Jacobs

# Officer South Hydrogeology Factual Report

**Date:** 16 May 2023
**Project name:** Officer South DSS
**Project no:** IA5000EI
**Attention:** Nino Polon
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# 1. Hydrogeological Assessment

## 1.1 Regional Geology and Aquifers

The surface geology of the sites in Officer South, Victoria, is largely shaped by the Quaternary Alluvium, which is composed of unconsolidated sediments. The depth of the Quaternary Alluvium varies depending on the proximity to surface water bodies, such as Cardinia Creek, and can reach depths of approximately 11 metres below ground level (mbgl). Despite the dominance of the Quaternary Alluvium at shallow depths, this layer is underlain by the Upper Tertiary Fluvial Aquifer, which is composed of consolidated sedimentary rocks.

The Upper Tertiary Fluvial Aquifer occurs at greater depths than the Quaternary Alluvium and can be found at depths of approximately 3 mbgl. However, the water table in the area occurs primarily in the Quaternary Alluvium Aquifer, as it is generally found at shallow depths of <5 mbgl. Connectivity between the Upper Tertiary Fluvial Aquifer and the Quaternary Alluvium has not been confirmed; however, no confining layer has been identified between the two units.

## 1.2 Groundwater Wells

In March 2023, five groundwater wells (BH04, BH07, BH08, BH09, and BH10) were drilled and installed as part of a groundwater level assessment at Officer South. Construction details are summarised in Table 1-1. These wells were developed and allowed to stabilise for one month before permeability testing and sampling on 26 April 2023. The installation of BH08 failed due to the bottom well cap failing during installation. As a result, the groundwater team recommended drilling BH09 in a location to the southwest of the previous well. Unfortunately, no free groundwater was observed in BH09 as the scope of work was limited to a maximum depth of 8 metre; therefore, only three wells underwent permeability testing.

Permeability testing, in the form of slug testing, was used to determine potential infiltration rates during construction of assets below the groundwater table. Groundwater sampling was conducted using the micro-purging method (low flow) for one bore, but mechanical difficulties necessitated the use of the bailer method for the other two other wells.

**Table 1-1. Monitoring bore construction details**Error! Reference source not found.

| Bore ID | Easting (MGA94 Zone 55) | Northing (MGA94 Zone 55) | Screen depths (mBGL) | Total depth (m BTOC) |
|---|---|---|---|---|
| BH04 | 358698 | 5783360.452 | 4.5-8 | 8 |
| BH07 | 358977 | 5782664.771 | 2-8 | 8 |
| BH08 | 361585 | 5782226.057 | - | - |
| BH09 | 359645 | 5781875 | 5-8 | 8 |
| BH10 | 361170.289 | 5780667.061 | 4-8 | 8 |

## 1.3 Groundwater Level

A calibrated Solinst Interface Meter was used measure the groundwater level and the base of each borehole, accurately. To ensure consistency across all readings, the standing water level and total bore depth in each borehole were measured in metres to three decimal points with respect to Top of Casing (metres below Top of Casing). After each bore was measured, the equipment was decontaminated to avoid any cross-contamination.

## 1.4 Permeability (slug) testing

Slug testing was carried out to assess the permeability of the alluvium. A solid 2-meter PVC slug was used to displace water in the groundwater well, and a water level datalogger was used to record changes in water head. Falling head tests (FHT) and rising head tests (RHT) were performed on three wells, BH04, BH10, and BH07, and each test took between 10-17 minutes to stabilise water level (Table 1-2).

However, a minor deviation from the scope of work occurred during the testing of BH04 and BH07, as the slug was slightly broken at the top end. As a result, manual readings were not taken for the FHT, but data was still recorded using the water level datalogger.

**Table 1-2. RHT and FHT test duration**

| Bore ID | Rising Head Test (RHT) | Falling Head Test (FHT) |
|---|---|---|
| BH04 | 10 mins | 13 min |
| BH07 | 17 mins | 16 mins |
| BH10 | 10 mins | 15 mins |

The data collected during the testing was analysed using the AQTESOLV Pro 4.0 software to estimate the horizontal hydraulic conductivity (Kh) in metres per day (m/day) for the screened aquifer. The Kh value was determined by visually matching the data plots to the Bouwer and Rice (1976) analytical solution for unconfined aquifers. A summary of the slug testing conducted on the three bores are provided in Table 1-3.

**Table 1-3. Slug Test Setup**

| Bore Information | BH04 | BH07 | BH10 |
|---|---|---|---|
| Initial standing water level (m TOC) | 2.51 | 2.02 | 2.07 |
| Diameter of slug (mm) | 35 | 35 | 35 |
| Depth of logger (m TOC) | 7.5 | 7.0 | 7.2 |
| Height of water above logger (m) | 4.99 | 4.98 | 5.14 |
| Standing water level after logger installation | 2.51 | 2.03 | 2.06 |
| Total depth of bore (m TOC) | 8.21 | 7.67 | 7.74 |
| Height of water column (m) | 5.7 | 5.65 | 5.68 |
| Height of water above sand filter pack (m) | 1.49 | 0 | 1.44 |
| Aquifer thickness (m) | 11[1] | 5m[1] (Quaternary Alluvium)<br>23m[1] (Upper Tertiary Fluvial Aquifer) | 3m[1] (Quaternary Alluvium)<br>33m[1] (Upper Tertiary Fluvial Aquifer) |

m = metres
mm = millimetres
m TOC = metres below top of casing
[1] Visualising Victoria's Groundwater (VVG)

## 1.5 Groundwater Sampling

The low-flow sampling for one of the bores, BH07, was performed on 26 April 2023, using a Micropurge/GME kit. The kit included a low-flow sampling pump, QED MP10 controller, tag line, regulator, compressor, and YSI ProPlus. The interface meter was also used to monitor the level of the groundwater during purging.

For BH04 and BH10, the sampling was conducted between 27 and 28 April, using a bailer. During purging and bailing, water quality parameters (electrical conductivity [EC], pH, temperature, redox potential, and dissolved oxygen [DO]) were measured using a calibrated multi-parameter water quality meter instrument (YSI ProPlus). Readings were taken approximately every three minutes until the water level stabilised. Groundwater sampling was carried out in accordance with the EPA Victoria Publication 669.1 (Groundwater Sampling Guidelines) or within acceptable limits.

Samples were collected in laboratory-prepared bottles according to the specified analytical schedule. For metals analysis, samples were field filtered using a new, disposable 0.45 µm syringe filter. The samples were placed in chilled insulated containers for preservation.

## 1.6 Laboratory

The Environmental Division Melbourne lab of ALS Environmental, analysed the 39 samples collected from the low flow and bailing sampling. ALS follows analytical procedures published by USEPA, APHA, AS, and NEPM. The samples were analysed for a range of contaminants including 8 metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg), Total Recovery Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylene (meta-, para-, ortho-)

Polycyclic aromatic hydrocarbon (PAH), Total Dissolved Solids, cations, anions, PFAS short suite, and nutrients (Nitrate, Nitrite, Ammonia & Total Nitrogen).

As a quality assurance measure, the field team sent one duplicate sample to the laboratory for analysis. The duplicate sample, called BH04_duplicate, was analysed for the same analytes as the original sample. The duplicate was sent with the rest of the samples following fieldwork to check for any discrepancies.

## 1.7 Groundwater Site Investigation Criteria

To ensure the safety of human health and the environment, the groundwater encountered during construction must adhere to specific assessment criteria. These criteria aim to evaluate the likelihood of harm that may result from the contact or disposal of groundwater. The potential interactions with groundwater that could occur during these works include:

- Direct contact with construction workers
- Direct contact with underground infrastructure
- Disposal to trade waste in case of dewatering.

The quality of groundwater in Victoria is protected by the Environment Reference Standard (ERS May 2021). The impact of contaminants on groundwater is assessed in conjunction with the applicable environmental values, which are defined for specific segments of the water environment. For groundwater, these values are based on salinity.

Based on the groundwater analytical results provided in Appendix A, BH07 and BH10 are considered to contain Segment C groundwater, while BH04 is considered to contain Segment D groundwater. Table 1-4 outlines the environmental values associated with Segment C and D groundwater under the Environment Reference (EPA, 2011) and specifies the proposed site assessment criteria (SAC) adopted for protecting it.

**Table 1-4. Environmental values requiring protection at the site, and respective groundwater sites assessment criteria**

| Environmental Value | Adopted site assessment criteria |
|---|---|
| Water dependant ecosystems and species ANZECC Guidelines (ANZG 2018) - Freshwater 95% toxicant DGVs | Water dependant ecosystems and species ANZECC Guidelines (ANZG 2018) - Freshwater 95% toxicant DGVs |
| Potable water supply (acceptable) Not applicable for objectives of investigation | Potable water supply (acceptable) Not applicable for objectives of investigation |
| Potable mineral water supply Not applicable for objectives of investigation | Potable mineral water supply Not applicable for objectives of investigation |
| Agriculture and irrigation (irrigation) Not applicable for objectives of investigation | ANZECC 2000 Stock Watering |
| Industrial and commercial Not applicable for objectives of investigation | Industrial and commercial Not applicable for objectives of investigation |
| Water-based recreation (primary contact) 10 x Australian Drinking Water Guidelines (2018) (as per NEPM | Water-based recreation (primary contact) 10 x Australian Drinking Water Guidelines (2018) (as per NEPM) |
| Traditional Owner cultural values Areas of cultural heritage sensitivity located within development | Traditional Owner cultural values Areas of cultural heritage sensitivity located within development |
| Buildings and structures Australian Standards AS2159-2009 Buildings & Structures | Buildings and structures Australian Standards AS2159-2009 Buildings & Structures |
| Geothermal properties Not applicable for objectives of investigation | Geothermal properties Not applicable for objectives of investigation |

## 1.8 Groundwater Results

### 1.8.1 Groundwater levels

A summary of the water level gauging campaign is summarised in Table 1-5.

**Table 1-5. Summary of groundwater level measurements**

| Bore ID | Gauging date | Groundwater level (m BGL) | Total depth (m BTOC) | Groundwater Level (m AHD) |
|---|---|---|---|---|
| BH04 | 27/04/2023 | 2.512 | 8.210 | 27.328 |
| BH07 | 28/04/2023 | 2.020 | 7.665 | 24.080 |
| BH08 | 28/04/2023 | 1.895 | 7.390 | 15.875 |
| BH09 | 28/04/2023 | - | 7.985 | - |
| BH10 | 27/04/2023 | 2.065 | 7.744 | 10.378 |

### 1.8.2 Slug Testing BH10

BH10 was subjected to both rising and falling head tests, taking 10 and 15 minutes, respectively to complete. The displacement of groundwater during the rising head test is depicted in Figure 1-1. The results of both tests are shown in Figure 1-2 and Figure 1-3, respectively. More data points were available during the early time data, enabling a Bouwer-Rice type curve to be fitted. The range of best-estimate values for the

calculation of hydraulic conductivity (K) is represented by the two horizontal lines on the plot. The estimated average K from the rising head test is 4.6 m/day, while the falling test yielded an estimated average K of 4.4 m/day.

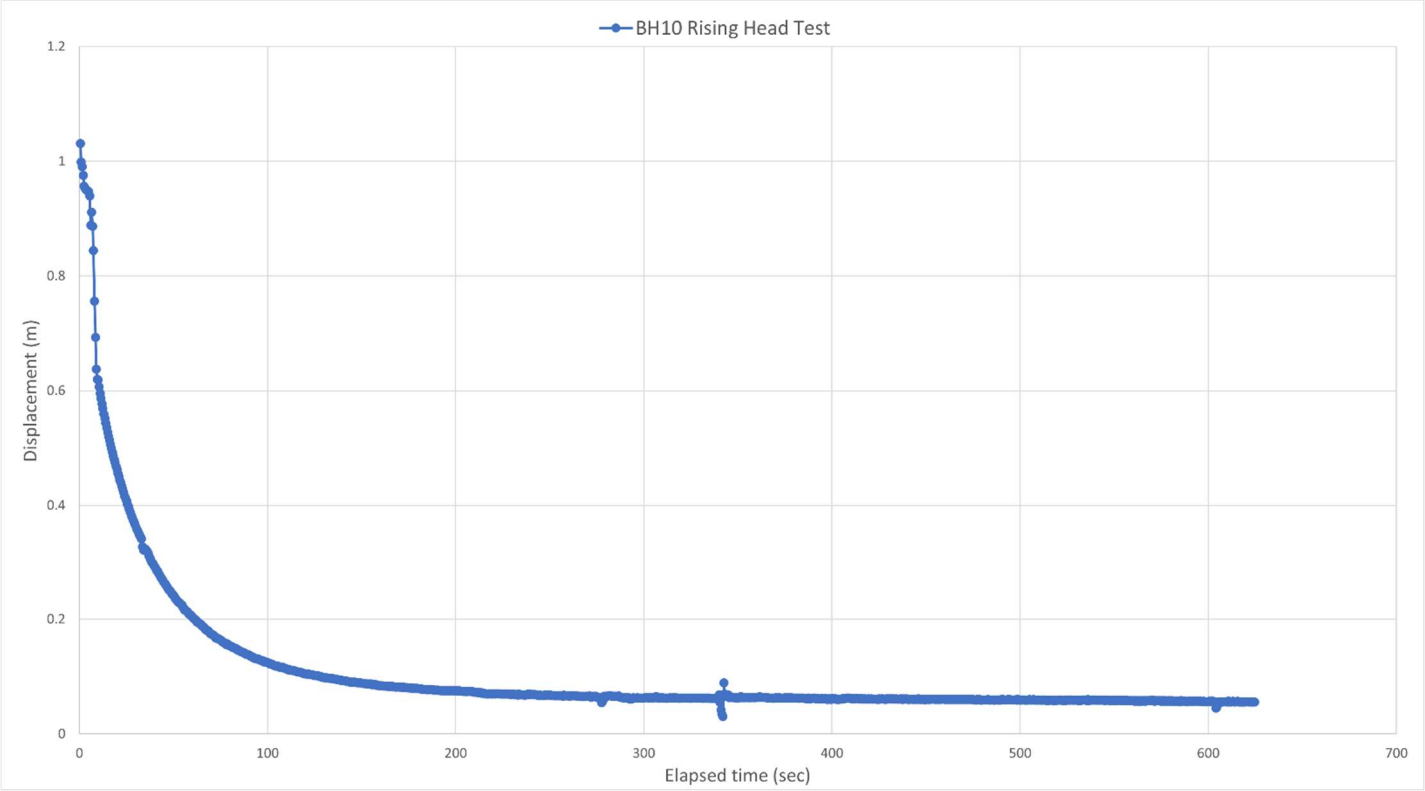
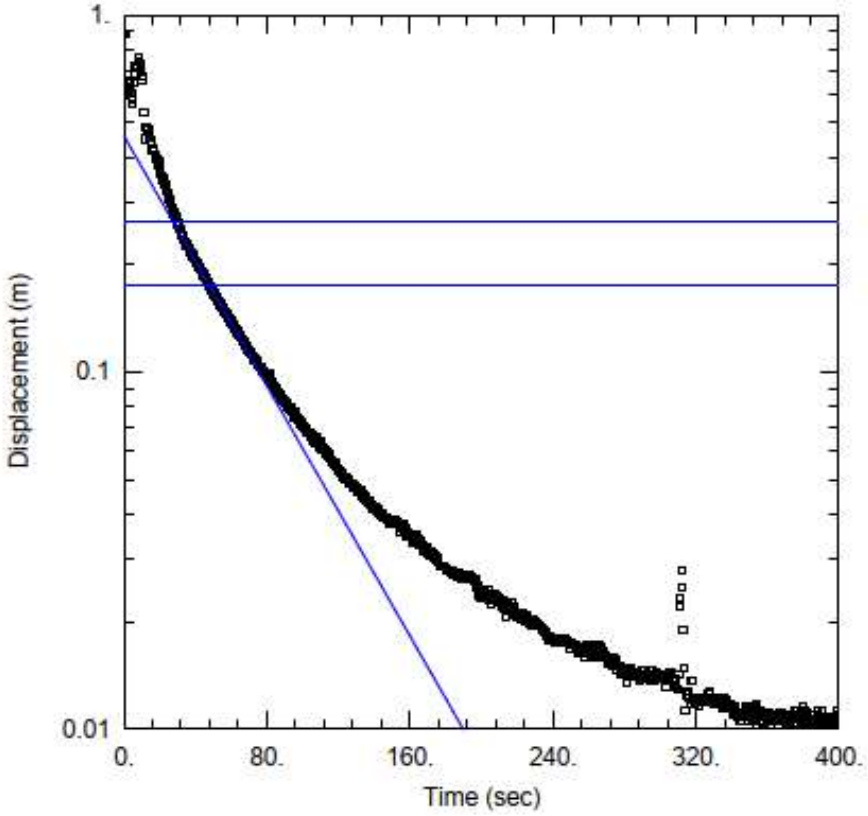



**Figure 1-1. Observed groundwater displacement during BH10 slug test**




WELL TEST ANALYSIS

Data Set: J:\...\BH10_RHT_2.aqt
Date: 05/11/23 Time: 08:05:14

PROJECT INFORMATION

Company: Jacobs
Client: Melbourne Water
Project: IA5000EI
Location: Officer South
Test Well: BH10
Test Date: 28/04/2023

