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E: admin@engage-es.com.au

M: 0478 362 005

**ENGAGE
ENVIRONMENTAL
SERVICES**

ABN 13 629 353 662

**GROUNDWATER
MONITORING**

**SCONE WASTE
FACILITY
NOBLET ROAD
SCONE NSW**



DOCUMENT CONTROL INFORMATION

Project Name – Groundwater Monitoring – Scone Waste Facility –Quarterly Monitoring Round

Client - Upper Hunter Shire Council

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Prepared – Stephen Challinor

Reviewed By and Approved for Release By – STC/ SJC

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OFFICE
113 Reservoir Rd
Glendale NSW 2285

Ph: 0478 362 005

Email: admin@engage-es.com.au

FIELD OFFICE
Unit 1, 104 George St
Singleton NSW 2330

Ph: 0478 364 588

Engage Environmental Services Pty Limited: ABN 13 629 353 662



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ABBREVIATIONS

The following is a list of common abbreviations used in the Contamination Sector within environmental reports.

B(a)P	Benzo(a)Pyrene
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethyl Benzene, Xylene
CLM	Contaminated Land Management
CSM	Conceptual Site Model
DA	Development Application
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	Environment Protection Authority (NSW)
EPL	Environmental Protection License
ESL	Ecological Screening Level
LOR	Limit of Reporting
LOT	Allotment
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW	New South Wales
OCP	Organochlorine Pesticides
OEH	Office of Environmental and Heritage
OPP	Organophosphorus Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCOC	Potential Contaminant of Concern
PCB	Polychlorinated Biphenyls
QA/QC	Quality Assurance and Quality Control
SAC	Site Acceptance Criteria
SEPP	State Environmental Planning Policy
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TRH	Total Recoverable Hydrocarbons
UHSC	Upper Hunter Shire Council
VOC	Volatile Organic Compounds
WHS	Work Health Safety



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1.0 INTRODUCTION

General

Under the requirements of the NSW EPA Environmental Protection Licence (EPL) 5863, Upper Hunter Shire Council (UHSC) is required to conduct quarterly and annual groundwater monitoring of the Scone Waste Facility located on Noblet Road, Scone, NSW, 2337.

The Quarterly Groundwater Monitoring Report provides a snapshot of the groundwater conditions at the Site in relation to the current Site Criteria and satisfies the groundwater monitoring requirements of the EPL.

The Scone Waste Facility is an active landfill, it has the potential to be a polluting activity or to adversely impact the groundwater within the immediate vicinity and down hydraulic gradient of the site if there was a leak within the landfill.

Engage Environmental Services (Engage) was commissioned by UHSC to undertake this quarterly round of groundwater monitoring at the site. The quarterly groundwater monitoring was carried out on 5th September 2019.

This report has been prepared utilising information supplied by the client, publicly accessible information, information obtained as part of the onsite fieldwork and analysis, information from Government bodies and from experience, knowledge, and current industry practice.

Briefing

The briefing provided by Upper Hunter Shire Council and contained within EPL 5863 indicates that quarterly groundwater monitoring is required at five locations on the site, monitoring wells A to E (MWA-MWE). Monitoring Well D is located within the landfill and the monitoring well accesses the perched water table (leachate) within the landfill. Comparisons against established criteria and historical data allow for trending of data. Trending of data can highlight seasonal variations, increases in analyte concentrations, decreases in analyte concentrations and fluctuations within the dataset. Over a time period the dataset can reveal increasing/decreasing trends highlighting potential site issues.

Refer to **Figure 1: Site Layout with Sample Locations**

2.0 SITE CRITERIA AND SAMPLING FREQUENCY

The groundwater analytical suite and sampling frequency were provided by UHSC and the EPL. Each of the wells have the same sampling regime and analytical suite for sample analysis. The site criterion are sourced from the Australian and New Zealand guidelines for fresh and marine water quality (ANZW 2018) 95% trigger values and National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 2013, unless otherwise stated.

Table 1: Analytes, Site Criteria and Sampling Frequency for Groundwater Monitoring Wells - Quarterly.

	Analytes/Pollutant	Units	Site Criteria NEPM	Sampling Frequency
			2013 and ANZW 2018 Fresh Water 95%	
IONS	Calcium	mg/L	NA	Quarterly
	Alkalinity (total)	mg/L	NA	Quarterly
	Chloride	mg/L	NA	Quarterly
	Fluoride	mg/L	NA	Quarterly
	Potassium¹	mg/L	410	Quarterly
	Magnesium	mg/L	NA	Quarterly
	Sulphate	mg/L	NA	Quarterly
HEAVY METALS	Iron	mg/L	0.3	Quarterly
	Manganese	mg/L	1.9	Quarterly
PHENOLS	Total phenolics	mg/L	0.32	Quarterly
OCP	Organochlorine Pesticide³ (OCP)	mg/L	0.00001	Quarterly
MISC. INORGANICS	pH	pH	6.5 – 8	Quarterly
	Sodium	mg/L	NA	Quarterly
	Ammonia²	mg/L	0.9	Quarterly
	Nitrate	mg/L	50	Quarterly
	Total organic carbon	mg/L	4	Quarterly
	Electrical conductivity	µS/cm	NA	Quarterly

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

3.0 SAMPLING METHODOLOGY

Groundwater Sampling

The five well locations were identified on the site. The site map was cross-referenced to the markings on the monitoring wells to ensure the correct wells were being sampled. 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 DECC, 2007).

