ANNUAL ENVIRONMENTAL MONITORING REPORT
17 AUGUST 2014 TO 16 AUGUST 2015

PORTLAND GARBAGE DEPOT EPL 10936

PREPARED FOR
LITHGOW CITY COUNCIL

SEPTEMBER 2015

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The preparation of this report has been in accordance with the project brief provided by the client and has relied upon the information, data and results provided or collected from the sources and under the conditions outlined in the report.

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Introduction

1.1 BACKGROUND

The Portland Garbage Depot (PGD) operates as a scheduled activity for waste disposal (application to land). The facility accepts all solid wastes consistent with this classification, including putrescible wastes and other wastes approved by the Environment Protection Authority (EPA).

The facility is owned by Lithgow City Council. The management and operation of the depot is undertaken in accordance with Environment Protection Licence (EPL) No. 10936 issued under Section 55 of the Protection of the Environment Operations Act 1997 (the Act). The depot is located approximately 2.5 kilometres north of Portland within Lots 156 and 157, DP 755769.

1.2 LICENCE REQUIREMENTS

EPL No. 10936 governs the design, construction, operation, monitoring and rehabilitation of the facility in accordance with the Act.

Section 5 of the licence provides instructions on environmental monitoring requirements. Specifically, Condition M2.1 describes the requirements to monitor the concentration of pollutants discharged to groundwater and surface water.

Annual reporting requirements are outlined in Condition R1.1:

> *R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:*
>
> *a) a Statement of Compliance; and*
>
> *b) a Monitoring and Complaints Summary.*
>
> *At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.*

The deadline for the Annual Return that is outlined in condition R1.5 states:

> *R1.5 The Annual Return for the reporting period must be supplied to the EPA by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').*

The reporting period is consistent with the enforcement period of the EPL and is from 17 August 2014 to 16 August 5

The monitoring period of this report is from December 2005 (when monitoring began at the facility with all current monitoring points) through to the end of the 2014/15 reporting period (i.e. 16 August 2015).

Condition R1.9 states:

> *R1.9 Monitoring Report.*
>
> *The licensee must supply with the Annual Return a Monitoring Report which provides:*
>
> *a) an analysis and interpretation of monitoring results;*
>
> *b) actions proposed/taken to correct identified adverse trends; and*

c) The achieved compaction rate (excluding cover material) for the premises, if applicable.

This Annual Environmental Management Report (AEMR) is a response to Condition R1.9. The reporting period for this AEMR is from 17 August 2014 to 16 August 2015.

1.3 REPORT STRUCTURE

- **Section 1** presents a brief introduction and background to the report;
- **Section 2** provides an overview of the environmental monitoring program undertaken at the facility during the reporting period;
- **Section 3** presents the data and discussion of data collected during the reporting period;
- **Section 4** presents all monitoring data that falls outside of the scope of environmental monitoring for the annual return year, including records of public complaints and quantities of waste deposited;
- **Section 5** presents a summary of all monitoring undertaken as described in detail in Section 3 and Section 4; and
- **Section 6** presents the conclusions and recommendations resulting from monitoring undertaken during the reporting period.

Environmental Monitoring Program

2.1 OVERVIEW

Environmental monitoring was undertaken at the PGD for groundwater in December 2014 and surface water in January 2015. Groundwater is required to be monitored annually and surface water is required to be monitored twice annually during discharge events, however the only discharge event that occurred during the reporting period was in January 2015.

This section summarises all environmental monitoring undertaken during the reporting period.

2.2 GROUNDWATER

The groundwater monitoring network was established in the late 1990s with the installation of three down-gradient monitoring wells (MP1, MP2 and MP3). CMJA (2005) designed and installed MP5, MP8 and MP9. MP5 was screened within the regional aquifer beneath the site, up gradient of the landfill. MP8 was designed to better define the hydraulic gradient in the deeper aquifer, and measure changes to groundwater quality from up-gradient monitoring wells. MP9 was screened within a confined aquifer and is down-gradient of the landfill. Drawing 01C_EV01 shows the configuration of the groundwater monitoring network. Additional monitoring points are identified on Drawing 01C_EV01 (including MP4, MP6 and MP7) which according to EPL 10936, no longer require to be monitored.

The groundwater monitoring points are identified as MP1, MP2, MP3, MP5, MP8 and MP9, respectively corresponding to EPL Points 3 through to 8.

Groundwater level measurement and sampling is undertaken on an annual basis in accordance with EPL 10936. Monitoring was undertaken in December 2014, where groundwater samples were collected and analysed for the following parameters:

- Alkalinity (as calcium carbonate)
- Ammonia
- Calcium
- Chloride
- Conductivity
- Fluoride
- Iron
- Magnesium
- Manganese
- Nitrate
- Pesticides
- pH
- Potassium
- Sodium
- Level
- Sulfate
- Total organic carbon
- Total Phenolics

Samples were unable to be collected from groundwater monitoring locations MP-2 and MP-3 (corresponding to EPL Points 4 and 5, respectively) due to insufficient water volume.

2.3 SURFACE WATER

Surface water monitoring is conducted at EPL Point 1, identified as SW1. The monitoring point is illustrated in Drawing 01C_EV01. In accordance with EPL 10936, this point is required to be sampled biannually during discharge, however only one discharge event occurred during the reporting period (January 2015).

Samples of surface water were collected and analysed for the following parameters:

- Alkalinity (as calcium carbonate)
- Ammonia
- Calcium
- Chemical oxygen demand
- Chloride
- Fluoride
- Iron
- Magnesium
- Manganese
- Nitrate
- pH
- Potassium
- Sodium
- Sulfate
- Total organic carbon
- Total Phenolics
- Total suspended solids

2.4 QUALITY CONTROL

The laboratory quality control meets the NEPM 2013 Schedule B(3) and ALS QCS3 requirement.

The ALS Quality Control Reports (**Appendix B**) provide the following:

- Laboratory Duplicate (DUP) Report: Relative Percentage Difference (RPD) and Acceptance Limits;
- Method Blank (MB) and Laboratory Control Spike (LCS) Report: % Recovery and Acceptance Limits; and
- Matrix Spike (MS) Report: % Recovery and Acceptance Limits.

Environmental Monitoring Results

3.1 INTRODUCTION

Monitoring results are presented in this section for all environmental monitoring undertaken during the reporting period. The laboratory data is presented, along with an interpretation of trends, variability and anomalies for groundwater and surface water. Any deficiencies in monitoring, environmental incidents and remedial actions undertaken to correct any problems or deficiencies are also discussed.

Monitoring data is summarised in the following figures and in the tables of **Appendix A**. All laboratory reports and chain-of-custody documentation are included in **Appendix B**.

3.2 GROUNDWATER

Groundwater monitoring consisted of annual level measurement and quality sampling at monitoring points MP1, MP2, MP3, MP5, MP8 and MP9. Monitoring was undertaken in December 2014.

No groundwater quality data was obtained from groundwater monitoring points MP2 and MP3 at the time of the annual sampling round due to insufficient water volume for sampling.

3.2.1 LEVELS

Groundwater level measurements are presented for all monitoring points in **Appendix A** and are illustrated below in **Figure 1**.

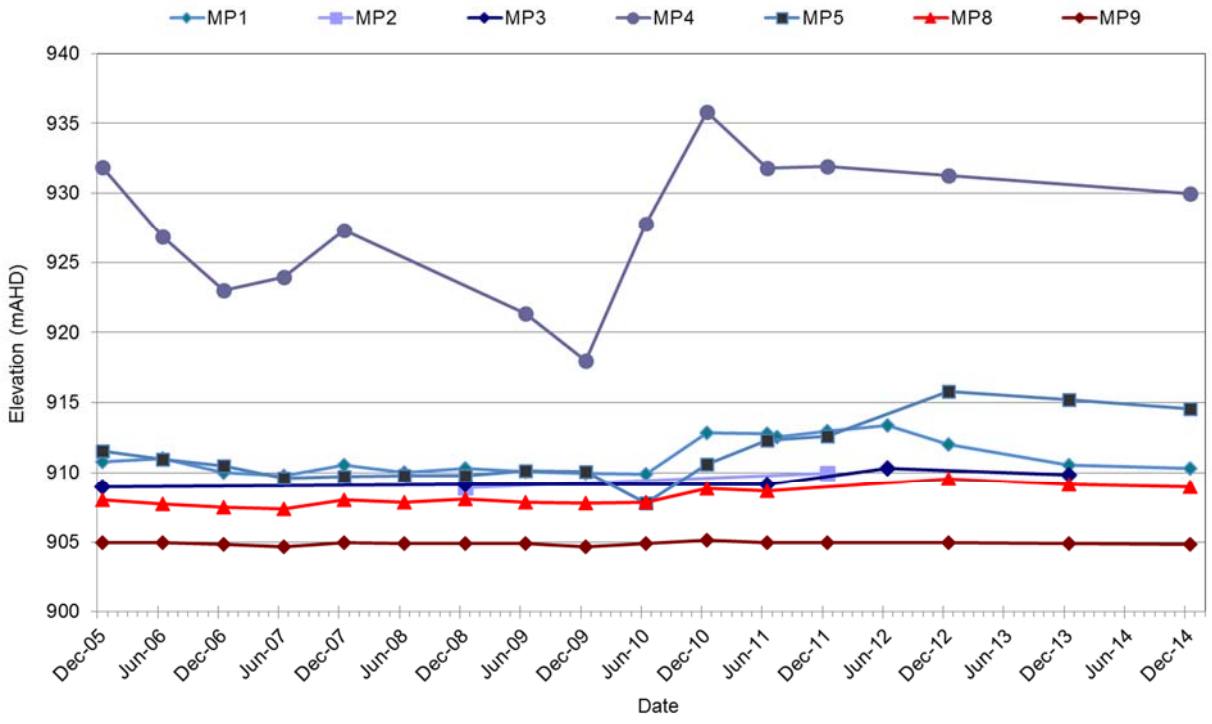


Figure 1: Groundwater levels – Portland Garbage Depot, December 2005 to December 2015

Groundwater levels were relatively constant in comparison to the previous reporting period. Groundwater levels generally decreased over the 12 month period, most notably at MP5 which decreased by 0.64 m in the 1 year period from December 2013 and December 2014, and at MP4 which decreased by 1.27 m in the 2 year period from December 2012 to December 2014 (insufficient volume

was available for sampling from MP4 in December 2013). All standing water levels were consistent with historical ranges.

Monitoring points MP4 and MP5 are paired shallow/deep groundwater bores, with groundwater at MP4 recorded to be 15.43 m higher than MP5. This is consistent with findings in the CMJA (2005) hydrogeological study for Portland Garbage Depot, and is attributed to the shallow groundwater system intersected by MP4, and deeper regional aquifer intersected by MP5.

From the data available it is likely that shallow groundwater flows in a north-westerly direction at a gradient of 0.067, generally consistent with the fall of the land, and consistent with CMJA (2005) findings.

The observed groundwater levels indicate that MP4 and MP5 are up-gradient of the landfill and MP1, MP2, MP3, MP8 and MP9 are down-gradient monitoring points (with MP9 the most down-gradient).

3.2.2 PHYSICAL PROPERTIES

In December 2014, groundwater pH levels were relatively neutral and slightly alkaline, with the exception of MP1, ranging between 7.43 (MP8) and 7.53MP4), as shown on **Figure 2**. The pH of MP1 was 6.12, and all samples except MP1 were within the recommended range for livestock drinking water (6.5 – 8.5, Markwick 2007) and were consistent with historical ranges.

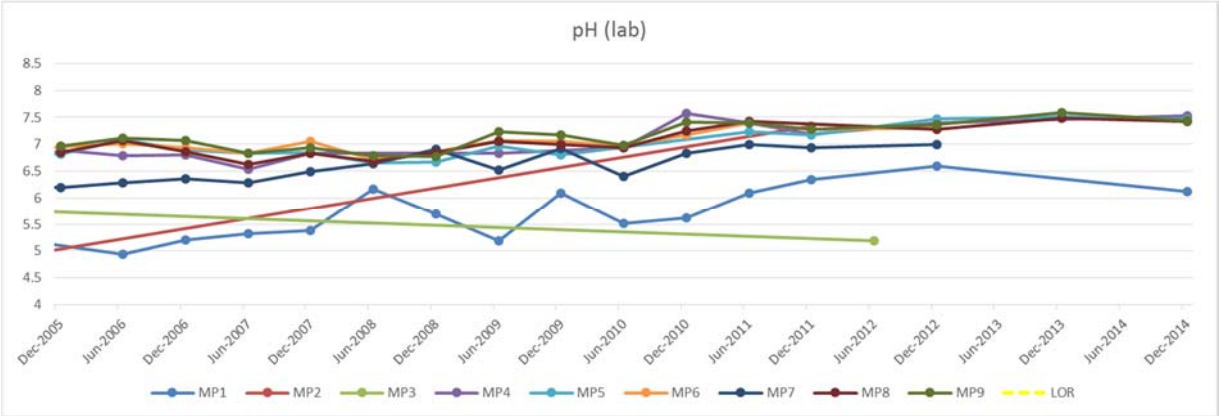


Figure 2: Groundwater pH – Portland Garbage Depot, December 2005 to December 2014

Groundwater electrical conductivity (EC) results in December 2014 were consistent with historical data and ranged from 1540 µS/cm at MP4, to 3240 µS/cm at MP9, as shown on **Figure 3**. Corresponding total dissolved solids (TDS) concentrations ranged from 1032 mg/L to 2171 mg/L and were below the loss of production threshold value of the most susceptible livestock category, poultry (ANZECC & ARMCANZ, 2000), however some initial reluctance to drink may be evident.