AQUIFER DATA

Saturated Thickness: 5.679 m Anisotropy Ratio (Kz/Kr): 0.1

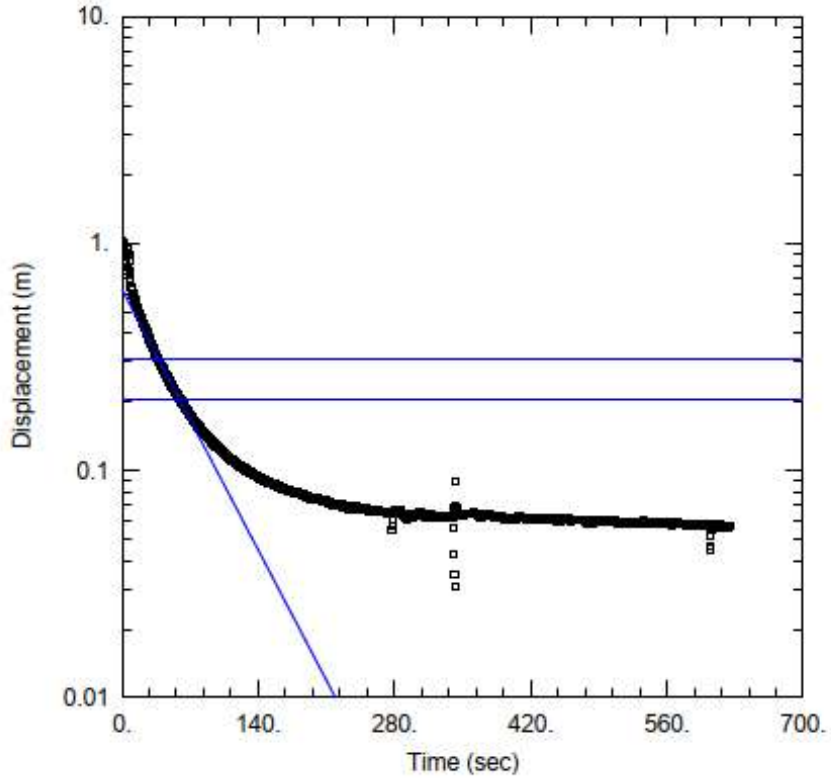
WELL DATA (BH10 RHT)

Initial Displacement: 0.8801 m
Total Well Penetration Depth: 5.935 m
Casing Radius: 0.05 m
Static Water Column Height: 5.679 m
Screen Length: 4. m
Well Radius: 0.1 m
Gravel Pack Porosity: 0.38

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 4.646 m/day y0 = 0.4584 m

**Figure 1-2. Rising Head Test for BH10**




WELL TEST ANALYSIS

Data Set: J:\...\BH10_FHT_2.aqt
Date: 05/11/23 Time: 08:04:36

PROJECT INFORMATION

Company: Jacobs
Client: Melbourne Water
Project: IA5000EI
Location: Officer South
Test Well: BH10
Test Date: 28/04/2023

AQUIFER DATA

Saturated Thickness: 5.679 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH10 FHT)

Initial Displacement: 1.031 m
Total Well Penetration Depth: 5.935 m
Casing Radius: 0.05 m
Static Water Column Height: 5.679 m
Screen Length: 4. m
Well Radius: 0.1 m
Gravel Pack Porosity: 0.38

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 4.35 m/day y0 = 0.6262 m

**Figure 1-3. Falling Head Test for BH10**

### 1.8.3 Slug Testing BH07

A single rising and falling head test were conducted on BH10, each test taking approximately 16 and 17 minutes, respectively to complete. Although there was a minor variation to the scope of works, with the top end of the slug being broken and no manually recorded water level readings taken, this was not considered a failed test as the slug remained below the water table and demonstrated groundwater displacement. The groundwater displacement observed during the rising head test is shown in Figure 1-4.

The results of both the rising and falling head tests are presented in Figure 1-5 and Figure 1-6. The Bouwer-Rice type curve was fitted to a larger number of data points available in the early time data. The two horizontal lines on the plot indicate the range of best-estimate values for the calculation of hydraulic conductivity (K). The average estimated K values from the rising and falling tests are 6.4 m/day and 7.8 m/day, respectively.

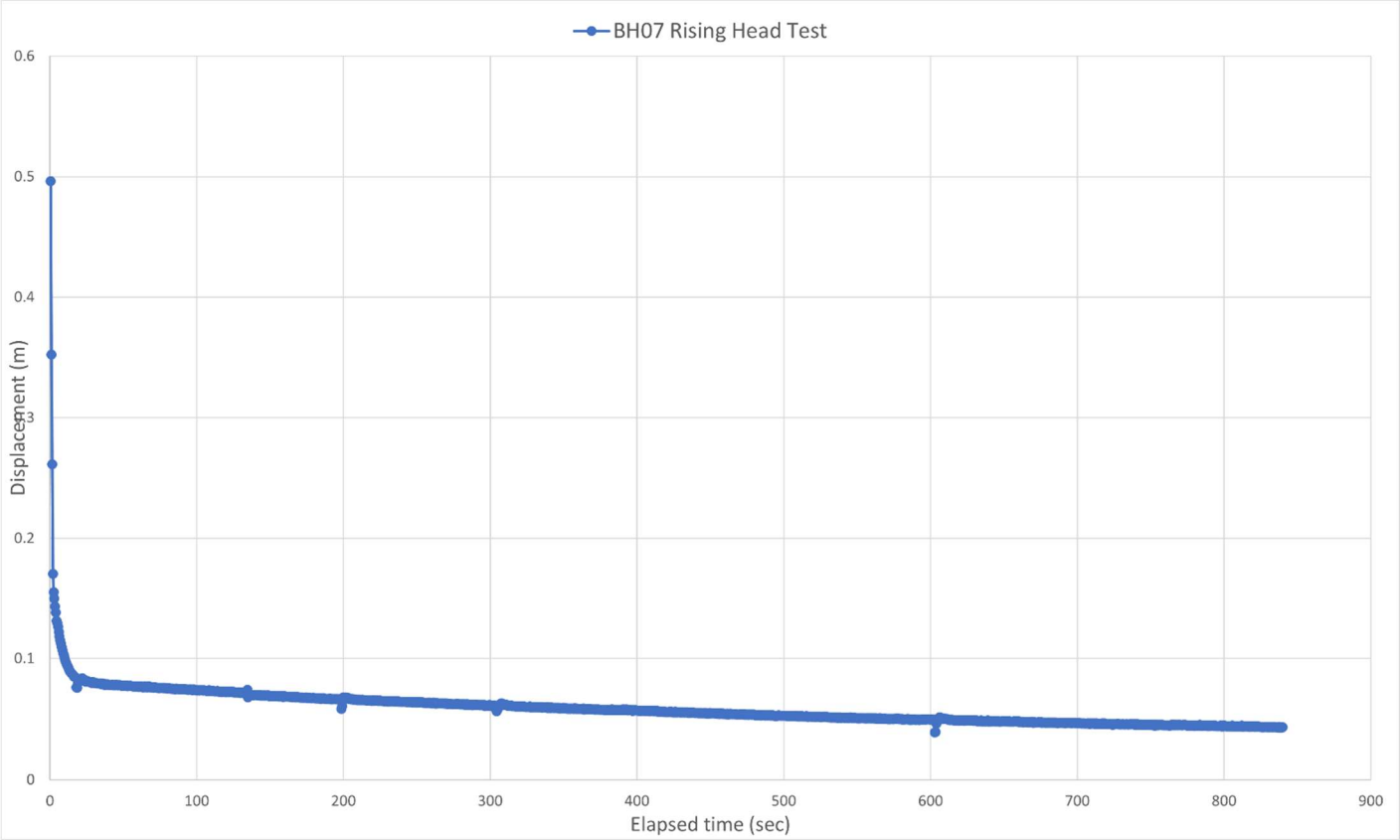
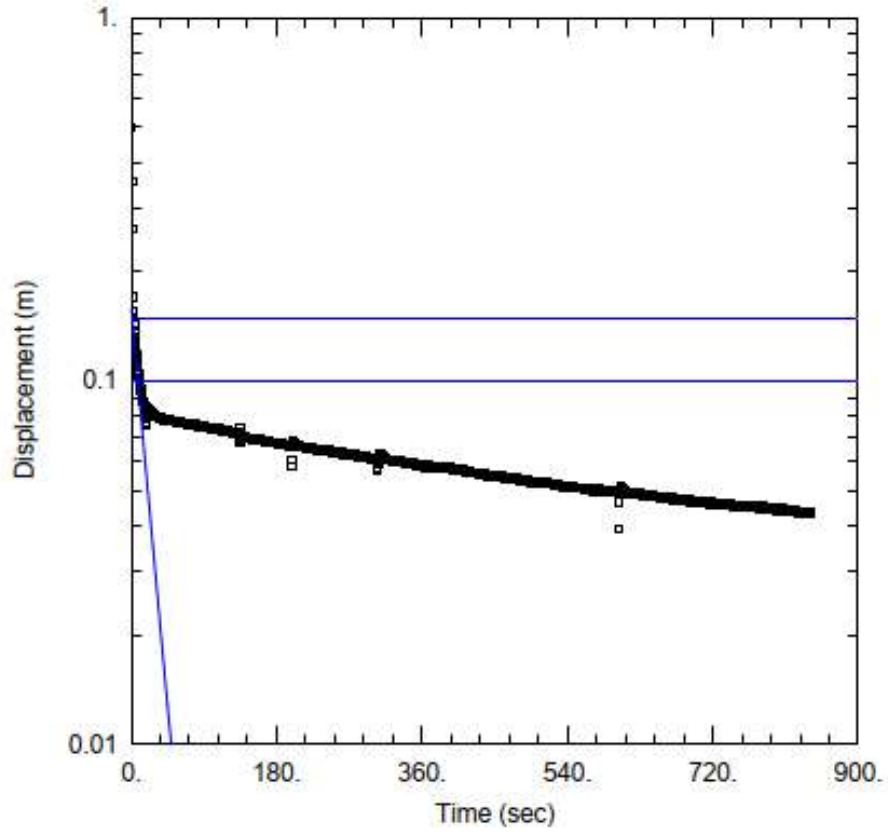



**Figure 1-4. Observed groundwater displacement during BH07 slug test**




WELL TEST ANALYSIS

Data Set: J:\...\BH07_RHT_2.aqt
Date: 05/11/23 Time: 09:15:30

PROJECT INFORMATION

Company: Jacobs
Client: Melbourne Water
Project: IA5000EI
Location: Officer South
Test Well: BH07
Test Date: 28/04/2023

AQUIFER DATA

Saturated Thickness: 0.4963 m Anisotropy Ratio (Kz/Kr): 0.1

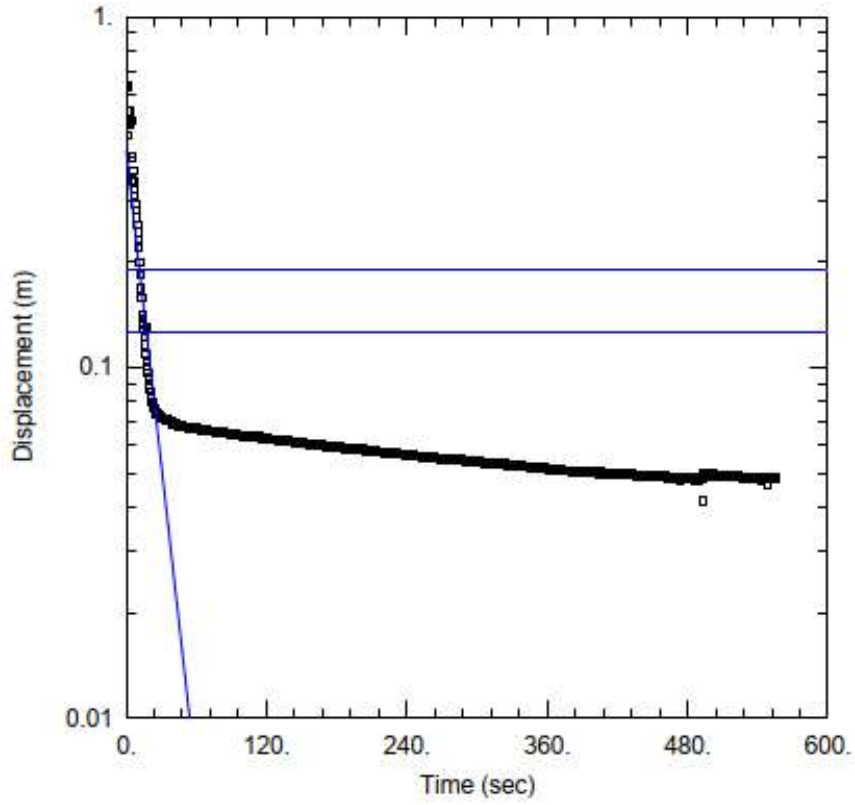
WELL DATA (BH07 RHT)

Initial Displacement: 0.4963 m
Total Well Penetration Depth: 6. m
Casing Radius: 0.05 m
Static Water Column Height: 1. m
Screen Length: 6. m
Well Radius: 0.1 m
Gravel Pack Porosity: 0.34

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 6.374 m/day y0 = 0.1576 m

**Figure 1-5. Rising Head Test for BH07**




WELL TEST ANALYSIS

Data Set: J:\...\BH07_FHT_2.aqt
Date: 05/11/23 Time: 09:15:13

PROJECT INFORMATION

Company: Jacobs
Client: Melbourne Water
Project: IA5000EI
Location: Officer South
Test Well: BH07
Test Date: 28/04/2023

AQUIFER DATA

Saturated Thickness: 5.645 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH07 FHT)

Initial Displacement: 0.631 m
Total Well Penetration Depth: 6. m
Casing Radius: 0.05 m
Static Water Column Height: 5.645 m
Screen Length: 6. m
Well Radius: 0.1 m
Gravel Pack Porosity: 0.34

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 7.82 m/day y0 = 0.4145 m

**Figure 1-6. Falling Head Test for BH07**

### 1.8.4 Slug Testing BH04

A falling and rising head test was performed on BH04, with each test taking approximately 13 and 10 minutes, respectively to complete. Although there was a minor deviation from the scope of works, the top end of the slug was broken, and water level readings were not manually recorded. However, the test was not deemed a failure as the slug remained below the water table and exhibited groundwater displacement. Figure 1-7 illustrates the groundwater displacement observed during the rising head test.

Figure 1-8 and Figure 1-9 display the results of both the rising and falling head tests. The Bouwer-Rice type curve was fitted to a larger number of data points available in the early time data. The two horizontal lines on the plot represent the range of best-estimate values used to calculate hydraulic conductivity (K). The estimated average K values from the rising and falling tests are 5 m/day and 7.5 m/day, respectively.

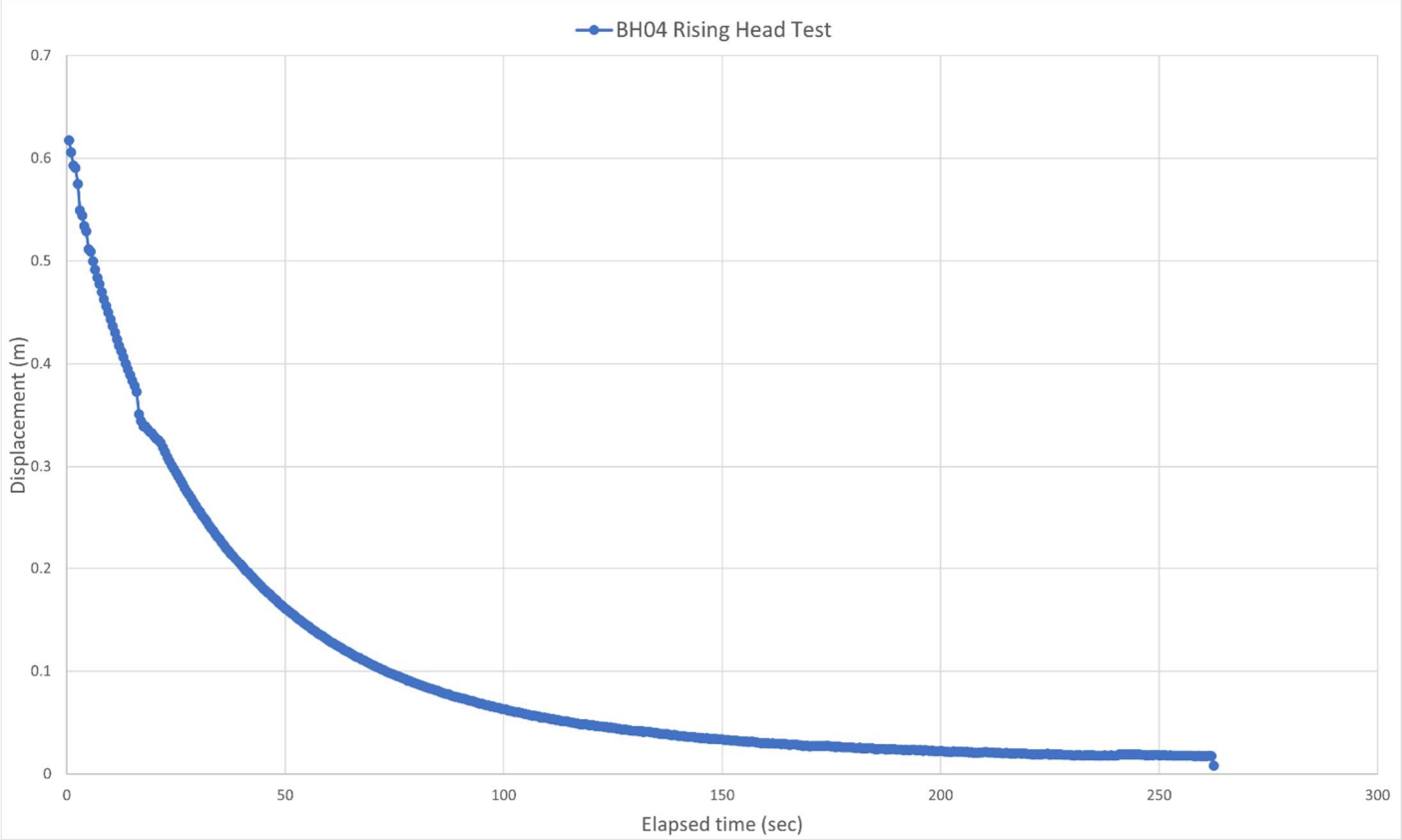
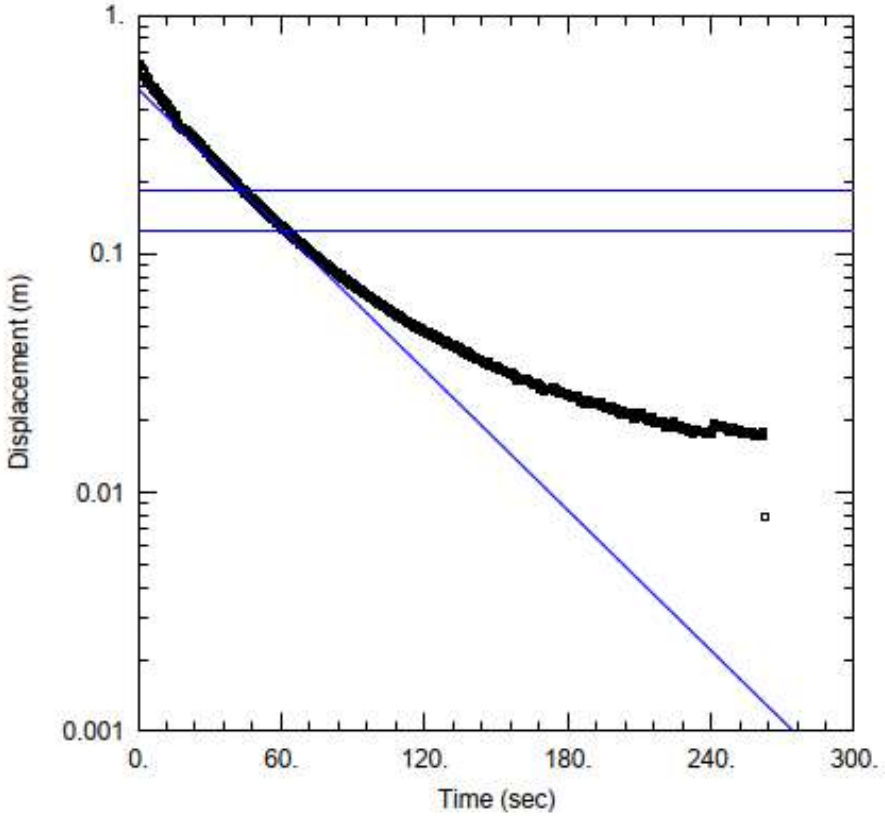



