



## **QUARTERLY GROUNDWATER MONITORING THE SCONE WASTE LANDFILL**

### **THE SCONE WASTE LANDFILL**

Noblet Road  
Scone  
NSW 2337

Upper Hunter Shire Council

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October 2017

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## ABBREVIATIONS

<b>ANZECC</b>	Australian and New Zealand Environment and Conservation Council
<b>ARMCANZ</b>	Agriculture and Resource Management Council of Australia and New Zealand
<b>DEC</b>	Department of Environment and Conservation (NSW)
<b>DLA</b>	DLA Environmental Services
<b>EC</b>	Electrical Conductivity
<b>EPA</b>	Environment Protection Authority (NSW)
<b>NEPC</b>	National Environment Protection Council
<b>NEPM</b>	National Environment Protection Measure
<b>NHMRC</b>	National Health and Medical Research Council
<b>NRMMC</b>	Natural Resource Management Ministerial Council
<b>NSW</b>	New South Wales
<b>OCP</b>	Organochlorine Pesticides
<b>TOC</b>	Total Organic Carbon

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## 1.0 INTRODUCTION

### 1.1 General

DLA Environmental Services (DLA) was engaged by Upper Hunter Shire Council (the Client) to conduct annual and quarterly surface and groundwater monitoring of the following area:

**Scone Waste Facility Area**  
Noblet Road Scone NSW 2337 (the Site).

Refer to **Figure 1: Site Location Regional** and **Figure 2: Site Location Local**.

The Groundwater Monitoring Report provides an overview of the current condition of groundwater at the Site in relation to the Site Criteria and satisfies the groundwater monitoring requirements of the New South Wales (NSW) Environmental Protection Authority (EPA) Environmental Protection Licence 5863.

The report has been prepared utilising information obtained as part of the investigation process, from previous monitoring reports and from experience, knowledge, and current industry practice in the monitoring of similar sites. It is anticipated that quarterly monitoring will be undertaken in April, July and October with annual reporting undertaken in the January reporting period.

Quarterly groundwater monitoring was undertaken on Friday 6<sup>th</sup> October 2017 by staff of DLA.

### 1.2 Scope of Works

The scope of work provided by Upper Hunter Shire Council indicates that annual and quarterly groundwater monitoring is required at the following groundwater sampling locations:

- MWA;
- MWB;
- MWC;
- MWD (landfill leachate monitoring well); and
- MWE.

Refer to **Figure 3: Site Layout with Sample Locations**.

## 2.0 MONITORING PARAMETERS

The following sample analysis parameters and monitoring frequency were provided by Upper Hunter Shire Council for the groundwater wells. Threshold Criteria are primarily sourced from *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000), *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)* ('NEPM', NEPC 2013), and the *Australian Drinking Water Guidelines* (NHMRC / NRMCC, 2011).

**Table 2a: Analytes, Threshold Criteria and Monitoring Frequency for Groundwater Monitoring Wells**

Analytes	Units	Threshold Criteria	
		NEPM 2013 / ANZECC 2000 Fresh Water 95%	Monitoring Frequency
Calcium	mg/L	NA	Quarterly
Alkalinity (total)	mg/L	NA	Quarterly
Chloride	mg/L	NA	Quarterly
Fluoride	mg/L	NA	Quarterly
Iron	mg/L	0.3 <sup>B</sup>	Quarterly
Magnesium	mg/L	NA	Quarterly
Manganese	mg/L	1.9 <sup>A</sup>	Quarterly
Organochlorine pesticides (OCP)	mg/L	0.00001 <sup>C</sup>	Quarterly
Potassium	mg/L	410 <sup>D</sup>	Quarterly
pH	pH	6.5 – 8	Quarterly
Sodium	mg/L	NA	Quarterly
Ammonia	mg/L	0.9 <sup>A</sup>	Quarterly
Nitrate	mg/L	0.7	Quarterly
Sulfate	mg/L	NA	Quarterly
Total organic carbon (TOC)	mg/L	4	Quarterly
Total phenolics	mg/L	0.32	Quarterly
Electrical conductivity (EC)	µS/cm	NA	Quarterly

A – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance

B - Interim working level, in absence of reliable trigger value

C - Trigger value for DDT used in absence of trigger value for total OCP

D – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

## 3.0 SAMPLING METHODOLOGY

### 3.1 Groundwater Sampling

Groundwater samples were collected from well locations MWA, MWB, MWC, MWD and MWE. Purging and sampling of monitoring wells was conducted in accordance with the NEPM (NEPC, 2013) and the *Guidelines for the Assessment and Management of Groundwater Contamination* (NSW DEC, 2007).

Wells were purged using a disposable bailer whilst being measured for physiochemical stability to indicate the flow of formation water. Physiochemical properties were measured at regular intervals following the purging of each equipment volume using a YSI Quatro Pro Plus Water Quality Meter and a flow through cell. Stable conditions were indicated by monitoring the following parameters for three consecutive readings of:

- pH  $\pm$  0.1 unit;
- Electrical Conductivity  $\pm$  5%;
- Temperature  $\pm$  0.20;
- Redox Potential  $\pm$  10%; and
- Dissolved Oxygen  $\pm$  10%.

Samples were obtained using a dedicated disposable bailer which was changed between each monitoring well to minimise the potential for cross contamination. Sampling equipment was cleaned prior to sampling and between sample locations to prevent cross contamination. The cleaning procedure included:

- Washing and brush scrub with phosphate free laboratory grade detergent;
- Rinsing with water of a potable quality; and
- Rinsing with deionised water.

Groundwater samples were collected into laboratory prepared and supplied sample containers for specific analytes (i.e. into a combination of plastic unpreserved, plastic preserved, glass amber unpreserved and preserved glass vials). Samples were collected and filled into the respective sample containers so no head space remained in the sample container, with no loss of any preservation agents, where present. Groundwater samples collected for metals analysis were filtered through 0.45um filter. Samples were placed immediately into a chilled cooler to minimise the likelihood for the loss of potential volatile components.

It is opinion of DLA that decontamination procedures were appropriate during groundwater sampling and no cross contamination can be inferred.



## 4.0 RESULTS

All wells were sampled during the October 2017 sampling event, results are detailed below.

Refer to **Table 4a – Table 4e** for a tabulated summary of the laboratory results.

Refer to **Figure 3** for sampling locations.