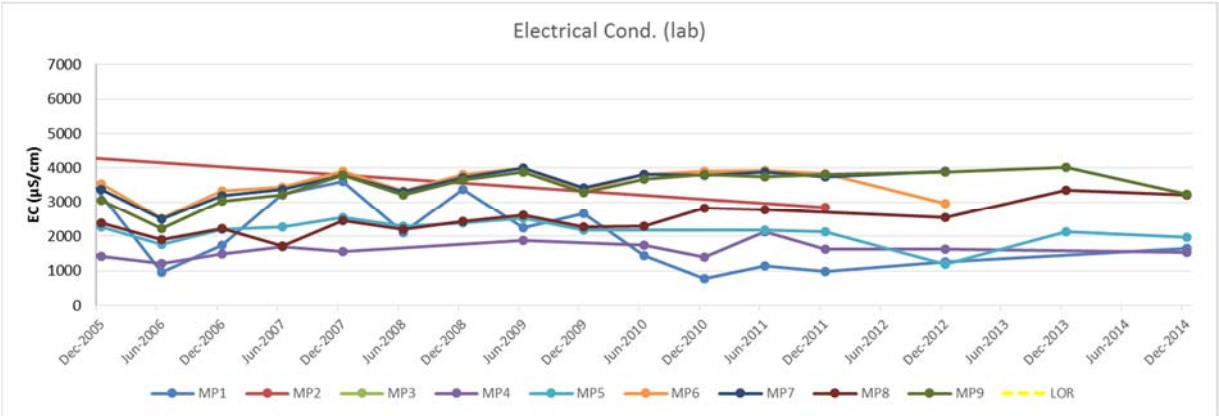


Figure 3: Groundwater EC – Portland Garbage Depot, December 2005 to December 2014

The lowest total alkalinity recorded in December 2014 was 44 mg/L at MP1 and the highest was 487 mg/L at MP8. All concentrations remained within the respective established ranges, with the

exception of a new minimum value (474 mg/L) at MP9, as shown on **Figure 4**. While there are no livestock drinking water guidelines for this parameter, all sites except MP1 and MP4 were higher than the guideline hardness value for potential fouling of waters (<350 mg/L – ANZECC & ARMCANZ, 2000).

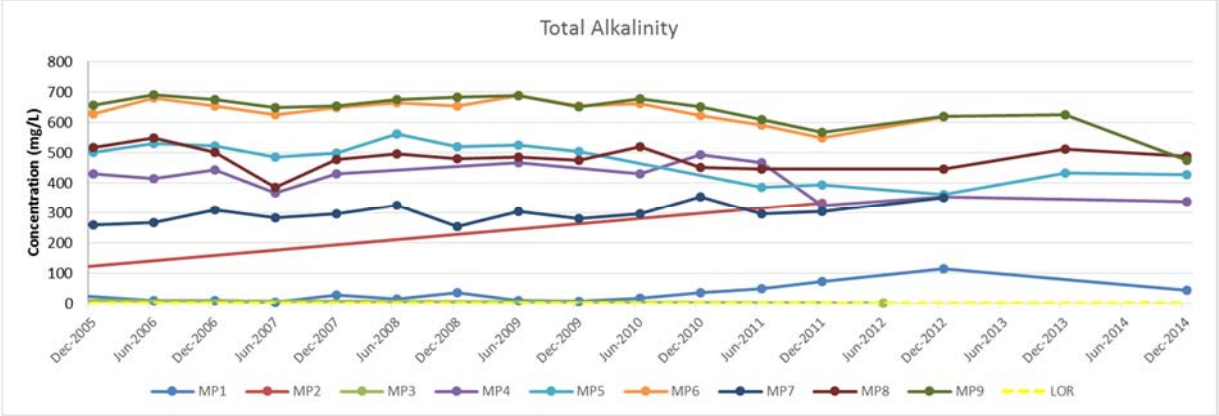


Figure 4: Groundwater Alkalinity – Portland Garbage Depot, December 2005 to December 2014

3.2.3 EXCHANGEABLE IONS

Fluoride concentrations in groundwater ranged from <0.1 mg/L (MP1) to 0.3 mg/L (MP5 and MP9) in December 2014. As shown on **Figure 5**, all values were consistent with historical results, and below the health limit for human drinking water (1.5 mg/L, NHMRC & NRMMC, 2011) and are considered suitable for livestock drinking water, being below the guideline value of 2 mg/L (ANZECC & ARMCANZ, 2000).

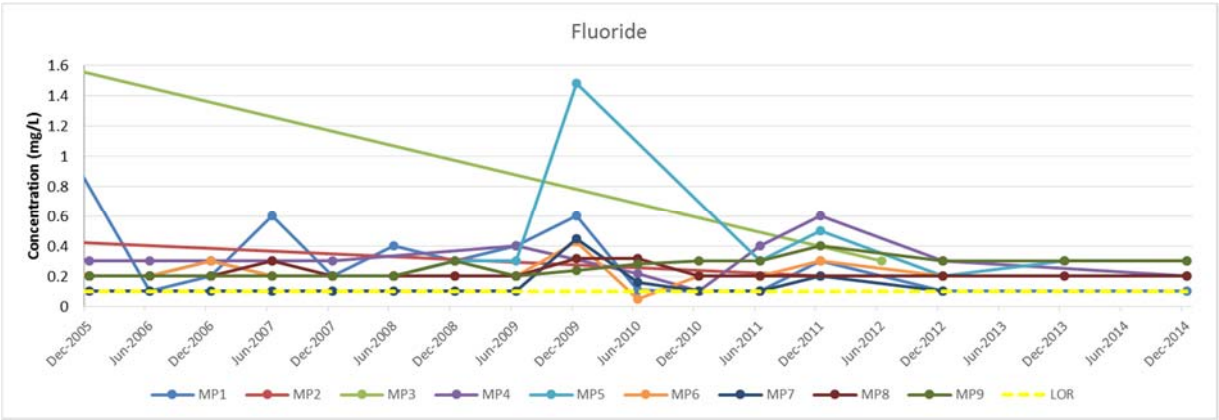


Figure 5: Groundwater Fluoride – Portland Garbage Depot, December 2005 to December 2014

The highest sulfate concentrations recorded in December 2014 were 1150 mg/L at MP9 and 1130 mg/L at MP8, where the latter exceeded the established range by 30 mg/L, as shown on **Figure 6**. All other concentrations were within established ranges. The elevated sulfate concentrations recorded at monitoring stations MP8 and MP9 may cause adverse health effects if consumed by susceptible animals (1000-2000mg/L – ANZECC & ARMCANZ, 2000).

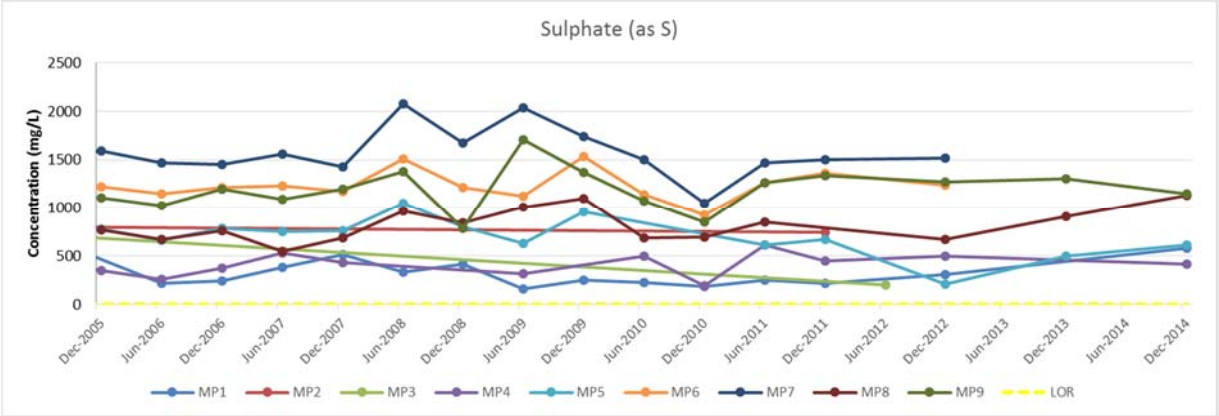


Figure 6: Groundwater Sulfate – Portland Garbage Depot, December 2005 to December 2014

Concentrations of calcium in groundwater in December 2014 were consistent with established ranges at all monitoring points. The highest concentration of the monitoring round was 374 mg/L (MP9), which was below the 1000 mg/L recommended for livestock drinking water (ANZECC & ARMCANZ, 2000), as shown on **Figure 7**.

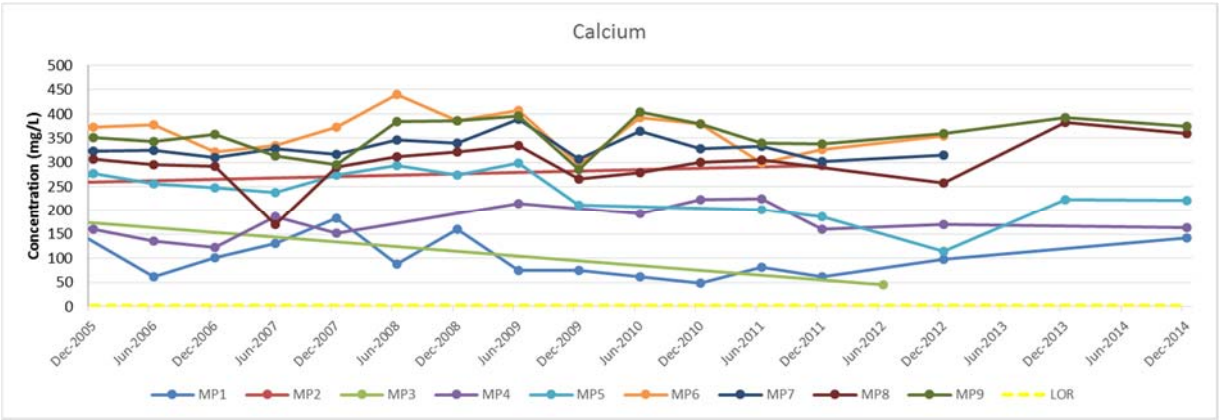


Figure 7: Groundwater Calcium – Portland Garbage Depot, December 2005 to December 2014

Chloride concentrations in groundwater ranged from 66 mg/L at MP4 to 300 mg/L at both MP8 and MP9 in December 2014. Chloride is a relatively new parameter in the analytical suite (n=3) and the range of variability has not been definitively established. Chloride concentrations were lower than the guideline for irrigation of moderately tolerant crops (< 700mg/L – ANZECC & ARMCANZ, 2000).

Magnesium, sodium, potassium and manganese were analysed for the third time under EPL 10936 in December 2014. Magnesium ranged from 41 mg/L at MP1 to 150 mg/L at MP8 and sodium concentrations ranged from a low of 83 mg/L at MP1 to 206 mg/L at MP9. All sodium values were lower than the guideline for irrigation to moderately tolerant crops (<230 mg/L – ANZECC & ARMCANZ, 2000). Potassium was highest at MP1 (88 mg/L) and lowest at MP9 (7mg/L). Concentrations of magnesium, sodium, potassium and chloride in groundwater are respectively shown in **Figures 8** to **11**.