**Figure 1-7. Observed groundwater displacement for BH04 slug test**




WELL TEST ANALYSIS

Data Set: J:\...\BH04_RHT_2.aqt
Date: 05/11/23 Time: 08:14:30

PROJECT INFORMATION

Company: Jacobs
Client: Melbourne Water
Project: IA5000EI
Location: Officer South
Test Well: BH04
Test Date: 28/04/2023

AQUIFER DATA

Saturated Thickness: 5698. m Anisotropy Ratio (Kz/Kr): 0.1

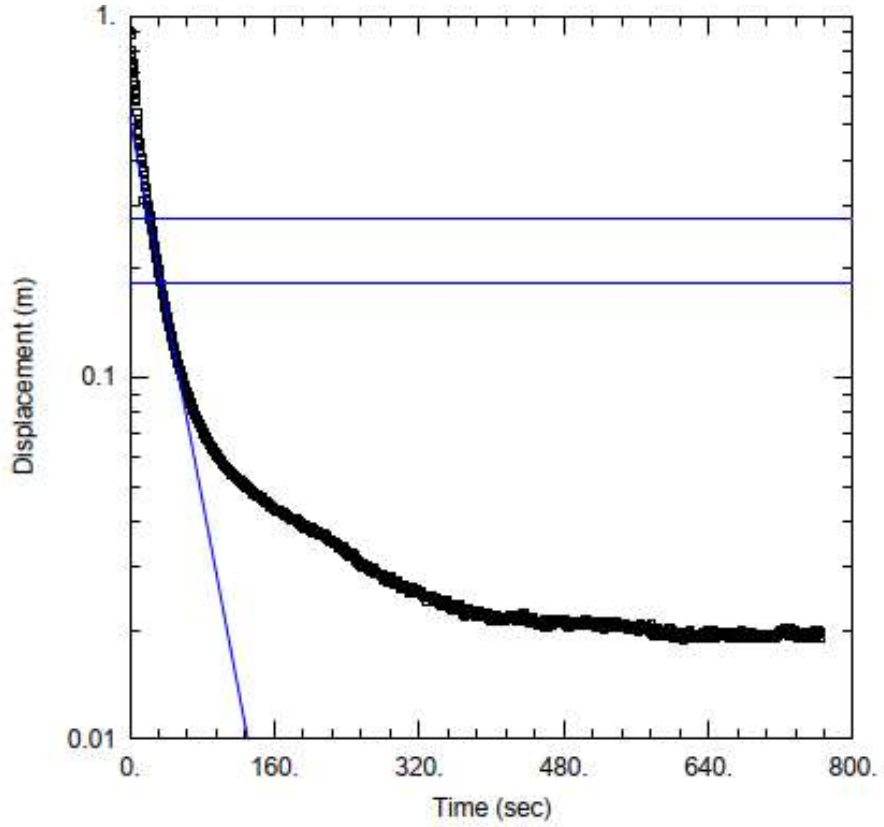
WELL DATA (BH04 RHT)

Initial Displacement: 0.6173 m
Total Well Penetration Depth: 5.488 m
Casing Radius: 0.05 m
Static Water Column Height: 5.698 m
Screen Length: 3.5 m
Well Radius: 0.1 m
Gravel Pack Porosity: 0.38

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 5.021 m/day y0 = 0.4908 m

**Figure 1-8. Rising Head Test for BH04**




WELL TEST ANALYSIS

Data Set: J:\...\BH04_FHT_2.aqt
Date: 05/11/23 Time: 08:14:45

PROJECT INFORMATION

Company: Jacobs
Client: Melbourne Water
Project: IA5000EI
Location: Officer South
Test Well: BH04
Test Date: 28/04/2023

AQUIFER DATA

Saturated Thickness: 5.698 m Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH04 FHT)

Initial Displacement: 0.91 m
Total Well Penetration Depth: 5.488 m
Casing Radius: 0.05 m
Static Water Column Height: 5.698 m
Screen Length: 3.5 m
Well Radius: 0.1 m
Gravel Pack Porosity: 0.38

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 7.449 m/day y0 = 0.5217 m

**Figure 1-9. Falling Head Test for BH04**

### 1.8.5 Summary of slug testing results

The results of the slug testing are included in Table 1-6.

**Table 1-6. Summary of hydraulic conductivity for BH10, BH07 and BH04.**

| Bore ID | Hydraulic Conductivity (Kh) Rising Head Test (m/day) | Hydraulic Conductivity (Kh) Falling Head Test (m/day) |
|---|---|---|
| BH10 | 4.6 | 4.4 |
| BH07 | 6.4 | 7.8 |
| BH04 | 5 | 7.5 |

### 1.8.6 Groundwater Sampling Field Observations

Parameter stabilisation for BH07 was achieved after approximately 23 minutes. Table 1-7 shows the observed groundwater field chemistry parameters during low-flow sampling at stabilisation, with the exception of Redox values which were not obtained during sampling.

**Table 1-7. BH07 low flow sampling parameters**

| Bore ID | EC (mS/cm) | pH (units) | TDS (mg/L) | Temp (°C) | Redox (mV) | Dissolved Oxygen (mg/L) |
|---|---|---|---|---|---|---|
| BH07 | 7429 | 5.9 | 4829.5 | 17.5 | - | 8.1 |

For BH04 and BH10, the necessary stabilisation of parameters were achieved after approximately 41 and 59 minutes, respectively, during bailing. Table 1-8 presents the observed groundwater field chemistry parameters during bailing at stabilisation. During bailing, BH10's dissolved oxygen values did not stabilise, but the results were still within an acceptable limit of 13% after an appropriate time had passed.

**Table 1-8. BH04 and BH10 bailer sampling parameters**

| Bore ID | EC (mS/cm) | pH (units) | TDS (mg/L) | Temp (°C) | Redox (mV) | Dissolved Oxygen (mg/L) |
|---|---|---|---|---|---|---|
| BH04 | 9650 | 6.0 | 6259.5 | 16.6 | 49.6 | 2.8 |
| BH10 | 7271 | 6.1 | 4725.5 | 16.6 | 46.7 | 3.1 |

### 1.8.7 Summary of Analytical Results

A summary of groundwater analytical results is provided in Appendix A. The certificates of analysis are provided in Appendix B.

The results show:

- Detectable concentrations of heavy metals (arsenic, copper, magnesium, nickel, and zinc) and nutrients.
- Exceedances above the adopted screening criteria for protecting freshwater ecosystems were reported for copper and zinc in all boreholes, and for nickel in BH07.
- Exceedances above the adopted screening criteria for ANZECC stock watering were reported for sodium in all boreholes.
- PFAS was not detected in the samples screened.
- No other exceedances were detected for the other analytical parameters.

