



GEOLYSE

154 Peisley Street
PO Box 1963
ORANGE NSW 2800

☎ 02 6393 5000
☎ 02 6393 5050

✉ orange@geolyse.com
🌐 geolyse.com

Our Ref: 202334_LET_053.docx

14 October 2014

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

Attention: Ms Peta Lette

Dear Peta

PORTLAND ENVIRONMENTAL MONITORING – 2013/2014 AEMR

Please find enclosed 2 copies of the 2013/2014 Annual Environmental Management Report (AEMR)

One copy of each document should be retained for your records and the other should be forwarded to the EPA along with payment of the administration fee, by express registered post, so that it is received no later than 16 October 2014.

Please do not hesitate to contact us if you have any questions.

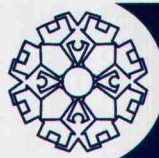
Yours faithfully
Geolyse Pty Ltd

CHLOE BIGG
Environmental Planner

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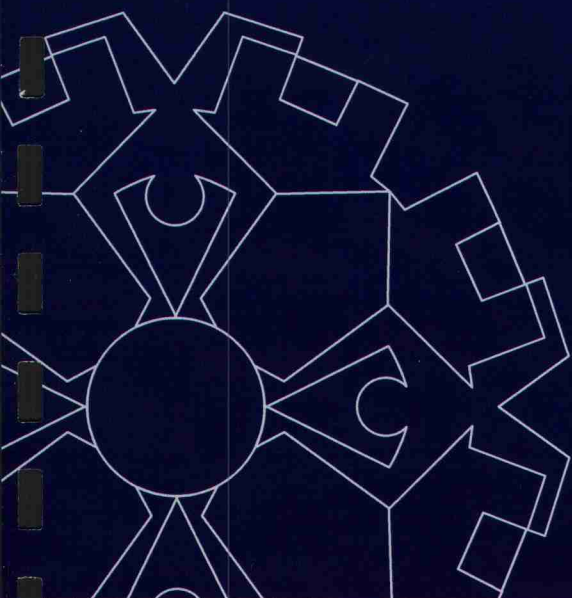


GEOLYSE

ANNUAL ENVIRONMENTAL MANAGEMENT REPORT
17 AUGUST 2013 – 16 AUGUST 2014-10-14
PORTLAND GARBAGE DEPOT
EPL 10936

PREPARED FOR
LITHGOW CITY COUNCIL

OCTOBER 2014



• Civil, Environmental & Structural Engineering • Surveying • Environmental • Planning • Architecture

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POSTAL ADDRESS PO Box 1963
LOCATION 154 PEISLEY STREET
TELEPHONE 02 6393 5000
EMAIL ORANGE@GEOLYSE.COM

ORANGE NSW 2800
ORANGE NSW 2800
FACSIMILE 02 6393 5050
WEB SITE WWW.GEOLYSE.COM



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Geolyse Pty Ltd and the authors responsible for the preparation and compilation of this report declare that we do not have, nor expect to have a beneficial interest in the study area of this project and will not benefit from any of the recommendations outlined in this report.

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.

All information contained within this report is prepared for the exclusive use of Lithgow City Council to accompany this report for the land described herein and are not to be used for any other purpose or by any other person or entity. No reliance should be placed on the information contained in this report for any purposes apart from those stated therein.

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Drawing 01C_EV01 – Environmental Monitoring Points

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 Statement of Compliance; and*
- a Monitoring and Complaints Summary..."*

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 no 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 2013 to 16 August 2014.

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 2013/14 reporting period (i.e. 16 August 2014).

Condition R1.9 states:

"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 2013 to 16 August 2014.

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 undertaken at the PGD during the reporting period included that required for groundwater and surface water. This section summarises all environmental monitoring undertaken during the reporting period (**Table 2.1**).

Table 2.1 – Environmental Monitoring

Date	Groundwater (Yearly when liquid is present)		Surface Water (Biannual during discharge)
	Level	Water Quality	
Sep 2013			
Oct 2013			
Nov 2013			
Dec 2013	✓	✓	✓
Jan 2014			
Feb 2014			
Mar 2014			
Apr 2014			✓
May 2014			
Jun 2014			
Jul 2014			
Aug 2014			

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, 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 2013.

Table 2.2 shows the list of groundwater parameters and their analysis frequency during the reporting period.

Table 2.2 – Groundwater Monitoring

Parameter	December 2013
Temperature* (field)	✓
Electrical Conductivity (field* + laboratory)	✓
pH (field* + laboratory)	✓
Alkalinity (as calcium carbonate)	✓
Ammonia	✓
Calcium	✓
Chloride	✓
Fluoride	✓
Iron	✓
Magnesium	✓
Manganese	✓
Nitrate	✓
Pesticides	✓
Potassium	✓
Sodium	✓
Standing Water Level	✓
Sulfate	✓
Total organic carbon	✓
Total Phenolics	✓

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.

Table 2.3 shows the list of surface water parameters and their analysis frequency during the reporting period.

Table 2.3 – Surface Water Monitoring

Discharge Parameter	December 2013	April 2014
Temperature* (field)	✓	✓
pH (field* + laboratory)	✓	✓
Alkalinity (as calcium carbonate)	✓	✓
Ammonia	✓	✓
Calcium	✓	✓
Chemical oxygen demand	✓	✓
Chloride	✓	✓
Fluoride	✓	✓
Iron	✓	✓

Table 2.3 – Surface Water Monitoring

Discharge Parameter	December 2013	April 2014
Magnesium	✓	✓
Manganese	✓	✓
Nitrate	✓	✓
Potassium	✓	✓
Sodium	✓	✓
Sulfate	✓	✓
Total organic carbon	✓	✓
Total Phenolics	✓	✓
Total Suspended Solids	✓	✓

Notes: * Additional to EPL requirements.

2.4 QUALITY CONTROL

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

The ALS Quality Control Report (refer – **Appendix B**) provides 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 2013.

No groundwater quality data was obtained from the following monitoring points at the time of the annual sampling round:

- MP1 and MP3 (No recharge)
- MP2 (Bore damaged)

3.2.1 LEVELS

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

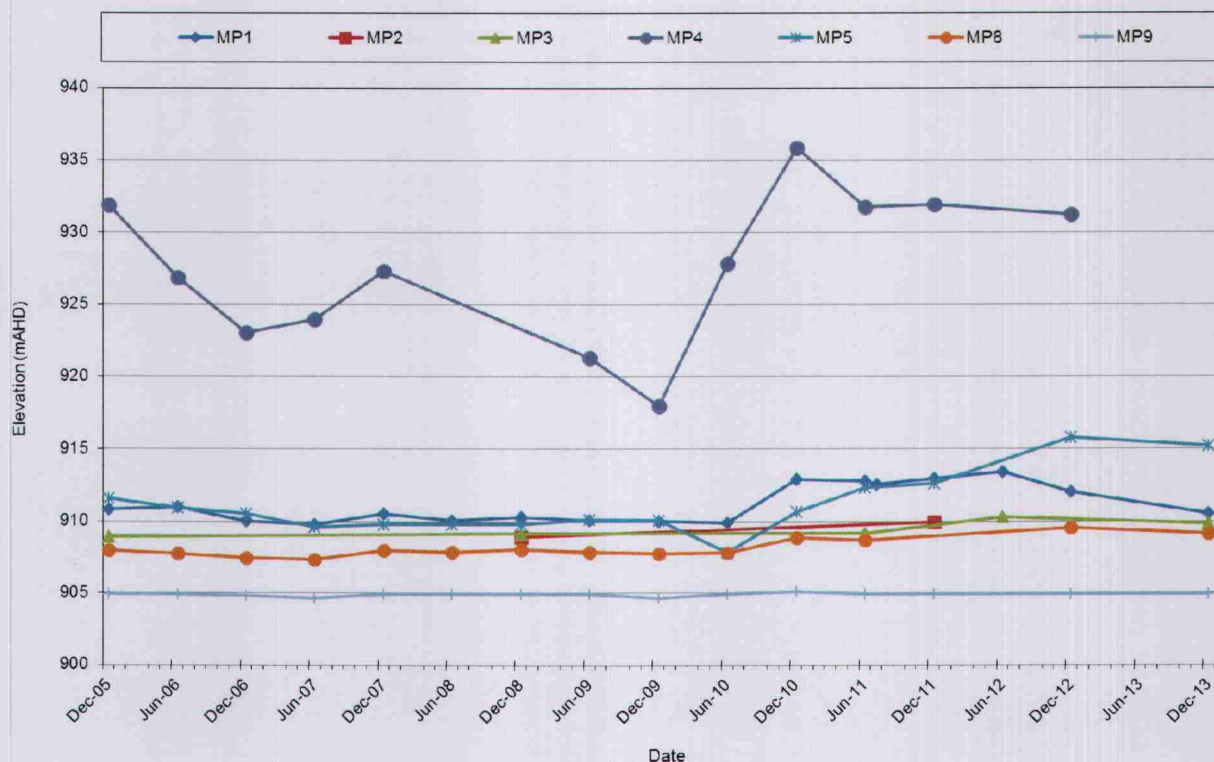


Figure 1: Groundwater levels – Portland Garbage Depot, December 2005 to December 2013

Groundwater levels remained relatively constant throughout the reporting period, with some degree of variation observed at each monitoring point. The most notable fluctuation was observed at MP1 which recorded the largest change of -1.48m between December 2012 and December 2013. All standing water levels were consistent with historical ranges.

From the data available it is likely that the hydraulic gradient falls in a north-westerly direction at a rate of 0.05m/m, generally consistent with the fall of the land, and consistent with CMJA (2005) findings. Despite that monitoring point MP4 is no longer required to be monitored (according to EPL 10936), it is noted that the average groundwater level at MP4 is significantly higher than the nearby monitoring point MP5; based on historical data, on average MP4 groundwater levels are 16.48m higher than MP5. This is consistent with findings in the CMJA (2005) hydrogeological study for Portland Garbage Depot; the difference in standing water levels is attributed to the shallow groundwater system intersected by MP4, and deeper regional aquifer intersected by MP5.

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 QUALITY

3.2.2.1 Physical Properties

Groundwater temperatures recorded at MP5 and MP8 were lower than those which have been recorded historically, with new minimum values of 14.0°C and 11.9°C (respectively). Reporting period temperatures ranged from 11.9°C at MP8 and MP9, to 14.0°C at MP5 in December 2013.

3.2.2.2 Chemical Properties

Measurements of pH across the site (**Figure 2**) were relatively neutral for the reporting period, with values ranging from 7.49pH units at MP8, to 5.79pH units at MP9. New maximum values were recorded at MP8 and MP9. pH values increased at each monitoring point sampled since the previous monitoring round in December 2012, following the steadily increasing alkaline trend. All values recorded during the December 2013 monitoring round at within the range recommended as suitable for livestock drinking water (6.5-8.5pH units, Marckwick, 2007).

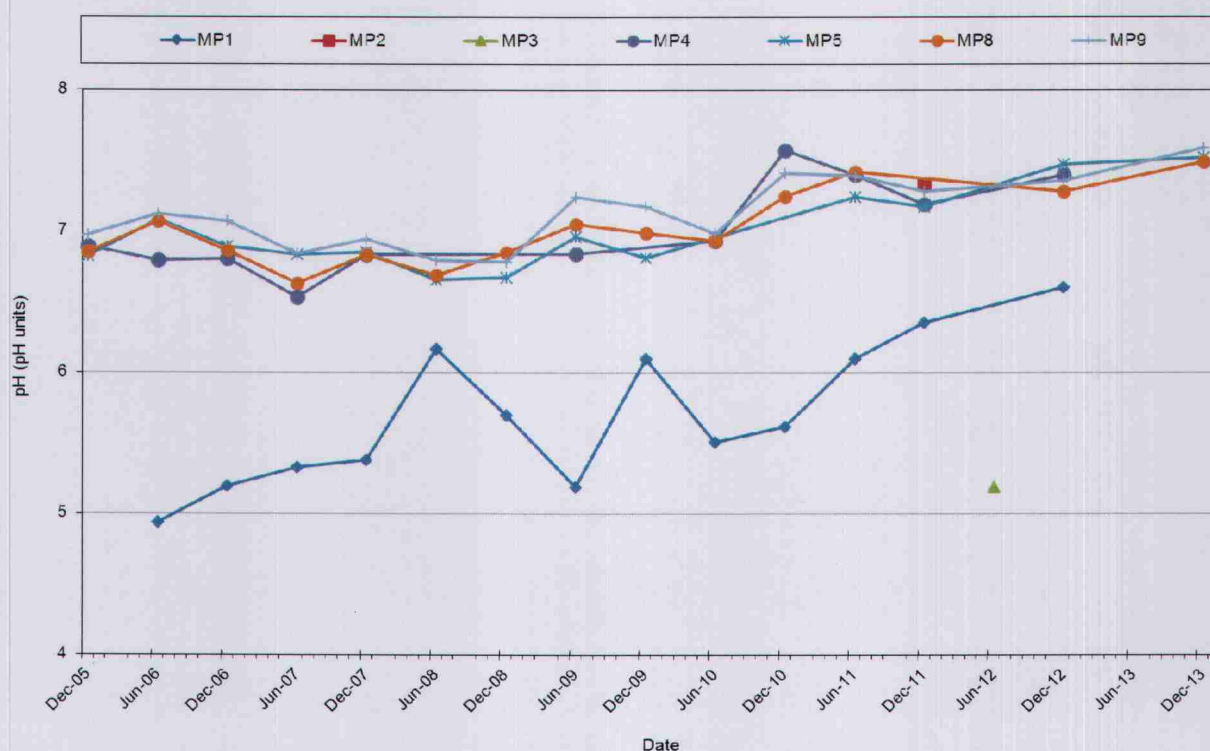


Figure 2: Groundwater pH – Portland Garbage Depot, December 2005 to December 2013

Electrical Conductivity (EC) measurements are presented in Figure 3.

Electrical conductivity increased at each monitoring point sampled, and across the site ranged from 2120 μ S/cm at MP5, to 4010 μ S/cm at MP9. The most significant change recorded since the previous monitoring round in December 2012 was an increase of 800 μ S/cm at MP8. Values recorded at MP8 and MP9 were new maximum values. All values remained below the upper value of livestock drinking water guideline range (4700 μ S/cm) for the most susceptible category, poultry (ANZECC & ARMCANZ, 2000).

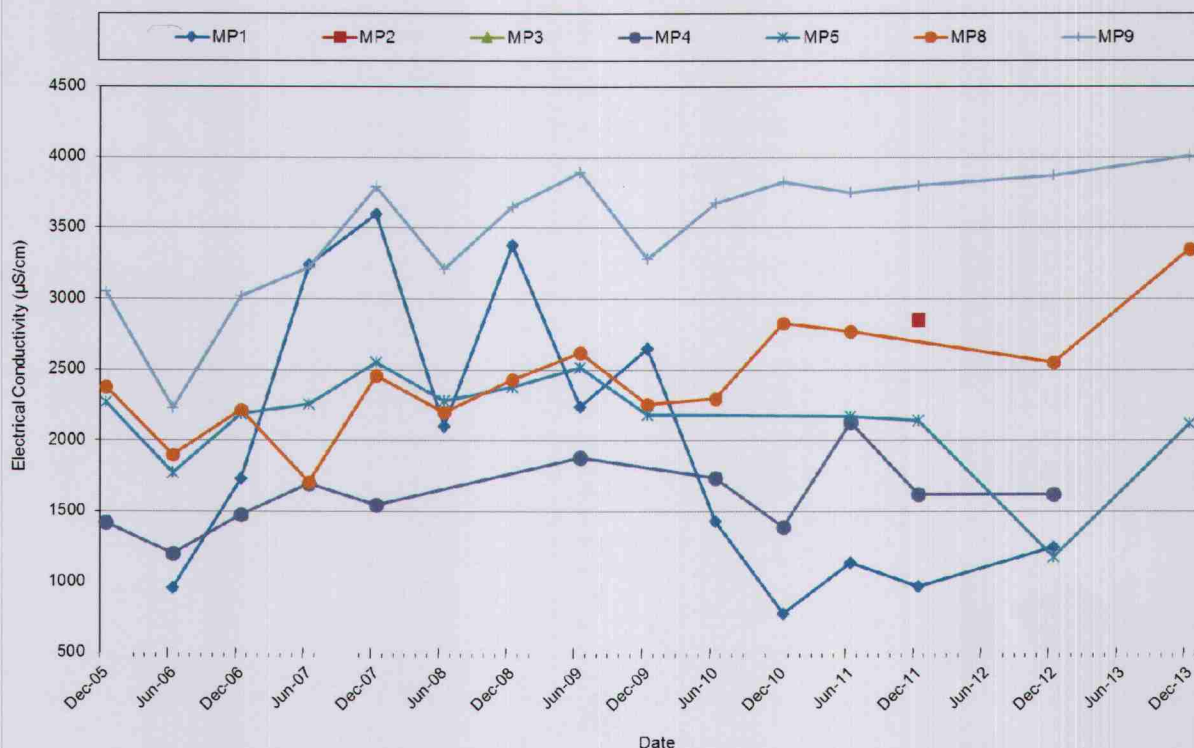


Figure 3: Groundwater EC – Portland Garbage Depot, December 2005 to December 2013

Concentrations of **Total Organic Carbon (TOC)** for the reporting period ranged from 4mg/L at MP8 to 9mg/L at MP5. Since the previous monitoring round (December 2012), TOC remained unchanged at MP5, decreased by 4mg/L at MP8, and increased from below the LOR (<1mg/L) to 5mg/L at MP9. TOC has only been required to be monitored at MP5, MP8 and MP9 since the 4 September 2013 licence variation and therefore, there are no historical values available for comparison.

Total Alkalinity (as calcium carbonate) concentrations are presented in **Figure 4**.

Concentrations of alkalinity for the reporting period ranged from 434mg/L at MP5, to 624mg/L at MP9. All values recorded during the reporting period were consistent with established ranges. All samples collected during the reporting period exceeded the 350mg/L guideline value for irrigation to moderately tolerant crops (ANZECC & ARMCANZ, 2000).

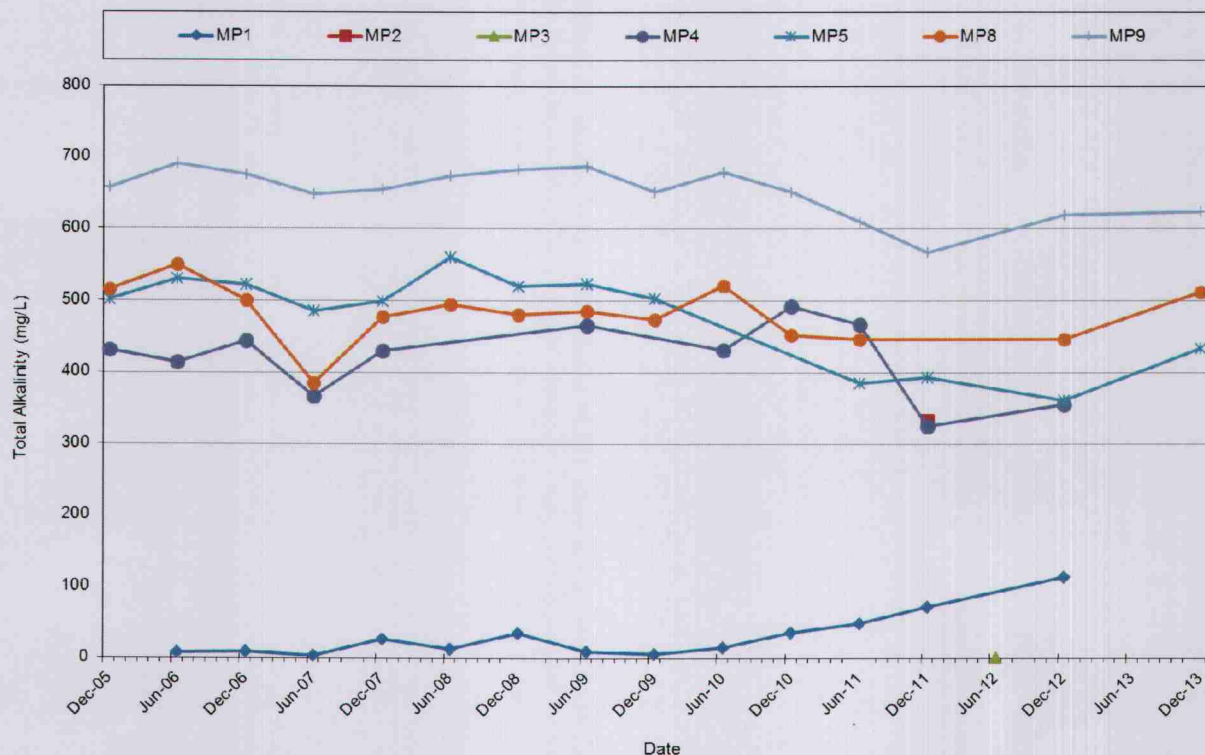


Figure 4: Groundwater Alkalinity – Portland Garbage Depot, December 2005 to December 2013

3.2.2.3 Exchangeable Ions

Chloride concentrations for the reporting period ranged from 110mg/L at MP5, to 340mg/L at MP9. Since the previous monitoring round (December 2012), chloride concentrations increased at MP5 and MP8, and decreased at MP9. Chloride has only been required to be monitored at MP5, MP8 and MP9 since the 4 September 2013 licence variation and therefore, there are no historical values available for comparison. All detected levels remained below the guideline value of 700mg/L for irrigation to moderately tolerant crops (ANZECC & ARMCANZ, 2000).