Purging is the process of removing stagnant water from a well, immediately prior to sampling, causing its replacement by groundwater from the adjacent formation that is representative of actual aquifer conditions. In order to determine when a well has been adequately purged, the physical parameters (pH \pm 0.1 unit, electrical conductivity \pm 5%, temperature \pm 0.20, reduction-oxidation (redox) \pm 10%; and dissolved oxygen \pm 10%.) are monitored while the groundwater is removed during purging.

The physical parameters were measured at regular intervals using a YSI Quatro Pro Plus Water Quality Meter. Stable conditions were indicated by monitoring for three consecutive readings of the physical parameters.

Collection of samples were direct into laboratory issued sampling containers for specific analytes. Samples were obtained using a disposable bailer. Care was taken so the bailer did not contact the sample container. All samples were collected and filled into the correct sample containers, a meniscus was formed on each sampling container prior to sealing to reduce or eliminate head space. The samples were placed immediately into a chilled esky to prevent the loss of potential volatile components.

Decontamination procedures between sampling events and sampling locations was undertaken. Sampling equipment was cleaned before and after sampling to prevent cross contamination. The cleaning procedure included:

- New nitrile disposable gloves for each well;
- Washing and wipe down with phosphate free laboratory grade detergent;
- Rinsing of brush before using brush on equipment;
- Using a brush on equipment if necessary;
- Rinsing with deionised water and wipe down with new wipe if necessary; and,
- New disposable bailer used for each well.

Appropriate decontamination procedures were appropriate during groundwater sampling.

4.0 RESULTS

The five groundwater monitoring wells were sampled during the June 2019 sampling event, results are detailed in **Tables 2 to 6**. Comparisons have been made to the previous round of monitoring (June 2019). Refer to **Attachment 1** – NATA Accredited Laboratory Results and **Attachment 3** – Data Log.

There was one exceedance of the site criteria for September in MWA, TOC at a concentration of 6mg/L. Refer to Table 2.

Table 2 – Quarterly Groundwater Results and Comparison June-Sept 2019 (MWA)

	Analytes	Units	Site Criteria (mg/L)	MWA June 2019	MWA Sept 2019
IONS	Calcium	mg/L	NA	600	610
	Alkalinity (total)	mg/L	NA	520	490
	Chloride	mg/L	NA	6500	6000
	Fluoride	mg/L	NA	0.1	0.1
	Potassium¹	mg/L	410	2.8	2.6
	Magnesium	mg/L	NA	1100	1200
	Sulphate	mg/L	NA	52	840
HEAVY METALS	Iron	mg/L	0.3	0.64	<LOR
	Manganese	mg/L	1.9	0.038	0.009
Phenols	Total phenolics	mg/L	0.32	<LOR	<LOR
OCPs	OCP³	mg/L	0.00001	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	6.7	6.6
	Sodium	mg/L	NA	2100	2700
	Ammonia²	mg/L	0.9	<LOR	<0.005
	Nitrate	mg/L	0.7	0.6	0.59
	Total Organic Carbon	mg/L	4	3	6
	EC	µS/cm	NA	19000	18000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory LOR

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

There were two exceedances of the site criteria for September in MWB, Nitrate and TOC at concentrations of 0.71mg/L and 7mg/L respectively. Refer to Table 3.

**Table 3 – Quarterly Groundwater Results and Comparison June - September 2019
(MWB)**

	Analytes	Units	Site Criteria (mg/L)	MWB June 2019	MWB Sept 2019
IONS	Calcium	mg/L	NA	560	580
	Alkalinity (total)	mg/L	NA	420	400
	Chloride	mg/L	NA	5200	4400
	Fluoride	mg/L	NA	0.3	0.3
	Potassium¹	mg/L	410	2.6	2.4
	Magnesium	mg/L	NA	740	720
	Sulphate	mg/L	NA	76	110
HEAVY METALS	Iron	mg/L	0.3	0.027	<LOR
	Manganese	mg/L	1.9	<LOR	<LOR
OCP	OCP³	mg/L	0.00001	<LOR	<LOR
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	6.9	7
	Sodium	mg/L	NA	1600	2100
	Ammonia²	mg/L	0.9	<LOR	0.017
	Nitrate	mg/L	0.7	0.71	0.71
	Total Organic Carbon (TOC)	mg/L	4	7	7
	EC	µS/cm	NA	15000	14000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory LOR

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

There were two exceedances of the site criteria for September in MWC Nitrate and TOC at concentrations of 1.8mg/L and 18mg/L respectively. Refer to Table 4.

**Table 4 – Quarterly Groundwater Results and Comparison June - September 2019
(MWC)**

	Analytes	Units	Site Criteria (mg/L)	MWC June 2019	MWC Sept 2019
IONS	Calcium	mg/L	NA	370	380
	Alkalinity (total)	mg/L	NA	690	670
	Chloride	mg/L	NA	4000	4200
	Fluoride	mg/L	NA	0.3	0.2
	Potassium¹	mg/L	410	2.1	1.8
	Magnesium	mg/L	NA	600	570
	Sulphate	mg/L	NA	160	170
HEAVY METALS	Iron	mg/L	0.3	12	<LOR
	Manganese	mg/L	1.9	5.8	1.1
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR
OCP	OCP³	mg/L	0.00001	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	6.8	7
	Sodium	mg/L	NA	1700	2400
	Ammonia²	mg/L	0.9	0.072	0.017
	Nitrate	mg/L	0.7	2.2	1.8
	Total Organic Carbon (TOC)	mg/L	4	80	18
	EC	µS/cm	NA	13000	13000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory LOR

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

MWD is a leachate monitoring well which provides access to the perched landfill leachate water table. The Site Criteria for this particular well is only used as a general indicator of the leachate water quality. Refer to Table 5.

