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QUARTERLY GROUNDWATER MONITORING

SCONE WASTE FACILITY
NOBLET ROAD
SCONE NSW

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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 15th December 2022.

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 2013 and ANZW 2018 Fresh Water 95%	Sampling Frequency
IONS	Calcium	mg/L	NA	Quarterly
	Alkalinity (total)	mg/L	NA	Quarterly
	Chloride	mg/L	NA	Quarterly
	Fluoride	mg/L	NA	Quarterly
	Potassium[1]	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 Pesticide[3] (OCP)	mg/L	0.00001	Quarterly
MISC. INORGANICS	pH	pH	6.5 – 8	Quarterly
	Sodium	mg/L	NA	Quarterly
	Ammonia[2]	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 ± 0.1 unit, electrical conductivity ± 5%, temperature ± 0.20, reduction-oxidation (redox) ± 10%; and dissolved oxygen ± 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 December 2022 sampling event, results are detailed in **Tables 2** to **6**. Comparisons have been made to the previous rounds of monitoring (March – September 2022). Refer to **Attachment 1** – NATA Accredited Laboratory Results and **Attachment 3** – Data Log.

There were two exceedances of the site criteria for December in MWA, TOC at a concentration of 8mg/L and Iron at 0.68mg/L.

Table 2 – Quarterly Groundwater Results and Comparison March 2022 – December 2022 (MWA)

	Analytes	Units	Site Criteria (mg/L)	MWA March 2022	MWA June 2022	MWA Sept 2022	MWA Dec 2022
IONS	Calcium	mg/L	NA	66	520	550	500
	Alkalinity (total)	mg/L	NA	610	510	510	510
	Chloride	mg/L	NA	250	7000	6900	5800
	Fluoride	mg/L	NA	0.7	0.2	0.1	0.1
	Potassium[1]	mg/L	410	1	3	3	3
	Magnesium	mg/L	NA	100	1100	950	960
	Sulphate	mg/L	NA	29	48	50	52
HEAVY METALS	Iron	mg/L	0.3	<LOR	<LOR	<LOR	**0.68**
	Manganese	mg/L	1.9	0.009	0.03	<LOR	0.037
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR	<LOR	<LOR
OCP	OCP[3]	mg/L	0.0000	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	7.6	6.9	6.2	6.7
	Sodium	mg/L	NA	350	1800	1800	1900
	Ammonia[2]	mg/L	0.9	0.031	0.037	0.049	<LOR
	Nitrate	mg/L	0.7	0.058	0.55	0.51	0.47
	Total Organic Carbon	mg/L	4	**20**	**5**	**5**	**8**
	EC	µS/cm	NA	1600	20000	17000	20000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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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 was one exceedance of the site criteria for December in MWB, TOC at a concentration of 7mg/L.

Table 3 – Quarterly Groundwater Results and Comparison March 2022 – December 2022 (MWB)

	Analytes	Units	Site Criteria (mg/L)	MWB March 2022	MWB June 2022	MWB Sept 2022	MWB Dec 2022
IONS	Calcium	mg/L	NA	420	460	470	440
	Alkalinity (total)	mg/L	NA	430	430	440	430
	Chloride	mg/L	NA	4600	4800	4700	3400
	Fluoride	mg/L	NA	0.2	0.3	0.2	0.3
	Potassium[1]	mg/L	410	2	2	3	3
	Magnesium	mg/L	NA	620	650	570	580
	Sulphate	mg/L	NA	85	81	77	60
HEAVY METALS	Iron	mg/L	0.3	0.04	0.06	<LOR	0.07
	Manganese	mg/L	1.9	0.01	0.01	0.014	0.01
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR	<LOR	<LOR
OCP	OCP[3]	mg/L	0.00001	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	6.8	7.0	6.8	6.9
	Sodium	mg/L	NA	1000	1300	1400	1300
	Ammonia[2]	mg/L	0.9	0.011	0.017	0.065	<LOR
	Nitrate	mg/L	0.7	0.38	0.36	0.32	0.31
	Total Organic Carbon	mg/L	4	**6**	**5**	**5**	**7**
	EC	µS/cm	NA	13000	14000	13000	14000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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 three exceedances of the site criteria for December in MWC; Iron, Manganese, and TOC at concentrations of 1.4mg/L, 2.1mg/L and 10mg/L respectively.