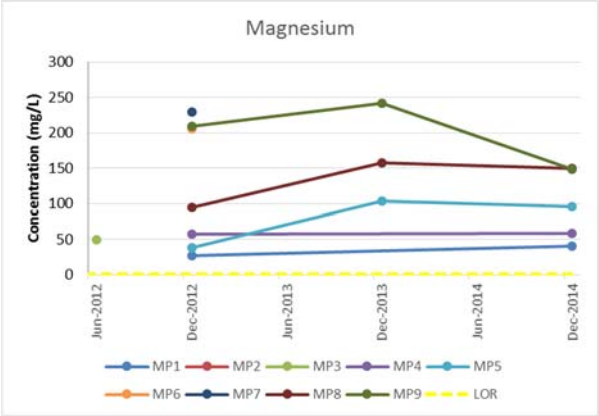


Figure 8: **Groundwater Magnesium – Portland Garbage Depot, June 2012 to December 2014**

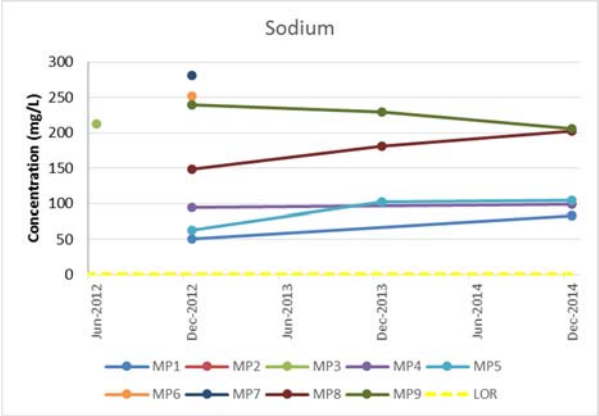


Figure 9: **Groundwater Sodium – Portland Garbage Depot, June 2012 to December 2014**

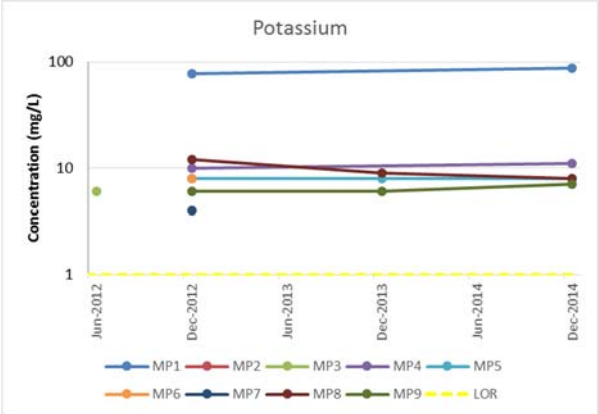


Figure 10: **Groundwater Potassium – Portland Garbage Depot, June 2012 to December 2014**

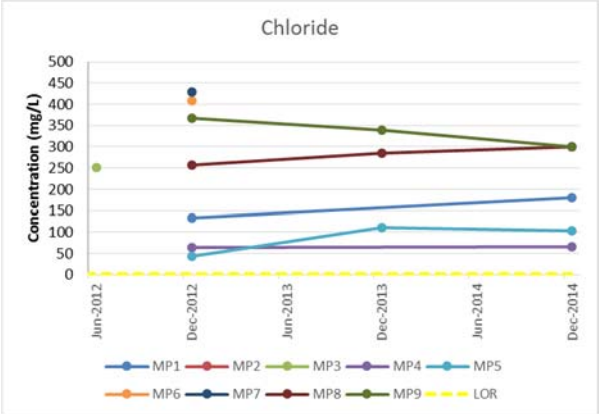


Figure 11: **Groundwater Chloride – Portland Garbage Depot, June 2012 to December 2014**

3.2.4 NUTRIENTS

Ammonia concentrations recorded in groundwater in December 2014 ranged from 0.03 mgN/L at MP8, to 4.84 mgN/L at MP1, where the latter was a new maximum value for the monitoring point, with the previous maximum being 2.47 mgN/L in June 2011. Concentrations at MP1 will continue to be monitored to identify the development of any adverse trend. All other values were consistent with historical results, as shown on **Figure 12**, and were below the conservative human drinking water health guideline of 0.41 mgN/L (NHMRC & NRMMC, 2011).

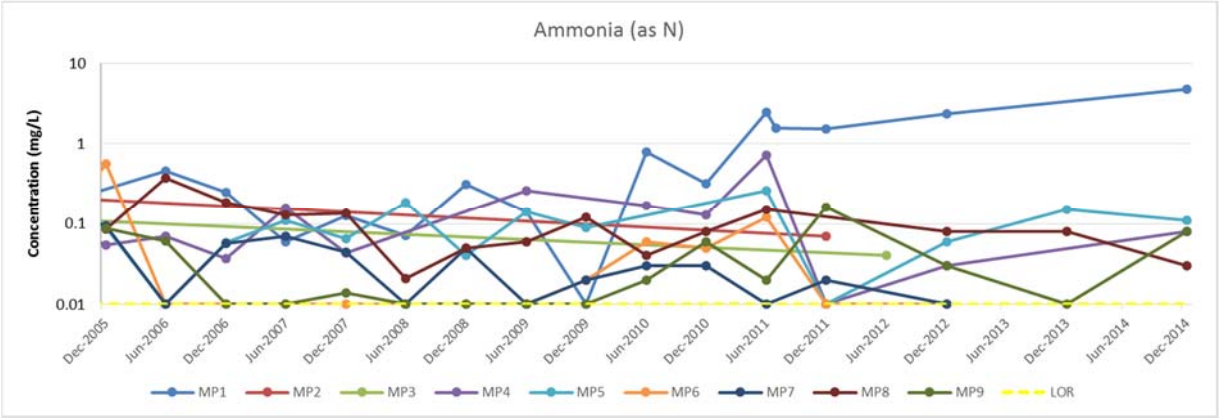


Figure 12: **Groundwater Ammonia – Portland Garbage Depot, December 2005 to December 2014**

Nitrate concentrations ranged from 0.03 mgN/L at MP8 to 1.02 mgN/L at MP1 as shown on **Figure 13**. A new maximum concentration of nitrate in groundwater was recorded at MP9 (0.39 mgN/L). All concentrations were significantly lower than the livestock drinking water guideline value of 90.29 mgN/L (ANZECC & ARMCANZ, 2000) and ,with the exception of MP9, were consistent with historical ranges.

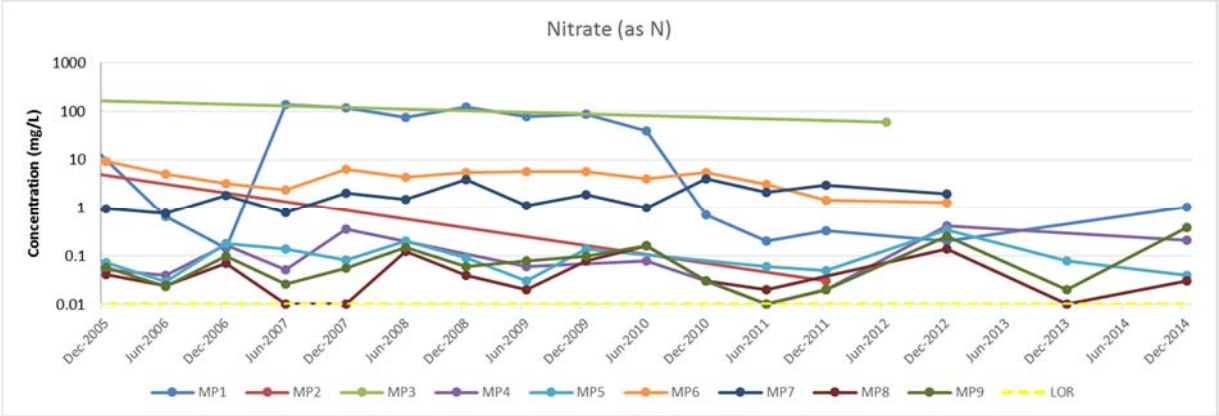


Figure 13: Groundwater Nitrate – Portland Garbage Depot, December 2005 to December 2014

3.2.5 METALS

Groundwater iron concentrations in December 2014 ranged from 0.74 mg/L at MP9 to 6.49 mg/L at MP4, as shown on **Figure 14**. While there is no livestock drinking water guideline for this parameter, all values were considered suitable for short-term (i.e. <20 years) crop irrigation (<10 mg/L – ANZECC & ARMCANZ, 2000) and were consistent with established ranges.

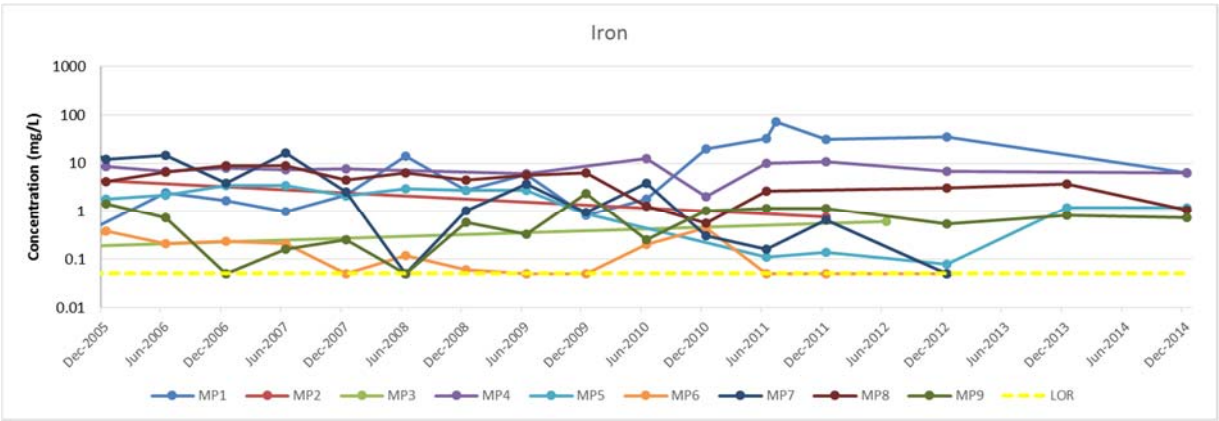


Figure 14: Groundwater Iron – Portland Garbage Depot, December 2005 to December 2014

Groundwater manganese concentrations were highest at MP8 (2.54 mg/L) and lowest at MP4 (0.398 mg/L), as shown on **Figure 15**. All manganese concentrations were considered suitable for short-term (i.e. <20 years) crop irrigation (<10 mg/L – ANZECC & ARMCANZ, 2000).

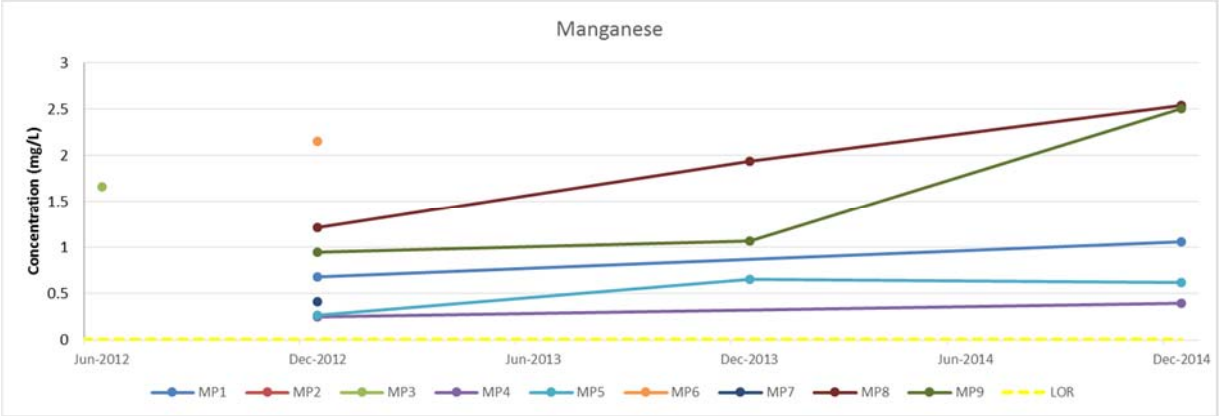


Figure 15: Groundwater Manganese – Portland Garbage Depot, June 2012 to December 2014

3.2.6 ORGANICS

Total organic carbon was analysed for the third time in December 2014. Values ranged from <1 mg/L at MP9 to 92 mg/L at MP1, as shown on **Figure 16**. The latter of these is considered elevated and concentrations will continue to be monitored to identify the development of any adverse trend.