Table 5 – Quarterly Groundwater Results and Comparison June – September 2019 (MWD)

	Analytes	Units	Site	MWD	MWD
			Criteria	(leachate)	(leachate)
			(mg/L)	June 2019	Sept 2019
IONS	Calcium	mg/L	NA	79	94
	Alkalinity (total)	mg/L	NA	2700	2500
	Chloride	mg/L	NA	2900	2700
	Fluoride	mg/L	NA	0.3	0.3
	Potassium¹	mg/L	410	190	220
	Magnesium	mg/L	NA	170	230
	Sulphate	mg/L	NA	40	29
HEAVY METALS	Iron	mg/L	0.3	13	0.89
	Manganese	mg/L	1.9	0.21	0.19
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR
OCP	OCP³	mg/L	0.00001	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	7.6	7.8
	Sodium	mg/L	NA	1900	2800
	Ammonia²	mg/L	0.9	290	300
	Nitrate	mg/L	0.7	<LOR	<LOR
	Total Organic Carbon (TOC)	mg/L	4	170	280
	EC	µS/cm	NA	13000	14000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory LOR

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs.

There were two exceedances of the site criteria for June in MWE, Iron and TOC at concentrations of 9.4 mg/L and 340mg/L respectively. Refer to Table 5.

Table 5 –Quarterly Groundwater Results and Comparison June-September 2019 (MWE)

	Analytes	Units	Threshold Criteria (mg/L)	MWE June 2019	MWE Sept 2019
IONS	Calcium	mg/L	NA	53	65
	Alkalinity (total)	mg/L	NA	1200	630
	Chloride	mg/L	NA	310	420
	Fluoride	mg/L	NA	0.6	0.6
	Potassium¹	mg/L	410	0.5	2.1
	Magnesium	mg/L	NA	57	69
	Sulphate	mg/L	NA	130	130
HEAVY METALS	Iron	mg/L	0.3	9.4	<LOR
	Manganese	mg/L	1.9	0.22	0.031
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR
OCP	OCP³	mg/L	0.00001	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	7.2	7.6
	Sodium	mg/L	NA	690	760
	Ammonia²	mg/L	0.9	0.052	0.011
	Nitrate	mg/L	0.7	0.01	0.008
	Total Organic Carbon (TOC)	mg/L	4	340	5
	EC	µS/c	NA	3100	3500

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory LOR

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

2 - Criteria value may not protect key species from chronic toxicity, refer to ANZW 2018 for further guidance.

3 - A Trigger value for DDT is used in the absence of a criteria value for Total OCP. DDT has the lowest criteria of OCPs

5.0 DISCUSSION

The inferred hydraulic gradient for the site is a down gradient towards Parsons Gully to the west. The location of the four wells surrounding the landfill place wells MWA, MWB and MWC down-hydraulic gradient and well MWE up-hydraulic gradient of the landfill. Well MWD is located within the perched landfill water table, this enables access to the leachate within the landfill.

The following is a summary of the significant results for June 2019 in relation to the Site Criteria. Key increasing trends, decreasing trends and exceedances of the threshold criteria are indicated.

MWA

MWA is located in the north west section of the site and is considered to be a down-hydraulic gradient monitoring well. There is farmland adjoining to the north and west of this location. The following changes have occurred in the water quality of MWA:

- Iron has decreased from 0.64mg/L to below the limit of reporting;
- Total Organic Carbon has increased from 3mg/L to 6mg/L, now above the site criteria (4mg/L); and,
- Sulphate has increased significantly from 52mg/L to 840mg/L, no site criteria.

All other analytes reported concentrations consistent with previous monitoring data.

MWB

MWB is located in the south west section of the site and is considered to be a down-hydraulic gradient monitoring well. There is farmland to the south and west of this location. The well has remained relatively stable. There are two exceedances of the site criteria:

- A concentration of TOC (7 mg/L) was reported in MWB exceeding the Site Criteria (4 mg/L). This is stable from the previous reporting period; and,
- Nitrate has remained relatively consistent with the previous sampling event with a concentration of 0.71mg/L, above the site criteria of 0.7mg/L.

All other analytes reported concentrations consistent with previous monitoring data.

MWC

MWC is located on the southern boundary of the site, down hydraulic gradient of the landfill and onsite dam. There is farmland to the south of well, along with a stand of vegetation immediately south of the well. This well has shown increasing turbidity with sedimentation in observations from the field.

There were two concentrations which exceeded the site criteria. The following changes have occurred in the water quality of MWC:

- A concentration of Manganese (1.1mg/L) was reported in MWC, now below the Site Criteria (1.9 mg/L). The June concentration was 5.8mg/L, there has been a decrease;
- A concentration of TOC (18 mg/L) was reported in MWC exceeding the Site Criteria (1.9 mg/L), which is a decrease from the previous reported concentration in June 2019 (80 mg/L);
- A concentration of Nitrate (1.8 mg/L) was reported in MWC exceeding the Site Criteria (0.7 mg/L), which is a small decrease from the previous reported concentration in June 2019 (2.2 mg/L); and,
- A concentration of Iron was a non detection decreasing from the June sampling event of 12 mg/L.