Table 4 – Quarterly Groundwater Results and Comparison March 2022 – December 2022 (MWC)

	Analytes	Units	Site Criteria (mg/L)	MWC March 2022	MWC June 2022	MWC Sept 2022	MWC Dec 2022
IONS	Calcium	mg/L	NA	370	300	61	300
	Alkalinity (total)	mg/L	NA	930	940	600	950
	Chloride	mg/L	NA	4000	3800	840	3100
	Fluoride	mg/L	NA	0.2	0.2	0.3	0.2
	Potassium[1]	mg/L	410	2	2	1	2
	Magnesium	mg/L	NA	440	440	110	410
	Sulphate	mg/L	NA	120	88	170	71
HEAVY METALS	Iron	mg/L	0.3	<LOR	0.01	0.05	1.4
	Manganese	mg/L	1.9	2.2	2.1	0.68	2.1
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR	<LOR	<LOR
OCP	OCP[3]	mg/L	0.00001	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	6.9	6.9	7.2	6.7
	Sodium	mg/L	NA	2000	1400	500	1500
	Ammonia[2]	mg/L	0.9	0.048	0.073	0.05	0.016
	Nitrate	mg/L	0.7	0.11	0.092	**1.2**	0.11
	Total Organic Carbon	mg/L	4	**8**	**8**	**75**	**10**
	EC	µS/c	NA	11000	13000	3600	13000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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.

Table 5 – Quarterly Groundwater Results and Comparison March 2022 – December 2022 (MWD) Leachate Well

	Analytes	Units	Site Criteria (mg/L)	MWD March 2022	MWD June 2022	MWD Sept 2022	MWD Dec 2022
IONS	Calcium	mg/L	NA	220	190	190	220
	Alkalinity (total)	mg/L	NA	1700	1500	1500	1900
	Chloride	mg/L	NA	1700	1800	1400	2000
	Fluoride	mg/L	NA	0.3	0.3	0.3	0.3
	Potassium[1]	mg/L	410	79	91	82	100
	Magnesium	mg/L	NA	140	170	150	220
	Sulphate	mg/L	NA	49	38	85	200
HEAVY METALS	Iron	mg/L	0.3	0.65	0.87	**0.75**	2.6
	Manganese	mg/L	1.9	0.59	0.45	0.61	0.49
PHENOLS	Total phenolics	mg/L	0.32	<LOR	<LOR	<LOR	<LOR
OCP	OCP[3]	mg/L	0.00001	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	7.4	7.4	7.5	7.5
	Sodium	mg/L	NA	840	1100	810	1300
	Ammonia[2]	mg/L	0.9	**130**	**130**	**140**	**180**
	Nitrate	mg/L	0.7	0.02	<LOR	0.056	<LOR
	Total Organic Carbon	mg/L	4	**140**	**130**	**220**	**190**
	EC	µS/c	NA	7300	8100	6400	11000

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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, 0.71mg/L and 7mg/L respectively.

Table 6 –Quarterly Groundwater Results and Comparison March 2022 – December 2022 (MWE)

	Analytes	Units	Threshold Criteria (mg/L)	MWE March 2022	MWE June 2022	MWE Sept 2022	MWE Dec 2022
IONS	Calcium	mg/	NA	140	86	57	88
	Alkalinity (total)	mg/	NA	1200	1300	1000	1700
	Chloride	mg/	NA	990	690	260	490
	Fluoride	mg/	NA	1.1	0.5	0.3	0.4
	Potassium[1]	mg/	410	1	0.8	2	0.8
	Magnesium	mg/	NA	130	100	54	93
	Sulphate	mg/	NA	200	170	18	110
HEAVY METALS	Iron	mg/	0.3	0.03	0.48	**2.2**	**0.71**
	Manganese	mg/	1.9	1.3	0.6	1	0.59
PHENOLS	Total phenolics	mg/	0.32	<LOR	<LOR	<LOR	<LOR
OCP	OCP[3]	mg/	0.00001	<LOR	<LOR	<LOR	<LOR
MISC. INORGANICS	pH	pH	6.5 – 8	7.2	7.3	7.1	7.2
	Sodium	mg/	NA	700	650	380	590
	Ammonia[2]	mg/	0.9	0.036	0.23	0.068	0.018
	Nitrate	mg/	0.7	<LOR	<LOR	<LOR	<LOR
	Total Organic Carbon	mg/	4	**6**	**7**	**150**	**7**
	EC	µS/	NA	4900	4500	2300	4200

Highlighted results exceed site criteria

<LOR = No Detection. Analyte is below the Laboratory Limit of reporting.