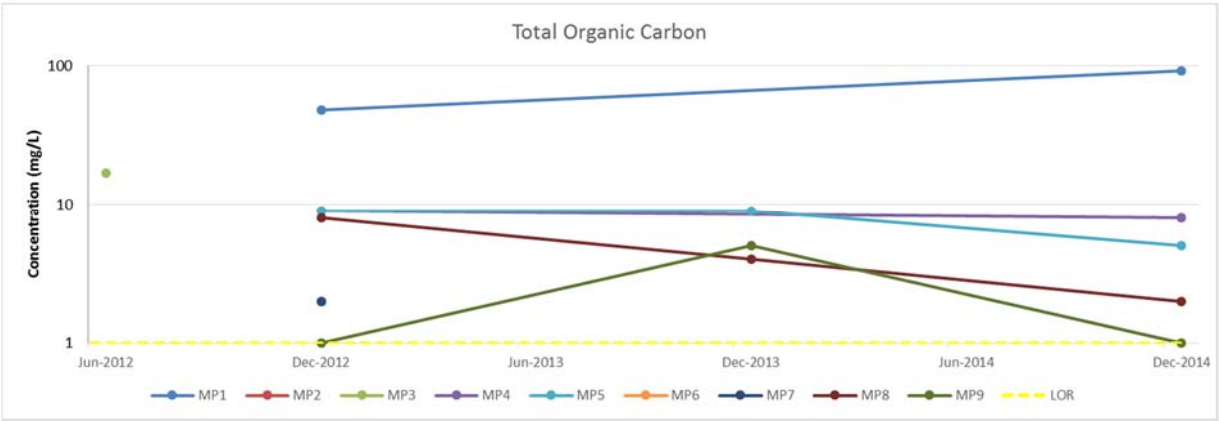


Figure 16: Groundwater TOC – Portland Garbage Depot, June 2012 to December 2014

Total phenols were below the laboratory limit of reporting (LOR) of 0.05 mg/L at all groundwater monitoring stations.

Organochlorine and organophosphorus pesticides were also below the LOR at all groundwater monitoring stations.

3.3 SURFACE WATER

Surface water monitoring consists of a single monitoring point SW1, which is required to be sampled biannually during discharge. The location of the monitoring point is illustrated in Drawing 01C_EV01 Discharge samples were obtained in January 2015.

3.3.1 PHYSICAL PROPERTIES

pH in January 2015 was recorded at within the EPL 100 percentile range of 6.5 – 8.5 at 6.58 and was a new minimum for the monitoring point, as shown on **Figure 17**. The EPL 100 percentile range corresponds to the ideal range for livestock drinking water quality (Markwick, 2007) and for reducing corrosion and encrustation in pipes and fittings (NHMRC & NRMMC, 2011).

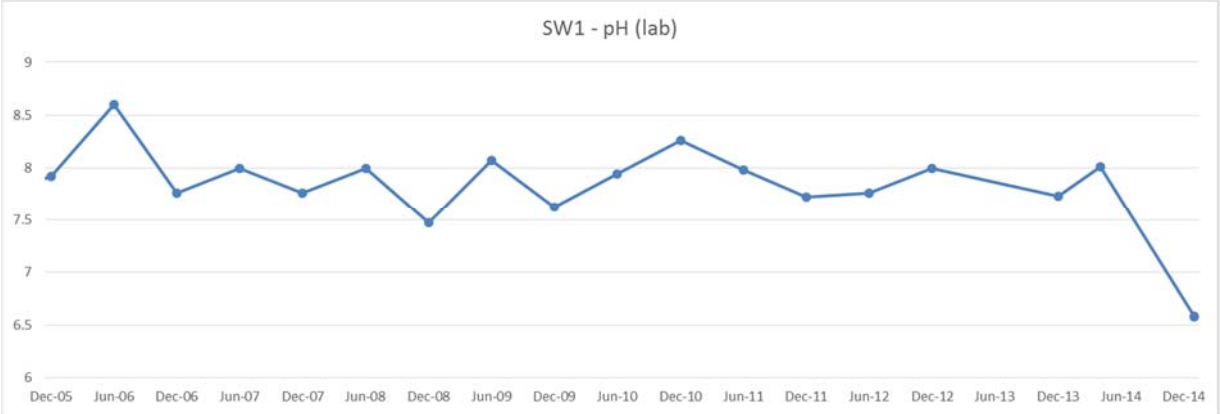


Figure 17: Surface Water pH – Portland Garbage Depot, December 2005 to January 2015

EC monitoring is no longer required by EPL licence 10936, however voluntary field analysis was undertaken and was recorded to be 132 µS/cm which sets a new minimum for the monitoring point, as shown on **Figure 18**. The corresponding TDS concentration (88 mg/L) value remains well below the livestock drinking water guidelines (ANZECC & ARMCANZ, 2000).

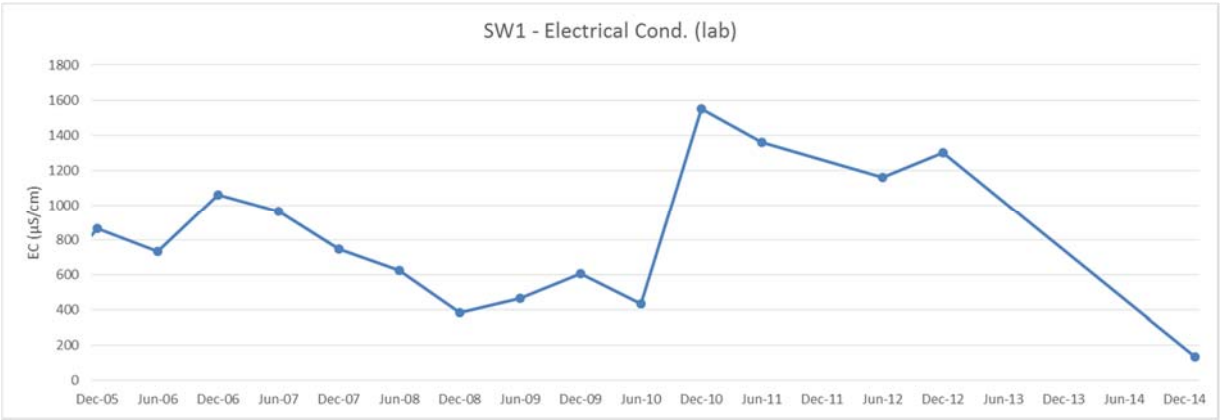


Figure 18: Surface Water EC – Portland Garbage Depot, December 2005 to January 2015

Total suspended solids (TSS) in surface water in January 2015 were recorded to be 20 mg/L, which is below the EPL 100 percentile discharge limit of 30 mg/L, as shown on **Figure 19**.

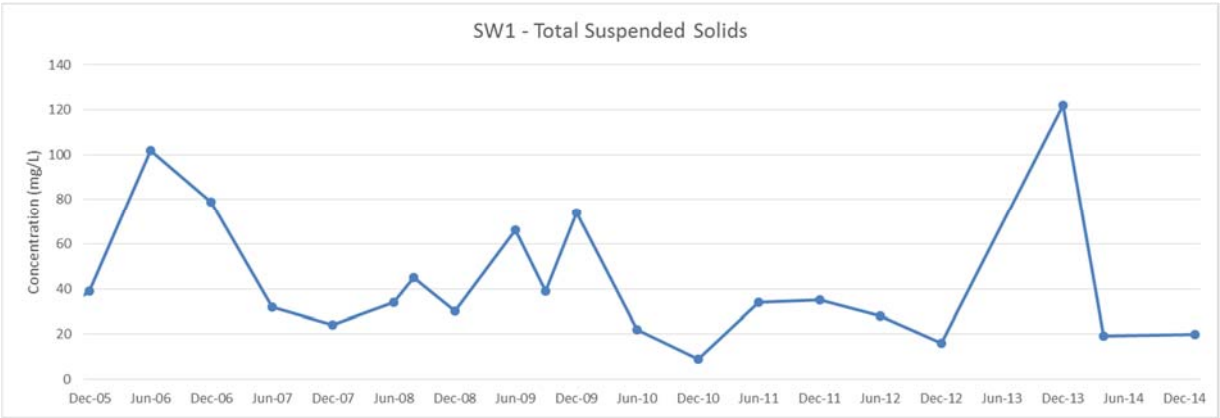


Figure 19: Surface Water TSS – Portland Garbage Depot, December 2005 to January 2015

Alkalinity of surface water in January 2015 was measured to be 25 mg/L, which was a new minimum for the monitoring point, as shown on **Figure 20**, and corresponds to the decrease in pH (i.e. increased acidity). Alkalinity was below the irrigation guideline hardness value for potential fouling of waters (350mg/L, ANZECC & ARMCANZ, 2000).

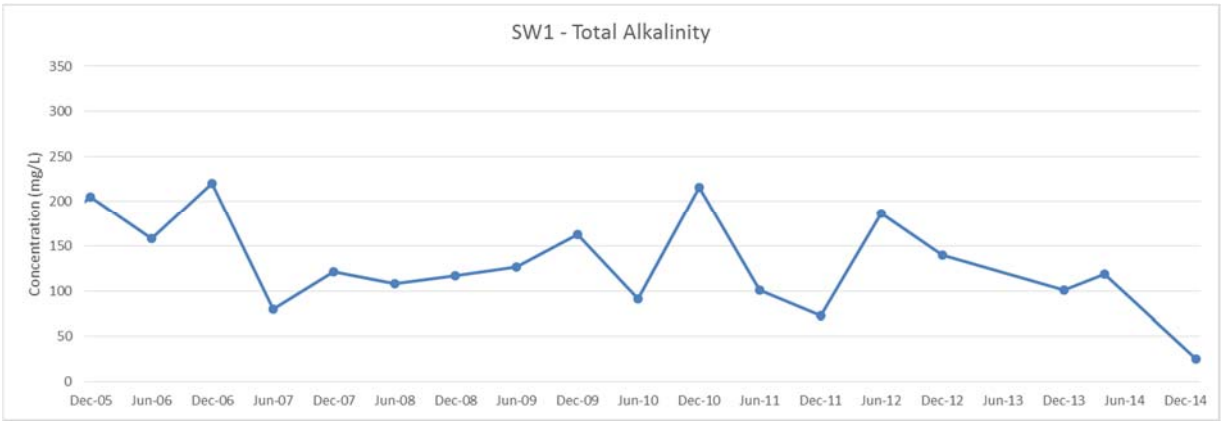


Figure 20: Surface Water Alkalinity – Portland Garbage Depot, December 2005 to January 2015

Chemical oxygen demand of surface water in January 2015 was 41 mg/L, which had decreased from 81 mg/L recorded in the April 2014 discharge sample, as shown on **Figure 21**.

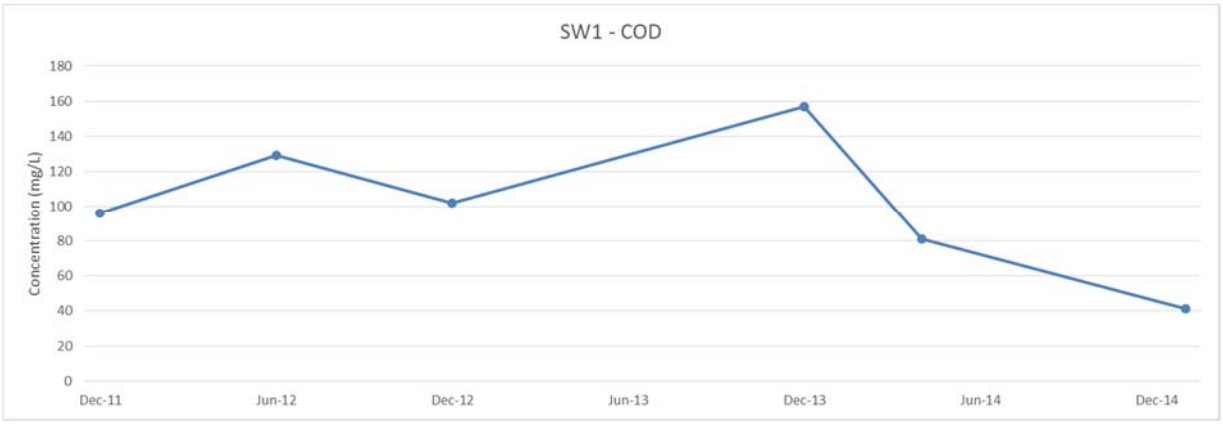


Figure 21: Surface Water COD – Portland Garbage Depot, December 2005 to January 2015

3.3.2 EXCHANGEABLE IONS

The fluoride concentration of surface water in January 2015 was below the laboratory limit of reporting (LOR) which is the lowest value recorded for this monitoring point, as shown on **Figure 22**.

