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





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## TABLE OF CONTENTS

**1.0 INTRODUCTION..... 1**

**General..... 1**

**Briefing..... 1**

**2.0 SITE CRITERIA AND SAMPLING FREQUENCY..... 2**

**3.0 SAMPLING METHODOLOGY ..... 3**

**Groundwater Sampling..... 3**

**4.0 RESULTS ..... 4**

**5.0 DISCUSSION ..... 10**

**MWA..... 10**

**MWB..... 10**

**MWC..... 10**

**MWD ..... 11**

**MWE..... 11**

**Site and Maintenance ..... 12**

**6.0 CONCLUSIONS..... 13**

**REFERENCES ..... 14**

### FIGURES

**Figure 1**                      Site layout with sample locations

### ATTACHMENTS

**Attachment 1**                      NATA Accredited Laboratory Results

**Attachment 2**                      YSI water quality meter calibration certificate

**Attachment 3**                      Data log

## 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 16<sup>th</sup> September 2020.

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. The on-site Dam that is located up gradient of monitoring well C was also sampled to determine if any correlation exists between the dam and the increased turbidity that is visible in well C.

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<br>Fresh Water 95% |                    |
| <b>IONS</b>             | <b>Calcium</b>                                    | mg/L  | NA                                    | Quarterly          |
|                         | <b>Alkalinity (total)</b>                         | mg/L  | NA                                    | Quarterly          |
|                         | <b>Chloride</b>                                   | mg/L  | NA                                    | Quarterly          |
|                         | <b>Fluoride</b>                                   | mg/L  | NA                                    | Quarterly          |
|                         | <b>Potassium<sup>1</sup></b>                      | mg/L  | 410                                   | Quarterly          |
|                         | <b>Magnesium</b>                                  | mg/L  | NA                                    | Quarterly          |
|                         | <b>Sulphate</b>                                   | mg/L  | NA                                    | Quarterly          |
| <b>HEAVY METALS</b>     | <b>Iron</b>                                       | mg/L  | 0.3                                   | Quarterly          |
|                         | <b>Manganese</b>                                  | mg/L  | 1.9                                   | Quarterly          |
| <b>PHENOLS</b>          | <b>Total phenolics</b>                            | mg/L  | 0.32                                  | Quarterly          |
| <b>OCP</b>              | <b>Organochlorine Pesticide<sup>3</sup> (OCP)</b> | mg/L  | 0.00001                               | Quarterly          |
| <b>MISC. INORGANICS</b> | <b>pH</b>   | pH    | 6.5 – 8                               | Quarterly          |
|                         | <b>Sodium</b>                                     | mg/L  | NA                                    | Quarterly          |
|                         | <b>Ammonia<sup>2</sup></b>                        | mg/L  | 0.9                                   | Quarterly          |
|                         | <b>Nitrate</b>                                    | mg/L  | 50                                    | Quarterly          |
|                         | <b>Total organic carbon</b>                       | mg/L  | 4                                     | Quarterly          |
|                         | <b>Electrical conductivity</b>                    | 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 as well as the on-site dam. 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 2020 sampling event, results are detailed in **Tables 2 to 6**. Comparisons have been made to the previous round of monitoring (March 2020). Refer to **Attachment 1** – NATA Accredited Laboratory Results and **Attachment 3** – Data Log.

There were no exceedances of the site criteria for September in MWA. Refer to Table 2.

**Table 2 – Quarterly Groundwater Results and Comparison June 2020–Sept 2020 (MWA)**

|                         | Analytes                     | Units | Site Criteria<br>(mg/L) | MWA<br>June<br>2020 | MWA<br>Sept<br>2020 |
|-------------------------|------------------------------|-------|-------------------------|---------------------|---------------------|
| <b>IONS</b>             | <b>Calcium</b>               | mg/L  | NA                      | 440                 | 570                 |
|                         | <b>Alkalinity (total)</b>    | mg/L  | NA                      | 500                 | 520                 |
|                         | <b>Chloride</b>              | mg/L  | NA                      | 6700                | 7000                |
|                         | <b>Fluoride</b>              | mg/L  | NA                      | 0.1                 | <LOR                |
|                         | <b>Potassium<sup>1</sup></b> | mg/L  | 410                     | 2.8                 | 3.0                 |
|                         | <b>Magnesium</b>             | mg/L  | NA                      | 940                 | 1100                |
|                         | <b>Sulphate</b>              | mg/L  | NA                      | 42                  | 47                  |
| <b>HEAVY METALS</b>     | <b>Iron</b>                  | mg/L  | 0.3                     | <LOR                | <LOR                |
|                         | <b>Manganese</b>             | mg/L  | 1.9                     | 0.024               | 0.037               |
| <b>Phenols</b>          | <b>Total phenolics</b>       | mg/L  | 0.32                    | <LOR                | <LOR                |
| <b>OCPs</b>             | <b>OCP<sup>3</sup></b>       | mg/L  | 0.00001                 | <LOR                | <LOR                |
| <b>MISC. INORGANICS</b> | <b>pH</b>                    | pH    | 6.5 – 8                 | 6.8                 | 6.7                 |
|                         | <b>Sodium</b>                | mg/L  | NA                      | 1700                | 1900                |
|                         | <b>Ammonia<sup>2</sup></b>   | mg/L  | 0.9                     | <LOR                | 0.079               |
|                         | <b>Nitrate</b>               | mg/L  | 0.7                     | 0.57                | 0.014               |
|                         | <b>Total Organic Carbon</b>  | mg/L  | 4                       | 4                   | 2                   |
|                         | <b>EC</b>                    | µS/cm | NA                      | 19000               | 19000               |

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 was no exceedances of the site criteria for September in MWB. Refer to Table 3.