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 December 2022 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 northwest 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. There were two exceedances of the site criteria:

- The TOC concentration has increased from 5mg/L to 8mg/L, remaining above the site criteria of 4mg/L
- Iron concentration increased from below limit of reporting in September to 0.68 mg/L in December 2022, above the site criteria.

The following changes have occurred in the water quality of MWA since the previous monitoring period in September:

- Calcium concentration decreased from 550 mg/L to 500 mg/L;
- Chloride concentration decreased from 6900mg/l to 5800mg/L;
- Magnesium concentration increased from 950mg/L to 960 mg/L;
- Manganese concentration increased from below limit of reporting to 0.037/L;
- Nitrate concentration decreased from 0.51 mg/L to 0.47 mg/L, remaining slightly below the site criteria.
- Sodium concentration increased from 1800mg/L to 1900mg/L;
- The EC increased from 17000 to 20000 µS/cm.

All other analytes reported concentrations consistent with previous monitoring data.

MWB

MWB is located in the southwest 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. There is one exceedance of the site criteria:

- The TOC concentration increased from 5mg/L to 7 mg/L, remaining above site Criteria of 4 mg/L.

The following significant changes have occurred in the water quality of MWB since the previous monitoring period in September:

- Calcium concentration decreased from 470 mg/L to 440mg/L;
- Chloride concentration decreased from 4700mg/L to 3400mg/L;
- Iron concentration increased from below limit of reporting to 0.07mg/L, remaining below site criteria.
- Sodium concentration decreased from 1400mg/L to 1300mg/L;
- Sulphate concentration decreased from 77mg/L to 60mg/L;
- The EC has increased from 13000 µS/cm to 14000 µS/cm.

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. There were two concentrations which exceeded the site criteria:

- A concentration of Manganese (2.1mg/L) was reported in MWC, an increase compared to the previous concentrations reported in September 2022 (0.68 mg/L);
- A concentration of TOC (10 mg/L) was reported in MWC exceeding the Site Criteria (4 mg/L), this has decreased since the previous reported concentration in September 2022 (75 mg/L).

The following changes have occurred in the water quality of MWC since the previous monitoring period in September:

- There was an increase in concentrations of Calcium from 61mg/L to 300mg/L,
- A decrease in Sulphate from 170mg/L to 71mg/L,
- Increase in Sodium from 500mg/L to 1500mg/L
- Decrease in Nitrate from 1.2mg/L to 0.11mg/L;
- The EC has increased from 3600 µS/cm to 13000 µS/cm.

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.

The following changes occurred in the water quality of the landfill leachate well MWD the previous monitoring period in September:

- Iron concentration increased from 0.75 mg/L in September to 2.6 mg/L in the December 2022 results;
- Ammonia concentration increased from 140 mg/L in September to 180 mg/L in the December 2022 monitoring period.
- The TOC concentration has decreased from 220mg/L to 190 mg/L in comparison to September;
- There was an increased in Chloride concentration from 1400 mg/L to 2000 mg/L.
- Potassium increased from 82mg/L to 100 mg/L.
- Magnesium increased from 150 mg/L to 220 mg/L
- Sodium increased from 810 mg/L to 1300 mg/L;
- Sulphate concentration increased from 85mg/L to 200 mg/L;
- Manganese concentration decreased from 0.61mg/L to 0.49mg/L;
- The EC has increased from 6400 µS/cm to 11000 µS/cm.

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. There were two concentration which exceeded the site criteria The following changes have occurred in the water quality of MWE since the previous monitoring period in September:

- The TOC concentration decreased from 150mg/L to 7 mg/L, remaining above the site criteria of 4mg/L;
- The Iron concentration decreased from 2.2 mg/L to 0.71 mg/L, exceeding the site criteria of 0.3mg/L.