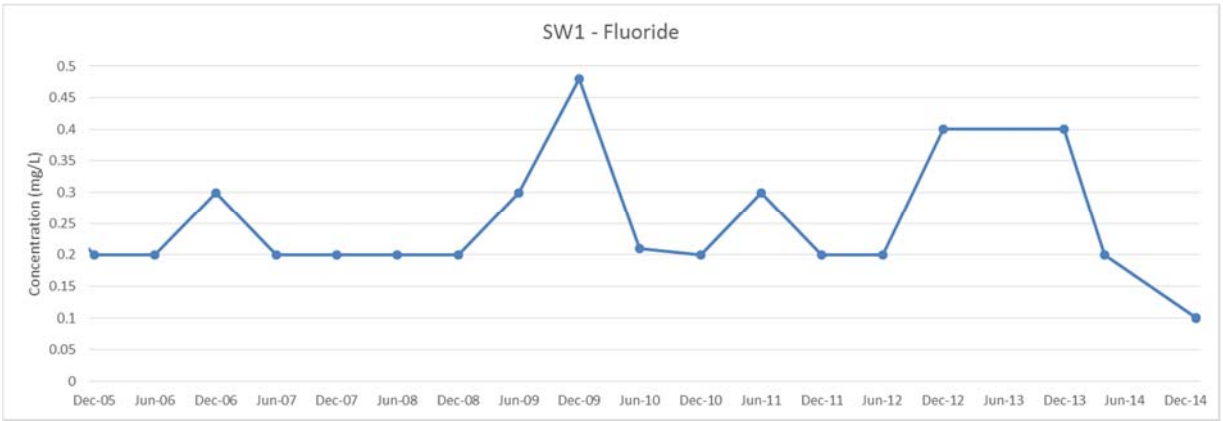


Figure 22: Surface Water Fluoride – Portland Garbage Depot, December 2005 to January 2015

Sulfate (2 mg/L) and chloride (22 mg/L) concentrations in surface water in January 2015 both set minimum values for this monitoring point, as shown on **Figures 23** and **24**, and were below relevant guideline values for stock watering and/or crop irrigation (ANZECC & ARMCANZ, 2000).

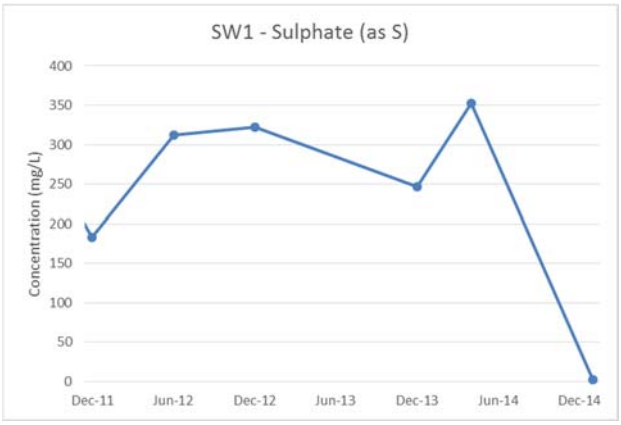


Figure 23: Surface Water Sulfate – Portland Garbage Depot, December 2011 to January 2015

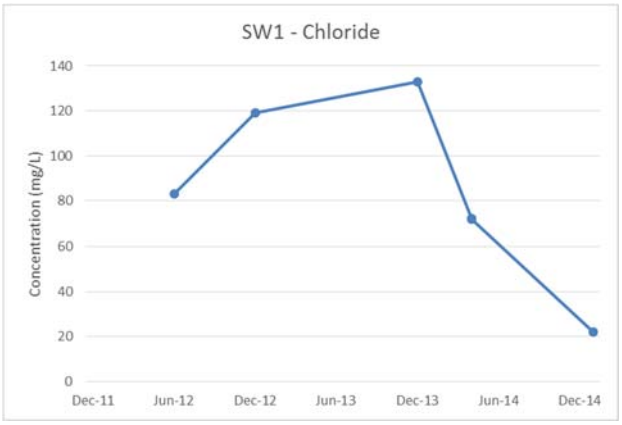


Figure 24: Surface Water Chloride – Portland Garbage Depot, December 2011 to January 2015

The recorded calcium concentration detected in surface water in January 2015 was 2 mg/L and a new minimum for the monitoring point, as shown on **Figure 25**. This is below the 1000 mg/L livestock drinking water guideline value (ANZECC & ARMCANZ, 2000) and consistent with historical data.

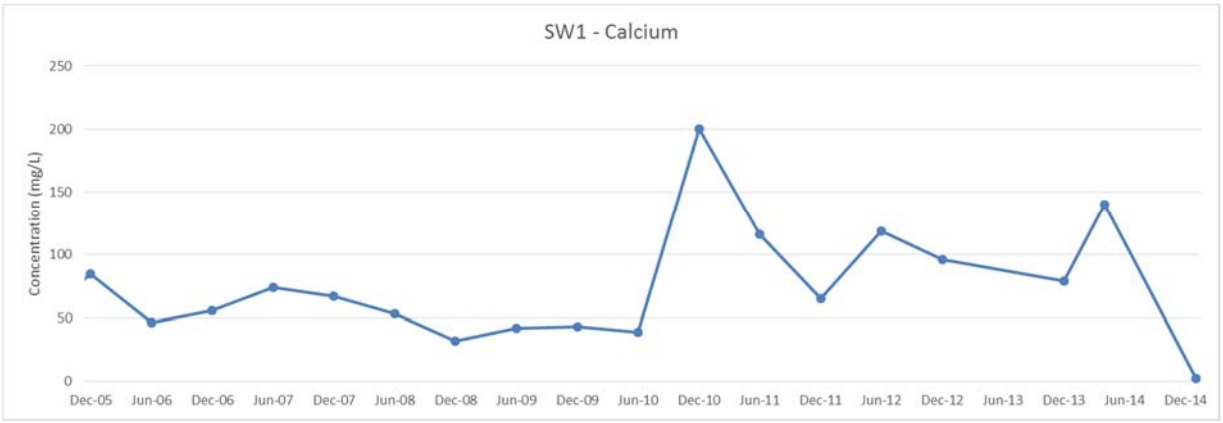


Figure 25: Surface Water Calcium – Portland Garbage Depot, December 2005 to January 2015

Magnesium in surface water in January 2015 was detected at a concentration of 3 mg/L, which sets a new minimum recorded concentration for this monitoring point, as shown on **Figure 26**.

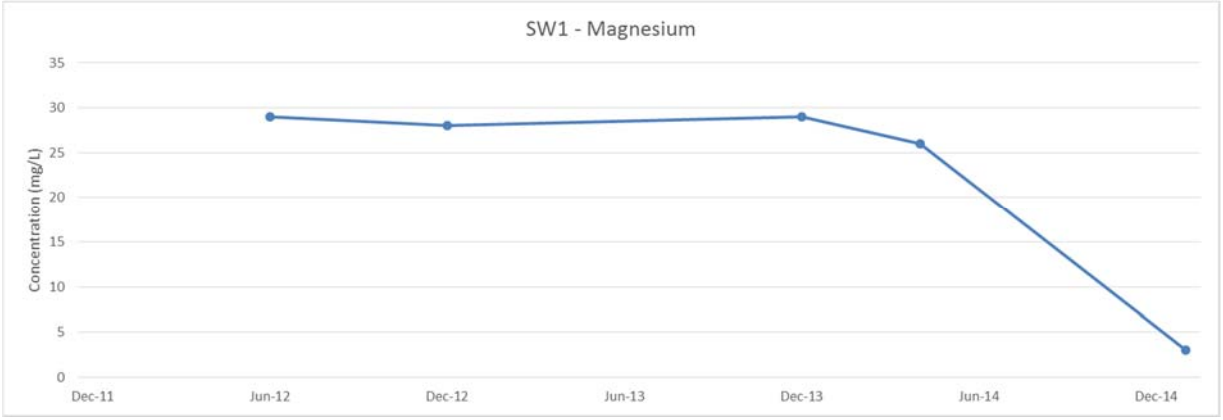


Figure 26: Surface Water Magnesium – Portland Garbage Depot, December 2011 to January 2015

Concentrations of sodium and potassium in surface water in January 2015 were recorded at new minimum values with concentrations of 14 mg/L and 4 mg/L respectively, as shown on **Figures 27** and **28**. Sodium remains below the relevant guideline values (NHMRC & NRMMC, 2011 and ANZECC & ARMCANZ, 2000).

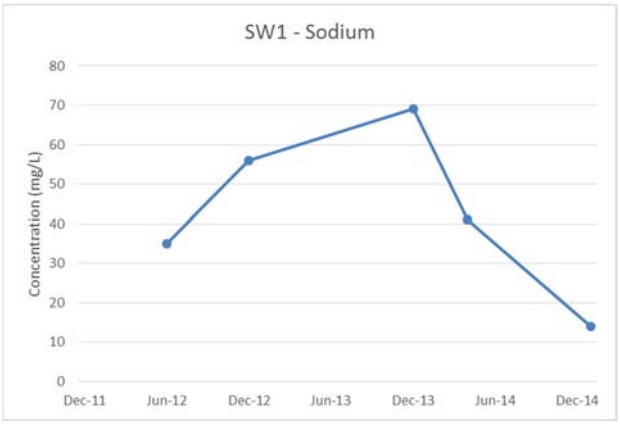


Figure 27: Surface Water Sodium – Portland Garbage Depot, December 2011 to January 2015

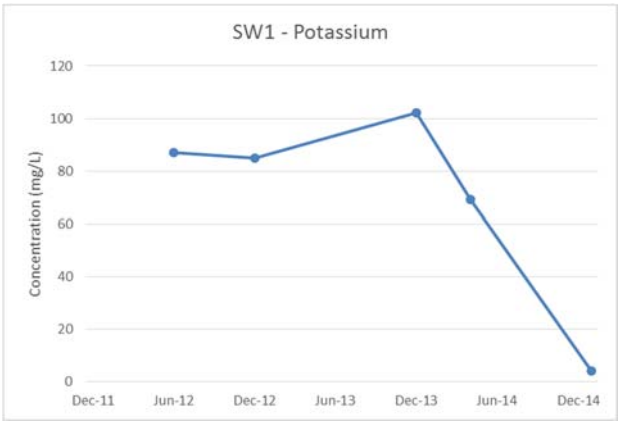


Figure 28: Surface Water Potassium – Portland Garbage Depot, December 2011 to January 2015

3.3.3 NUTRIENTS

Ammonia and nitrate in surface water in January 2015 were recorded at 0.1 mgN/L and 0.02 mgN/L respectively. Both values were consistent with the established ranges as shown on **Figures 29** and **30**. Ammonia was lower than the conservative aesthetic guideline for human drinking water (0.41 mgN/L, NHMRC & NRMMC, 2004) and nitrate was lower than the livestock drinking water guideline value of 90.29 mgN/L (ANZECC & ARMCANZ, 2000).

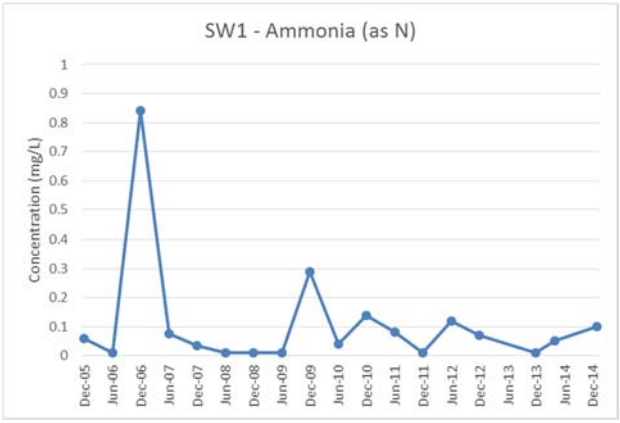


Figure 29: Surface Water Ammonia – Portland Garbage Depot, December 2005 to January 2015

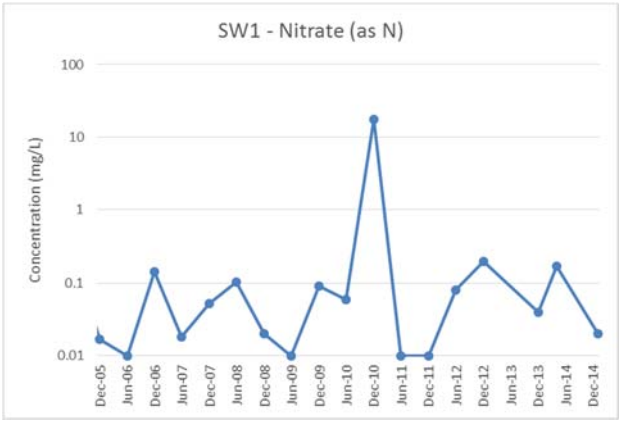


Figure 30: Surface Water Nitrate – Portland Garbage Depot, December 2005 to January 2015

3.3.4 METALS

Manganese in surface water in January 2015 was recorded at a concentration of 0.026 mg/L, below the guideline value for long-term crop irrigation (<100years, ANZECC & ARMCANZ, 2000) and within the established range, as shown on **Figure 31**.