**Table 4a – Groundwater Results Comparison October 2017**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWA Oct 2016	MWA Jan 2017	MWA Apr 2017	MWA July 2017	MWA Oct 2017
Calcium	mg/L	NA	580	600	570	640	600
Alkalinity (total)	mg/L	NA	430	460	450	470	470
Chloride	mg/L	NA	7400	8200	7700	7900	7600
Fluoride	mg/L	NA	0.15	ND	0.14	0.12	0.14
Iron	mg/L	0.3 <sup>B</sup>	ND	ND	ND	ND	0.034
Magnesium	mg/L	NA	1100	1200	1100	1200	1100
Manganese	mg/L	1.9 <sup>A</sup>	0.02	0.004	0.006	0.007	0.014
OCP	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND	ND
Potassium	mg/L	410 <sup>D</sup>	4.4	5.6	3.1	4.3	4.9
pH	pH	6.5 – 8	6.8	7.3	6.8	7.0	6.6
Sodium	mg/L	NA	2100	2100	2200	2200	2000
Ammonia	mg/L	0.9 <sup>A</sup>	0.14	0.13	0.14	0.07	0.42
Nitrate	mg/L	0.7	0.50	0.13	0.24	0.24	0.41
Sulfate	mg/L	NA	37	38	39	42	43
TOC	mg/L	4.0	<b>6.2</b>	3.9	<b>6.4</b>	<b>8.0</b>	<b>5.0</b>
Total phenolics	mg/L	0.32	0.22	0.02	0.16	ND	ND
EC	µS/cm	NA	21000	19000	21000	21000	20000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

A – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance

B - Interim working level, in absence of reliable trigger value

C - Trigger value for DDT used in absence of trigger value for total OCP

D – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

NA – Not Applicable

**Table 4b – Groundwater Results Comparison October 2017**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWB Oct 2016	MWB Jan 2017	MWB Apr 2017	MWB July 2017	MWB Oct 2017
Calcium	mg/L	NA	600	590	580	640	610
Alkalinity (total)	mg/L	NA	360	380	360	390	380
Chloride	mg/L	NA	6000	6300	6000	6000	6000
Fluoride	mg/L	NA	0.22	ND	0.27	0.26	0.26
Iron	mg/L	0.3 <sup>B</sup>	0.006	ND	ND	ND	0.005
Magnesium	mg/L	NA	830	850	760	820	790
Manganese	mg/L	1.9 <sup>A</sup>	0.008	ND	0.009	0.01	0.009
OCP	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND	ND
Potassium	mg/L	410 <sup>D</sup>	3.6	5	2.8	4.0	4.1
pH	pH	6.5 – 8	6.9	7.2	6.6	7.0	6.7
Sodium	mg/L	NA	1800	1700	1700	1800	1600
Ammonia	mg/L	0.9 <sup>A</sup>	0.09	0.10	0.09	0.21	0.09
Nitrate	mg/L	0.7	<b>1.1</b>	0.59	<b>0.71</b>	<b>0.83</b>	<b>0.75</b>
Sulfate	mg/L	NA	69	70	77	75	70
TOC	mg/L	4.0	<b>6.6</b>	<b>5</b>	<b>6.8</b>	<b>8.2</b>	<b>6.3</b>
Total phenolics	mg/L	0.32	0.14	0.04	0.02	ND	ND
EC	µS/cm	NA	17000	16000	17000	16000	16000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

A – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance

B - Interim working level, in absence of reliable trigger value

C - Trigger value for DDT used in absence of trigger value for total OCP

D – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

NA – Not Applicable

**Table 4c – Groundwater Results Comparison October 2017**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWC Oct 2016	MWC Jan 2017	MWC April 2017	MWC July 2017	MWC Oct 2017
Calcium	mg/L	NA	67	44	34	26	35
Alkalinity (total)	mg/L	NA	630	830	670	640	720
Chloride	mg/L	NA	770	880	520	370	500
Fluoride	mg/L	NA	0.34	0.13	0.44	0.46	0.41
Iron	mg/L	0.3 <sup>B</sup>	ND	ND	ND	0.008	ND
Magnesium	mg/L	NA	120	89	68	52	73
Manganese	mg/L	1.9 <sup>A</sup>	<b>5.6</b>	<b>7.8</b>	<b>7.3</b>	<b>4.6</b>	<b>4.6</b>
OCP	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND	ND
Potassium	mg/L	410 <sup>D</sup>	1.1	2	0.9	0.8	0.9
pH	pH	6.5 – 8	7.1	7.6	7.1	7.2	7.1
Sodium	mg/L	NA	620	510	540	430	490
Ammonia	mg/L	0.9 <sup>A</sup>	0.04	0.12	0.06	0.33	0.41
Nitrate	mg/L	0.7	ND	ND	ND	0.005	ND
Sulfate	mg/L	NA	180	200	120	90	110
TOC	mg/L	4.0	<b>24</b>	<b>21</b>	<b>23</b>	<b>23</b>	<b>19</b>
Total phenolics	mg/L	0.32	ND	ND	ND	ND	ND
EC	µS/cm	NA	3900	4200	2900	2400	3000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

A – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARM CANZ (2000) for further guidance

B - Interim working level, in absence of reliable trigger value

C - Trigger value for DDT used in absence of trigger value for total OCP

D – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

NA – Not Applicable

**Table 4d – Groundwater Results Comparison October 2017**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWD	MWD	MWD	MWD	MWD
			(leachate) Oct 2016	(leachate) Jan 2017	(leachate) April 2017	(leachate) July 2017	(leachate) Oct 2017
Calcium	mg/L	NA	210	260	260	150	190
Alkalinity (total)	mg/L	NA	1600	2300	1500	2500	2500
Chloride	mg/L	NA	1600	2800	2200	2800	3700
Fluoride	mg/L	NA	0.27	ND	0.28	0.35	0.32
Iron	mg/L	0.3 <sup>B</sup>	<b>1.2</b>	<b>1.1</b>	<b>0.920</b>	<b>1.6</b>	0.3
Magnesium	mg/L	NA	150	230	190	230	260
Manganese	mg/L	1.9 <sup>A</sup>	0.6	0.850	0.780	0.42	0.28
OCP	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND	ND
Potassium	mg/L	410 <sup>D</sup>	140	210	130	180	210
pH	pH	6.5 – 8	7.3	7.5	7.3	7.5	7.2
Sodium	mg/L	NA	1000	1400	1200	1700	1800
Ammonia	mg/L	0.9 <sup>A</sup>	<b>150</b>	<b>250</b>	<b>210</b>	<b>310</b>	<b>350</b>
Nitrate	mg/L	0.7	ND	ND	ND	ND	ND
Sulfate	mg/L	NA	110	330	310	100	240
Total Organic	mg/L	4.0	<b>200</b>	<b>270</b>	<b>150</b>	<b>320</b>	<b>320</b>
Total phenolics	mg/L	0.32	0.07	0.04	0.19	0.05	0.03
EC	µS/cm	NA	7800	11000	9400	12000	13000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

A – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARM CANZ (2000) for further guidance

B - Interim working level, in absence of reliable trigger value

C - Trigger value for DDT used in absence of trigger value for total OCP

D – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

NA – Not Applicable

As MWD is within the perched landfill leachate water table, the Threshold Criteria are only applicable as indicators of general water quality for comparison to the wells surrounding the landfill. Exceedances of the Threshold Criteria for MWD are expected and do not indicate contamination is leaving the Site.