The following changes have occurred in the water quality of MWE:

- There was an increase in concentrations of Calcium, from 57 mg/L to 88 mg/L.
- Chloride increased from 260 mg/L to 490 mg/L.
- Fluoride incre3ased from 0.3 mg/L to 0.4 mg/L.
- Magnesium increased from 54 mg/L to 93 mg/L.
- Sulphate increased from 18mg/L to 110 mg/L.
- Sodium increased from 380 mg/L to 590 mg/L;
- Ammonia concentration decreased from 0.068 mg/L to 0.018 mg/L;
- The EC has increased from 2300 µS/cm to 4200 µS/cm.

All other analytes reported concentrations consistent with previous monitoring data.

The following analytes exceeded the Threshold Criteria during the December 2022 sampling event, excluding the Leachate Monitoring well (MWD); TOC in MWA, MWB, MWC and MWE, Manganese in MWC and Iron in MWA, MWC and MWE. Refer to **Attachment 3** – Data Log.

There has been significant rainfall events and flooding throughout the region in the last 6 months. These events have had an impact on the analyte concentrations.

Site Maintenance

The leachate well remains broken off at the ground level. No immediate maintenance is required on the other wells. The tops of some of the monuments have rusted off at the hinge, they still close and protect the monitoring well at this stage.

6.0 CONCLUSIONS

There are seasonal fluctuations and flooding events observed which would have impacted the regional groundwater conditions. The recent weather conditions of heavy rain and flooding during 2022 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 December 2022 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 December 2022 sampling event; TOC in MWA, MWB, MWC and MWE, Manganese in MWC and Iron in MWA, MWC and MWE.

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

The next water sampling event will be an quarterly monitoring event which will be undertaken in March 2023.

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);
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- *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

Legend

Monitoring Well Location

Image: Google Maps 2019

N

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

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 313287

Client Details

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

Sample Details

Your Reference	**E04-1222 - UHSC**
Number of Samples	5 Water
Date samples received	16/12/2022
Date completed instructions received	16/12/2022

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	03/01/2023
Date of Issue	03/01/2023

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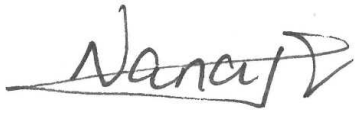
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Inorganics Supervisor
Hannah Nguyen, Metals Supervisor
Josh Williams, Organics and LC Supervisor
Nick Sarlamis, Assistant Operation Manager
Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Organochlorine Pesticides in Water						
Our Reference		313287-1	313287-2	313287-3	313287-4	313287-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	19/12/2022	19/12/2022	19/12/2022	19/12/2022	19/12/2022
Date analysed	-	20/12/2022	20/12/2022	20/12/2022	22/12/2022	22/12/2022
alpha-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
HCB	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
gamma-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
Endosulfan II	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
Endrin Aldehyde	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
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	%	89	78	76	75	88

Total Phenolics in Water						
Our Reference		313287-1	313287-2	313287-3	313287-4	313287-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
Date analysed	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05

Ion Balance						
Our Reference		313287-1	313287-2	313287-3	313287-4	313287-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
Date analysed	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
Calcium - Dissolved	mg/L	500	440	300	220	88
Potassium - Dissolved	mg/L	3	3	2	100	0.8
Sodium - Dissolved	mg/L	1,900	1,300	1,500	1,300	590
Magnesium - Dissolved	mg/L	960	580	410	220	93
Hardness	mgCaCO 3 /L	5,200	3,500	2,500	1,500	600
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	510	430	950	1,900	1,700
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	510	430	950	1,900	1,700
Sulphate, SO4	mg/L	52	60	71	200	110
Chloride, Cl	mg/L	5,800	3,400	3,100	2,000	490
Ionic Balance	%	3.0	9.0	2.0	-7.0	-14

Miscellaneous Inorganics						
Our Reference	UNITS	313287-1	313287-2	313287-3	313287-4	313287-5
Your Reference		MWA	MWB	MWC	MWD	MWE
Date Sampled		15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
Date analysed	-	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
Ammonia as N in water	mg/L	<0.005	<0.005	0.016	180	0.018
Fluoride, F	mg/L	0.1	0.3	0.2	0.3	0.4
Total Organic Carbon	mg/L	8	7	10	190	7
Nitrate as N in water	mg/L	0.47	0.31	0.11	<0.005	<0.005
pH	pH Units	6.7	6.9	6.9	7.5	7.2
Electrical Conductivity	µS/cm	20,000	14,000	13,000	11,000	4,200

HM in water - total						
Our Reference		313287-1	313287-2	313287-3	313287-4	313287-5
Your Reference	UNITS	MWA	MWB	MWC	MWD	MWE
Date Sampled		15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Date analysed	-	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Iron-Total	µg/L	680	70	1,400	2,600	710
Manganese-Total	µg/L	37	10	2,100	490	590

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 +/- 15% ie total anions = total cations +/-15%.
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-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.