Fluoride concentrations are presented in **Figure 5**.

Concentrations of fluoride for the reporting period ranged from 0.2mg/L at MP8, to 0.3mg/L at MP5 and MP9. All values recorded during the reporting period were consistent with established ranges. All concentrations were considered suitable for long term crop irrigation (<1mg/L, ANZECC & ARMCANZ, 2000).

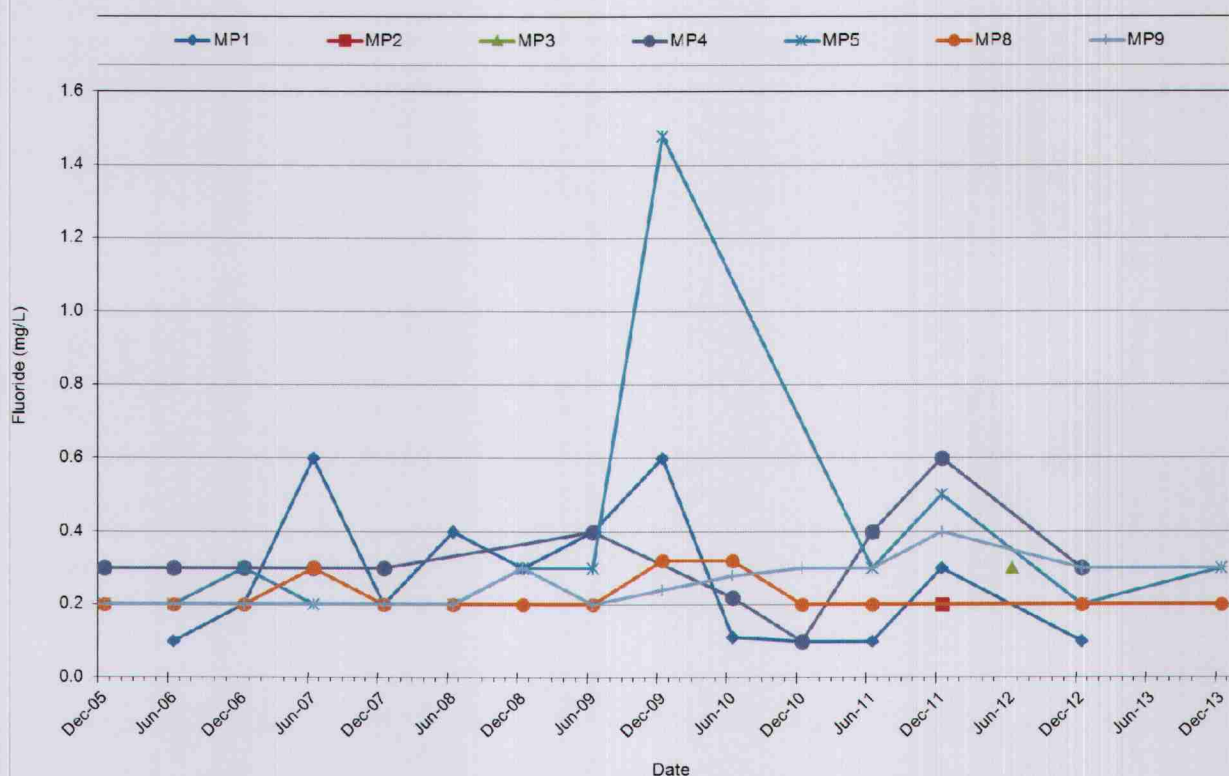


Figure 5: Groundwater Fluoride – Portland Garbage Depot, December 2005 to December 2013

Sulfate concentrations are presented in **Figure 6**.

Concentrations of sulfate increased in all samples, with values for the reporting period ranging from 495mg/L at MP5, to 1300mg/L at MP9. All values recorded during the reporting period were consistent with established ranges. MP5 remains significantly lower than the livestock drinking water guideline value of 1000mg/L (ANZECC & ARMCANZ, 2000) but MP8 (906mg/L) is close to the guideline value and MP9 exceeds the guideline value.

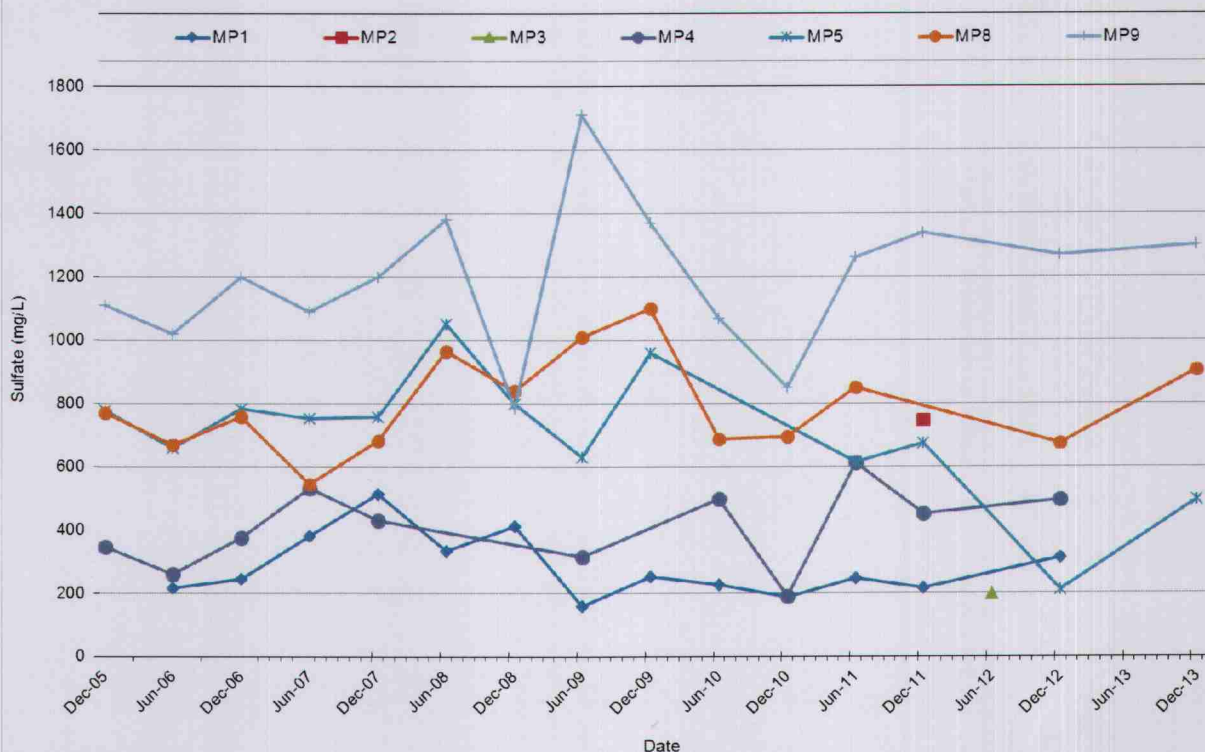


Figure 6: Groundwater Sulfate – Portland Garbage Depot, December 2005 to December 2013

Calcium concentrations are presented in **Figure 7**.

Concentrations of calcium increased in all samples, with values for the reporting period ranging from 223mg/L at MP5, to 392mg/L at MP9. All values recorded during the reporting period were consistent with established ranges, excepting MP8 which recorded a new maximum value of 383mg/L (an exceedance of 48mg/L). All values remain significantly lower than the livestock drinking water guideline value of 1000mg/L (ANZECC & ARMCANZ, 2000).

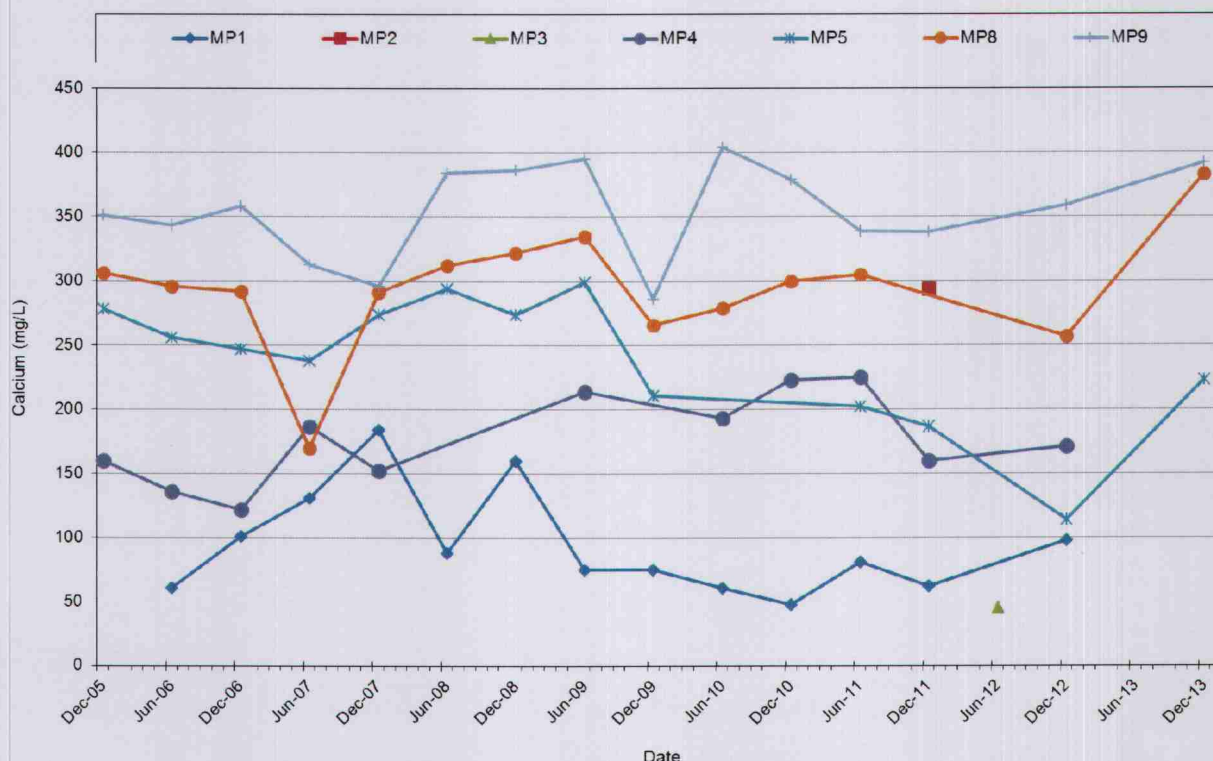


Figure 7: Groundwater Calcium – Portland Garbage Depot, December 2005 to December 2013

Magnesium concentrations for the reporting period ranged from 104mg/L at MP5, to 242mg/L at MP9. Since the previous monitoring round (December 2012), magnesium concentrations increased at all monitoring points. Magnesium has only been required to be monitored at MP5, MP8 and MP9 since the 4 September 2013 licence variation and therefore, there are no historical values available for comparison.

Potassium concentrations for the reporting period ranged from 6mg/L at MP9, to 9mg/L at MP8. Since the previous monitoring round (December 2012), Magnesium concentrations remain unchanged at MP5 and MP9, and slightly decreased at MP8. Potassium has only been required to be monitored at MP5, MP8 and MP9 since the 4 September 2013 licence variation and therefore, there are no historical values available for comparison.

Sodium concentrations for the reporting period ranged from 102mg/L at MP5, to 229mg/L at MP9. Since the previous monitoring round (December 2012), sodium concentrations increased at MP5 and MP8, and decreased at MP9. Sodium has only been required to be monitored at MP5, MP8 and MP9 since the 4 September 2013 licence variation and therefore, there are no historical values available for comparison. All values except the 572mg/L recorded at MB6 in April were below the irrigation guideline value for moderately tolerant crops (<460mg/L, ANZECC & ARMCANZ, 2000).

3.2.2.4 Nutrients

Ammonia concentrations are presented in **Figure 8**.

Concentrations of ammonia for the reporting period ranged from below the LOR ($<0.01\text{mgN/L}$) at MP9, to 0.15mgN/L at MP5. All values recorded during the reporting period were consistent with established ranges. All values remain significantly lower than the livestock drinking water guideline value of 1000mg/L (ANZECC & ARMCANZ, 2000).

There is no data available for MP1 (nil recharge); MP1 will continue to be monitored to identify the development of any adverse trend.

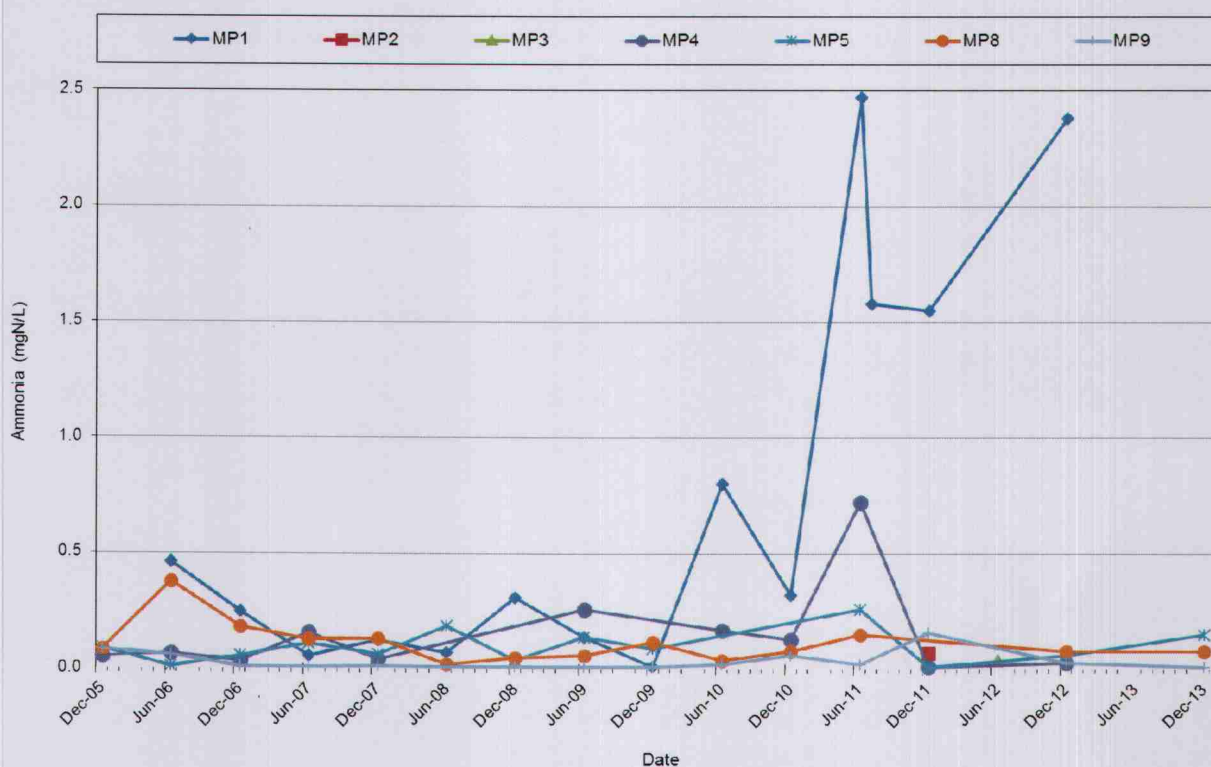


Figure 8: Groundwater Ammonia (as N) – Portland Garbage Depot, December 2005 to December 2013

Nitrate concentrations are presented in **Figure 9** for all monitoring points except MP1 which is presented separately in **Figure 10**.

Concentrations of nitrate are relatively low with values ranging from below the LOR (<0.01mgN/L) at MP8, to 0.08mgN/L at MP5. All values decreased since the previous monitoring round and all values during the reporting period are within the established ranges. All detected concentrations were significantly lower than the livestock drinking water guideline value of 90.29mgN/L (ANZECC & ARMCANZ, 2000).

Since December 2010, nitrate concentrations at MP1 have remained below 0.70mgN/L, indicating that the effects of nightsoil disposal at the PGD are significantly reduced and appear to be decreasing gradually with values ranging from 0.70mgN/L in December 2010 to 0.20mgN/L in December 2012, down from a maximum value of 360mgN/L in June 2003.