**Table 3 – Quarterly Groundwater Results and Comparison June 2020–Sept 2020  
(MWB)**

|                         | Analytes                   | Units | Site<br>Criteria<br>(mg/L) | MWB<br>June<br>2020 | MWB<br>Sept<br>2020 |
|-------------------------|----------------------------|-------|----------------------------|---------------------|---------------------|
| <b>IONS</b>             | Calcium                    | mg/L  | NA                         | 390                 | 520                 |
|                         | Alkalinity (total)         | mg/L  | NA                         | 410                 | 430                 |
|                         | Chloride                   | mg/L  | NA                         | 4800                | 5500                |
|                         | Fluoride                   | mg/L  | NA                         | 0.2                 | 0.3                 |
|                         | Potassium <sup>1</sup>     | mg/L  | 410                        | 2.3                 | 2.6                 |
|                         | Magnesium                  | mg/L  | NA                         | 560                 | 650                 |
|                         | Sulphate                   | mg/L  | NA                         | 72                  | 83                  |
| <b>HEAVY METALS</b>     | Iron                       | mg/L  | 0.3                        | <LOR                | <LOR                |
|                         | Manganese                  | mg/L  | 1.9                        | 0.01                | 0.007               |
| <b>OCP</b>              | OCP <sup>3</sup>           | mg/L  | 0.00001                    | <LOR                | <LOR                |
| <b>PHENOLS</b>          | Total phenolics            | mg/L  | 0.32                       | <LOR                | <LOR                |
| <b>MISC. INORGANICS</b> | pH                         | pH    | 6.5 – 8                    | 7                   | 6.8                 |
|                         | Sodium                     | mg/L  | NA                         | 1200                | 1400                |
|                         | Ammonia <sup>2</sup>       | mg/L  | 0.9                        | 0.016               | <LOR                |
|                         | Nitrate                    | mg/L  | 0.7                        | 0.55                | <LOR                |
|                         | Total Organic Carbon (TOC) | mg/L  | 4                          | 5                   | 4                   |
|                         | EC                         | µS/cm | NA                         | 14000               | 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 MWC; Manganese and TOC at concentrations of 2.4mg/L and 6mg/L respectively. Refer to Table 4.

**Table 4 – Quarterly Groundwater Results and Comparison June 2020–Sept 2020  
(MWC)**

|                         | Analytes                          | Units | Site<br>Criteria<br>(mg/L) | MWC<br>June<br>2020 | MWC<br>Sept<br>2020 |
|-------------------------|-----------------------------------|-------|----------------------------|---------------------|---------------------|
| <b>IONS</b>             | <b>Calcium</b>                    | mg/L  | NA                         | 300                 | 410                 |
|                         | <b>Alkalinity (total)</b>         | mg/L  | NA                         | 750                 | 830                 |
|                         | <b>Chloride</b>                   | mg/L  | NA                         | 4400                | 4400                |
|                         | <b>Fluoride</b>                   | mg/L  | NA                         | 0.2                 | 0.2                 |
|                         | <b>Potassium<sup>1</sup></b>      | mg/L  | 410                        | 2                   | 2.2                 |
|                         | <b>Magnesium</b>                  | mg/L  | NA                         | 470                 | 550                 |
|                         | <b>Sulphate</b>                   | mg/L  | NA                         | 110                 | 120                 |
| <b>HEAVY METALS</b>     | <b>Iron</b>                       | mg/L  | 0.3                        | <LOR                | <LOR                |
|                         | <b>Manganese</b>                  | mg/L  | 1.9                        | <b>2.9</b>          | <b>2.4</b>          |
| <b>PHENOLS</b>          | <b>Total phenolics</b>            | mg/L  | 0.32                       | <LOR                | <LOR                |
| <b>OCP</b>              | <b>OCP<sup>3</sup></b>            | mg/L  | 0.00001                    | <LOR                | <LOR                |
| <b>MISC. INORGANICS</b> | <b>pH</b>                         | pH    | 6.5 – 8                    | 6.8                 | 6.9                 |
|                         | <b>Sodium</b>                     | mg/L  | NA                         | 1400                | 1600                |
|                         | <b>Ammonia<sup>2</sup></b>        | mg/L  | 0.9                        | <LOR                | 0.019               |
|                         | <b>Nitrate</b>                    | mg/L  | 0.7                        | <b>0.67</b>         | <LOR                |
|                         | <b>Total Organic Carbon (TOC)</b> | mg/L  | 4                          | <b>8</b>            | <b>6</b>            |
|                         | <b>EC</b>                         | µS/cm | NA                         | 14000               | 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.