QUALITY CONTROL: Organochlorine Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			19/12/2022	[NT]	[NT]	[NT]	[NT]	19/12/2022	[NT]
Date analysed	-			22/12/2022	[NT]	[NT]	[NT]	[NT]	22/12/2022	[NT]
alpha-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	114	[NT]
HCB	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	124	[NT]
gamma-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	117	[NT]
delta-BHC	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	126	[NT]
Heptachlor Epoxide	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	118	[NT]
gamma-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	117	[NT]
Dieldrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	124	[NT]
Endrin	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	109	[NT]
Endosulfan II	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	94	[NT]
Endrin Aldehyde	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	130	[NT]
Methoxychlor	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	116	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: Total Phenolics in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			16/12/2022	[NT]	[NT]	[NT]	[NT]	16/12/2022	[NT]
Date analysed	-			16/12/2022	[NT]	[NT]	[NT]	[NT]	16/12/2022	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	313287-2
Date prepared	-			16/12/2022	1	16/12/2022	16/12/2022		16/12/2022	16/12/2022
Date analysed	-			16/12/2022	1	16/12/2022	16/12/2022		16/12/2022	16/12/2022
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	500	500	0	103	#
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	3	3	0	98	96
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	1900	1800	5	101	#
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	960	950	1	105	#
Hardness	mgCaCO 3 /L	3	Metals-020	[NT]	1	5200	5200	0	[NT]	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	510	510	0	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	510	510	0	97	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	52	46	12	87	89
Chloride, Cl	mg/L	1	Inorg-081	<1	1	5800	5800	0	86	105
Ionic Balance	%		Inorg-040	[NT]	1	3.0	2.0	40	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	313287-2
Date prepared	-			16/12/2022	1	16/12/2022	16/12/2022		16/12/2022	16/12/2022
Date analysed	-			16/12/2022	1	16/12/2022	16/12/2022		16/12/2022	16/12/2022
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	<0.005	<0.005	0	100	104
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	0.1	[NT]		101	[NT]
Total Organic Carbon	mg/L	1	Inorg-079	<1	1	8	8	0	92	90
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.47	0.47	0	96	92
pH	pH Units		Inorg-001	[NT]	1	6.7	6.8	1	100	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	20000	20000	0	101	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	313287-2
Date prepared	-			20/12/2022	1	20/12/2022	20/12/2022		20/12/2022	20/12/2022
Date analysed	-			20/12/2022	1	20/12/2022	20/12/2022		20/12/2022	20/12/2022
Iron-Total	µg/L	10	Metals-022	<10	1	680	560	19	101	98
Manganese-Total	µg/L	5	Metals-022	<5	1	37	35	6	100	101

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.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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 (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

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.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Ion Balance - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Dissolved Metals: no filtered, preserved sample was received, therefore the unpreserved sample was filtered through 0.45µm filter at the lab.
Note: there is a possibility some elements may be underestimated.

ATTACHMENT 2

CALIBRATION CERTIFICATE

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **21B104021**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	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
2. pH 7.00		pH 7.00		386467	pH 6.99
3. pH 4.00		pH 4.00		389384	pH 3.96
4. ORP		236.7mV		393734/393728	237.6mV
5. EC		2.76mS		385789	2.76mS
6. D.O		0ppm		391223	0ppm
7. Temp		21.7°C		MultiTherm	21.3°C