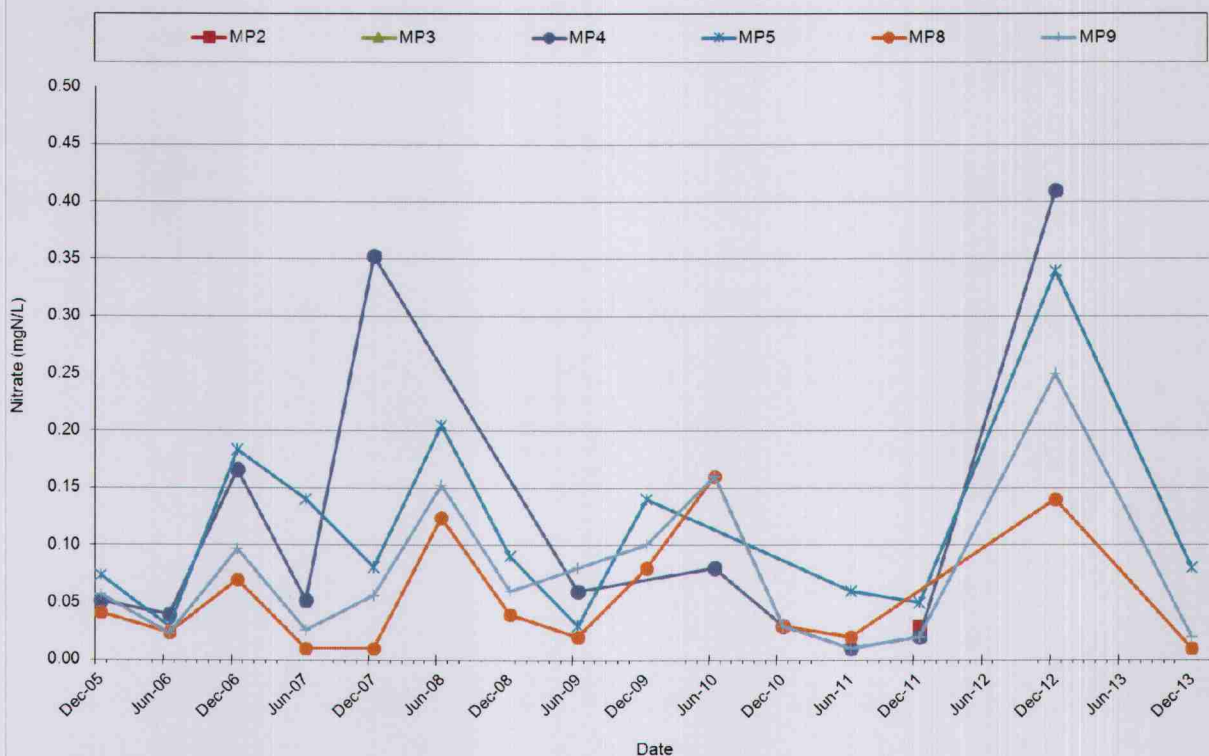


Figure 9: Groundwater Nitrate – Portland Garbage Depot, December 2005 to December 2013

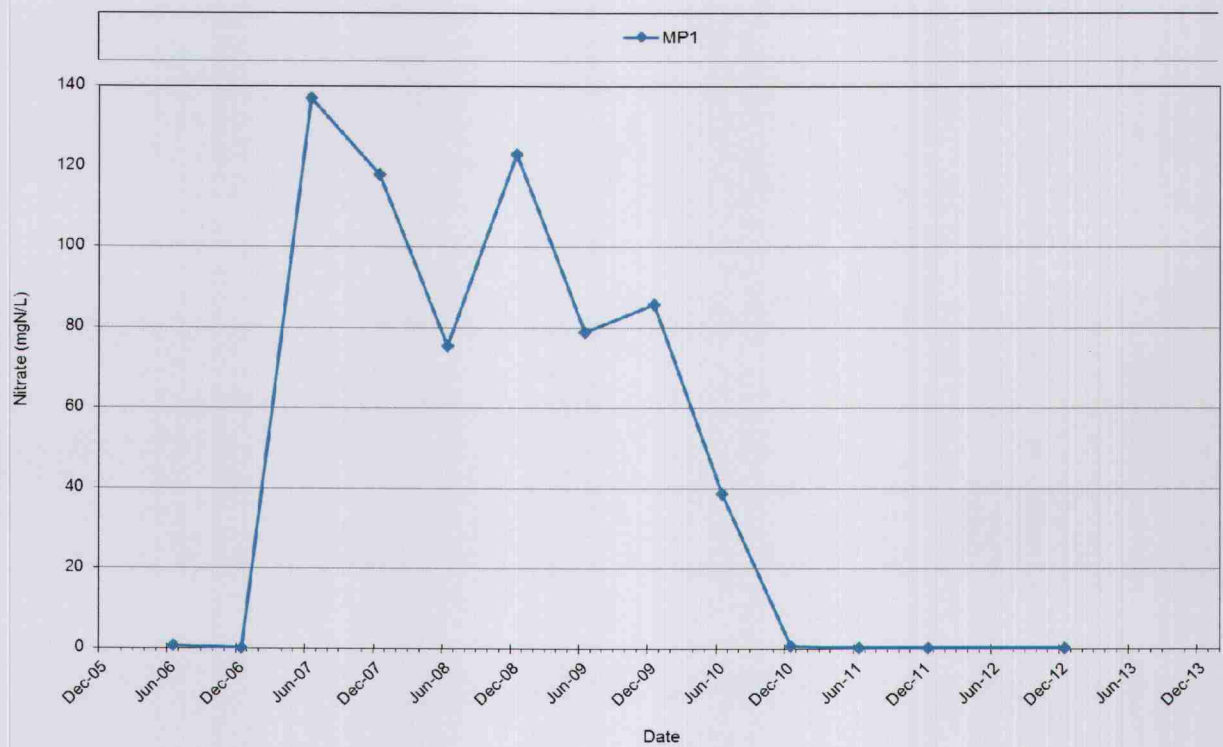


Figure 10: Groundwater Nitrate at MP1 – Portland Garbage Depot, December 2005 to December 2013

3.2.2.5 Metals

Manganese concentrations for the reporting period ranged from 0.65mg/L at MP5, to 1.94mg/L at MP8. Since the previous monitoring round (December 2012), manganese concentrations increased at all monitoring points. Manganese has only been required to be monitored at MP5, MP8 and MP9 since the 4 September 2013 licence variation and therefore, there are no historical values available for comparison. All concentrations were considered suitable for crop irrigation for periods less than 20 years (<10mg/L, ANZECC & ARMCANZ, 2000).

Iron concentrations are presented in **Figure 11**.

Iron concentrations for the reporting period ranged from 0.83mg/L at MP9, to 3.74mg/L at MP8. Since the previous monitoring round (December 2012), iron concentrations increased at all monitoring points but remain below the guideline value for short term crop irrigation (periods of less than 20 years) (<10mg/L, ANZECC & ARMCANZ, 2000).

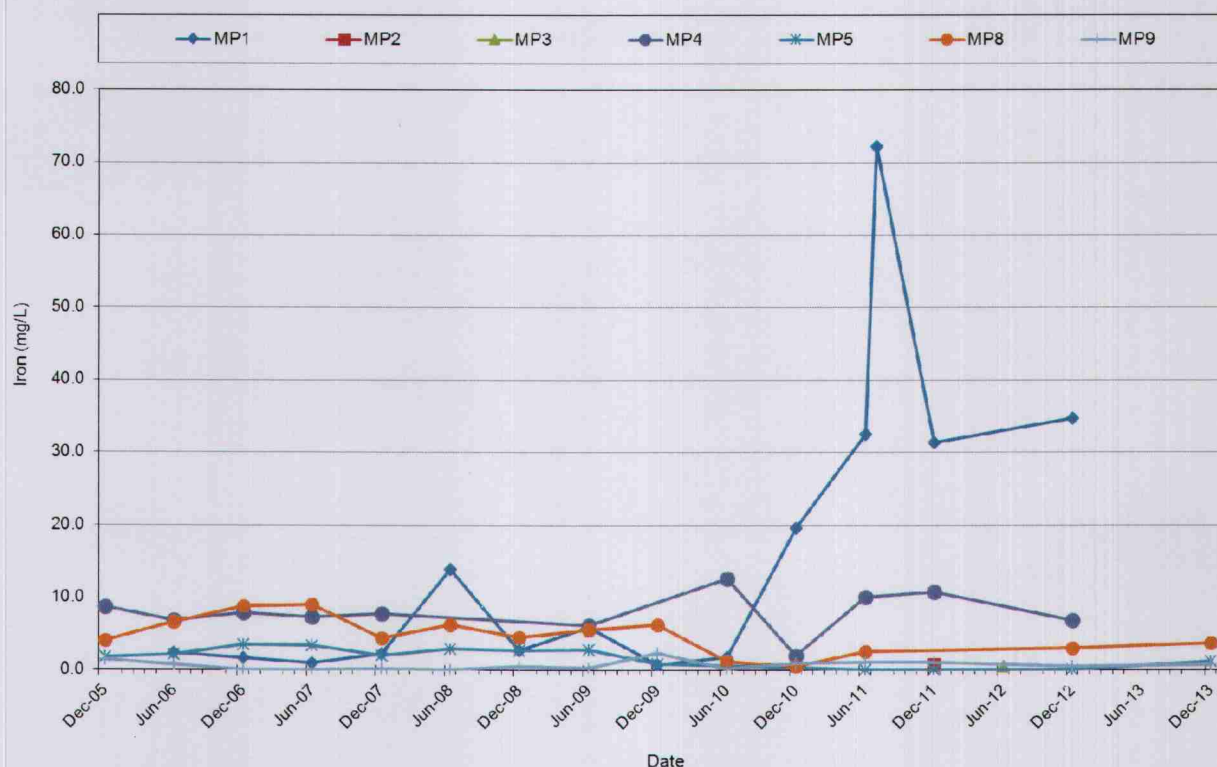


Figure 11: Groundwater Iron – Portland Garbage Depot, December 2005 to December 2013

3.2.2.6 Organics

Total phenols concentrations were below the laboratory limit of reporting (<0.05mg/L) at all monitoring points sampled throughout the reporting period. This is consistent with the established ranges.

Organochlorine and **Organophosphorus** pesticide (OCP and OPP) concentrations were below the laboratory limit of reporting at all groundwater monitoring points during the reporting period.

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 December 2013 and April 2014.

3.3.1 QUALITY

3.3.1.1 Chemical Properties

pH concentrations are presented in **Figure 12**.

pH remained within the established range, with values of 7.73pH units and 8.01pH units recorded. These values are considered suitable for consumption by livestock (ANZECC & ARMCANZ, 2000) and are within the EPL limit of 6.5-8.5pH units.

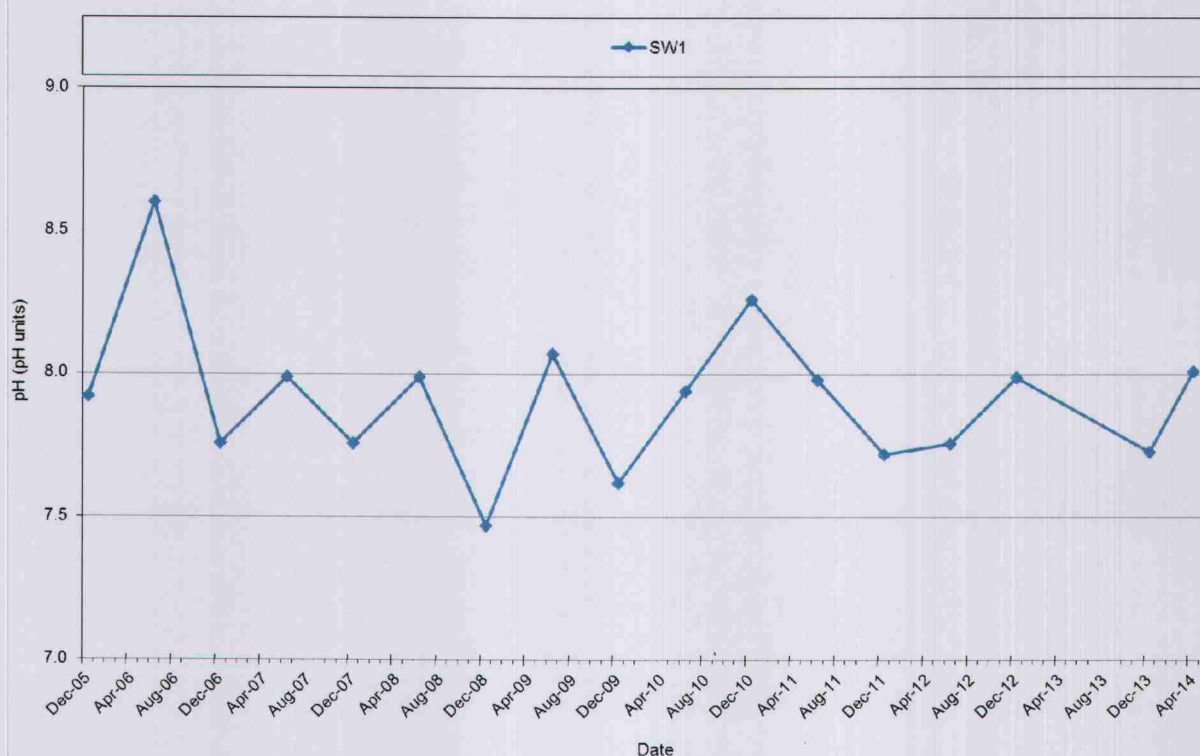


Figure 12: Surface water pH – Portland Garbage Depot, December 2005 to December 2013

Total Organic Carbon (TOC) concentrations are presented in **Figure 13**. TOC has been required to be monitored at SW1 since the 3 February 2010 licence variation but has only been recorded since June 2012.

Total organic carbon was elevated in December 2013 (62mg/L, a new maximum value) and a new minimum value was recorded in April 2014 (28mg/L).

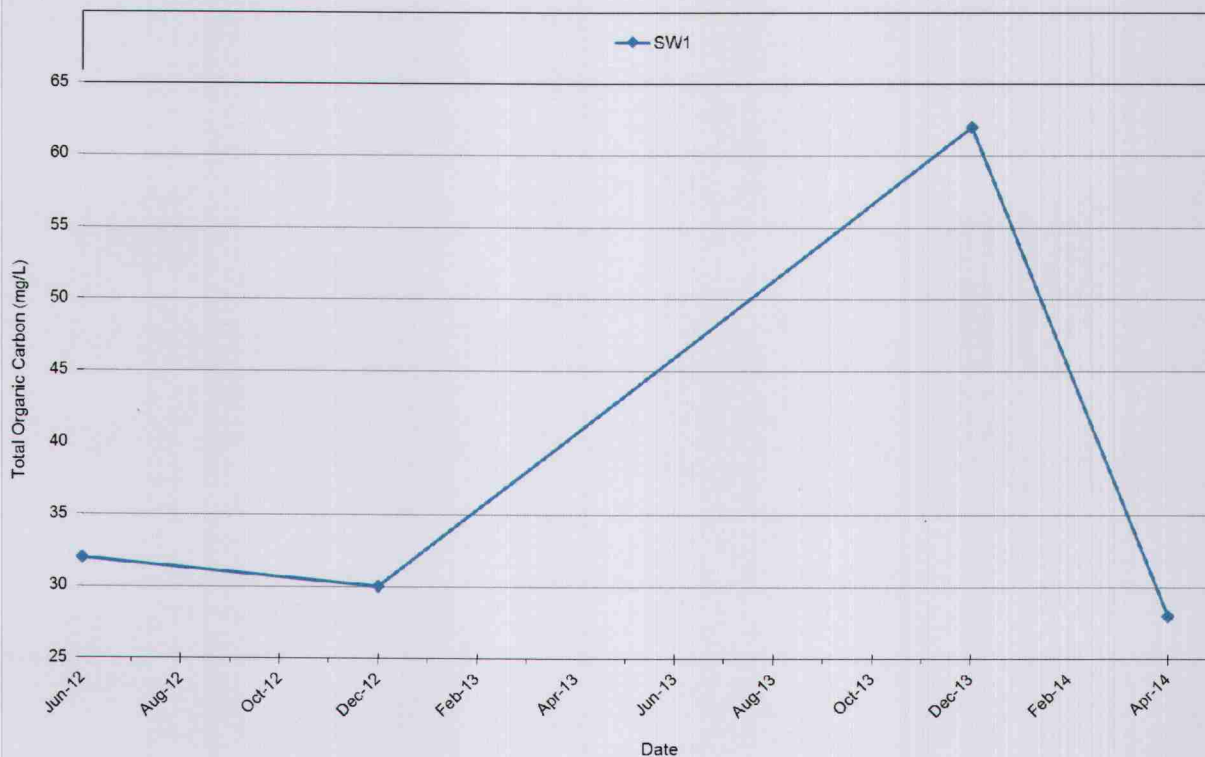


Figure 13: Surface water TOC – Portland Garbage Depot, December 2005 to December 2013

Chloride concentrations are presented in **Figure 14**. Chloride has been required to be monitored at SW1 since the 3 February 2010 licence variation but has only been recorded since June 2012.

Chloride concentrations recorded during the reporting period were new maximum and minimum values of 133mg/L in December 2013 and 72mg/L in April 2014. These values are below the guideline value of 700mg/L recommended for irrigation to moderately tolerant crops (ANZECC & ARMCANZ, 2000).



Figure 14: Surface water chloride – Portland Garbage Depot, December 2005 to December 2013

Sulfate concentrations are presented in **Figure 15**.

Sulfate was measured to be 247mg/L and 353mg/L, which is consistent with the established range and significantly lower than the 1000mg/L recommended for livestock drinking water (ANZECC & ARMCANZ, 2000).

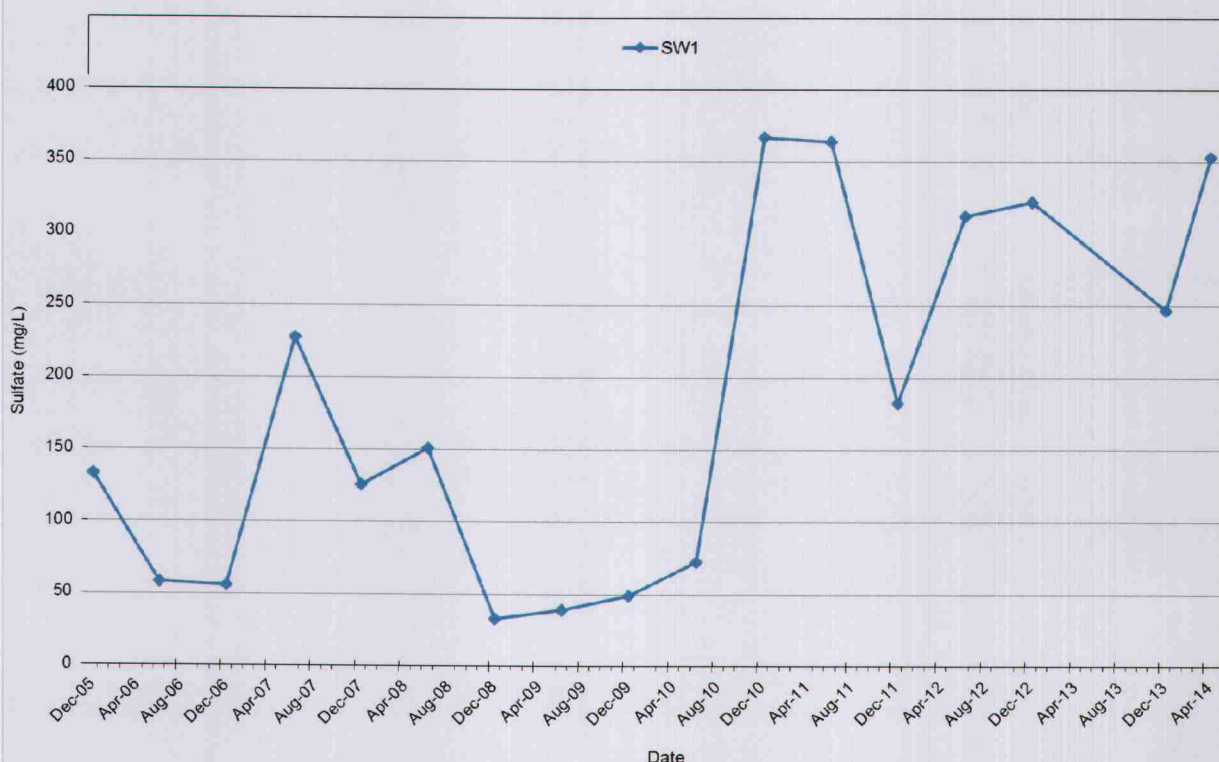


Figure 15: Surface water sulfate – Portland Garbage Depot, December 2005 to December 2013

Calcium concentrations are presented in **Figure 16**

Calcium was significantly lower than the 1000mg/L livestock drinking water guideline (ANZECC & ARMCANZ, 2000) in both samples collected during the reporting period. Concentrations were consistent with the historical range at 133mg/L and 72mg/L.

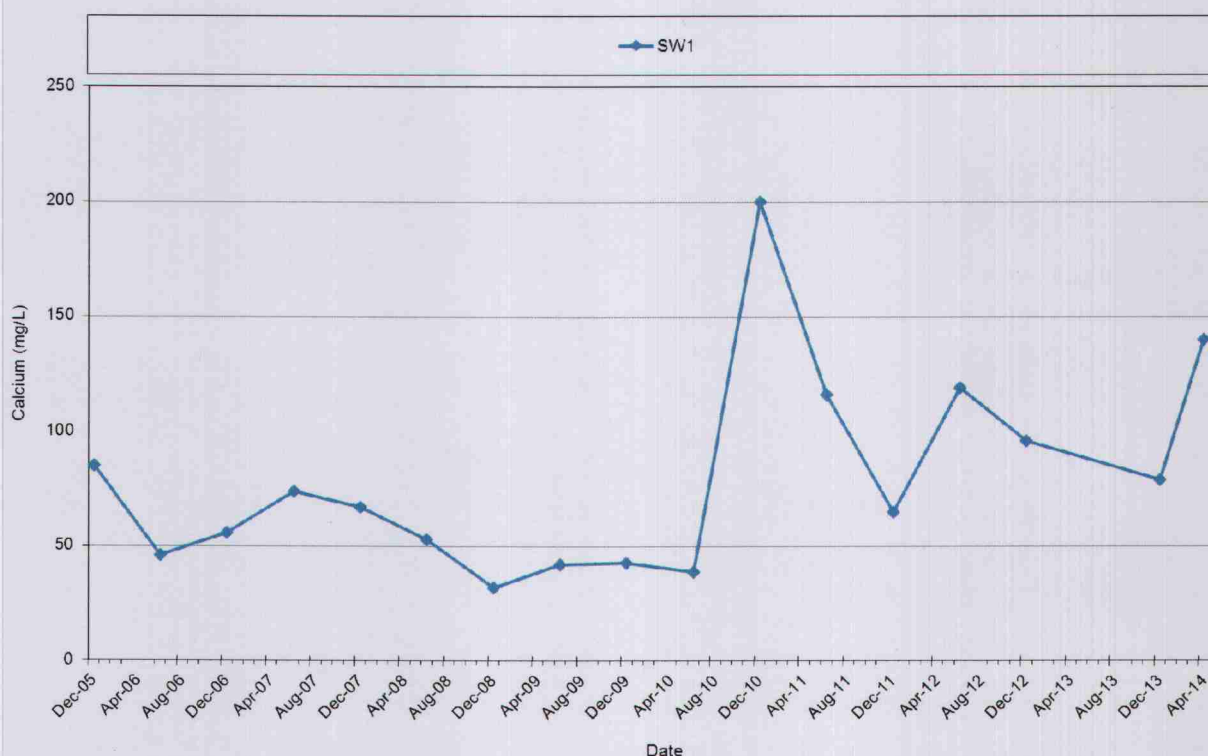


Figure 16: Surface water calcium – Portland Garbage Depot, December 2005 to December 2013

Magnesium concentrations are presented in **Figure 17**. Magnesium has been required to be monitored at SW1 since the 3 February 2010 licence variation but has only been recorded since June 2012. Magnesium was measured to be 29mg/L and 26mg/L during the reporting period.