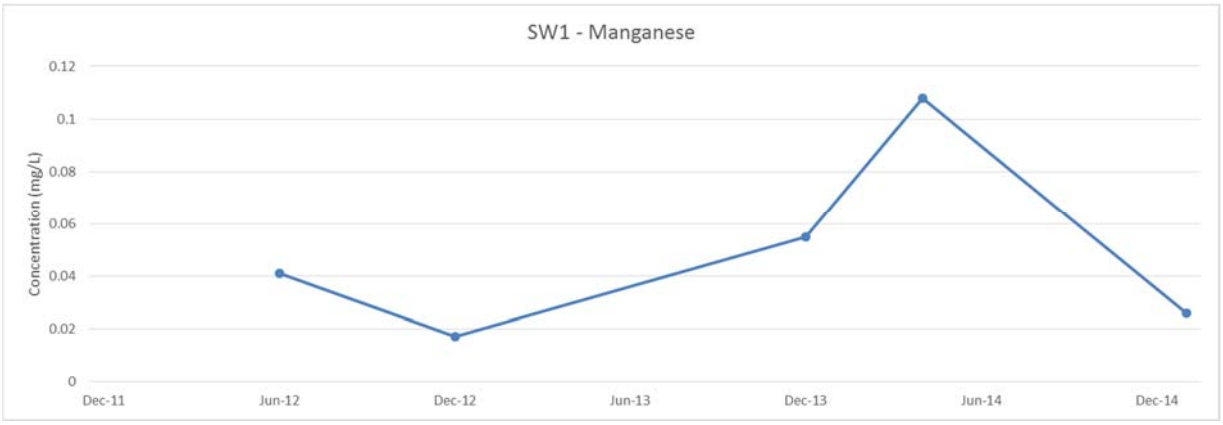


Figure 31: Surface Water Manganese – Portland Garbage Depot, December 2011 to January 2015

Iron in surface water in January 2015 was consistent with the historical range at 2.34 mg/L, though was noted to be the highest concentration recorded since June 2006, as shown on **Figure 32**. The recorded iron concentration is considered suitable for crop irrigation for periods of less than 20 years (<10 mg/L, ANZECC & ARMCANZ, 2000).

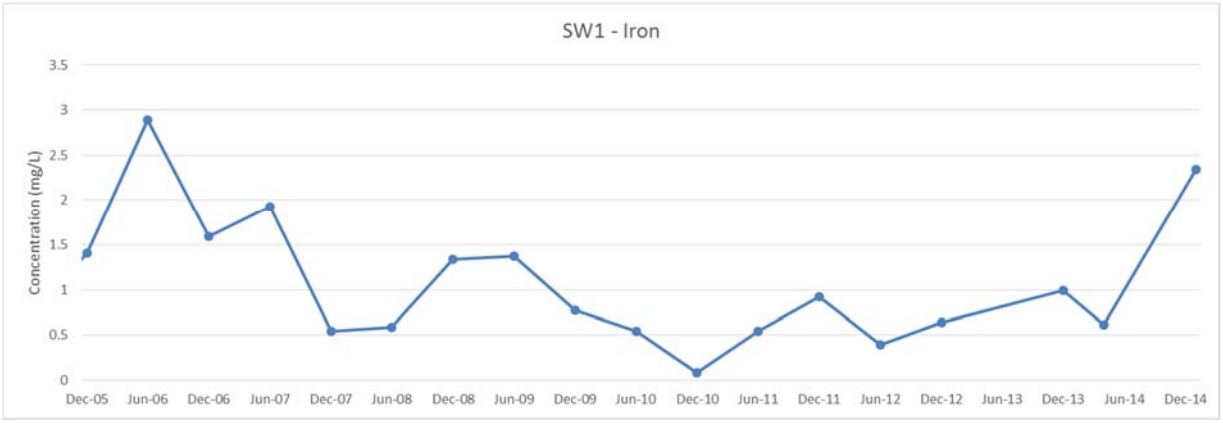


Figure 32: Surface Water Iron – Portland Garbage Depot, December 2005 to January 2015

3.3.5 ORGANICS

Total phenols were not detected in the discharge sample collected in January 2015 (<0.05 mg/L).

Total organic carbon in surface water in January 2015 was 12 mg/L, which had reduced from the concentration recorded in April 2014 (28 mg/L), as shown on **Figure 33**.

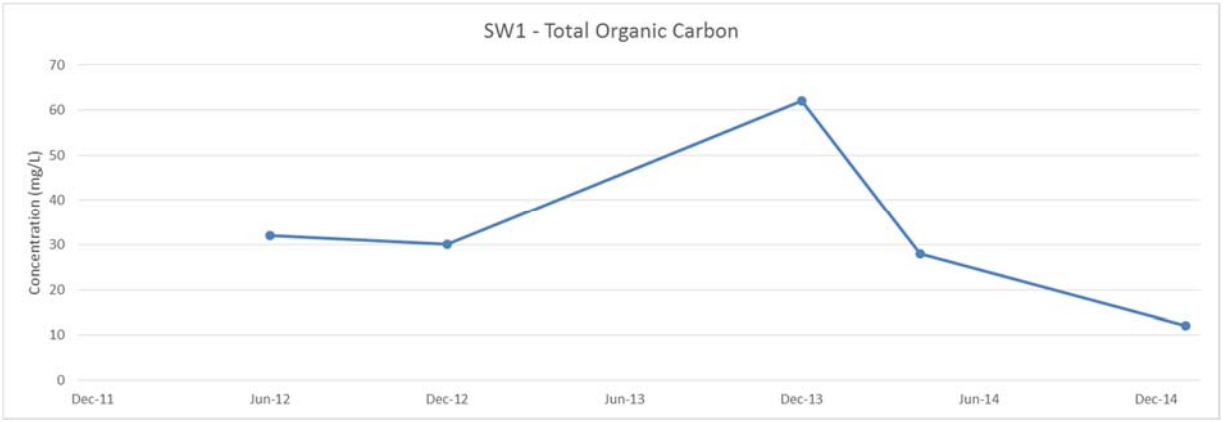


Figure 33: Surface Water TOC – Portland Garbage Depot, December 2011 to January 2015

3.4 QUALITY CONTROL

3.4.1 OUTLINE

The laboratory quality control meets the NEPM 2013 Schedule B(3) and ALS QCS3 requirement.

The ALS Quality Control Report provides the following:

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity.

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix.

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

3.4.2 RESULTS

For the groundwater and surface water sampling conducted in December 2014 and January 2015, the following QC comments have been reported:

- Groundwater, December 2014: Matrix spike recovery for manganese not determined as the background level in ‘anonymous’ sample was greater than or equal to 4 times the spike level
- Surface Water, January 2015: Matrix spike recovery for sulfate not determined as the background level in ‘anonymous’ sample was greater than or equal to 4 times the spike level
- Surface Water, January 2015: Matrix spike recovery for COD not determined as the background level in ‘anonymous’ sample was greater than or equal to 4 times the spike level

Other Monitoring

4.1 WASTE QUANTITIES

Waste quantities recorded by Council and reported to the EPA for the 2014-2015 reporting year (year ending 30 June 2015) totalled 4,212 tonnes.

This included a soil component of 2,400 tonnes used for capping. Therefore, the total waste amount for licensing purposes was 1,812 tonnes. Compaction is achieved using a 35 tonne excavator, as required.

4.2 COMPLAINTS

There was one (1) public complaint made regarding the operations of the landfill during the annual reporting period, relating to potentially noxious weeds. The details of the complaint are provided below.

Date:
10 October 2014

Complaint description:
Noxious weeds present at landfill – Requested to investigate

Response to Complaint:
Work actioned by LCC to engage contractor to spray weeds.

Summary

5.1 GROUNDWATER LEVELS

Measurement of standing water level is required annually by EPL 10936. Routine measurements were undertaken during the December 2014 sampling round.

Groundwater levels generally reduced slightly throughout the reporting period. The most notable decrease was observed at MP5, and the water level at MP4 was gauged for the first time since December 2012. All standing water levels were consistent with historical ranges.

Shallow groundwater is considered to flow in a north-westerly direction at a gradient of 0.067, generally consistent with the fall of the land.

5.2 GROUNDWATER QUALITY

Annual groundwater quality sampling was undertaken in December 2014 in accordance with EPL 10936. No samples were able to be obtained from MP2 and MP3 (insufficient recharge).

Minimal change in groundwater conditions at the site was evident, however the following items were noted:

- Ammonia and total organic carbon at MP1 were elevated and concentrations will continue to be monitored to identify the development of any adverse trend.
- pH at MP1 was consistent with historical results but remains more acidic than the range recommended for livestock drinking water.
- The sulfate concentrations recorded at MP8 and MP9 may pose a health risk to susceptible livestock. An increasing trend may be present in the groundwater at MP8, based on the concentration consistently increasing since December 2012.
- Alkalinity at all groundwater points except MP1 and MP4 may result in potential fouling of waters.

No adverse trends were evident in other groundwater monitoring points.

5.3 SURFACE WATER QUALITY

Analysis of the surface water discharge sample collected on 21 January 2015 indicated that pH and suspended solids were within the EPL limit criteria.

Most cations and anions set new minimum values for the surface water monitoring point, and other parameters were generally consistent with historical results.

Conclusion

6.1 CONCLUSIONS

Environmental monitoring of groundwater and surface water quality in the 2014-2015 reporting period is not considered to be indicative of adverse off-site impacts resulting from the operation of the Portland Garbage Depot.

6.2 RECOMMENDATIONS

It is recommended that environmental monitoring be continued at the Portland Garbage Depot in accordance with the monitoring requirements of Environment Protection Licence 10936.

References

Australian and New Zealand Environment and Conservation Council & Agricultural and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ) 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

C.M. Jewell & Associates, November 2005, Hydrogeological Study: Portland Landfill, Report No. J0952.11-rev0.

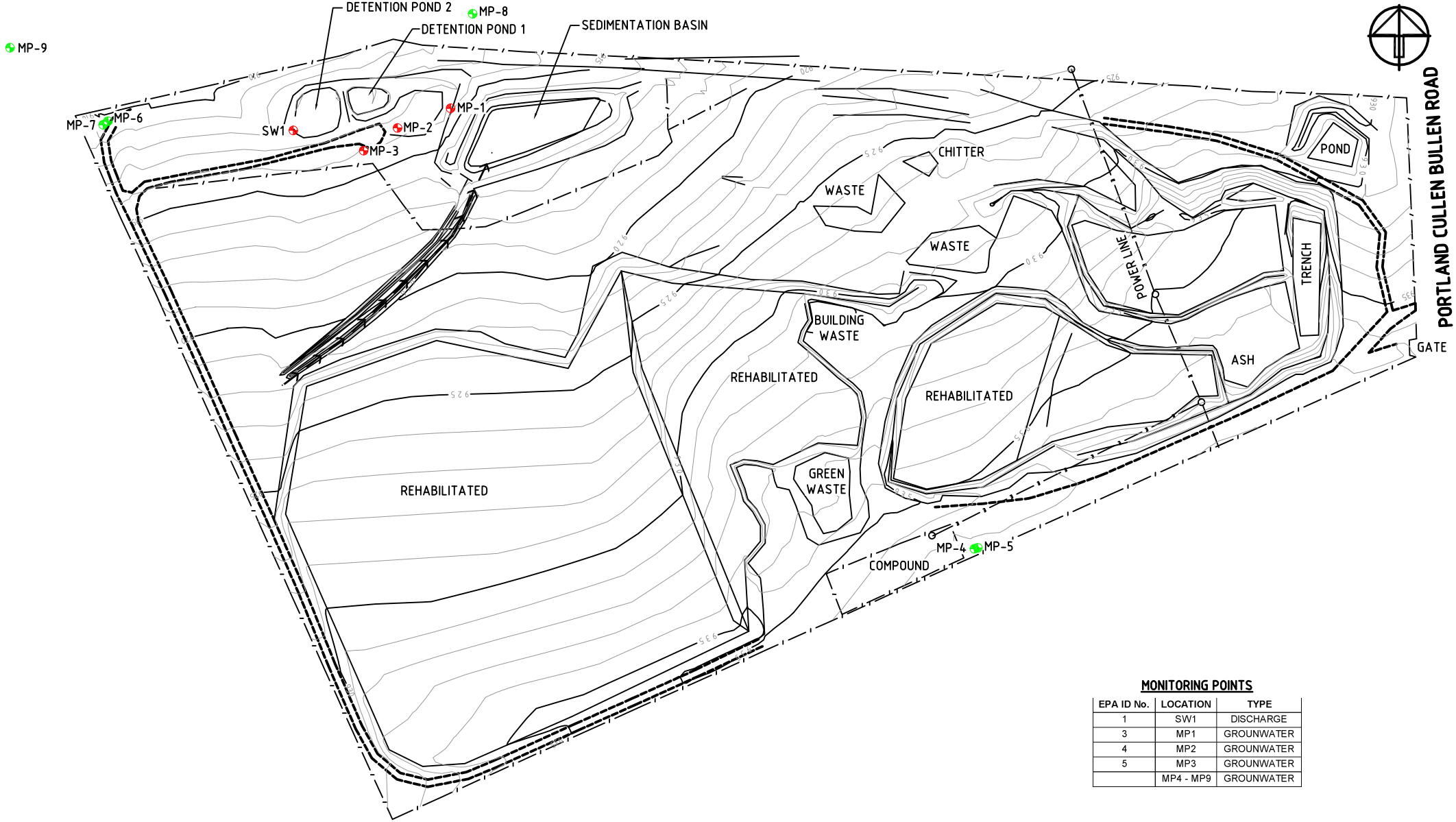
Markwick, G 2007, 'Water requirements for sheep and cattle', Primefact 326, New South Wales Department of Primary Industries, Australia.

