13	0.02	0.04	0.02	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		2.51	0.08	0.06	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		2.51	0.08	0.06	<0.01	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		14.1	15.0	38.6	49.2	----
Total Cations	----	0.01	meq/L		13.4	14.5	34.9	44.8	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MP1	MP5	MP8	MP9	----
				Client sampling date / time	03-Dec-2015 12:30	03-Dec-2015 08:30	03-Dec-2015 09:15	03-Dec-2015 11:00	----
Compound	CAS Number	LOR	Unit		ES1537995-001	ES1537995-002	ES1537995-003	ES1537995-004	--------
					Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
Ionic Balance	----	0.01	%		**2.54**	**1.85**	**4.96**	**4.68**	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**45**	**6**	**3**	**2**	----
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		<0.05	<0.05	<0.05	<0.05	----
EP068A: Organochlorine Pesticides (OC)									
alpha-BHC	319-84-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
beta-BHC	319-85-7	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
gamma-BHC	58-89-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
delta-BHC	319-86-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Heptachlor	76-44-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Aldrin	309-00-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Heptachlor epoxide	1024-57-3	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
trans-Chlordane	5103-74-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
alpha-Endosulfan	959-98-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
cis-Chlordane	5103-71-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Dieldrin	60-57-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
4.4`-DDE	72-55-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Endrin	72-20-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
beta-Endosulfan	33213-65-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
4.4`-DDD	72-54-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Endrin aldehyde	7421-93-4	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Endosulfan sulfate	1031-07-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
4.4`-DDT	50-29-3	2	µg/L		<2.0	<2.0	<2.0	<2.0	----
Endrin ketone	53494-70-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Methoxychlor	72-43-5	2	µg/L		<2.0	<2.0	<2.0	<2.0	----
^ Total Chlordane (sum)	----	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	MP1	MP5	MP8	MP9	----
				Client sampling date / time	03-Dec-2015 12:30	03-Dec-2015 08:30	03-Dec-2015 09:15	03-Dec-2015 11:00	----
Compound	CAS Number	LOR	Unit		ES1537995-001	ES1537995-002	ES1537995-003	ES1537995-004	--------
					Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued									
Monocrotophos	6923-22-4	2	µg/L		<2.0	<2.0	<2.0	<2.0	----
Dimethoate	60-51-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Diazinon	333-41-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Parathion-methyl	298-00-0	2	µg/L		<2.0	<2.0	<2.0	<2.0	----
Malathion	121-75-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Fenthion	55-38-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos	2921-88-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Parathion	56-38-2	2	µg/L		<2.0	<2.0	<2.0	<2.0	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Chlorfenvinphos	470-90-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Bromophos-ethyl	4824-78-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.5	%		**104**	**117**	**106**	**75.1**	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.5	%		**94.1**	**94.3**	**88.2**	**80.4**	----