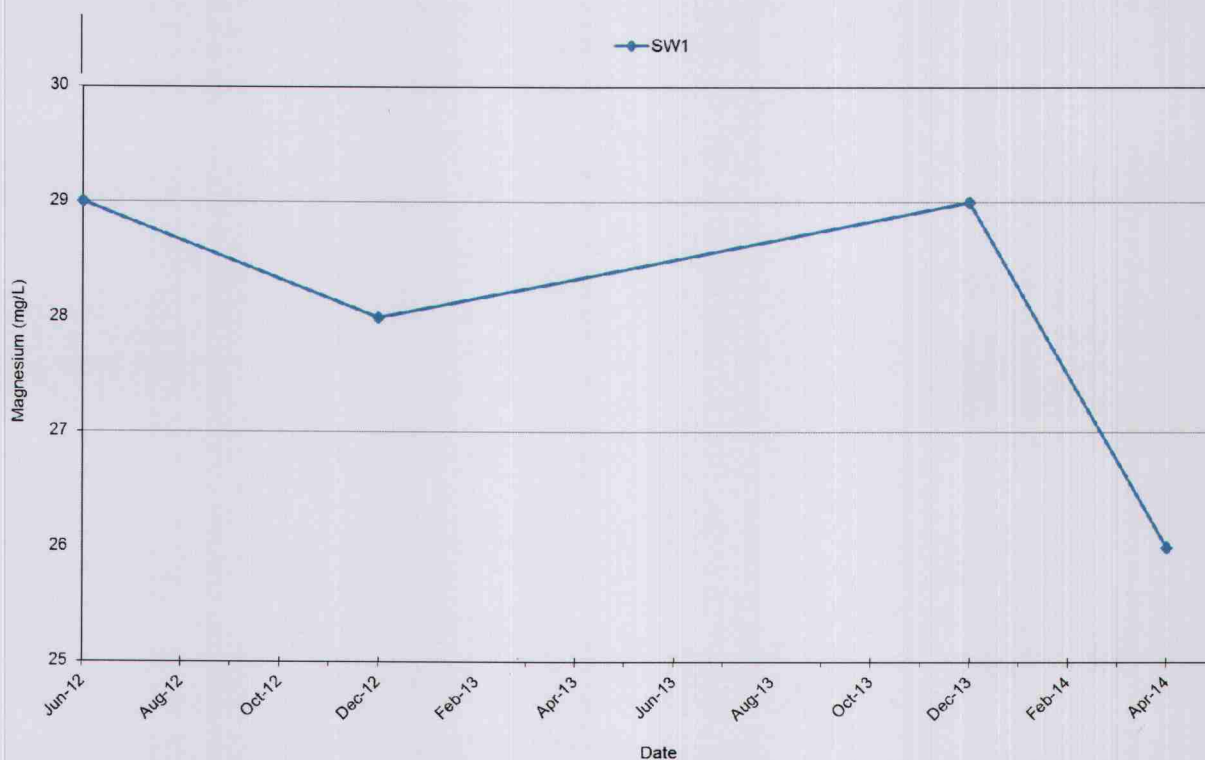


Figure 17: Surface water magnesium – Portland Garbage Depot, December 2005 to December 2013

Potassium concentrations are presented in **Figure 18**. Potassium has been required to be monitored at SW1 since the 3-Feb-2010 licence variation but has only been recorded since June 2012. Potassium was measured to be 102mg/L and 69mg/L during the reporting period.

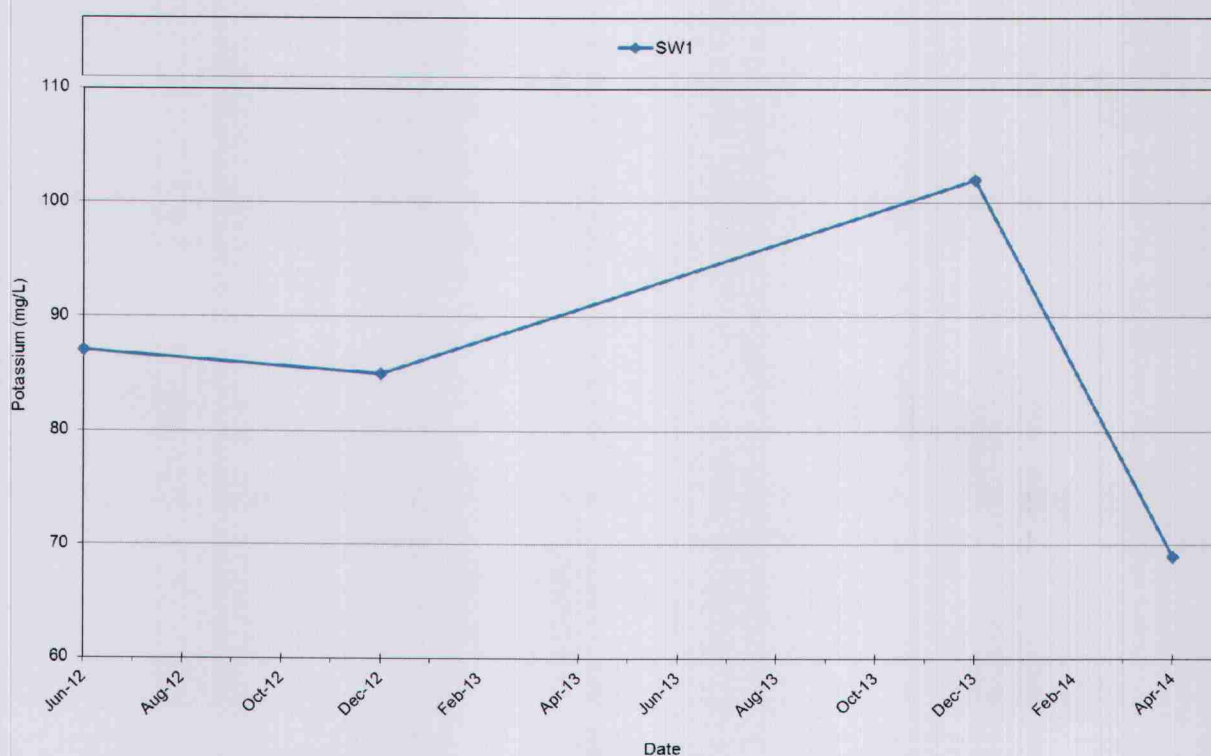


Figure 18: Surface water potassium – Portland Garbage Depot, December 2005 to December 2013

Sodium concentrations are presented in **Figure 19**. Sodium has been required to be monitored at SW1 since the 3 February 2010 licence variation but has only been recorded since June 2012. Sodium was measured to be 69mg/L and 41mg/L during the reporting period, which is and significantly lower than the crop irrigation guideline value of 460mg/L for moderately tolerant crops (ANZECC & ARMCANZ, 2000).

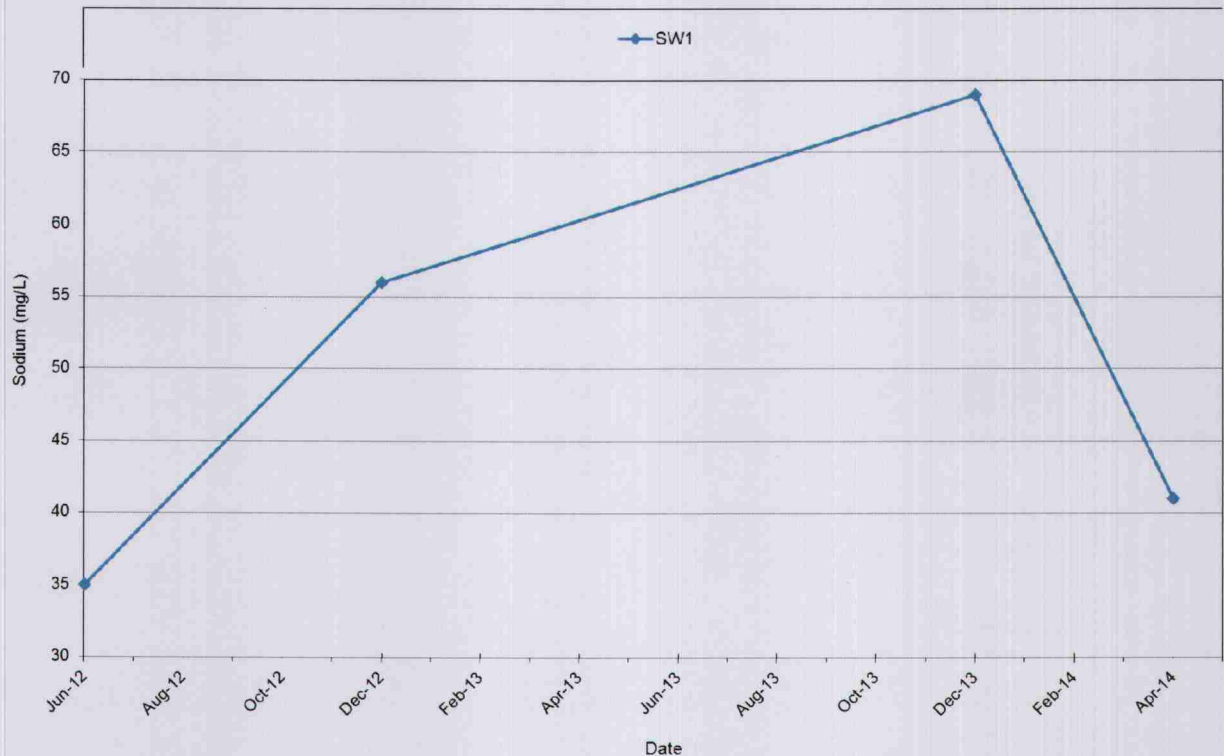


Figure 19: Surface water sodium – Portland Garbage Depot, December 2005 to December 2013

Ammonia concentrations are presented in **Figure 20**.

Ammonia concentrations during the reporting period were measured to be below the LOR (<0.01mgN/L) and 0.05mgN/L, which is consistent with the established range and remains below the guideline value for livestock drinking water (9.12mgN/L, ANZECC & ARMCANZ, 2000).

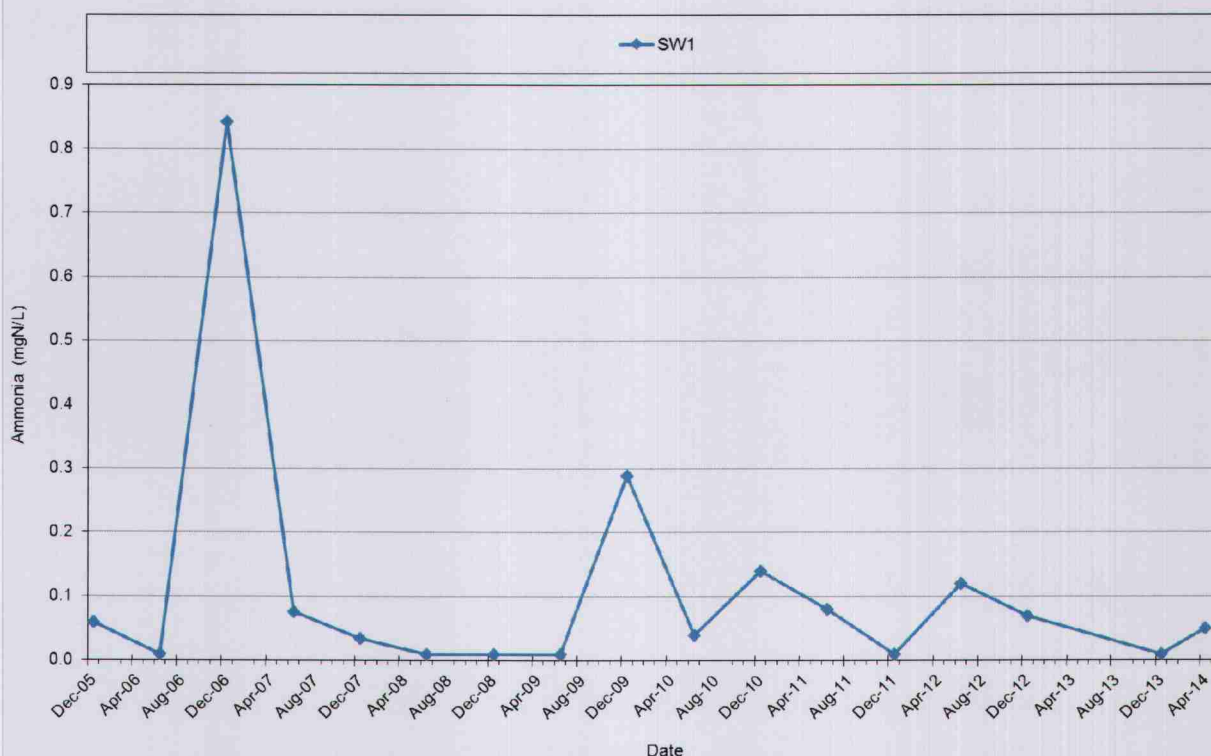


Figure 20: Surface water Ammonia (as N) – Portland Garbage Depot, December 2005 to December 2013

Nitrate concentrations are presented in **Figure 21**.

Nitrate concentrations during the reporting period were measured to be 0.04mgN/L and 0.17mgN/L, which is consistent with the established range and remains significantly lower than the livestock drinking water guideline value of 90.29mgN/L (ANZECC & ARMCANZ, 2000).

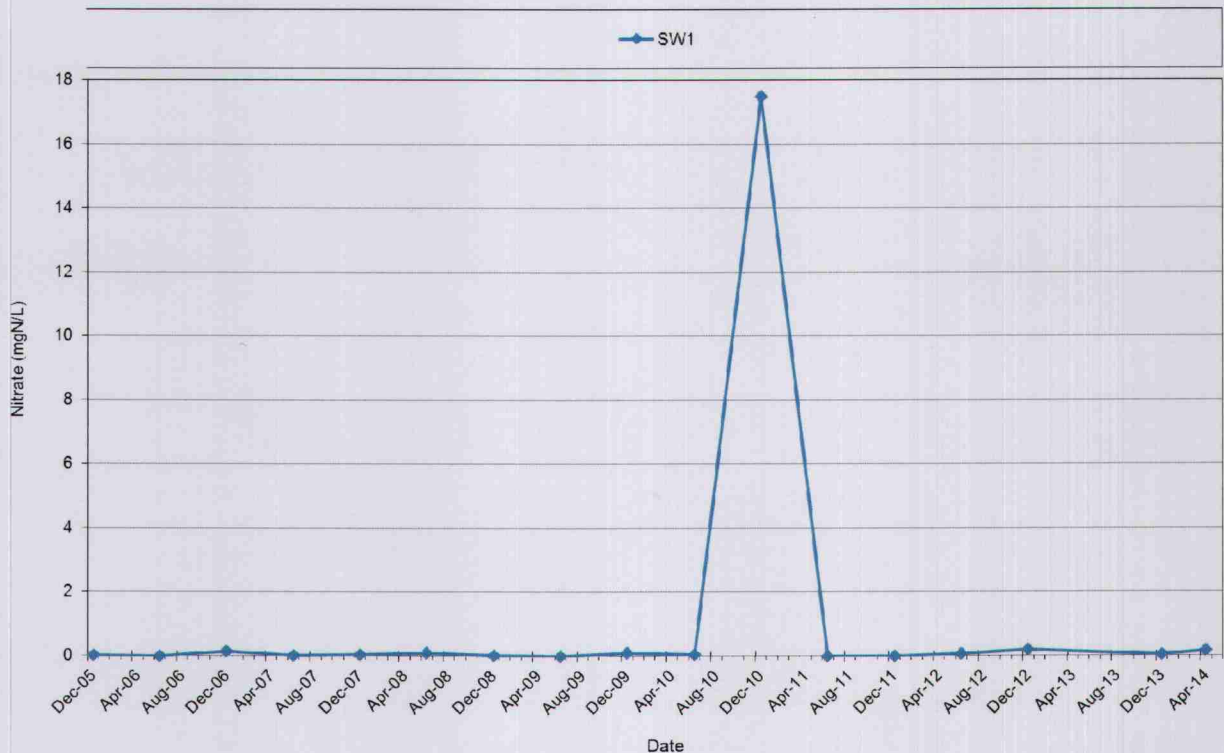


Figure 21: Surface water nitrate (as N) – Portland Garbage Depot, December 2005 to December 2013

Alkalinity (as CaCO_3) concentrations are presented in **Figure 22**.

Alkalinity was measured to be 101mg/L and 119mg/L during the reporting period, which is consistent with the established range and below the 350mg/L recommended for crop irrigation (ANZECC & ARMCANZ, 2000).

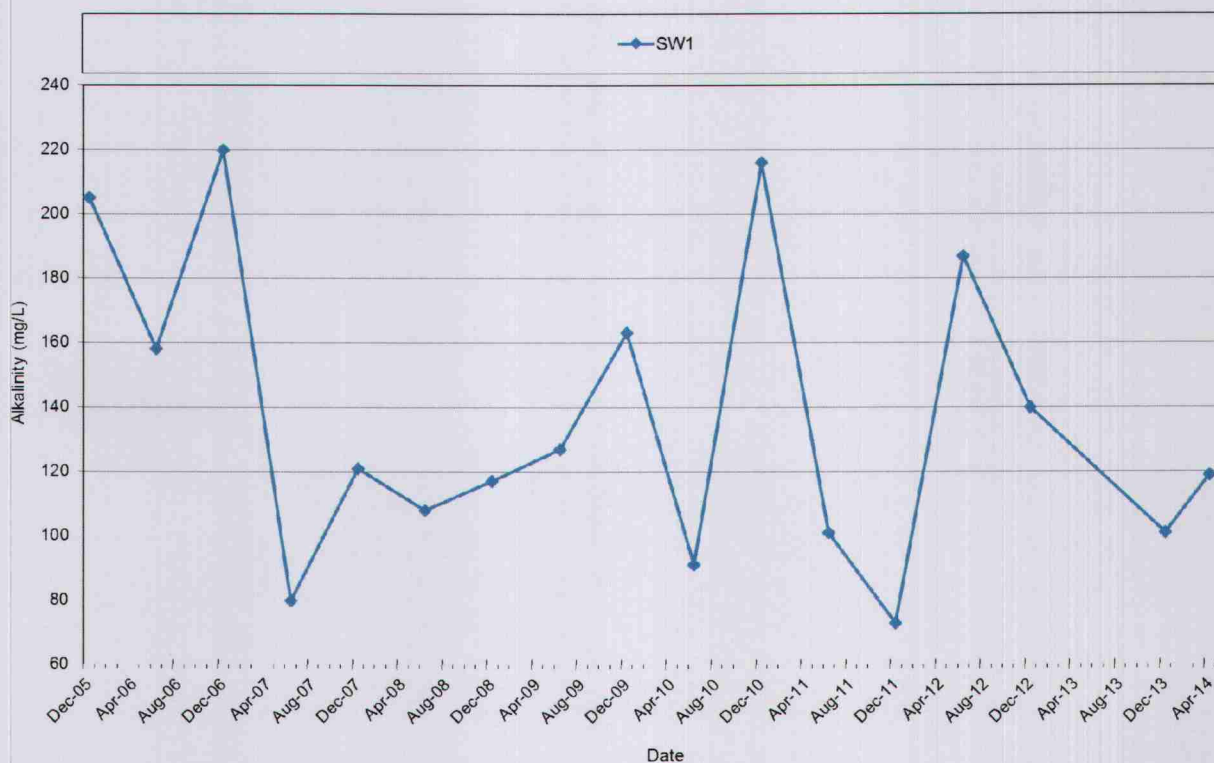


Figure 22: Surface water alkalinity – Portland Garbage Depot, December 2005 to December 2013

Fluoride concentrations are presented in **Figure 23**.