National Health and Medical Research Council & the Natural Resource Management Ministerial Council (NHMRC & NRMMC) 2011, National Water Quality Management Strategy: Australian Drinking Water Guidelines, Updated March 2015.

NSW Environment Protection Authority 2013, Environment Protection Licence No. 10936 – Portland Garbage Depot Licence.

NSW Environment Protection Authority, January 1996, Environmental Guidelines: Solid Waste Landfills, NSW EPA, Chatswood.

Drawings



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

APPROX. SCALE

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P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6362 1055
Fax. (02) 6361 8178

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

Appendix A

MONITORING DATA

TABLE 1 - GROUNDWATER LEVEL MEASUREMENTS

Piezometer Details

Bore ID	Ground Elev (mRL)	Stick-up (m)
Bore 1	913.7	0.40
Bore 2	913.60	0.20
Bore 3	914.20	0.60
Bore 4	937.2	0.80
Bore 5	937.2	0.80
Bore 6	910.5	0.70
Bore 7	910.7	0.70
Bore 8	911.8	0.50
Bore 9	903.8	1.10

Definitions:

Ground Elev:	Actual elevation of ground at the piezometer in Australian Height Datum (AHD).
GWL:	Actual elevation of groundwater at the piezometer (AHD)
Measured:	depth of groundwater measured from the top of the piezometer pipe.
NMWL:	No Measureable Water Level
NM:	Not Monitored
OF:	Overflowing

Date	MP1		MP2		MP3		MP4		MP5		MP6		MP7		MP8		MP9	
	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)
7-Dec-01	3.32	910.78	4.53	909.27	4.70	910.10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
7-Jun-02	3.85	910.25	4.93	908.87	5.48	909.32	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
18-Dec-02	4.46	909.64	NMWL	NMWL	NMWL	NMWL	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
5-Feb-03	4.55	909.55	NMWL	NMWL	NMWL	NMWL	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
19-May-03	4.63	909.47	NMWL	NMWL	NMWL	NMWL	NMWL	NMWL	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
30-Jun-03	4.79	909.31	NMWL	NMWL	NMWL	NMWL	20.97	917.03	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
2-Feb-04	4.51	909.59	NMWL	NMWL	NMWL	NMWL	9.09	928.91	24.07	913.93	3.38	907.82	3.27	908.13	NM	NM	NM	NM
23-Jun-04	5.03	909.07	NMWL	NMWL	NMWL	NMWL	11.17	926.83	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
7-Dec-04	4.55	909.55	NMWL	NMWL	NMWL	NMWL	7.16	930.84	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
11-Jan-05	NM	NM	NM	NM	NM	NM	NM	NM	25.32	912.68	3.75	907.45	3.68	907.72	NM	NM	NM	NM
1-Jun-05	4.74	909.36	NMWL	NMWL	NMWL	NMWL	14.3	923.70	26.21	911.79	3.92	907.28	3.84	907.56	NM	NM	NM	NM
13-Dec-05	3.31	910.79	NMWL	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 OF	904.95
20-Jun-06	3.10	911.00	NMWL	NMWL	NMWL	NMWL	11.14	926.86	27.05	910.95	3.77	907.43	3.70	907.70	4.57	907.73	-0.05 OF	904.95
11-Dec-06	4.08	910.02	NMWL	NMWL	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	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	NMWL	NMWL	10.7	927.30	28.25	909.75	3.52	907.68	3.42	907.98	4.31	907.99	-0.05 OF	904.95
30-Jun-08	4.06	910.04	NMWL	NMWL	NMWL	NMWL	NMWL	NMWL	28.22	909.78	3.65	907.55	3.55	907.85	4.45	907.85	-0.05 OF	904.95
16-Dec-08	3.80	910.30	4.90	908.90	5.65	909.15	NMWL	NMWL	28.21	909.79	3.62	907.58	3.45	907.95	4.25	908.05	-0.05 OF	904.95
23-Jun-09	4.02	910.08	NMWL	NMWL	NMWL	NMWL	16.67	921.33	27.86	910.14	3.64	907.56	3.55	907.85	4.45	907.85	-0.05 OF	904.95
14-Dec-09	4.11	909.99	NMWL	NMWL	NMWL	NMWL	20.02	917.98	27.95	910.05	3.72	907.48	3.63	907.77	4.52	907.78	0.27	904.63
1-Jun-10	4.21	909.89	NMWL	NMWL	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	NMWL	NMWL	2.15	935.85	27.37	910.63	2.70	908.50	2.62	908.78	3.44	908.86	-0.05 OF	904.95
29-Jun-11	1.30	912.80	NMWL	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 OF	904.95
27-Jul-11	1.57	912.53	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
6-Dec-11	1.14	912.96	3.85	909.95	NMWL	NMWL	6.09	931.91	25.40	912.60	2.67	908.53	2.59	908.81	Bore Damaged		-0.05 OF	904.95
13-Jun-12	0.70	913.40	NMWL	NMWL	4.48	910.32	NMWL	NMWL	NMWL	NMWL	NM	NM	NM	NM	NMWL	NMWL	NMWL	NMWL
16-Dec-12	2.09	912.01	NMWL	NMWL	NMWL	NMWL	6.73	931.27	22.22	915.78	1.99	909.21	1.92	909.48	2.77	909.53	-0.05 OF	904.95
11-Dec-13	3.57	910.53	Bore Damaged		4.98	909.82	NMWL	NMWL	22.79	915.21	NM	NM	NM	NM	3.16	909.14	-0.05 OF	904.95
4-Dec-14	3.80	910.30	NMWL	NMWL	NMWL	NMWL	8.00	930.00	23.43	914.57	NM	NM	NM	NM	3.33	908.97	0.050	904.85

Notes:
The figures before December 2002 were supplied by Lithgow City Council
Piezometer elevations and figures for February 2004 were supplied by CM Jewell & Associates Pty Ltd

TABLE 2 - RESULTS OF LABORATORY ANALYSIS - DECEMBER 2014

Analyte	Units	EPL Limit (SW1*)	Groundwater Boreholes							Surface Water
			MP1	MP2	MP3	MP4	MP5	MP8	MP9	SW1
Temperature (field)	ºC		16.2	Nil recharge	Nil recharge	17.4	17.6	15.7	15.3	Nil Discharge
pH (lab)	pH units	6.5-8.5	6.12			7.53	7.47	7.43	7.44	
pH (field)	pH units		5.56			6.49	6.93	6.91	6.71	
Electrical Cond. (lab)	uS/cm		1650			1540	1970	3210	3240	
Electrical Cond. (field)	uS/cm		1566			1544	1816	2550	2570	
Total Alkalinity (as $CaCO_3$)	mg/L		44			339	427	487	474	
Ammonia (as N)	mgN/L		4.84			0.08	0.11	0.03	0.08	
Fluoride	mg/L		<0.1			0.2	0.3	0.2	0.3	
Nitrate (as N)	mgN/L		1.02			0.21	0.04	0.03	0.39	
Sulfate	mg/L		578			416	615	1130	1150	
Chloride	mg/L		180			66	104	300	300	
BOD	mg/L									
COD	mg/L									
Calcium	mg/L		142			164	221	360	374	
Magnesium	mg/L		41			58	96	150	148	
Sodium	mg/L		83			99	105	203	206	
Potassium	mg/L		88			11	8	8	7	
Manganese	mg/L		1.06			0.398	0.618	2.54	2.51	
Iron	mg/L		6.35			6.49	1.19	1.06	0.74	
Total Suspended Solids	mg/L	30								
Total Organic Carbon	mg/L		92			8	5	2	<1	
Total Phenolics	mg/L		<0.05			<0.05	<0.05	<0.05	<0.05	
Organochlorine Pesticides	mg/L		<0.01			<0.01	<0.01	<0.01	<0.01	
Organophosphorus Pesticides	mg/L		<0.022			<0.022	<0.022	<0.022	<0.022	

Notes:

* Environment Protection Licence (EPL) 100 percentile limit for monitoring station SW1

Bold text indicates exceedence of EPL limit

TABLE 3 - RESULTS OF LABORATORY ANALYSIS - JANUARY 2015

Analyte	Units	EPL Limit (SW1*)	Groundwater Boreholes							Surface Water
			MP1	MP2	MP3	MP4	MP5	MP8	MP9	SW1
Temperature (field)	ºC									20.7
pH (lab)	pH units	6.5-8.5								8.68
pH (field)	pH units									7.55
Electrical Cond. (lab)	uS/cm									
Electrical Cond. (field)	uS/cm									132
Total Alkalinity (as $CaCO_3$)	mg/L									25
Ammonia (as N)	mgN/L									0.10
Fluoride	mg/L									<0.1
Nitrate (as N)	mgN/L									0.02
Sulfate	mg/L									2
Chloride	mg/L									22
BOD	mg/L									
COD	mg/L									41
Calcium	mg/L									2
Magnesium	mg/L									3
Sodium	mg/L									14
Potassium	mg/L									4
Manganese	mg/L									0.026
Iron	mg/L									2.34
Total Suspended Solids	mg/L	30								20
Total Organic Carbon	mg/L									12
Total Phenolics	mg/L									<0.05
Organochlorine Pesticides	mg/L									
Organophosphorus Pesticides	mg/L									

Notes:

* Environment Protection Licence (EPL) 100 percentile limit for monitoring station SW1

Bold text indicates exceedence of EPL limit

Appendix B

LABORATORY ANALYSIS REPORTS

CERTIFICATE OF ANALYSIS

Work Order	: **ES1427031**	Page	: 1 of 6
Client	: **LITHGOW CITY COUNCIL**	Laboratory	: Environmental Division Sydney
Contact	: MS KERRY FRAGAR	Contact	: Client Services
Address	: PO Box 19 LITHGOW NSW 2790	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kfragar@geolyse.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 6362 1055	Telephone	: +61-2-8784 8555
Facsimile	: +61 6361 8178	Facsimile	: +61-2-8784 8500
Project	: 202334 PORTLAND LANDFILL	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 075309-ENVR		
C-O-C number	: ----	Date Samples Received	: 05-DEC-2014
Sampler	: DEAN LAVERS	Issue Date	: 12-DEC-2014
Site	: ----		
		No. of samples received	: 5
Quote number	: SY/476/14	No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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
Dian Dao	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.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	MP1	MP4	MP5	MP8	MP9
				Client sampling date / time	04-DEC-2014 15:00	04-DEC-2014 12:30	04-DEC-2014 08:30	04-DEC-2014 09:15	04-DEC-2014 11:00
					ES1427031-001	ES1427031-002	ES1427031-003	ES1427031-004	ES1427031-005
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.12	7.53	7.47	7.43	7.44
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		1650	1540	1970	3210	3240
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		44	339	427	487	474
Total Alkalinity as CaCO3	----	1	mg/L		44	339	427	487	474
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		578	416	615	1130	1150
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		180	66	104	300	300
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		142	164	221	360	374
Magnesium	7439-95-4	1	mg/L		41	58	96	150	148
Sodium	7440-23-5	1	mg/L		83	99	105	203	206
Potassium	7440-09-7	1	mg/L		88	11	8	8	7
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		1.06	0.398	0.618	2.54	2.51
Iron	7439-89-6	0.05	mg/L		6.35	6.49	1.19	1.06	0.74
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	0.2	0.3	0.2	0.3
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		4.84	0.08	0.11	0.03	0.08
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		0.05	<0.01	<0.01	0.02	0.05
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		1.02	0.21	0.04	0.03	0.39
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		1.07	0.21	0.04	0.05	0.44
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		18.0	17.3	24.3	41.7	41.9
Total Cations	----	0.01	meq/L		16.3	17.5	23.7	39.3	40.0