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 2020–Sept 2020  
(MWD)**

|                         | Analytes                          | Units | Site<br>Criteria<br>(mg/L) | MWD<br>(leachate)<br>June 2020 | MWD<br>(leachate)<br>Sept 2020 |
|-------------------------|-----------------------------------|-------|----------------------------|--------------------------------|--------------------------------|
| <b>IONS</b>             | <b>Calcium</b>                    | mg/L  | NA                         | 94                             | 99                             |
|                         | <b>Alkalinity (total)</b>         | mg/L  | NA                         | 2800                           | 2600                           |
|                         | <b>Chloride</b>                   | mg/L  | NA                         | 240                            | 2900                           |
|                         | <b>Fluoride</b>                   | mg/L  | NA                         | 0.3                            | 0.2                            |
|                         | <b>Potassium<sup>1</sup></b>      | mg/L  | 410                        | 150                            | 180                            |
|                         | <b>Magnesium</b>                  | mg/L  | NA                         | 220                            | 240                            |
|                         | <b>Sulphate</b>                   | mg/L  | NA                         | 3                              | 12                             |
| <b>HEAVY METALS</b>     | <b>Iron</b>                       | mg/L  | 0.3                        | <b>1</b>                       | <b>1.1</b>                     |
|                         | <b>Manganese</b>                  | mg/L  | 1.9                        | 0.17                           | 0.18                           |
| <b>PHENOLS</b>          | <b>Total phenolics</b>            | mg/L  | 0.32                       | <LOR                           | <LOR                           |
| <b>OCP</b>              | <b>OCP<sup>3</sup></b>            | mg/L  | 0.00001                    | <LOR                           | <LOR                           |
| <b>MISC. INORGANICS</b> | <b>pH</b>                         | pH    | 6.5 – 8                    | 7.6                            | 7.6                            |
|                         | <b>Sodium</b>                     | mg/L  | NA                         | 1200                           | 1800                           |
|                         | <b>Ammonia<sup>2</sup></b>        | mg/L  | 0.9                        | <b>250</b>                     | <b>290</b>                     |
|                         | <b>Nitrate</b>                    | mg/L  | 0.7                        | <LOR                           | <LOR                           |
|                         | <b>Total Organic Carbon (TOC)</b> | mg/L  | 4                          | <b>270</b>                     | <b>250</b>                     |
|                         | <b>EC</b>                         | µS/cm | NA                         | 11000                          | 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.



There was one exceedance of the site criteria for June in MWE, TOC at concentrations of 5 mg/L. Refer to Table 6.

**Table 6 –Quarterly Groundwater Results and Comparison June 2020-Sept 2020 (MWE)**

|                         | Analytes                          | Units | Threshold<br>Criteria<br>(mg/L) | MWE<br>June<br>2020 | MWE<br>Sept<br>2020 |
|-------------------------|-----------------------------------|-------|---------------------------------|---------------------|---------------------|
| <b>IONS</b>             | <b>Calcium</b>                    | mg/L  | NA                              | 57                  | 63                  |
|                         | <b>Alkalinity (total)</b>         | mg/L  | NA                              | 1000                | 1300                |
|                         | <b>Chloride</b>                   | mg/L  | NA                              | 640                 | 550                 |
|                         | <b>Fluoride</b>                   | mg/L  | NA                              | 0.5                 | 0.4                 |
|                         | <b>Potassium<sup>1</sup></b>      | mg/L  | 410                             | 0.6                 | 0.6                 |
|                         | <b>Magnesium</b>                  | mg/L  | NA                              | 65                  | 71                  |
|                         | <b>Sulphate</b>                   | mg/L  | NA                              | 130                 | 120                 |
| <b>HEAVY METALS</b>     | <b>Iron</b>                       | mg/L  | 0.3                             | <LOR                | <LOR                |
|                         | <b>Manganese</b>                  | mg/L  | 1.9                             | 0.32                | 0.21                |
| <b>PHENOLS</b>          | <b>Total phenolics</b>            | mg/L  | 0.32                            | <LOR                | <LOR                |
| <b>OCP</b>              | <b>OCP<sup>3</sup></b>            | mg/L  | 0.00001                         | <LOR                | <LOR                |
| <b>MISC. INORGANICS</b> | <b>pH</b>                         | pH    | 6.5 – 8                         | 7.2                 | 7.2                 |
|                         | <b>Sodium</b>                     | mg/L  | NA                              | 700                 | 740                 |
|                         | <b>Ammonia<sup>2</sup></b>        | mg/L  | 0.9                             | 0.018               | 0.084               |
|                         | <b>Nitrate</b>                    | mg/L  | 0.7                             | <LOR                | <LOR                |
|                         | <b>Total Organic Carbon (TOC)</b> | mg/L  | 4                               | <b>5</b>            | <b>5</b>            |
|                         | <b>EC</b>                         | µS/c  | NA                              | 3800                | 3500                |

Highlighted results exceed site criteria

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

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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

**Table 7 –Water Analysis Results September 2020 (Dam and MWC) comparison**

|                         | Analytes                          | Units | Threshold<br>Criteria<br>(mg/L) | Dam<br>Sept<br>2020 | MWC<br>Sept<br>2020 |
|-------------------------|-----------------------------------|-------|---------------------------------|---------------------|---------------------|
| <b>IONS</b>             | <b>Calcium</b>                    | mg/L  | NA                              | 49                  | 410                 |
|                         | <b>Alkalinity (total)</b>         | mg/L  | NA                              | 110                 | 820                 |
|                         | <b>Chloride</b>                   | mg/L  | NA                              | 95                  | 4400                |
|                         | <b>Fluoride</b>                   | mg/L  | NA                              | 0.2                 | 0.2                 |
|                         | <b>Potassium<sup>1</sup></b>      | mg/L  | 410                             | 17                  | 2.2                 |
|                         | <b>Magnesium</b>                  | mg/L  | NA                              | 26                  | 550                 |
|                         | <b>Sulphate</b>                   | mg/L  | NA                              | 160                 | 120                 |
| <b>HEAVY METALS</b>     | <b>Iron</b>                       | mg/L  | 0.3                             | <LOR                | <LOR                |
|                         | <b>Manganese</b>                  | mg/L  | 1.9                             | <LOR                | <b>2.4</b>          |
| <b>PHENOLS</b>          | <b>Total phenolics</b>            | mg/L  | 0.32                            | <LOR                | <LOR                |
| <b>OCP</b>              | <b>OCP<sup>3</sup></b>            | mg/L  | 0.00001                         | <LOR                | <LOR                |
| <b>MISC. INORGANICS</b> | <b>pH</b>                         | pH    | 6.5 – 8                         | 7.8                 | 6.9                 |
|                         | <b>Sodium</b>                     | mg/L  | NA                              | 71                  | 1600                |
|                         | <b>Ammonia<sup>2</sup></b>        | mg/L  | 0.9                             | 0.04                | 0.019               |
|                         | <b>Nitrate</b>                    | mg/L  | 0.7                             | <LOR                | <LOR                |
|                         | <b>Total Organic Carbon (TOC)</b> | mg/L  | 4                               | <b>14</b>           | <b>6</b>            |
|                         | <b>EC</b>                         | µS/c  | NA                              | 890                 | 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