Fluoride was measured to be 0.4mg/L and 0.2mg/L during the reporting period, which is consistent with the established range and below the 1mg/L recommended for long-term crop irrigation (ANZECC & ARMCANZ, 2000).

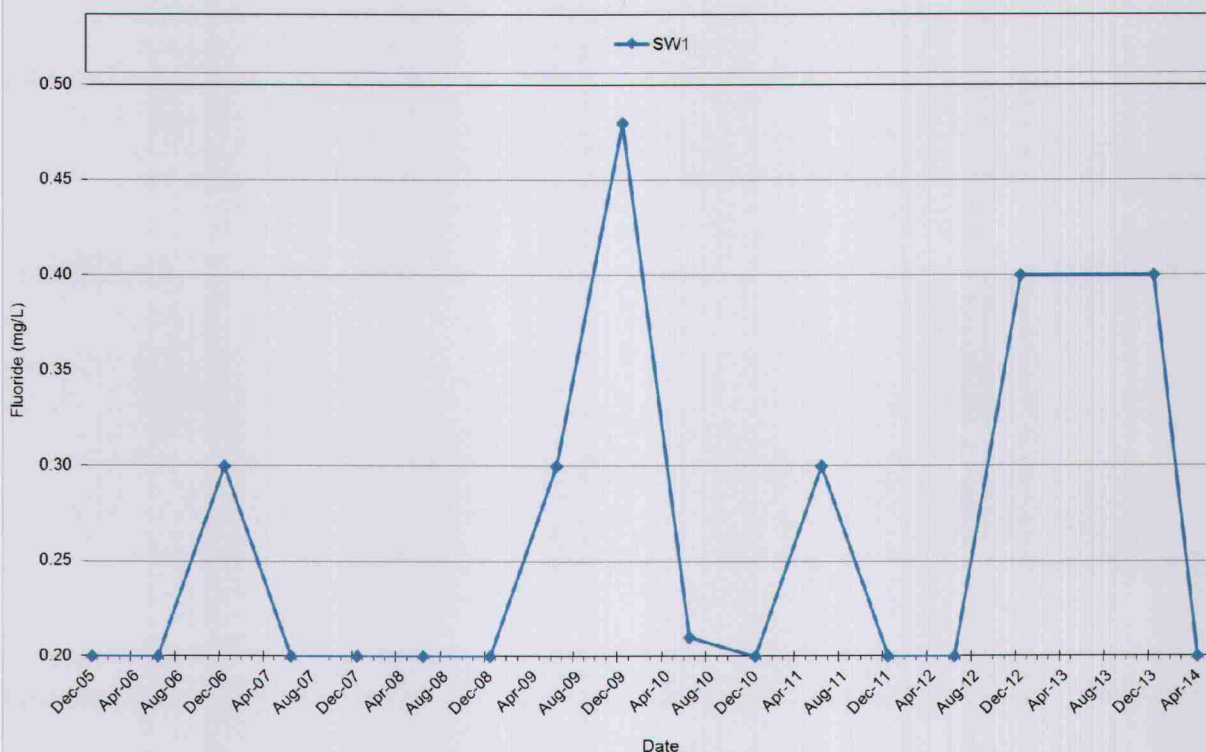


Figure 23: Surface water fluoride – Portland Garbage Depot, December 2005 to December 2013

Iron concentrations are presented in **Figure 24**.

Iron was measured to be 0.99mg/L and 0.61mg/L during the reporting period, which is consistent with the established range and significantly below the 10mg/L recommended for short-term crop irrigation (ANZECC & ARMCANZ, 2000).

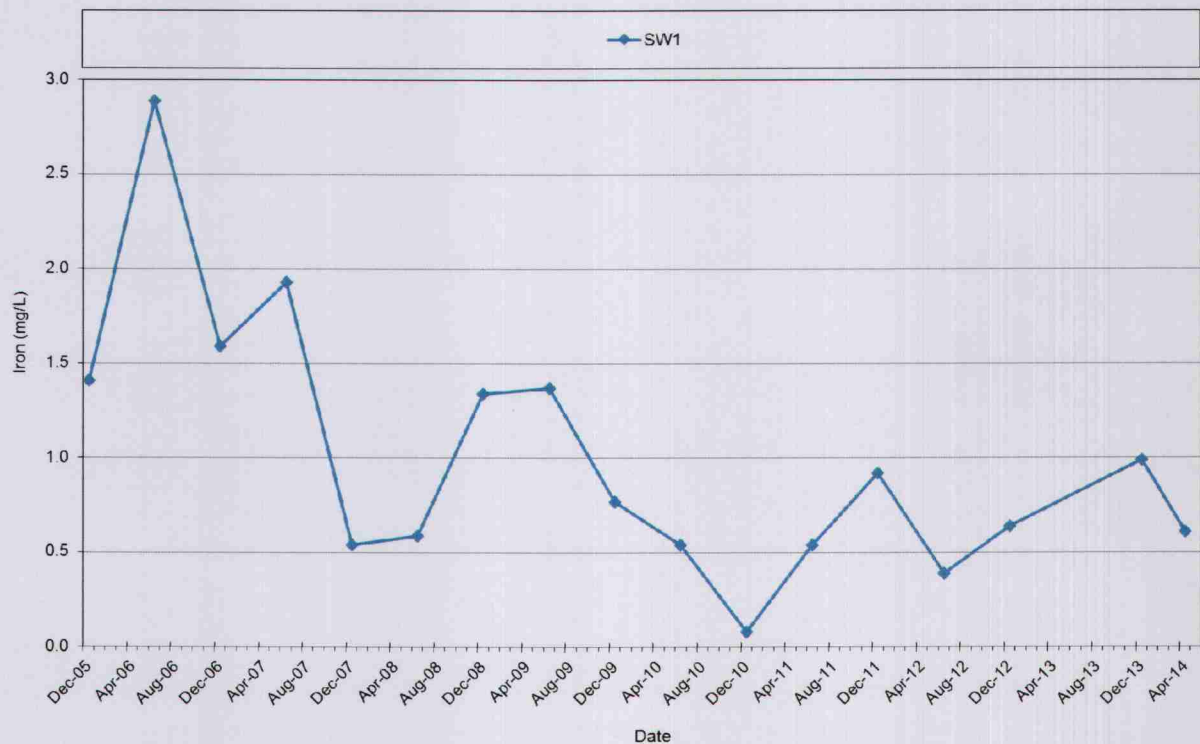


Figure 24: Surface water Iron – Portland Garbage Depot, December 2005 to December 2013

Manganese concentrations are presented in **Figure 25**. Manganese has been required to be monitored at SW1 since the 3 February 2010 licence variation but has only been recorded since June 2012. Manganese was measured to be 0.055mg/L and 0.108mg/L during the reporting period, which is below the 0.2mg/L recommended for long-term crop irrigation (ANZECC & ARMCANZ, 2000).

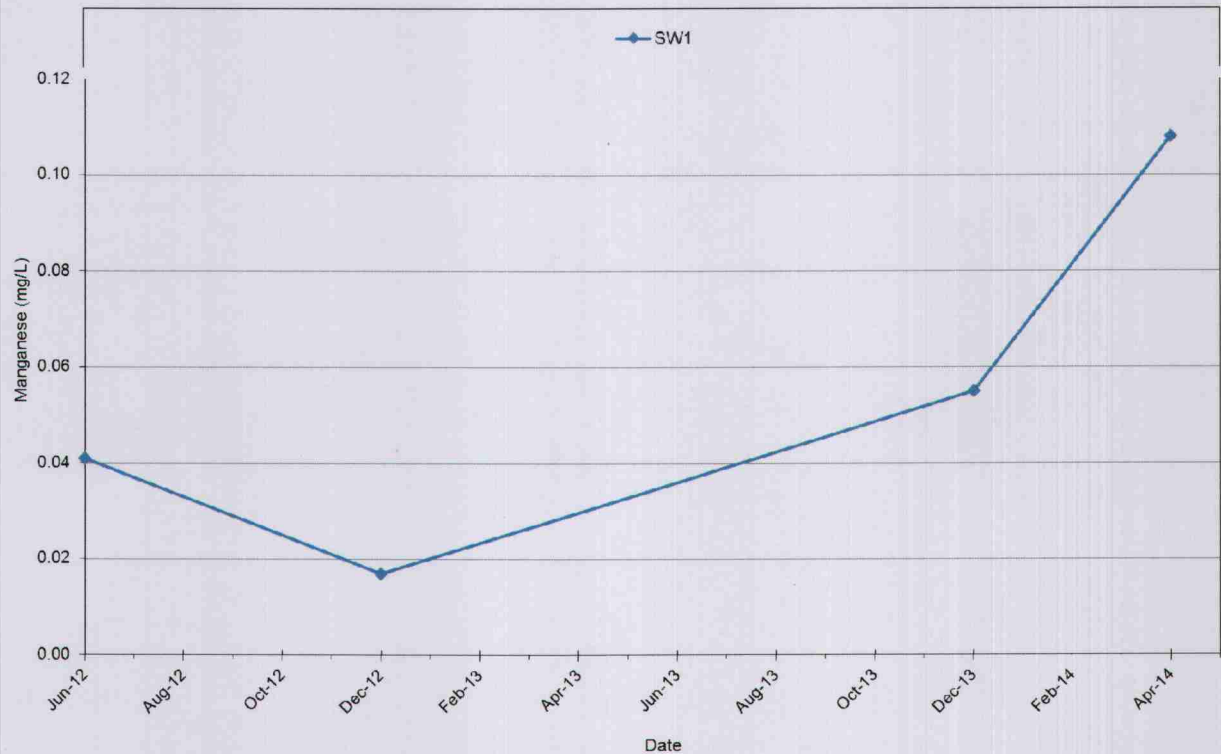


Figure 25: Surface water manganese – Portland Garbage Depot, December 2005 to December 2013

Chemical oxygen demand (COD) is presented in **Figure 19**. COD has only been required to be monitored at SW1 since the 13 July 2011 licence variation. Sodium was measured to be 157mg/L (new maximum value) and 81mg/L (new minimum value) during the reporting period.



Figure 26: Surface water COD – Portland Garbage Depot, December 2005 to December 2013

Total Suspended Solids (TSS) is presented in **Figure 20**. Total suspended solids were measured to be 122mg/L and 19mg/L in December 2013 and April 2014 respectively; both values are within the established range but the former of these exceeded the EPL limit of 30mg/L. SW1 will continue to be monitored to identify the development of adverse trends.

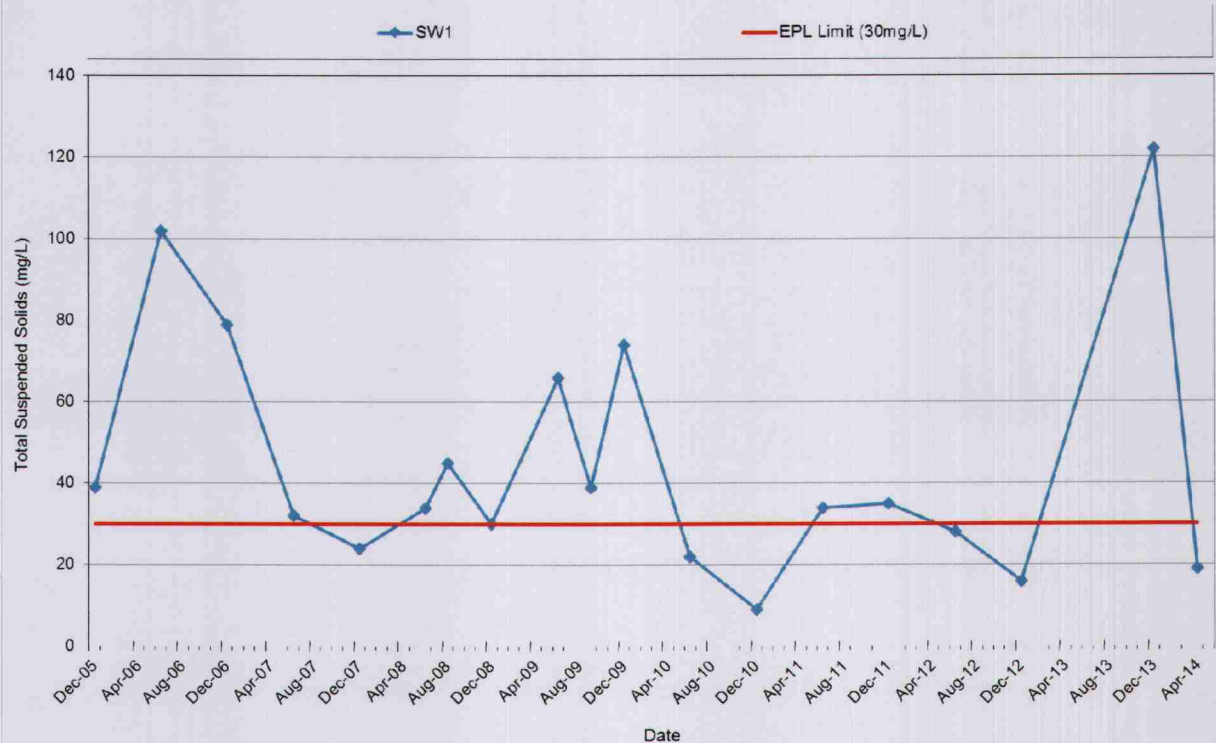


Figure 27: Surface water TSS – Portland Garbage Depot, December 2005 to December 2013

Total phenols were not detected at SW1 (<0.05mg/L).

3.4 QUALITY CONTROL

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:** Relative Percentage Difference (RPD) and Acceptance Limits
 - 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:** Recovery and Acceptance Limits
 - 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:** Recovery and Acceptance Limits
 - 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.

3.4.1 DECEMBER 2013 QUALITY CONTROL

The statistical variation in sample results as shown by the RPD between sample and duplicate pairs is variable, ranging from 0% to 46.2% in the December 2013 QC report. However, only one (1) result exceeded 25% RDP; all other results were below 13.3%. All RPD results are below the Recovery Limits specified (refer – **Appendix B**), indicating that the sampling methodology was consistent between samples.

3.4.2 APRIL 2014 QUALITY CONTROL

The statistical variation in sample results as shown by the RPD between sample and duplicate pairs is variable, ranging from 0% to 105% in the April 2014 QC report. However, only one (1) result exceeded 25% RDP and the higher value is due to the comparison of low concentrations where high variation is not considered to be significant. All RPD results are below the Recovery Limits specified (refer – **Appendix B**), indicating that the sampling methodology was consistent between samples.

Other Monitoring

4.1 WASTE QUANTITIES

Waste quantities recorded by Council and reported to the EPA for the 2013-2014 reporting year (year ending 30 June 2014) are summarised in **Table 4.1**.

Table 4.1 – Waste Data 2013-2014 Reporting Period

Sector		Total (tonnes)
Municipal	Ash	46
	Ferrous (iron or steel)	14
	Mixed Waste	248
	Soil (not contaminated or VENM soil)	1,085
	Vegetation or garden	424
Construction and Demolition	Mixed Waste	1,059
TOTALS		2,876

The total tonnage received into the landfill for the reporting year 2013-2014 was 2,876 tonnes. The soil component (1,085 tonnes) is not required to be included in the calculations for total waste as this material is used beneficially for rehabilitation. Therefore, the total waste amount for licensing purposes was 1,791 tonnes.

4.2 COMPLAINTS

There was one (1) public complaint made regarding the operations of the landfill during the annual reporting period for windblown litter. The details of the complaint are provided below.

Date: 2nd December 2013

Contributing Factors:

- Loose litter at the landfill; and
- Wind.

Response to Complaint:

- Work actioned by LCC to remove loose litter.

Summary

5.1 GROUNDWATER LEVELS

Measurement of standing water level is required annually by EPL 10936. Routine measurements were undertaken during the December 2013 sampling round.

Groundwater levels remained relatively constant throughout the reporting period, with some degree of variation observed at each monitoring point. The most notable fluctuation was observed at MP1. All standing water levels were consistent with historical ranges.

The hydraulic gradient of the site falls in a north-westerly direction at a rate of 0.05m/m, generally consistent with the fall of the land.

5.2 GROUNDWATER QUALITY

Groundwater quality sampling was undertaken annually in December 2013 in accordance with EPL 10936. No samples were able to be obtained from MP1 and MP3 (No recharge), and MP2 (Bore damaged). Repairs of MP2 have been subsequently undertaken.

No significant fluctuations in groundwater quality parameters were observed at the up-gradient monitoring point MP5, with all values recorded consistent with established ranges. New maximum values were recorded for Electrical Conductivity and pH at both down-gradient monitoring points (MP8 and MP9), and a new maximum value was recorded for Calcium at MP8. Despite these increases, pH Electrical Conductivity and Calcium values were below the guideline values for livestock drinking water.

No adverse trends were evident in other groundwater monitoring points.

5.3 SURFACE WATER QUALITY

Discharge samples as required biannually by EPL were obtained from SW1 in December 2013 and April 2014. It is noted that results generally indicated no significant change from historical quality, excepting that the total suspended solids concentration in December 2013 exceeded the EPL limit of 30mg/L, but was consistent with the historical range. SW1 will continue to be monitored to identify the development of adverse trends.

Conclusion

6.1 CONCLUSIONS

Despite increases in some parameters in the results for the 2013-2014 reporting period, monitoring indicates no 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 & NRMCC) 2004, *National Water Quality Management Strategy: Australian Drinking Water Guidelines*.

NSW Department of Environment, Climate Change and Water (DECCW) 2008, *Environment Protection Licence No. 10936 – Portland Garbage Depot Licence*.

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

Drawings



PORTLAND CULLEN BULLEN ROAD

GATE

DETENTION POND 2

DETENTION POND 1



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



GEOLYSE
ORANGE
18 FLOOR
28-31 SALE STREET
P.O. BOX 1583
ORANGE, NSW 2800
orange@geolyse.com
www.geolyse.com

REV	DATE	DESCRIPTION	BY	CHECKED	DATE	DETAILS
A	15/01/18	ISSUED TO CLIENT	ASB			
B	10/02/18	ISSUED TO CLIENT	LUP			
C	01/01/18	ISSUED TO CLIENT	NBF			

PROJECT
PORTLAND WASTE DISPOSAL DEPOT
FILE REFERENCE: 0\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 EPL 10936 Portland Garbage Depot Environmental Monitoring

Ground Water Levels

Piezometer Details:

Piezometer Details:		Definitions:	
MP1	Ground Elev (mAHD)	Stickup	Height of piezometer pipe above ground surface
	913.70	(m)	Actual elevation of ground at the piezometer relative to an arbitrary datum.
MP2	913.60	0.40	All ground elevations are measured to the same datum, hence piezo GWL's are relative to each other.
MP3	914.20	0.60	Actual elevation of groundwater at the piezometer relative to an arbitrary datum.
MP5	937.2	0.8	Depth of groundwater measured from the top of the bore casing.
MP8	911.8	0.5	
MP9	903.80	1.10	
		No measureable water level.	