**Table 4e – Groundwater Results Comparison October 2017**

Sampling Parameter	Units	Threshold Criteria (mg/L)	MWE Oct 2016	MWE Jan 2017	MWE April 2017	MWE July 2017	MWE Oct 2017
Calcium	mg/L	NA	61	70	34	60	56
Alkalinity (total)	mg/L	NA	900	1100	1100	1200	1100
Chloride	mg/L	NA	560	580	360	340	310
Fluoride	mg/L	NA	0.41	0.18	0.52	0.5	0.51
Iron	mg/L	0.3 <sup>B</sup>	0.012	0.021	0.006	0.077	0.015
Magnesium	mg/L	NA	67	76	67	65	55
Manganese	mg/L	1.9 <sup>A</sup>	0.110	0.27	<b>7.3</b>	0.14	0.055
OCP	mg/L	0.00001 <sup>C</sup>	ND	ND	ND	ND	ND
Potassium	mg/L	410 <sup>D</sup>	1.3	1.8	0.9	1.5	1.4
pH	pH	6.5 – 8	7.3	7.8	7.3	7.5	7.4
Sodium	mg/L	NA	650	610	530	570	520
Ammonia	mg/L	0.9 <sup>A</sup>	0.04	0.04	0.07	0.1	0.38
Nitrate	mg/L	0.7	ND	ND	ND	ND	ND
Sulfate	mg/L	NA	120	130	110	99	110
Total Organic	mg/L	4.0	<b>16</b>	<b>13</b>	<b>20</b>	<b>26</b>	<b>17</b>
Total phenolics	mg/L	0.32	0.01	ND	ND	ND	ND
EC	µS/cm	NA	3600	3500	3200	3100	3000

Samples highlighted in **Bold** exceed threshold criteria

ND = No Detection above Laboratory LOR

A – Trigger value may not protect key species from chronic toxicity, refer to ANZECC & ARM CANZ (2000) for further guidance

B - Interim working level, in absence of reliable trigger value

C - Trigger value for DDT used in absence of trigger value for total OCP

D – Poor (acceptable) drinking water criteria, World Health Organisation Guidelines for Drinking-water Quality 2009

NA – Not Applicable

## 5.0 DISCUSSION

Due to the sites topography, the inferred hydraulic gradient is generally to the west. Wells MWA, MWB and MWC are located down-hydraulic gradient of the landfill. Well MWE is considered to be up-hydraulic gradient of the landfill. Well MWD is located within the perched landfill water table, being the leachate within the landfill.

The water sampled from well MWD is landfill leachate and as such the Threshold Criteria is not used as a comparison, only as an indicator of current conditions. MWD is to be used as a general indicator of water quality within the landfill for comparison to the external monitoring wells.

The following is a summary of the results of the October 2017 sampling event in relation to the Threshold Criteria. The following exceedances of the Threshold Criteria occurred:

- Nitrate in MWB exceeded the Threshold Criteria (0.7 mg/L) with a concentration of 0.75 mg/L. Exceedances of nitrate have been consistent in MWB since October 2016. There has been no nitrate detected in leachate well MWD which suggests that the landfill is not the source of the nitrate. The nitrate may be migrating onto the Site through groundwater from the farmland to the north.
- Manganese in MWC exceeded the Threshold Criteria (1.9 mg/L) with a concentration of 4.6 mg/L. The reported concentration is equivalent to the results of the previous monitoring round in July 2017, however represents an overall decrease since the previous rounds of monitoring carried out between October 2016 and April 2017. Manganese concentrations in leachate well MWD have been consistently below the Threshold Criteria which suggests that the landfill is not the source of the nitrate.
- Ammonia in MWD exceeded the Threshold Criteria (0.9mg/L) with a concentration of 320 mg/L. The concentration of ammonia in MWD has consistently increased since October 2016.
- Total Organic Carbon (TOC) exceeds the Threshold Criteria (4 mg/L) in all monitoring wells (MWA, MWB, MWC, MWD and MWE) as follows:
  - o TOC in MWA reported a concentration of 5 mg/L, decreasing from 8.0 mg/L reported in July 2017;
  - o TOC in MWB reported a concentration of 6.6 mg/L, decreasing from 8.2 mg/L reported in July 2017;
  - o TOC in MWC reported a concentration of 19 mg/L, decreasing from 23 mg/L reported in July 2017;

- TOC in MWD reported a concentration of 320 mg/L which is equivalent to the concentration reported in July 2017, however is an overall increase the previous rounds of monitoring carried out between October 2016 and April 2017; and
- TOC in MWE reported a concentration of 17 mg/L, decreasing from 26 mg/L reported in July 2017.

The Threshold Criteria used for TOC is intended for drinking water, not groundwater. Due to the magnitude of the exceedances and the intention of the Threshold Criteria used, these exceedances are regarded as minor. The TOC concentration in MWE indicates that TOC is likely to be elevated in the local groundwater.

All other analytes in all other wells reported detections which were within the Threshold Criteria.

The following notable changes occurred within the groundwater chemistry in landfill leachate well MWD:

- Ammonia has increased to 350 mg/L, from a concentration of 310 mg/L in the July 2017 monitoring round. Concentrations of ammonia in MWD have consistently been substantially higher than in the surrounding wells.
- Chloride has increased to 3700mg/L, from a concentration of 2800 mg/L in the July 2017 monitoring round. The current concentration is the highest concentration reported since the October 2016 monitoring round, and represents a continued increase in concentration overtime.
- Iron has decreased to 0.3 mg/L, from a concentration of 1.6 mg/L in the July 2017 monitoring round. The current concentration is less than the Threshold Criteria (0.3 mg/L).

Refer to **Attachment 3** – Data Log.

The data will be viewed on a trending basis as more results become available.

## 6.0 CONCLUSIONS

The results of laboratory analysis of the samples collected from the Scone Waste Landfill during the October 2017 quarterly sampling event confirmed several exceedances of the Threshold Criteria in the wells external to the landfill. The Threshold Criteria are sourced from the ANZECC 2000 Guidelines for Fresh Water 95% level of protection, NEPM 2013 and Australian Drinking Water Guidelines 2011.

The following analytes exceeded the Threshold Criteria during the October 2017 sampling event: nitrate in MWB, manganese in MWC, ammonia in MWD, and TOC in MWA, MWB, MWC and MWE. There were no other exceedances of the Threshold Criteria in the wells surrounding the landfill.

Some exceedances have been explained by local conditions or regarded as minor due to the criteria being Australian Drinking Water Guidelines. Trending of these analytes over time may indicate a seasonal fluctuation of regional groundwater conditions. All remaining exceedances are in MWD which is the leachate monitoring well. Exceeding concentrations in MWD are substantially higher than other wells, this indicates that it is unlikely that releases of landfill leachate into the local groundwater are occurring.

The elevated concentrations of nitrate, manganese and TOC in the monitoring wells external to the landfill do not necessarily indicate the concentrations are due to the landfill leachate, future testing and trending of data will allow for appropriate comparisons. Further monitoring may reveal the source and extent of elevated concentrations of particular analytes. As more data becomes available, it will become clearer which analytes are consistently elevated and may allow for determining the source of contamination.

The next water sampling event will be the annual monitoring which will be undertaken in January 2018.



## 7.0 REFERENCES

ANZECC/ARMCANZ (2000). *Australian Water Quality Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, October 2000.