Calibrated by: **Yu Jiang**

Calibration date: **13/12/2022**

Next calibration due: **14/06/2023**

ATTACHMENT 3
DATALOG

ENGAGE ENVIRONMENTAL SERVICES		Threshold Criteria	NA	NA	NA	NA	0.3	NA		0.00001	NA	6.5–8	NA	0.9	0.7	NA	4	0.32	NA
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µS/cm
		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)
		Monitoring frequency	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly
MWA	313287 15/12/2022	quarterly	500	510	5800	0.1	0.68	960	0.037	<0.0002	3	6.7	1900	<0.005	0.47	52	8	<0.05	20000
MWB	313287 15/12/2022	quarterly	440	430	3400	0.3	0.07	580	0.01	<0.0002	3	6.9	1300	<0.005	0.31	60	7	<0.05	14000
MWC	313287 15/12/2022	quarterly	300	950	3100	0.2	1.4	410	2.1	<0.0002	2	6.9	1500	0.016	0.11	71	10	<0.05	13000
MWD	313287 15/12/2022	quarterly	220	1900	2000	0.3	2.6	220	0.49	<0.0002	100	7.5	1300	180	<0.005	200	190	<0.05	11000
MWE	313287 15/12/2022	quarterly	88	1700	490	0.4	0.71	93	0.59	<0.0002	0.8	7.2	590	0.018	<0.005	110	7	<0.05	4200

ATTACHMENT 4

FIELD DATA SHEETS

GROUNDWATER MONITORING FIELD DATA SHEET

Project: E04-1222 Scone	**Sample ID: MWA**
Client: UHSC	**Sampler:** DB
Site Address: Noblet Road Scone	**Date:** 15.12.22

Well Information

Monument damaged: Rusty	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: .....0.77.....	m agl	**Weather Conditions**:	
Standing water level: ..... 6.466.....	m bgl	Temperature >15 ☐ 15-20 ☐	
Total well depth: 15.66	m bgl	20-25 X 25-30 ☐	
Initial well volume:	L		
Water level after purging: .....8.114.....	m bgl	Clear X Partly cloudy ☐ Overcast ☐	
Volume of water purged:	L		
Water level at time of sampling: .....8.114.....	m bgl	Calm ☐ Slight breeze X Moderate breeze ☐	
Well purged dry:	YES / **NO**	Windy ☐	
Purging equipment:	Bailer		
Sample equipment:	Bailer	Fine X Showers ☐ Rain ☐	

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	Comments
10:20am	2.25	16502	6.21	273.5	20.4		Water clear no smell
10:24am	2.03	15259	6.59	239.3	20.1		
10:26am	1.98	16493	6.56	225.7	20.3		
10:28am	1.76	17206	6.51	192.5	20.3		
10:30am	1.32	17730	6.47	171.5	20.3		

Water Quality and General Comments:

Water was clear no odour or sheen or hydrocarbons. Vegetation around monument and no standing water around monument. Landfill works.

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GROUNDWATER MONITORING FIELD DATA SHEET

Project: E04-1222 Scone	**Sample ID: MWB**
Client: UHSC	**Sampler:** DB
Site Address: Noblet Road Scone	**Date:** 15.12.22

Well Information

Monument damaged: Rusty	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: Rusty	YES / **NO** / N/A	Odours from groundwater:	YES / **NO** / N/A
Casing above ground: .....0.8.....	m agl	**Weather Conditions**:	
Standing water level: ..... 5.964.....	m bgl	Temperature >15 ☐	15-20 ☐
Total well depth: 14.04	m bgl	20-25 X	25-30 ☐
Initial well volume:	L		
Water level after purging: .....6.602.....	m bgl	Clear X	Partly cloudy ☐ Overcast ☐
Volume of water purged:	L		
Water level at time of sampling: .....6.602.....	m bgl	Calm ☐	Slight breeze X Moderate breeze ☐
Well purged dry:	YES / **NO**		Windy ☐
Purging equipment:	Bailer		
Sample equipment:	Bailer	Fine X	Showers ☐ Rain ☐

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	Comments
11:18am	1.55	12842	6.36	144.4	20.6		
11:20am	1.58	12779	6.51	133.1	19.6		
11:22am	1.48	12748	6.53	127.1	19.7		

Water Quality and General Comments:

Water was clear no odour or sheen or hydrocarbons. Vegetation around monument and no standing water around monument.