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	MP1	MP4	MP5	MP8	MP9
				Client sampling date / time	04-DEC-2014 15:00	04-DEC-2014 12:30	04-DEC-2014 08:30	04-DEC-2014 09:15	04-DEC-2014 11:00
					ES1427031-001	ES1427031-002	ES1427031-003	ES1427031-004	ES1427031-005
EN055: Ionic Balance - Continued									
Ionic Balance	----	0.01	%		**4.83**	**0.72**	**1.18**	**2.92**	**2.30**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**92**	**8**	**5**	**2**	<1
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		<0.05	<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	<0.5
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L		<0.5	<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	<0.5
gamma-BHC	58-89-9	0.5	µg/L		<0.5	<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	<0.5
Heptachlor	76-44-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	309-00-2	0.5	µg/L		<0.5	<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	<0.5
trans-Chlordane	5103-74-2	0.5	µg/L		<0.5	<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	<0.5
cis-Chlordane	5103-71-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	60-57-1	0.5	µg/L		<0.5	<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	<0.5
Endrin	72-20-8	0.5	µg/L		<0.5	<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	<0.5
4.4`-DDD	72-54-8	0.5	µg/L		<0.5	<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	<0.5
Endosulfan sulfate	1031-07-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
4.4`-DDT	50-29-3	2.0	µg/L		<2.0	<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	<0.5
Methoxychlor	72-43-5	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
^ **Total Chlordane (sum)**	----	0.5	µg/L		<0.5	<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	<0.5
^ **Sum of Aldrin + Dieldrin**	309-00-2/60-57-1	0.5	µg/L		<0.5	<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	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: MP1	MP4	MP5	MP8	MP9
				Client sampling date / time: 04-DEC-2014 15:00	04-DEC-2014 12:30	04-DEC-2014 08:30	04-DEC-2014 09:15	04-DEC-2014 11:00
				ES1427031-001	ES1427031-002	ES1427031-003	ES1427031-004	ES1427031-005
EP068B: Organophosphorus Pesticides (OP) - Continued								
Monocrotophos	6923-22-4	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L	<0.5	<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	<0.5
Parathion-methyl	298-00-0	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L	<2.0	<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	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	<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	<0.5
Fenamiphos	22224-92-6	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L	<0.5	<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	<0.5
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**103**	**108**	**76.4**	**105**	**89.2**
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**104**	**107**	**72.9**	**103**	**87.6**

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	30	120
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	26.8	129

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1427031**	Page	: 1 of 9
Client	: LITHGOW CITY COUNCIL	Laboratory	: Environmental Division Sydney
Contact	: MS KERRY FRAGAR	Contact	: Client Services
Address	: PO Box 19 LITHGOW NSW 2790	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kfragar@geolyse.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 6362 1055	Telephone	: +61-2-8784 8555
Facsimile	: +61 6361 8178	Facsimile	: +61-2-8784 8500
Project	: 202334 PORTLAND LANDFILL	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 05-DEC-2014
Sampler	: DEAN LAVERS	Issue Date	: 12-DEC-2014
Order number	: 075309-ENVR		
		No. of samples received	: 5
Quote number	: SY/476/14	No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	04-DEC-2014	----	**05-DEC-2014**	04-DEC-2014	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	01-JAN-2015	----	**05-DEC-2014**	01-JAN-2015	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	18-DEC-2014	----	**05-DEC-2014**	18-DEC-2014	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	01-JAN-2015	----	**05-DEC-2014**	01-JAN-2015	✓
ED045G: Chloride Discrete analyser							
Clear Plastic Bottle - Natural (ED045G)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	01-JAN-2015	----	**05-DEC-2014**	01-JAN-2015	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	01-JAN-2015	----	**11-DEC-2014**	01-JAN-2015	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	02-JUN-2015	----	**11-DEC-2014**	02-JUN-2015	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	01-JAN-2015	----	**05-DEC-2014**	01-JAN-2015	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	01-JAN-2015	----	**09-DEC-2014**	01-JAN-2015	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	06-DEC-2014	----	**05-DEC-2014**	06-DEC-2014	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**---**	01-JAN-2015	----	**09-DEC-2014**	01-JAN-2015	✓
EP005: Total Organic Carbon (TOC)							
Amber VOC Vial - Sulfuric Acid (EP005)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**----**	----	----	**08-DEC-2014**	01-JAN-2015	✓
EP035G: Total Phenol by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EP035G)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**08-DEC-2014**	01-JAN-2015	✓	**08-DEC-2014**	01-JAN-2015	✓
EP068A: Organochlorine Pesticides (OC)							
Amber Glass Bottle - Unpreserved (EP068)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**10-DEC-2014**	11-DEC-2014	✓	**11-DEC-2014**	19-JAN-2015	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP068B: Organophosphorus Pesticides (OP)							
Amber Glass Bottle - Unpreserved (EP068)							
MP1, MP4, MP5, MP8, MP9	**04-DEC-2014**	**10-DEC-2014**	11-DEC-2014	✓	**11-DEC-2014**	19-JAN-2015	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	18	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	19	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	11	**18.2**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	2	19	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	18	**11.1**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	10	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	2	12	**16.7**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phenol by Discrete Analyser	EP035G	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	18	**5.6**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	19	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	11	**9.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.6**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	10	**10.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phenol by Discrete Analyser	EP035G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	11	**9.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.6**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	10	**10.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phenol by Discrete Analyser	EP035G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.6**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Pesticides by GCMS	EP068	1	10	**10.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phenol by Discrete Analyser	EP035G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 21st ed. 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM (2013) Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 21st ed., 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 21st ed., 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 21st ed., 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 21st ed., 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 21st Ed. 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 21st ed., 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
Total Phenol by Discrete Analyser	EP035G	WATER	In house: Referenced to APHA 21st ed., 5530 B&D. Steam distillable Phenols are reacted with 4-aminoantipyrine. The resultant colour intensity is measured by Seal. This method is compliant with NEPM (2013) Schedule B(3)
Pesticides by GCMS	EP068	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Phenols After Microdistillation	EP035D	WATER	APHA 21st ed., 5530 A, B&D pH adjusted Steam distillable Phenolic compounds. The resultant colour intensity is measured by Discrete Analyser.
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG020F: Dissolved Metals by ICP-MS	ES1426944-003	Anonymous	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
MP1, MP4, MP5, MP8, MP9	----	----	----	05-DEC-2014	04-DEC-2014	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

CERTIFICATE OF ANALYSIS

Work Order	: **ES1501527**	Page	: 1 of 4
Client	: **LITHGOW CITY COUNCIL**	Laboratory	: Environmental Division Sydney
Contact	: MS KERRY FRAGAR	Contact	: Client Services
Address	: PO Box 19 LITHGOW NSW 2790	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kfragar@geolyse.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 6362 1055	Telephone	: +61-2-8784 8555
Facsimile	: +61 6361 8178	Facsimile	: +61-2-8784 8500
Project	: 202334 PORTLAND LANDFILL	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 075309_ENVR		
C-O-C number	: ----	Date Samples Received	: 23-JAN-2015
Sampler	: DL	Issue Date	: 02-FEB-2015
Site	: ----		
		No. of samples received	: 1
Quote number	: SY/476/14	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

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
Celine Conceicao	Senior Spectroscopist	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.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	SW1	----	----	----	----
			Client sampling date / time	21-JAN-2015 08:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1501527-001	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.58**	----	----	----	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	**20**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**25**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**25**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**2**	----	----	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**22**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**2**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**3**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**14**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**4**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.026**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**2.34**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.10**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	----	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.02**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	----	----	----	----
EN055: Ionic Balance								
Total Anions	----	0.01	meq/L	**1.16**	----	----	----	----
Total Cations	----	0.01	meq/L	**1.06**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW1	----	----	----	----
				Client sampling date / time	21-JAN-2015 08:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1501527-001	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**12**	----	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		**41**	----	----	----	----
EP035G: Total Phenol by Discrete Analyser									
Phenols (Total)	----	0.05	mg/L		<0.05	----	----	----	----

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES1501527**	Page	: 1 of 8
Client	: LITHGOW CITY COUNCIL	Laboratory	: Environmental Division Sydney
Contact	: MS KERRY FRAGAR	Contact	: Client Services
Address	: PO Box 19 LITHGOW NSW 2790	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: kfragar@geolyse.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 6362 1055	Telephone	: +61-2-8784 8555
Facsimile	: +61 6361 8178	Facsimile	: +61-2-8784 8500
Project	: 202334 PORTLAND LANDFILL	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 23-JAN-2015
Sampler	: DL	Issue Date	: 02-FEB-2015
Order number	: 075309_ENVR		
		No. of samples received	: 1
Quote number	: SY/476/14	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with recommended holding times (USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
SW1	**21-JAN-2015**	---	21-JAN-2015	----	**23-JAN-2015**	21-JAN-2015	×
EA025: Suspended Solids							
Clear Plastic Bottle - Natural (EA025H)							
SW1	**21-JAN-2015**	---	28-JAN-2015	----	**27-JAN-2015**	28-JAN-2015	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
SW1	**21-JAN-2015**	---	04-FEB-2015	----	**23-JAN-2015**	04-FEB-2015	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
SW1	**21-JAN-2015**	---	18-FEB-2015	----	**23-JAN-2015**	18-FEB-2015	✓
ED045G: Chloride Discrete analyser							
Clear Plastic Bottle - Natural (ED045G)							
SW1	**21-JAN-2015**	---	18-FEB-2015	----	**23-JAN-2015**	18-FEB-2015	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
SW1	**21-JAN-2015**	---	28-JAN-2015	----	**27-JAN-2015**	28-JAN-2015	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Natural (EG020A-F)							
SW1	**21-JAN-2015**	---	20-JUL-2015	----	**27-JAN-2015**	20-JUL-2015	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
SW1	**21-JAN-2015**	---	18-FEB-2015	----	**23-JAN-2015**	18-FEB-2015	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
SW1	**21-JAN-2015**	---	18-FEB-2015	----	**27-JAN-2015**	18-FEB-2015	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
SW1	**21-JAN-2015**	---	23-JAN-2015	----	**23-JAN-2015**	23-JAN-2015	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
SW1	**21-JAN-2015**	---	18-FEB-2015	----	**27-JAN-2015**	18-FEB-2015	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP005: Total Organic Carbon (TOC)							
Clear Plastic Bottle - Natural (EP005)							
SW1	**21-JAN-2015**	**----**	----	----	**27-JAN-2015**	22-JAN-2015	×
EP026SP: Chemical Oxygen Demand (Spectrophotometric)							
Clear Plastic Bottle - Sulfuric Acid (EP026SP)							
SW1	**21-JAN-2015**	**----**	----	----	**28-JAN-2015**	18-FEB-2015	✓
EP035G: Total Phenol by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EP035G)							
SW1	**21-JAN-2015**	**27-JAN-2015**	18-FEB-2015	✓	**27-JAN-2015**	18-FEB-2015	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	2	19	**10.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	2	11	**18.2**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	1	10	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	11	**18.2**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH by PC Titrator	EA005-P	1	7	**14.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	14	**14.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	2	**50.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phenol by Discrete Analyser	EP035G	1	8	**12.5**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser	EK055G	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	2	20	**10.0**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	11	**9.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	1	10	**10.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	14	**14.3**	**10.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phenol by Discrete Analyser	EP035G	1	8	**12.5**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	11	**9.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved	ED093F	1	10	**10.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	14	**7.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phenol by Discrete Analyser	EP035G	1	8	**12.5**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	19	**5.3**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	11	**9.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.1**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Organic Carbon	EP005	1	2	**50.0**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Total Phenol by Discrete Analyser	EP035G	1	8	**12.5**	**5.0**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 21st ed. 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM (2013) Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 21st ed., 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 21st ed., 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 21st ed., 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3) Hardness parameters are calculated based on APHA 21st ed., 2340 B. This method is compliant with NEPM (2013) Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 21st ed., 4500 F--C CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (2013) Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 21st ed., 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 21st ed., 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 21st ed., 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	In house: Referenced to APHA 21st Ed. 1030F. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 21st ed., 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3)
Chemical Oxygen Demand (COD) (Spectrophotometric)	EP026SP	WATER	In house: Referenced to APHA 21st ed., 5220 D. Samples are digested with a known excess of an acidic potassium dichromate solution using silver sulfate as a catalyst. The chromium is reduced from the Cr (VI) oxidation state to the Cr (III) state by the oxygen present in the organic material. Both of these chromium species are coloued and absorb in the visible region of (400nm & 600nm) the spectrum. The oxidisable organic matter can be calculated in terms of oxygen equivalents.
Total Phenol by Discrete Analyser	EP035G	WATER	In house: Referenced to APHA 21st ed., 5530 B&D. Steam distillable Phenols are reacted with 4-aminoantipyrine. The resultant colour intensity is measured by Seal. This method is compliant with NEPM (2013) Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Phenols After Microdistillation	EP035D	WATER	APHA 21st ed., 5530 A, B&D pH adjusted Steam distillable Phenolic compounds. The resultant colour intensity is measured by Discrete Analyser.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES1501470-001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP026SP: Chemical Oxygen Demand (Spectrophotome	ES1501409-001	Anonymous	**Chemical Oxygen Demand**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
SW1	----	----	----	23-JAN-2015	21-JAN-2015	**2**
EP005: Total Organic Carbon (TOC)						
Clear Plastic Bottle - Natural						
SW1	----	----	----	27-JAN-2015	22-JAN-2015	**5**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**