# Appendix A. Analytical Results

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Monitoring Zone | | | | | | | |
| | | | | | | | | Location Code | BH04 | BH04 | BH04 | BH07 | BH07 | BH10 | BH10 |
| | | | | | | | | Location Description | | | | | | | |
| | | | | | | | | Field ID | BH04_270423 | BH04_270423_QAQC | BH04_duplicate | BH07_260423 | BH07_260423_QAQC | BH10_270423 | BH10_270423_QAQC |
| | | | | | | | | Location Type | Borehole | Borehole | Borehole | Borehole | Borehole | Borehole | Borehole |
| | | | | | | | | Date | 27 Apr 2023 | 27 Apr 2023 | 27 Apr 2023 | 26 Apr 2023 | 26 Apr 2023 | 27 Apr 2023 | 27 Apr 2023 |
| | | | | | | | | Depth | | | | | | | |
| | | | | | | | | Lab Report Number | EM2307410 | EM2307410 | EM2307410 | EM2307410 | EM2307410 | EM2307410 | EM2307410 |
| | | | | | | | | Sample Type | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | | Unit | EQL | PFAS NEMP 2020 Table 1 Recreational Water | PFAS NEMP 2020 Table 5 Freshwater 99% | **ADWG 2018 Health x 10 (Adjusted for recreational screening)** | **ANZECC 2000 Stock Watering** | **AS2159-2009 Piling – Design and Installation (Buildings & Structures)** | ANZG (2018) Freshwater 95% toxicant DGVs | | | | | | |
| NA | | | | | | | | | | | | | | | |
| | Naphthalene (value used in F2 calc) | µg/L | | | | | | | | <5 | - | <5 | <5 | - | <5 | - |
| Metals | | | | | | | | | | | | | | | |
| | Aluminium | µg/L | 10 | | | | **5,000** | | 55[#10] | - | - | - | - | - | - | - |
| | Antimony | µg/L | 1 | | | **30**[#1] | | | | - | - | - | - | - | - | - |
| | Arsenic | µg/L | 1 | | | **100**[#1] | **500** | | | - | - | - | - | - | - | - |
| | Arsenic (filtered) | µg/L | 1 | | | **100**[#1] | **500** | | | **1** | - | <1 | **3** | - | **1** | - |
| | Barium | µg/L | 1 | | | **20,000**[#1] | | | | - | - | - | - | - | - | - |
| | Barium (filtered) | µg/L | 1 | | | **20,000**[#1] | | | | - | - | - | - | - | - | - |
| | Beryllium | µg/L | 1 | | | **600**[#1] | | | | - | - | - | - | - | - | - |
| | Beryllium (filtered) | µg/L | 1 | | | **600**[#1] | | | | - | - | - | - | - | - | - |
| | Boron | µg/L | 50 | | | **40,000**[#1] | **5,000** | | 370[#11] | - | - | - | - | - | - | - |
| | Boron (filtered) | µg/L | 50 | | | **40,000**[#1] | **5,000** | | 370[#11] | - | - | - | - | - | - | - |
| | Cadmium | µg/L | 0.1 | | | **20**[#1] | **10** | | 0.2[#12] | - | - | - | - | - | - | - |
| | Cadmium (filtered) | µg/L | 0.1 | | | **20**[#1] | **10** | | 0.2[#12] | <0.1 | - | <0.1 | <0.1 | - | <0.1 | - |
| | Chromium (III+VI) | µg/L | 1 | | | | **1,000** | | | - | - | - | - | - | - | - |
| | Chromium (III+VI) (filtered) | µg/L | 1 | | | | **1,000** | | | <1 | - | <1 | <1 | - | <1 | - |
| | Cobalt | µg/L | 1 | | | | **1,000** | | | - | - | - | - | - | - | - |
| | Cobalt (filtered) | µg/L | 1 | | | | **1,000** | | | - | - | - | - | - | - | - |
| | Copper | µg/L | 1 | | | **20,000**[#1] | **1,000**[#8] | | 1.4[#12] | - | - | - | - | - | - | - |
| | Copper (filtered) | µg/L | 1 | | | **20,000**[#1] | **1,000**[#8] | | 1.4[#12] | **2** | - | **2** | **2** | - | **2** | - |
| | Iron | µg/L | 50 | | | | | | | - | - | - | - | - | - | - |
| | Lead | µg/L | 1 | | | **100**[#1] | **100** | | 3.4[#10] | - | - | - | - | - | - | - |
| | Lead (filtered) | µg/L | 1 | | | **100**[#1] | **100** | | 3.4[#10] | <1 | - | <1 | <1 | - | <1 | - |
| | Magnesium (filtered) | µg/L | 1,000 | | | | | | | **232,000** | - | **234,000** | **152,000** | - | **208,000** | - |
| | Manganese | µg/L | 1 | | | **5,000**[#1] | | | 1,900[#13] | - | - | - | - | - | - | - |
| | Manganese (filtered) | µg/L | 1 | | | **5,000**[#1] | | | 1,900[#13] | - | - | - | - | - | - | - |
| | Mercury | µg/L | 0.1 | | | **10**[#1] | **2** | | 0.6[#14] | - | - | - | - | - | - | - |
| | Mercury (filtered) | µg/L | 0.1 | | | **10**[#1] | **2** | | 0.6[#14] | <0.1 | - | <0.1 | <0.1 | - | <0.1 | - |
| | Molybdenum | µg/L | 1 | | | **500**[#1] | **150** | | | - | - | - | - | - | - | - |
| | Nickel | µg/L | 1 | | | **200**[#1] | **1,000** | | 11[#14] | - | - | - | - | - | - | - |
| | Nickel (filtered) | µg/L | 1 | | | **200**[#1] | **1,000** | | 11[#14] | **9** | - | **9** | **53** | - | **7** | - |
| | Selenium | µg/L | 10 | | | **100**[#1] | **20** | | 11[#14] | - | - | - | - | - | - | - |
| | Selenium (filtered) | µg/L | 10 | | | **100**[#1] | **20** | | 11[#14] | - | - | - | - | - | - | - |
| | Silver | µg/L | 1 | | | **1,000**[#1] | | | 0.05[#14] | - | - | - | - | - | - | - |
| | Tin | µg/L | 1 | | | | | | | - | - | - | - | - | - | - |
| | Vanadium | µg/L | 10 | | | | | | | - | - | - | - | - | - | - |
| | Vanadium (filtered) | µg/L | 10 | | | | | | | - | - | - | - | - | - | - |
| | Zinc | µg/L | 5 | | | | **20,000** | | 8[#15] | - | - | - | - | - | - | - |
| | Zinc (filtered) | µg/L | 5 | | | | **20,000** | | 8[#15] | **28** | - | **34** | **97** | - | **37** | - |
| Inorganics | | | | | | | | | | | | | | | | |
| | Phosphate total (as P) | MG/L | 0.01 | | | | | | | **0.10** | - | **0.08** | **0.02** | - | **0.08** | - |
| | | MG/L | 0.01 | | | | | | | **0.10** | - | **0.08** | **0.02** | - | **0.08** | - |
| | Soluble Carbonate as CaCO3* | mg/L | 1 | | | | | | | <1 | - | <1 | <1 | - | <1 | - |
| | Alkalinity (Hydroxide) as CaCO3 | mg/L | 1 | | | | | | | <1 | - | <1 | <1 | - | <1 | - |
| | Alkalinity (total) as CaCO3 | mg/L | 1 | | | | | | | **105** | - | **104** | **89** | - | **130** | - |
| | Ammonia as N | mg/L | 0.01 | | | | | | 0.9[#16] | <0.01 | - | <0.01 | <0.01 | - | <0.02[#17] | - |
| | Anions Total | meq/L | 0.01 | | | | | | | **99.0** | - | **98.4** | **73.1** | - | **74.1** | - |
| | | meq/L | 0.01 | | | | | | | **99.0** | - | **98.4** | **73.1** | - | **74.1** | - |
| | Bicarbonate Alkalinity as CaCO3 | mg/L | 1 | | | | | | | **105** | - | **104** | **89** | - | **130** | - |
| | Calcium (filtered) | mg/L | 1 | | | | | | | **58** | - | **58** | **58** | - | **62** | - |
| | Cations Total | meq/L | 0.01 | | | | | | | **91.3** | - | **91.9** | **68.5** | - | **68.2** | - |
| | | meq/L | 0.01 | | | | | | | **91.3** | - | **91.9** | **68.5** | - | **68.2** | - |
| | Chloride | mg/L | 1 | | | | | **6,000** | | **3,340** | - | **3,320** | **2,440** | - | **2,440** | - |
| | Ionic Balance | % | 0.01 | | | | | | | **4.05** | - | **3.43** | **3.22** | - | **4.12** | - |
| | | % | 0.01 | | | | | | | **4.05** | - | **3.43** | **3.22** | - | **4.12** | - |
| | Kjeldahl Nitrogen Total | mg/L | 0.1 | | | | | | | **0.2** | - | **0.3** | **0.7** | - | **0.8** | - |
| | Nitrate & Nitrite (as N) | mg/L | 0.01 | | | | | | | **0.03** | - | **0.02** | **0.07** | - | **0.01** | - |
| | Nitrate (as N) | mg/L | 0.01 | | | **112.9**[#2] | | | | **0.03** | - | **0.02** | **0.07** | - | **0.01** | - |
| | Nitrite (as N) | mg/L | 0.01 | | | **9.1**[#3] | | | | <0.01 | - | <0.01 | <0.01 | - | <0.01 | - |
| | Nitrogen (Total) | mg/L | 0.1 | | | | | | | **0.2** | - | **0.3** | **0.8** | - | **0.8** | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Monitoring Zone** | | | | | | | | | | | | | | | |
| **Location Code** | | | | | | | | | BH04 | BH04 | BH04 | BH07 | BH07 | BH10 | BH10 |
| **Location Description** | | | | | | | | | | | | | | | |
| **Field ID** | | | | | | | | | BH04_270423 | BH04_270423_QAQC | BH04_duplicate | BH07_260423 | BH07_260423_QAQC | BH10_270423 | BH10_270423_QAQC |
| **Location Type** | | | | | | | | | Borehole | Borehole | Borehole | Borehole | Borehole | Borehole | Borehole |
| **Date** | | | | | | | | | 27 Apr 2023 | 27 Apr 2023 | 27 Apr 2023 | 26 Apr 2023 | 26 Apr 2023 | 27 Apr 2023 | 27 Apr 2023 |
| **Depth** | | | | | | | | | | | | | | | |
| **Lab Report Number** | | | | | | | | | EM2307410 | EM2307410 | EM2307410 | EM2307410 | EM2307410 | EM2307410 | EM2307410 |
| **Sample Type** | | | | | | | | | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| | | Unit | EQL | PFAS NEMP 2020 Table 1 Recreational Water | PFAS NEMP 2020 Table 5 Freshwater 99% | **ADWG 2018 Health x 10 (Adjusted for recreational screening)** | **ANZECC 2000 Stock Watering** | **AS2159-2009 Piling – Design and Installation (Buildings & Structures)** | ANZG (2018) Freshwater 95% toxicant DGVs | | | | | | |
| | Potassium (filtered) | mg/L | 1 | | | | | | | **7** | - | **7** | **3** | - | **6** | - |
| | Sodium (filtered) | mg/L | 1 | | | | **230**[#9] | | | **1,590** | - | **1,600** | **1,220** | - | **1,100** | - |
| | Sulfate as SO4 - Turbidimetric (filtered) | mg/L | 1 | | | | | | | **131** | - | **131** | **120** | - | **127** | - |
| | Total Dissolved Solids | mg/L | 10 | | | | | | | **5,900** | - | **6,160** | **4,920** | - | **5,150** | - |
| TRH - NEPM 2013 Fractions | | | | | | | | | | | | | | | | |
| | TRH >C6 - C10 | µg/L | 20 | | | | | | | <20 | - | <20 | <20 | - | <20 | - |
| | TRH >C10 - C16 | µg/L | 100 | | | | | | | <100 | - | <100 | <100 | - | <100 | - |
| | TRH >C16 - C34 | µg/L | 100 | | | | | | | <100 | - | <100 | <100 | - | <100 | - |
| | TRH >C34 - C40 | µg/L | 100 | | | | | | | <100 | - | <100 | <100 | - | <100 | - |
| | TRH >C10 - C40 (Sum of total) | µg/L | 100 | | | | | | | <100 | - | <100 | <100 | - | <100 | - |
| | TRH >C6 - C10 less BTEX (F1) | µg/L | 20 | | | | | | | <20 | - | <20 | <20 | - | <20 | - |
| | TRH >C10 - C16 less Naphthalene (F2) | µg/L | 100 | | | | | | | <100 | - | <100 | <100 | - | <100 | - |
| TPH - NEPM 1999 Fractions | | | | | | | | | | | | | | | | |
| | TPH C6 - C9 | µg/L | 20 | | | | | | | <20 | - | <20 | <20 | - | <20 | - |
| | TPH C10 - C14 | µg/L | 50 | | | | | | | <50 | - | <50 | <50 | - | <50 | - |
| | TPH C15 - C28 | µg/L | 100 | | | | | | | <100 | - | <100 | <100 | - | <100 | - |
| | TPH C29-C36 | µg/L | 50 | | | | | | | <50 | - | <50 | <50 | - | <50 | - |
| | TPH C10 - C36 (Sum of total) | µg/L | 50 | | | | | | | <50 | - | <50 | <50 | - | <50 | - |
| BTEXN | | | | | | | | | | | | | | | | |
| | Benzene | µg/L | 1 | | | | | | 950[#10] | <1 | - | <1 | <1 | - | <1 | - |
| lic aromatic hydrocarbons (PAHs) | | | | | | | | | | | | | | | | |
| | Acenaphthene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Acenaphthylene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Anthracene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Benz(a)anthracene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Benzo(k)fluoranthene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Benzo(b+j)fluoranthene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Benzo(g,h,i)perylene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Benzo(a) pyrene | µg/L | 0.5 | | | | | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| | Benzo(a)pyrene TEQ calc (zero) | µg/L | 0.5 | | | | | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| | Chrysene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Dibenz(a,h)anthracene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Fluoranthene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Fluorene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Indeno(1,2,3-c,d)pyrene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Phenanthrene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Pyrene | µg/L | 1 | | | | | | | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | Naphthalene | µg/L | 1 | | | | | | 16[#14] | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | PAHs (Sum of total) | µg/L | 0.5 | | | | | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| lic Aromatic Hydrocarbons (MAHs) | | | | | | | | | | | | | | | | |
| | Toluene | µg/L | 2 | | | | | | | <2 | - | <2 | <2 | - | <2 | - |
| | Ethylbenzene | µg/L | 2 | | | | | | | <2 | - | <2 | <2 | - | <2 | - |
| | Xylene (m & p) | µg/L | 2 | | | | | | | <2 | - | <2 | <2 | - | <2 | - |
| | Xylene (o) | µg/L | 2 | | | | | | 350[#14] | <2 | - | <2 | <2 | - | <2 | - |
| | Xylene Total | µg/L | 2 | | | | | | | <2 | - | <2 | <2 | - | <2 | - |
| | Total BTEX | µg/L | 1 | | | | | | | <1 | - | <1 | <1 | - | <1 | - |
| Poly-fluoroalkyl Substances (PFAS) | | | | | | | | | | | | | | | | |
| | Perfluorooctanesulfonic acid (PFOS) | µg/L | 0.01 | | 0.00023 | | | | | <0.01 | <0.01 | <0.01 | <0.01 | - | <0.01 | <0.01 |
| | Perfluorooctanoic acid (PFOA) | µg/L | 0.01 | 10 | 19 | | | | | <0.01 | <0.01 | <0.01 | <0.01 | - | <0.01 | <0.01 |
| | Perfluoro-n-pentanoic acid (PFPeA) | µg/L | 0.02 | | | | | | | <0.02 | <0.02 | <0.02 | <0.02 | - | <0.02 | <0.02 |
| | Perfluorohexanoic acid (PFHxA) | µg/L | 0.02 | | | | | | | <0.02 | <0.02 | <0.02 | <0.02 | - | <0.02 | <0.02 |
| | Perfluorohexanesulfonic acid (PFHxS) | µg/L | 0.01 | | | | | | | <0.01 | <0.01 | <0.01 | <0.01 | - | <0.01 | <0.01 |
| | Perfluoroheptanoic acid (PFHpA) | µg/L | 0.02 | | | | | | | <0.02 | <0.02 | <0.02 | <0.02 | - | <0.02 | <0.02 |
| | Perfluorobutanesulfonic acid (PFBS) | µg/L | 0.02 | | | | | | | <0.02 | <0.02 | <0.02 | <0.02 | - | <0.02 | <0.02 |
| | Perfluorobutanoic acid (PFBA) | µg/L | 0.1 | | | | | | | <0.1 | <0.1 | <0.1 | <0.1 | - | <0.1 | <0.1 |
| | Sum (PFHxS + PFOS) | µg/L | 0.01 | 2 | | | | | | <0.01 | <0.01 | <0.01 | <0.01 | - | <0.01 | <0.01 |
| ) Fluorotelomer Sulfonic Acids | | | | | | | | | | | | | | | | |
| | 4:2 Fluorotelomer sulfonic acid (4:2 FTS) | µg/L | 0.05 | | | | | | | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 |
| | 6:2 Fluorotelomer sulfonic acid (6:2 FTS) | µg/L | 0.05 | | | | | | | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 |

| | Unit | EQL | PFAS NEMP 2020 Table 1 Recreational Water | PFAS NEMP 2020 Table 5 Freshwater 99% | ADWG 2018 Health x 10 (Adjusted for recreational screening) | ANZECC 2000 Stock Watering | AS2159-2009 Piling – Design and Installation (Buildings & Structures) | ANZG (2018) Freshwater 95% toxicant DGVs | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Monitoring Zone** | | | | | | | | | | | | | | |
| **Location Code** | | | | | | | | | BH04 | BH04 | BH04 | BH07 | BH07 | BH10 | BH10 |
| **Location Description** | | | | | | | | | | | | | | | |
| **Field ID** | | | | | | | | | BH04_270423 | BH04_270423_QAQC | BH04_duplicate | BH07_260423 | BH07_260423_QAQC | BH10_270423 | BH10_270423_QAQC |
| **Location Type** | | | | | | | | | Borehole | Borehole | Borehole | Borehole | Borehole | Borehole | Borehole |
| **Date** | | | | | | | | | 27 Apr 2023 | 27 Apr 2023 | 27 Apr 2023 | 26 Apr 2023 | 26 Apr 2023 | 27 Apr 2023 | 27 Apr 2023 |
| **Depth** | | | | | | | | | | | | | | | |
| **Lab Report Number** | | | | | | | | | EM2307410 | EM2307410 | EM2307410 | EM2307410 | EM2307410 | EM2307410 | EM2307410 |
| **Sample Type** | | | | | | | | | Normal | Normal | Normal | Normal | Normal | Normal | Normal |
| 8:2 Fluorotelomer sulfonic acid (8:2 FTS) | µg/L | 0.05 | | | | | | | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 |
| 10:2 Fluorotelomer sulfonic acid (10:2 FTS) | µg/L | 0.05 | | | | | | | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 |

**Comments**

ria, as per Guidelines for managing risk in recreational waters (NHMRC, 2008)
for managing risk in recreational waters (NHMRC, 2008). Converted from Nitrate as NO3 (50 mg/L)
s for managing risk in recreational waters (NHMRC, 2008). Converted from Nitrite as NO2 (3 mg/L)
nverted from 400 mg/L nitrate
y in sensitive crops (e.g. almond, apricot, citrus, grape & plum)
converted from 30 mg/L nitrite
tle. Other values available for specific livestock.
rigget value for cattle adopted
adopted. Specific values available for other tolerance levels.
#10 Moderate reliability
ental chronic values or geometric mean for species). Check toxicant DGV technical brief for spread of data and its significance.
#12 Very high reliability
rimental chronic values or geometric mean for species). Check toxicant DGV technical brief for spread of data and its significance.
#14 Low reliability
#15 High reliability
protect key test species from chronic toxicity (this refers to experimental chronic values or geometric mean for species).
te LOR is higher than Requested Analyte LOR

**Environmental Standards**

, PFAS NEMP 2020 Table 1 Recreational Water
0, PFAS NEMP 2020 Table 5 Freshwater 99%
r 2000, ANZECC 2000 Irrigation Short-Term
r 2000, ANZECC 2000 Irrigation Long-Term
ber 2000, ANZECC 2000 Stock Watering
-2009 Piling – Design and Installation (Buildings & Structures)
IZG (2018) Freshwater 95% toxicant DGVs

# Appendix B. Laboratory Documentation

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **EM2307410** | Page | : 1 of 11 |
| Client | : **JACOBS GROUP(AUSTRALIA)PTY LTD** | Laboratory | : Environmental Division Melbourne |
| Contact | : STEPHEN SONNENBERG | Contact | : Peter Ravlic |
| Address | : PO BOX 312 FLINDERS LANE MELBOURNE VIC AUSTRALIA 8009 | Address | : 4 Westall Rd Springvale VIC Australia 3171 |
| Telephone | : ---- | Telephone | : +6138549 9645 |
| Project | : IA500EI | Date Samples Received | : 28-Apr-2023 07:35 |
| Order number | : IA500EI | Date Analysis Commenced | : 28-Apr-2023 |
| C-O-C number | : ---- | Issue Date | : 03-May-2023 17:58 |
| Sampler | : NU | | |
| Site | : | | |
| Quote number | : MEBQ/003/21 - Vic Only - Primary Work | | |
| No. of samples received | : 7 | | |
| No. of samples analysed | : 7 | | |

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

## *Signatories*

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Arenie Vijayaratnam | Senior Inorganic Chemist | Melbourne Inorganics, Springvale, VIC |
| Dilani Fernando | Laboratory Coordinator | Melbourne Inorganics, Springvale, VIC |
| Jarwis Nheu | Non-Metals Team Leader | Melbourne Inorganics, Springvale, VIC |
| Nancy Wang | 2IC Organic Chemist | Melbourne Organics, Springvale, VIC |