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GROUNDWATER MONITORING FIELD DATA SHEET

Project: E04-1222 Scone	**Sample ID: MWC**
Client: UHSC	**Sampler:** DB
Site Address: Noblet Road Scone	**Date:** 15.12.22

Well Information

Monument damaged: Rusty	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: Rusty	YES / **NO** / N/A	Odours from groundwater:	YES / **NO** / N/A
Casing above ground: .....0.75.....	m agl	**Weather Conditions**:	
Standing water level: ..... 4.246.....	m bgl	Temperature >15 ☐	15-20 ☐
Total well depth: 12.6	m bgl	20-25 X	25-30 ☐
Initial well volume:	L		
Water level after purging: .....4.431.....	m bgl	Clear ☐ Partly cloudy X	Overcast X
Volume of water purged:	L		
Water level at time of sampling: .....4.431.....	m bgl	Calm ☐ Slight breeze X	Moderate breeze ☐
Well purged dry:	YES / **NO**	Windy ☐	
Purging equipment:	Bailer		
Sample equipment:	Bailer	Fine X Showers ☐	Rain ☐

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	Comments
11:50am	2.35	11580	6.45	-267.2	19.1		Clear water
11:52am	1.61	11441	6.55	-266.2	18.9		
11:54am	1.68	3525	6.60	-261.1	19.0		

Water Quality and General Comments:

Water was clear no odour or sheen or hydrocarbons. Vegetation around monument and no standing water around monument.

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GROUNDWATER MONITORING FIELD DATA SHEET

Project: E04-1222 Scone	**Sample ID: MWD Leachate well**
Client: UHSC	**Sampler:** DB
Site Address: Noblet Road Scone	**Date:** 15.12.22

Well Information

Monument damaged: Rusty	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: Rusty	YES / NO / **N/A**	Odours from groundwater:	**YES** / NO / N/A
Casing above ground: .....N/A.....	m agl	**Weather Conditions**:	
Standing water level: ..... 9.301.....	m bgl	Temperature >15 ☐	15-20 ☐
Total well depth: 12.96	m bgl	20-25 X	25-30 ☐
Initial well volume:	L		
Water level after purging: .....9.666.....	m bgl	Clear X	Partly cloudy ☐ Overcast ☐
Volume of water purged:	L		
Water level at time of sampling: .....9.666.....	m bgl	Calm X	Slight breeze ☐ Moderate breeze ☐
Well purged dry:	YES / **NO**		Windy ☐
Purging equipment:	Bailer		
Sample equipment:	Bailer	Fine X	Showers ☐ Rain ☐

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	Comments
12:48pm	0.78	5306	7.44	-286.9	25.6		
12:50pm	0.33	13355	7.05	-278.0	28.4		Methane odour, Dark green sediment in water
12:52pm	0.26	13105	7.10	-278.2	27.3		
12:54pm	0.29	12251	7.09	-263.0	27.2		

Water Quality and General Comments:

Water was dark green tinged with some sediment, methane odour, no sheen or hydrocarbons. Vegetation around monument and no standing water around monument. Monitoring well was cut to ground level. Well, was surrounded by tyres.

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GROUND WATER MONITORING FIELD DATA SHEET

Project: E04-1222 Scone	**Sample ID: MWE**
Client: UHSC	**Sampler:** DB
Site Address: Noblet Road Scone	**Date:** 15.12.22

Well Information

Monument damaged: Rusty	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: Rusty	YES / **NO** / N/A	Odours from groundwater:	YES / **NO** / N/A
Casing above ground: .....0.68.....	m agl	**Weather Conditions**:	
Standing water level: ..... 2.983.....	m bgl	Temperature >15 ☐	15-20 ☐
Total well depth: 9.46	m bgl	20-25 X	25-30 ☐
Initial well volume:	L		
Water level after purging: .....3.153.....	m bgl	Clear X	Partly cloudy ☐ Overcast ☐
Volume of water purged:	L		
Water level at time of sampling: .....3.153.....	m bgl	Calm ☐	Slight breeze X Moderate breeze ☐
Well purged dry:	YES / **NO**		Windy ☐
Purging equipment:	Bailer		
Sample equipment:	Bailer	Fine X	Showers ☐ Rain ☐

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	Comments
12:20pm	1.43	3809	6.66	-109.6	20.1		Clear water
12:22pm	0.70	3673	6.73	-135.2	18.5		
12:23pm	1.06	3640	6.71	-149.6	18.2		
12:26pm	1.06	3642	6.70	-148.6	18.2		

Water Quality and General Comments:

Water was clear, no odour or sheen or hydrocarbons. Vegetation around monument and no standing water around monument.

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