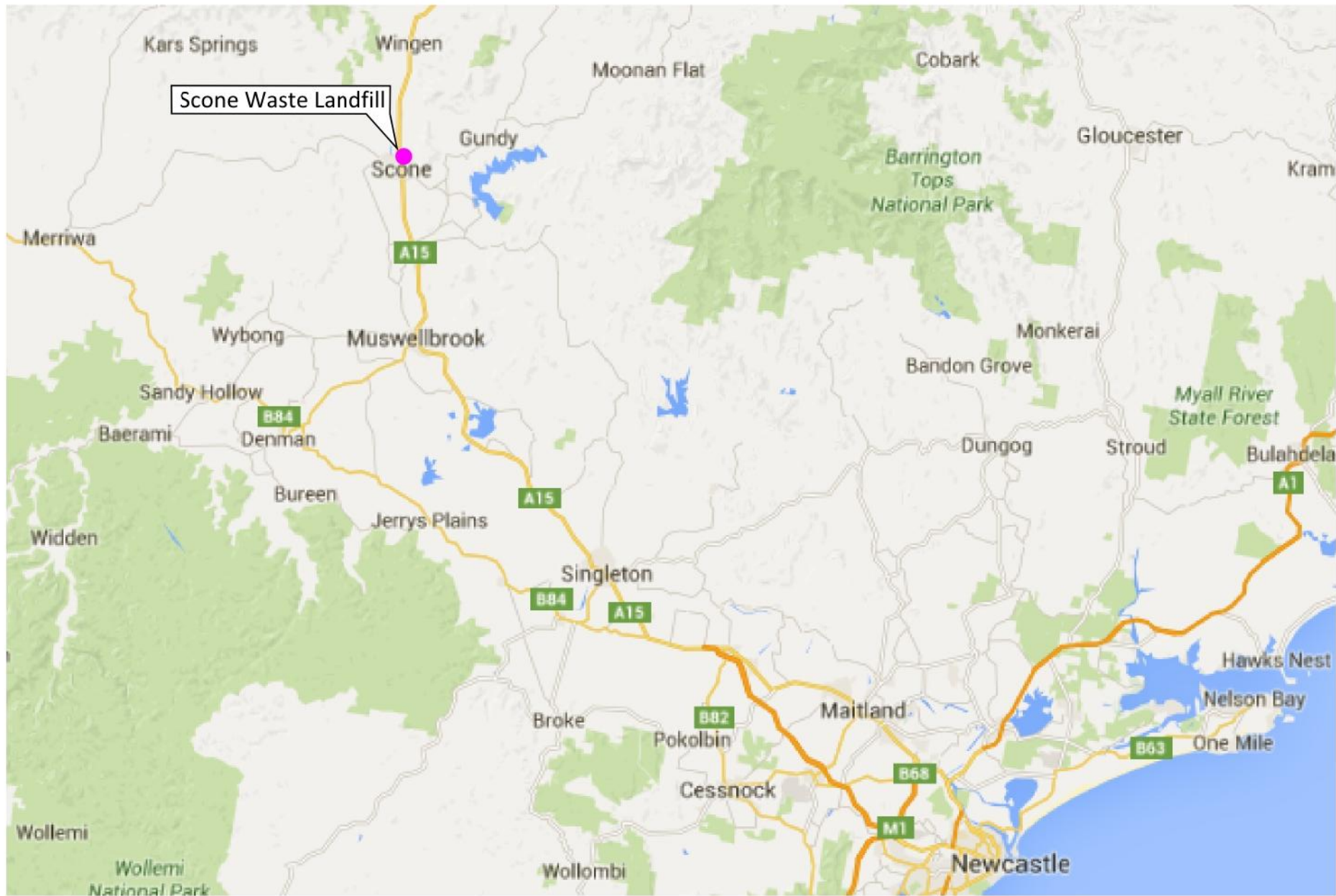
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**FIGURE 1 – SITE LOCATION REGIONAL**

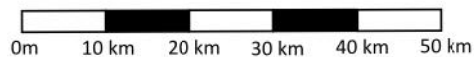


**Legend**

● Site location - Noblet Rd, Scone



**Approximate Scale**



Sydney Office  
Phone (02) 9476 1765  
Fax (02) 9476 1557

Maitland Office  
Phone (02) 4933 0001

Title <b>Site location regional</b>			
Client <b>Upper Hunter Shire Council</b>	Project No. <b>DLH1186</b>	Figure No <b>1</b>	Date <b>3/11/2015</b>
Scale <b>As Shown</b>	Compiled <b>BF</b>	Revision <b>R01</b>	

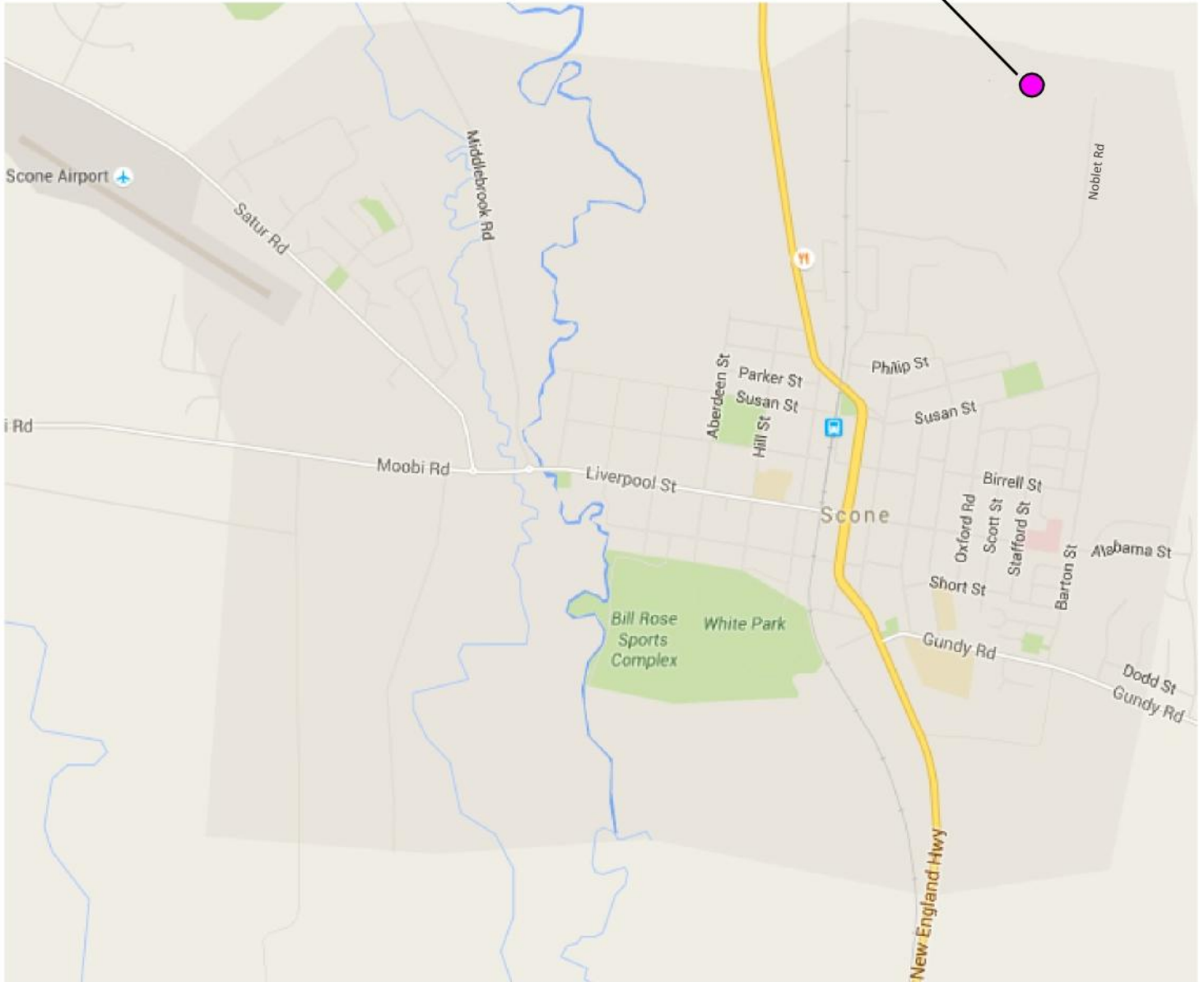
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**FIGURE 2 – SITE LOCATION LOCAL**