## General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- EK055G: EM2307410 #3 Poor matrix spike recovery for Ammonia as N due to sample matrix. Confirmed by re-extraction and re-analysis.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Sample ID | BH07_260423 | BH07_260423_QAQC | BH10_270423 | BH10_270423_QAQC | BH04_270423 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 26-Apr-2023 00:00 | 26-Apr-2023 00:00 | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 |
| Compound | CAS Number | LOR | Unit | | EM2307410-001 | EM2307410-002 | EM2307410-003 | EM2307410-004 | EM2307410-005 |
| | | | | | Result | Result | Result | Result | Result |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | | **4920** | ---- | **5150** | ---- | **5900** |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | | <1 | ---- | <1 | ---- | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | | <1 | ---- | <1 | ---- | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | | **89** | ---- | **130** | ---- | **105** |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | | **89** | ---- | **130** | ---- | **105** |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | | **120** | ---- | **127** | ---- | **131** |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | | **2440** | ---- | **2440** | ---- | **3340** |
| **ED093F: Dissolved Major Cations** | | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | | **58** | ---- | **62** | ---- | **58** |
| Magnesium | 7439-95-4 | 1 | mg/L | | **152** | ---- | **208** | ---- | **232** |
| Sodium | 7440-23-5 | 1 | mg/L | | **1220** | ---- | **1100** | ---- | **1590** |
| Potassium | 7440-09-7 | 1 | mg/L | | **3** | ---- | **6** | ---- | **7** |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | | |
| Arsenic | 7440-38-2 | 0.001 | mg/L | | **0.003** | ---- | **0.001** | ---- | **0.001** |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | | <0.0001 | ---- | <0.0001 | ---- | <0.0001 |
| Chromium | 7440-47-3 | 0.001 | mg/L | | <0.001 | ---- | <0.001 | ---- | <0.001 |
| Copper | 7440-50-8 | 0.001 | mg/L | | **0.002** | ---- | **0.002** | ---- | **0.002** |
| Nickel | 7440-02-0 | 0.001 | mg/L | | **0.053** | ---- | **0.007** | ---- | **0.009** |
| Lead | 7439-92-1 | 0.001 | mg/L | | <0.001 | ---- | <0.001 | ---- | <0.001 |
| Zinc | 7440-66-6 | 0.005 | mg/L | | **0.097** | ---- | **0.037** | ---- | **0.028** |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | | <0.0001 | ---- | <0.0001 | ---- | <0.0001 |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | | <0.01 | ---- | <0.02 | ---- | <0.01 |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | | |
| Nitrite as N | 14797-65-0 | 0.01 | mg/L | | <0.01 | ---- | <0.01 | ---- | <0.01 |
| **EK058G: Nitrate as N by Discrete Analyser** | | | | | | | | | |
| Nitrate as N | 14797-55-8 | 0.01 | mg/L | | **0.07** | ---- | **0.01** | ---- | **0.03** |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | | **0.07** | ---- | **0.01** | ---- | **0.03** |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Sample ID | BH07_260423 | BH07_260423_QAQC | BH10_270423 | BH10_270423_QAQC | BH04_270423 |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 26-Apr-2023 00:00 | 26-Apr-2023 00:00 | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 |
| Compound | CAS Number | LOR | Unit | EM2307410-001 | EM2307410-002 | EM2307410-003 | EM2307410-004 | EM2307410-005 |
| | | | | Result | Result | Result | Result | Result |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | **0.7** | **----** | **0.8** | **----** | **0.2** |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | **0.8** | **----** | **0.8** | **----** | **0.2** |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | **0.02** | **----** | **0.08** | **----** | **0.10** |
| **EN055: Ionic Balance** | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | **73.1** | **----** | **74.1** | **----** | **99.0** |
| ø Total Cations | ---- | 0.01 | meq/L | **68.5** | **----** | **68.2** | **----** | **91.3** |
| ø Ionic Balance | ---- | 0.01 | % | **3.22** | **----** | **4.12** | **----** | **4.05** |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons** | | | | | | | | |
| Naphthalene | 91-20-3 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Acenaphthylene | 208-96-8 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Acenaphthene | 83-32-9 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Fluorene | 86-73-7 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Phenanthrene | 85-01-8 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Anthracene | 120-12-7 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Fluoranthene | 206-44-0 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Pyrene | 129-00-0 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benz(a)anthracene | 56-55-3 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Chrysene | 218-01-9 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzo(b+j)fluoranthene | 205-99-2 205-82-3 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzo(k)fluoranthene | 207-08-9 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzo(a)pyrene | 50-32-8 | 0.5 | µg/L | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Indeno(1.2.3.cd)pyrene | 193-39-5 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Dibenz(a.h)anthracene | 53-70-3 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzo(g.h.i)perylene | 191-24-2 | 1.0 | µg/L | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| ^ Sum of polycyclic aromatic hydrocarbons | ---- | 0.5 | µg/L | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| ^ Benzo(a)pyrene TEQ (zero) | ---- | 0.5 | µg/L | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **EP080/071: Total Petroleum Hydrocarbons** | | | | | | | | |
| C6 - C9 Fraction | ---- | 20 | µg/L | <20 | **----** | <20 | **----** | <20 |
| C10 - C14 Fraction | ---- | 50 | µg/L | <50 | **----** | <50 | **----** | <50 |
| C15 - C28 Fraction | ---- | 100 | µg/L | <100 | **----** | <100 | **----** | <100 |
| C29 - C36 Fraction | ---- | 50 | µg/L | <50 | **----** | <50 | **----** | <50 |
| ^ C10 - C36 Fraction (sum) | ---- | 50 | µg/L | <50 | **----** | <50 | **----** | <50 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Sample ID | BH07_260423 | BH07_260423_QAQC | BH10_270423 | BH10_270423_QAQC | BH04_270423 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 26-Apr-2023 00:00 | 26-Apr-2023 00:00 | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 |
| Compound | CAS Number | LOR | Unit | | EM2307410-001 | EM2307410-002 | EM2307410-003 | EM2307410-004 | EM2307410-005 |
| | | | | | Result | Result | Result | Result | Result |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions** | | | | | | | | | |
| **C6 - C10 Fraction** | C6_C10 | 20 | µg/L | | <20 | ---- | <20 | ---- | <20 |
| ^ **C6 - C10 Fraction minus BTEX (F1)** | C6_C10-BTEX | 20 | µg/L | | <20 | ---- | <20 | ---- | <20 |
| **>C10 - C16 Fraction** | ---- | 100 | µg/L | | <100 | ---- | <100 | ---- | <100 |
| **>C16 - C34 Fraction** | ---- | 100 | µg/L | | <100 | ---- | <100 | ---- | <100 |
| **>C34 - C40 Fraction** | ---- | 100 | µg/L | | <100 | ---- | <100 | ---- | <100 |
| ^ **>C10 - C40 Fraction (sum)** | ---- | 100 | µg/L | | <100 | ---- | <100 | ---- | <100 |
| ^ **>C10 - C16 Fraction minus Naphthalene (F2)** | ---- | 100 | µg/L | | <100 | ---- | <100 | ---- | <100 |
| **EP080: BTEXN** | | | | | | | | | |
| **Benzene** | 71-43-2 | 1 | µg/L | | <1 | ---- | <1 | ---- | <1 |
| **Toluene** | 108-88-3 | 2 | µg/L | | <2 | ---- | <2 | ---- | <2 |
| **Ethylbenzene** | 100-41-4 | 2 | µg/L | | <2 | ---- | <2 | ---- | <2 |
| **meta- & para-Xylene** | 108-38-3 106-42-3 | 2 | µg/L | | <2 | ---- | <2 | ---- | <2 |
| **ortho-Xylene** | 95-47-6 | 2 | µg/L | | <2 | ---- | <2 | ---- | <2 |
| ^ **Total Xylenes** | ---- | 2 | µg/L | | <2 | ---- | <2 | ---- | <2 |
| ^ **Sum of BTEX** | ---- | 1 | µg/L | | <1 | ---- | <1 | ---- | <1 |
| **Naphthalene** | 91-20-3 | 5 | µg/L | | <5 | ---- | <5 | ---- | <5 |
| **EP231A: Perfluoroalkyl Sulfonic Acids** | | | | | | | | | |
| **Perfluorobutane sulfonic acid (PFBS)** | 375-73-5 | 0.02 | µg/L | | <0.02 | ---- | <0.02 | <0.02 | <0.02 |
| **Perfluorohexane sulfonic acid (PFHxS)** | 355-46-4 | 0.01 | µg/L | | <0.01 | ---- | <0.01 | <0.01 | <0.01 |
| **Perfluorooctane sulfonic acid (PFOS)** | 1763-23-1 | 0.01 | µg/L | | <0.01 | ---- | <0.01 | <0.01 | <0.01 |
| **EP231B: Perfluoroalkyl Carboxylic Acids** | | | | | | | | | |
| **Perfluorobutanoic acid (PFBA)** | 375-22-4 | 0.1 | µg/L | | <0.1 | ---- | <0.1 | <0.1 | <0.1 |
| **Perfluoropentanoic acid (PFPeA)** | 2706-90-3 | 0.02 | µg/L | | <0.02 | ---- | <0.02 | <0.02 | <0.02 |
| **Perfluorohexanoic acid (PFHxA)** | 307-24-4 | 0.02 | µg/L | | <0.02 | ---- | <0.02 | <0.02 | <0.02 |
| **Perfluoroheptanoic acid (PFHpA)** | 375-85-9 | 0.02 | µg/L | | <0.02 | ---- | <0.02 | <0.02 | <0.02 |
| **Perfluorooctanoic acid (PFOA)** | 335-67-1 | 0.01 | µg/L | | <0.01 | ---- | <0.01 | <0.01 | <0.01 |
| **EP231D: (n:2) Fluorotelomer Sulfonic Acids** | | | | | | | | | |
| **4:2 Fluorotelomer sulfonic acid (4:2 FTS)** | 757124-72-4 | 0.05 | µg/L | | <0.05 | ---- | <0.05 | <0.05 | <0.05 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Sample ID | BH07_260423 | BH07_260423_QAQC | BH10_270423 | BH10_270423_QAQC | BH04_270423 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 26-Apr-2023 00:00 | 26-Apr-2023 00:00 | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 |
| Compound | CAS Number | LOR | Unit | | EM2307410-001 | EM2307410-002 | EM2307410-003 | EM2307410-004 | EM2307410-005 |
| | | | | | Result | Result | Result | Result | Result |
| **EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued** | | | | | | | | | |
| 6:2 Fluorotelomer sulfonic acid (6:2 FTS) | 27619-97-2 | 0.05 | µg/L | | <0.05 | ---- | <0.05 | <0.05 | <0.05 |
| 8:2 Fluorotelomer sulfonic acid (8:2 FTS) | 39108-34-4 | 0.05 | µg/L | | <0.05 | ---- | <0.05 | <0.05 | <0.05 |
| 10:2 Fluorotelomer sulfonic acid (10:2 FTS) | 120226-60-0 | 0.05 | µg/L | | <0.05 | ---- | <0.05 | <0.05 | <0.05 |
| **EP231P: PFAS Sums** | | | | | | | | | |
| Sum of PFHxS and PFOS | 355-46-4/1763-23-1 | 0.01 | µg/L | | <0.01 | ---- | <0.01 | <0.01 | <0.01 |
| Sum of PFAS (WA DER List) | ---- | 0.01 | µg/L | | <0.01 | ---- | <0.01 | <0.01 | <0.01 |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | | | | | | | |
| Phenol-d6 | 13127-88-3 | 1.0 | % | | 30.1 | 37.8 | 30.4 | 29.9 | 37.2 |
| 2-Chlorophenol-D4 | 93951-73-6 | 1.0 | % | | 56.4 | 68.1 | 64.1 | 56.0 | 65.3 |
| 2.4.6-Tribromophenol | 118-79-6 | 1.0 | % | | 84.9 | 93.9 | 101 | 85.2 | 96.8 |
| **EP075(SIM)T: PAH Surrogates** | | | | | | | | | |
| 2-Fluorobiphenyl | 321-60-8 | 1.0 | % | | 63.0 | 71.2 | 74.8 | 70.8 | 79.5 |
| Anthracene-d10 | 1719-06-8 | 1.0 | % | | 75.0 | 85.8 | 87.1 | 78.4 | 81.0 |
| 4-Terphenyl-d14 | 1718-51-0 | 1.0 | % | | 71.2 | 81.2 | 78.3 | 78.4 | 84.0 |
| **EP080S: TPH(V)/BTEX Surrogates** | | | | | | | | | |
| 1.2-Dichloroethane-D4 | 17060-07-0 | 2 | % | | 106 | ---- | 110 | ---- | 108 |
| Toluene-D8 | 2037-26-5 | 2 | % | | 106 | ---- | 109 | ---- | 106 |
| 4-Bromofluorobenzene | 460-00-4 | 2 | % | | 117 | ---- | 118 | ---- | 115 |
| **EP231S: PFAS Surrogate** | | | | | | | | | |
| 13C4-PFOS | ---- | 0.02 | % | | 89.8 | ---- | 92.1 | 90.2 | 95.5 |
| 13C8-PFOA | ---- | 0.02 | % | | 99.0 | ---- | 97.9 | 97.6 | 97.8 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Sample ID | BH04_270423_QAQC | BH04_duplicate | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Sampling date / time | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | EM2307410-006 | EM2307410-007 | -------- | -------- | -------- |
| | | | | Result | Result | ---- | ---- | ---- |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | | |
| Total Dissolved Solids @180°C | ---- | 10 | mg/L | ---- | 6160 | ---- | ---- | ---- |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | ---- | <1 | ---- | ---- | ---- |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | ---- | <1 | ---- | ---- | ---- |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | ---- | 104 | ---- | ---- | ---- |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | ---- | 104 | ---- | ---- | ---- |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | ---- | 131 | ---- | ---- | ---- |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | ---- | 3320 | ---- | ---- | ---- |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | ---- | 58 | ---- | ---- | ---- |
| Magnesium | 7439-95-4 | 1 | mg/L | ---- | 234 | ---- | ---- | ---- |
| Sodium | 7440-23-5 | 1 | mg/L | ---- | 1600 | ---- | ---- | ---- |
| Potassium | 7440-09-7 | 1 | mg/L | ---- | 7 | ---- | ---- | ---- |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| Arsenic | 7440-38-2 | 0.001 | mg/L | ---- | <0.001 | ---- | ---- | ---- |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | ---- | <0.0001 | ---- | ---- | ---- |
| Chromium | 7440-47-3 | 0.001 | mg/L | ---- | <0.001 | ---- | ---- | ---- |
| Copper | 7440-50-8 | 0.001 | mg/L | ---- | 0.002 | ---- | ---- | ---- |
| Nickel | 7440-02-0 | 0.001 | mg/L | ---- | 0.009 | ---- | ---- | ---- |
| Lead | 7439-92-1 | 0.001 | mg/L | ---- | <0.001 | ---- | ---- | ---- |
| Zinc | 7440-66-6 | 0.005 | mg/L | ---- | 0.034 | ---- | ---- | ---- |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | ---- | <0.0001 | ---- | ---- | ---- |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | ---- | <0.01 | ---- | ---- | ---- |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 0.01 | mg/L | ---- | <0.01 | ---- | ---- | ---- |
| **EK058G: Nitrate as N by Discrete Analyser** | | | | | | | | |
| Nitrate as N | 14797-55-8 | 0.01 | mg/L | ---- | 0.02 | ---- | ---- | ---- |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | ---- | 0.02 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Sample ID | BH04_270423_QAQC | BH04_duplicate | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | EM2307410-006 | EM2307410-007 | -------- | -------- | -------- |
| | | | | | Result | Result | ---- | ---- | ---- |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | | ---- | **0.3** | ---- | ---- | ---- |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | | ---- | **0.3** | ---- | ---- | ---- |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | | ---- | **0.08** | ---- | ---- | ---- |
| **EN055: Ionic Balance** | | | | | | | | | |
| ø Total Anions | ---- | 0.01 | meq/L | | ---- | **98.4** | ---- | ---- | ---- |
| ø Total Cations | ---- | 0.01 | meq/L | | ---- | **91.9** | ---- | ---- | ---- |
| ø Ionic Balance | ---- | 0.01 | % | | ---- | **3.43** | ---- | ---- | ---- |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons** | | | | | | | | | |
| Naphthalene | 91-20-3 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Acenaphthylene | 208-96-8 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Acenaphthene | 83-32-9 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Fluorene | 86-73-7 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Phenanthrene | 85-01-8 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Anthracene | 120-12-7 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Fluoranthene | 206-44-0 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Pyrene | 129-00-0 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Benz(a)anthracene | 56-55-3 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Chrysene | 218-01-9 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Benzo(b+j)fluoranthene | 205-99-2 205-82-3 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Benzo(k)fluoranthene | 207-08-9 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Benzo(a)pyrene | 50-32-8 | 0.5 | µg/L | | <0.5 | <0.5 | ---- | ---- | ---- |
| Indeno(1.2.3.cd)pyrene | 193-39-5 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Dibenz(a.h)anthracene | 53-70-3 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| Benzo(g.h.i)perylene | 191-24-2 | 1.0 | µg/L | | <1.0 | <1.0 | ---- | ---- | ---- |
| ^ Sum of polycyclic aromatic hydrocarbons | ---- | 0.5 | µg/L | | <0.5 | <0.5 | ---- | ---- | ---- |
| ^ Benzo(a)pyrene TEQ (zero) | ---- | 0.5 | µg/L | | <0.5 | <0.5 | ---- | ---- | ---- |
| **EP080/071: Total Petroleum Hydrocarbons** | | | | | | | | | |
| C6 - C9 Fraction | ---- | 20 | µg/L | | ---- | <20 | ---- | ---- | ---- |
| C10 - C14 Fraction | ---- | 50 | µg/L | | ---- | <50 | ---- | ---- | ---- |
| C15 - C28 Fraction | ---- | 100 | µg/L | | ---- | <100 | ---- | ---- | ---- |
| C29 - C36 Fraction | ---- | 50 | µg/L | | ---- | <50 | ---- | ---- | ---- |
| ^ C10 - C36 Fraction (sum) | ---- | 50 | µg/L | | ---- | <50 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Sample ID | BH04_270423_QAQC | BH04_duplicate | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | EM2307410-006 | EM2307410-007 | -------- | -------- | -------- |
| | | | | | Result | Result | ---- | ---- | ---- |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions** | | | | | | | | | |
| **C6 - C10 Fraction** | C6_C10 | 20 | µg/L | | ---- | <20 | ---- | ---- | ---- |
| ^ **C6 - C10 Fraction minus BTEX (F1)** | C6_C10-BTEX | 20 | µg/L | | ---- | <20 | ---- | ---- | ---- |
| **>C10 - C16 Fraction** | ---- | 100 | µg/L | | ---- | <100 | ---- | ---- | ---- |
| **>C16 - C34 Fraction** | ---- | 100 | µg/L | | ---- | <100 | ---- | ---- | ---- |
| **>C34 - C40 Fraction** | ---- | 100 | µg/L | | ---- | <100 | ---- | ---- | ---- |
| ^ **>C10 - C40 Fraction (sum)** | ---- | 100 | µg/L | | ---- | <100 | ---- | ---- | ---- |
| ^ **>C10 - C16 Fraction minus Naphthalene (F2)** | ---- | 100 | µg/L | | ---- | <100 | ---- | ---- | ---- |
| **EP080: BTEXN** | | | | | | | | | |
| **Benzene** | 71-43-2 | 1 | µg/L | | ---- | <1 | ---- | ---- | ---- |
| **Toluene** | 108-88-3 | 2 | µg/L | | ---- | <2 | ---- | ---- | ---- |
| **Ethylbenzene** | 100-41-4 | 2 | µg/L | | ---- | <2 | ---- | ---- | ---- |
| **meta- & para-Xylene** | 108-38-3 106-42-3 | 2 | µg/L | | ---- | <2 | ---- | ---- | ---- |
| **ortho-Xylene** | 95-47-6 | 2 | µg/L | | ---- | <2 | ---- | ---- | ---- |
| ^ **Total Xylenes** | ---- | 2 | µg/L | | ---- | <2 | ---- | ---- | ---- |
| ^ **Sum of BTEX** | ---- | 1 | µg/L | | ---- | <1 | ---- | ---- | ---- |
| **Naphthalene** | 91-20-3 | 5 | µg/L | | ---- | <5 | ---- | ---- | ---- |
| **EP231A: Perfluoroalkyl Sulfonic Acids** | | | | | | | | | |
| **Perfluorobutane sulfonic acid (PFBS)** | 375-73-5 | 0.02 | µg/L | | <0.02 | <0.02 | ---- | ---- | ---- |
| **Perfluorohexane sulfonic acid (PFHxS)** | 355-46-4 | 0.01 | µg/L | | <0.01 | <0.01 | ---- | ---- | ---- |
| **Perfluorooctane sulfonic acid (PFOS)** | 1763-23-1 | 0.01 | µg/L | | <0.01 | <0.01 | ---- | ---- | ---- |
| **EP231B: Perfluoroalkyl Carboxylic Acids** | | | | | | | | | |
| **Perfluorobutanoic acid (PFBA)** | 375-22-4 | 0.1 | µg/L | | <0.1 | <0.1 | ---- | ---- | ---- |
| **Perfluoropentanoic acid (PFPeA)** | 2706-90-3 | 0.02 | µg/L | | <0.02 | <0.02 | ---- | ---- | ---- |
| **Perfluorohexanoic acid (PFHxA)** | 307-24-4 | 0.02 | µg/L | | <0.02 | <0.02 | ---- | ---- | ---- |
| **Perfluoroheptanoic acid (PFHpA)** | 375-85-9 | 0.02 | µg/L | | <0.02 | <0.02 | ---- | ---- | ---- |
| **Perfluorooctanoic acid (PFOA)** | 335-67-1 | 0.01 | µg/L | | <0.01 | <0.01 | ---- | ---- | ---- |
| **EP231D: (n:2) Fluorotelomer Sulfonic Acids** | | | | | | | | | |
| **4:2 Fluorotelomer sulfonic acid (4:2 FTS)** | 757124-72-4 | 0.05 | µg/L | | <0.05 | <0.05 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | | Sample ID | BH04_270423_QAQC | BH04_duplicate | ---- | ---- | ---- |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sampling date / time | 27-Apr-2023 00:00 | 27-Apr-2023 00:00 | ---- | ---- | ---- |
| Compound | CAS Number | LOR | Unit | | EM2307410-006 | EM2307410-007 | -------- | -------- | -------- |
| | | | | | Result | Result | ---- | ---- | ---- |
| **EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued** | | | | | | | | | |
| 6:2 Fluorotelomer sulfonic acid (6:2 FTS) | 27619-97-2 | 0.05 | µg/L | | <0.05 | <0.05 | ---- | ---- | ---- |
| 8:2 Fluorotelomer sulfonic acid (8:2 FTS) | 39108-34-4 | 0.05 | µg/L | | <0.05 | <0.05 | ---- | ---- | ---- |
| 10:2 Fluorotelomer sulfonic acid (10:2 FTS) | 120226-60-0 | 0.05 | µg/L | | <0.05 | <0.05 | ---- | ---- | ---- |
| **EP231P: PFAS Sums** | | | | | | | | | |
| Sum of PFHxS and PFOS | 355-46-4/1763-23-1 | 0.01 | µg/L | | <0.01 | <0.01 | ---- | ---- | ---- |
| Sum of PFAS (WA DER List) | ---- | 0.01 | µg/L | | <0.01 | <0.01 | ---- | ---- | ---- |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | | | | | | | |
| Phenol-d6 | 13127-88-3 | 1.0 | % | | 34.9 | 31.9 | ---- | ---- | ---- |
| 2-Chlorophenol-D4 | 93951-73-6 | 1.0 | % | | 63.3 | 62.9 | ---- | ---- | ---- |
| 2.4.6-Tribromophenol | 118-79-6 | 1.0 | % | | 98.4 | 93.8 | ---- | ---- | ---- |
| **EP075(SIM)T: PAH Surrogates** | | | | | | | | | |
| 2-Fluorobiphenyl | 321-60-8 | 1.0 | % | | 84.3 | 72.7 | ---- | ---- | ---- |
| Anthracene-d10 | 1719-06-8 | 1.0 | % | | 85.1 | 82.6 | ---- | ---- | ---- |
| 4-Terphenyl-d14 | 1718-51-0 | 1.0 | % | | 96.1 | 80.0 | ---- | ---- | ---- |
| **EP080S: TPH(V)/BTEX Surrogates** | | | | | | | | | |
| 1.2-Dichloroethane-D4 | 17060-07-0 | 2 | % | | ---- | 106 | ---- | ---- | ---- |
| Toluene-D8 | 2037-26-5 | 2 | % | | ---- | 102 | ---- | ---- | ---- |
| 4-Bromofluorobenzene | 460-00-4 | 2 | % | | ---- | 113 | ---- | ---- | ---- |
| **EP231S: PFAS Surrogate** | | | | | | | | | |
| 13C4-PFOS | ---- | 0.02 | % | | 96.2 | 93.3 | ---- | ---- | ---- |
| 13C8-PFOA | ---- | 0.02 | % | | 98.6 | 96.0 | ---- | ---- | ---- |