## 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 dam is located approximately 100metres upgradient from MWC

The following is a summary of the significant results for June 2020 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.

All reported analyte concentrations are 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 were no exceedances of the site criteria. Changes at MWB include;

- The TOC concentration has reduced to 4mg/L from 5mg/L. Now meeting site criteria (4mg/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 increased turbidity compared to other wells 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 (2.4 mg/L) was reported exceeding the Site Criteria (1.9 mg/L). This is a decrease from the previous reporting period (2.9 mg/L);

- A concentration of TOC (6 mg/L) was reported exceeding the Site Criteria (4 mg/L), which is a decrease from the previous monitoring period.
- Nitrate has decreased from a concentration of 0.7 mg/L to no detection.

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:

- Ammonia has increased to a concentration of 290 mg/L;
- Iron concentration of 1.1 mg/L has slightly increased since July's sampling event concentration of 1 mg/L; and,
- TOC has decreased from 270 mg/L to a concentration of 250 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:

- The TOC concentration has remained the same at 5mg/L, still exceeding site criteria of 4mg/L.

All other analytes reported concentrations consistent with previous monitoring data.

### **Dam**

The dam onsite is located approximately 100metres up-gradient from monitoring well C. The only exceedance for this site was the TOC at a level of 14mg/L. There are a few similarities in analytes detected in both MWC and the Dam, additional monitoring is required to determine if there is a correlation between the water in Dam and MWC. A second round of monitoring should be undertaken of the Dam in the December monitoring event.

The following analytes exceeded the Threshold Criteria during the September 2020 sampling event, excluding the Leachate Monitoring well (MWD); TOC in MWC and MWE and Manganese in MWC. Refer to **Attachment 3** – Data Log.

### **Site and Maintenance**

The concrete surrounding the base of several of the wells are cracked. These are requiring maintenance to stop any surface water from entering the groundwater.

## 6.0 CONCLUSIONS

There are seasonal fluctuations observed with regional 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.

It is apparent that the previously observed fluctuations are beginning to settle with results obtained appearing more stable than previous monitoring periods. The past two monitoring periods occurred during a time of drought through to the breaking of the drought. The results obtained during this monitoring period appear to be an accurate representation of the site health during stable times.

The increase in turbidity of MWC has been noticed over different monitoring periods along with elevated concentrations of analytes. The Dam is up-hydraulic gradient from MWC and was considered a potential linkage to MWC and the elevated concentrations, additionally sampling of the Dam is required for correlation between the two sampling locations.

The results and discussion of the laboratory sample analysis from the Scone Waste Facility during the September 2020 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 September 2020 sampling event; TOC in MWC and MWE, and Manganese in MWC

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

The next water sampling event will be the annual monitoring event which will be undertaken in December 2020.

## 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





**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<br>NA | Compiled<br>SC | Revision<br>3 |

**ATTACHMENT A**  
**NATA ACCREDITED LABORATORY RESULTS**



## CERTIFICATE OF ANALYSIS 251568

### Client Details

|                  |                                       |
|------------------|---------------------------------------|
| <b>Client</b>    | Engage Environmental Services         |
| <b>Attention</b> | Stephen Challinor                     |
| <b>Address</b>   | 113 Reservoir Rd, GLENDALE, NSW, 2285 |

### Sample Details

|   |                      |
|---|----------------------|
| <b>Your Reference</b>                       | <u>E04-0920-UHSC</u> |
| <b>Number of Samples</b>                    | 6 Water              |
| <b>Date samples received</b>                | 18/09/2020           |
| <b>Date completed instructions received</b> | 18/09/2020           |

### 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

|                                  |            |
|----------------------------------|------------|
| <b>Date results requested by</b> | 25/09/2020 |
| <b>Date of Issue</b>             | 24/09/2020 |

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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, Team Leader, Inorganics  
Dragana Tomas, Senior Chemist  
Hannah Nguyen, Senior Chemist