Date	MP1 (EPL 3)		MP2 (EPL 4)		MP3 (EPL 5)		MP5 (EPL 6)		MP8 (EPL 7)		MP9 (EPL 8)	
	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)	Measured	GWL (m AHD)
13-Dec-05	3.31	910.79	NMWL	NMWL	5.87	908.93	26.45	911.55	4.30	908.00	-0.05	904.95
20-Jun-06	3.10	911.00	NMWL	NMWL	NMWL	NMWL	27.05	910.95	4.57	907.73	-0.03	904.93
11-Dec-06	4.08	910.02	NMWL	NMWL	NMWL	NMWL	27.50	910.50	4.81	907.49	0.10	904.80
5-Jun-07	4.33	909.77	NMWL	NMWL	NMWL	NMWL	28.38	909.62	4.94	907.36	0.26	904.64
19-Dec-07	3.57	910.53	NMWL	NMWL	NMWL	NMWL	28.25	909.75	4.31	907.99	-0.03	904.93
30-Jun-08	4.06	910.04	NMWL	NMWL	NMWL	NMWL	28.22	909.78	4.45	907.85	-0.01	904.91
16-Dec-08	3.80	910.30	4.90	908.90	NMWL	NMWL	28.21	909.79	4.25	908.05	-0.01	904.91
23-Jun-09	4.02	910.08	NMWL	NMWL	NMWL	NMWL	27.86	910.14	4.45	907.85	-0.01	904.91
14-Dec-09	4.11	909.99	NMWL	NMWL	NMWL	NMWL	27.95	910.05	4.52	907.78	0.27	904.63
1-Jun-10	4.21	909.89	NMWL	NMWL	NMWL	NMWL	30.20	907.80	4.48	907.82	0.00	904.90
15-Dec-10	1.23	912.87	NMWL	NMWL	NMWL	NMWL	27.37	910.63	3.44	908.86	-0.20	905.10
29-Jun-11	1.30	912.80	NMWL	NMWL	5.65	909.15	25.67	912.33	3.62	908.68	-0.03	904.93
27-Jul-11	1.57	912.53										
6-Dec-11	1.14	912.96	3.85	909.95	NMWL	NMWL	25.40	912.60	Bore Damaged		-0.02	904.92
13-Jun-12	0.70	913.40	NMWL	NMWL	4.48	910.32	NMWL	NMWL	NMWL	NMWL	NMWL	NMWL
16-Dec-12	2.09	912.01	NMWL	NMWL	NMWL	NMWL	22.22	915.78	2.77	909.53	-0.05	904.95
11-Dec-13	3.57	910.53	Bore Damaged		4.98	909.82	22.79	915.21	3.16	909.14	-0.01	904.91

TABLE 2 - RESULTS OF LABORATORY ANALYSIS - DECEMBER 2013

Analyte	Units	EPL Limit (SW1*)	Groundwater Boreholes					Surface Water (non-discharge)		
			MP1	MP2	MP3	MP4	MP5		MP8	MP9
Temperature (field)	°C	6.5-8.5	No recharge	Bore Damaged	No recharge	Dry	14.0	11.9	11.9	21.6
pH (lab)	pH units						7.52	7.49	7.59	7.73
pH (field)	pH units						7.20	7.01	7.11	8.96
Electrical Cond. (lab)	uS/cm						2120	3350	4010	122
Electrical Cond. (field)	uS/cm						1846	2536	2950	1325
Total Alkalinity (as CaCO ₃)	mg/L						434	512	624	101
Ammonia (as N)	mgN/L						0.15	0.08	<0.01	<0.01
Fluoride	mg/L						0.3	0.2	0.3	0.4
Nitrate (as N)	mgN/L						0.08	<0.01	0.02	0.04
Sulfate	mg/L						495	906	1300	247
Chloride	mg/L						110	285	340	133
BOD	mg/L									157
COD	mg/L									79
Calcium	mg/L						223	383	392	29
Magnesium	mg/L						104	157	242	69
Sodium	mg/L						102	181	229	102
Potassium	mg/L						8	9	6	0.055
Manganese	mg/L						0.652	1.94	1.07	0.99
Iron	mg/L						1.21	3.74	0.83	122
Total Suspended Solids	mg/L	30				9	4	5	62	
Total Organic Carbon	mg/L					<0.05	<0.05	<0.05	<0.05	
Total Phenolics	mg/L					<0.01	<0.01	<0.01	<0.01	
Organochlorine Pesticides	mg/L					<0.014	<0.014	<0.014	<0.014	
Organophosphorus Pesticides	mg/L									

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 - APRIL 2014

Analyte	Units	EPL Limit (SW1*)	Groundwater Boreholes						Surface Water (Discharge)	
			MP1	MP2	MP3	MP4	MP5	MP8		MP9
Temperature (field)	°C	6.5-8.5								15.2
pH (lab)	pH units									8.01
pH (field)	pH units									7.39
Electrical Cond. (field)	uS/cm									2562
Total Alkalinity (as CaCO ₃)	mg/L									119
Ammonia (as N)	mgN/L									0.05
Fluoride	mg/L									0.2
Nitrate (as N)	mgN/L									0.17
Sulfate	mg/L									353
Chloride	mg/L									72
COD	mg/L									81
Calcium	mg/L									140
Magnesium	mg/L									26
Sodium	mg/L									41
Potassium	mg/L									69
Manganese	mg/L									0.108
Iron	mg/L	30							0.61	
Total Suspended Solids	mg/L								19	
Total Organic Carbon	mg/L								28	
Total Phenolics	mg/L								<0.05	

Notes:

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

Bold text indicates exceedence of EPL limit

Appendix B

LABORATORY ANALYSIS REPORTS



Work Order

: ES1327399

Client: **LITHGOW CITY COUNCIL**

Contact : MS KERRY FRAGAR

Address : PO Box 19

LITHGOW NSW 2790

...: kfragar@geolyse.com

Telephone : +61 6362 1055

Facsimile
: +61 6361 8178

Project : 202334

Order number : 070865-ENVR

C-O-C number

Sampler

Site
Sample

Quote number

SY/413/12

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
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Phalak Inthaksono	Laboratory Manager - Organics	Sydney Organics



Page : 2 of 6
Work Order : ES1327399
Client : LITHGOW CITY COUNCIL
Project : 202334

General Comments

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

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

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

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

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

Key :

CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

▲ = This result is computed from individual analyte detections at or above the level of reporting



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID			
Compound	CAS Number	LOR	Client sampling date / time		SW1
			MP5	MP8	
EA005P: pH by PC Titrator					
pH Value	---	0.01	pH Unit	7.52	7.49
EA010P: Conductivity by PC Titrator					
Electrical Conductivity @ 25°C	---	1	µS/cm	2120	3350
EA025: Suspended Solids					
Suspended Solids (SS)	---	5	mg/L	---	---
ED037P: Alkalinity by PC Titrator					
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	434	512
Total Alkalinity as CaCO3	---	1	mg/L	434	512
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA					
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	495	906
ED045G: Chloride Discrete analyser					
Chloride	16887-00-6	1	mg/L	110	285
ED093F: Dissolved Major Cations					
Calcium	7440-70-2	1	mg/L	223	383
Magnesium	7439-95-4	1	mg/L	104	157
Sodium	7440-23-5	1	mg/L	102	181
Potassium	7440-09-7	1	mg/L	8	9
EG020F: Dissolved Metals by ICP-MS					
Manganese	7439-96-5	0.001	mg/L	0.652	1.94
Iron	7439-89-6	0.05	mg/L	1.21	3.74
EK040P: Fluoride by PC Titrator					
Fluoride	16984-48-8	0.1	mg/L	0.3	0.2
EK055G: Ammonia as N by Discrete Analyser					
Ammonia as N	7664-41-7	0.01	mg/L	0.15	0.08
EK057G: Nitrite as N by Discrete Analyser					
Nitrite as N	---	0.01	mg/L	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser					
Nitrate as N	14797-55-8	0.01	mg/L	0.08	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser					
Nitrite + Nitrate as N	---	0.01	mg/L	0.08	<0.01
EN055: Ionic Balance					



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID		Client sampling date / time		Client sample ID	
Compound	CAS Number	LOR	Unit	MP5	MP8	MP9	SW1
EN055: Ionic Balance - Continued							
Total Anions	---	0.01	meq/L	22.1	37.1	49.1	10.9
Total Cations	---	0.01	meq/L	24.3	40.1	49.6	11.9
Ionic Balance	---	0.01	%	4.85	3.90	0.48	4.52
EP005: Total Organic Carbon (TOC)							
Total Organic Carbon	---	1	mg/L	9	4	5	62
EP026ST: Chemical Oxygen Demand (Sealed Tube)							
Chemical Oxygen Demand	---	5	mg/L	---	---	---	157
EP035G: Total Phenol by Discrete Analyser							
Phenols (Total)	---	0.05	mg/L	<0.05	<0.05	<0.05	<0.05
EP068A: Organochlorine Pesticides (OC)							
alpha-BHC	319-84-6	0.5	µg/L	<0.5	<0.5	<0.5	---
Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	<0.5	<0.5	---
beta-BHC	319-85-7	0.5	µg/L	<0.5	<0.5	<0.5	---
gamma-BHC	58-89-9	0.5	µg/L	<0.5	<0.5	<0.5	---
delta-BHC	319-86-8	0.5	µg/L	<0.5	<0.5	<0.5	---
Heptachlor	76-44-8	0.5	µg/L	<0.5	<0.5	<0.5	---
Aldrin	309-00-2	0.5	µg/L	<0.5	<0.5	<0.5	---
Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	<0.5	<0.5	---
trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	<0.5	<0.5	---
alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	<0.5	<0.5	---
cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	<0.5	<0.5	---
Dieldrin	60-57-1	0.5	µg/L	<0.5	<0.5	<0.5	---
4,4'-DDE	72-55-9	0.5	µg/L	<0.5	<0.5	<0.5	---
Endrin	72-20-8	0.5	µg/L	<0.5	<0.5	<0.5	---
beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	<0.5	<0.5	---
4,4'-DDD	72-54-8	0.5	µg/L	<0.5	<0.5	<0.5	---
Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	<0.5	<0.5	---
Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	<0.5	<0.5	---
4,4'-DDT	50-29-3	2.0	µg/L	<2.0	<2.0	<2.0	---
Endrin ketone	53494-70-5	0.5	µg/L	<0.5	<0.5	<0.5	---
Methoxychlor	72-43-5	2.0	µg/L	<2.0	<2.0	<2.0	---
^ Total Chlordane (sum)	---	0.5	µg/L	<0.5	<0.5	<0.5	---
^ Sum of DDD + DDE + DDT	---	0.5	µg/L	<0.5	<0.5	<0.5	---



Analytical Results

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

Compound	CAS Number		Client sampling date / time		Client sample ID	
	LOR	Unit	MP5	MP8	MP9	SW1
EP068A: Organochlorine Pesticides (OC) - Continued						
Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.5 µg/L	<0.5	<0.5	<0.5	---
EP068B: Organophosphorus Pesticides (OP)						
Dichlorvos	62-73-7	0.5 µg/L	<0.5	<0.5	<0.5	---
Demeton-S-methyl	919-86-8	0.5 µg/L	<0.5	<0.5	<0.5	---
Monocrotophos	6923-22-4	2.0 µg/L	<2.0	<2.0	<2.0	---
Dimethoate	60-51-5	0.5 µg/L	<0.5	<0.5	<0.5	---
Diazinon	333-41-5	0.5 µg/L	<0.5	<0.5	<0.5	---
Chlorpyrifos-methyl	5598-13-0	0.5 µg/L	<0.5	<0.5	<0.5	---
Parathion-methyl	298-00-0	2.0 µg/L	<2.0	<2.0	<2.0	---
Malathion	121-75-5	0.5 µg/L	<0.5	<0.5	<0.5	---
Fenthion	55-38-9	0.5 µg/L	<0.5	<0.5	<0.5	---
Chlorpyrifos	2921-88-2	0.5 µg/L	<0.5	<0.5	<0.5	---
Parathion	56-38-2	2.0 µg/L	<2.0	<2.0	<2.0	---
Pirimphos-ethyl	23505-41-1	0.5 µg/L	<0.5	<0.5	<0.5	---
Chlorfenvinphos	470-90-6	0.5 µg/L	<0.5	<0.5	<0.5	---
Bromophos-ethyl	4824-78-6	0.5 µg/L	<0.5	<0.5	<0.5	---
Fenamiphos	22224-92-6	0.5 µg/L	<0.5	<0.5	<0.5	---
Prothiofos	34643-46-4	0.5 µg/L	<0.5	<0.5	<0.5	---
Ethion	563-12-2	0.5 µg/L	<0.5	<0.5	<0.5	---
Carbophenothion	786-19-6	0.5 µg/L	<0.5	<0.5	<0.5	---
Azinphos Methyl	86-50-0	0.5 µg/L	<0.5	<0.5	<0.5	---
EP068S: Organochlorine Pesticide Surrogate						
Dibromo-DDE	21655-73-2	0.1 %	59.1	63.4	72.2	---
EP068T: Organophosphorus Pesticide Surrogate						
DEF	78-48-8	0.1 %	56.6	62.5	67.3	---



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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



Environmental

QUALITY CONTROL REPORT

Work Order	: ES1327399	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	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site		Date Samples Received	: 13-DEC-2013
C-O-C number		Issue Date	: 23-DEC-2013
Sampler		No. of samples received	: 4
Order number	: 070865-ENVR	No. of samples analysed	: 4
Quote number	: SY/413/12		

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 Quality Control Report contains the following information:

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



WORLD RECOGNISED
ACCREDITATION

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
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics
Phalak Inthaksono	Laboratory Manager - Organics	Sydney Organics



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Work Order : ES1327399
Client : LITHGOW CITY COUNCIL
Project : 202334

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.

Key :

Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot

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

RPD = Relative Percentage Difference

= Indicates failed QC



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. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%, Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: WATER

Sub-Matrix: WATER									
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3215257)									
ES1327399-001	MP5	EA005-P: pH Value	---	0.01	pH Unit	7.52	7.58	0.8	0% - 20%
EW1303661-001	Anonymous	EA005-P: pH Value	---	0.01	pH Unit	6.96	6.97	0.1	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 3215256)									
ES1327399-001	MP5	EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	2120	2120	0.0	0% - 20%
EA025: Suspended Solids (QC Lot: 3213709)									
ES1327372-014	Anonymous	EA025H: Suspended Solids (SS)	---	5	mg/L	56	59	5.2	0% - 50%
ES1327372-033	Anonymous	EA025H: Suspended Solids (SS)	---	5	mg/L	24	26	7.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3215253)									
ES1327151-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	196	196	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	---	1	mg/L	196	196	0.0	0% - 20%
		ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	1160	1160	0.2	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	---	1	mg/L	1160	1160	0.2	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3212937)									
ES1327336-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	93	92	0.0	0% - 20%
ED045G: Chloride Discrete analyser (QC Lot: 3212936)									
ES1327336-005	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	368	368	0.0	0% - 20%
ES1327417-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	22	20	5.4	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3212935)									
ES1327338-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	5	4	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	64	56	13.3	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	4680	4400	6.2	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	129	118	8.8	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3220362)									
ES1327347-001	Anonymous	EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.022	0.021	0.0	0% - 20%
		EG020A-F: Iron	7439-98-6	0.05	mg/L	1.08	1.06	1.0	0% - 20%
ES1327467-002	Anonymous	EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.184	0.192	4.1	0% - 20%
		EG020A-F: Iron	7439-98-6	0.05	mg/L	0.67	0.65	2.6	0% - 50%
EK040P: Fluoride by PC Titrator (QC Lot: 3215258)									
ES1327399-001	MP5	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.3	0.3	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 3219264)									



Sub-Matrix: WATER									
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 3219264) - continued									
ES1327365-005	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.04	0.04	0.0	No Limit
ES1327416-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3212938)									
ES1327343-001	Anonymous	EK057G: Nitrite as N	---	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES1327417-002	Anonymous	EK057G: Nitrite as N	---	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3219265)									
ES1327365-005	Anonymous	EK059G: Nitrite + Nitrate as N	---	0.01	mg/L	0.08	0.08	0.0	No Limit
ES1327416-001	Anonymous	EK059G: Nitrite + Nitrate as N	---	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3220747)									
ES1327367-002	Anonymous	EP005: Total Organic Carbon	---	1	mg/L	6	6	0.0	No Limit
ES1327384-008	Anonymous	EP005: Total Organic Carbon	---	1	mg/L	5	4	0.0	No Limit
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QC Lot: 3225702)									
EP1309482-001	Anonymous	EP026ST: Chemical Oxygen Demand	---	5	mg/L	162	166	2.4	0% - 20%
ES1327006-007	Anonymous	EP026ST: Chemical Oxygen Demand	---	5	mg/L	8	5	46.2	No Limit
EP035G: Total Phenol by Discrete Analyser (QC Lot: 3216193)									
ES1327126-004	Anonymous	EP035G: Phenols (Total)	---	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES1327164-008	Anonymous	EP035G: Phenols (Total)	---	0.05	mg/L	<0.05	<0.05	0.0	No Limit



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. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: WATER

Sub-Matrix: WATER		Method Blank (MB) Report				Laboratory Control Spike (LCS) Report			
						Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	Low
Method: Compound	CAS Number	LOR	Unit	Result					
EA010P: Conductivity by PC Titrator (QCLot: 3215256)									
EA010-P: Electrical Conductivity @ 25°C	---	1	µS/cm	<1	2000 µS/cm	110	95	113	
EA025: Suspended Solids (QCLot: 3213709)									
EA025H: Suspended Solids (SS)	---	5	mg/L	<5	150 mg/L	110	86	129	
ED037P: Alkalinity by PC Titrator (QCLot: 3215253)									
ED037-P: Total Alkalinity as CaCO3	---	1	mg/L	---	200 mg/L	96.1	81	111	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3212937)									
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	86	122	
ED045G: Chloride Discrete analyser (QCLot: 3212936)									
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	91.2	77	123	
ED093F: Dissolved Major Cations (QCLot: 3212935)									
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	107	87	113	
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	89	113	
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	106	79	113	
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	109	87	115	
EG020F: Dissolved Metals by ICP-MS (QCLot: 3220362)									
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	90.3	81	113	
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	95.4	77	115	
EK040P: Fluoride by PC Titrator (QCLot: 3215258)									
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5.0 mg/L	97.8	75	119	
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3219264)									
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1.00 mg/L	105	86	112	
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3212938)									
EK057G: Nitrite as N	---	0.01	mg/L	<0.01	0.5 mg/L	94.6	83	119	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3219265)									
EK059G: Nitrite + Nitrate as N	---	0.01	mg/L	<0.01	0.5 mg/L	108	87	119	
EP005: Total Organic Carbon (TOC) (QCLot: 3220747)									
EP005: Total Organic Carbon	---	1	mg/L	<1	10 mg/L	90.2	76	120	
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 3225702)									
EP026ST: Chemical Oxygen Demand	---	5	mg/L	<5	500 mg/L	102	92	116	
EP035G: Total Phenol by Discrete Analyser (QCLot: 3216193)									
EP035G: Phenols (Total)	---	0.05	mg/L	<0.05	0.50 mg/L	83.2	64	98	
EP068A: Organochlorine Pesticides (OC) (QCLot: 3214434)									