All other analytes reported concentrations consistent with previous monitoring data.

MWD

The water collected and analysed from well MWD is landfill leachate and as such the Site Criteria is not used to compare the results against. The results of MWD are used as an indicator of current conditions within the landfill with trends and seasonal variations apparent. MWD is also to be used as a comparison to the external monitoring wells.

Well MWD was reported to contain no detection of Nitrate, giving no indication that the Nitrate in the affected wells is sourced from the landfill being as this well is located in the perched leachate water table. The Nitrate may be migrating onto the site from the farmland to the north through the local ground water.

The following changes occurred in the water quality of the landfill leachate well MWD:

- Ammonia has remained steady at a concentration of 300 mg/L;
- Iron concentration of 0.89 mg/L has significantly decreased since June 2019 concentration of 13 mg/L; and,
- TOC has increased from 170 mg/L to a concentration of 280 mg/L.

MWE

MWE is located on the eastern boundary of the site and is considered to be an up-gradient groundwater monitoring well. There are a series of dams to the east of the well. The following changes have occurred in the water quality of MWC:

- A concentration of TOC (5 mg/L) was reported in MWE significantly decreasing from the previous round of monitoring 340mg/l in June 2019; and,
- -Iron has decreased to a non-detection from the June concentration of 9.4mg/L.

All other analytes reported concentrations consistent with previous monitoring data.

The following analytes exceeded the Threshold Criteria during the September 2019 sampling event, excluding the Leachate Monitoring well (MWD); TOC in MWA, MWB, MWC and MWE, and Nitrate in MWB and MWC. Refer to **Attachment 3** – Data Log.

Site and Maintenance

The area has been in drought for some time and may be factors influencing the groundwater concentrations of some analytes in wells.

The weather conditions (drought and rain events) and surrounding land uses are likely impacting the local groundwater conditions. The apparent anomalies in the last round of monitoring may have been influenced by the rain event preceding the sampling event.

The concrete surrounding the base of several of the wells are cracked. These can be easily maintained, which would also reset a barrier for surface migrating into the groundwater. There was additional waste on the western side of the landfill, more than normal.

6.0 CONCLUSIONS

There are seasonal fluctuations observed with regional groundwater conditions. The recent weather conditions of drought and the rain may have influenced the groundwater conditions. Trending of these analytes over time may indicate a seasonal fluctuation, an anomaly or highlight an issue on the site (or surrounding area). The trending of analytes occurs in the annual groundwater monitoring report with a running comparison in the quarterly monitoring reports.

The results and discussion of the laboratory sample analysis from the Scone Waste Facility during the September 2019 quarterly sampling event displayed several ongoing exceedances of the Site Criteria from the previous monitoring period.

The following analytes exceeded the Site Criteria for the June 2019 sampling event; TOC in MWA, MWB, MWC and MWE, and Nitrate in MWB and MWC.

The previous higher than normal concentration of TOC which was noted in June for MWC and a major increase in MWE, have reduced to a more normal concentration range for these two wells.

Continued sampling and data collection will allow robust trending and statistical analysis of data to occur.

The next water sampling event will be an annual monitoring event which will be undertaken in December 2019.

REFERENCES

- *Australian and New Zealand Guidelines for the Management of Contaminated Sites* (ANZECC/NHMRC 1992);
- *Australia and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZW, 2018);
- *Australian Drinking Water Guidelines, National Water Quality Management Strategy 2011*;
- *Contaminated Land Management Act 1997* (NSW);
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA 2011);
- *Contaminated Sites: Guidelines on Duty to Report Contamination under the Contamination Land Management Act 1997* (NSW DECC, 2009);
- *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination* (NSW DEC, 2007);
- *Contaminated Sites: Guidelines on Significant Risk of Harm from Contaminated Land and the Duty to Report* (NSW EPA 1999);
- *Contaminated Sites: Sampling Design Guidelines* (NSW EPA 1995);
- *Environmental Guidelines: Solid Waste Landfills* (NSW EPA, 1996);
- *Environmental Guidelines Solid Waste Landfills* Second edition, (NSW EPA 2016);
- *Health - Based Soil Investigation Levels*, Imray, P & Langley, A, *National Environmental Health Forum Monographs, Soil Series No. 2 (2nd Ed)*, South Australian Health Commission (NEHF 1998);
- *National Environment Protection (Assessment of Site Contamination) Measure (No.1)* (NEPM, 2013) as amended;
- *Storage and Handling of Dangerous Goods Code of Practice 2005*;
- *Work Health and Safety Act 2011* (NSW) and associated regulations.

FIGURE 1
SITE LAYOUT AND
SAMPLING LOCATIONS



Legend

● Monitoring Well Location

Image: Google Maps 2019



ENGAGE Environmental
 Services Pty Limited
 113 Reservoir Rd
 Glendale NSW 2285
 0478 362005

Title: Figure 1 - Site Layout and Well Locations			
Client	Project No.	Figure No	Date
UHSC	E04-0619	1	17/6/2019
admin@engage-es.com.au	Scale NA	Compiled SC	Revision 3

ATTACHMENT 1
NATA ACCREDITED LABORATORY RESULTS



CERTIFICATE OF ANALYSIS 225631

Client Details

Client	Engage Environmental Services
Attention	Stephen Challinor
Address	113 Reservoir Rd, GLENDALE, NSW, 2285