#### **Authorised By**

Nancy Zhang, Laboratory Manager

| Organochlorine Pesticides in Water |       |            |            |            |            |            |
|------------------------------------|-------|------------|------------|------------|------------|------------|
| Our Reference                      |       | 251568-1   | 251568-2   | 251568-3   | 251568-4   | 251568-5   |
| Your Reference                     | UNITS | MWA        | MWB        | MWC        | MWD        | MWE        |
| Date Sampled                       |       | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 |
| Type of sample                     |       | Water      | Water      | Water      | Water      | Water      |
| Date extracted                     | -     | 22/09/2020 | 22/09/2020 | 22/09/2020 | 22/09/2020 | 22/09/2020 |
| Date analysed                      | -     | 22/09/2020 | 22/09/2020 | 22/09/2020 | 22/09/2020 | 22/09/2020 |
| 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                     | %     | 88         | 83         | 83         | 80         | 91         |

| Organochlorine Pesticides in Water |       |            |
|------------------------------------|-------|------------|
| Our Reference                      |       | 251568-6   |
| Your Reference                     | UNITS | Dam        |
| Date Sampled                       |       | 16/09/2020 |
| Type of sample                     |       | Water      |
| Date extracted                     | -     | 22/09/2020 |
| Date analysed                      | -     | 22/09/2020 |
| alpha-BHC                          | µg/L  | <0.2       |
| HCB                                | µg/L  | <0.2       |
| beta-BHC                           | µg/L  | <0.2       |
| gamma-BHC                          | µg/L  | <0.2       |
| Heptachlor                         | µg/L  | <0.2       |
| delta-BHC                          | µg/L  | <0.2       |
| Aldrin                             | µg/L  | <0.2       |
| Heptachlor Epoxide                 | µg/L  | <0.2       |
| gamma-Chlordane                    | µg/L  | <0.2       |
| alpha-Chlordane                    | µg/L  | <0.2       |
| Endosulfan I                       | µg/L  | <0.2       |
| pp-DDE                             | µg/L  | <0.2       |
| Dieldrin                           | µg/L  | <0.2       |
| Endrin                             | µg/L  | <0.2       |
| Endosulfan II                      | µg/L  | <0.2       |
| pp-DDD                             | µg/L  | <0.2       |
| Endrin Aldehyde                    | µg/L  | <0.2       |
| pp-DDT                             | µg/L  | <0.2       |
| Endosulfan Sulphate                | µg/L  | <0.2       |
| Methoxychlor                       | µg/L  | <0.2       |
| Surrogate TCMX                     | %     | 90         |

| Total Phenolics in Water    |       |            |            |            |            |            |
|-----------------------------|-------|------------|------------|------------|------------|------------|
| Our Reference               |       | 251568-1   | 251568-2   | 251568-3   | 251568-4   | 251568-5   |
| Your Reference              | UNITS | MWA        | MWB        | MWC        | MWD        | MWE        |
| Date Sampled                |       | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 |
| Type of sample              |       | Water      | Water      | Water      | Water      | Water      |
| Date extracted              | -     | 21/09/2020 | 21/09/2020 | 21/09/2020 | 21/09/2020 | 21/09/2020 |
| Date analysed               | -     | 21/09/2020 | 21/09/2020 | 21/09/2020 | 21/09/2020 | 21/09/2020 |
| Total Phenolics (as Phenol) | mg/L  | <0.05      | <0.05      | <0.05      | <0.05      | <0.05      |

| Total Phenolics in Water    |       |            |
|-----------------------------|-------|------------|
| Our Reference               |       | 251568-6   |
| Your Reference              | UNITS | Dam        |
| Date Sampled                |       | 16/09/2020 |
| Type of sample              |       | Water      |
| Date extracted              | -     | 21/09/2020 |
| Date analysed               | -     | 21/09/2020 |
| Total Phenolics (as Phenol) | mg/L  | <0.05      |

| Ion Balance  |       |            |            |            |            |            |
|--|-------|------------|------------|------------|------------|------------|
| Our Reference  |       | 251568-1   | 251568-2   | 251568-3   | 251568-4   | 251568-5   |
| Your Reference   | UNITS | MWA        | MWB        | MWC        | MWD        | MWE        |
| Date Sampled   |       | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 |
| Type of sample   |       | Water      | Water      | Water      | Water      | Water      |
| Date prepared  | -     | 18/09/2020 | 18/09/2020 | 18/09/2020 | 18/09/2020 | 18/09/2020 |
| Date analysed  | -     | 18/09/2020 | 18/09/2020 | 18/09/2020 | 18/09/2020 | 18/09/2020 |
| Calcium - Dissolved  | mg/L  | 570        | 520        | 410        | 99         | 63         |
| Potassium - Dissolved  | mg/L  | 3.0        | 2.6        | 2.2        | 180        | 0.6        |
| Sodium - Dissolved   | mg/L  | 1,900      | 1,400      | 1,600      | 1,800      | 740        |
| Magnesium - Dissolved  | mg/L  | 1,100      | 650        | 550        | 240        | 71         |
| Hydroxide Alkalinity (OH <sup>-</sup> ) as CaCO <sub>3</sub> | mg/L  | <5         | <5         | <5         | [NT]       | <5         |
| Bicarbonate Alkalinity as CaCO <sub>3</sub>                  | mg/L  | 520        | 430        | 830        | 2,600      | 1,300      |
| Carbonate Alkalinity as CaCO <sub>3</sub>                    | mg/L  | <5         | <5         | <5         | [NT]       | <5         |
| Total Alkalinity as CaCO <sub>3</sub>                        | mg/L  | 520        | 430        | 830        | 2,600      | 1,300      |
| Sulphate, SO <sub>4</sub>                                    | mg/L  | 47         | 83         | 120        | 12         | 120        |
| Chloride, Cl   | mg/L  | 7,000      | 5,500      | 4,400      | 2,900      | 550        |
| Ionic Balance  | %     | -1.0       | -8.0       | -2.0       | -12        | -3.0       |