Sub-Matrix: WATER									
Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
					Spike Concentration	Spike Recovery (%)	LCS	Recovery Limits (%)	
				Result				Low	High
EP068A: Organochlorine Pesticides (OC) (QCLot: 3214434) - continued									
EP068: alpha-BHC	319-84-6	0.5	µg/L	<0.5	5 µg/L	78.7		65	107
EP068: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/L	<0.5	5 µg/L	78.4		51	119
EP068: beta-BHC	319-85-7	0.5	µg/L	<0.5	5 µg/L	82.3		63	113
EP068: gamma-BHC	58-89-9	0.5	µg/L	<0.5	5 µg/L	78.8		62	112
EP068: delta-BHC	319-86-8	0.5	µg/L	<0.5	5 µg/L	84.6		60	106
EP068: Heptachlor	76-44-8	0.5	µg/L	<0.5	5 µg/L	82.8		58	108
EP068: Aldrin	309-00-2	0.5	µg/L	<0.5	5 µg/L	84.5		58	114
EP068: Heptachlor epoxide	1024-57-3	0.5	µg/L	<0.5	5 µg/L	80.2		59	111
EP068: trans-Chlordane	5103-74-2	0.5	µg/L	<0.5	5 µg/L	92.1		62	114
EP068: alpha-Endosulfan	959-98-8	0.5	µg/L	<0.5	5 µg/L	92.1		64	114
EP068: cis-Chlordane	5103-71-9	0.5	µg/L	<0.5	5 µg/L	85.5		62	114
EP068: Dieldrin	60-57-1	0.5	µg/L	<0.5	5 µg/L	86.0		59	111
EP068: 4,4'-DDE	72-55-9	0.5	µg/L	<0.5	5 µg/L	89.3		63	111
EP068: Endrin	72-20-8	0.5	µg/L	<0.5	5 µg/L	89.6		61	119
EP068: beta-Endosulfan	33213-65-9	0.5	µg/L	<0.5	5 µg/L	93.3		71	119
EP068: 4,4'-DDD	72-54-8	0.5	µg/L	<0.5	5 µg/L	93.5		70	118
EP068: Endrin aldehyde	7421-93-4	0.5	µg/L	<0.5	5 µg/L	88.7		62	112
EP068: Endosulfan sulfate	1031-07-8	0.5	µg/L	<0.5	5 µg/L	82.1		53	113
EP068: 4,4'-DDT	50-29-3	2.0	µg/L	<2.0	5 µg/L	81.0		52	120
EP068: Endrin ketone	53494-70-5	0.5	µg/L	<0.5	5 µg/L	81.9		51	117
EP068: Methoxychlor	72-43-5	2.0	µg/L	<2.0	5 µg/L	92.7		53	127
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3214434)									
EP068: Dichlorvos	62-73-7	0.5	µg/L	<0.5	5 µg/L	109		52	122
EP068: Demeton-S-methyl	919-86-8	0.5	µg/L	<0.5	5 µg/L	94.4		51	123
EP068: Monocrotophos	6923-22-4	0.5	µg/L	---	5 µg/L	34.1		10	89.1
		2.0	µg/L	<2.0	---	---		---	---
EP068: Dimethoate	60-51-5	0.5	µg/L	<0.5	5 µg/L	89.4		61	119
EP068: Diazinon	333-41-5	0.5	µg/L	<0.5	5 µg/L	80.7		67	113
EP068: Chlorpyrifos-methyl	5598-13-0	0.5	µg/L	<0.5	5 µg/L	82.1		60	116
EP068: Parathion-methyl	298-00-0	2.0	µg/L	<2.0	5 µg/L	99.3		64	120
EP068: Malathion	121-75-5	0.5	µg/L	<0.5	5 µg/L	84.8		67	115
EP068: Fenthion	55-38-9	0.5	µg/L	<0.5	5 µg/L	83.8		64	110
EP068: Chlorpyrifos	2921-88-2	0.5	µg/L	<0.5	5 µg/L	79.7		63	109
EP068: Parathion	56-38-2	2.0	µg/L	<2.0	5 µg/L	95.2		63	121
EP068: Pirimphos-ethyl	23505-41-1	0.5	µg/L	<0.5	5 µg/L	88.6		60	110
EP068: Chlorfenvinphos	470-90-6	0.5	µg/L	<0.5	5 µg/L	88.5		68	114
EP068: Bromophos-ethyl	4824-78-6	0.5	µg/L	<0.5	5 µg/L	85.6		61	109
EP068: Fenamiphos	22224-92-6	0.5	µg/L	<0.5	5 µg/L	89.0		63	117
EP068: Prothiofos	34643-46-4	0.5	µg/L	<0.5	5 µg/L	92.6		63	111



Sub-Matrix: **WATER**

Sub-Matrix: WATER									
Method: Compound	CAS Number		LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
						Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	Low
EP068B: Organophosphorus Pesticides (OP) (QCLot: 3214434) - continued									
EP068: Ethion	563-12-2		0.5	µg/L	<0.5	5 µg/L	85.4	65	115
EP068: Carbophenothion	786-19-6		0.5	µg/L	<0.5	5 µg/L	78.8	55	115
EP068: Azinphos Methyl	86-50-0		0.5	µg/L	<0.5	5 µg/L	81.9	44	124

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.

Sub-Matrix: **WATER**

Sub-Matrix: WATER			Matrix Spike (MS) Report				
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3212937)							
ES1327336-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70	130
ED045G: Chloride Discrete analyser (QCLot: 3212936)							
ES1327336-005	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	81.9	70	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 3220362)							
ES1327348-001	Anonymous	EG020A-F: Manganese	7439-96-5	0.2 mg/L	80.6	70	130
EK040P: Fluoride by PC Titrator (QCLot: 3215258)							
ES1327399-001	MP5	EK040P: Fluoride	16984-48-8	5.0 mg/L	100	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3219264)							
ES1327365-005	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	99.2	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3212938)							
ES1327343-001	Anonymous	EK057G: Nitrite as N	----	0.5 mg/L	97.6	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3219265)							
ES1327365-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	104	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 3220747)							
ES1327367-003	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	102	70	130
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 3225702)							
EP1309482-001	Anonymous	EP026ST: Chemical Oxygen Demand	----	500 mg/L	103	70	130
EP035G: Total Phenol by Discrete Analyser (QCLot: 3216193)							
ES1327126-004	Anonymous	EP035G: Phenols (Total)	----	0.42 mg/L	88.1	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report



The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are 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.

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report					RPDs (%)		
				Spike Concentration	MS	Spike Recovery (%)	MSD	Recovery Limits (%)	Low	High	Value
ED045G: Chloride Discrete analyser (QCLot: 3212936)											
ES1327336-005	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	81.9	---	---	70	130	---	---
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3212937)											
ES1327336-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	---	---	70	130	---	---
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3212938)											
ES1327343-001	Anonymous	EK057G: Nitrite as N	---	0.5 mg/L	97.6	---	---	70	130	---	---
EK040P: Fluoride by PC Titrator (QCLot: 3215258)											
ES1327399-001	MP5	EK040P: Fluoride	16984-48-8	5.0 mg/L	100	---	---	70	130	---	---
EP035G: Total Phenol by Discrete Analyser (QCLot: 3216193)											
ES1327126-004	Anonymous	EP035G: Phenols (Total)	---	0.42 mg/L	88.1	---	---	70	130	---	---
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3219264)											
ES1327365-005	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	99.2	---	---	70	130	---	---
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3219265)											
ES1327365-005	Anonymous	EK059G: Nitrite + Nitrate as N	---	0.5 mg/L	104	---	---	70	130	---	---
EG020F: Dissolved Metals by ICP-MS (QCLot: 3220362)											
ES1327348-001	Anonymous	EG020A-F: Manganese	7439-96-5	0.2 mg/L	80.6	---	---	70	130	---	---
EP005: Total Organic Carbon (TOC) (QCLot: 3220747)											
ES1327367-003	Anonymous	EP005: Total Organic Carbon	---	100 mg/L	102	---	---	70	130	---	---
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 3225702)											
EP1309482-001	Anonymous	EP026ST: Chemical Oxygen Demand	---	500 mg/L	103	---	---	70	130	---	---



Environmental

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1327399	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	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Site		Date Samples Received	: 13-DEC-2013
C-O-C number		Issue Date	: 23-DEC-2013
Sampler		No. of samples received	: 4
Order number	: 070865-ENVR	No. of samples analysed	: 4
Quote number	: SY/413/12		

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		Sample Date	Extraction / Preparation		Analysis	
Container / Client Sample ID(s)	Date extracted		Due for extraction	Evaluation	Date analysed	Due for analysis
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural (EA005-P)	MP8, MP5, MP9, SW1	13-DEC-2013	---	13-DEC-2013	16-DEC-2013	13-DEC-2013
EA010P: Conductivity by PC Titrator						
Clear Plastic Bottle - Natural (EA010-P)	MP8, MP5, MP9	13-DEC-2013	---	10-JAN-2014	16-DEC-2013	10-JAN-2014
EA025: Suspended Solids						
Clear Plastic Bottle - Natural (EA025H)	SW1	13-DEC-2013	---	20-DEC-2013	16-DEC-2013	20-DEC-2013
ED037P: Alkalinity by PC Titrator						
Clear Plastic Bottle - Natural (ED037-P)	MP8, MP5, MP9, SW1	13-DEC-2013	---	27-DEC-2013	16-DEC-2013	27-DEC-2013
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA						
Clear Plastic Bottle - Natural (ED041G)	MP8, MP5, MP9, SW1	13-DEC-2013	---	10-JAN-2014	14-DEC-2013	10-JAN-2014
ED045G: Chloride Discrete analyser						
Clear Plastic Bottle - Natural (ED045G)	MP8, MP5, MP9, SW1	13-DEC-2013	---	10-JAN-2014	14-DEC-2013	10-JAN-2014
ED093F: Dissolved Major Cations						
Clear Plastic Bottle - Natural (ED093F)	MP8, MP5, MP9, SW1	13-DEC-2013	---	20-DEC-2013	14-DEC-2013	20-DEC-2013
EG020F: Dissolved Metals by ICP-MS						
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)	MP8, MP5, MP9, SW1	13-DEC-2013	---	11-JUN-2014	19-DEC-2013	11-JUN-2014



Matrix: WATER

Matrix: WATER						
Method	Sample Date	Extraction / Preparation		Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis
Evaluation: * = Holding time breach ; ✓ = Within holding time						
EK040P: Fluoride by PC Titrator						
Clear Plastic Bottle - Natural (EK040P)						
MP8, MP5, MP9, SW1	13-DEC-2013	---	10-JAN-2014	---	16-DEC-2013	10-JAN-2014
						✓
EK055G: Ammonia as N by Discrete Analyser						
Clear Plastic Bottle - Sulfuric Acid (EK055G)						
MP8, MP5, MP9, SW1	13-DEC-2013	---	10-JAN-2014	---	18-DEC-2013	10-JAN-2014
						✓
EK057G: Nitrite as N by Discrete Analyser						
Clear Plastic Bottle - Natural (EK057G)						
MP8, MP5, MP9, SW1	13-DEC-2013	---	15-DEC-2013	---	14-DEC-2013	15-DEC-2013
						✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser						
Clear Plastic Bottle - Sulfuric Acid (EK059G)						
MP8, MP5, MP9, SW1	13-DEC-2013	---	10-JAN-2014	---	18-DEC-2013	10-JAN-2014
						✓
EP005: Total Organic Carbon (TOC)						
Amber TOC Vial - Sulfuric Acid (EP005)						
MP8, MP5, MP9, SW1	13-DEC-2013	----	---	---	19-DEC-2013	10-JAN-2014
						✓
EP026ST: Chemical Oxygen Demand (Sealed Tube)						
Clear Plastic Bottle - Sulfuric Acid (EP026ST)						
SW1	13-DEC-2013	----	---	---	23-DEC-2013	10-JAN-2014
						✓
EP035G: Total Phenol by Discrete Analyser						
Clear Plastic Bottle - Sulfuric Acid (EP035G)						
MP8, MP5, MP9, SW1	13-DEC-2013	17-DEC-2013	10-JAN-2014	✓	17-DEC-2013	10-JAN-2014
						✓
EP068A: Organochlorine Pesticides (OC)						
Amber Glass Bottle - Unpreserved (EP068)						
MP8, MP5, MP9	13-DEC-2013	20-DEC-2013	20-DEC-2013	✓	21-DEC-2013	29-JAN-2014
						✓
EP068B: Organophosphorus Pesticides (OP)						
Amber Glass Bottle - Unpreserved (EP068)						
MP8, MP5, MP9	13-DEC-2013	20-DEC-2013	20-DEC-2013	✓	21-DEC-2013	29-JAN-2014
						✓



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		Method	Count		Rate (%)		Evaluation	Quality Control Specification
Analytical Methods			QC	Regular	Actual	Expected		
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	14	14.3	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)		EP026ST	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser		ED045G	2	11	18.2	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator		EA010-P	1	6	16.7	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A		EG020A-F	2	19	10.5	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator		EK040P	1	4	25.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved		ED093F	1	9	11.1	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser		EK059G	2	18	11.1	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	2	10	20.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser		ED041G	1	8	12.5	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)		EA025H	2	18	11.1	9.5	✓	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	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Ammonia as N by Discrete analyser		EK055G	1	14	7.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)		EP026ST	2	20	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser		ED045G	2	11	18.2	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator		EA010-P	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals by ICP-MS - Suite A		EG020A-F	1	19	5.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator		EK040P	1	4	25.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved		ED093F	1	9	11.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) by Discrete Analyser		EK059G	1	18	5.6	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
Pesticides by GCMS		EP068	1	7	14.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser		ED041G	1	8	12.5	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)		EA025H	2	18	11.1	9.5	✓	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	14	7.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)		EP026ST	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser		ED045G	1	11	9.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator		EA010-P	1	6	16.7	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							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	19	5.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
	EK040P	1	4	25.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	ED093F	1	9	11.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Major Cations - Dissolved							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	18	5.6	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
Pesticides by GCMS	EP068	1	7	14.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	8	12.5	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	18	5.6	4.8	✓	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	14	7.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chemical Oxygen Demand (Sealed Tube)	EP026ST	1	20	5.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Chloride by Discrete Analyser	ED045G	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	19	5.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Fluoride by PC Titrator	EK040P	1	4	25.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOX) by Discrete Analyser	EK059G	1	18	5.6	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	8	12.5	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	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) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	In-House, 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) (Appdx. 2)
Alkalinity by PC Titrator	ED037-P	WATER	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrator) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	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) (Appdx. 2)
Chloride by Discrete Analyser	ED045G	WATER	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 liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	Major Cations is determined based on APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises the 0.45um filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
			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) (Appdx. 2)
			Hardness parameters are calculated based on APHA 21st ed., 2340 B. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	(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	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) (Appdx. 2)



Analytical Methods		Method	Matrix	Method Descriptions
Ammonia as N by Discrete analyser	EK055G	WATER	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) (Appdx. 2)	
Nitrite as N by Discrete Analyser	EK057G	WATER	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) (Appdx. 2)	
Nitrate as N by Discrete Analyser	EK058G	WATER	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 separately 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) (Appdx. 2)	
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	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) (Appdx. 2)	
Ionic Balance by PCT DA and Turbi SO4 DA	EN055 - PG	WATER	APHA 21st Ed. 1030F. The Ionic Balance is calculated based on the major Anions and Cations. The major anions include Alkalinity, Chloride and Sulfate which determined by PCT and DA. The Cations are determined by Turbi SO4 by DA. This method is compliant with NEPM (2013) Schedule B(3) (Appdx. 2)	
Total Organic Carbon	EP005	WATER	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) (Appdx. 2)	
Chemical Oxygen Demand (Sealed Tube)	EP026ST	WATER	(APHA 21st ed., 5220C, ALS QWI-EN/EP026) 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. The unreacted Cr (VI) can then be titrated with ferrous ammonium sulfate to determine the amount of Cr (VI) consumed. The oxidisable organic matter can be calculated in terms of oxygen equivalents.	
Total Phenol by Discrete Analyser	EP035G	WATER	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) (Appdx. 2)	
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) (Appdx. 2)	
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) (Appdx. 2). 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 SW846 or ALS-QW/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	ES1327336-005	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	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	Date analysed	Due for analysis
Days overdue				
EA005P: pH by PC Titrator Clear Plastic Bottle - Natural MP5, MP9, MP8, SW1	----	----	16-DEC-2013	13-DEC-2013
				Days overdue 3

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.



CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory:
please tick →

CLIENT: Goolye		TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)		☐ Standard TAT (List due date) ☐ Non Standard or urgent TAT (List due date)	
OFFICE:		ALS QUOTE NO.:			
PROJECT:					
ORDER NUMBER:					
PROJECT MANAGER: Dean Lavers		CONTACT PH:			
SAMPLER:		SAMPLER MOBILE:			
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):			
Email Reports to (will default to PM if no other addresses are listed):					
Email Invoice to (will default to PM if no other addresses are listed):					
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:					

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE codes below	CONTAINER INFORMATION	ANALYSIS REQUIRED including SUITES (NB: Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
MP5			W			NT-1 (Ca, Mg, Na, K), NT-2A (Alkalinity, Sol, Chloride, Fluoride), W-12 (OC/OP Pesticides), Manganese, Iron pH, Ammonia, Conductivity, Nitrate, TOC, Total Phenolics	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
MP8			W				
MP9			W				
SW1			W			NT-1 (Ca, Mg, Na, K), NT-2A (Alkalinity, Sol, Chloride, Fluoride) pH, Ammonia, COD, TOC, Total Phosphorus, TSS, Nitrate Manganese and Iron	
TOTAL							

Environmental Division
Sydney
Work Order
ES1327399



Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulfate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Plastic; HS = HCl Preserved Plastic; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottle; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Solids; B = Unpreserved Bag.



Environmental

CERTIFICATE OF ANALYSIS

Work Order	: ES1407524	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	:	Date Samples Received	: 04-APR-2014
C-O-C number	:	Issue Date	: 10-APR-2014
Sampler	: DL	No. of samples received	: 1
Site	:	No. of samples analysed	: 1
Quote number	: SY/413/12		

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



WORLD RECOGNISED
ACCREDITATION

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
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

Address: 277-289 Woodpark Road Smithfield NSW Australia 2164 | PHONE: +61-2-8784 8555 | Facsimile: +61-2-8784 8500
Environmental Division Sydney | 84 009 936 029 Part of the ALS Group | An ALS Limited Company



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Page : 2 of 4
Work Order : ES1407524
Client : LITHGOW CITY COUNCIL
Project : 202334 PORTLAND LANDFILL

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



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Work Order : ES1407524
Client : LITHGOW CITY COUNCIL
Project : 202334 PORTLAND LANDFILL

Analytical Results

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

Compound	CAS Number		Client sample ID		SW1	SW1-PORT	
	LOR	Unit	Client sampling date / time	Unit	03-APR-2014 08:00	ES1407524-001	
EA005P: pH by PC Titrator							
pH Value	---	0.01	pH Unit		8.01		
EA025: Suspended Solids							
Suspended Solids (SS)	---	5	mg/L		19		
ED037P: Alkalinity by PC Titrator							
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1		
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1		
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		119		
Total Alkalinity as CaCO ₃	---	1	mg/L		119		
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA							
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		353		
ED045G: Chloride Discrete analyser							
Chloride	16887-00-6	1	mg/L		72		
ED093F: Dissolved Major Cations							
Calcium	7440-70-2	1	mg/L		140		
Magnesium	7439-95-4	1	mg/L		26		
Sodium	7440-23-5	1	mg/L		41		
Potassium	7440-09-7	1	mg/L		69		
EG020T: Total Metals by ICP-MS							
Manganese	7439-96-5	0.001	mg/L		0.108		
Iron	7439-89-6	0.05	mg/L		0.61		
EK040P: Fluoride by PC Titrator							
Fluoride	16984-48-8	0.1	mg/L		0.2		
EK055G: Ammonia as N by Discrete Analyser							
Ammonia as N	7664-41-7	0.01	mg/L		0.05		
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		0.17		
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Nitrite + Nitrate as N	---	0.01	mg/L		0.17		
EN055: Ionic Balance							
Total Anions	---	0.01	meq/L		11.8		
Total Cations	---	0.01	meq/L		12.7		



Analytical Results

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

Sub-Matrix: WATER (Matrix: WATER)		Client sample ID				
Compound	CAS Number	LOR	Client sampling date / time		SW1	
			Unit	SW1-PORT		
EN055: Ionic Balance - Continued						
Ionic Balance	----	0.01	%	3.79	----	
EP005: Total Organic Carbon (TOC)						
Total Organic Carbon	----	1	mg/L	28	----	
EP026ST: Chemical Oxygen Demand (Sealed Tube)						
Chemical Oxygen Demand	----	5	mg/L	81	----	
EP035G: Total Phenol by Discrete Analyser						
Phenols (Total)	----	0.05	mg/L	<0.05	----	

**Environmental****QUALITY CONTROL REPORT**

Work Order

: ES1407524

Page

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Client

: LITHGOW CITY COUNCIL

Contact

: MS KERRY FRAGAR

Address

: PO Box 19
LITHGOW NSW 2790

Laboratory

: Environmental Division Sydney

Contact

: Client Services

Address

: 277-289 Woodpark Road Smithfield NSW Australia 2164

E-mail

: kfragar@geolyse.com

Telephone

: +61 6362 1055

Facsimile

: +61 6361 8178

E-mail

: sydney@alsglobal.com

Telephone

: +61-2-8784 8555

Facsimile

: +61-2-8784 8500

Project

: 202334 PORTLAND LANDFILL

Site

: -----

C-O-C number

: -----

Sampler

: DL

Order number

: -----

QC Level

: NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Date Samples Received

: 04-APR-2014

Issue Date

: 10-APR-2014

No. of samples received

: 1

No. of samples analysed

: 1

Quote number

: SY/413/12

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 Quality Control Report contains the following information:

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



WORLD RECOGNISED
ACCREDITATION

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
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

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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.