N



Scone Waste Landfill



**Legend**

● Site Location - Noblet Rd, Scone

Approximate Scale



Sydney Office Phone (02) 9476 1765 Fax (02) 9476 1557  
Maitland Office Phone (02) 4933 0001

Title Site location local

Client	Upper Hunter Shire Council	Figure No	2	Date	3/11/2015
Project No.	DLH1186	Scale	As Shown	Compiled	BF
				Revision	R01

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**FIGURE 3** – SITE LAYOUT WITH SAMPLE LOCATIONS





**Legend**

● Groundwater well location



Approximate Scale  
 0m 50m 100m



Sydney Office Phone (02) 9476 1765 Fax (02) 9476 1557  
 Maitland Office Phone (02) 4933 0001

Title Site layout with sample locations			
Client Upper Hunter Shire Council	Project No. DLH1186	Figure No 3	Date 16/10/2015
	Scale As Shown	Compiled BF	Revision R01

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**ATTACHMENT 1 – NATA CERTIFIED ANALYTICAL RESULTS**



CLIENT DETAILS

LABORATORY DETAILS

Contact Tobias Scheid  
 Client DLA ENVIRONMENTAL SERVICES PTY LTD  
 Address 42b Church St  
 Maitland  
 NSW 2320

Telephone 61 2 4933 0001  
 Facsimile 61 2 98700999  
 Email tobias.scheid@dlaenvironmental.com.au

Project **DLH1186**  
 Order Number (Not specified)  
 Samples 5

Manager Huang Crawford  
 Laboratory SGS Alexandria Environmental  
 Address Unit 16, 33 Maddox St  
 Alexandria NSW 2015

Telephone +61 2 8594 0400  
 Facsimile +61 2 8594 0499  
 Email au.environmental.sydney@sgs.com

SGS Reference **SE171359 R0**  
 Date Received 13/10/2017  
 Date Reported 20/10/2017

COMMENTS

Accredited for compliance with ISO/IEC 17025-Testing. NATA accredited laboratory 2562(4354).

Ion Chromatography - The Limit of Reporting (LOR) has been raised for NO3-N due to high conductivity of the sample requiring dilution.

SIGNATORIES



**Dong Liang**  
 Metals/Inorganics Team Leader



**Huang Crawford**  
 Production Manager



**Kamrul Ahsan**  
 Senior Chemist



**Ly Kim Ha**  
 Organic Section Head

OC Pesticides in Water [AN420] Tested: 16/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER 6/10/2017 SE171359.001	WATER 6/10/2017 SE171359.002	WATER 6/10/2017 SE171359.003	WATER 6/10/2017 SE171359.004	WATER 6/10/2017 SE171359.005
Hexachlorobenzene (HCB)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane (gamma BHC)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Gamma Chlordane	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDD	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDD	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin aldehyde	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin ketone	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Total Phenolics in Water [AN289] Tested: 17/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER 6/10/2017 SE171359.001	WATER 6/10/2017 SE171359.002	WATER 6/10/2017 SE171359.003	WATER 6/10/2017 SE171359.004	WATER 6/10/2017 SE171359.005
Total Phenols	mg/L	0.01	<0.01	<0.01	<0.01	<b>0.03</b>	<0.01

Anions by Ion Chromatography in Water [AN245] Tested: 17/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 6/10/2017 SE171359.001	WATER - 6/10/2017 SE171359.002	WATER - 6/10/2017 SE171359.003	WATER - 6/10/2017 SE171359.004	WATER - 6/10/2017 SE171359.005
Fluoride	mg/L	0.1	<b>0.14</b>	<b>0.26</b>	<b>0.41</b>	<b>0.32</b>	<b>0.51</b>
Chloride	mg/L	1	<b>7600</b>	<b>6000</b>	<b>500</b>	<b>3700</b>	<b>310</b>
Nitrate Nitrogen, NO3-N	mg/L	0.005	<b>0.41</b>	<b>0.75</b>	<0.005	<0.050 †	<0.005
Sulfate, SO4	mg/L	1	<b>43</b>	<b>70</b>	<b>110</b>	<b>240</b>	<b>110</b>

pH in water [AN101] Tested: 16/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER 6/10/2017 SE171359.001	WATER 6/10/2017 SE171359.002	WATER 6/10/2017 SE171359.003	WATER 6/10/2017 SE171359.004	WATER 6/10/2017 SE171359.005
pH**	No unit	-	<b>6.6</b>	<b>6.7</b>	<b>7.1</b>	<b>7.2</b>	<b>7.4</b>

Conductivity and TDS by Calculation - Water [AN106] Tested: 16/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 6/10/2017 SE171359.001	WATER - 6/10/2017 SE171359.002	WATER - 6/10/2017 SE171359.003	WATER - 6/10/2017 SE171359.004	WATER - 6/10/2017 SE171359.005
Conductivity @ 25 C	µS/cm	2	<b>20000</b>	<b>16000</b>	<b>3000</b>	<b>13000</b>	<b>3000</b>
Total Dissolved Solids (by calculation)	mg/L	2	<b>12000</b>	<b>9400</b>	<b>1800</b>	<b>8100</b>	<b>1800</b>

Alkalinity [AN135] Tested: 13/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 6/10/2017 SE171359.001	WATER - 6/10/2017 SE171359.002	WATER - 6/10/2017 SE171359.003	WATER - 6/10/2017 SE171359.004	WATER - 6/10/2017 SE171359.005
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	5	<b>470</b>	<b>380</b>	<b>720</b>	<b>2500</b>	<b>1100</b>
Carbonate Alkalinity as CaCO <sub>3</sub>	mg/L	1	<1	<1	<1	<1	<1
Hydroxide Alkalinity as CaCO <sub>3</sub>	mg/L	5	<5	<5	<5	<5	<5
Phenolphthalein Alkalinity as CaCO <sub>3</sub> *	mg/L	5	<5	<5	<5	<5	<5
Total Alkalinity as CaCO <sub>3</sub>	mg/L	5	<b>470</b>	<b>380</b>	<b>720</b>	<b>2500</b>	<b>1100</b>

Acidity and Free CO2 [AN140] Tested: 17/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 6/10/2017 SE171359.001	WATER - 6/10/2017 SE171359.002	WATER - 6/10/2017 SE171359.003	WATER - 6/10/2017 SE171359.004	WATER - 6/10/2017 SE171359.005
Acidity to pH 8.3	mg CaCO3/L	5	<b>200</b>	<b>140</b>	<b>130</b>	<b>360</b>	<b>84</b>