Sample Details

Your Reference	<u>E04-01919, UHSC</u>
Number of Samples	5 Water
Date samples received	06/09/2019
Date completed instructions received	06/09/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	13/09/2019
Date of Issue	13/09/2019

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Results Approved By

Diego Bigolin, Team Leader, Inorganics
Greta Petzold, Chemist
Josh Williams, Chemist
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

OCP in water						
Our Reference		225631-1	225631-2	225631-3	225631-4	225631-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		05/09/2019	05/09/2019	05/09/2019	05/09/2019	05/09/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	09/09/2019	09/09/2019	09/09/2019	09/09/2019	09/09/2019
Date analysed	-	10/09/2019	10/09/2019	10/09/2019	10/09/2019	10/09/2019
TCB	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
alpha-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate TCMX	%	71	70	79	91	68

Total Phenolics in Water						
Our Reference		225631-1	225631-2	225631-3	225631-4	225631-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		05/09/2019	05/09/2019	05/09/2019	05/09/2019	05/09/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	09/09/2019	09/09/2019	09/09/2019	09/09/2019	09/09/2019
Date analysed	-	09/09/2019	09/09/2019	09/09/2019	09/09/2019	09/09/2019
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

HM in water - dissolved						
Our Reference		225631-1	225631-2	225631-3	225631-4	225631-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		05/09/2019	05/09/2019	05/09/2019	05/09/2019	05/09/2019
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	09/09/2019	09/09/2019	09/09/2019	09/09/2019	09/09/2019
Date analysed	-	09/09/2019	09/09/2019	09/09/2019	09/09/2019	09/09/2019
Manganese-Dissolved	µg/L	9	<5	1,100	190	31
Iron-Dissolved	µg/L	<10	<10	<10	890	<10

Miscellaneous Inorganics						
Our Reference		225631-1	225631-2	225631-3	225631-4	225631-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		05/09/2019	05/09/2019	05/09/2019	05/09/2019	05/09/2019
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	06/09/2019	06/09/2019	06/09/2019	06/09/2019	06/09/2019
Date analysed	-	06/09/2019	06/09/2019	06/09/2019	06/09/2019	06/09/2019
Total Organic Carbon	mg/L	6	7	18	280	5
pH	pH Units	6.6	7.0	7.0	7.8	7.6
Electrical Conductivity	µS/cm	18,000	14,000	13,000	14,000	3,500
Fluoride, F	mg/L	0.1	0.3	0.2	0.3	0.6
Nitrate as N in water	mg/L	0.59	0.71	1.8	<0.05	0.008
Ammonia as N in water	mg/L	<0.005	0.017	0.017	300	0.011

Ion Balance						
Our Reference		225631-1	225631-2	225631-3	225631-4	225631-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		05/09/2019	05/09/2019	05/09/2019	05/09/2019	05/09/2019
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	06/09/2019	06/09/2019	06/09/2019	10/09/2019	06/09/2019
Date analysed	-	06/09/2019	06/09/2019	06/09/2019	10/09/2019	06/09/2019
Calcium - Dissolved	mg/L	610	580	380	94	65
Potassium - Dissolved	mg/L	2.6	2.4	1.8	220	2.1
Sodium - Dissolved	mg/L	2,700	2,100	2,400	2,800	760
Magnesium - Dissolved	mg/L	1,200	720	570	230	69
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as CaCO ₃	mg/L	490	400	670	2,500	630
Carbonate Alkalinity as CaCO ₃	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	490	400	670	2,500	630
Sulphate, SO ₄	mg/L	840	110	170	29	130
Chloride, Cl	mg/L	6,000	4,400	4,200	2,700	420
Ionic Balance	%	11	14	12	8.0	22

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 10% ie total anions = total cations +/-10%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-079	TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-022	Determination of various metals by ICP-MS.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.

Client Reference: E04-01919, UHSC

QUALITY CONTROL: OCP in water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			09/09/2019	[NT]	[NT]	[NT]	[NT]	09/09/2019	[NT]
Date analysed	-			10/09/2019	[NT]	[NT]	[NT]	[NT]	10/09/2019	[NT]
HCB	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	85	[NT]
gamma-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	90	[NT]
Heptachlor	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	90	[NT]
delta-BHC	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	90	[NT]
Heptachlor Epoxide	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	97	[NT]
gamma-Chlordane	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	101	[NT]
Dieldrin	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	106	[NT]
Endrin	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	110	[NT]
pp-DDD	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	102	[NT]
Endosulfan II	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endrin Aldehyde	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	99	[NT]
Methoxychlor	µg/L	0.2	Org-005	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-005	92	[NT]	[NT]	[NT]	[NT]	81	[NT]

Client Reference: E04-01919, UHSC

QUALITY CONTROL: Total Phenolics in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			09/09/2019	1	09/09/2019	09/09/2019		09/09/2019	[NT]
Date analysed	-			09/09/2019	1	09/09/2019	09/09/2019		09/09/2019	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	1	<0.05	<0.05	0	103	[NT]

Client Reference: E04-01919, UHSC

QUALITY CONTROL: HM in water - dissolved				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			09/09/2019	[NT]	[NT]	[NT]	[NT]	09/09/2019	[NT]
Date analysed	-			09/09/2019	[NT]	[NT]	[NT]	[NT]	09/09/2019	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	93	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			06/09/2019	1	06/09/2019	06/09/2019		06/09/2019	[NT]
Date analysed	-			06/09/2019	1	06/09/2019	06/09/2019		06/09/2019	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	6	[NT]		97	[NT]
pH	pH Units		Inorg-001	[NT]	1	6.6	[NT]		103	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	18000	[NT]		102	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	0.1	[NT]		100	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.59	0.58	2	102	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	<0.005	<0.005	0	99	[NT]