| Ion Balance  |       |            |
|--|-------|------------|
| Our Reference  |       | 251568-6   |
| Your Reference   | UNITS | Dam        |
| Date Sampled   |       | 16/09/2020 |
| Type of sample   |       | Water      |
| Date prepared  | -     | 18/09/2020 |
| Date analysed  | -     | 18/09/2020 |
| Calcium - Dissolved  | mg/L  | 49         |
| Potassium - Dissolved  | mg/L  | 17         |
| Sodium - Dissolved   | mg/L  | 71         |
| Magnesium - Dissolved  | mg/L  | 26         |
| Hydroxide Alkalinity (OH <sup>-</sup> ) as CaCO <sub>3</sub> | mg/L  | <5         |
| Bicarbonate Alkalinity as CaCO <sub>3</sub>                  | mg/L  | 110        |
| Carbonate Alkalinity as CaCO <sub>3</sub>                    | mg/L  | <5         |
| Total Alkalinity as CaCO <sub>3</sub>                        | mg/L  | 110        |
| Sulphate, SO <sub>4</sub>                                    | mg/L  | 160        |
| Chloride, Cl   | mg/L  | 95         |
| Ionic Balance  | %     | -1.0       |

| Miscellaneous Inorganics |          |            |            |            |            |            |
|--------------------------|----------|------------|------------|------------|------------|------------|
| Our Reference            |          | 251568-1   | 251568-2   | 251568-3   | 251568-4   | 251568-5   |
| Your Reference           | UNITS    | MWA        | MWB        | MWC        | MWD        | MWE        |
| Date Sampled             |          | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 |
| Type of sample           |          | Water      | Water      | Water      | Water      | Water      |
| Date prepared            | -        | 18/09/2020 | 18/09/2020 | 18/09/2020 | 18/09/2020 | 18/09/2020 |
| Date analysed            | -        | 18/09/2020 | 18/09/2020 | 18/09/2020 | 18/09/2020 | 18/09/2020 |
| Ammonia as N in water    | mg/L     | 0.079      | <0.005     | 0.019      | 290        | 0.084      |
| pH                       | pH Units | 6.7        | 6.8        | 6.9        | 7.6        | 7.2        |
| Electrical Conductivity  | µS/cm    | 19,000     | 14,000     | 14,000     | 13,000     | 3,500      |
| Nitrite as N in water    | mg/L     | 0.014      | <0.005     | <0.005     | <0.005     | <0.005     |
| Total Organic Carbon     | mg/L     | 2          | 4          | 6          | 250        | 5          |
| Fluoride, F              | mg/L     | <0.1       | 0.3        | 0.2        | 0.2        | 0.4        |

| Miscellaneous Inorganics |          |            |
|--------------------------|----------|------------|
| Our Reference            |          | 251568-6   |
| Your Reference           | UNITS    | Dam        |
| Date Sampled             |          | 16/09/2020 |
| Type of sample           |          | Water      |
| Date prepared            | -        | 18/09/2020 |
| Date analysed            | -        | 18/09/2020 |
| Ammonia as N in water    | mg/L     | 0.040      |
| pH                       | pH Units | 7.8        |
| Electrical Conductivity  | µS/cm    | 890        |
| Nitrite as N in water    | mg/L     | <0.005     |
| Total Organic Carbon     | mg/L     | 14         |
| Fluoride, F              | mg/L     | 0.2        |



| All metals in water-dissolved |       |            |            |            |            |            |
|-------------------------------|-------|------------|------------|------------|------------|------------|
| Our Reference                 |       | 251568-1   | 251568-2   | 251568-3   | 251568-4   | 251568-5   |
| Your Reference                | UNITS | MWA        | MWB        | MWC        | MWD        | MWE        |
| Date Sampled                  |       | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 | 16/09/2020 |
| Type of sample                |       | Water      | Water      | Water      | Water      | Water      |
| Date prepared                 | -     | 21/09/2020 | 21/09/2020 | 21/09/2020 | 21/09/2020 | 21/09/2020 |
| Date analysed                 | -     | 21/09/2020 | 21/09/2020 | 21/09/2020 | 21/09/2020 | 21/09/2020 |
| Iron-Dissolved                | µg/L  | <10        | <10        | <10        | 1,100      | <10        |
| Manganese-Dissolved           | µg/L  | 37         | 7          | 2,400      | 180        | 210        |

| All metals in water-dissolved |       |            |
|-------------------------------|-------|------------|
| Our Reference                 |       | 251568-6   |
| Your Reference                | UNITS | Dam        |
| Date Sampled                  |       | 16/09/2020 |
| Type of sample                |       | Water      |
| Date prepared                 | -     | 21/09/2020 |
| Date analysed                 | -     | 21/09/2020 |
| Iron-Dissolved                | µg/L  | <10        |
| Manganese-Dissolved           | µg/L  | <5         |

| Method ID          | Methodology Summary  |
|--------------------|--|
| <b>Inorg-001</b>   | 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.  |
| <b>Inorg-002</b>   | Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.  |
| <b>Inorg-006</b>   | Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.  |
| <b>Inorg-026</b>   | Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.   |
| <b>Inorg-031</b>   | Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.  |
| <b>Inorg-040</b>   | 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%.   |
| <b>Inorg-055</b>   | Nitrite - determined colourimetrically based on APHA latest edition NO2- B. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.   |
| <b>Inorg-057</b>   | 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.  |
| <b>Inorg-079</b>   | TOC determined using a TOC analyser using the combustion method. Dissolved requires filtering prior to determination. Analysis using APHA latest edition 5310B.  |
| <b>Inorg-081</b>   | 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. |
| <b>Metals-020</b>  | Determination of various metals by ICP-AES.  |
| <b>Metals-022</b>  | Determination of various metals by ICP-MS.   |
| <b>Org-022/025</b> | Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.   |