## Surrogate Control Limits

| Sub-Matrix: WATER | | Recovery Limits (%) | |
|---|---|---|---|
| Compound | CAS Number | Low | High |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | |
| Phenol-d6 | 13127-88-3 | 10 | 51 |
| 2-Chlorophenol-D4 | 93951-73-6 | 30 | 114 |
| 2.4.6-Tribromophenol | 118-79-6 | 26 | 133 |
| **EP075(SIM)T: PAH Surrogates** | | | |
| 2-Fluorobiphenyl | 321-60-8 | 35 | 127 |
| Anthracene-d10 | 1719-06-8 | 44 | 122 |
| 4-Terphenyl-d14 | 1718-51-0 | 44 | 124 |
| **EP080S: TPH(V)/BTEX Surrogates** | | | |
| 1.2-Dichloroethane-D4 | 17060-07-0 | 73 | 129 |
| Toluene-D8 | 2037-26-5 | 70 | 125 |
| 4-Bromofluorobenzene | 460-00-4 | 71 | 129 |
| **EP231S: PFAS Surrogate** | | | |
| 13C4-PFOS | ---- | 65 | 140 |
| 13C8-PFOA | ---- | 71 | 133 |

# QA/QC Compliance Assessment to assist with Quality Review

| | | | |
|---|---|---|---|
| **Work Order** | : **EM2307410** | Page | : 1 of 11 |
| Client | : **JACOBS GROUP(AUSTRALIA)PTY LTD** | Laboratory | : Environmental Division Melbourne |
| Contact | : STEPHEN SONNENBERG | Telephone | : +6138549 9645 |
| Project | : IA500EI | Date Samples Received | : 28-Apr-2023 |
| Site | : | Issue Date | : 03-May-2023 |
| Sampler | : NU | No. of samples received | : 7 |
| Order number | : IA500EI | No. of samples analysed | : 7 |

**This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.**

Brief method summaries and references are also provided to assist in traceability.

## *Summary of Outliers*

### *Outliers : Quality Control Samples*

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

### *Outliers : Analysis Holding Time Compliance*

- **NO Analysis Holding Time Outliers exist.**

### *Outliers : Frequency of Quality Control Samples*

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

## Outliers : Quality Control Samples

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **WATER**

| Compound Group Name | Laboratory Sample ID | Client Sample ID | Analyte | CAS Number | Data | Limits | Comment |
|---|---|---|---|---|---|---|---|
| **Matrix Spike (MS) Recoveries** | | | | | | | |
| EK055G: Ammonia as N by Discrete Analyser | EM2307410--003 | BH10_270423 | **Ammonia as N** | 7664-41-7 | 152 % | 70.0-130% | **Recovery greater than upper data quality objective** |

## Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

| Quality Control Sample Type | Count | | Rate (%) | | Quality Control Specification |
|---|---|---|---|---|---|
| Method | QC | Regular | Actual | Expected | |
| | 1 | | | | |
| Laboratory Duplicates (DUP) | | | | | |
| Ammonia as N by Discrete analyser | 1 | 16 | 6.25 | 10.00 | NEPM 2013 B3 & ALS QC Standard |
| PAH/Phenols (GC/MS - SIM) | 0 | 8 | 0.00 | 10.00 | NEPM 2013 B3 & ALS QC Standard |
| Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS | 0 | 18 | 0.00 | 10.00 | NEPM 2013 B3 & ALS QC Standard |
| TRH - Semivolatile Fraction | 0 | 7 | 0.00 | 10.00 | NEPM 2013 B3 & ALS QC Standard |
| Matrix Spikes (MS) | | | | | |
| PAH/Phenols (GC/MS - SIM) | 0 | 8 | 0.00 | 5.00 | NEPM 2013 B3 & ALS QC Standard |
| Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS | 0 | 18 | 0.00 | 5.00 | NEPM 2013 B3 & ALS QC Standard |
| TRH - Semivolatile Fraction | 0 | 7 | 0.00 | 5.00 | NEPM 2013 B3 & ALS QC Standard |

# Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

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

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C** | | | | | | | |
| **Clear Plastic Bottle - Natural (EA015H)** BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 03-May-2023 | ✓ |
| **Clear Plastic Bottle - Natural (EA015H)** BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 04-May-2023 | ✓ |

Matrix: **WATER**

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

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | |
| **Clear Plastic Bottle - Natural (ED037-P)** BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 10-May-2023 | ✓ |
| **Clear Plastic Bottle - Natural (ED037-P)** BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 11-May-2023 | ✓ |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | |
| **Clear Plastic Bottle - Natural (ED041G)** BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **01-May-2023** | 24-May-2023 | ✓ |
| **Clear Plastic Bottle - Natural (ED041G)** BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **01-May-2023** | 25-May-2023 | ✓ |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Natural (ED045G)** BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **01-May-2023** | 24-May-2023 | ✓ |
| **Clear Plastic Bottle - Natural (ED045G)** BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **01-May-2023** | 25-May-2023 | ✓ |
| **ED093F: Dissolved Major Cations** | | | | | | | |
| **Clear Plastic Bottle - Natural (ED093F)** BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 03-May-2023 | ✓ |
| **Clear Plastic Bottle - Natural (ED093F)** BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 04-May-2023 | ✓ |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | |
| **Clear Plastic Bottle - Natural (EG020A-F)** BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 23-Oct-2023 | ✓ |
| **Clear Plastic Bottle - Natural (EG020A-F)** BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 24-Oct-2023 | ✓ |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | |
| **Clear Plastic Bottle - Natural (EG035F)** BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 24-May-2023 | ✓ |
| **Clear Plastic Bottle - Natural (EG035F)** BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 25-May-2023 | ✓ |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Sulfuric Acid (EK055G)** BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 24-May-2023 | ✓ |
| **Clear Plastic Bottle - Sulfuric Acid (EK055G)** BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 25-May-2023 | ✓ |

Matrix: **WATER**

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

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Natural (EK057G)** | | | | | | | |
| BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **28-Apr-2023** | 28-Apr-2023 | ✓ |
| **Clear Plastic Bottle - Natural (EK057G)** | | | | | | | |
| BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **28-Apr-2023** | 29-Apr-2023 | ✓ |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Sulfuric Acid (EK059G)** | | | | | | | |
| BH07_260423 | **26-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 24-May-2023 | ✓ |
| **Clear Plastic Bottle - Sulfuric Acid (EK059G)** | | | | | | | |
| BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **----** | ---- | ---- | **02-May-2023** | 25-May-2023 | ✓ |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Sulfuric Acid (EK061G)** | | | | | | | |
| BH07_260423 | **26-Apr-2023** | **29-Apr-2023** | 24-May-2023 | ✓ | **01-May-2023** | 24-May-2023 | ✓ |
| **Clear Plastic Bottle - Sulfuric Acid (EK061G)** | | | | | | | |
| BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **29-Apr-2023** | 25-May-2023 | ✓ | **01-May-2023** | 25-May-2023 | ✓ |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Sulfuric Acid (EK067G)** | | | | | | | |
| BH07_260423 | **26-Apr-2023** | **29-Apr-2023** | 24-May-2023 | ✓ | **01-May-2023** | 24-May-2023 | ✓ |
| **Clear Plastic Bottle - Sulfuric Acid (EK067G)** | | | | | | | |
| BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **29-Apr-2023** | 25-May-2023 | ✓ | **01-May-2023** | 25-May-2023 | ✓ |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons** | | | | | | | |
| **Amber Glass Bottle - Unpreserved (EP075(SIM))** | | | | | | | |
| BH07_260423, BH07_260423_QAQC | **26-Apr-2023** | **28-Apr-2023** | 03-May-2023 | ✓ | **01-May-2023** | 07-Jun-2023 | ✓ |
| **Amber Glass Bottle - Unpreserved (EP075(SIM))** | | | | | | | |
| BH10_270423, BH10_270423_QAQC, BH04_270423, BH04_270423_QAQC, BH04_duplicate | **27-Apr-2023** | **28-Apr-2023** | 04-May-2023 | ✓ | **01-May-2023** | 07-Jun-2023 | ✓ |
| **EP080/071: Total Petroleum Hydrocarbons** | | | | | | | |
| **Amber Glass Bottle - Unpreserved (EP071)** | | | | | | | |
| BH07_260423 | **26-Apr-2023** | **28-Apr-2023** | 03-May-2023 | ✓ | **01-May-2023** | 07-Jun-2023 | ✓ |
| **Amber Glass Bottle - Unpreserved (EP071)** | | | | | | | |
| BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **28-Apr-2023** | 04-May-2023 | ✓ | **01-May-2023** | 07-Jun-2023 | ✓ |
| **Amber VOC Vial - Sulfuric Acid (EP080)** | | | | | | | |
| BH07_260423 | **26-Apr-2023** | **01-May-2023** | 10-May-2023 | ✓ | **02-May-2023** | 10-May-2023 | ✓ |
| **Amber VOC Vial - Sulfuric Acid (EP080)** | | | | | | | |
| BH10_270423, BH04_270423, BH04_duplicate | **27-Apr-2023** | **01-May-2023** | 11-May-2023 | ✓ | **02-May-2023** | 11-May-2023 | ✓ |

Matrix: **WATER**

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

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions** | | | | | | | |
| **Amber Glass Bottle - Unpreserved (EP071)**<br>BH07_260423 | **26-Apr-2023** | **28-Apr-2023** | 03-May-2023 | ✓ | **01-May-2023** | 07-Jun-2023 | ✓ |
| **Amber Glass Bottle - Unpreserved (EP071)**<br>BH10_270423, BH04_270423,<br>BH04_duplicate | **27-Apr-2023** | **28-Apr-2023** | 04-May-2023 | ✓ | **01-May-2023** | 07-Jun-2023 | ✓ |
| **Amber VOC Vial - Sulfuric Acid (EP080)**<br>BH07_260423 | **26-Apr-2023** | **01-May-2023** | 10-May-2023 | ✓ | **02-May-2023** | 10-May-2023 | ✓ |
| **Amber VOC Vial - Sulfuric Acid (EP080)**<br>BH10_270423, BH04_270423,<br>BH04_duplicate | **27-Apr-2023** | **01-May-2023** | 11-May-2023 | ✓ | **02-May-2023** | 11-May-2023 | ✓ |
| **EP080: BTEXN** | | | | | | | |
| **Amber VOC Vial - Sulfuric Acid (EP080)**<br>BH07_260423 | **26-Apr-2023** | **01-May-2023** | 10-May-2023 | ✓ | **02-May-2023** | 10-May-2023 | ✓ |
| **Amber VOC Vial - Sulfuric Acid (EP080)**<br>BH10_270423, BH04_270423,<br>BH04_duplicate | **27-Apr-2023** | **01-May-2023** | 11-May-2023 | ✓ | **02-May-2023** | 11-May-2023 | ✓ |
| **EP231A: Perfluoroalkyl Sulfonic Acids** | | | | | | | |
| **HDPE (no PTFE) (EP231X)**<br>BH07_260423 | **26-Apr-2023** | **01-May-2023** | 23-Oct-2023 | ✓ | **02-May-2023** | 23-Oct-2023 | ✓ |
| **HDPE (no PTFE) (EP231X)**<br>BH10_270423, BH10_270423_QAQC,<br>BH04_270423, BH04_270423_QAQC,<br>BH04_duplicate | **27-Apr-2023** | **01-May-2023** | 24-Oct-2023 | ✓ | **02-May-2023** | 24-Oct-2023 | ✓ |
| **EP231B: Perfluoroalkyl Carboxylic Acids** | | | | | | | |
| **HDPE (no PTFE) (EP231X)**<br>BH07_260423 | **26-Apr-2023** | **01-May-2023** | 23-Oct-2023 | ✓ | **02-May-2023** | 23-Oct-2023 | ✓ |
| **HDPE (no PTFE) (EP231X)**<br>BH10_270423, BH10_270423_QAQC,<br>BH04_270423, BH04_270423_QAQC,<br>BH04_duplicate | **27-Apr-2023** | **01-May-2023** | 24-Oct-2023 | ✓ | **02-May-2023** | 24-Oct-2023 | ✓ |
| **EP231D: (n:2) Fluorotelomer Sulfonic Acids** | | | | | | | |
| **HDPE (no PTFE) (EP231X)**<br>BH07_260423 | **26-Apr-2023** | **01-May-2023** | 23-Oct-2023 | ✓ | **02-May-2023** | 23-Oct-2023 | ✓ |
| **HDPE (no PTFE) (EP231X)**<br>BH10_270423, BH10_270423_QAQC,<br>BH04_270423, BH04_270423_QAQC,<br>BH04_duplicate | **27-Apr-2023** | **01-May-2023** | 24-Oct-2023 | ✓ | **02-May-2023** | 24-Oct-2023 | ✓ |

Matrix: **WATER**

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

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EP231P: PFAS Sums** | | | | | | | |
| **HDPE (no PTFE) (EP231X)**<br>BH07_260423 | **26-Apr-2023** | **01-May-2023** | 23-Oct-2023 | ✓ | **02-May-2023** | 23-Oct-2023 | ✓ |
| **HDPE (no PTFE) (EP231X)**<br>BH10_270423, BH10_270423_QAQC,<br>BH04_270423, BH04_270423_QAQC,<br>BH04_duplicate | **27-Apr-2023** | **01-May-2023** | 24-Oct-2023 | ✓ | **02-May-2023** | 24-Oct-2023 | ✓ |

# Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

| Quality Control Sample Type | | Count | | Rate (%) | | | Quality Control Specification |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC* | *Regular* | ***Actual*** | ***Expected*** | *Evaluation* | |
| **Laboratory Duplicates (DUP)** | | | | | | | |
| Alkalinity by Auto Titrator | ED037-P | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Ammonia as N by Discrete analyser | EK055G | 1 | 16 | **6.25** | **10.00** | × | NEPM 2013 B3 & ALS QC Standard |
| Chloride by Discrete Analyser | ED045G | 1 | 7 | **14.29** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Mercury by FIMS | EG035F | 2 | 12 | **16.67** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Major Cations - Dissolved | ED093F | 2 | 16 | **12.50** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | 2 | 18 | **11.11** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N by Discrete Analyser | EK057G | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| PAH/Phenols (GC/MS - SIM) | EP075(SIM) | 0 | 8 | **0.00** | **10.00** | × | NEPM 2013 B3 & ALS QC Standard |
| Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS | EP231X | 0 | 18 | **0.00** | **10.00** | × | NEPM 2013 B3 & ALS QC Standard |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | 1 | 7 | **14.29** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Dissolved Solids (High Level) | EA015H | 4 | 40 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | 2 | 19 | **10.53** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus as P By Discrete Analyser | EK067G | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| TRH - Semivolatile Fraction | EP071 | 0 | 7 | **0.00** | **10.00** | × | NEPM 2013 B3 & ALS QC Standard |
| TRH Volatiles/BTEX | EP080 | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| **Laboratory Control Samples (LCS)** | | | | | | | |
| Alkalinity by Auto Titrator | ED037-P | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Ammonia as N by Discrete analyser | EK055G | 1 | 16 | **6.25** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride by Discrete Analyser | ED045G | 2 | 7 | **28.57** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Mercury by FIMS | EG035F | 1 | 12 | **8.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Major Cations - Dissolved | ED093F | 1 | 16 | **6.25** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | 1 | 18 | **5.56** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N by Discrete Analyser | EK057G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| PAH/Phenols (GC/MS - SIM) | EP075(SIM) | 1 | 8 | **12.50** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS | EP231X | 1 | 18 | **5.56** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | 2 | 7 | **28.57** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Dissolved Solids (High Level) | EA015H | 3 | 40 | **7.50** | **7.50** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | 1 | 19 | **5.26** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus as P By Discrete Analyser | EK067G | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| TRH - Semivolatile Fraction | EP071 | 1 | 7 | **14.29** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| TRH Volatiles/BTEX | EP080 | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| **Method Blanks (MB)** | | | | | | | |
| Ammonia as N by Discrete analyser | EK055G | 1 | 16 | **6.25** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride by Discrete Analyser | ED045G | 1 | 7 | **14.29** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

| Quality Control Sample Type | | Count | | Rate (%) | | | Quality Control Specification |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC* | *Regular* | ***Actual*** | ***Expected*** | *Evaluation* | |
| **Method Blanks (MB) - Continued** | | | | | | | |
| Dissolved Mercury by FIMS | EG035F | 1 | 12 | **8.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Major Cations - Dissolved | ED093F | 1 | 16 | **6.25** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | 1 | 18 | **5.56** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N by Discrete Analyser | EK057G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| PAH/Phenols (GC/MS - SIM) | EP075(SIM) | 1 | 8 | **12.50** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS | EP231X | 1 | 18 | **5.56** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | 1 | 7 | **14.29** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Dissolved Solids (High Level) | EA015H | 2 | 40 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | 1 | 19 | **5.26** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus as P By Discrete Analyser | EK067G | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| TRH - Semivolatile Fraction | EP071 | 1 | 7 | **14.29** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| TRH Volatiles/BTEX | EP080 | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| **Matrix Spikes (MS)** | | | | | | | |
| Ammonia as N by Discrete analyser | EK055G | 1 | 16 | **6.25** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride by Discrete Analyser | ED045G | 1 | 7 | **14.29** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Mercury by FIMS | EG035F | 1 | 12 | **8.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | 1 | 18 | **5.56** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N by Discrete Analyser | EK057G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| PAH/Phenols (GC/MS - SIM) | EP075(SIM) | 0 | 8 | **0.00** | **5.00** | × | NEPM 2013 B3 & ALS QC Standard |
| Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS | EP231X | 0 | 18 | **0.00** | **5.00** | × | NEPM 2013 B3 & ALS QC Standard |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | 1 | 7 | **14.29** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | 1 | 19 | **5.26** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus as P By Discrete Analyser | EK067G | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| TRH - Semivolatile Fraction | EP071 | 0 | 7 | **0.00** | **5.00** | × | NEPM 2013 B3 & ALS QC Standard |
| TRH Volatiles/BTEX | EP080 | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |

## Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

| Analytical Methods | Method | Matrix | Method Descriptions |
|---|---|---|---|
| Total Dissolved Solids (High Level) | EA015H | WATER | In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3) |
| Alkalinity by Auto Titrator | ED037-P | WATER | In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3) |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | WATER | In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3) |
| Chloride by Discrete Analyser | ED045G | WATER | In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm. |
| Major Cations - Dissolved | ED093F | WATER | In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3) |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | WATER | In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. |
| Dissolved Mercury by FIMS | EG035F | WATER | In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3). |
| Ammonia as N by Discrete analyser | EK055G | WATER | In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3) |
| Nitrite as N by Discrete Analyser | EK057G | WATER | In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3) |
| Nitrate as N by Discrete Analyser | EK058G | WATER | In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3) |

| Analytical Methods | Method | Matrix | Method Descriptions |
|---|---|---|---|
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | WATER | In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3) |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | WATER | In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3) |
| Total Nitrogen as N (TKN + Nox) By Discrete Analyser | EK062G | WATER | In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3) |
| Total Phosphorus as P By Discrete Analyser | EK067G | WATER | In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3) |
| Ionic Balance by PCT DA and Turbi SO4 DA | * EN055 - PG | WATER | In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3) |
| TRH - Semivolatile Fraction | EP071 | WATER | In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3) |
| PAH/Phenols (GC/MS - SIM) | EP075(SIM) | WATER | In house: Referenced to USEPA SW 846 - 8270 Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3) |
| TRH Volatiles/BTEX | EP080 | WATER | In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3) |
| Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS | EP231X | WATER | In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements. |

| Preparation Methods | Method | Matrix | Method Descriptions |
|---|---|---|---|
| TKN/TP Digestion | EK061/EK067 | WATER | In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3) |
| Separatory Funnel Extraction of Liquids | ORG14 | WATER | In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container. |
| Volatiles Water Preparation | ORG16-W | WATER | A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging. |

| *Preparation Methods* | *Method* | *Matrix* | *Method Descriptions* |
|---|---|---|---|
| Solid Phase Extraction (SPE) for PFAS in water | ORG72 | WATER | In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements. |

# QUALITY CONTROL REPORT

| | | | |
|---|---|---|---|
| **Work Order** | : **EM2307410** | Page | : 1 of 8 |
| Client | : **JACOBS GROUP(AUSTRALIA)PTY LTD** | Laboratory | : Environmental Division Melbourne |
| Contact | : STEPHEN SONNENBERG | Contact | : Peter Ravlic |
| Address | : PO BOX 312 FLINDERS LANE MELBOURNE VIC AUSTRALIA 8009 | Address | : 4 Westall Rd Springvale VIC Australia 3171 |
| Telephone | : ---- | Telephone | : +6138549 9645 |
| Project | : IA500EI | Date Samples Received | : 28-Apr-2023 |
| Order number | : IA500EI | Date Analysis Commenced | : 28-Apr-2023 |
| C-O-C number | : ---- | Issue Date | : 03-May-2023 |
| Sampler | : NU | | |
| Site | : | | |
| Quote number | : MEBQ/003/21 - Vic Only - Primary Work | | |
| No. of samples received | : 7 | | |
| No. of samples analysed | : 7 | | |

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

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

## *Signatories*

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Arenie Vijayaratnam | Senior Inorganic Chemist | Melbourne Inorganics, Springvale, VIC |
| Dilani Fernando | Laboratory Coordinator | Melbourne Inorganics, Springvale, VIC |
| Jarwis Nheu | Non-Metals Team Leader | Melbourne Inorganics, Springvale, VIC |
| Nancy Wang | 2IC Organic Chemist | Melbourne Organics, Springvale, VIC |

## General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

## Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

| | | | | Laboratory Duplicate (DUP) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Laboratory sample ID | Sample ID | Method: Compound | CAS Number | LOR | Unit | Original Result | Duplicate Result | RPD (%) | Acceptable RPD (%) |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 5021128)** | | | | | | | | | |
| EM2307392-002 | Anonymous | EA015H: Total Dissolved Solids @180°C | ---- | 10 | mg/L | 1190 | 1250 | 4.9 | 0% - 20% |
| EM2307410-003 | BH10_270423 | EA015H: Total Dissolved Solids @180°C | ---- | 10 | mg/L | 5150 | 5090 | 1.2 | 0% - 20% |
| EM2307425-004 | Anonymous | EA015H: Total Dissolved Solids @180°C | ---- | 10 | mg/L | 32600 | 37300 | 13.6 | 0% - 20% |
| EM2307440-009 | Anonymous | EA015H: Total Dissolved Solids @180°C | ---- | 10 | mg/L | 18400 | 22200 | 18.8 | 0% - 20% |
| **ED037P: Alkalinity by PC Titrator (QC Lot: 5020037)** | | | | | | | | | |
| EM2307270-012 | Anonymous | ED037-P: Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | 0.0 | No Limit |
| | | ED037-P: Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | 0.0 | No Limit |
| | | ED037-P: Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 81 | 80 | 0.0 | 0% - 20% |
| | | ED037-P: Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 81 | 80 | 0.0 | 0% - 20% |
| EM2307270-005 | Anonymous | ED037-P: Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | 0.0 | No Limit |
| | | ED037-P: Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | 0.0 | No Limit |
| | | ED037-P: Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 79 | 76 | 3.2 | 0% - 20% |
| | | ED037-P: Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 79 | 76 | 3.2 | 0% - 20% |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 5017732)** | | | | | | | | | |
| EM2305719-031 | Anonymous | ED041G: Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 67 | 68 | 1.8 | 0% - 20% |
| **ED045G: Chloride by Discrete Analyser (QC Lot: 5017731)** | | | | | | | | | |
| EM2305719-031 | Anonymous | ED045G: Chloride | 16887-00-6 | 1 | mg/L | 646 | 672 | 4.0 | 0% - 20% |
| **ED093F: Dissolved Major Cations (QC Lot: 5021458)** | | | | | | | | | |
| EM2307368-001 | Anonymous | ED093F: Calcium | 7440-70-2 | 1 | mg/L | 33 | 33 | 0.0 | 0% - 20% |
| | | ED093F: Magnesium | 7439-95-4 | 1 | mg/L | 17 | 17 | 0.0 | 0% - 50% |
| | | ED093F: Sodium | 7440-23-5 | 1 | mg/L | 10 | 10 | 0.0 | No Limit |
| | | ED093F: Potassium | 7440-09-7 | 1 | mg/L | <1 | <1 | 0.0 | No Limit |
| EM2307392-005 | Anonymous | ED093F: Calcium | 7440-70-2 | 1 | mg/L | 29 | 24 | 17.7 | 0% - 20% |

Sub-Matrix: **WATER**

| | | | | Laboratory Duplicate (DUP) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Sample ID* | *Method: Compound* | *CAS Number* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD (%)* | *Acceptable RPD (%)* |
| **ED093F: Dissolved Major Cations (QC Lot: 5021458) - continued** | | | | | | | | | |
| EM2307392-005 | Anonymous | ED093F: Magnesium | 7439-95-4 | 1 | mg/L | 5 | 4 | 0.0 | No Limit |
| | | ED093F: Sodium | 7440-23-5 | 1 | mg/L | <1 | <1 | 0.0 | No Limit |
| | | ED093F: Potassium | 7440-09-7 | 1 | mg/L | <1 | <1 | 0.0 | No Limit |
| **EG020F: Dissolved Metals by ICP-MS (QC Lot: 5021455)** | | | | | | | | | |
| EM2307368-003 | Anonymous | EG020A-F: Cadmium | 7440-43-9 | 0.0001 | mg/L | 0.0005 | 0.0005 | 0.0 | No Limit |
| | | EG020A-F: Arsenic | 7440-38-2 | 0.001 | mg/L | <0.001 | <0.001 | 0.0 | No Limit |
| | | EG020A-F: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | 0.0 | No Limit |
| | | EG020A-F: Copper | 7440-50-8 | 0.001 | mg/L | 0.008 | 0.008 | 0.0 | No Limit |
| | | EG020A-F: Lead | 7439-92-1 | 0.001 | mg/L | 0.004 | 0.004 | 0.0 | No Limit |
| | | EG020A-F: Nickel | 7440-02-0 | 0.001 | mg/L | <0.001 | <0.001 | 0.0 | No Limit |
| | | EG020A-F: Zinc | 7440-66-6 | 0.005 | mg/L | 0.306 | 0.307 | 0.0 | 0% - 20% |
| EM2307253-001 | Anonymous | EG020A-F: Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0001 | <0.0001 | 0.0 | No Limit |
| | | EG020A-F: Arsenic | 7440-38-2 | 0.001 | mg/L | <0.001 | <0.001 | 0.0 | No Limit |
| | | EG020A-F: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | 0.0 | No Limit |
| | | EG020A-F: Copper | 7440-50-8 | 0.001 | mg/L | <0.001 | <0.001 | 0.0 | No Limit |
| | | EG020A-F: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | 0.0 | No Limit |
| | | EG020A-F: Nickel | 7440-02-0 | 0.001 | mg/L | <0.001 | <0.001 | 0.0 | No Limit |
| | | EG020A-F: Zinc | 7440-66-6 | 0.005 | mg/L | <0.005 | <0.005 | 0.0 | No Limit |
| **EG035F: Dissolved Mercury by FIMS (QC Lot: 5021456)** | | | | | | | | | |
| EM2307410-007 | BH04_duplicate | EG035F: Mercury | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | 0.0 | No Limit |
| EM2307253-001 | Anonymous | EG035F: Mercury | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | 0.0 | No Limit |
| **EK055G: Ammonia as N by Discrete Analyser (QC Lot: 5019199)** | | | | | | | | | |
| EM2307410-001 | BH07_260423 | EK055G: Ammonia as N | 7664-41-7 | 0.01 | mg/L | <0.01 | <0.01 | 0.0 | No Limit |
| **EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5017730)** | | | | | | | | | |
| EM2307404-001 | Anonymous | EK057G: Nitrite as N | 14797-65-0 | 0.01 | mg/L | 1.55 | 1.54 | 0.0 | 0% - 20% |
| EM2305719-031 | Anonymous | EK057G: Nitrite as N | 14797-65-0 | 0.01 | mg/L | <0.01 | <0.01 | 0.0 | No Limit |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5019198)** | | | | | | | | | |
| EM2307410-001 | BH07_260423 | EK059G: Nitrite + Nitrate as N | ---- | 0.01 | mg/L | 0.07 | 0.07 | 0.0 | No Limit |
| EM2307440-006 | Anonymous | EK059G: Nitrite + Nitrate as N | ---- | 0.01 | mg/L | 0.04 | 0.04 | 0.0 | No Limit |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5019002)** | | | | | | | | | |
| EM2305719-031 | Anonymous | EK061G: Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | 9.2 | 9.1 | 1.1 | No Limit |
| EM2307410-007 | BH04_duplicate | EK061G: Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | 0.3 | 0.3 | 0.0 | No Limit |
| **EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5019003)** | | | | | | | | | |
| EM2305719-031 | Anonymous | EK067G: Total Phosphorus as P | ---- | 0.01 | mg/L | 2.88 | 2.92 | 1.4 | 0% - 20% |
| EM2307410-007 | BH04_duplicate | EK067G: Total Phosphorus as P | ---- | 0.01 | mg/L | 0.08 | 0.12 | 45.2 | No Limit |
| **EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5018304)** | | | | | | | | | |
| EM2307427-001 | Anonymous | EP080: C6 - C9 Fraction | ---- | 20 | µg/L | <20 | <20 | 0.0 | No Limit |
| EM2307427-003 | Anonymous | EP080: C6 - C9 Fraction | ---- | 20 | µg/L | <20 | <20 | 0.0 | No Limit |

Sub-Matrix: **WATER**

| | | | | Laboratory Duplicate (DUP) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Sample ID* | *Method: Compound* | *CAS Number* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD (%)* | *Acceptable RPD (%)* |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5018304)** | | | | | | | | | |
| EM2307427-001 | Anonymous | EP080: C6 - C10 Fraction | C6_C10 | 20 | µg/L | <20 | <20 | 0.0 | No Limit |
| EM2307427-003 | Anonymous | EP080: C6 - C10 Fraction | C6_C10 | 20 | µg/L | <20 | <20 | 0.0 | No Limit |
| **EP080: BTEXN (QC Lot: 5018304)** | | | | | | | | | |
| EM2307427-001 | Anonymous | EP080: Benzene | 71-43-2 | 1 | µg/L | <1 | <1 | 0.0 | No Limit |
| | | EP080: Toluene | 108-88-3 | 2 | µg/L | <2 | <2 | 0.0 | No Limit |
| | | EP080: Ethylbenzene | 100-41-4 | 2 | µg/L | <2 | <2 | 0.0 | No Limit |
| | | EP080: meta- & para-Xylene | 108-38-3<br>106-42-3 | 2 | µg/L | <2 | <2 | 0.0 | No Limit |
| | | EP080: ortho-Xylene | 95-47-6 | 2 | µg/L | <2 | <2 | 0.0 | No Limit |
| | | EP080: Naphthalene | 91-20-3 | 5 | µg/L | <5 | <5 | 0.0 | No Limit |
| EM2307427-003 | Anonymous | EP080: Benzene | 71-43-2 | 1 | µg/L | <1 | <1 | 0.0 | No Limit |
| | | EP080: Toluene | 108-88-3 | 2 | µg/L | <2 | <2 | 0.0 | No Limit |
| | | EP080: Ethylbenzene | 100-41-4 | 2 | µg/L | <2 | <2 | 0.0 | No Limit |
| | | EP080: meta- & para-Xylene | 108-38-3<br>106-42-3 | 2 | µg/L | <2 | <2 | 0.0 | No Limit |
| | | EP080: ortho-Xylene | 95-47-6 | 2 | µg/L | <2 | <2 | 0.0 | No Limit |
| | | EP080: Naphthalene | 91-20-3 | 5 | µg/L | <5 | <5 | 0.0 | No Limit |

## Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

| | | | | Method Blank (MB) Report | Laboratory Control Spike (LCS) Report | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Spike Recovery (%) | Acceptable Limits (%) | |
| Method: Compound | CAS Number | LOR | Unit | Result | Concentration | LCS | Low | High |
| **EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 5021128)** | | | | | | | | |
| EA015H: Total Dissolved Solids @180°C | ---- | 10 | mg/L | <10 | 2000 mg/L | 102 | 91.0 | 110 |
| | | | | <10 | 2440 mg/L | 107 | 81.6 | 118 |
| | | | | <10 | 293 mg/L | 98.3 | 91.0 | 110 |
| **ED037P: Alkalinity by PC Titrator (QCLot: 5020037)** | | | | | | | | |
| ED037-P: Total Alkalinity as CaCO3 | ---- | ---- | mg/L | ---- | 200 mg/L | 97.4 | 85.0 | 116 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5017732)** | | | | | | | | |
| ED041G: Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | <1 | 25 mg/L | 102 | 90.0 | 110 |
| | | | | <1 | 500 mg/L | 105 | 90.0 | 110 |
| **ED045G: Chloride by Discrete Analyser (QCLot: 5017731)** | | | | | | | | |
| ED045G: Chloride | 16887-00-6 | 1 | mg/L | <1 | 10 mg/L | 107 | 90.0 | 110 |
| | | | | <1 | 1000 mg/L | 102 | 90.0 | 110 |
| **ED093F: Dissolved Major Cations (QCLot: 5021458)** | | | | | | | | |
| ED093F: Calcium | 7440-70-2 | 1 | mg/L | <1 | 50 mg/L | 96.9 | 80.0 | 120 |
| ED093F: Magnesium | 7439-95-4 | 1 | mg/L | <1 | 50 mg/L | 101 | 80.0 | 120 |
| ED093F: Sodium | 7440-23-5 | 1 | mg/L | <1 | 50 mg/L | 97.9 | 80.0 | 120 |
| ED093F: Potassium | 7440-09-7 | 1 | mg/L | <1 | 50 mg/L | 96.3 | 80.0 | 120 |
| **EG020F: Dissolved Metals by ICP-MS (QCLot: 5021455)** | | | | | | | | |
| EG020A-F: Arsenic | 7440-38-2 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 98.4 | 89.0 | 111 |
| EG020A-F: Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0001 | 0.1 mg/L | 92.7 | 83.5 | 111 |
| EG020A-F: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 95.3 | 83.2 | 109 |
| EG020A-F: Copper | 7440-50-8 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 96.1 | 83.1 | 107 |
| EG020A-F: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 97.3 | 84.6 | 108 |
| EG020A-F: Nickel | 7440-02-0 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 95.5 | 84.3 | 110 |
| EG020A-F: Zinc | 7440-66-6 | 0.005 | mg/L | <0.005 | 0.1 mg/L | 105 | 86.3 | 112 |
| **EG035F: Dissolved Mercury by FIMS (QCLot: 5021456)** | | | | | | | | |
| EG035F: Mercury | 7439-97-6 | 0.0001 | mg/L | <0.0001 | 0.01 mg/L | 106 | 71.6 | 116 |
| **EK055G: Ammonia as N by Discrete Analyser (QCLot: 5019199)** | | | | | | | | |
| EK055G: Ammonia as N | 7664-41-7 | 0.01 | mg/L | <0.01 | 1 mg/L | 109 | 90.0 | 110 |
| **EK057G: Nitrite as N by Discrete Analyser (QCLot: 5017730)** | | | | | | | | |
| EK057G: Nitrite as N | 14797-65-0 | 0.01 | mg/L | <0.01 | 0.5 mg/L | 108 | 90.0 | 110 |

Sub-Matrix: **WATER**

| Method: Compound | CAS Number | LOR | Unit | Method Blank (MB) Report: Result | Laboratory Control Spike (LCS) Report: Spike Concentration | Spike Recovery (%): LCS | Acceptable Limits (%): Low | Acceptable Limits (%): High |
|---|---|---|---|---|---|---|---|---|
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5019198)** | | | | | | | | |
| EK059G: Nitrite + Nitrate as N | ---- | 0.01 | mg/L | <0.01 | 0.5 mg/L | 100 | 90.0 | 110 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5019002)** | | | | | | | | |
| EK061G: Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | <0.1 | 5 mg/L | 84.1 | 70.0 | 117 |
| **EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5019003)** | | | | | | | | |
| EK067G: Total Phosphorus as P | ---- | 0.01 | mg/L | <0.01 | 2.21 mg/L | 88.8 | 71.9 | 114 |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5017832)** | | | | | | | | |
| EP075(SIM): Naphthalene | 91-20-3 | 1 | µg/L | <1.0 | 5 µg/L | 94.3 | 42.8 | 114 |
| EP075(SIM): Acenaphthylene | 208-96-8 | 1 | µg/L | <1.0 | 5 µg/L | 90.0 | 48.6 | 119 |
| EP075(SIM): Acenaphthene | 83-32-9 | 1 | µg/L | <1.0 | 5 µg/L | 93.2 | 47.0 | 117 |
| EP075(SIM): Fluorene | 86-73-7 | 1 | µg/L | <1.0 | 5 µg/L | 101 | 49.5 | 119 |
| EP075(SIM): Phenanthrene | 85-01-8 | 1 | µg/L | <1.0 | 5 µg/L | 94.3 | 49.4 | 121 |
| EP075(SIM): Anthracene | 120-12-7 | 1 | µg/L | <1.0 | 5 µg/L | 93.9 | 48.4 | 122 |
| EP075(SIM): Fluoranthene | 206-44-0 | 1 | µg/L | <1.0 | 5 µg/L | 99.8 | 50.3 | 124 |
| EP075(SIM): Pyrene | 129-00-0 | 1 | µg/L | <1.0 | 5 µg/L | 100 | 50.0 | 126 |
| EP075(SIM): Benz(a)anthracene | 56-55-3 | 1 | µg/L | <1.0 | 5 µg/L | 103 | 49.4 | 127 |
| EP075(SIM): Chrysene | 218-01-9 | 1 | µg/L | <1.0 | 5 µg/L | 96.8 | 48.7 | 126 |
| EP075(SIM): Benzo(b+j)fluoranthene | 205-99-2<br>205-82-3 | 1 | µg/L | <1.0 | 5 µg/L | 95.3 | 54.5 | 134 |
| EP075(SIM): Benzo(k)fluoranthene | 207-08-9 | 1 | µg/L | <1.0 | 5 µg/L | 90.6 | 56.1 | 134 |
| EP075(SIM): Benzo(a)pyrene | 50-32-8 | 0.5 | µg/L | <0.5 | 5 µg/L | 82.8 | 55.6 | 135 |
| EP075(SIM): Indeno(1.2.3.cd)pyrene | 193-39-5 | 1 | µg/L | <1.0 | 5 µg/L | 95.4 | 54.4 | 126 |
| EP075(SIM): Dibenz(a.h)anthracene | 53-70-3 | 1 | µg/L | <1.0 | 5 µg/L | 95.5 | 54.5 | 126 |
| EP075(SIM): Benzo(g.h.i)perylene | 191-24-2 | 1 | µg/L | <1.0 | 5 µg/L | 91.3 | 54.4 | 126 |
| **EP080/071: Total Petroleum Hydrocarbons (QCLot: 5017831)** | | | | | | | | |
| EP071: C10 - C14 Fraction | ---- | 50 | µg/L | <50 | 4560 µg/L | 74.0 | 47.2 | 122 |
| EP071: C15 - C28 Fraction | ---- | 100 | µg/L | <100 | 16200 µg/L | 86.1 | 52.9 | 131 |
| EP071: C29 - C36 Fraction | ---- | 50 | µg/L | <50 | 8650 µg/L | 89.8 | 50.4 | 127 |
| **EP080/071: Total Petroleum Hydrocarbons (QCLot: 5018304)** | | | | | | | | |
| EP080: C6 - C9 Fraction | ---- | 20 | µg/L | <20 | 360 µg/L | 94.4 | 66.2 | 134 |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5017831)** | | | | | | | | |
| EP071: >C10 - C16 Fraction | ---- | 100 | µg/L | <100 | 6190 µg/L | 88.4 | 49.1 | 125 |
| EP071: >C16 - C34 Fraction | ---- | 100 | µg/L | <100 | 22200 µg/L | 84.0 | 51.6 | 128 |
| EP071: >C34 - C40 Fraction | ---- | 100 | µg/L | <100 | 1520 µg/L | 89.2 | 47.2 | 130 |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5018304)** | | | | | | | | |

Sub-Matrix: **WATER**

| Method: Compound | CAS Number | LOR | Unit | Method Blank (MB) Report: Result | Laboratory Control Spike (LCS) Report: Spike Concentration | Spike Recovery (%): LCS | Acceptable Limits (%): Low | Acceptable Limits (%): High |
|---|---|---|---|---|---|---|---|---|
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5018304) - continued** | | | | | | | | |
| EP080: C6 - C10 Fraction | C6_C10 | 20 | µg/L | <20 | 450 µg/L | 91.6 | 66.2 | 132 |
| **EP080: BTEXN (QCLot: 5018304)** | | | | | | | | |
| EP080: Benzene | 71-43-2 | 1 | µg/L | <1 | 20 µg/L | 93.3 | 68.8 | 127 |
| EP080: Toluene | 108-88-3 | 2 | µg/L | <2 | 20 µg/L | 96.7 | 72.9 | 129 |
| EP080: Ethylbenzene | 100-41-4 | 2 | µg/L | <2 | 20 µg/L | 95.6 | 71.7 | 130 |
| EP080: meta- & para-Xylene | 108-38-3<br>106-42-3 | 2 | µg/L | <2 | 40 µg/L | 94.4 | 72.3 | 136 |
| EP080: ortho-Xylene | 95-47-6 | 2 | µg/L | <2 | 20 µg/L | 97.0 | 75.9 | 134 |
| EP080: Naphthalene | 91-20-3 | 5 | µg/L | <5 | 5 µg/L | 101 | 68.3 | 131 |
| **EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5019580)** | | | | | | | | |
| EP231X: Perfluorobutane sulfonic acid (PFBS) | 375-73-5 | 0.02 | µg/L | <0.02 | 0.222 µg/L | 83.1 | 72.0 | 130 |
| EP231X: Perfluorohexane sulfonic acid (PFHxS) | 355-46-4 | 0.01 | µg/L | <0.01 | 0.228 µg/L | 94.5 | 68.0 | 131 |
| EP231X: Perfluorooctane sulfonic acid (PFOS) | 1763-23-1 | 0.01 | µg/L | <0.01 | 0.232 µg/L | 86.6 | 65.0 | 140 |
| **EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5019580)** | | | | | | | | |
| EP231X: Perfluorobutanoic acid (PFBA) | 375-22-4 | 0.1 | µg/L | <0.1 | 1.25 µg/L | 115 | 73.0 | 129 |
| EP231X: Perfluoropentanoic acid (PFPeA) | 2706-90-3 | 0.02 | µg/L | <0.02 | 0.25 µg/L | 81.4 | 72.0 | 129 |
| EP231X: Perfluorohexanoic acid (PFHxA) | 307-24-4 | 0.02 | µg/L | <0.02 | 0.25 µg/L | 84.0 | 72.0 | 129 |
| EP231X: Perfluoroheptanoic acid (PFHpA) | 375-85-9 | 0.02 | µg/L | <0.02 | 0.25 µg/L | 90.7 | 72.0 | 130 |
| EP231X: Perfluorooctanoic acid (PFOA) | 335-67-1 | 0.01 | µg/L | <0.01 | 0.25 µg/L | 91.2 | 71.0 | 133 |
| **EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5019580)** | | | | | | | | |
| EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS) | 757124-72-4 | 0.05 | µg/L | <0.05 | 0.234 µg/L | 93.3 | 63.0 | 143 |
| EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS) | 27619-97-2 | 0.05 | µg/L | <0.05 | 0.238 µg/L | 101 | 64.0 | 140 |
| EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS) | 39108-34-4 | 0.05 | µg/L | <0.05 | 0.24 µg/L | 105 | 67.0 | 138 |
| EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS) | 120226-60-0 | 0.05 | µg/L | <0.05 | 0.242 µg/L | 76.5 | 70.0 | 130 |
| **EP231P: PFAS Sums (QCLot: 5019580)** | | | | | | | | |
| EP231X: Sum of PFHxS and PFOS | 355-46-4/17<br>63-23-1 | 0.01 | µg/L | <0.01 | ---- | ---- | ---- | ---- |
| EP231X: Sum of PFAS (WA DER List) | ---- | 0.01 | µg/L | <0.01 | ---- | ---- | ---- | ---- |

## Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

| Laboratory sample ID | Sample ID | Method: Compound | CAS Number | Matrix Spike (MS) Report: Spike Concentration | SpikeRecovery(%): MS | Acceptable Limits (%): Low | Acceptable Limits (%): High |
|---|---|---|---|---|---|---|---|

Sub-Matrix: **WATER**

| | | | | Matrix Spike (MS) Report | | | |
|---|---|---|---|---|---|---|---|
| | | | | Spike | SpikeRecovery(%) | Acceptable Limits (%) | |
| *Laboratory sample ID* | *Sample ID* | *Method: Compound* | *CAS Number* | *Concentration* | *MS* | *Low* | *High* |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5017732)** | | | | | | | |
| EM2307404-001 | Anonymous | ED041G: Sulfate as SO4 - Turbidimetric | 14808-79-8 | 100 mg/L | 105 | 70.0 | 130 |
| **ED045G: Chloride by Discrete Analyser (QCLot: 5017731)** | | | | | | | |
| EM2307404-001 | Anonymous | ED045G: Chloride | 16887-00-6 | 400 mg/L | 103 | 70.0 | 142 |
| **EG020F: Dissolved Metals by ICP-MS (QCLot: 5021455)** | | | | | | | |
| EM2307253-001 | Anonymous | EG020A-F: Arsenic | 7440-38-2 | 0.2 mg/L | 88.7 | 76.6 | 124 |
| | | EG020A-F: Cadmium | 7440-43-9 | 0.05 mg/L | 89.2 | 74.6 | 118 |
| | | EG020A-F: Chromium | 7440-47-3 | 0.2 mg/L | 90.7 | 71.0 | 135 |
| | | EG020A-F: Copper | 7440-50-8 | 0.2 mg/L | 89.8 | 76.0 | 130 |
| | | EG020A-F: Lead | 7439-92-1 | 0.2 mg/L | 90.0 | 75.0 | 133 |
| | | EG020A-F: Nickel | 7440-02-0 | 0.2 mg/L | 86.6 | 73.0 | 131 |
| | | EG020A-F: Zinc | 7440-66-6 | 0.2 mg/L | 91.1 | 75.0 | 131 |
| **EG035F: Dissolved Mercury by FIMS (QCLot: 5021456)** | | | | | | | |
| EM2307392-001 | Anonymous | EG035F: Mercury | 7439-97-6 | 0.01 mg/L | 92.7 | 70.0 | 120 |
| **EK055G: Ammonia as N by Discrete Analyser (QCLot: 5019199)** | | | | | | | |
| EM2307410-003 | BH10_270423 | EK055G: Ammonia as N | 7664-41-7 | 2 mg/L | # 152 | 70.0 | 130 |
| **EK057G: Nitrite as N by Discrete Analyser (QCLot: 5017730)** | | | | | | | |
| EM2307404-002 | Anonymous | EK057G: Nitrite as N | 14797-65-0 | 0.5 mg/L | 95.0 | 80.0 | 114 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5019198)** | | | | | | | |
| EM2307410-003 | BH10_270423 | EK059G: Nitrite + Nitrate as N | ---- | 0.5 mg/L | 91.2 | 70.0 | 130 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5019002)** | | | | | | | |
| EM2307300-001 | Anonymous | EK061G: Total Kjeldahl Nitrogen as N | ---- | 5 mg/L | 79.6 | 70.0 | 130 |
| **EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5019003)** | | | | | | | |
| EM2307300-001 | Anonymous | EK067G: Total Phosphorus as P | ---- | 1 mg/L | 95.0 | 70.0 | 130 |
| **EP080/071: Total Petroleum Hydrocarbons (QCLot: 5018304)** | | | | | | | |
| EM2307427-002 | Anonymous | EP080: C6 - C9 Fraction | ---- | 280 µg/L | 81.8 | 33.9 | 126 |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5018304)** | | | | | | | |
| EM2307427-002 | Anonymous | EP080: C6 - C10 Fraction | C6_C10 | 330 µg/L | 76.2 | 34.0 | 122 |
| **EP080: BTEXN (QCLot: 5018304)** | | | | | | | |
| EM2307427-002 | Anonymous | EP080: Benzene | 71-43-2 | 20 µg/L | 97.6 | 56.3 | 133 |
| | | EP080: Toluene | 108-88-3 | 20 µg/L | 99.1 | 60.4 | 132 |