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	4	06/09/2019	06/09/2019		[NT]	[NT]
Date analysed	-			[NT]	4	06/09/2019	06/09/2019		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	4	280	[NT]		[NT]	[NT]
pH	pH Units		Inorg-001	[NT]	4	7.8	7.8	0	[NT]	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	[NT]	4	14000	14000	0	[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	4	0.3	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	4	<0.05	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	4	300	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	5	06/09/2019	06/09/2019		[NT]	[NT]
Date analysed	-			[NT]	5	06/09/2019	06/09/2019		[NT]	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	[NT]	5	5	5	0	[NT]	[NT]
pH	pH Units		Inorg-001	[NT]	5	7.6	[NT]		[NT]	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	[NT]	5	3500	[NT]		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	5	0.6	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	5	0.008	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	5	0.011	[NT]		[NT]	[NT]

Client Reference: E04-01919, UHSC

QUALITY CONTROL: Ion Balance				Duplicate				Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			06/09/2019	4	10/09/2019	10/09/2019		06/09/2019	[NT]
Date analysed	-			06/09/2019	4	10/09/2019	10/09/2019		06/09/2019	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	4	94	[NT]		96	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	4	220	[NT]		101	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	4	2800	[NT]		109	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	4	230	[NT]		96	[NT]
Hydroxide Alkalinity (OH ⁻) as CaCO ₃	mg/L	5	Inorg-006	<5	4	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	4	2500	2500	0	[NT]	[NT]
Carbonate Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	4	<5	<5	0	[NT]	[NT]
Total Alkalinity as CaCO ₃	mg/L	5	Inorg-006	<5	4	2500	2500	0	100	[NT]
Sulphate, SO ₄	mg/L	1	Inorg-081	<1	4	29	[NT]		93	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	4	2700	[NT]		93	[NT]
Ionic Balance	%		Inorg-040	[NT]	4	8.0	[NT]		[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Report Comments

Samples received in good order:

MISC_INORG: Nitrate as N PQL has been raised due to matrix interferences. Samples were diluted and reanalysed however same results were achieved.

The mass imbalance in may be caused by other ions that have not been measured.



CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 42 43 44

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph 02 9910 6200 / sydney@envirolab.com.au

- Combo1=TRH/BTEX/Pb
- Combo2=TRH/BTEX/PAH/Pb
- Combo3=TRH/BTEX/PAH/Met
- Combo4=TRH/BTEX/PAH/Met/Phen
- Combo5=TRH/BTEX/PAH/OC/PCB/Met
- Combo6=TRH/BTEX/PAH/OC/OP/PCB/Met
- Combo7=TRH/BTEX/PAH/OC/PCB/Met/Phen
- Combo8=TRH/BTEX/PAH/OC/OP/PCB/Met/Phen
- Combo9=TRH/BTEX/PAH/OC/PCB/Met/Phen/CN
- Combo10=TRH/BTEX/PAH/OC/OP/PCB/Met/Phen/CN
- Combo11=TRH/BTEX/PAH/OC/PCB/12met/Phen/CN
- Combo12=TRH/BTEX/PAH/OC/PCB/Met/TCLP-PAH,6 Met
- Combo13=TRH/BTEX/PAH/OC/OP/PCB/Met/TCLP-PAH,6Met

A Combo with an 'A' indicates Asbestos is also needed.

Client: Engage Environmental Services
 Contact Person: Stephen Challinor
 Project Mgr: Stephen
 Sampler: Stephen Challinor
 Address: 113 Reservoir Rd, Glendale NSW 2285
 Phone: 0478 362 005 Mob: 0478362005
 Email: stephen.challinor@engage-es.com.au;
admin@engage-es.com.au

Client Project Name / Number / Site etc (ie report title): E04-0919 - UHSC
 PO No.:
 Envirolab Quote No. :
 Date results required:
 Or choose: STANDARD
 Note: Inform lab in advance if urgent turnaround is required - surcharges apply
 Report format: esdat / equis /
 Lab Comments:

Sample Information					Tests Required													Comments		
Envirolab Sample ID	Client Sample ID or Information	Depth	Date sampled	Type of sample	OCp	Cation suite: Ca, K, Na, Mg	Anions major: Chloride, Sulfate, alkalinity	phenols	Ammonia	iron	manganese	Fluoride	TOC	Nitrate	EC	pH				Provide as much information about the sample as you can
1	MWA		5/9/19	Water	X	X	X	X	X	X	X	X	X	X	X	X				
2	MWB		↓	Water	X	X	X	X	X	X	X	X	X	X	X	X				
3	MWC			Water	X	X	X	X	X	X	X	X	X	X	X	X				
4	MWD			Water	X	X	X	X	X	X	X	X	X	X	X	X				
5	MWE			Water	X	X	X	X	X	X	X	X	X	X	X	X				leachate

Relinquished by (Company): Engage Environmental Services
 Print Name: Stephen Challinor
 Date & Time: 6/9/19
 Signature: *[Signature]*

Received by (Company): ELS
 Print Name: K. Gore
 Date & Time: 6.9.19 1344
 Signature: *[Signature]*

Lab use only:
 Samples Received: Cool or Ambient (circle one)
 Temperature Received at: 19.6 (if applicable)
 Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book Page No:

ENVIROLAB
 Envirolab Services
 12 Ashley St
 Chatswood NSW 2067
 Ph: (02) 9910 6200

Job No: 225631

Date Received: 6.9.19
 Time Received: 1344
 Received by: KG
 Temp: Cool Ambient
 Cooling: Ice/icepack
 Security: Intact Broken/None

ATTACHMENT 2
CALIBRATION CERTIFICATE

Multi Parameter Water Meter



airmet

Air-Met Scientific Pty Ltd
1300 137 067Instrument YSI Quatro Pro Plus
Serial No. 18G103299

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
	Display	✓	
Grill Filter	Operation (segments)	✓	
	Condition	✓	
PCB	Seal	✓	
	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		324189	pH 9.67
2. pH 7.00		pH 7.00		330737	pH 7.03
3. pH 4.00		pH 4.00		330734	pH 4.00
4. mV		231.8mV		325420/325421	231.9mV
5. EC		2.76mS		329027	2.77mS
6. D.O		0.00ppm		329994	0.00ppm
7. Temp		20.7°C		MultiTherm	21.1°C

Calibrated by: _____ Sen philip

Calibration date: 3/09/2019

Next calibration due: 3/10/2019

ATTACHMENT 3
DATA LOG

ENGAGE ENVIRONMENTAL SERVICES			Sampler/Reviewer			STC/SJC			Site Criteria
			Sample ID	MWA	MWB	MWC	MWD	MWE	
Site : SCONE WASTE FACILITY			LAB REF	225631	225631	225631	225631	225631	
Monitoring Frequency			Sampling Date	5/09/2019	5/09/2019	5/09/2019	5/09/2019	5/09/2019	
Monitoring Frequency	Analytes	Units	--	--	--	--	--	--	
Quarterly	Calcium	mg/L	610	580	380	94	65	NA	
Quarterly	Alkalinity	mg/L	490	400	670	2500	630	NA	
Quarterly	Chloride	mg/L	6000	4400	4200	2700	420	NA	
Quarterly	Fluoride	mg/L	0.1	0.3	0.2	0.3	0.6	NA	
Quarterly	Iron	mg/L	<0.010	<0.010	<0.010	0.89	<0.010	0.3	
Quarterly	Magnesium	mg/L	1200	720	570	230	69	NA	
Quarterly	Manganese	mg/L	0.009	<0.005	1.1	0.19	0.031	1.9	
Quarterly	Organochlorine pesticides (OCP)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00001*	
Quarterly	Potassium	mg/L	2.6	2.4	1.8	220	2.1	NA	
Quarterly	pH	pH units	6.6	7	7	7.8	7.6	6.5-8	
Quarterly	Sodium	mg/L	2700	2100	2400	2800	760	NA	
Quarterly	Ammonia	mg/L	<0.005	0.017	0.017	300	0.011	0.9	
Quarterly	Nitrate	mg/L	0.59	0.71	1.8	<0.05	0.008	0.7	
Quarterly	Sulphate	mg/L	840	110	170	29	130	NA	
Quarterly	Total organic carbon	mg/L	6	7	18	280	5	4	
Quarterly	Total phenolics	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.32	
Quarterly	Electrical conductivity (EC)	µS/cm	18000	14000	13000	14000	3500	NA	

* - trigger value

ATTACHMENT 4
FIELD DATA SHEETS

GROUNDWATER FIELD DATA SHEET

Project: <u>FO4</u>	Sample ID: <u>MWA</u>
Client: <u>UTSC</u>	Sampler: <u>SK</u>
Site Address: <u>Scane Waste Facility</u>	Date: <u>8.9.19</u>

Well Information			
Monument damaged:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Well ID visible:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A
Locked well casing:	YES <input checked="" type="radio"/> / <input type="radio"/> NO / <input type="radio"/> N/A	Cap on PVC casing:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A
Cement footing damaged:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Water in monument casing:	YES <input checked="" type="radio"/> / <input type="radio"/> NO / <input type="radio"/> N/A
Standing water, vegetation around monument:	<input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Internal obstruction in casing:	YES <input checked="" type="radio"/> / <input type="radio"/> NO / <input type="radio"/> N/A
Well Damaged:	YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A	Odours from groundwater:	YES <input checked="" type="radio"/> / <input type="radio"/> NO / <input type="radio"/> N/A
Casing above ground:	m agl	Weather Conditions:	
Standing water level: <u>7.99</u>	m bgl	Temperature	15-20 <input type="checkbox"/> 20-25 <input checked="" type="checkbox"/>
Total well depth:	m bgl		25-30 <input type="checkbox"/> >30 <input type="checkbox"/>
Initial well volume:	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:	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		
Purging equipment:	<u>Bailer</u>		
Sample equipment:			

Note: 50mm internal diameter pipe = 1.96 L/m.