Client Reference: E04-0920-UHSC

| QUALITY CONTROL: Organochlorine Pesticides in Water |       |     |             | Duplicate  |      |      |      | Spike Recovery % |            |      |
|---|-------|-----|-------------|------------|------|------|------|------------------|------------|------|
| Test Description                                    | Units | PQL | Method      | Blank      | #    | Base | Dup. | RPD              | LCS-W2     | [NT] |
| Date extracted                                      | -     |     |             | 22/09/2020 | [NT] | [NT] | [NT] | [NT]             | 22/09/2020 | [NT] |
| Date analysed                                       | -     |     |             | 22/09/2020 | [NT] | [NT] | [NT] | [NT]             | 22/09/2020 | [NT] |
| alpha-BHC   | µg/L  | 0.2 | Org-022/025 | <0.2       | [NT] | [NT] | [NT] | [NT]             | 76         | [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]             | 74         | [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]             | 74         | [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]             | 86         | [NT] |
| Heptachlor Epoxide                                  | µg/L  | 0.2 | Org-022/025 | <0.2       | [NT] | [NT] | [NT] | [NT]             | 83         | [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]             | 83         | [NT] |
| Dieldrin  | µg/L  | 0.2 | Org-022/025 | <0.2       | [NT] | [NT] | [NT] | [NT]             | 86         | [NT] |
| Endrin  | µg/L  | 0.2 | Org-022/025 | <0.2       | [NT] | [NT] | [NT] | [NT]             | 82         | [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]             | 77         | [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]             | 85         | [NT] |
| Methoxychlor  | µg/L  | 0.2 | Org-022/025 | <0.2       | [NT] | [NT] | [NT] | [NT]             | [NT]       | [NT] |
| Surrogate TCMX                                      | %     |     | Org-022/025 | 84         | [NT] | [NT] | [NT] | [NT]             | 71         | [NT] |

Client Reference: E04-0920-UHSC

| QUALITY CONTROL: Total Phenolics in Water |       |      |           |            |   | Duplicate  |            | Spike Recovery % |            |      |
|---|-------|------|-----------|------------|---|------------|------------|------------------|------------|------|
| Test Description                          | Units | PQL  | Method    | Blank      | # | Base       | Dup.       | RPD              | LCS-W1     | [NT] |
| Date extracted                            | -     |      |           | 21/09/2020 | 1 | 21/09/2020 | 21/09/2020 |                  | 21/09/2020 | [NT] |
| Date analysed                             | -     |      |           | 21/09/2020 | 1 | 21/09/2020 | 21/09/2020 |                  | 21/09/2020 | [NT] |
| Total Phenolics (as Phenol)               | mg/L  | 0.05 | Inorg-031 | <0.05      | 1 | <0.05      | <0.05      | 0                | 98         | [NT] |

Client Reference: E04-0920-UHSC

| QUALITY CONTROL: Ion Balance                                 |       |     |            | Duplicate  |   |            |            | Spike Recovery % |            |            |
|--|-------|-----|------------|------------|---|------------|------------|------------------|------------|------------|
| Test Description   | Units | PQL | Method     | Blank      | # | Base       | Dup.       | RPD              | LCS-W1     | 251568-2   |
| Date prepared  | -     |     |            | 18/09/2020 | 1 | 18/09/2020 | 18/09/2020 |                  | 18/09/2020 | 18/09/2020 |
| Date analysed  | -     |     |            | 18/09/2020 | 1 | 18/09/2020 | 18/09/2020 |                  | 18/09/2020 | 18/09/2020 |
| Calcium - Dissolved  | mg/L  | 0.5 | Metals-020 | <0.5       | 1 | 570        | 560        | 2                | 94         | [NT]       |
| Potassium - Dissolved  | mg/L  | 0.5 | Metals-020 | <0.5       | 1 | 3.0        | 3.0        | 0                | 92         | [NT]       |
| Sodium - Dissolved   | mg/L  | 0.5 | Metals-020 | <0.5       | 1 | 1900       | 1900       | 0                | 97         | [NT]       |
| Magnesium - Dissolved  | mg/L  | 0.5 | Metals-020 | <0.5       | 1 | 1100       | 1100       | 0                | 97         | [NT]       |
| Hydroxide Alkalinity (OH <sup>-</sup> ) as CaCO <sub>3</sub> | mg/L  | 5   | Inorg-006  | <5         | 1 | <5         | [NT]       |                  | [NT]       | [NT]       |
| Bicarbonate Alkalinity as CaCO <sub>3</sub>                  | mg/L  | 5   | Inorg-006  | <5         | 1 | 520        | [NT]       |                  | [NT]       | [NT]       |
| Carbonate Alkalinity as CaCO <sub>3</sub>                    | mg/L  | 5   | Inorg-006  | <5         | 1 | <5         | [NT]       |                  | [NT]       | [NT]       |
| Total Alkalinity as CaCO <sub>3</sub>                        | mg/L  | 5   | Inorg-006  | <5         | 1 | 520        | [NT]       |                  | 110        | [NT]       |
| Sulphate, SO <sub>4</sub>                                    | mg/L  | 1   | Inorg-081  | <1         | 1 | 47         | 44         | 7                | 119        | 97         |
| Chloride, Cl   | mg/L  | 1   | Inorg-081  | <1         | 1 | 7000       | 6800       | 3                | 94         | #          |
| Ionic Balance  | %     |     | Inorg-040  | [NT]       | 1 | -1.0       | [NT]       |                  | [NT]       | [NT]       |