Key :

Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot

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

RPD = Relative Percentage Difference

= Indicates failed QC



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Work Order : ES1407524
Client : LITHGOW CITY COUNCIL
Project : 202334 PORTLAND LANDFILL

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. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit, Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER									
Laboratory sample ID	Client sample ID	Method/Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3375819)									
ES1407452-004	Anonymous	EA005-P: pH Value	---	0.01	pH Unit	8.52	8.51	0.1	0% - 20%
EA025: Suspended Solids (QC Lot: 3379264)									
ES1407105-001	Anonymous	EA025H: Suspended Solids (SS)	---	5	mg/L	<5	16	105	No Limit
ES1407504-001	Anonymous	EA025H: Suspended Solids (SS)	---	5	mg/L	<5	6	18.2	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3375817)									
ES1407378-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	36	41	12.7	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	349	342	2.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	---	1	mg/L	386	384	0.5	0% - 20%
		ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	---	<1	# Not Determined	No Limit
ES1407451-001	Anonymous	ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	---	214	# Not Determined	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	---	544	# Not Determined	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	---	1	mg/L	---	758	# Not Determined	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3375833)									
ES1407307-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	30	31	0.0	0% - 20%
ED045G: Chloride Discrete analyser (QC Lot: 3375839)									
ES1407405-013	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	22	20	6.0	0% - 20%
ES1407524-001	SW1 SW1-PORT	ED045G: Chloride	16887-00-6	1	mg/L	72	73	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3375837)									
ES1407405-008	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	15	15	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
		ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.0	No Limit
ES1407405-018	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	14	14	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 3380359)									
ES1407441-003	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
ES1407462-002	Anonymous	EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.261	0.246	5.9	0% - 20%



Sub-Matrix: WATER									
Laboratory sample ID	Client sample ID	Method/Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020T: Total Metals by ICP-MS (QC Lot: 3380359) - continued									
ES1407462-002	Anonymous	EG020A-T: Iron	7439-89-6	0.05	mg/L	3.01	3.08	2.4	0% - 20%
EK040P: Fluoride by PC Titrator (QC Lot: 3375812)									
ES1407372-002	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.2	0.2	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 3378655)									
ES1407438-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	129	122	5.6	0% - 20%
ES1407483-003	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 3375831)									
ES1407307-001	Anonymous	EK057G: Nitrite as N	---	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 3378656)									
ES1407523-003	Anonymous	EK059G: Nitrite + Nitrate as N	---	0.01	mg/L	0.32	0.32	0.0	0% - 20%
ES1407526-004	Anonymous	EK059G: Nitrite + Nitrate as N	---	0.01	mg/L	0.28	0.28	0.0	0% - 20%
EP005: Total Organic Carbon (TOC) (QC Lot: 3380339)									
ES1407523-002	Anonymous	EP005: Total Organic Carbon	---	1	mg/L	2	2	0.0	No Limit
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QC Lot: 3377608)									
ES1407380-001	Anonymous	EP026ST: Chemical Oxygen Demand	---	5	mg/L	61	61	0.0	0% - 50%
ES1407524-001	SW1 SW1-PORT	EP026ST: Chemical Oxygen Demand	---	5	mg/L	81	80	1.2	0% - 50%
EP035G: Total Phenol by Discrete Analyser (QC Lot: 3380314)									
ES1407519-005	Anonymous	EP035G: Phenols (Total)	---	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES1407598-001	Anonymous	EP035G: Phenols (Total)	---	0.05	mg/L	<0.05	<0.05	0.0	No Limit



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Work Order : ES1407524
Client : LITHGOW CITY COUNCIL
Project : 202334 PORTLAND LANDFILL

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. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report		Laboratory Control Spike (LCS) Report			
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)	Low	High	
EA025: Suspended Solids (QCLot: 3379264)									
EA025H: Suspended Solids (SS)	---	5	mg/L	<5	150 mg/L	102	86	129	
ED037P: Alkalinity by PC Titrator (QCLot: 3375817)									
ED037-P: Total Alkalinity as CaCO3	---	1	mg/L	---	200 mg/L	87.8	81	111	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3375833)									
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	109	86	122	
ED045G: Chloride Discrete analyser (QCLot: 3375839)									
ED045G: Chloride	16887-00-6	1	mg/L	<1	1000 mg/L	98.7	77	123	
ED093F: Dissolved Major Cations (QCLot: 3375837)									
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.0	90	114	
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	96.7	90	110	
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	99.2	82	118	
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	99.5	87	117	
EG020T: Total Metals by ICP-MS (QCLot: 3380359)									
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	102	85	115	
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	105	82	120	
EK040P: Fluoride by PC Titrator (QCLot: 3375812)									
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5.0 mg/L	91.2	75	119	
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3378655)									
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1.00 mg/L	108	86	112	
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3375831)									
EK057G: Nitrite as N	---	0.01	mg/L	<0.01	0.5 mg/L	101	83	119	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3378656)									
EK059G: Nitrite + Nitrate as N	---	0.01	mg/L	<0.01	0.5 mg/L	104	87	119	
EP005: Total Organic Carbon (TOC) (QCLot: 3380339)									
EP005: Total Organic Carbon	---	1	mg/L	<1	10 mg/L	94.8	76	120	
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 3377608)									
EP026ST: Chemical Oxygen Demand	---	5	mg/L	<5	500 mg/L	96.0	92	116	
EP035G: Total Phenol by Discrete Analyser (QCLot: 3380314)									
EP035G: Phenols (Total)	---	0.05	mg/L	<0.05	0.50 mg/L	77.1	64	98	

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.

Sub-Matrix: WATER

Sub-Matrix: WATER				Matrix Spike (MS) Report			
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3375833)							
ES1407307-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	75.1	70	130
ED045G: Chloride Discrete analyser (QCLot: 3375839)							
ES1407405-013	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	97.2	70	130
EG020T: Total Metals by ICP-MS (QCLot: 3380359)							
ES1407441-004	Anonymous	EG020A-T: Manganese	7439-96-5	1 mg/L	112	70	130
EK040P: Fluoride by PC Titrator (QCLot: 3375812)							
ES1407372-002	Anonymous	EK040P: Fluoride	16984-48-8	5.0 mg/L	91.6	70	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3378655)							
ES1407438-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	# Not Determined	70	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3375831)							
ES1407307-001	Anonymous	EK057G: Nitrite as N	---	0.5 mg/L	97.8	70	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3378656)							
ES1407523-003	Anonymous	EK059G: Nitrite + Nitrate as N	---	0.5 mg/L	92.2	70	130
EP005: Total Organic Carbon (TOC) (QCLot: 3380339)							
ES1407523-003	Anonymous	EP005: Total Organic Carbon	---	100 mg/L	91.2	70	130
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 3377608)							
ES1407380-001	Anonymous	EP026ST: Chemical Oxygen Demand	---	286 mg/L	101	70	130
EP035G: Total Phenol by Discrete Analyser (QCLot: 3380314)							
ES1407519-005	Anonymous	EP035G: Phenols (Total)	---	0.42 mg/L	84.3	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are 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.

Sub-Matrix: WATER

Sub-Matrix: WATER										
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Limit
EK040P: Fluoride by PC Titrator (QCLot: 3375812)										
ES1407372-002	Anonymous	EK040P: Fluoride	16984-48-8	5,0 mg/L	91.6	---	70	130	---	---
EK057G: Nitrite as N by Discrete Analyser (QCLot: 3375831)										
ES1407307-001	Anonymous	EK057G: Nitrite as N	---	0.5 mg/L	97.8	---	70	130	---	---
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3375833)										



Sub-Matrix: **WATER**

Sub-Matrix: WATER											
			Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report								
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)		
					MS	MSD	Low	High	Value	Control Limit	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3375833) - continued											
ES1407307-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	75.1	---	70	130	---	---	
ED045G: Chloride Discrete analyser (QCLot: 3375839)											
ES1407405-013	Anonymous	ED045G: Chloride	16887-00-6	250 mg/L	97.2	---	70	130	---	---	
EP026ST: Chemical Oxygen Demand (Sealed Tube) (QCLot: 3377608)											
ES1407380-001	Anonymous	EP026ST: Chemical Oxygen Demand	---	286 mg/L	101	---	70	130	---	---	
EK055G: Ammonia as N by Discrete Analyser (QCLot: 3378655)											
ES1407438-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1.00 mg/L	# Not Determined	---	70	130	---	---	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 3378656)											
ES1407523-003	Anonymous	EK059G: Nitrite + Nitrate as N	---	0.5 mg/L	92.2	---	70	130	---	---	
EP035G: Total Phenol by Discrete Analyser (QCLot: 3380314)											
ES1407519-005	Anonymous	EP035G: Phenols (Total)	---	0.42 mg/L	84.8	---	70	130	---	---	
EP005: Total Organic Carbon (TOC) (QCLot: 3380339)											
ES1407523-003	Anonymous	EP005: Total Organic Carbon	---	100 mg/L	91.2	---	70	130	---	---	
EG020T: Total Metals by ICP-MS (QCLot: 3380359)											
ES1407441-004	Anonymous	EG020A-T: Manganese	7439-96-5	1 mg/L	112	---	70	130	---	---	



Environmental

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1407524	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	: ---	Date Samples Received	: 04-APR-2014
C-O-C number	: ---	Issue Date	: 10-APR-2014
Sampler	: DL	No. of samples received	: 1
Order number	: ---	No. of samples analysed	: 1
Quote number	: SY/413/12		

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



Page : 2 of 9
Work Order : ES1407524
Client : LITHGOW CITY COUNCIL
Project : 202334 PORTLAND LANDFILL

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		Sample Date	Extraction / Preparation		Analysis	
Container / Client Sample ID(s)			Date extracted	Due for extraction	Date analysed	Due for analysis
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural (EA005-P)		03-APR-2014	---	03-APR-2014	04-APR-2014	03-APR-2014
SW1 - SW1-PORT						✗
EA025: Suspended Solids						
Clear Plastic Bottle - Natural (EA025H)		03-APR-2014	---	10-APR-2014	07-APR-2014	10-APR-2014
SW1 - SW1-PORT						✓
ED037P: Alkalinity by PC Titrator						
Clear Plastic Bottle - Natural (ED037-P)		03-APR-2014	---	17-APR-2014	04-APR-2014	17-APR-2014
SW1 - SW1-PORT						✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA						
Clear Plastic Bottle - Natural (ED041G)		03-APR-2014	---	01-MAY-2014	04-APR-2014	01-MAY-2014
SW1 - SW1-PORT						✓
ED045G: Chloride Discrete analyser						
Clear Plastic Bottle - Natural (ED045G)		03-APR-2014	---	01-MAY-2014	04-APR-2014	01-MAY-2014
SW1 - SW1-PORT						✓
ED093F: Dissolved Major Cations						
Clear Plastic Bottle - Natural (ED093F)		03-APR-2014	---	10-APR-2014	04-APR-2014	10-APR-2014
SW1 - SW1-PORT						✓
EG020T: Total Metals by ICP-MS						
Clear Plastic Bottle - Nitric Acid, Unfiltered (EG020A-T)		03-APR-2014	08-APR-2014	30-SEP-2014	09-APR-2014	30-SEP-2014
SW1 - SW1-PORT						✓
EK040P: Fluoride by PC Titrator						
Clear Plastic Bottle - Natural (EK040P)		03-APR-2014	---	01-MAY-2014	04-APR-2014	01-MAY-2014
SW1 - SW1-PORT						✓
EK055G: Ammonia as N by Discrete Analyser						
Clear Plastic Bottle - Sulfuric Acid (EK055G)		03-APR-2014	---	01-MAY-2014	07-APR-2014	01-MAY-2014
SW1 - SW1-PORT						✓
EK057G: Nitrite as N by Discrete Analyser						
Clear Plastic Bottle - Natural (EK057G)		03-APR-2014	---	05-APR-2014	04-APR-2014	05-APR-2014
SW1 - SW1-PORT						✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser						
Clear Plastic Bottle - Sulfuric Acid (EK059G)		03-APR-2014	---	01-MAY-2014	07-APR-2014	01-MAY-2014
SW1 - SW1-PORT						✓



Matrix: WATER

Method		Sample Date	Extraction / Preparation		Analysis	
Container / Client Sample ID(s)			Date extracted	Due for extraction	Date analysed	Due for analysis
EP005: Total Organic Carbon (TOC)						
Clear Plastic Bottle - Sulfuric Acid (EP005) SW1 - SW1-PORT		03-APR-2014	----	----	08-APR-2014	01-MAY-2014
EP026ST: Chemical Oxygen Demand (Sealed Tube)						
Clear Plastic Bottle - Sulfuric Acid (EP026ST) SW1 - SW1-PORT		03-APR-2014	----	----	07-APR-2014	01-MAY-2014
EP035G: Total Phenol by Discrete Analyser						
Clear Plastic Bottle - Sulfuric Acid (EP035G) SW1 - SW1-PORT		03-APR-2014	08-APR-2014	01-MAY-2014	08-APR-2014	01-MAY-2014

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

Analysis

Evaluation

Due for extraction

Date extracted

Sample Date

Method
Container / Client Sample ID(s)

Matrix: WATER



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(when) 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		Method	Count		Rate (%)		Quality Control Specification	
Analytical Methods			QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)								
Alkalinity by PC Titrator	ED037-P	2	13	15.4	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	
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	15	13.3	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Chloride by Discrete Analyser	ED045G	2	10	20.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Fluoride by PC Titrator	EK040P	1	7	14.3	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Major Cations - Dissolved	ED093F	2	19	10.5	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	18	11.1	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Nitrite as N by Discrete Analyser	EK057G	1	2	50.0	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	1	6	16.7	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Suspended Solids (High Level)	EA025H	2	21	9.5	9.5	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Metals by ICP-MS - Suite A	EG020A-T	2	14	14.3	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Organic Carbon	EP005	1	10	10.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Phenol by Discrete Analyser	EP035G	2	12	16.7	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Laboratory Control Samples (LCS)								
Alkalinity by PC Titrator	ED037-P	1	13	7.7	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	
Chemical Oxygen Demand (Sealed Tube)	EP026ST	2	15	13.3	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Chloride by Discrete Analyser	ED045G	2	10	20.0	10.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Fluoride by PC Titrator	EK040P	1	7	14.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Major Cations - Dissolved	ED093F	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	18	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Nitrite as N by Discrete Analyser	EK057G	1	2	50.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	6	16.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Suspended Solids (High Level)	EA025H	2	21	9.5	9.5	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Metals by ICP-MS - Suite A	EG020A-T	1	14	7.1	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Organic Carbon	EP005	1	10	10.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Phenol by Discrete Analyser	EP035G	1	12	8.3	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	
Chemical Oxygen Demand (Sealed Tube)	EP026ST	1	15	6.7	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Chloride by Discrete Analyser	ED045G	1	10	10.0	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Fluoride by PC Titrator	EK040P	1	7	14.3	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Major Cations - Dissolved	ED093F	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	18	5.6	5.0	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Nitrite as N by Discrete Analyser	EK057G	1	2	50.0	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		Method	Count		Rate (%)		Evaluation	Quality Control Specification	
Analytical Methods			QC	Regular	Actual	Expected			
Method Blanks (MB) - Continued									
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser		ED041G	1	6	16.7	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Suspended Solids (High Level)		EA025H	1	21	4.8	4.8	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Metals by ICP-MS - Suite A		EG020A-T	1	14	7.1	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Organic Carbon		EP005	1	10	10.0	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Phenol by Discrete Analyser		EP035G	1	12	8.3	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	
Chemical Oxygen Demand (Sealed Tube)		EP026ST	1	15	6.7	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Chloride by Discrete Analyser		ED045G	1	10	10.0	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Fluoride by PC Titrator		EK040P	1	7	14.3	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Nitrite and Nitrate as N (NOx) by Discrete Analyser		EK059G	1	18	5.6	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Nitrite as N by Discrete Analyser		EK057G	1	2	50.0	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser		ED041G	1	6	16.7	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Metals by ICP-MS - Suite A		EG020A-T	1	14	7.1	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Organic Carbon		EP005	1	10	10.0	5.0	✔	NEPM 2013 Schedule B(3) and ALS QCS3 requirement	
Total Phenol by Discrete Analyser		EP035G	1	12	8.3	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	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, 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	APHA 21st ed., 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrator) 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	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	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 liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003
Major Cations - Dissolved	ED093F	WATER	Major Cations is determined based on APHA 21st ed., 3120; USEPA SW 846 - 6010 The ICPAES technique ionises the 0.45um filtered sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification. This method is compliant with NEPM (2013) Schedule B(3)
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	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)
Fluoride by PC Titrator	EK040P	WATER	Hardness parameters are calculated based on APHA 21st ed., 2340 B. This method is compliant with NEPM (2013) Schedule B(3) (APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): 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.
Ammonia as N by Discrete analyser	EK055G	WATER	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)
Nitrite as N by Discrete Analyser	EK057G	WATER	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) APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3)



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Analytical Methods		Method	Matrix	Method Descriptions
Nitrate as N by Discrete Analyser	EK058G	WATER	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 separately 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	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	APHA 21st Ed. 1030F. The Ionic Balance is calculated based on the major Anions and Cations. The major anions include Alkalinity, Chloride and Sulfate which determined by PCT and DA. The Cations are determined by Turbi SO4 by DA. This method is compliant with NEPM (2013) Schedule B(3)	
Total Organic Carbon	EP005	WATER	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 (Sealed Tube)	EP026ST	WATER	(APHA 21st ed., 5220C, ALS QWI-EN/EP026) 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. The unreacted Cr (VI) can then be titrated with ferrous ammonium sulfate to determine the amount of Cr (VI) consumed. The oxidisable organic matter can be calculated in terms of oxygen equivalents.	
Total Phenol by Discrete Analyser	EP035G	WATER	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
Digestion for Total Recoverable Metals	EN25	WATER	USEPA SW846-3005 Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3)	
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.	



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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 SW846 or ALS-QM/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
Duplicate (DUP) RPDs							
ED037P: Alkalinity by PC Titrator	ES1407451-001	Anonymous	Hydroxide Alkalinity as CaCO ₃	DMO-210-001	Not Determined		Analyte not determined in allocated original sample.
ED037P: Alkalinity by PC Titrator	ES1407451-001	Anonymous	Carbonate Alkalinity as CaCO ₃	3812-32-6	Not Determined		RPD exceeds LOR based limits
ED037P: Alkalinity by PC Titrator	ES1407451-001	Anonymous	Carbonate Alkalinity as CaCO ₃	3812-32-6	Not Determined		Analyte not determined in allocated original sample.
ED037P: Alkalinity by PC Titrator	ES1407451-001	Anonymous	Bicarbonate Alkalinity as CaCO ₃	71-52-3	Not Determined		Analyte not determined in allocated original sample.
ED037P: Alkalinity by PC Titrator	ES1407451-001	Anonymous	Bicarbonate Alkalinity as CaCO ₃	71-52-3	Not Determined		RPD exceeds LOR based limits
ED037P: Alkalinity by PC Titrator	ES1407451-001	Anonymous	Total Alkalinity as CaCO ₃	----	Not Determined		RPD exceeds LOR based limits
ED037P: Alkalinity by PC Titrator	ES1407451-001	Anonymous	Total Alkalinity as CaCO ₃	----	Not Determined		Analyte not determined in allocated original sample.
Matrix Spike (MS) Recoveries							
EK055G: Ammonia as N by Discrete Analyser	ES1407438-001	Anonymous	Ammonia as N	7664-41-7	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 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	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 - SW1-PORT	----	----	----	04-APR-2014	03-APR-2014	1

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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.**