Water Quality Details:

Time am / pm	DO (mg/L ⁻¹)	EC (μ S cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
11.35	1.77	19215	6.58	99.5	22.8	11.84	
11.38	1.02	19035	6.54	112.4	22.8	11.86	
11.39	1.09	18905	6.53	117.8	22.6	11.85	
11.41	0.85	18811	6.52	117.8	22.6	11.84	

Water Quality and General Comments:

No odour - no sediment

GROUNDWATER FIELD DATA SHEET

Project: <u>EOT</u>	Sample ID: <u>MWB3</u>
Client: <u>OHSC</u>	Sampler: <u>SC</u>
Site Address: <u>Score waste facility</u>	Date: <u>5.9.19</u>

Well Information

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
Casing above ground:	m agl	Weather Conditions:	
Standing water level: <u>7.83</u>	m bgl	Temperature 15-20 <input type="checkbox"/>	20-25 <input checked="" type="checkbox"/>
Total well depth:	m bgl	25-30 <input type="checkbox"/>	>30 <input type="checkbox"/>
Initial well volume:	L	Clear <input type="checkbox"/>	Partly cloudy <input checked="" type="checkbox"/>
Water level after purging:	m bgl	Overcast <input type="checkbox"/>	
Volume of water purged:	L	Calm <input type="checkbox"/>	Slight breeze <input checked="" type="checkbox"/>
Water level at time of sampling:	m bgl	Moderate breeze <input type="checkbox"/>	
Well purged dry:	YES / NO	Windy <input type="checkbox"/>	
Purging equipment: <u>Budel</u>		Fine <input checked="" type="checkbox"/>	Showers <input type="checkbox"/>
Sample equipment:		Rain <input type="checkbox"/>	

Note: 50mm internal diameter pipe = 1.96 L/m.

Water Quality Details:

Time am / pm	DO (mg/L ⁻¹)	EC (μ S cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
12.02	2.52	14586	6.87	110.9	21.8	9.09	
12.05	1.73	14280	6.75	113.9	21.2	8.99	
12.08	1.68	1451	6.68	113.9	20.9	8.97	
12.12	1.68	14160	6.69	113.6	20.9	8.99	

Water Quality and General Comments:

Clear - no odour - no sediment

GROUNDWATER FIELD DATA SHEET

Project: <u>EOT</u>	Sample ID: <u>MWD</u>
Client: <u>OHSC</u>	Sampler: <u>SC</u>
Site Address: <u>Stone Waste Facility</u>	Date: <u>5/9/19</u>

Well Information

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
Casing above ground: <u>— 0.0</u>	m agl	Weather Conditions:	
Standing water level: <u>9.86</u>	m bgl	Temperature 15-20 <input type="checkbox"/>	20-25 <input type="checkbox"/>
Total well depth:	m bgl	25-30 <input checked="" type="checkbox"/>	>30 <input type="checkbox"/>
Initial well volume:	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:	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		
Purging equipment: <u>Bailer</u>			
Sample equipment:			

Note: 50mm internal diameter pipe = 1.96 L/m.

Water Quality Details:

Time am / pm	DO (mg/L ⁻¹)	EC (μS cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
<u>1.30</u>	<u>0.29</u>	<u>14869</u>	<u>7.33</u>	<u>-25.3</u>	<u>27.7</u>	<u>8.14</u>	

Water Quality and General Comments:

Green suspended sediment
Odour very strong

GROUNDWATER FIELD DATA SHEET

Project: <u>EO4</u>	Sample ID: <u>MWC</u>
Client: <u>UHSC</u>	Sampler: <u>SL</u>
Site Address: <u>Stone Waste Facility</u>	Date: <u>5/9/19</u>

Well Information

Monument damaged: <input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Well ID visible: <input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A
Locked well casing: YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A	Cap on PVC casing: <input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A
Cement footing damaged: <input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> N/A	Water in monument casing: YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A
Standing water, vegetation around monument: YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A	Internal obstruction in casing: YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A
Well Damaged: YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A	Odours from groundwater: YES / <input checked="" type="radio"/> NO / <input type="radio"/> N/A
Casing above ground: m agl	Weather Conditions:
Standing water level: <u>7.32</u> m bgl	
Total well depth: m bgl	25-30 <input checked="" type="checkbox"/> >30 <input type="checkbox"/>
Initial well volume: 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: 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	
Purging equipment: <u>Baker</u>	
Sample equipment:	

Note: 50mm internal diameter pipe = 1.96 L/m.

Water Quality Details:

Time am / pm	DO (mg/L ⁻¹)	EC (µS cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
12.35	2.11	13426	6.6	103.9	21.5	8.21	
12.40	1.42	13199	6.61	106.3	21.5	8.18	
12.42	1.36	13205	6.57	105.2	21.5	8.22	
12.46	1.44	13220	6.58	106.1	21.5	8.18	

Water Quality and General Comments:

Browser suspended sediment

GROUNDWATER FIELD DATA SHEET

Project: E04	Sample ID: MWE
Client: UTSC	Sampler: S.C
Site Address: Scene Waste facility	Date: 5/9/12

Well Information

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
Casing above ground: m agl	Weather Conditions:
Standing water level: 5.90 m bgl	Temperature 15-20 <input type="checkbox"/> 20-25 <input type="checkbox"/>
Total well depth: m bgl	25-30 <input checked="" type="checkbox"/> >30 <input type="checkbox"/>
Initial well volume: 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: 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	
Purging equipment: Bailer	
Sample equipment:	

Note: 50mm internal diameter pipe = 1.96 L/m.

Water Quality Details:

Time am / pm	DO (mg/L ⁻¹)	EC (μ S cm ⁻¹)	pH	Redox (mV)	Temp (°C)	Salinity (% Refract)	Comments
1.05	1.30	3328	7.10	29.9	21.7	1.86	
1.09	0.48	3223	7.06	33.1	21.3	1.82	
1.11	0.57	3200	7.08	29.9	21.4	1.84	

Water Quality and General Comments:

Clear no sediment.