Client Reference: E04-0920-UHSC

| QUALITY CONTROL: Miscellaneous Inorganics |          |       |           | Duplicate  |   |            |            | Spike Recovery % |            |            |
|---|----------|-------|-----------|------------|---|------------|------------|------------------|------------|------------|
| Test Description                          | Units    | PQL   | Method    | Blank      | # | Base       | Dup.       | RPD              | LCS-W1     | 251568-2   |
| Date prepared                             | -        |       |           | 18/09/2020 | 1 | 18/09/2020 | 18/09/2020 |                  | 18/09/2020 | 18/09/2020 |
| Date analysed                             | -        |       |           | 18/09/2020 | 1 | 18/09/2020 | 18/09/2020 |                  | 18/09/2020 | 18/09/2020 |
| Ammonia as N in water                     | mg/L     | 0.005 | Inorg-057 | <0.005     | 1 | 0.079      | 0.075      | 5                | 107        | [NT]       |
| pH  | pH Units |       | Inorg-001 | [NT]       | 1 | 6.7        | [NT]       |                  | 99         | [NT]       |
| Electrical Conductivity                   | µS/cm    | 1     | Inorg-002 | <1         | 1 | 19000      | [NT]       |                  | 108        | [NT]       |
| Nitrite as N in water                     | mg/L     | 0.005 | Inorg-055 | <0.005     | 1 | 0.014      | 0.014      | 0                | 101        | [NT]       |
| Total Organic Carbon                      | mg/L     | 1     | Inorg-079 | <1         | 1 | 2          | 2          | 0                | 105        | 76         |
| Fluoride, F                               | mg/L     | 0.1   | Inorg-026 | <0.1       | 1 | <0.1       | <0.1       | 0                | 96         | 86         |

Client Reference: E04-0920-UHSC

| QUALITY CONTROL: All metals in water-dissolved |       |     |            | Duplicate  |   |            |            | Spike Recovery % |            |            |
|--|-------|-----|------------|------------|---|------------|------------|------------------|------------|------------|
| Test Description                               | Units | PQL | Method     | Blank      | # | Base       | Dup.       | RPD              | LCS-W2     | 251568-2   |
| Date prepared                                  | -     |     |            | 21/09/2020 | 1 | 21/09/2020 | 21/09/2020 |                  | 21/09/2020 | 21/09/2020 |
| Date analysed                                  | -     |     |            | 21/09/2020 | 1 | 21/09/2020 | 21/09/2020 |                  | 21/09/2020 | 21/09/2020 |
| Iron-Dissolved                                 | µg/L  | 10  | Metals-022 | <10        | 1 | <10        | <10        | 0                | 94         | 90         |
| Manganese-Dissolved                            | µg/L  | 5   | Metals-022 | <5         | 1 | 37         | 37         | 0                | 96         | 81         |

| Result Definitions |   |
|--------------------|---|
| <b>NT</b>          | Not tested                                |
| <b>NA</b>          | Test not required                         |
| <b>INS</b>         | Insufficient sample for this test         |
| <b>PQL</b>         | Practical Quantitation Limit              |
| <b>&lt;</b>        | Less than                                 |
| <b>&gt;</b>        | Greater than                              |
| <b>RPD</b>         | Relative Percent Difference               |
| <b>LCS</b>         | Laboratory Control Sample                 |
| <b>NS</b>          | Not specified                             |
| <b>NEPM</b>        | National Environmental Protection Measure |
| <b>NR</b>          | Not Reported                              |



## Quality Control Definitions

|  |  |
|--|--|
| <b>Blank</b>   | 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.           |
| <b>Duplicate</b>   | 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.   |
| <b>Matrix Spike</b>  | 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. |
| <b>LCS (Laboratory Control Sample)</b>   | 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.                                |
| <b>Surrogate Spike</b>   | 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.

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:

Chloride # Percent recovery is not possible to report 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.

Test PH have exceeded the recommended technical holding times, Envirolab Group form 347 "Recommended Preservation and Holding Times" can be provided on request (available on the Envirolab website)

**ATTACHMENT B**  
**CALIBRATION**  
**CERTIFICATE**

**ATTACHMENT C**  
**DATA LOG**

## Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus  
Serial No. 18G103119



Air-Met Scientific Pty Ltd  
1300 137 067

| Item          | Test                 | Pass | Comments |
|---------------|----------------------|------|----------|
| Battery       | Charge Condition     | ✓    |          |
|               | Fuses                | ✓    |          |
|               | Capacity             | ✓    |          |
| Switch/keypad | Operation            | ✓    |          |
|               | Display              |      |          |
| 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 |
|-------------|-----------|--------------------|-----------|------------------------|--------------------|
| 1. pH 10.00 |           | pH 10.00           |           | 352607                 | pH 9.86            |
| 2. pH 7.00  |           | pH 7.00            |           | 330737                 | pH 7.03            |
| 3. pH 4.00  |           | pH 4.00            |           | 347027                 | pH 4.02            |
| 4. mV       |           | 231.8mV            |           | 357172/357173          | 231.8mV            |
| 5. EC       |           | 2.76mS             |           | 343511                 | 2.76mS             |
| 6. D.O      |           | 0.00ppm            |           | 1904288592             | 0.05ppm            |
| 7. Temp     |           | 21.3°C             |           | MultiTherm             | 21.2°C             |

Calibrated by: Eloise Carroll

Calibration date: 14/09/2020

Next calibration due: 14/10/2020