Ammonia Nitrogen by Discrete Analyser (Aquakem) [AN291] Tested: 18/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 6/10/2017 SE171359.001	WATER - 6/10/2017 SE171359.002	WATER - 6/10/2017 SE171359.003	WATER - 6/10/2017 SE171359.004	WATER - 6/10/2017 SE171359.005
Ammonia Nitrogen, NH <sub>3</sub> as N	mg/L	0.01	<b>0.42</b>	<b>0.09</b>	<b>0.41</b>	<b>350</b>	<b>0.38</b>

Forms of Carbon [AN190] Tested: 18/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 6/10/2017 SE171359.001	WATER - 6/10/2017 SE171359.002	WATER - 6/10/2017 SE171359.003	WATER - 6/10/2017 SE171359.004	WATER - 6/10/2017 SE171359.005
Total Organic Carbon as NPOC	mg/L	0.2	<b>5.0</b>	<b>6.3</b>	<b>19</b>	<b>320</b>	<b>17</b>

Metals in Water (Dissolved) by ICPOES [AN320] Tested: 18/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER	WATER	WATER	WATER	WATER
			6/10/2017 SE171359.001	6/10/2017 SE171359.002	6/10/2017 SE171359.003	6/10/2017 SE171359.004	6/10/2017 SE171359.005
Calcium, Ca	mg/L	0.1	<b>600</b>	<b>610</b>	<b>35</b>	<b>190</b>	<b>56</b>
Magnesium, Mg	mg/L	0.1	<b>1100</b>	<b>790</b>	<b>73</b>	<b>260</b>	<b>55</b>
Sodium, Na	mg/L	0.1	<b>2000</b>	<b>1600</b>	<b>490</b>	<b>1800</b>	<b>520</b>
Potassium, K	mg/L	0.2	<b>4.9</b>	<b>4.1</b>	<b>0.9</b>	<b>210</b>	<b>1.4</b>

Trace Metals (Dissolved) in Water by ICPMS [AN318] Tested: 16/10/2017

PARAMETER	UOM	LOR	MWA	MWB	MWC	MWD	MWE
			WATER - 6/10/2017 SE171359.001	WATER - 6/10/2017 SE171359.002	WATER - 6/10/2017 SE171359.003	WATER - 6/10/2017 SE171359.004	WATER - 6/10/2017 SE171359.005
Iron, Fe	µg/L	5	<b>34</b>	<b>5</b>	<5	<b>300</b>	<b>15</b>
Manganese, Mn	µg/L	1	<b>14</b>	<b>9</b>	<b>4600</b>	<b>280</b>	<b>55</b>

METHOD

METHODOLOGY SUMMARY

- AN020** Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
- AN101** pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
- AN106** Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2510 B.
- AN135** Alkalinity (and forms of) by Titration: The sample is titrated with standard acid to pH 8.3 (P titre) and pH 4.5 (T titre) and permanent and/or total alkalinity calculated. The results are expressed as equivalents of calcium carbonate or recalculated as bicarbonate, carbonate and hydroxide. Reference APHA 2320. Internal Reference AN135
- AN140** Acidity by Titration: The water sample is titrated with sodium hydroxide to designated pH end point. In a sample containing only carbon dioxide, bicarbonates and carbonates, titration to pH 8.3 at 25°C corresponds to stoichiometric neutralisation of carbonic acid to bicarbonate. Method reference APHA 2310 B.
- AN190** TOC and DOC in Water: A homogenised micro portion of sample is injected into a heated reaction chamber packed with an oxidative catalyst that converts organic carbon to carbon dioxide. The CO<sub>2</sub> is measured using a non-dispersive infrared detector. The process is fully automated in a commercially available analyser. If required a sugar value can be calculated from the TOC result. Reference APHA 5310 B.
- AN190** Chemical oxygen demand can be calculated/estimated based on the O<sub>2</sub>/C relation as 2.67\*NPOC (TOC). This is an estimate only and the factor will vary with sample matrix so results should be interpreted with caution.
- AN245** Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO<sub>2</sub>, NO<sub>3</sub> and SO<sub>4</sub> are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B
- AN289** Analysis of Total Phenols in Soil Sediment and Water: Steam distillable phenols react with 4-aminoantipyrine at pH 7.9±0.1 in the presence of potassium ferricyanide to form a coloured antipyrine dye analysed by Discrete Analyser. Reference APHA 5530 B/D.
- AN291** Ammonia in solution reacts with hypochlorite ions from Sodium Dichloroisocyanate, and salicylate in the presence of Sodium Nitroprusside to form indophenol blue and measured at 670 nm by Discrete Analyser.
- AN318** Determination of elements at trace level in waters by ICP-MS technique, in accordance with USEPA 6020A.
- AN320** Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
- AN320** Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements . Reference APHA 3120 B.
- AN420** SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
- Calculation** Free and Total Carbon Dioxide may be calculated using alkalinity forms only when the samples TDS is <500mg/L. If TDS is >500mg/L free or total carbon dioxide cannot be reported . APHA4500CO<sub>2</sub> D.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
		IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Samples analysed as received.  
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : <http://www.sgs.com.au/~media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf>

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**ATTACHMENT 2 – YSI WATER QUALITY METER CALIBRATION CERTIFICATE**

## Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus  
Serial No. 10H100317



**airmet**

Air-Met Scientific Pty Ltd  
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad Display	Operation	✓	
	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

### Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 10.00		pH 10.00		304261	pH 9.29
1. pH 7.00		pH 7.00		290453	pH 6.65
2. pH 4.00		pH 4.00		288994	pH 3.81
3. mV		229.6mV		299345/297604	230.9mV
4. EC		2.76mS		292380	2.83mS
5. D.O		0.00ppm		CS13715	0.00ppm
6. Temp		22.0°C		MultiTherm	21.8°C

Calibrated by:

Ben O'Donnell

Calibration date:

3/10/2017

Next calibration due:

2/11/2017



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**ATTACHMENT 3 – DATA LOG**











Monitoring Well	Chemical Report	Date Sampled	Comment	Calcium	Alkalinity	Chloride	Fluoride	Iron	Magnesium	Manganese	Organochlorine pesticides (OCP)	Potassium	pH	Sodium	Ammonia	Nitrate	Sulfate	Total organic carbon	Total phenolics	Electrical conductivity (EC)	Total dissolved solids	Biochemical oxygen demand	Phosphate	Arsenic III & V	Aluminum	Barium	Cadmium	Cobalt	Copper	Chromium VI	Chromium (total)	Lead	Mercury	Zinc	TPH	Benzene	Toluene	Ethylbenzene	total	Tetrachlorethene [TC]	1,1,1-Trichloroethane [TCA]	Tetrachloroethene [PCE]	1,2-Dichloroethene	Vinyl Chloride	PCBs	PAHs	OPPs	
Threshold Criteria	-	-	-	0.3	-	1.9	0.00001	-	6.5-8	-	0.9	0.7	-	4	0.32	-	-	-	0.015	0.024 (III) 0.013 (V)	0.055 (pH> 6.5)	-	0.0002	0.09	0.0014	0.001	-	0.0034	0.0006	0.008	0.26	0.95	0.18	0.08	-	-	6500	0.05	0.03	0.0003	3E-05	0.016	0.00002					
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Analytes	Calcium	Alkalinity	Chloride	Fluoride	Iron	Magnesium	Manganese	Organochlorine pesticides (OCP)	Potassium	pH	Sodium	Ammonia	Nitrate	Sulfate	Total organic carbon	Total phenolics	Electrical conductivity (EC)	Total dissolved solids	Biochemical oxygen demand	Phosphate	Arsenic III & V	Aluminum	Barium	Cadmium	Cobalt	Copper	Chromium VI	Chromium (total)	Lead	Mercury	Zinc	TPH	Benzene	Toluene	Ethylbenzene	total	Tetrachlorethene [TC]	1,1,1-Trichloroethane [TCA]	Tetrachloroethene [PCE]	1,2-Dichloroethene	Vinyl Chloride	PCBs	PAHs	OPPs				
Monitoring frequency	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	Yearly	
MWD	135493	6/10/2015	leachate	150	2400	2800	0.3	<b>1.8</b>	220	0.46	ND	170	7.6	1700	<b>310</b>	ND	66	<b>330</b>	ND	11000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWD	SE148082	14/01/2016	leachate	170	1200	1000	0.32	<b>0.33</b>	110	0.87	ND	110	7.3	690	<b>110</b>	ND	18	<b>140</b>	0.47	5800	2500	48	0.13	0.017	ND	0.49	ND	0.004	ND	ND	0.031	ND	ND	<b>0.026</b>	34	0.0028	0.0034	0.023	0.0351	ND	ND	ND	ND	0.0059	ND	0.004	ND	
MWD	144481	7/04/2016	leachate	160	2200	2600	0.3	<b>2.2</b>	230	0.45	ND	180	7.7	1900	<b>210</b>	ND	35	<b>290</b>	ND	9600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWD	SE154534	6/07/2016	leachate	250	1200	1000	0.14	<b>5.2</b>	120	0.96	ND	120	7.3	630	<b>80</b>	ND	140	<b>140</b>	0.01	5200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWD	SE157866	6/10/2016	leachate	210	1600	1600	0.27	0.001	150	0.600	ND	140	7.3	1000	<b>150</b>	ND	110	<b>200</b>	0.07	7800	4700	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MWD	SE160904	12/01/2017	leachate	260	2300	2800	ND	<b>1.100</b>	230	0.850	ND	210	7.5	1400	<b>250</b>	ND	330	<b>270</b>	0.04	11000	6200	170	<b>0.89</b>	NA	0.014	0.91	ND	0.017	ND	ND	0.03	ND	ND	<b>0.035</b>	<b>3</b>	0.002	0.0009	0.0034	0.042	ND	ND	ND	ND	<b>0.0004</b>	ND	<b>0.017</b>	ND	
MWD	SE164082	6/4/2017	leachate	260	1500	2200	0.28	<b>0.920</b>	190	0.780	ND	130	7.3	1200	<b>210</b>	ND	310	<b>150</b>	0.19	9400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
MWD	SE167897	6/7/2017	leachate	150	2500	2800	0.35	<b>1.6</b>	230	0.42	ND	180	7.5	1700	<b>310</b>	ND	100	<b>320</b>	0.05	12000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
MWD	SE171359	6/10/2017	leachate	190	2500	3700	0.32	0.300	260	0.28	ND	210.0	7.2	1800	<b>350</b>	ND	240	<b>320</b>	0.03	13000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

\*As MWD is within the perched landfill leachate water table, the Threshold Criteria are only applicable as indicators of general water quality for comparison to the wells surrounding the landfill. Exceedances of the Threshold Criteria for MWD are expected and do not indicate contamination is leaving the site.



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**ATTACHMENT 4 – GROUNDWATER FIELD DATA SHEETS**



### GROUNDWATER FIELD DATA SHEET

DLA Project Code: DLH1186	Sample ID: <i>MWA</i>
Project: The Scone Waste Landfill	Well Collar RL:
Client:  Upper Hunter Shire Council	Sampler(s): <i>T.S</i>
Address: Noblet Rd, Scone NSW 2289	Signature:
BH ID: MWA	Date: <i>11.10.17</i>

#### Well Status

Monument damaged:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>	Well ID visible:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>
Locked well casing:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>	Cap on PVC casing:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>
Cement footing damaged:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>	Water in monument casing:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>
Standing water, vegetation around monument:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>	Internal obstruction in casing:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>
Well Damaged:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>	Odours from groundwater:	YES <input type="radio"/> NO <input checked="" type="radio"/> N/A <input type="radio"/>
Nearby works: .....	<i>at slight depth</i>		
Comments: .....	<i>sediment no odour.</i>		
Casing above ground: .....	m agl	Weather Conditions:	
Standing water level: <i>6.18</i>	m bgl	Temperature	15-20 <input type="checkbox"/> 20-25 <input checked="" type="checkbox"/>
Total well depth: <i>15.90</i>	m bgl		25-30 <input type="checkbox"/> >30 <input type="checkbox"/>
Initial well volume: <i>3.7</i>	L	Clear <input type="checkbox"/>	Partly cloudy <input type="checkbox"/> Overcast <input checked="" type="checkbox"/>
Water level after purging: <i>2</i>	m bgl	Calm <input type="checkbox"/>	Slight breeze <input checked="" type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged: <i>2L</i>	L	Windy <input type="checkbox"/>	
Water level at time of sampling: .....	m bgl	Fine <input type="checkbox"/>	Showers <input checked="" type="checkbox"/> Rain <input type="checkbox"/>
Well purged dry:	YES <input type="radio"/> NO <input checked="" type="radio"/>		
Purging equipment: <i>backer</i>			
Sample equipment:			

Note: 50mm internal diameter pipe = 1.96 L/m. All measurements below well collar

#### Water Quality Details: *ms/cm*

Time am / pm	DO (mg/L <sup>-1</sup> )	EC (µS cm <sup>-1</sup> )	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
<i>9:55</i>	<i>5.11</i>	<i>19683</i>	<i>7.8</i>	<i>71.3</i>	<i>21.5</i>	<i>12.67</i>	
	<i>7.09</i>	<i>14709</i>	<i>7.08</i>	<i>72.5</i>	<i>21.5</i>	<i>12.69</i>	
	<i>1.93</i>	<i>19726</i>	<i>7.03</i>	<i>72.9</i>	<i>21.5</i>	<i>12.70</i>	

Additional Comments:

## GROUNDWATER FIELD DATA SHEET

DLA Project Code: DLH1186	Sample ID:
Project: The Scone Waste Landfill	Well Collar RL:
Client: Upper Hunter Shire Council	Sampler(s):
Address: Noblet Rd, Scone NSW 2289	Signature:
BH ID: MWB	Date:

### Well Status

Monument damaged:	YES / NO / N/A	Well ID visible:	YES / NO / N/A
Locked well casing:	YES / NO / N/A	Cap on PVC casing:	YES / NO / N/A
Cement footing damaged:	YES / NO / N/A	Water in monument casing:	YES / NO / N/A
Standing water, vegetation around monument:	YES / NO / N/A	Internal obstruction in casing:	YES / NO / N/A
Well Damaged:	YES / NO / N/A	Odours from groundwater:	YES / NO / N/A
Nearby works: .....			
Comments: ..... <i>clear no odours</i> .....			
Casing above ground: ..... <i>0.15</i> .....	m agl	Weather Conditions:	
Standing water level: ..... <i>5.75</i> .....	m bgl	Temperature	15-20 <input type="checkbox"/> 20-25 <input checked="" type="checkbox"/>
Total well depth: ..... <i>15.45</i> .....	m bgl		25-30 <input type="checkbox"/> >30 <input type="checkbox"/>
Initial well volume: ..... <i>19.0</i> .....	L	Clear <input type="checkbox"/>	Partly cloudy <input type="checkbox"/> Overcast <input checked="" type="checkbox"/>
Water level after purging: ..... <i>18</i> .....	m bgl	Calm <input type="checkbox"/>	Slight breeze <input checked="" type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged: ..... <i>18</i> .....	L	Windy <input type="checkbox"/>	
Water level at time of sampling: .....	m bgl	Fine <input checked="" type="checkbox"/>	Showers <input type="checkbox"/> Rain <input type="checkbox"/>
Well purged dry:	YES / NO <input checked="" type="checkbox"/>		
Purging equipment:			
Sample equipment: <i>bauler</i>			

Note: 50mm internal diameter pipe = 1.96 L/m. All measurements below well collar

### Water Quality Details:

Time am / pm	DO (mg/L <sup>-1</sup> )	EC (µS cm <sup>-1</sup> )	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
<i>0 15</i>	<i>3.63</i>	<i>16072</i>	<i>7.06</i>	<i>76.5</i>	<i>20.9</i>	<i>10.30</i>	
	<i>3.57</i>	<i>16072</i>	<i>7.03</i>	<i>75.8</i>	<i>20.9</i>	<i>10.30</i>	
	<i>3.53</i>	<i>16072</i>	<i>7.03</i>	<i>75.4</i>	<i>20.9</i>	<i>10.30</i>	

Additional Comments:

### GROUNDWATER FIELD DATA SHEET

DLA Project Code: DLH1186	Sample ID:
Project: The Scone Waste Landfill	Well Collar RL:
Client:  Upper Hunter Shire Council	Sampler(s):
Address: Noblet Rd, Scone NSW 2289	Signature:
BH ID: MWC	Date: 12.10.12

**Well Status**

Monument damaged:	YES / <input checked="" type="radio"/> NO / N/A	Well ID visible:	YES / NO / N/A
Locked well casing:	YES / <input checked="" type="radio"/> NO / N/A	Cap on PVC casing:	<input checked="" type="radio"/> YES / NO / N/A
Cement footing damaged:	YES / <input checked="" type="radio"/> NO / N/A	Water in monument casing:	YES / <input checked="" type="radio"/> NO / N/A
Standing water, vegetation around monument:	YES / <input checked="" type="radio"/> NO / N/A	Internal obstruction in casing:	YES / <input checked="" type="radio"/> NO / N/A
Well Damaged:	YES / <input checked="" type="radio"/> NO / N/A	Odours from groundwater:	YES / <input checked="" type="radio"/> NO / N/A
Nearby works: .....			
Comments: .....			
Casing above ground: 0.75	m agl	<b>Weather Conditions:</b>	
Standing water level: 4.12	m bgl	Temperature	15-20 <input type="checkbox"/> 20-25 <input type="checkbox"/>
Total well depth: 11.87	m bgl		25-30 <input type="checkbox"/> >30 <input type="checkbox"/>
Initial well volume: 8.07	L	Clear <input type="checkbox"/>	Partly cloudy <input checked="" type="checkbox"/> Overcast <input type="checkbox"/>
Water level after purging:	m bgl	Calm <input checked="" type="checkbox"/>	Slight breeze <input type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged:	L	Windy <input type="checkbox"/>	
Water level at time of sampling: .....	m bgl	Fine <input checked="" type="checkbox"/>	Showers <input type="checkbox"/> Rain <input type="checkbox"/>
Well purged dry:	YES / <input checked="" type="radio"/> NO		
Purging equipment: Bailer			
Sample equipment:			

Note: 50mm Internal diameter pipe = 1.96 L/m. All measurements below well collar

**Water Quality Details:**

Time am / pm	DO (mg/L <sup>-1</sup> )	EC (μS cm <sup>-1</sup> )	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
10.50	2.13	3026	7.31	-72.9	20.7	1.73	
10.52	7.80	3025	7.26	-83.3	20.7	1.73	
10.53	1.72	3025	7.23	-83.8	20.7	1.73	
10.55	1.69	3025	7.21	-84.9	20.7	1.73	

Additional Comments:

### GROUNDWATER FIELD DATA SHEET

DLA Project Code: DLH1186	Sample ID:
Project: The Scone Waste Landfill	Well Collar RL:
Client: Upper Hunter Shire Council	Sampler(s):
Address: Noblet Rd, Scone NSW 2289	Signature:
BH ID: MWE	Date:

**Well Status**

Monument damaged:	YES / <input checked="" type="radio"/> NO / N/A	Well ID visible:	YES / NO / N/A
Locked well casing:	YES / <input checked="" type="radio"/> NO / N/A	Cap on PVC casing:	YES / NO / N/A
Cement footing damaged:	YES / <input checked="" type="radio"/> NO / N/A	Water in monument casing:	YES / NO / N/A
Standing water, vegetation around monument:	<input checked="" type="radio"/> YES / NO / N/A	Internal obstruction in casing:	YES / NO / N/A
Well Damaged:	YES / <input checked="" type="radio"/> NO / N/A	Odours from groundwater:	YES / NO / N/A
Nearby works:	.....		
Comments:	.....		
Casing above ground:	0.75 m agl	<b>Weather Conditions:</b>	
Standing water level:	3.57 m bgl	Temperature	15-20 <input checked="" type="checkbox"/> 20-25 <input type="checkbox"/>
Total well depth:	9.53 m bgl		25-30 <input type="checkbox"/> >30 <input type="checkbox"/>
Initial well volume:	5.96 L	Clear <input type="checkbox"/>	Partly cloudy <input checked="" type="checkbox"/> Overcast <input type="checkbox"/>
Water level after purging:	m bgl	Calm <input type="checkbox"/>	Slight breeze <input checked="" type="checkbox"/> Moderate breeze <input type="checkbox"/>
Volume of water purged:	12 L	Windy <input type="checkbox"/>	
Water level at time of sampling:	2.82 Bgl m bgl	Fine <input checked="" type="checkbox"/>	Showers <input type="checkbox"/> Rain <input type="checkbox"/>
Well purged dry:	YES / NO		
Purging equipment:			
Sample equipment:			

Note: 50mm internal diameter pipe = 1.96 L/m. All measurements below well collar

**Water Quality Details:**

Time am / pm	DO (mg/L <sup>-1</sup> )	EC (µS cm <sup>-1</sup> )	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
11.45	3.70	2844	7.75	27.8	18.7	1.70	
11.47	3.05	2847	7.68	25.3	18.8	1.69	
11.49	2.34	2847	7.68	22.4	18.8	1.69	
11.51	2.15	2847	7.60	21.4	18.9	1.69	
11.53	2.10	2852	7.59	20.2	18.9	1.69	

Additional Comments: